

**UNIVERSITY OF ENGINEERING & MANAGEMENT, KOLKATA**



**University Area, Plot No. III – B/5, New Town  
Action Area – III, Kolkata – 700 156**

**ABSTRACT OF THE PAPERS  
PUBLISHED BY THE  
FACULTY IN JOURNALS**

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**ABSTRACT OF THE PAPERS  
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## **1. Classification of Indian Classical Music with Time-Series Matching using Deep Learning**

**Akhilesh Kumar Sharma, GauravAggarwal, SachitBhardwaj, PrasunChakrabarti, Anirban Das**

### **Abstract**

Music is a heavenly way of expressing feelings about the world. The language of music has vast diversity. For centuries, people have indulged in debates to stratisfy between Western and Indian Classical Music. But through this paper, an understanding can be fabricated while differentiating the types of Indian Classical Music. Classical music is one of the essential characteristics of Indian Cultural Heritage. Indian Classical Music is divided into two major parts, i.e. Hindustani and Carnatic. Models have been sculptured and trained to classify between Hindustani and Carnatic Music. In this paper, two approaches are used to implement classification models. MFCCs are used as features and implemented models like DNN (1 Layer, 2 Layers, 3 Layers), CNN (1 Layer, 2 Layers, 3 Layers), RNN-LSTM, SVM (Sigmoid, Polynomial & Gaussian Kernel) as one approach. A 3 channels input is created by merging features like MFCC, Spectrogram and Scalogram and implemented models like VGG-16, CNN (1 Layer, 2 Layers, 3 Layers), ResNet-50 as another approach. 3 Layered CNN and RNN-LSTM model performed best among all the approaches.

IEEE Access, DOI: 10.1109/ACCESS.2021.3093911, Print ISSN: 2169-3536 Online ISSN:2169-3536

## **2. Early detection of Heart Disease by using the most significant factors of Diabetes using Data Mining Techniques**

**Avijit Kumar Chaudhuri, Dr. AnirbanDas,Dr. DeepankarSinha, Dr. Dilip K. Banerjee**

### **Abstract-**

Medical science is witnessing high levels of specialization with doctors specializing in specific areas, say, heart disease (HD), diabetes, nephrology, and the like. In the process, patients have to make multiple visits for treatment of simultaneous ailments. Studies show that there is overlap in causes of different diseases. One such co-existence is observed in patients with diabetes suffering from HD too. In many cases, one precedes the other. Hence, it is worth diagnosing that a patient having a particular ailment is likely to develop another. Artificial Intelligence and machine learning methods are widely used in healthcare. There are few references to such work using data mining approaches. HD is a primary cause of death worldwide. Studies show that diabetes patients also have HD. This paper aims to identify the association and common risk factors between diabetes and HD - this finding aid in anticipating the HD of a diabetic patient. The authors use proven data mining approaches - logistics regression, decision tree, and random forest to arrive at the most accurate results. The validation is done using unsupervised method: K-means Clustering. The initial investigation demonstrates that body-mass-index (BMI) and age are among the key risk factors for diabetes; and smoking habit, age, gender-male and diabetes (glucose level) lead to HD. 31% of diabetic patients had HD.

Asian Journal For Convergence In Technology (SCOPUS),2021, Vol:7(1), 168-178. ISSN: 2350-1146

## **3. A novel enhanced decision tree model for detecting chronic kidney disease**

**AvijitChaudhuri, DeepankarSinha, Dilip K. Banerjee, Anirban Das**

### **Abstract-**

Prediction of diseases is sensitive as any error can result in the wrong person's treatment or not treating the right patient. Besides, some features distinguish a disease from curable to fatal or curable to chronic disease. Data mining techniques have been widely used in health-related research. The researchers, so far, could attain around 97 percent accuracy using several methods. Some researchers have demonstrated that the selection of correct

features increases the prediction accuracy. This research work propose a method to distinguish between chronic and non-chronic kidney disease, identify its crucial features without reducing the accuracy of prediction, and a prediction algorithm to eliminate the possibility of under or overfitting. This study uses the recursive feature elimination (RFE) method that selects an optimal subset of features and an ensemble algorithm, the enhanced decision tree (EDT), to predict the disease. The results obtained in this paper show that the accuracy level of EDT is not changed with the removal of less significant features, thus enabling the decision-makers to concentrate on few features to reduce time and error of treatment. EDT establishes substantially high consistency in predicting, with or without feature selection, the disease.

Network Modeling Analysis in Health Informatics and Bioinformatics Vol:10, No. 29, 2021, (2021). <https://doi.org/10.1007/s13721-021-00302-w> (ESCI, SCOPUS), ISSN: 2192-6670

#### **4. Application of data mining techniques for avoiding underestimation of an event**

**Avijit Chaudhuri, Deepankar Sinha, Anirban Das**

##### **Abstract-**

Medical records comprise varied data types; artificial intelligence and data-mining methods (DMTs) are useful to draw insights and patterns. Several scholars claim that there is no universal way of addressing diagnosis issues, and a mixed model is desirable to resolve these concerns. In this paper, the authors compare the proven approaches and propose a framework to integrate the findings from various techniques to evade Type 2 and Type 1 errors. The dataset chosen for this purpose includes medical data on HPV disease. Two sets of dataset – disease and treatment dataset and features found significant from ensemble method – the random forest were used and to predict the disease. The results show that traditional methods such as Logistic Regression (LR) performed better with features found significant using Random Forest (RF). However, this approach fails when the dichotomy of data (i.e., disease or no disease) is not distinct. Decision Tree (DT) analysis shows consistent performance across all variants of the dataset chosen in this paper. The paper suggests an amalgamation of association rules and a prediction approach (with or without integration) that provides higher accuracy.

Asian Journal For Convergence In Technology (SCOPUS), 2021, Vol:7(1), 179-189. ISSN: 2350-1146

#### **5. Early Detection of Cardiovascular Disease in Patients with Chronic Kidney Disease using Data Mining Techniques**

**Avijit Kumar Chaudhuri, Arkadip Ray, Anirban Das, Prasun Chakrabarti, Dilip K. Banerjee**

##### **Abstract**

A constant obstacle for doctors is the high prevalence of cardiovascular disease (CVD) in patients with chronic kidney disease (CKD). Increasing efforts have been made to jointly treat patients with heart and kidney disease, as shown by an increasing number of basic research and clinical investigations concerning CVD in CKD. Typical risk factors for CVD are common in CKD, such as age, blood pressure (bp), hypertension (htn), and blood sugar (sg). Standard risk factors tend to be the major contributors to CVD in patients with mild to moderate CKD. However, in patients with advanced CKD, non-traditional CKD-specific risk factors (e.g. Potassium level in blood) are more prevalent than in the general population, contributing, in addition to traditional risk factors, to the high burden of CVD in CKD. However, in patients with CKD, CVD often remains underdiagnosed and undertreated. Nevertheless, CVD still remains under control and care in patients with CKD. Researchers in this paper aims to predict the probability of CVD from CKD by using various popular data mining techniques and definitively propose a decision tree and by using Random Forest analysis to test its specificity and sensitivity to achieve concrete results with sufficient precision.

Asian Journal For Convergence In Technology (SCOPUS), 2021, 6(3), 65-76

## **6. Character Segmentation for Handwritten Bangla Words using Image Processing**

**PoojariniMitra, KaustavBhattacharjee, Anirban Das, Sayan Kumar Dey, DeepjyotiChakraborty, AritraGhosal, ShadabAkhtar**

### **Abstract-**

Character segmentation has long been a critical area of the OCR process. The higher recognition rates for isolated characters vs. those obtained for words and connected character strings well illustrate this fact. A good part of recent progress in reading unconstrained printed and written text may be ascribed to more insightful handling of segmentation. To take care of variability involved in the writing style of different individuals in this paper we propose a robust scheme to segment unconstrained handwritten Bangla texts into lines, words and characters. For line segmentation, at first, we divide the text into vertical stripes. Stripe width of a document is computed by statistical analysis of the text height in the document. Next we determine the horizontal histogram of these stripes and the relationship of the minimal values of the histograms is used to segment text lines. Based on vertical projection profile lines are segmented into words. Segmentation of characters from handwritten words is very tricky as the characters are seldom vertically separable. Segmentation of cursive handwriting is the challenging step of Optical Character Recognition (OCR). The recognition accuracy will highly depend on the good segmentation. Segmentation of cursive handwriting is very difficult. The segmentation can be done on the basis of zoning, a line segment of text, a word segment from line and character segment from word. This can be done by the use of horizontal, vertical methods. This paper reviews many basic and advanced techniques of handwritten word segmentation.

American Journal of Electronics & Communication (AJEC), Vol. 1, Issue 3, Pp. 8 - 11. May 2021. ISSN: 2690-2087

## **7. A Large Software System Test Engineering Practices**

**BiswadebBandyopadhyay**

### **Abstract**

The following Paper describes the experiences of a test engineering team, which had worked with a large software product development and support activity. This team has studied the existing software product, available test tools, test environment, with an objective of analyzing existing testing processes and methodologies for this large software product. The Paper discusses a number of initiatives and recommendations made by this test engineering group aimed at increasing the testing efficiency, optimizing the test suites, measuring and improving effectiveness of test cases and the quantifiable benefits and process improvements, that can derived from such initiatives. This activity was undertaken as part of a test engineering initiative to bring in place a set of innovative test engineering practices as potential business value drivers.

AMERICAN JOURNAL OF ADVANCED COMPUTING (AJAC), Vol 1, Issue 3, 18.08.2020

## **8. Ticket Analytics by an AMS Team to Assess Applications Deficiencies**

**BiswadebBandyopadhyay**

### **Abstract**

The paper discusses a Ticket Analytics undertaken by an Application Maintenance and Support (AMS) team engaged in providing end to end Application Maintenance and Support services of large number of applications performing a host of operational, tactical and strategic functions of the organization. The team has been providing AMS support of these applications for the last two years very efficiently with almost 100% compliances of all applicable SLAs. The team gained considerable knowledge of the applications and have been credited with solving some of the most critical and challenging production problems. Client has expressed their deep appreciation of the work being done by the AMS team from time to time.

However, client has of late expressed a desire to know more about nature of production incidents and have a better understanding of these applications in terms of their nature of defects to unearth certain fundamental characteristics of these applications. Client therefore wanted the AMS team to delve into the defects that have

uncovered so far and carry out a comprehensive analysis of those defects (production incidents) to bring out certain very fundamental characteristics of those applications in terms of nature of future problems they may throw up in their operational life. Idea was to undertake a comprehensive analytics of the production tickets that were created in those applications and come up with a set of predictions of problems those applications may throw up in future. With this knowledge in place, client in addition wanted the team to make suitable recommendations to alleviate those future problems by initiating appropriate corrective and preventive measures.

AMERICAN JOURNAL OF ADVANCED COMPUTING OF ELECTRONICS & COMMUNICATION (AJEC), Vol 1, Issue 3, 28.05.2021

## **9. Review on Sensors for Emotion Recognition**

**StobakDutta, AnirbanMitra, NeelamadhabPadhy, Gitosree Khan**

### **Abstract-**

Emotions have an essential role in our life in a daily basis. Emotions play an important role not only in the case of human interaction in our daily life but also in the process of decision making. Emotions also change our perception of the outer world. These emotions are sometimes initially supposed as irrelevant. However, a small change in emotion can bring a huge change of behavior. Emotion recognition with the help of physiological signal is an area of research nowadays. This paper is based on a wide-ranging review of biological signal-based emotion recognition. Many methodologies for recognition of human emotional states in an automated way are proposed in different articles. Most of them using physiological signals such as galvanic skin response (G.S.R.), electrocardiogram (E.C.G.), electroencephalogram (E.E.G.), electromyogram (E.M.G.), photoplethysmogram (P.P.G.), respiration, skin temperature, etc. In this paper, the researchers are going to present a comprehensive review of emotion recognition on the basis of the physiological signal and proposed a workflow for identifying several emotional analyses using different physiological signals to make the accuracy and performance much better.

Lecture Notes on Data Engineering and Communications Technologies, vol 63. Springer, Singapore. [https://doi.org/10.1007/978-981-16-0081-4\\_57](https://doi.org/10.1007/978-981-16-0081-4_57)

## **Department of Business Administration**

10. Tests of the Fama and French Three Factor Model with reference to Industry Cost of Equity : Evidence from India, Finance India, SmitaDatta&AninditaChakraborty, XXXIV(2), 379 – 394. (ISSN: 0970-3772)

### **Tests of the Fama and French Three Factor Model with reference to Industry Cost of Equity : Evidence from India**

**SmitaDatta, AninditaChakraborty**

#### **Abstract**

In this article the performance of the CAPM and the Fama and French three factor model in the Indian context has been re-evaluated and compared by employing industry portfolio as test assets. In addition, the possibility of developing a more parsimonious model has been explored. While the CAPM fails to explain the cross section of excess industry returns, the three factor model succeeds in this task. Also, no evidence has been found in support of the claim that a two factor model comprising of market and size factors provides a more parsimonious description of stock return in the Indian context. The study reveals that eight out of mini industry portfolios earn statistically significant average monthly excess returns. The study period considered for testing is October 2002 to September 2016.

Finance India, 34(2), Pg 379-394 (2020)

11. A Comparison of Traditional and Alternative Three Factor Asset Pricing Models in India, SmitaDatta&AninditaChakraborty, GIS Science Journal, 8(1), 1270 – 1288. (ISSN: 1869-9391)

### **A Comparison of Traditional and Alternative Three Factor Asset Pricing Models in India**

**SmitaDatta, AninditaChakraborty**

#### **Abstract**

In this paper the performance of the alternative three factor model (Chen et al., 2011) in pricing Indian equities has been compared to that of the traditional three factor model Fama and French (1993). The study is based on a sample comprising the S & P BSE 500 index and covers a fifteen years time period- from October 2001 to September 2016. A set of nine industry test portfolios has been employed for judging the relative performance of the two three factor models. Two key findings have been documented. First, the explanatory factors comprising the alternative three factor model in the Indian sample exhibit properties similar to the ones shown by these factors in the international, developed and emerging market samples and different from those exhibited by these factors in the U.S. and European Union markets. Second, traditional three factor model outperforms the alternative one.

GIS Science Journal, 8(1), 1270 – 1288 (2021)

12. Revisiting Marketing Management Teaching Pedagogy: A Study based on the voice of Indian Marketing professionals. Bhattacharya, S. Kumar V. R. and Chattopadhyay, S FIIB Business Review, SAGE Publications (This journal is indexed in SCOPUS, ABI Inform, EBSCO, UGC), May 2021

**Revisiting Marketing Management Teaching Pedagogy: A Study based on the voice of Indian Marketing professionals.**

**Subhajit Bhattacharya, Rohit Vishal Kumar, Subrata Chattopadhyay**

**Abstract**

Marketing management is one of the practical-oriented subjects in management education, which is very dynamic. In this changing and newly emerging business and marketing ecosystem, the challenge of marketing teaching pedagogy is increasing day by day. In marketing management teaching pedagogical research, there is a scarcity of integrated blended framework consisting of teaching technology and augmented learning exposure in supporting classroom teaching methodology. The study attempts to identify how various factors like theoretical knowledge, practical orientation, teaching technology and augmented learning can impact marketing management education's learning outcome in the Indian context. Current research has also tried developing and examining a structured framework that may strengthen the classroom teaching environment. This article is based on empirical data of 693 marketing and sales professionals who are mostly alumni from topmost Indian B-schools. Exploratory factor analyses and structural equation modelling, and path analysis are being done to test the conceptual research model. The results of this article demonstrate how contemporary integrated classroom teaching can boost the marketing management learning outcomes with a proper blend of augmented learning exposure, out-of-class exercises and teaching technology in an Indianized way.

FIIB Business Review, May 2021, <https://doi.org/10.1177/23197145211006961>

13. A study of the adaptation to innovative online teaching learning pedagogy by stakeholders in Covid times. Indian Journal of Ecology, Dr. Subrata Chattopadhyay and Arunava Dalal, Volume - 18, Special Issue 14, April 2021. (ISSN 0304-5250, indexed in SCOPUS)

**A Study of the Adaptation to Innovative Online Teaching-Learning Pedagogy by Stakeholders in Covid Times**

**Subrata Chattopadhyay, Arunava Dalal**

**Abstract**

Advancement in technology has been a boon for mankind. It has helped in all segments and industries and the educational sector is no different. There have been new modes of delivering education, engaging with the learners, and enriching the learners' knowledge through the use of technology. The Covid-19 pandemic and the subsequent lockdowns that were implemented across many countries only helped in accelerating the adaption of these new technologies bringing in an innovative online teaching-learning pedagogy. The necessity of continuing with the education process and enhancing knowledge during a lockdown situation has led to a spectacular awareness of online education. This paper looks into the impact of online education from the students' perspective, they being the main recipients of this process, and the views of the faculties who are the enablers. It also tried to understand the effects that the external ecosystem consisting of technology partners, content developers, and the organizations in the online education sector have in developing the online teaching-learning process. The paper through primary research has looked



into the benefits and drawbacks of this education model, the learning which can be used in the future to make this an innovative teaching-learning methodology even post the Covid-19 era.

Indian Journal Of Ecology, Volume 48 (14) Special Issue, pp 89-93 (2021)

14. Impact of Employee Demography, Family Responsibility and Perceived Family Support on Career Resilience, Sujata Bose, Global Business Review – August 2020 (ISSN: 0973 0664)  
Impact of Employee Demography, Family Responsibility and Perceived Family Support on Workplace Resilience

**Sujata Bose, Durba Pal**

### **Abstract**

Resilience at workplace has been identified as an essential attribute of employees which enables them to cope with challenges associated with the changing nature of modern businesses. Among the work and non-work factors that add up to these challenges for employees, family responsibility features as a very crucial factor that also plays a significant role in an employee's career-related choices and outcomes. This study examines the impact of family responsibilities and perceived family support on an employee's workplace resilience, probing further into their interaction effect. It also examines the effect of three demographic variables, namely employee's age, gender and marital status on workplace resilience. Data were collected from more than 200 professionals from one of the major metropolises in India. The results show that the employee's age has a significant main effect on workplace resilience. Multiple regression with interaction effect reveals that while family responsibility and perceived family support have a significant main effect, their interaction effect is insignificant.

Global Business Review, 21(5), 1249-1262.(2020)

15. Challenges Encountered by Healthcare Providers in COVID-19 Times: An Exploratory Study, Journal of Health Management, MitaliSengupta, Arijit Roy, ArnabGanguly, KuldeepBaishya, SatyajitChakrabarti, IndraneelMukhopadhyay, SAGE Publications, 15 June 2021. (This journal is indexed in SCOPUS, ESCI, EBSCO, UGC), <https://doi.org/10.1177/09720634211011695>

### **Challenges Encountered by Healthcare Providers in COVID-19 Times: An Exploratory Study**

**MitaliSengupta, Arijit Roy, ArnabGanguly, KuldeepBaishya, SatyajitChakrabarti, IndraneelMukhopadhyay**

### **Abstract**

Healthcare establishments are unique and complex. The Indian healthcare system comprises of public and private healthcare establishments. Different challenges are encountered by the healthcare professionals in their daily operations. The sudden emergence of COVID-19 posed a new threat to the already burdened healthcare system. The pandemic changed the healthcare paradox with newer workplace and societal challenges faced by the healthcare personnel. The purpose of this study is to identify the antecedents of workplace and societal challenges faced by the healthcare personnel.

Our study conducted in Kolkata and other adjoining areas of West Bengal included respondents who volunteered for individual in-depth interviews. The sample size was kept at  $n = 20$  after due technical considerations. Freelisting and pile sorting was done to generate clusters.

The qualitative study identified five constructs with 18 items under workplace challenges and three constructs with five items under societal/community challenges. Workplace challenges included resource availability, adequacy and allocation, financial issues, perceived managerial ineffectiveness, inconsistent guidelines and perceived occupational stress, while societal/community challenges included dread disease, social adaptiveness and challenges related to essential services. A salience threshold was established and the multidimensional scaling provided four major clusters: financial support and sustainability, adaptive resilience, infection risk mitigation and healthcare facility preparedness.

Suggestive actions for the identified challenges were summed as enhanced production of diagnostic kits through public-private partnership models and industrial production reforms. Enhanced testing facility for COVID-19 will help to identify new cases. Financial stresses need long-term sustainable alternative that will avoid pay cuts and unemployment. Treatment regimen, diagnostic protocols, waste disposal guidelines should be worked upon and leading national agencies be consulted for technical support, research and development.

Journal of Health Management, Volume: 23 issue: 2, page(s): 339-356, 2021

16. Waiting time: The expectations and preferences of patients in a paediatric OPD. Journal of Health Management, 21(3), 427-442.(2019). Sengupta, M., Chakrabarti, S., & Mukhopadhyay, I. (This journal is indexed in SCOPUS, ESCI, EBSCO, UGC), <https://doi.org/10.1177/0972063419868586>

## **Waiting Time: The Expectations and Preferences of Patients in a Paediatric OPD**

**Mitali Sengupta, Satyajit Chakrabarti, Indraneel Mukhopadhyay**

### **Abstract**

Quality healthcare and satisfaction are gradually emerging as important areas, which need much attention. The factors of patient satisfaction have been identified under varied conditions globally. In the Indian context, one key patient satisfaction factor has been attributed to waiting time. Long waiting time has been one of the major reasons of patient dissatisfaction and assumes significance when associated with paediatric events. The following study has successfully identified key attributes, which are associated with long waiting times within paediatric outpatient department (OPD) settings. The possible implications of the long waiting periods have been recorded through semi-structured interviews, and further in-depth analysis of individual factors were carried out to predict the probable outcomes.

The qualitative exploratory study design has helped to understand the perception of parents/care givers (in case of neonates and toddlers) and adolescents, thereby successfully highlighting the need for further study in the patient satisfaction domain involving paediatric population. The various implications which the waiting time has on them have been taken into consideration. The inter-related themes have been identified after analysing the interviews. These substantiate the fact that designing innovative mitigation strategies on proper and timely communication, updated technological know-how, improvising hospital protocols for better operational processes and coordination among the staff can go a long way in enhancing the patient/parent experience within OPD settings.

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## Department of LAW

17. ARTICLE : An Effort to Unveil the Best Test on Criminal Attempt - Decoding Judicial Interpretations of India, UK and USA, Roy, Souvik, PalArch's Journal of Archaeology of Egypt/ Egyptology, PalArch Foundation, E-ISSN: 1567-214X, – [Vol. 17 No. 7 (02/12/2020) PalArch's Journal of Archaeology of Egypt/ Egyptology ISSN: 1567-214X] as a first author-Scopus, Scimago, Google Scholar Indexed.

### **An Effort to Unveil the Best Test on Criminal Attempt - Decoding Judicial Interpretations of India, UK and USA**

Souvik Roy, N.K. Chakrabarti, Arpita Mitra

#### **Abstract**

The topic on 'An Effort to Unveil the Best Test on Criminal Attempt - Decoding Judicial Interpretations of India, UK and USA' relates to the intriguing, enigmatic and a grey area of criminal law. Under the Indian Penal Code 1860; attempt has been put forth as a substantive penal provision in more ways than one. This work aims to find out the best possible test (s) which the judiciary can undertake and also, mostly applies in solving cases pertaining to attempted crimes by way of a work based upon a study of 100 cases by way of Mixed (Qualitative and Quantitative) Content Analysis whereby, the researcher have tried to systematically decode the approach involved in the judicial decisions of some of the leading cases and relate the same with the existing rules and tests pertaining to the topic to derive the best possible, logical and most frequently used test(s).

Journal of Archaeology of Egypt/ Egyptology Vol. 17 No. 7 (02/12/2020) PalArch's ISSN: 1567-214X

18. Legal Protection to tackle employment deficiencies in the Govt Sector during COVID-19, Mazumdar, Mehendi, International Journal of Legal Enforcement Journal-, June 2021

### **LEGAL PROTECTION TO TACKLE EMPLOYMENT DEFICIENCIES IN INDIAN GOVERNMENT SECTOR DURING COVID-19**

Mehendi Mazumdar

#### **ABSTRACT:**

The COVID-19 pandemic has pushed the world into an extra-ordinary hardship and uncertainty, calling to accelerate the implementation of the Centenary Declaration. It called upon constituents to pursue 'with implacable capability its International Labour Organization's (ILO) constitutional mandate for social justice by further developing its human centred approach to the future of work'. It called for putting workers' rights, the needs, aspirations and rights of all people at the heart of economic, social and environmental policies. The International community and ILO's constituents have engaged in a collective effort to tackle the devastating human impact of the pandemic, but more is needed.

International Journal of Legal Enforcement, Pages 1-15 (2021)

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## 19.A compact polarization reconfigurable stacked microstrip antenna for WiMAX application

MurariShaw,NiranjanMandal andMalayGangopadhyay

### Abstract

In this paper, a stacked microstrip patch antenna with polarization reconfigurable property has been proposed for worldwide interoperability for microwave access (WiMAX) application. The proposed antenna has two substrate layers: upper and lower layers with two radiating patches connected with the coaxial probe. Without the upper layer the lower square-shaped substrate layer having regular hexagonal radiating patch with probe fed acts as a linear polarized antenna with impedance bandwidth for ( $S_{11} \leq -10$  dB) is 370 MHz 10.56% (3.32–3.69 GHz) cover WiMAX (3.4–3.69 GHz) application band. The hexagonal radiating patch is perturbed with an optimum rectangular slot to enhance the impedance bandwidth of the antenna. The lower substrate layer having hexagonal patch with the same probe position is stacked with the upper square-shaped substrate layer with same sized square patch and the upper patch soldered with the coaxial probe. The overall stacked antenna generates a circularly polarized band when the opposite corner of the top square radiating patch of the upper layer is truncated with optimum size. In order to generate another circularly polarized band and to improve the input impedance matching of the stacked antenna, the top radiating patch is perturbed with two slots and a slit. The stacked circularly polarized antenna generates impedance bandwidth of 12.75% (3.23–3.67 GHz) for ( $S_{11} \leq -10$  dB) with two circularly polarized bands (3.34–3.37 GHz) and (3.66–3.70 GHz) as per (axial ratio  $\leq 3$  dB) for WiMAX application. Therefore, the proposed antenna can be used as linearly polarized or dual band circularly polarized according to requirement.

International Journal of Microwave and Wireless Technologies, (SCI), pp. 1-16 January 2021

## 20. A compact circularly polarized isosceles triangular microstrip patch antenna with parasitic elements for multiband application

Murari Shaw, NiranjanMandal and Malay Gangopadhyay

### Abstract

In this research paper, a isosceles triangular radiating patch with two triangular coplanar parasitic elements has been used to design a compact circularly polarized (CP) microstrip patch antenna that can be used for (2.320-2.345 GHz) satellite digital audio radio systems (SDARS), (2.30-2.39 GHz) wireless broadband (WiBro), LTE 2300 (2.3-2.4 GHz), and WIMAX (2.50-2.69 GHz) application band. Corners of the two parasitic element along with a portion of driver patch has been cut and optimize to obtain CP characteristics of the antenna with broadside radiation pattern. A slot is also introduced and optimized on the radiating patch to improve the impedance matching. Frequency band generated by the antenna is (2.09-2.64 GHz) having impedance bandwidth of ( $S_{11} \leq -10$  dB) 550 MHz 23.25% and two 3-dB axial ratio (AR) bandwidth of 5.1% (2.29-2.41GHz) and 1.54% (2.58-2.62 GHz). The size of proposed antenna is  $56 \times 52 \times 3.2 \text{ mm}^3$  in which, FR4 material has been used as dielectric substrate and thin copper plate as radiating patch and ground. Before physical fabrication, HFSS ver13 software has been used to design and analyzed the proposed antenna. It has been found that the measured results of fabricated antenna and simulated results are closely matching.

Microwave and Optical Technology (SCI), Vol.60, No.10, pp. 3275 -3282, January 2021

## **21. A low profile miniaturized circular microstrip patch antenna for dual band application**

**Murari Shaw, Niranjana Mandal and Malay Gangopadhyay**

### **Abstract**

A low profile Circular Microstrip Patch Antenna (CMPA) with radius 5 mm has been designed to generate two resonant frequency bands that can be used for WLAN 5.2 (5.15–5.25) GHz, Wi-Fi (5.725–5.850) GHz and Dedicated Short-Range Communications (DSRC) (5.85–5.925) GHz application bands. The designed antenna has been slitted with two slits and a stub has also been attached resulting in an additional resonant band alongside the primary resonant band. Also, primary resonant frequency shifted from 7.22 GHz to 5.87 GHz yielding about 18.7% antenna miniaturization. Frequency bands generated by the designed antenna are (5.15–5.25) GHz and (5.71–6.01) GHz having peak gain 2.3 and 4.9 dB with broadside radiation pattern. A square shape FR4 substrate having dimension 32×32×3.2 mm<sup>3</sup> and very thin copper sheet for radiating patch and ground has been used in the proposed antenna, which can fulfill the requirement of smaller antenna with dual band application. Simulation software HFSS ver.13 has been used to design and analyze the proposed antenna. Very good matching has been obtained between simulated and measured results.

Frequenz (SCI) Vol.74, No. 9-10, pp. 333 -349, February 2021

## **22. A Predictable Active Queue Management to reduce sensitivity of RED parameters**

**Soamdeep Singha, Biswapati Jana and Niranjana Kumar Mandal**

### **Abstract**

The basic philosophy behind RED is to prevent congestion. When the average queue length exceeds the minimum threshold, packets are randomly dropped, or the explicit congestion notification bit is marked. To overcome the problem in RED without changing queue weight parameter, we have proposed three models to control the congestion by introducing range parameter with probability and control mechanism which will belong between minimum and maximum threshold. The current queue size is controlled together with average queue size. A new range variable has been introduced to improve the performance of priority queue of existing RED based algorithm which improves the overall performance of networks. For each packet, minimum and maximum threshold has been updated and dropped with probability ( $P_a$ ) for a special condition. Instead of multiplicative increase and decrease the maximum probability, the scheme uses additive-increase and multiplicative-decrease. Once the AVG queue length is close to the minimum threshold value, our approach automatically sets queue parameter according to queue conditions and handles queuing delay and improve throughput. The simulated results prove that our approaches are better than RED in terms of throughput, end to end delay, packet delivery ratio and goodput.

International Journal of Engineering & Technology, Science Publishing Corporation, Dubai, First Available Online: April 2021

## **23. Effect of TCO, BSF and Back contact barrier on CDs/ CdTe solar cell: Modelling and Simulation**

**K. Sarkar, K. K. Ghosh, Niranjana Kumar Mandal**

### **Abstract**

We have commenced an in-depth study through modeling and simulation to investigate the performance of a CdTe solar cell at different Schottky barrier heights for different combinations thicknesses of BSF as well as window layer and front contact oxide layer (TCO). The inter relation between BSF layer and back contact Schottky barrier height has been focused. Effect of the BSF layer regarding the tunneling of charges has been investigated. In the present

paper, we achieved in our study the highest  $\eta$  of 18.39%, Voc of 0.591 volt, Isc of 0.411 amp for 0.1  $\mu\text{m}$  absorber and 1nm BSF layer thickness in presence of higher schottky barrier (0.6eV) with higher doping concentration of absorber layer. Thinning of the layers have always been better in terms of performance and cost. But it brings pinhole formation problems what we excluded here in our present work

J.Mech.Cont.& Math. Sci., Vol.-13, No.-1, March – April (2018) Pages 128-140, Published online March 2021

## **24. Design of Encoder circuit using Layered NAND and NOR gates in Quantum Dot Cellular Automata**

**RatnaChakrabarty and Niranjana Kumar Mandal**

### **Abstract**

Quantum dot cellular automata or QCA represents a new methodology of quantum computing with the potential for higher performance over existing devices. It adds necessary features such as enhanced speed, smaller size and lower power consumption in comparison to existing CMOS based technology. Based on this study the proposed paper designed three different kinds of encoder circuits using QCA technology. Following paper used layered 2-input NAND gate and NOR gates to design 4 to 2 encoder, priority encoder and octal to binary encoder circuits. The paper also showed the cell count, area, length, breadth & latency calculations for the designed encoder circuits. Proposed circuits are compared with the previously suggested designs in terms of area consumption and cell count. All the circuits designed without majority gate circuit. Potential energy for the designed circuits also calculated to check the stable output and reliability of the circuits.

Int. J. Nanosci. Nanotechnol., Vol. 17, No. 1, March 2021, pp. 11-21



## **Department of Bio Technology**

25. Analyzing the concentration of bioactive molecules in hydroponically grown plants, Mukherjee, Susmita, Paul Sonali, International Journal of Agricultural Sciences and Veterinary Medicine. 2021. 9: 10-14

### **Analyzing the concentration of bioactive molecules in hydroponically grown plants**

**Susmita Mukherjee, Sonali Paul**

#### **Abstract**

Hydroponics is a newly emerging concept of soil less cultivation of plants. In our current study, two common seasonal plants - Capsicum annum and Foeniculum vulgare having different nutritional and economical benefits were grown by the hydroponic system and compared with the traditional system of growing plants in soil. It was found from our work that both the plants grown by the hydroponic system showed faster growth rate and higher yield. A detailed analyses of the phytonutrient concentrations were done which revealed that all the principal bioactive molecules were significantly enhanced in the hydroponically grown plants as compared with the plants grown in soil pots. From the current work, we can conclude that hydroponics will be the forefront of horticulture as it will lead to naturally nutritionally enhanced produce in an economically viable methodology.

International Journal of Agricultural Sciences and Veterinary Medicine. 9, Pg: 10-14 (2021)

26. Adulteration in Spices – A Threat to Human Health and Well Being., Mukherjee, Susmita, Paul Sonali, American Journal of Applied Biotechnology Research. 2020. 3: 25-28.

### **Adulteration in Spices – A Threat to Human Health and Well Being**

**Susmita Mukherjee, Sonali Paul**

#### **Abstract**

Spices are used to flavor food and are a common ingredient of cooking. But adulteration by some people have led these spices to not increase the aroma of food but to convert it into a food item unfit for human consumption. This study is based on detection of food adulterants in various samples of turmeric powder using various analytical methods. It was found from the results that branded turmeric powder contains different adulterants like yellow lead, metanil yellow which are toxic for human health.

American Journal of Applied Biotechnology Research. 3, Pg: 25-28 (2020)

27. RNAi technology and Possible Vaccines to Combat SARS CoV2., Talukder, Pratik, Applied Biochemistry and Biotechnology, [SCI] volume 193, pages1744–1756 (2021), 2021

### **RNAi Technology and Investigation on Possible Vaccines to Combat SARS-CoV-2 Infection**

**Pratik Talukder & Sounak Chanda**

#### **Abstract**

Coronavirus disease of 2019 (COVID-19) pandemic, taking place globally, occurs as a result of the SARS-CoV-2 viral infection which has caused death of innumerable numbers of people and is responsible for a massive drop in the global economy. Millions of people are infected, and the death rate is also quite high in different countries. So, there is an urgent requirement of the invention of some effective and efficient drugs that can be effective against this deadly viral infection. The invention of new drugs and vaccine has become a matter of utmost importance to stop the

mayhem of coronavirus pandemic. In the middle of such a deadly pandemic, the necessity of development of a vaccine is of high importance in this context. Among all the popular methods of vaccine development, the mRNA vaccines turned out to be the one of the most versatile vaccine with quick responses. However, in this review, we have explained all the possible types of vaccines available including DNA vaccines, RNA vaccines, and live and attenuated vaccines. Their effectiveness, importance, and application of the vaccines against the SARS-CoV-2 virus have been discussed. Research is also being conducted in the field of gene silencing, and one of the best possible ways to combat the virus at the molecular level is by applying RNAi technology. The modified siRNA molecules can be used to silence the gene expression of the virus. A summarization of the virus's behavior, characteristics, and the methods by which RNAi technology can be administered to control the virus is depicted in this study.

Applied Biochemistry and Biotechnology, 193(6), Pg: 1744-1756 (2021)

28. Role of Phytochelatin and Metallothionein in phytoremediation of heavy metals by Aloe vera L. (Aloe barbadensis Miller), [SCIE] Talukder, Pratik, Journal of Indian Chemical Society 97 (4), 2020

### **Role of phytochelatin and metallothionein in phytoremediation of heavy metals by Aloe vera L. (Aloe barbadensis Miller)**

**Pratik Talukder**

#### **Abstract**

Plants, though sessile, have various enzymatic and non-enzymatic antioxidant systems which help them in combating metal toxicity and various other abiotic stresses. Metallothioneins (MTs) as well as phytochelatins (PCs) act as metal chelators. In the present investigation, a comparative study on the role of MTs and PCs in combating zinc induced oxidative stress in Aloe barbadensis was carried out. Seedlings were exposed to various sub-lethal doses of zinc and were grown for a period of one month. Relative expression of these genes was studied by RT and Q PCR and the presence of major secondary metabolites and phytochelatins was measured by High Performance Liquid Chromatographic (HPLC) technique. In both the cases, it was observed that 800  $\mu$ M of zinc treatment is the highest dose that the plants can withstand. A sharp decrease in the expression of the genes was observed under high level of metal toxicity. Results of this study proves that phytochelatin and metallothionein function in a coordinated way to chelate, detoxify and play significant role in bioremediation of transition metals such as zinc.

Journal of Indian Chemical Society, 97, Pg: 685-691 (2020)

29. Regulation of Induction of Phenylalanine Ammonia Lyase and Its Role in Production of Phenolic Compounds in Plants, Talukder, Pratik, International Journal of Current Research in Biosciences and Plant Biology, [SCOPUS] 7(6), 55-63, 2020

### **Regulation of induction of phenylalanine ammonia lyase and its role in production of phenolic compounds in plants**

**Pratik Talukder**

#### **Abstract**

Phenylalanine ammonia lyase or PAL is known to be the first committed enzyme of phenylpropanoid pathway which produces trans-cinnamic acid, the precursor of polyphenol biosynthesis. Some facts related to the physiology, enzymology and biochemistry of Phenylalanine ammonia lyase (PAL) from different organisms has been reviewed. Emphasis is given on the biological aspects of regulation of the induction of PAL by various stimuli and its role in producing polyphenolic compounds in plants. Levels of the enzyme are mainly affected by light, wounding, infection, ethylene level, concentration of plant growth regulators and metals. The possibility that PAL is involved in the control of polyphenol production has also been examined.

International Journal of Current Research in Biosciences and Plant Biology, 7(6), Pg: 55-63 (2020)

30. Nutrient Sensing: A New Emerging Pathway. ,Talukder, Pratik ,American Journal of Applied Bio-Technology Research (AJABTR), Vol: 1(2), Pg: 15-24, 2020

## **Nutrient Sensing: A New Emerging Pathway**

**Pratik Talukder and Sreejita Das**

### **Abstract:**

Nutrients are the compound present in foods and essential for health and provide us energy; act as building blocks and essential component of cells and organs. They help us to regulate various chemical processes in the body. Nutrient Sensing is a cell's ability to recognize and respond to fuel substances such as protein, carbohydrates and lipids. One of the most serious problems in the present world is the increasing number of overweight and obese people around the world. Nutrient Sensing has become a major focus in scientific research over the past few decades as it enables us to understand mechanism of nutrient metabolism and feeding process. By studying the basic metabolic pathway and uptake of nutrients by the cells, which ultimately control the feeding process; it enables us to understand the physiological processes which are disrupted by diseases such as- diabetes, cardiovascular diseases and obesity. Nutrient Sensing is the basic mechanism which not only helps us to maintain balance between stored energy and calorie intake but also regulate various metabolic pathways in our body. If nutrient sensing is disrupted it leads to several chronic lifestyle diseases, hence understanding and restoring the proper nutrient diet would enable us to lead a healthy and less disease prone life. In consideration of nutrient homeostasis, particularly in human and also in all living organisms, our aim is to provide an outlook of nutrient sensing mechanism as our present knowledge in this domain is scarce.

American Journal of Applied Bio-Technology Research, 1(2), Pg: 15-24 (2020)

31. Expression of Somatic Embryogenesis Receptor Kinase (SERK) gene and its regulation under the influence of exogenous additives during in vitro somantic embryo development in medicinal plants. Talukder, Pratik ,American Journal of Applied Bio-Technology Research (AJABTR), Vol: 1 (1), Pg: 34-43, 2020.

## **Expression of Somatic Embryogenesis Receptor Kinase (SERK) gene and its regulation under the influence of exogenous additives during in vitro somantic embryo development in medicinal plants**

**Pratik Talukder**

### **Abstract:**

Somatic embryogenesis is a process whereby a single cell or a group of cells are induced to form totipotent embryogenic cells. Somatic embryogenesis always served as a model system for studying the molecular mechanisms underlying the embryogenic developmental process. There is an upsurge of interest in scientists to explore the molecular understanding of embryogenesis and the involvement of different genes and proteins during this developmental process. Studies have shown that somatic embryogenesis is under a stringent coordinated control of some regulatory genes among which somatic embryogenesis receptor kinase (*SERK*) gene has claimed an important role. In recent time expression of *SERK* gene was identified in embryogenic cultures of many higher plants indicating its positive role in embryogenic development. Studying the impact of *SERK* gene on somatic as well as zygotic embryogenesis shall improve the understanding of the molecular events leading to the formation of embryogenic cultures. The review highlights the correlation of *SERK* gene expression during somatic embryogenesis process and diverse functions of *SERK* gene during developmental changes in plants

American Journal of Applied Bio-Technology Research (AJABTR), 1 (1), Pg: 34-43 (2020)

32. A Comparative study on the impact of bio fertilizer and chemical fertilizer in the biosynthesis of secondary metabolites in Okra (*Abelmoschus esculentus* L.),Talukder, Pratik , American Journal of Applied Bio-Technology Research (AJABTR), Vol: 1(2), Pg: 44-53, 2020

## **A Comparative study on the impact of bio fertilizer and chemical fertilizer in the biosynthesis of secondary metabolites in Okra (*Abelmoschus esculentus* L.)**

Susmita Mukherjee and Pratik Talukder

### **Abstract:**

Vegetables are the integral part of the balanced diet of human since time immemorial. Globally, the role of vegetables has been recognized in solving the problem of food and nutritional security. Okra (*Abelmoschus esculentus* L.) is an important vegetable crop of Malvaceae family, which supplies higher nutrition. The present study was intended at determining the importance of using organic bio fertilizers instead of harmful chemical fertilizers in Okra (*Abelmoschus esculentus*). The requirements of fertilizers in Okra are important for the early growth and total production. Integrated use of organic bio fertilizers can improve crop productivity. The modern system of farming, it is increasingly felt, is becoming unsustainable as evidenced by declining crop productivities, damage to environment, chemical contaminations, etc. The necessity of having an alternative agriculture method which can function in a friendly eco-system while sustaining and increasing the crop productivity is realized now. The objective of the study was to assess the comparative effect of organic bio fertilizers and chemical fertilizers in terms of growth, nutrition value and secondary metabolite production. The result of this study clearly indicates the nutritional benefits of consuming vegetables grown by using bio fertilizers and also states how enhanced accumulation of natural antioxidants such as polyphenols are additionally adding to our health benefits.

American Journal of Applied Bio-Technology Research, 1(2), Pg: 44-53 (2020)

33. Covid 19 medicines: Drugs which entered clinical trial. American Journal of Applied Bio-Technology Research (AJABTR), Talukder, Pratik, Vol: 1(3), Pg: 44-53, 2020.

## **Covid 19 medicines: Drugs which entered clinical trial**

Debshikha Dutta Roy, Sohini Roy, Pratik Talukder

### **Abstract**

Coronavirus disease 2019 (COVID 19) is an illness caused by novel corona virus which is now known as SARS-CoV-2. This disease has become a global pandemic as a large population worldwide is suffering from it. Due to this reason, researchers have conducted clinical trials for some potential drugs like hydroxychloroquine, favipiravir, remdesivir, lopinavir-ritonavir, Dexamethasone and Tocilizumab. Hydroxychloroquine which was previously used to treat rheumatoid arthritis, when taken in combination with azithromycin has shown to prevent SARS-CoV-2 in some cases. Favipiravir which was previously used to treat influenza and ebola virus has shown promising results. Remdesivir is a broad spectrum antiviral drug has also emerged as a potential drug but further information is required to verify its effects. Lopinavir-ritonavir is an anti-HIV drug. Both of them are protease inhibitor, as a result this drug is beneficial for treating COVID 19. Dexamethasone is a corticosteroid drug previously used to treat rheumatic conditions, has shown to prevent SARS-CoV2. Tocilizumab is an immunosuppressant drug which blocks IL6 and used to prevent COVID 19. Tocilizumab was previously used for treating psoriasis, has showed positive results in treating SARS-CoV-2. This article shows a comparative study of the different drugs which has entered the clinical trials.

American Journal of Applied Bio-Technology Research, Vol: 1(3), Pg: 44-53 (2020)

34. Polyamines, Metallothioneins and Phytochelatins - Natural Defence of plants to mitigate heavy metals, Talukder, Pratik, Studies in Natural Products Chemistry [SCOPUS] 69: 227-261, 2021

## **Polyamines, Metallothioneins and Phytochelatins - Natural Defence of plants to mitigate heavy metals**

Sarmistha Sen Raychaudhuri, Paulami Pramanick, Apala Basak, Pratik Talukder

### **Abstract**

Polyamines are naturally occurring secondary metabolites that are known to possess nonenzymatic antioxidant properties. They are carbon- and nitrogen-containing polycationic compounds (at physiologic pH) and are widely found in plants, animals, and bacteria. The three most predominant polyamines in plants are putrescine, spermidine, and spermine. Putrescine serves as the precursor molecule in the subsequent biosyntheses of spermidine and spermine. Plants under oxidative stress have enhanced endogenous polyamine levels. Polyamines combat oxidative stress by

scavenging the free radicals. The exogenous addition of polyamines to growth medium is found to be beneficial for plants as it happened to alleviate the damage caused by oxidative stress. Polyamines are known to bind metals and this can be an implication at their mode of action in mitigating stress. Metallothioneins, on the other hand, are gene-encoded protein products that function as a nonenzymatic, antioxidant system in plants. Metallothioneins are low molecular weight, cysteine-rich polypeptides that are responsive to heavy metal stress, and their gene expression is induced by oxidative stress of different kinds. Metallothioneins have cysteine-rich N- and C-terminal domains that bind heavy metal ions, mostly, Cu, Zn, and Cd. Among the various kinds of oxidative stress, heavy metal-induced stress has become a serious concern in recent years. Plants are regularly being exposed to heavy metal-induced toxicity and this is affecting the food (e.g., *Oryza sativa*, *Triticum aestivum*, *Zea mays*) and the cash (e.g., *Brassica juncea*, *Brassica napus*, *Hordeum vulgare*, *Sesamum indicum*) crops at large. Heavy metals are defined as those metals and metalloids which have an atomic number greater than 20 and density 5 g cc<sup>-1</sup> and also have properties of metals. Essential and nonessential heavy metals, when present in the soil in an excess concentration, causes reactive oxygen species (ROS) generation. ROS contains unpaired electron(s) which causes oxidative damage to the plants which ultimately leads to the death of the plant. In this review, we discuss the effect of two essential and two nonessential heavy metals—copper, zinc, and cadmium and lead, respectively, and their effects on plants in general. *Plantago ovata* is a medicinally and commercially vital crop with a repertoire of antioxidant compounds like polyphenols, flavonoids, metallothionein (types 1, 2, and 3), phytochelatins, and polyamines present in it and it is the test system. The biochemical and molecular alterations that occur due to the exposure of *P. ovata* to copper, zinc, cadmium, and lead are discussed in this review. This review also talks of how metallothionein genes and especially type 2 metallothionein in *P. ovata* aid in tolerance and homeostasis of the four heavy metals—Zn, Cu, Cd, and Pb; and their differential expressions. This study also demonstrates alteration in metallothionein type 2 (PoMT2) expression of *P. ovata* in the presence of polyamines putrescine, spermidine, and spermine in addition to ZnSO<sub>4</sub>·H<sub>2</sub>O by semiquantitative and quantitative PCR techniques. When *P. ovata* seedlings are exposed to heavy metals—Cu, Zn, Cd, and Pb, they showed increased expressions of metallothionein type 2. We have observed downregulations in the expression of metallothionein type 2 gene in the presence of polyamines, putrescine, spermidine, and spermine, which implies their concerted protective and antioxidant activities to fight against the zinc-induced oxidative stress. This review also shows phytochelatins, which are naturally produced by plants *in vivo*, in response to oxidative stress induced by heavy metals. They are also cysteine-rich peptides which aid in heavy metal homeostasis and detoxification—a function very similar to metallothioneins and hence also classified as class III metallothioneins. Concerted action of all the heavy metal chelating entities has been emphasized in this study

Studies in Natural Products Chemistry, 69, Pg: 227-261 (2021)

35. Studies on blocking of replicase of human corona virus by bioactive compounds-In silico and Molecular Docking Studies, Lahiri, Dibyajit, Nag, Moupriya, International Journal of Scientific Research in Biological Sciences (UGC Approved) [SCOPUS], 7(3), 2020

## **Studies on blocking of replicase of human corona virus by bioactive compounds-In silico and Molecular Docking Studies**

**Dibyajit Lahiri, Moupriya Nag, Sudipta Dash, Bandita Dutta, Rina Rani Ray**

### **Abstract**

The sudden outbreak of COVID-19 as pandemic affected people at large and resulted in a high mortality rate throughout the world. Although according to WHO, more than 200 drugs are under the process of clinical trials, till date no proper medication is available for treating this pandemic. The present work was an attempt to provide information about the bioactive ingredients being present within the indigenous plants that can be used as a potential drug against SARS-CoVs since they show considerable interaction with the viral replicating protein; replicase 6W4B (PDB). It was observed the Quercetin and Curcumin had remarkable interaction with the target protein and had a binding energy of -52.273 Kcal/mole and -43.909 Kcal/mole respectively that were comparatively higher than hydroxychloroquine. Both of the bioactive compounds possessed same docking site and interacted with GLNA 50 by a hydrogen bond, like that of hydroxychloroquine, a widely used remedial drug against COVID 19. This research may help in providing an alternative idea on drug development from the easily available indigenous plants for combating against COVID-19.

International Journal of Scientific Research in Biological Sciences 7(3), Pg: 19-24(2020)

36. Effects of SARS-COV-2 Viral Infection on Cancer Patients: A Biological and Statistical Study during the COVID-19 Outbreak, Lahiri, Dibyajit, Nag, Moupriya, American Journal of applied biotechnology research (ISSN- 2689-8500), July, 2020

## **Effects of SARS-COV-2 Viral Infection on Cancer Patients: A Biological and Statistical Study during the COVID-19 Outbreak**

**Dipro Mukherjee, Sayantani Garai, Dibyajit Lahiri, Moupriya Nag**

### **Abstract**

The novel COVID-19 Pandemic has affected the World terribly causing death of more than 500,000 people, affecting over 200 countries and demolishing the World Economy. As prior studies and researches suggest, cancer patients are generally considered more prone to the viral infections owing to various relevant reasons. Therefore, a systematic analysis of cancer patients affected by COVID-19 is highly required. In this paper, data from several performed experiments in many multi-centred studies are included and evaluated to draw conclusions, specifically focusing on the age-matched non-cancer patients confirmed with COVID-19. The results suggest that COVID-19 patients with cancer had higher risks in all severe outcomes. Patients with hematologic cancer, lung cancer, or with metastatic cancer (stage IV) had minimum survival chances. Patients with non-metastatic cancer also showed similar results to those observed in patients without cancer. Patients who received surgery had low mortality rates. Again, patients undergoing radiotherapy did not possess any differences which is significant. These results clearly suggest that patients with cancer are more prone to SARS-CoV-2 viral infection.

American Journal of Applied Bio-Technology Research (AJABTR) 1, Pg: 16-24 (2020)

37. Production and purification of bacteriocin from *Leuconostoc lactis* SM 2 strain, Lahiri, Dibyajit, Nag, Moupriya, Biocatalysis and Agricultural Biotechnology, [SCOPUS] 2020, 30, 101845

## **Production and purification of bacteriocin from *Leuconostoc lactis* SM 2 strain**

**Dibyajit Lahiri, Somdeepa Chakraborti, Amrita Jasu, Moupriya Nag, Bandita Dutta, Sudipta Dash, Rina Rani Ray**

### **Abstract**

Food bio-preservation can be accomplished by antimicrobial peptides, the bacteriocins. In the present study, bacteriocin producing bacteria were screened and isolated from various food sources. Amongst them, *Leuconostoc lactis* SM2 was found to produce bacteriocin, with maximum antimicrobial activity against target bacterial strains. The bacteriocin was produced in shake flasks for 24 h at pH 7.0 and temperature 37 °C. The bacteriocin was purified through subsequent steps of salting out and size exclusion chromatography thus achieving a purity of 34.75%. Elution spectrum of HPLC revealed the leucocin nature of the bacteriocin. Although leucocin showed antimicrobial activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas putida*, *Klebsiella* and *Serratia sp.*, but the highest towards *E. coli* upon *Lactobacillus* MRS agar medium. This affinity was confirmed by molecular docking studies, indicating greater binding energy towards *E. coli* (123.22 kcal/mol) than *S. aureus* (64.63 kcal/mol). The antimicrobial effect was most prominent if the pure leucocin was added at the lag phase of growth of the target organism. Failure of revival by the bacteriocin treated second generation cells revealed the bactericidal, not bacteriostatic nature of the protein. Sustained skin texture, freshness of seeds with characteristic sharp smell in bacteriocin treated chillies indicated the applicability of leucocin for food preservation.

Biocatalysis and Agricultural Biotechnology 30, Pg: 101845-101853 (2020)

38. Phytocompounds of *Curcuma longa* extract are more effective against bacterial biofilm than pure curcumin only: An in-vitro and in-silico analysis, Lahiri, Dibyajit, Nag, Moupriya, Kuwait Journal of Sciences, [SCIE] 48 (20) 2021

## **Phytocompounds of *Curcuma longa* extract are more effective against bacterial biofilm than pure curcumin only: An in-vitro and in-silico analysis**

**Dibyajit Lahiri, Moupriya Nag, Soumik Dey, Bandita Dutta, Sudipta Dash, Rina Rani Ray**

#### **Abstract**

Bioactive compounds are the group of secondary metabolites of plants that have a potent impact on antimicrobial and antibiofilm agents. Although *Curcuma longa* (turmeric) is well known for its antimicrobial activity, the question arises if curcumin, the primary bioactive compound is only responsible for it or the synergistic and simultaneous contribution of more than one bioactive compound are responsible for this antibiofilm efficacy. The research work aims to determine the efficacy of the extract *Curcuma longa* has a higher potential of antimicrobial and antibiofilm activity than the purchased curcumin and standard antibiotic. Present work was initiated with GC-MS analysis of the ethanolic extract of *Curcuma longa* (turmeric) and showed that in addition to curcumin, methyl palmitate de-hydro zingerone had a higher percent of availability within the extract. The in-silico studies also showed that when targeted upon Gram-positive biofilm-forming protein of *Staphylococcus aureus* (3TIP), curcumin alone had a binding constant value of -6.33 Kcal/mol but showed a value of -17.811 Kcal/mol when acted in association with Dehydrozingerone. Similarly, the binding constant's value changed from -6.07 Kcal/mol to -23.844 Kcal/mol, when Gram-negative biofilm-forming protein (3ZYB) of *Pseudomonas aeruginosa* was acted upon by curcumin only and in association with methyl palmitate, respectively. Lower minimum inhibitory concentration (MIC) and higher effectivity in reducing the bacterial quorum sensing (QS) activity of the turmeric extract than pure Curcumin indicated the higher antimicrobial and antibiofilm efficiency of the extract, respectively. This indicated clearly that the synergistic action of all the bioactive compounds imparts the antibiofilm activity of turmeric. The result was further confirmed by the scanning electron microscopic (SEM) studies, fluorescent microscopic studies, and FTIR analysis of EPS as well.

Kuwait Journal of Sciences, 48 (20), Pg: 1-14 (2021)

39. The Chemistry Of Antibiofilm Phytocompounds, Lahiri, Dibyajit,Nag, Moupriya,Mini Reviews in Medicinal Chemistry,[SCIE] 21(9): 2021

## **The Chemistry of Antibiofilm Phytocompounds**

**Dibyajit Lahiri, Moupriya Nag, Sayantani Garai, Rina Rani Ray**

#### **Abstract**

Phytocompounds are long known for their therapeutic uses due to their competence as anti-microbial agents. The antimicrobial activity of these bioactive compounds manifests their ability as an antibiofilm agent and is thereby proved to be competent to treat the widespread biofilm-associated chronic infections. The rapid development of antibiotic resistance in bacteria has made the treatment of these infections almost impossible by conventional antibiotic therapy, which forced a switch-over to the use of phytocompounds. The present overview deals with the classification of a huge array of phytocompounds according to their chemical nature, detection of their target pathogen, and elucidation of their mode of action.

Mini Reviews in Medicinal Chemistry21(9), Pg: 1-14(2021)

40. Microbiologically synthesized nanoparticles and their role in silencing the biofilm signaling cascade, Frontiers in Microbiology,[SCI], Lahiri, Dibyajit,Nag, Moupriya,doi: 10.3389/fmicb.2021.636588, 2021

## **Microbiologically-Synthesized Nanoparticles and Their Role in Silencing the Biofilm Signaling Cascade**

**Dibyajit Lahiri , Moupriya Nag, Hassan I. Sheikh, Tanmay Sarkar, Hisham Atan Edinur, Siddhartha Pati, Rina Rani Ray**

#### **Abstract**

The emergence of bacterial resistance to antibiotics has led to the search for alternate antimicrobial treatment strategies. Engineered nanoparticles (NPs) for efficient penetration into a living system have become more common in the world of health and hygiene. The use of microbial enzymes/proteins as a potential reducing agent for synthesizing NPs has increased rapidly in comparison to physical and chemical methods. It is a fast, environmentally safe,

and cost-effective approach. Among the biogenic sources, fungi and bacteria are preferred not only for their ability to produce a higher titer of reductase enzyme to convert the ionic forms into their nano forms, but also for their convenience in cultivating and regulating the size and morphology of the synthesized NPs, which can effectively reduce the cost for large-scale manufacturing. Effective penetration through exopolysaccharides of a biofilm matrix enables the NPs to inhibit the bacterial growth. Biofilm is the consortia of sessile groups of microbial cells that are able to adhere to biotic and abiotic surfaces with the help extracellular polymeric substances and glycocalyx. These biofilms cause various chronic diseases and lead to biofouling on medical devices and implants. The NPs penetrate the biofilm and affect the quorum-sensing gene cascades and thereby hamper the cell-to-cell communication mechanism, which inhibits biofilm synthesis. This review focuses on the microbial nano-techniques that were used to produce various metallic and non-metallic nanoparticles and their “signal jamming effects” to inhibit biofilm formation. Detailed analysis and discussion is given to their interactions with various types of signal molecules and the genes responsible for the development of biofilm.

Frontiers in Microbiology 12, Pg: 636588- 636607 (2021)

41. Catechin as the most efficient bioactive compound from *Azadirachta indica* with antibiofilm and antiquorum sensing activities against dental biofilm: an in vitro and in silico study., Lahiri, Dibyajit ,Nag, Moupriya, Applied Biochemistry and Biotechnology,[SCI], Springer, 2021 Jan 26. doi: 10.1007/s12010-021-03511-1

### **Catechin as the Most Efficient Bioactive Compound from *Azadirachta indica* with Antibiofilm and Anti-quorum Sensing Activities against Dental Biofilm: an in Vitro and in Silico Study**

**Dibyajit Lahiri, Moupriya Nag, Bandita Dutta, Indranil Mukherjee, Shreyasi Ghosh, Ankita Dey, Ritwik Banerjee, Rina Rani Ray**

#### **Abstract**

Neem (*Azadirachta indica* [AI]) is a unique and traditional source of antioxidant and antibacterial compounds. The GC-MS studies revealed that phytoextract of *Azadirachta indica* comprises a large number of phytocompounds that possess the efficacy of inhibiting the biofilm. It was observed that phytocompounds like catechin showed maximum eradication of biofilm along with the degradation of EPS structural components like carbohydrates and proteins compared to quercetin, nimbolide, nimbin, and azadirachtin, and hence, catechin was proved to be the best against dental plaque-forming bacteria. It was also observed that catechin was able to bring about a marked reduction in quorum sensing (QS) both in *Alcaligenes faecalis* and *Pseudomonas gingivalis* dental biofilm-forming strains. The extent of such reduction was maximum for catechin (94.56±2.56% in *P. gingivalis* & 96.56±2.5 in *A. faecalis*) in comparison to other bioactive compounds. It was further observed that the bioactive compounds possess the ability to quickly pass across the membrane and bring about inhibition in the DNA and RNA content of the sessile cells. This was further validated by microscopic and in silico studies. Thus, this study revealed that catechin obtained from the phytoextract of AI showed a marked ability to inhibit the dental biofilm and can be used as a natural drug-like compound in treating biofilm-associated chronic infections.

Applied Biochemistry and Biotechnology, pg: 1-14 (2021)

42. Antibiofilm activity of  $\alpha$ -Amylase from *Bacillus subtilis* and prediction of the optimized conditions for biofilm removal by Response Surface Methodology (RSM) and Artificial Neural Network (ANN), Lahiri, Dibyajit ,Nag, Moupriya. Applied Biochemistry and Biotechnology[SCI], Springer, 2021 Mar 1. doi: 10.1007/s12010-021-03509-9

### **Antibiofilm Activity of $\alpha$ -Amylase from *Bacillus subtilis* and Prediction of the Optimized Conditions for Biofilm Removal by Response Surface Methodology (RSM) and Artificial Neural Network (ANN)**

**Dibyajit Lahiri, Moupriya Nag, Tanmay Sarkar, Bandita Dutta, Rina Rani Ray**

#### **Abstract**

$\alpha$ -amylase is known to have antibiofilm activity against biofilms of both Gram positive and Gram-negative bacterial strains. Partially purified  $\alpha$ -amylase from *Bacillus subtilis* was found to have inhibit biofilm formed by



*P. aeruginosa* and *S. aureus*. The spectrophotometric and microscopic studies revealed that the antibiofilm efficacy of the working strain is greater than commercially purchased  $\alpha$ -amylase. Response surface methodology (RSM) and artificial neural network (ANN) help to predict the optimum conditions [pH 8, treatment time 6 h and enzyme concentration (200  $\mu$ g/mL)] for maximum biofilm eradication. This was confirmed by several in vitro experiments. Molecular docking interactions of  $\alpha$ -amylase with the extracellular polymeric substances (EPS) of both *P. aeruginosa* and *S. aureus* indicate towards the existence of an efficient energy driven spontaneous process. Thus, this study highlights a combination of experimental and computational approach showing the naturally extracted  $\alpha$ -amylase from *B. subtilis* having the potency of removing the biofilms of harmful bacterial strains involved in causing various nosocomial infections

Applied Biochemistry and Biotechnology, pg: 1-21 (2021)

43. Bacterial biopolymer: Its role in pathogenesis to effective biomaterials, Lahiri, Dibyajit, Nag, Moupriya, Polymers (MDPI), 13(8), 2021.

## **Bacterial Biopolymer: Its Role in Pathogenesis to Effective Biomaterials**

**Sreejita Ghosh, Dibyajit Lahiri, Moupriya Nag, Ankita Dey, Tanmay Sarkar, Sushil Kumar Pathak, Hisham Atan Edinur, Siddhartha Pati, Rina Rani Ray**

### **Abstract**

Bacteria are considered as the major cell factories, which can effectively convert nitrogen and carbon sources to a wide variety of extracellular and intracellular biopolymers like polyamides, polysaccharides, polyphosphates, polyesters, proteinaceous compounds, and extracellular DNA. Bacterial biopolymers find applications in pathogenicity, and their diverse materialistic and chemical properties make them suitable to be used in medicinal industries. When these biopolymer compounds are obtained from pathogenic bacteria, they serve as important virulence factors, but when they are produced by non-pathogenic bacteria, they act as food components or biomaterials. There have been interdisciplinary studies going on to focus on the molecular mechanism of synthesis of bacterial biopolymers and identification of new targets for antimicrobial drugs, utilizing synthetic biology for designing and production of innovative biomaterials. This review sheds light on the mechanism of synthesis of bacterial biopolymers and its necessary modifications to be used as cell based microfactories for the production of tailor-made biomaterials for high-end applications and their role in pathogenesis.

Polymers, 13, pg: 1242- 1270 (2021)

44. Biodegradation of used polyethylene bags by a new marine strain of *Alcaligenes faecalis* LND-1, Lahiri, Dibyajit, Nag, Moupriya, Environmental Science and Pollution Research, DOI: 10.1007/s11356-021-13704-0

## **Biodegradation of used polyethylene bags by a new marine strain of *Alcaligenes faecalis* LND-1**

**Moupriya Nag, Dibyajit Lahiri, Bandita Dutta, Gaurav Jadav, Rina Rani Ray**

### **Abstract**

Disposable plastic bags of two different chemical compositions and colors were remediated by the application of novel mesophilic group of bacteria isolated from the banks of sea water, using a 10 week soil burial method. The new strain, LND-1, was identified as *Alcaligenes faecalis* by its morphological features and 16S rRNA sequencing. LND-1 was able to produce extracellular enzymes such as lipase, CMCase, xylanase, and protease, having PET surface degrading activity. It was found that LND-1 had a better decay rate of  $15.25 \pm 1\%$  and  $21.72 \pm 2.1\%$  for black and white plastic bags respectively in 10 weeks without prior oxidation as compared to *S. marcescens*. Polyethylene degradation was confirmed by substantial weight loss, alterations in surface topology, and hydrophobicity index and was found to be directly proportional to the ability to form biofilm on the plastic surface. FTIR results suggest presence of different metabolites in the bags treated with bacterial biofilm in comparison to the control setup inferring various types of metabolic pathways. Present study also reveals the ability of the strain to utilize the used polyethylene bag as the carbon source, without any prior treatment, and as per the literature survey, the working strain is with the capacity to biodegrade plastic at a considerably appreciable rate. This study suggests effectual method for the mechanism of biodegradation of plastic mediated by extracellular enzymes and formation of biofilm.

45. Amylases: biofilm inducer or biofilm inhibitor? *Frontiers Cellular and Infection Microbiology* 2021, Lahiri, Dibyajit, Nag, Moupriya, (DOI: 10.3389/fcimb.2021.660048)

### **Amylases: Biofilm Inducer or Biofilm Inhibitor?**

**Dibyajit Lahiri, Moupriya Nag, Ritwik Banerjee, Dipro Mukherjee, Sayantani Garai, Tanmay Sarkar, Ankita Dey, Hassan I. Sheikh, Sushil Kumar Pathak, Hisham Atan Edinur, Siddhartha Pati, Rina Rani Ray**

#### **Abstract**

Biofilm is a syntrophic association of sessile groups of microbial cells that adhere to biotic and abiotic surfaces with the help of pili and extracellular polymeric substances (EPS). EPSs also prevent penetration of antimicrobials/antibiotics into the sessile groups of cells. Hence, methods and agents to avoid or remove biofilms are urgently needed. Enzymes play important roles in the removal of biofilm in natural environments and may be promising agents for this purpose. As the major component of the EPS is polysaccharide, amylase has inhibited EPS by preventing the adherence of the microbial cells, thus making amylase a suitable antimicrobial agent. On the other hand, salivary amylase binds to amylase-binding protein of plaque-forming Streptococci and initiates the formation of biofilm. This review investigates the contradictory actions and microbe-associated genes of amylases, with emphasis on their structural and functional characteristics.

*Frontiers in Cellular and Infection Microbiology* 11, Pg: 660048- 660061 (2021)

46. Strategies of Nanomaterial Application for Enhanced Wound Curing: An Overview, Lahiri, Dibyajit, Nag, Moupriya, *Nano Biomed. Eng.*, 13 (2), 2021

### **Strategies of Nanomaterial Application for Enhanced Wound Curing: An Overview**

**Moupriya Nag, Dibyajit Lahiri, Sudipta Dash, Sayantani Garai, Dipro Mukherjee, Ritwik Banerjee, Rina Rani Ray**

#### **Abstract**

The biological process of healing of wounds deals with the regeneration of cells and is of utmost importance mainly because of the morphological and functional attributes of the tissue. One of the modern approaches is to use novel nanomaterial based wound dressings and other therapeutic treatments that have higher efficiency and specificity. Researchers all around the world have established the competence of various organic, inorganic or polymer-based and biogenically synthesized nanomaterials as a weapon for wound curing. Various matrices carrying nanoparticles like hydrogels, hydrocolloids are used in nano based drug delivery system. The biocompatibility, antimicrobial efficacy and sustained rate of drug delivery are the three main features that are considered for designing a nano drug for effective wound healing. The modification of the nanosized liposome using propylene glycol increases cell-permeation and retention in skin layer. Curcumin loaded liposomes show high anti-inflammatory effect, carbon nanodots (CNDs) and graphene oxide based nanosheets have also shown an immense importance in possessing high surface area. They also show potency in promoting fibroblast growth factors and collagen deposition for speedy recovery of wound. Moreover, the chronic wounds, that could not be cured by common antibiotics, can be addressed by nano based drugs not only for their easy penetration to deeper layer of tissues but also for their efficiency in killing some biofilm associated bacterial strains. Hence, nowadays nano based dressing materials are widely used for rapid recovery of wounds of various types.

*Nano Biomedicine and Engineering* 13 (2), Pg: 109-126 (2021)

47. Recent trends in approaches for optimization of process parameters for the production of microbial cellulase from wastes, Lahiri, Dibyajit, Nag, Moupriya, *Environmental Sustainability* (2021)

### **Recent trends in approaches for optimization of process parameters for the production of microbial cellulase from wastes**

**Dibyajit Lahiri , Moupriya Nag, Dipro Mukherjee, Sayantani Garai, Ritwik Banerjee, Rina Rani Ray**

#### **Abstract**

Cellulose is considered to be one of the most underutilized biomass available on earth. These cellulosic resources, if utilized as the precursor of food, feed and biofuel can meet up the ever-increasing demands for food and energy. Since cellulase is an enzyme complex, fermentation of cellulose from agro-wastes and industrial effluents is a complex event. The physicochemical parameters are generally optimized in "one at a time" mode in fed-batch culture. But with the advent of time, statistical and mathematical modelling is used, like response surface methodology (RSM), artificial neural network (ANN), machine learning algorithm, and genetic algorithm to improve enzyme production. In bioreactor-based cellulase production, a LabVIEW-based intelligent system for monitoring bio-processing is used for the optimization of the target parameters. RSM and ANN are high-quality prediction mathematical models but ANN shows its superiority in context to the fitting of data as well as its estimation capabilities. The difference of ANN concerning RSM is its requirement of a large number of trained data. This review provides a comprehensive study of literature in context to various advanced mechanisms for optimization of cellulase production.

Environmental Sustainability 4, Pg: 273–284(2021)

48. Antibiofilm and Anti-Quorum sensing Activities of Eugenol and Linalool From *Ocimum tenuiflorum* against *Pseudomonas aeruginosa* Biofilm, Lahiri, Dibyajit, Nag, Moupriya, Journal of Applied Microbiology, 2021

### **Antibiofilm and Anti-Quorum sensing Activities of Eugenol and Linalool from *Ocimum tenuiflorum* against *Pseudomonas aeruginosa* Biofilm**

**Dibyajit Lahiri, Moupriya Nag, Bandita Dutta, Soumik Dey, Dipro Mukherjee, Sanket Joshi, Rina Rani Ray**

#### **Abstract**

The aim of this study is to determine the ability of two bioactive compounds, namely, eugenol and linalool, purified from leaves of *Ocimum tenuiflorum* for eradication of biofilm produced by *Pseudomonas aeruginosa*. The phytoextract of *O. tenuiflorum* (KT), a common ethno-botanical plant of India, was purified through high-performance liquid chromatography and was analysed using ultraviolet (UV) spectroscopy and gas chromatography–mass spectrometry (GC-MS). Eugenol and linalool were found to be the most active amongst all phytocompounds present in phytoextract and showed a significant reduction in the viability of sessile cells of *P. aeruginosa* and the minimum revival after withdrawal of phyto-challenge. They could bring about notable reduction in the protein and carbohydrate content of exopolysaccharide of biofilm. Eugenol and linalool could affect the synthesis of quorum sensing (QS) proteins like LasA and LasB as well as virulence factors such as pyocyanin, and rhamnolipids, which seriously hamper the formation of biofilm. The biofilm framework was extremely affected by the phytocompounds through the reduction of protein and carbohydrate content of extracellular polymeric substance (EPS). Another interesting found out was that they brought about maximum inhibition to the genomic DNA and RNA content. The studies were supported by in silico interaction between eugenol and linalool with the QS proteins. The antibiofilm efficacies of eugenol, linalool and phytoextract (KT) were further confirmed by microscopic studies with scanning electron microscopy (SEM), atomic force microscopy and fluorescence confocal microscopy microscopic studies. The phytocompounds are proved to be more effective than conventional antibiotics in inhibiting the biofilm forming sessile cells and can be used as a replacement for antibiotic. Pure eugenol extracted from common basil leaves can be used as a safe substitute for common antibiotic for treatment of chronic infections caused by *P. aeruginosa*. It will be cost effective, devoid of notable side effects and will not generate antibiotic resistance in host body.

Frontiers in Cellular and Infection Microbiology 11, Pg: 660048- 660061 (2021)

49. Artificial Neural Network and Response Surface Methodology-Mediated Optimization of Bacteriocin Production by *Rhizobium leguminosarum*, Lahiri, Dibyajit, Nag, Moupriya, Iran J Sci Technol Trans Sci (2021). <https://doi.org/10.1007/s40995-021-01157-6>

### **Artificial Neural Network and Response Surface Methodology-Mediated Optimization of Bacteriocin Production by *Rhizobium leguminosarum***

**Dibyajit Lahiri, Moupriya Nag, Bandita Dutta, Tanmay Sarkar., Rina Rani Ray**

#### **Abstract**

Bacteriocins are the group of antimicrobial peptides synthesized by certain groups of bacterial species. A bacteriocin-producing bacterial strain of *Rhizobium leguminosarum* DM 20 was isolated from leguminous plant. The produced bacteriocin was found to exert its antibacterial effect against *Staphylococcus aureus*, a significant food spoiling pathogen. The molecular interaction between bacteriocin and enterotoxin protein of *Staphylococcus aureus* depicted the effectiveness of the former produced against the pathogen. With the aim to enhance the production of bacteriocin, the main three parameters, namely temperature, pH and cultivation time, were optimized. Response surface methodology (RSM) was applied for the optimization process instead of the conventional “one-at-a-time” method. It was found that the observed values were about 15–18% higher than that of expected ones. Artificial neural network (ANN) was also applied for conforming the optimization model.

Iranian Journal of Science and Technology, Transactions A: Science Pg: 1-18 (2021)

50. Heavy Metals in Health Issues and Microbes in Remediation: A Review, Mukherjee, Susmita, Paul, Sonali, American Journal of Applied Biotechnology Research. 2021. 2: 47-60

## **Heavy Metals in Health Issues and Microbes in Remediation: A Review**

**Mouli Sarkar, Sonali Paul, Susmita Mukherjee**

### **Abstract**

Industrializations are the major source of environmental pollution. The waste discharge from several industries can create an immense impact on water bodies which can disrupt the balance of several parameters of it. Too much accumulation of heavy metals through waste water can hamper human health as well as food chain. Thus several diseases take place in daily life because of accumulation of several heavy metals. These can accelerate generation of reactive oxygen species (ROS) which is the ultimatum of age related disease like Parkinson disease, Alzheimer's disease etc. This accumulation is not only limited to ROS production it has the ability to hamper immune system abruptly. To get rid of these bioremediation can be an alternative and efficient way. With the help of several micro-organisms it can dispose these heavy metals. This review focuses on several heavy metal related diseases as well as bioremediation

American Journal of Applied Biotechnology Research. 2, Pg: 47-60 (2021)

## Department of Basic Sciences & Humanities

51. Synthesis of Graphene Oxide from Hydrogenated Diamond Like Carbon and Protein Immobilization onto It: Characterization and Study of Practical Utility, SubhashisBala, Reshmi Bose, ShaonaChaterjee, SanjitSarkar, IndranilSaha, Hari Shankar Biswas, Journal of Materials Science and Chemical Engineering(International)

### **Synthesis of Graphene Oxide from Hydrogenated Diamond Like Carbon and Protein Immobilization onto It: Characterization and Study of Practical Utility**

**SubhashisBala, Reshmi Bose, ShaonaChaterjee, SanjitSarkar, IndranilSaha, Hari Shankar Biswas**

#### **Abstract**

In the last few years, Graphene oxide material and biomolecules studies have increased. The various synthesis methods of graphene oxide are constantly pursued to improve and provide safer and more effective alternatives. Though the preparation of graphene oxide from Graphite powder or Graphite flake through Hummers method is one of the oldest techniques but still now it is one of the most suitable methods. Here, Graphene Oxide has been prepared from a tunable material Hydrogenated diamond like carbon (HDLC) which is an atomically smooth surface that can be deposited on high-surface area Silicon (100) wafer plate. The HDLC film was heated at a fixed temperature of 900°C for 30min in high vacuum  $\sim 1 \times 10^{-6}$  torr and Oxygenated at room temperature. A synthetic sequence is described involving oxidation of annealed HDLC (A-HDLC). Raman measurements confirm the G and D peak by Oxidation of A-HDLC and FTIR confirms functional groups. Atomic force microscopy (AFM) images describe the surface of A-HDLC, Oxidized Graphene and BSA immobilized GO. This GO onto Silicon substrate offers many technical advantages than as oxidized graphene synthesis from other Chemical methods.

Journal of Materials Science and Chemical Engineering, 9, 32-41 (2021)

52. ECOLOGICALINTERDISCIPLINARITY AND LITERATURE TAGORE: THE ECO-LITERARY ARTIST AND BEYOND -AyanitaBanerjee, INTERNATIONAL JOURNAL OF ENGLISH AND LITERATURE (IJEL)- VOL - 11, ISSUE - 1; EDITION: FEB-2021

### **ECOLOGICAL INTER-DISCIPLINARITY AND LITERATURE TAGORE: THE ECOLITERARY ARTIST AND BEYOND**

**AyanitaBanerjee**

With the development of science, technology, industrialism and urbanization, the natural environment that mankind depends for living is being seriously destructed. The grave ecological imbalance is threatening human existence. The litany of present and impending catastrophes is making us aware of the imminent doom of our planetary ecosystem, owing to an array of human-caused environmental catastrophe that have no precedent in the entire history of the Earth. The diversity of the diminishing species upon the planet is warning each of us, to be aware of the gravity of this ecological crisis and bear the responsibility of alleviating and eliminating the crisis. This paper intends to represent Tagore as an eco-literary artist voicing his deep-rooted protest against human aggression and his earnest concern for the preservation and subsequent restoration of the ecological balance. Furthermore, in the context of the present global

environmental deterioration or ecological degradation, ecocriticism, as a tide of “green” criticism seeks and believes in a solution for this environmental crisis aiming to protect the integrity of the Earth’s ecological communities and the ecocentric values.

INTERNATIONAL JOURNAL OF ENGLISH AND LITERATURE (IJEL)- VOL - 11, ISSUE – 1 (2021)

53. Tagore’s Visvobod Deconstructing 21st century Creative Violence, Ayanita Banerjee, Rupkatha Journal on Interdisciplinary Studies in Humanities Vol. 12, No. 5, 2020. 1-6

## **Nature and Self Reflection in Tagore’s The Crescent Moon**

**Ayanita Banerjee**

### **Abstract**

To perceive the human world in co-existence with nature and thereby to nurture freedom and constructive processes we need to rethink the transformative literature of Rabindranath Tagore, who explored an environment conscious, almost ecocritical vision of human existence inspiring a “deep ecological” sense of identification with the immediate environment. Tagore’s philosophy of nature with its wide range and variety reifies the real possibility of ‘living, learning and uniting oneself’ with the “organic wholeness of nature”. The relationship between the man and nature remains interwoven in his writings promoting an intimate, interdependent relationship revealing “the deepest harmony that existed between man and his surroundings”. The paper dealing with Tagore’s simplest collection of poetry The Crescent Moon in particular lays emphasis on the relationship of the mother and the child developing out of his traumatic experiences of childhood namely losing his mother quite at an early age and his subsequent identification with nature as an ‘alternative mother-principle’ Nature confers a psychological closure by connecting him with Mother Nature (my italics) “mother nature you have taken me in your affectionate embrace and have begun to sing your imposing music to me rich in harmony and melody”. Nature removed from the crudity of its daily entanglements activated within him a spirit of companionship and receptivity revealing to him “the deepest harmony that existed between him and his surroundings”.

Rupkatha Journal on Interdisciplinary Studies in Humanities Vol. 12, No. 5, 2020. 1-6

54. Re-Mapping Culture and Identity- Diasporic Theorisation and Dislocation Strain in the Selected Poems of Agha Shahid Ali - Ayanita Banerjee, The International Journal of English Learning & Teaching Skills. Vol-3.2. Jan 2021. Pg-2022-2032. ISSN- IJELTS [ISSN No. 2639-7412-Print], Online-2638-5546

## **Re-Mapping Culture and Identity: Diasporic Theorisation and Dislocation Strain in the Selected Poems of Agha Shahid Ali**

**Ayanita Banerjee.**

Diasporic writings occupy a place of great significance between countries and cultures, mostly as a response to their lost homes. Addressing the predominant issues of dislocation, nostalgia, discrimination, survival, cultural change and identity-crisis, dislocation is one of the stern feelings that rip apart the diaspora community. When people find themselves dislocated from their native strain, their mental trauma haunts them incessantly, and they strive to re-locate themselves by remembering their nostalgic past. The earnest quest for self identity remains the central praxis for an individual’s social existence. But how to reach to its end –either by retreating from the world into one’s shelled cocoon or by adopting moderate adherence to

Westernization remains much a debatable concern to be answered by nations as well as by the individuals at large. Diasporic literature deals with these experiences of migration and exile, cultural or geographical displacement and the diasporic writers often remain preoccupied with the elements of nostalgia seeking to re-locate themselves in new cultures. AghaShahid Ali is a Kashmiri poet, who despite being a migrant to USA transcends all geographical, national, and cultural boundaries by the dint of his sheer poetic brilliance. He articulates vehemently his diaspora experiences of “loss and exile” in his poetry and as a visionary integrates the global and the local. In this paper my aim is to represent how literature and culture inter-relates to form the basis of an independent original expression and in turn reflect the problems and aspirations of an individual’s existence in the society. Ali the eminent Indian poet represents his earnest urge to relocate his Self amidst “cultural hybridization” asserting his transnational identity to transform ‘violent cartographies’ to ‘The Ghat of the Only World’.

The International Journal of English Learning & Teaching Skills. Vol-3.2. Jan 2021. Pg-2022-2032.

55. A Psychological Lesson Intertwining Enchanting Transformations - A Psychological Lesson Intertwining Enchanting Transformations - AyanitaBanerjee, International Journal of Research and Analytical Reviews. ICI with the link-<https://ijrar.org>ISSN/ISBN-E-ISSN- 0975-2935 Vol – VII-Issue-II

### **A Psychological Lesson Intertwining Enchanting Transformations**

**AyanitaBanerjee**

#### **Abstract**

These are days of transition for countries which face economic depression and global slowdown in growth. These are times when one realizes the need for stronger moral values in individuals than ever before so they may face personal and professional challenges. Material wealth is considered the hallmark of success in many nations of the world, but as Emerson is reputed to have said, a person’s real success should be measured instead by the values that he or she possesses such as empathy, care, love, enthusiasm, and humaneness. Today, there is a gradual moral decline in society’s and humankind’s values. This paper aims to present folktale narratives used for propagating moral and ethical standards amongst children in the contemporary society. Folktales like *Panchatantra*, *Hitopadesha Tales*, *Jataka Tales*, *KathasarithSagar* play a prominent role in shaping the personality of children, orienting them with the guidance to develop self-reliance and aesthetic sense. The characters in these stories motivate children to acquire positive attitude even in spite of being defamed with problems, miseries, merits and demerits theoretically

International Journal of Research and Analytical Reviews. ICI with the link-<https://ijrar.org>ISSN/ISBN-E-ISSN- 0975-2935 Vol – VII-Issue-II

56. Folk Literature -Reflections of our Own Identity - Indian Folk Life AyanitaBanerjee, .ICI with the link-<https://openfolklore.org/journals>ISSN/ISBN-E-ISSN-ISSN (P) 0972-6470 ISSN (L) 0972-6470 Vol –VII-Issue-V

### **Folk Literature -Reflections of our Own Identity**

**AyanitaBanerjee**

#### **Abstract**

The evolution of human civilization depicts the symbiotic connection between community living and the folktales. They seem to have emerged almost at the same time brewing a fellowship rooted in the necessity of sharing the experiences-cognitive, emotive and creative. Folktales, in its variegated forms distinctly incorporate these three aspects of mind formulating the formation of belief systems and customs deeply en-rooted in the cultural codes of the community. Folktales passed from one generation to another acts as an identity marker for the community groups framing the guidelines of both intra and inter community interaction. The paper is an attempt towards understanding the importance of the disciplines of folktale

and culture studies, especially those pertaining to oral tradition which forms an important part of the intangible heritage of man and his environment. Both are complimentary disciplines and needs to be studied from a holistic understanding of the term ‘culture’ and folk traditions in a society. The paper traces a brief background of both the disciplines of folktale studies as well as the use of narrative techniques made imperative for imparting oral educative values. A cumulative study is an imperative necessity in the recent global world where the term ‘education’ denotes a much wider definition than was connoted decades ago as part of the civilisation of man.

Indian Folk Life, <https://openfolklore.org/journals> ISSN/ISBN-E-ISSN- ISSN (P) 0972-6470 ISSN (L) 0972-6470 Vol –VII- Issue-V

57. Paradisiacal Imagination: A Re-thinking of Tagore’s Visvobod in the 21st Century Research Journal of English. AyanitaBanerjeeICI with the link-SSN:2395-2636(P):2321 – 3108(E)ISSN/ISBN-E-ISSN- Vol – II-Issue-VII

**Paradisiacal Imagination: A Re-thinking of Tagore’s Visvobod in the 21st Century.**

**AyanitaBanerjee**

**Abstract**

The Golden Age of Science set out to solidify an objective reality now obscures its form, moulding it into infinite possibilities. Science, that acclaims the success of the human brain as ‘progressive changes’ continue to prosper through its mutual interdependence leaving us in a state of flux and ensuing apprehension. Prominent images of scientism, ingestion, fecology, cartelized capitalism; chemistry and rocket technology fill the creative cosmos of modern scientific progression. If we look at the twenty -first century from the point of view of the given nexus, we are quite likely to conclude that it has remained a century when human destructiveness has reached its creative pinnacle. ‘Creative violence’ has deemed out to be a natural consequence of the destruction of communities, cultures and worldviews giving rise to low grade mental illness such as depression, anxiety and trauma. To add flavor to the platter with the cruel on-set of the Pandemic Covid-19 and its after marts, death, disaster, depression, anxiety and existential crisis has taken its steering force in the forefront Of human existence. The true self denied of the ideals of truth, beauty, sympathy or moral welfare for mankind is bathed in the “spirit of conflict and conquest” tossed in the whirlwind of greed, jealousy and suspicion. World today is ripped apart and the shelter for peace is denied. In this paper emphasizing the dire need of the world to be resurrected from the gnawing clutches of the raving human race, Rabindranath Tagore’s Universalism or his ‘Paradisaal Imagination’ as an individual and planetary remedy to counter the negative and devastating effects of modernization is delineated to disseminate hope, enlightenment and rejuvenation to relive humanity at large.

Research Journal of English. ICI with the link-SSN:2395-2636(P):2321 – 3108(E)ISSN/ISBN-E-ISSN- Vol – II-Issue-VII



58. Functionally significant metabolic differences between b and t lymphocyte lineages.  
NabanitaDas,Publication: 2020/10, International Journal: Immunology, Volume: 158, Issue: 2,  
Page: 104

## Functionally significant metabolic differences between B and T lymphocyte lineages

**Nabanita Das, Dr. PintuSil, MitraliChakraborty**

### **Abstract**

Activation of B and T lymphocytes leads to major remodeling of the metabolic landscape of the cells enabling their post-activation functions. However, naive B and T lymphocytes also show metabolic differences, and the genesis, nature and functional significance of these differences are not yet well understood. Here we show that resting B-cells appeared to have lower energy demands than resting T-cells as they consumed lower levels of glucose and fatty acids and produced less ATP. Resting B-cells are more dependent on OXPHOS, while T-cells show more dependence on aerobic glycolysis. However, despite an apparently higher energy demand, T lineage cells showed lower rates of protein synthesis than equivalent B lineage stages. These metabolic differences between the two lineages were established early during lineage differentiation, and were functionally significant. Higher levels of protein synthesis in B-cells were associated with increased synthesis of MHC class II molecules and other proteins associated with antigen internalization, transport and presentation. The combination of higher energy demand and lower protein synthesis in T-cells was consistent with their higher ATP-dependent motility. Our data provide an integrated perspective of the metabolic differences and their functional implications between the B and T lymphocyte lineages.

International Journal of Immunology, the journal of system and technologies 158, 104-120 (2020).

59. Study of nontrivial magnetism in 3d-5d transition metal based double perovskites,  
ShreemoyeeGanguly and SayantikaBhowal, Physical Review B, 101 85104 (2020)

## Study of nontrivial magnetism in 3d–5d transition metal based double perovskites

**ShreemoyeeGanguly and SayantikaBhowal**

### **Abstract**

The coexistence of the strongly correlated 3d transition metal (TM) atom and the strong spin-orbit coupling of the 5d TM atom potentially hosts exotic physical phenomena. In the present work, we have studied the magnetism resulting from such a coexistence in  $\text{La}_2\text{CoIrO}_6$  (LCIO), a representative of bulk 3d–5d double perovskites. In order to gain further insight into the effect of Co-d states on the Ir-d states, comparisons are carried out with the isostructural  $\text{La}_2\text{ZnIrO}_6$ , where the nonmagnetic Zn atom replaces the Co atom. An in-depth analysis of the magnetic states in the framework of first-principles calculations, using Landau theory and magnetic multipole analysis, shows that the magnetism at the two constituent TM atoms in LCIO is driven by two different magnetic order parameters, viz., the spin moment as the primary order parameter responsible for the broken time-reversal state in Co and the higher-order multipole: the triakontadipole for the Ir magnetic state. A tight-binding analysis with the Ir- $t_{2g}$  orbitals further indicates that the Ir-d states are hardly affected by the Co-d states, in agreement with the multipole analysis. The computed hierarchy of the relevant multipoles in the present work can be probed in neutron diffraction measurements, motivating further experiments in this direction.

Phys. Rev. B 101, Pg085104-085113 (2020)

60. Exact solutions of a damped harmonic oscillator in a time dependent noncommutative space, ManjariDutta, ShreemoyeeGanguly, SunandanGangopadhyay, International Journal of Theoretical Physics, 3852 29 (2020) SCI

### **Exact Solutions of a Damped Harmonic Oscillator in a Time Dependent Noncommutative Space**

**ManjariDutta, ShreemoyeeGanguly, SunandanGangopadhyay**

#### **Abstract**

In this paper we have obtained the exact eigenstates of a two dimensional damped harmonic oscillator in time dependent noncommutative space. It has been observed that for some specific choices of the damping factor and the time dependent frequency of the oscillator, there exists interesting solutions of the time dependent noncommutative parameters following

from the solutions of the Ermakov-Pinney equation. Further, these solutions enable us to get exact analytic forms for the phase which relates the eigenstates of the Hamiltonian with the eigenstates of the Lewis invariant. We then obtain expressions for the matrix elements of the coordinate operators raised to a finite arbitrary power. From these general results we then compute the expectation value of the Hamiltonian. The expectation values of the energy are found to vary with time for different solutions of the Ermakov-Pinney equation corresponding to different choices of the damping factor and the time dependent frequency of the oscillator.

International Journal of Theoretical Physics 59, Pg 3852–3875 (2020)

61. Binary Nanoalloy Clusters: A Case Study for FeCr Clusters., ShreemoyeeGanguly, American Journal of Physical Sciences and Applications, 6 1 (2020)

### **Binary Nanoalloy Clusters: A Case Study for FeCr Clusters.**

**ShreemoyeeGanguly**

#### **Abstract**

A study of  $\text{Fe}_x\text{Cr}_y$  binary nanoalloy clusters is carried out for sizes  $n=x+y=13$  and 55, the first two closed shell structures. While for  $n=13$ , various compositions like  $x=12$  and  $y=1$ ;  $x=11$  and  $y=2$ ;  $x=10$  and  $y=3$ ;  $x=1$  and  $y=12$  are studied, for the larger size ( $n=55$ ) the morphology of a Fe-rich cluster ( $\text{Fe}_{42}\text{Cr}_{13}$ ) and a Cr-rich cluster ( $\text{Fe}_{13}\text{Cr}_{42}$ ) are analysed. The potential energy surface of the nanoalloys are scanned thoroughly using an evolutionary genetic algorithm in conjunction with a density functional theory based first principles method and the most stable clusters are picked up for every size and composition. A definite hierarchy in Cr-Cr, Fe-Cr and Fe-Fe bonding strengths is seen to determine the stability of the clusters. Cr-Cr bonding is promoted over Fe-Cr bonding which in turn is preferred over Fe-Fe bonding in the nanoalloy systems.

American Journal of Physical Sciences and Applications, 1( 2), Pg 6-11 (2020)

62. Hierarchical design of rGO-PEDOT-  $\delta$ -MnO<sub>2</sub> nanocomposite for supercapacitor, P. Sen, S. Rana and A. De, Journal of Electronic Materials 49 (2020) 763-772. International SCI Index Journal. (Print ISSN 0361-5235)

### **Hierarchical design of rGO-PEDOT- $\delta$ -MnO<sub>2</sub> nanocomposite for supercapacitor**

**Pintu.Sen, SubhasisRana and Amitabha De**

#### **Abstract:**

A hierarchical strategy has been adopted for the development of ternary composites, where nanostructured  $\delta$ -MnO<sub>2</sub> has been fabricated sonochemically on a unique mesoporous binary composite made of 3,4-ethylenedioxythiophene (EDOT) and reduced graphene oxide (rGO) in order to achieve maximum loading of 89% Mn+4 oxidation state essential for high capacitance value. All composite samples have been characterized by transmission electron microscopy, x-ray diffraction, Fourier infrared spectroscopy and thermogravimetry analysis. Oxidation states of manganese have been evaluated by x-ray photoelectron spectroscopy (XPS). The charge storage mechanism in the nanocomposite materials is primarily governed by the unique mesoporous structure developed during oxidative polymerization of the EDOT and rGO in the composites. The cumulative charge accumulation reveals the storage mechanism where, the entrance of Li<sup>+</sup> ion into the mesoporous layered structure of rGO based nanocomposites during reduction followed by re-entrance of Li<sup>+</sup> ion on oxidation, is comparable to that of Li<sup>+</sup> ion adsorption/desorption on the surface of the nanocomposites. Impedance measurements are carried out to evaluate the contribution of the pseudocapacitance over the electrical double layer capacitance. Achievement of high specific capacitance (345 F g<sup>-1</sup>) with small attenuation (~ 12%) over 1000 continuous charging/discharging cycles, suggests that the ternary nanocomposites with 70% loading of  $\delta$ -MnO<sub>2</sub> (RGPT70M) acts as a promising candidate for the electrode materials of the supercapacitor.

Journal of Electronic Materials 49, 763-772 (2020).

63. Effect of loading rate on crystallization of metallic glass supercooled liquids, E. Davoodi, M. Hasan, S. Rana and G. Kumar, The American Journal of Physical Sciences and Applications, 1 (2020) 18-21, The Smart Society Publication, (US: ISSN 2644 – 0792)

### **Effect of loading rate on crystallization of metallic glass supercooled liquids**

**E. Davoodi, M. Hasan, S. Rana and G. Kumar**

#### **Abstract**

Metallic glasses exhibit unique thermoplastic processing capability, which is enabled by their metastable supercooled liquid state below the crystallization temperature. The thermoplastic processing critically depends on the crystallization time (processing time window), temperature (viscosity), applied load, and strain-rate. Among these parameters, the effects of crystallization time and processing temperature have been extensively studied. However, the effects of load and loading rate have not been thoroughly investigated. In this work, we performed a systematic study of load on the supercooled liquid state of three metallic glass formers: Pt-based, Zr-based, and Pd-based. The results show that the load-response of a metallic glass supercooled liquids is strongly composition dependent. The onset temperature of crystallization decreases with increasing load in Pt-based metallic glass whereas for Zr-based and Pd-based metallic glasses the onset temperature remains unchanged. The crystallization peak time is reduced for all three metallic glasses after thermoplastic forming. The results are discussed in terms of nucleation and growth of crystallites in metallic glasses.

The American Journal of Physical Sciences and Applications, 1, 18-21, (2020).

64. Development of graphene based nanostructures and its applications in food quality control and health care, Kar Gupta, A. Dutta, K. Dutta and S. Rana, World Journal of Engineering Research and Technology, 6 (2020) 141-160. An ISO 9001 : 2015 Certified International Journal (ISSN 2454 - 695X)

### **Development of graphene based nanostructures and its applications in food quality control and health care**

**Abhijit Kar Gupta, Arjun Dutta, Kakoli Dutta and Subhasis Rana**

## Abstract

Synthetic dyes are very often used as food colors to make the food stuff attractive. All the dyes however, are not good for health and therefore are not permitted to be used in food. There are total nine synthetic dyes approved by U.S Food and Drug Administration(FDA) which are commonly used in soft drinks, breakfast cereals, candies snacks, baked goods, frozen desserts etc. Recently certain dyes contain azo-groups are also found to be deleterious to the consumers causing cancers, hyperactivity and other disorders. So the determination of trace amount of these toxic food dyes in food stuff has become an analytical challenge. Graphene is a single layer of carbon atoms(sp<sup>2</sup> hybridized), that are packed in a hexagonal honeycomb crystalline structure. It has extremely high electron mobility at room temperature high surface to volume ratio and high electrical conductivity. Synthesis of graphene can be done either by chemical vapour deposition technique or by chemical exfoliation of graphite into GrapheneOxide(GO).The reduced GO(RGO) sheets are usually considered as one kind of chemically derived graphite whose properties can be altered depending on the reduction process. There is different domain of application in this graphene based nanostructures of which food quality control and healthcare is an important sector. In the present work our aim is to synthesize and characterize several graphene oxide based nanostructures and to study their applicability in the detection of trace amount of some carcinogenic food dyes.

World Journal of Engineering Research and Technology, 6, 141-160 (2020).

65. Oral andrographolidenanocrystals protect liver from paracetamol induced injury in mice. BasuAalok, Gutisujay, Kundu Sonia, Das Aatrayee, Das Suvadra, Mukherjee Arup, Journal of Drug Delivery Science and Technology, 55, 101406, 2020. (impact factor 2.734). (International journal)

### **Oral andrographolidenanocrystals protect liver from paracetamol induced injury in mice.**

**AalokBasu, SujayGuti, Sonia Kundu, Aatrayee Das, Suvadra Das, Arup Mukherjee**

## Abstract

Andrographolide (AG) is a labdane-type terpenoid obtained from aerial parts of *Andrographis paniculata*. Though known as a potent bioactive in a myriad of biological conditions, the applications of AG in translational medicine are mostly limited due to its low aqueous solubility and poor bioavailability. Nanocrystal technology was envisaged as a possible solution. Andrographolidenanocrystals (AGNC) were prepared through solvent-diffusion followed by homogenization. AGNC hydrodynamic diameter of  $630 \pm 12$  nm and crystallinity changes led to significant increase of aqueous solubility and intestinal permeation *ex vivo*. Pharmacodynamic studies on mice showed that AGNC exerted hepatoprotective activity at a lower dose against paracetamol induced liver injury, in comparison to crude AG. The work highlighted that nanocrystal technology can be considered as one platform for circumventing the biopharmaceutical limitations of AG. This also ensures significant successes in biological applications.

Journal of Drug Delivery Science and Technology 55, Pg 101406 (2020)

66. Lactoferrin Tethered Betulinic Acid Nanoparticles Promotes Rapid Delivery And Cell Death In Triple Negative Breast And Laryngeal Cancer Cells. HalderAsim, JethwaMegha, MukherjeePritha, GhoshSubarna, Das Suvadra, HelalUddine A. B. M., Mukherjee Arup, ChatterjiUrmi and Roy Partha, Artificial Cells, Nanomedicine and Biotechnology, 48,(1), 1362-1371,2020

# **Lactoferrin Tethered Betulinic Acid Nanoparticles Promotes Rapid Delivery And Cell Death In Triple Negative Breast And Laryngeal Cancer Cells.**

**Asim Halder, Megha Jethwa, Pritha Mukherjee, Subarna Ghosh, Suvadra Das, A. B. M. Helal Uddine, Arup Mukherjee, Urmi Chatterji and Partha Roy**

## **Abstract**

Cancer management presents multifarious problems. Triple negative breast cancer (TNBC) is associated with inaccurate prognosis and limited chemotherapeutic options. Betulinic acid (BA) prevents angiogenesis and causes apoptosis of TNBC cells. NIH recommends BA for rapid access in cancer chemotherapy because of its cell-specific toxicity. BA however faces major challenges in therapeutic practices due to its limited solubility and cellular entry. We report lactoferrin (Lf) attached BA nanoparticles (Lf-BANp) for rapid delivery in triple negative breast (MDA-MB-231) and laryngeal (HEp-2) cancer cell types. Lf association was confirmed by SDS-PAGE and FT-IR analysis. Average hydrodynamic size of Lf-BANp was  $147.7 \pm 6.20$  nm with  $\xi$  potential of  $-28.51 \pm 3.52$  mV. BA entrapment efficiency was  $75.38 \pm 2.70\%$  and the release mechanism followed non-Fickian pattern. Impact of Lf-BANp on cell cycle and cytotoxicity of triple negative breast cancer and its metastatic site laryngeal cancer cell lines were analyzed. Lf-BANp demonstrated strong anti-proliferative and cytotoxic effects, along with increased sub-G1 population and reduced number of cells in G1 and G2/M phases of the cell cycle, confirming reduced cell proliferation and significant cell death. Speedy intracellular entry of Lf-BANp occurred within 30 min. Lf-BANp design was explored for the first time as safer chemotherapeutic arsenals against complex TNBC conditions.

Artificial Cells, Nanomedicine and Biotechnology 48, Pg 1362-1371 (2020)

67. Mesoporous carbon nanospheres derived from agro-waste as novel antimicrobial agents against gram-negative bacteria, Roy Partha, Bhat Vinay S., Saha Sumana, Sengupta Dipanjan, Das Suvadra, Datta Sriparna & Hegde Gurumurthy, Environmental Science and Pollution Research, doi: 10.1007/s11356-020-11587-1, 2020

## **Mesoporous carbon nanospheres derived from agro-waste as novel antimicrobial agents against gram-negative bacteria.**

**Partha Roy, Vinay S. Bhat, Sumana Saha, Dipanjan Sengupta, Suvadra Das, Sriparna Datta, Gurumurthy Hegde.**

## **Abstract**

Porous carbon nanospheres were synthesized from agro-waste garlic peels by a one-pot facile and easy to scale-up pyrolysis method. Surface morphology and structural features of the nanospheres have been studied by field emission scanning electron microscopy, energy-dispersive spectroscopy, X-ray diffraction, and Raman spectroscopy. Fourier transform infrared spectroscopy (FTIR) and  $N_2$  adsorption-desorption experiments were explored to detect surface functionality, surface area, and porosity. Average particle diameter of the synthesized nanospheres was  $31 \pm 6.3$  nm and zeta potential of  $-25.2$  mV  $\pm$   $1.75$  mV. Nanoscale carbon was mesoporous in nature with type IV isotherms, mean pore diameter of 15.2 nm, and total pore volume of 0.032 cm<sup>3</sup>/g. Minimum inhibitory concentration and minimum bactericidal concentration values of carbon nanospheres against *Escherichia coli* are  $480 \pm 0.5$   $\mu$ g/ml and  $495 \pm 0.5$   $\mu$ g/ml, respectively. Synthesized nanospheres exhibited gram-selective antimicrobial action against *Escherichia coli* probably linked to membrane deformity due to interaction of nanocarbon with the bacterial membrane. Carbon nanospheres resulting from waste to wealth transformation emerged as promising candidates for antibacterial application.

Environmental Science and Pollution Research 28, Pg 13552-13561 (2020)

68. Flavonoid-decorated nano- gold for antimicrobial therapy against Gram-negative bacteria *Escherichia coli*, Suvadra Das, TanayPramanik , MeghaJethwa , Partha Roy, Applied Biochemistry and Biotechnology. doi: 10.1007/s12010-021-03543-7,2021 (impact factor 1.638)

### **Flavonoid-decorated nano- gold for antimicrobial therapy against Gram-negative bacteria *Escherichia coli***

Suvadra Das, TanayPramanik ,MeghaJethwa , Partha Roy

#### **Abstract**

Nano-gold (Aunps) have emerged as promising options that exhibit unique features discrete from traditional materials suited for biomedical applications. Aunps were synthesized using flavonoidquercetin (Q) as reducing agent, and resultant nanoparticles were further conjugated with the flavonoid. The resultant nano-system was expected to perform a dual role as antibacterial and as antioxidant agent. Nano-gold surface Plasmon peaks were recorded at 560 nm with size around 62 nm and having slim distribution pattern. Spherical particle with smooth surface was observed under TEM and AFM studies. TEM micrographs confirmed a homogeneous particle population of size around 30 nm. Quercetin association to nano-gold was corroborated through FTIR and EDAXanalysis. Antioxidant nature of nano-gold prevented rapid oxidation of brilliant cresyl blue dye, in presence of sodium hypochlorite. Antimicrobial action of QuAunp was tested against Gram-negative bacteria *Escherichia coli*. Nano-gold designed produced a minimum inhibitory concentration of 7.6 µg/ml and minimum bactericidal concentration 10.5 µg/ml against *E. coli*. Further TEM analysis and membrane permeability studies revealed the impact of QuAunps on bacterial membrane leading to cell damage.

Applied Biochemistry and Biotechnology 193, Pg 1727-1743 (2021)

69. Polyphenol capping on gold nanosurface modulates human serum albumin fibrillation. AalokBasu, Sonia Kundu, Aatrayee Das, ChitraBasu, Sagar S Bhayye, Suvadra Das and Arup Mukherjee, Materials Advances,1.1142,2020

### **Polyphenol capping on gold nanosurface modulates human serum albumin fibrillation.**

AalokBasu, Sonia Kundu, Aatrayee Das, ChitraBasu, Sagar S Bhayye, Suvadra Das and Arup Mukherjee

#### **Abstract**

Different small molecules and nanomaterials have been known as inhibitors of protein misfolding and subsequent fibrillation, which marks the initiation of various degenerative conditions. This work explores the effect of polyphenol-capped gold nanoparticles on the extent of human serum albumin fibrillation. Silymarin-capped (SAuNPs), quercetin-capped (QAuNPs) and gallic acid-capped gold nanoparticles (GAuNPs) were synthesized with a uniform size range and their relative antioxidant capacity was determined through DPPH assay. The fibrillation of HSA at 65 °C was inhibited by ~15% in the presence of SAuNPs and the process was monitored through a combination of Thioflavin T fluorescence spectroscopy, circular dichroism spectroscopy and microscopic analysis. The inhibitory effect appeared much pronounced in the case of QAuNPs (~67%) and GAuNPs (~60%). Using SDS PAGE analysis, we demonstrated that the different inhibitory activity of SAuNPs, QAuNPs, and GAuNPs could be attributed to the antioxidant potential of the individual nanoparticles. Our work revealed that apart from protein–nanoparticle surface interactions, the antioxidant capacity has a role in determining the effectiveness of a protein fibrillation

inhibitor. Cytotoxic analysis of protein–gold nanoparticle aggregates on HaCaT cell lines further confirmed that the nanoparticles were biosafe and can be considered as active therapeutics for translational use.

Materials Advances 1, Pg 1142-1150 (2020)

70. Diabetes associated delay in wound healing and strategies for its management, MeghaJethwa, NagmaBanjare, TamalSadhukhan, , and Suvadra Das, American Journal of Physical Sciences and Application (AJPSA) Vol -I, Issues 2, 2020

### **Diabetes associated delay in wound healing and strategies for its management**

**MeghaJethwa, NagmaBanjare, TamalSadhukhan, Suvadra Das**

#### **Abstract**

Diabetes one of the leading causes of deaths worldwide because of its secondary manifestations as discussed in this review. These manifestations are neuropathy, retinopathy, nephropathy, cardiovascular system related disorder and alterations in normal wound healing process. Healing of skin and foot ulcers retards which give rise to chronic conditions around ulcers due to changes in the pathological conditions of wound in diabetes. This review discuss about these pathological changes and therapies which are currently available in the market. This review also explores some important research studies based on novel drug delivery system i.e. nanoparticle in diabetic wound healing.

American Journal of Physical Sciences and Application (AJPSA) I, Pg 16-23 (2020)

71. Thiocoumarins and Dithiocoumarins: Advances in Synthesis and Pharmacological Activity- D. Chaudhary, T. Pramanik and S. Santra, Current Organic Chemistry, 2020, 24(16), 1793-1814.

### **Thiocoumarins and Dithiocoumarins: Advances in Synthesis and Pharmacological Activity**

**Diksha.Chaudhary, Tanay. Pramanik and Soumava.Santra**

#### **Abstract**

Thiocoumarins and dithiocoumarins are two important classes of Sulphur- containing heterocyclic compounds, which are bioisosteres of coumarins. Herein, various synthetic strategies for these two classes of heterocyclic compounds reported in the literature have been discussed. Different solvents, catalysts, reagents and reaction conditions, which were employed successfully for synthesizing thiocoumarins and dithiocoumarins have also been described concisely in this review. Mechanistic overview has been given wherever it was necessary. In addition, a comparative view of various solvents, catalysts and reagents focusing on their efficiency for synthesizing thiocoumarins and dithiocoumarins, has been discussed as well. Furthermore, pharmacological activities of these two classes of compounds have also been discussed  
Current Organic Chemistry, 2020, 24(16), 1793-1814

72. Garlic Catalyzed and Grindstone Assisted Solvent Free Green Synthesis of Pharmaceutically Important Schiff Bases, TanayPramanik, Research Journal of Pharmacy and Technology 2020, 13 (1), 152-156

## **Garlic Catalyzed and Grindstone Assisted Solvent Free Green Synthesis of Pharmaceutically Important Schiff Bases**

**TanayPramanik**

### **Abstract**

Present research work demonstrates the use of garlic as natural biocatalyst for green synthesis of a series of Schiff bases which are an important class of pharmaceutically important compounds, employing p-toluidine and variety of aromatic aldehydes as reactants. The products were obtained with good percentage of yield by simply grinding the reactants together with pestle in a mortar in presence of a piece of garlic in a completely solvent freecondition. The synthesized crude products were purified by recrystallization from hot ethanol to obtain pure Schiff bases which were characterized by melting point, FTIR, <sup>1</sup>H-NMR and <sup>13</sup>C-NMR. Through this work, a very simple, eco-friendly, effective, economic and new methodology is developed for synthesis of Schiff bases.

Research Journal of Pharmacy and Technology 2020, 13 (1), 152-156

73. A novel and green water softening technology using biodegradable materials- S. Lzaod, P. Bedi, D. Chowdhury, S. Santra and T.Pramanik, Drug Invention Today 2020, 14 (3), 232-237

### **A novel and green water softening technology using biodegradable materials Stanzin.Lzaod, Pooja. Bedi, Diksha. Chowdhury, Soumava. Santra and Tanay.Pramanik.**

#### **Abstract**

Objective: Water hardness is the measure of calcium and magnesium salts dissolved in water. Hard water poses variousdifficulties when used domestically and industrially. Conventionally, permanent water hardness is removed using limesoda treatment or ion-exchange methods. The precipitates formed during lime soda treatment and the brine collectedafter backwashing of the ion exchange resins can prove detrimental to the environment if not disposed properly.Materials and Methods: In this work, varieties of eco-friendly natural products were used for removal of permanent waterhardness. Results: Comparative analysis of their efficiency revealed that fresh pomegranate peels were the most efficient asa water softening agent. Conclusion: Hereby, an eco-friendly, economic, simple, and efficient method has been developed forremoval of permanent water hardness simply by applying various naturally occurring materials without using any chemicalreagents or a source of energy

Drug Invention Today 2020, 14 (3), 232-237

74. RELATIONSHIP OF SELECTED PHYSIOLOGICAL VARIABLES WITH SWIMMING PERFORMANCE,ManasBanerjee, International Journal Of Physiology,Nutrition And Physical Education, Volume.5 Issue.1, Jan-Jun 2020 - Issn:2456-0057

### **Relationship of selected physiological variables with swimming performance**

**ManasBanerjee and Dr. Somnath Bag**

#### **Abstract**

Man learned to swim long before it was possible for him to leave us any written record of his aquatic accomplishments (Robert Bartels, 1969) [9]. Heart rate testing is one of the most common forms of



physiological monitoring, given the availability of several different heart rate monitors that can be used in the pool. Heart rates are often taken during sub maximal and maximal effort swimming to evaluate the response to different training sets. The purpose of the study was to investigate the relationship of physiological variables (Resting Heart rate, Breath hold time, Peak expiratory flow rate) with Short Distance swimming performance. For this study, 25 District level Short Distance male swimmers specialized in 50 meters free hand swimming from different clubs of West Bengal were considered as subjects. Subjects were selected purposively and the age of the subjects ranged 16 to 17 years. Correlation of co-efficient was employed to calculate the collected data at 0.05 level of confidence. The result showed that there was no significant Relationship of Swimming Performance with Resting Heart rate, Breath hold time and Peak expiratory flow rate. There was a positive relationship of resting heart rate and peak expiratory flow rate with swimming performance. As it is established fact that performance has an inverse relation with time. So it can be concluded that both variables were negatively associated with each other in true sense. In case of breath hold time there was a negative relationship with swimming performance. As it is established fact that performance has an inverse relation with time. So it can be concluded that both variables were positively associated with each other in true sense.

**International Journal of Physiology, Nutrition and Physical Education 2020; 5(1): 01-05**ISSN: 2456-0057  
IJPNE 2020; 5(1): 01-05

75. INFLUENCE OF SEASONAL CHANGES ON PERFORMANCE OF SWIMMERS ,  
ManasBanerjee AMERICAN JOURNAL OF APPLIED MATHEMATICS AND COMPUTING -  
(AJAMC) VOLUME.1 ISSUE.3 - ISSN( Print):2691-783, ISSN( Online ): 2689-9957

### **Influence of seasonal changes on performance of swimmers**

**Limon Kumar Saha, ManasBanerjee**

The purpose of the study was to investigate the effect of seasonal changes on performance of swimmers. For this study, 20 State level male swimmers specialized in 50 meter and 100 meter backstroke swimming from different clubs of West Bengal were considered as subjects. Subjects were selected purposively and the age of the subjects ranged from 15 to 17 years. To find out the differences in relation to the performance of swimmers between summer and winter season, t test was employed. To analysis the collected data, level of significance was set at 0.05 level. The result showed that there was significant difference of 50 meters and 100 meter backstroke Swimming Performance in winter as well as in summer.

AJAMC, Vol 1, Issue 3, 2020

76. A New DNA sequencing alignment methodology using the Longest Common Subsequence technique, Chowdhury D., Sau, K, American Journal of Applied Mathematics and Computing ,  
Vol 1, Issue 3, 2020

### **A New DNA sequencing alignment methodology using the Longest Common Subsequence Technique**

**DebkumarChowdhury, KartikSau and SanjuktaMishra**

The goal of this paper is to perform DNA sequence alignment using the Longest Common Subsequence Algorithm to obtain the longest common subsequence from the two strings X and Y for matching DNA in molecular biology etc. This paper would seek to establish the differences between the 2 species DNA and thereby conclude on their genetic similarity. The paper will be implemented in terms of space and time using the optimized longest common subsequence algorithm. This paper acts as a bridge between computer science and genomics, exploring the interdisciplinary area of computational biology and helping us to consider the very fundamental concepts of life and our relationship with other species.

American Journal of Applied Mathematics and Computing ,Vol 1, Issue 3, 2020

77. Walsh transforms of trace forms with three or more terms and some maximal Artin-Schreier curves -Sankhadip Roy, *Functiones et Approximatio Commentarii Mathematici*, 21-01-2021

## **Walsh transforms of trace forms with three or more terms and some maximal Artin-Schreier curves**

**Sankhadip Roy**

### **Abstract**

We introduce some results for the Walsh transforms of quadratic trace forms with three or more terms. We also generalize some results on Kasami–Welch functions. We use Walsh transforms to obtain the number of rational points on Artin–Schreier curves over  $\mathbb{F}_{2^k}$ . Later we construct some maximal Artin–Schreier curves over  $\mathbb{F}_{2^k}$  for an even integer  $k$ .

*Funct. Approx. Comment. Math. Advance Publication* 1-9 (2021). DOI: 10.7169/facm/1909

78. Different method for counting the number of Quadratic functions with prescribed spectra - Sankhadip Roy, *American Journal of Applied Mathematics and Computing* 01-07-2020

## **Different method for counting the number of Quadratic functions with prescribed spectra**

**Sankhadip Roy**

### **Abstract**

In this correspondence we study a class of quadratic binary functions  $\{ \text{cal}\{F\}_{2,n} \}$  from  $\mathbb{F}_{2^n}$  to  $\mathbb{F}_2$ , which are well-known to have plateaued Walsh spectrum; i.e., for each  $b \in \mathbb{F}_{2^n}$  the Walsh transform  $\hat{f}(b)$  satisfies  $|\hat{f}(b)|^2 \in \{0, 2^{n+s}\}$  for some integer  $0 \leq s \leq n-1$ . For the type of integers  $n = q_1 q_2$ , where  $q_1, q_2$  are two different odd primes, we determine possible values of  $s$  and present some enumeration results for counting the number of quadratic functions having those particular form of  $s$ .

*American Journal of Applied Mathematics and Computing*, Volume 1, Number 1, January 2020, pp. 5-7(3)

79. Science in Scriptures Analysing the Presence of Modern Technology in Ancient Indian Mythology - Ankana Ghosh Dastidar, *ICELTS* 2020

## **Science in Scriptures-----Analysing the Presence of Modern Technology in Ancient Indian Mythology.**

**Ankana Ghosh Dastidar, Ayon Chakraborty, Abhishek Tripathi**

### **Abstract**

Myths are the study and interpretation of sacred tales (which can often be religious) of any particular culture or civilisation and Mythology as the dictionary suggests is the study of these Myths. This paper attempts to study and analyse the various instances where the depiction of Modern scientific technology is being found in the various mythological scripts in India.

ICELTS 2020

80. Justice served or Justice denied - AnkanaGhoshDastidar, Decoding the absurd nuances of the Jurisprudence in Leo Tolstoy's selected short stories - ICELTS 2020

### **Justice served or Justice denied ----- Decoding the absurd nuances of the Jurisprudence in Leo Tolstoy's selected short stories**

**AnkanaGhoshDastidar,SkShabibunUllah, SunitaBasak**

#### **Abstract**

Justice is one of the main societal values which construct a society. The very structure of the society is governed by the law and order. But frequently the revered legal system fails pathetically to conduct a fair play. Though in theory there are various moralities and promises to serve all with equality but many a times human emotions and genuinity are considered irrelevant and proves that law is indeed blind in its exact meaning. In the chosen short stories the truth has been overshadowed by facts and law is stretched to any extent to suit the changing interest of the powerful. This paper shows how logic creates opacity and strangely prevents us to see the truth and differentiate the right from the wrong.

ICELTS 2020

81. Exploring Coping Styles & Present Mental Health Status of Final Year Undergraduate Students in Relation to their Psychological Capital amidst uncertainties of COVID Pandemic, AninditaMajumdar, KritiSarkar, AbhinitaGhosh, International Journal of English Learning and Teaching Skills (ISSN: 2639-7412 (Print) ISSN: 2638-5546 (Online), International Vol 3, No.2 1945-1962 2021

### **Exploring Coping Styles & Present Mental Health Status of Final Year Undergraduate Students in Relation to their Psychological Capital amidst uncertainties of COVID Pandemic**

**AninditaMajumdar, KritiSarkar, AbhinitaGhosh**

COVID-19 pandemic and the lockdown declared due to this, has brought a robust stagnation in different sectors of human life. When the world is facing delayed development and crisis in economic sectors, job markets, work culture, etc., educational realm has also undergone a massive change within just few months. In this era of new normal, not only the teaching-learning system is forced to be shifted to online platform; but also the students who were supposed to complete their college/ university degrees this year are still in a stagnated state. Along with the present pandemic environment stress, the uncertainties relating to their future aspirations have become an added burden for these students' mental health. This study has focused on the present mental health status of these final year students of undergraduate (UG) level (groups separated as higher education and job aspirants) and the coping styles adopted by them to combat environmental uncertainties in relation to their psychological capital. The study, thus, investigated difference in psychological capital, present mental status and adopted coping style between final year UG students aspiring for higher studies and job. The data was collected through online platform and after proper screening, and analysed with the help of descriptive and multivariate statistical techniques. Final results observed no particular difference in psychological capital between the two groups of final year UG students. However, difference was observed in their adopted coping strategies and present mental health status. As the psychological capital shows no difference, the difference observed in mental health condition and coping, hence, could be attributed to the stress and insecurities culminating from pandemic crisis.

82. The Effect of Online Teaching and Learning in Primary School Kids — A Changed Education Scenario in 2020 India. KritiSarkar, AvishiktaChatterjee, Kumar Satyam, Anushka Paul, RupnathMallick, International Journal of English Learning and Teaching Skills (ISSN: 2639-7412 (Print) ISSN: 2638-5546 (Online), International Vol 3, No.2 2051-2061 2021

### **The Effect of Online Teaching and Learning in Primary School Kids — A Changed Education Scenario in 2020 India.**

**KritiSarkar, AvishiktaChatterjee, Kumar Satyam, Anushka Paul, RupnathMallick**

Online medium of conducting education was previously there but was never chosen up on the conventional method. But the covid-19 pandemic had left no other options of conducting education. It has become a big step in the developing history of India. If this medium of learning is utilized to its fullest success can be achieved easily. Usually what was restricted to some course and degrees now includes the whole educational system. Since the beginning of the year 2020 there has been a sudden shift in the education process after the COVID-19 the learning and teaching process drastically changed towards the online and virtual based learning process. The online based learning that is the E-learning process became common and several schools and colleges started adapting it. It was not a very big of a problem since billions of people all over the world are familiar with phones, laptops, and other digital devices which made it easier to attend this e-classes [Lone. A]. Not only education is advancing by the help of virtual meet, but also through the internet, a lot of effort and importance is given to the internet both by the students and by teachers. Online based learning came to be quite handy proved to be a useful way of learning and teaching. Free online courses are leading students and showing opportunities to upgrade themselves, this eventually helps the students to plan a better future for themselves. Not only education is advancing by the help of virtual meet, but also through the internet, a lot of effort and importance is given to the internet both by the students and by teachers. A new world of studies is advancing i.e., the virtual world. Several online courses are making there way through by providing certified certificates to the students and other learners, one of the top website among them is coursera. Free online courses are leading students and showing opportunities to upgrade themselves and to become even more advance. This eventually helps the students to plan a better future for themselves. This research paper is mainly aimed making people understand the new emerging model of educational system by putting light on its various aspects. This is a big step in the developing history of India. But keeping in mind the technological infrastructure of our country this new model is restricted to some portions. This technological lack is keeping the non-accessors a step behind the accessors.

International Journal of English Learning and Teaching Skills (ISSN: 2639-7412 (Print) ISSN: 2638-5546 (Online), International Vol 3, No.2 2051-2061 2021

83. Information overload – Managing Cognition and Emotion in Work from Home – Documentation of Review based Findings, KritiSarkar, ShainaSengupta, Pallabi Roy, International Journal of English Learning and Teaching Skills (ISSN: 2639-7412 (Print) ISSN: 2638-5546 (Online)

### **Information overload – Managing Cognition and Emotion in Work from Home – Documentation of Review based Findings**

**KritiSarkar, ShainaSengupta, Pallabi Roy**

#### **Abstract:**

One of the recent studies contained of a review based study of about 80 academic articles which concerns about flexible working from home. The study gave a little clear evidence that the telework increases satisfaction and a lot of productivity. In the year 2007 a Meta based analysis was conducted on telecommuting. It was suggested that telecommuting is actually more good than bad for an individual and found some small but favourable effects on perceived work and family conflict, autonomy, performance, job

satisfaction, turnover intent, and stress. On the other hand it was discovered that telecommuting had no direct damaging effects towards the quality of workplace relationships. Inconsistent results are also found in several studies. Few studies showed that there is no direct effect of teleworking based on productivity or in some cases there were even negative effects. While on the other hand some studies reported that teleworking are much likely results in increase of work overtime, which actually should not be considered as an increase in work productivity, but it can be considered as a risk factor towards health.

International Journal of English Learning and Teaching Skills (ISSN: 2639-7412 (Print) ISSN: 2638-5546 (Online))

84. Nature, Freedom and Pedagogy-A Comparative Analysis of Rousseau and Tagore. AyanitaBanerjee, The Global Journal of Humanities and Social Sciences.(GSHSS Vol-XXI Issue IV, Version 1 15.05.2021 (May)Pgs-57-68. ISSN Online-2249-460X ISSN Print-0975-587X DOI\_10.17406/GJHSS)

### **Nature, Freedom and Pedagogy-A Comparative Analysis of Rousseau and Tagore**

**AyanitaBanerjee**

Naturalism, the philosophy of Nature which subordinates mind and spirit to matter denies belief in the Supernatural and the Spiritual. While Idealism idolizes the 'Mind' or the 'Self', Naturalism emphasizes 'matter' and the physical world. Unlike the Idealists' claim substantiating that "God alone is the true agreement of concept [Begriff] and reality [Realität]; all finite [endlichen] things involve some untruth [Unwahrheit], they have a concept and an existence [Existenz] which are incommensurable". The Naturalists say that the ultimate reality is 'matter' which manifests itself in the form of 'Nature'. According to this philosophy 'the material world' or 'the physical world' or 'Nature' is the only real world that can be comprehended through human senses and unfurled through scientific investigations. 'Atom', 'Empty' space and 'Motion' are the three postulates on the basis of which the entire Nature and the phenomena of the Universe can be explained.

The Global Journal of Humanities and Social Sciences.(GSHSS Vol-XXI Issue IV, Version 1 15.05.2021 (May)Pgs-57-68.

85. A Novel, Eco-Friendly and Economical Process for Desalination of Water Using Waste Food Materials- RunjhunTandon, SoumavaSantraand,TanayPramanik, Oriental Journal of Chemistry. 2021, 37 (3), 524-530.

### **A Novel, Eco-Friendly and Economical Process for Desalination of Water Using Waste Food Materials**

**RunjhunTandon, SoumavaSantraand, TanayPramanik.**

#### **Abstract**

Scarcity of water in this world can be solved by removal of salinity from sea-water but this salinity removal is usually a costly and tedious task. In this work an efficient process has been developed for desalination of water using food waste materials which is completely eco-friendly and economic. A large number of starch rich food materials have been employed for the purpose of desalination of water and it was observed that all of them are effective to remove the salt contained from water, however it was observed that all of those food materials were not equally effective to remove salt contained. Cornflour was seen to be most effective which can remove salinity from sea water up 75-80%. This technology has a great prospect to evolve as a novel and green method for the purpose of desalination of water in near future.

Oriental Journal of Chemistry. 2021, 37 (3), 524-530.

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## Department of Electrical and Communication Engineering

### 86. Half mode semi-hexagonal SIW antennas and arrays for cellular V2X communication

Soumen Banerjee, Sampoorna Das Mazumdar, Sombuddha Chatterjee & Susanta Kumar Parui

#### Abstract

In this paper, the authors have proposed semi-hexagonal half-mode Substrate Integrated Waveguide (SIW) antennas generated by splitting the hexagonal SIW cavity across two different lines of symmetry, type 1: the diametric line the joining the opposite vertices of the cavity and type 2: the line connecting the opposite edge centers of the cavity. The resultant line of separation exposes the radiating edge of the antennas, with the other edges lined with hollow metallic cylindrical vias. The antennas thus designed and fabricated on Arlon AD270 substrate have a gain of 5.8 dBi at the resonating frequency of 5.9 GHz. The proposed antennas are compounded to design linear  $1 \times 2$  and  $1 \times 4$  arrays. The resonating frequencies for both  $1 \times 2$  and  $1 \times 4$  linear arrays of type 1 is 5.9 GHz with respective gain of 8.27 dBi and 11.3 dBi, thereby providing a gain improvement of 2.47 dBi and 5.5 dBi over the single array element. The type 2 linear antenna arrays also resonate at 5.9 GHz for both  $1 \times 2$  and  $1 \times 4$  configurations exhibiting a gain of 8.2 dBi and 11.2 dBi respectively, thus providing a gain improvement of 2.4 dBi and 5.4 dBi over the single array element. The antennas find significant utility in Intelligent Transportation Systems (ITS) for vehicular communication using Cellular-V2X (C-V2X) technology with frequency of operation lying in the allocated IEEE 802.11p band. The antennas also find application in satellite communication in the C-band. The measured results of the fabricated prototype of the antenna arrays are found to bear a close agreement with the simulated ones.

Microsystem Technologies, (2021)

### 87. Deep learning based real-time Industrial framework for rotten and fresh fruit detection using semantic segmentation

Kyamelia Roy, Sheli Sinha Chaudhuri & Sayan Pramanik

#### Abstract

Computer vision finds wide range of applications in fruit processing industries, allowing the tasks to be done with automation. Classification of fruit's quality and thereby gradation of the same is very important for the industry manufacture unit for production of best quality finished food products and the finest quality of the raw fruits to be sellable in the market. In the present paper, detection of rotten or fresh apple has been accomplished based on the defects present on the peel of the fruit. The work proposes a semantic segmentation of the rotten portion present in the apple's RGB image based on deep learning architecture. UNet and a modified version of it, the Enhanced UNet (En-UNet) are implemented for segmentation yielding promising results. The proposed En-UNet model generated enhanced outputs than UNet with training and validation accuracies of 97.46% and 97.54% respectively while UNet as the base architecture attaining an accuracy of 95.36%. The best mean IoU score under a threshold of 0.95 attained by En-UNet is 0.866 while that of UNet is 0.66. The experimental results show that the proposed model is a better one to be used for segmentation, detection and categorization of the rotten or fresh apples in real time.

Microsystem Technologies, 3365–3375 (2021)

### 88. Heterostructure Ge-Body pTFETs for Analog/RF Applications

Sayani Ghosh, Kalyan Koley, Samar K. Saha and Chandan K. Sarkar

#### Abstract

This paper presents a systematic study on the analog and radio-frequency (RF) performance of type-II staggered heterostructure p-channel tunnel field-effect transistors (pTFETs) with Ge (Germanium) channel and different compound semiconductor source. In order to study the figure-of-merits (FOMs) of analog and RF performances, various Ge-channel pTFETs are designed with Ge, GaAsP, SiGe, and InAlAs sources. The numerical simulation data show an improvement in the FOMs of analog performance such as drain current ( $I_{ds}$ ), transconductance (gm), transconductance-generation-factor

(gm/Ids), and intrinsic gain (gmRo) of the devices with compound semiconductor source compared to Ge-source pTFET devices. Similarly, an improvement in the RF FOMs such as gate-to-source (Cgs) and gate-to-drain (Cgd) capacitances, maximum frequency of oscillation (fMAX), and cutoff frequency (fT) is observed for the devices with GaAsP, SiGe, and InAlAs source compared to Ge-source pTFETs. The simulation results also show that the common-source amplifiers, designed with Ge-heterostructurepTFETs, exhibit a significant enhancement in gain and GainBandwidth product of the circuit.

IEEE Journal of the Electron Devices Society ( Volume: 8), 1202 – 1209, 2020

## **89. Internet of Things for e-healthcare employing Telemedicine to treat COVID-19**

**Debanjana Ghosh, Piyali Mukherjee**

### **Abstract**

Telemedicine and Internet of Things (IoT) technology has gained a lot of attention in recent years owing to its potentiality to elevate the present healthcare scenario. Though being invented a few decades ago, they are now widely used due to the variety of scopes it offers. In spite of their effectiveness in a wide range of applications, they had not been implemented thoroughly to extract the best possible outcome from it. This can be mainly attributed to the absence of a constructive and standardized model, resulting in deprivation of people from their life-changing benefits. Needless to say that healthcare still stands at the forefront of any research areas even today. The current situation of combating the pandemic created by COVID-19 brings the entire healthcare systems on the verge of an existential crisis at every corner of the world. Thus the urge to find and propose alternatives like Telemedicine and e-Health is worth necessary. This paper proposes a cost-effective and time-efficient model of Telemedicine incorporating the use of IoT technologies with an aim to contribute an advanced solution to fight the battle with COVID-19.

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), 7418-7422, vol 9, 2020

## **90. Approach to reduce PAPR in Orthogonal Frequency Division Multiplexing Technique**

**Sakir Ahmed Mondal, Sagnik Chakraborty, Subhodeep Mondal, Raunav Ghosh, Manidipa Samanta, Piyali Mukherjee**

### **Abstract**

Orthogonal Frequency Division Multiplexing (OFDM) is an efficient and attractive modulation technique that can be considered as the heart of all major wireless communication applications used as well as in development today. OFDM is an advanced version of Frequency Division Multiplexing (FDM) technique that separates the channel bandwidth into multiple narrow sub-bands in order to transfer information. With the progress of advance communication field there should be high data rate along with power efficiency and lower Bit Error Rate (BER). Due to advent of Internet of Things (IoT), Artificial Intelligence (AI), 5G and other network demanding technologies network congesting scenarios are becoming common and because of interfering channels noise is observed caused by adjacency of communicating devices. So, the fulfillment of current as well as future demand of high data rate and greater power efficiency are very much essential. These requirements are achieved very well with OFDM technique but at the cost of high Peak to Average Power Ratio (PAPR). High PAPR leads to in band distortion and Out of Band radiation along with power inefficiency while using practical power amplifier at the transmitter. This paper presents a review of OFDM and analysis of a technique for PAPR reduction. Additionally, the scopes and challenges in PAPR reduction have been documented which describes clipping technique to reduce PAPR through MATLAB simulation models.

Turkish Journal of Computer and Mathematics Education, Vol.12 No.10 (2021), 4480-4484

## **91. Approach to design of optical microring resonator for biosensing with enhanced efficiency**

**Piyali Mukherjee, N. R. Das**



### **Abstract**

In this paper, design strategies for enhancement of efficiency for biosensing using optical microring resonator are described. Medical diagnostics play a crucial role in healthcare as it aims to provide early diagnosis of diseases. This urges the need to design an efficient point-of-care diagnostics to improve healthcare technologies. Among the existing biosensors, microring resonator based dielectric waveguide integrated biosensors possess a promising performance. The evanescent fields generated due to propagation of light extends beyond the structure and serves as the sole reason for field sensing. In this study, couple of strategies are addressed to design high r.i. contrast silicon-on-insulator (SOI) microring resonator to improve the efficiency of bio-sensing. The first strategy emphasizes on reducing resonator height for enhanced evanescence as sensing applications solely lie on evanescent fields. In the other approach, the conventional air clad waveguide coupling is replaced by the oxide-based waveguide coupling which results in higher coupling and higher Q-factor due to lowered index difference between the core and the cladding materials.

Microsystem Technologies, (2021)

## **92. Low profile polarization-insensitive wide stop-band frequency selective surface with effective electromagnetic shielding**

**Gouri Shankar Paul, Kaushik Mandal, Priyanka Das**

### **Abstract**

In this article, a polarization-insensitive, higher angular stability, and single-layered miniaturized wide stop-band frequency selective surface (FSS) is presented for effective electromagnetic shielding over an extremely wideband (9-20 GHz). A simple square gridded unit cell exhibits wideband rejection with  $-10$  and  $-20$  dB fractional bandwidth of 150.7% (3.4-24.2 GHz) and 74.5% (9.14-20 GHz), respectively. The designed unit cell has miniaturized dimensions ( $0.09\lambda_0 \times 0.09\lambda_0 \times 0.018\lambda_0$ ) as compared to existing research works on wideband FSSs. An equivalent circuit model is developed for the rigorous analysis of the proposed structure. The outcome of this circuit model is validated, and it shows good agreement with the structure simulation results. The measured results bear close resemblance with the simulated results. This FSS can be used to provide shielding from harmful radiations over a wide frequency range and as a good reflector to improve the gain of wideband antennas.

International Journal of RF and Microwave Computer Aided Engineering, Jan. 2021.

## **93. Hybrid frequency selective surface phase cancelation structure based broadband switchable radar cross section reduction**

**Priyanka Das, Kaushik Mandal**

### **Abstract**

In this paper, a switchable radar cross section (RCS) reduction between the two broadbands' (1-7 GHz and 4-10 GHz) has been achieved by just considering the integration of hybrid frequency selective surface (FSS) based phase cancelation structure (PCS) with a modified ground square patch antenna operating at 2.4 GHz. The full metallic ground plane of the conventional microstrip antenna (MSA) is replaced by a  $2 \times 2$  array of band-stop FSS having the same frequency as that of the MSA. This ground plane modification helps to increase the maximum out-of-band RCS reduction from 16.4 dB to 20 dB. The ground modified MSA without any PCS exhibits both in-band and out-of-band maximum RCS reduction of 20 dB over a wideband (1-7 GHz). A new approach is adopted to form the PCS. It is formed by placing two non-overlapping hybrid FSSs at different heights above the MSA. The MSA with FSS based ground plane along with the hybrid FSS based PCS exhibits good monostatic and bistatic RCS reduction across 4 to 10 GHz without affecting the radiation characteristics of the conventional MSA. The measured results show a close resemblance to the simulated ones.

International Journal of RF and Microwave Computer Aided Engineering, vol. 31, no. 3, Jan. 2021.

## 94. RCS reduction of microstrip antenna using split square loop thin absorber

Priyanka Das, Kaushik Mandal

### Abstract

This study proposes an electrically thin frequency-selective surface-based microwave absorber without using resistive surface and lumped resistors to make it simple and inexpensive. The ground plane of the microstrip antenna (MSA) serves as the metallic back of the absorber. The top two layers of the proposed absorber are printed on both sides of the top FR4 sheet in a square annular ring form to encircle the square patch. Both simulations and measurements are carried out to obtain the scattering parameters, which are used to retrieve the absorption coefficient, relative permittivity ( $\epsilon_r$ ), and relative permeability ( $\mu_r$ ). An equivalent circuit model for the proposed absorber is constructed and validated. The absorption performance is insensitive to the angle of incidence ( $\theta$ ) up to  $50^\circ$ . The absorption mechanisms are studied based on the surface current distribution, electric field distribution, and constitutive parameters. The absorber is then integrated with an MSA operating at 4.2 GHz, which gives a maximum monostatic radar cross-section (RCS) reduction of 15 dB. Numerical and experimental results of the radiation performance and the RCS of the absorber integrated antenna structure have been presented. A very good agreement between simulation and measurement results is observed.

IET Microwaves, Antennas & Propagation, Volume 14, Issue 14, 25 November 2020, p. 1771 – 1778.

## Department of Computer Science and Engineering

### 95. Synthetic Minority Oversampling in addressing imbalanced Sarcasm Detection in Social Media

ArghasreeBanerjee, MayukhBhattacharjee, KushankurGhosh, SankhadeepChatterjee

#### Abstract

Recent developments in sarcasm detection have been emerged as extremely successful tools in Social media opinion mining. With the advent of machine learning tools, accurate detection has been made possible. However, the social media data used to train the machine learning models is often ill suited due to the presence of highly imbalanced classes. In absence of any thorough study on the effect of imbalanced classes in sarcasm detection for social media opinion mining, the current article proposed synthetic minority oversampling based methods to mitigate the issue of imbalanced classes which can severely effect the classifier performance in social media sarcasm detection. In the current study, five different variants of synthetic minority oversampling technique have been used on two different datasets of varying sizes. The trustworthiness is judged by training and testing of six well known classifiers and measuring their performance in terms of test phase confusion matrix based performance measuring metrics. The experimental results indicated that SMOTE and BorderlineSMOTE – 1 are extremely successful in improving the classifier performance. A thorough analysis has been performed to better understand the effect of imbalanced classes in social media sarcasm detection.

Multimedia Tools and Applications,2020, ISSN-1573-7721

### 96. Analysis of Rheological Properties of MWCNT/SiO<sub>2</sub> Hydraulic Oil Nanolubricants Using Regression and Artificial Neural Network

AbhisekHaldar, SankhadeepChatterjee, AnkitKotia, Niranjana Kumar, Subrata Kumar Ghosh

#### Abstract

In this article, the rheological behavior of MWCNT/SiO<sub>2</sub> based nano-hydraulic oil nanolubricant is evaluated using experimental and Artificial Neural Network (ANN) approach. Viscosities of the hybrid nanolubricant samples were measured at temperature and shear rate range of 10–80 °C and 10–200 s<sup>-1</sup> respectively. A new regression model is being proposed to predict the dynamic viscosity of nanolubricants. The proposed regression model ( $R^2$  0.98338–0.99583) predicts the viscosity of nanolubricants closer to experimental results (least deviation 2.62%). Consistency index ( $m$ ) and power law index ( $n$ ) values reveal that nanolubricant samples are non-Newtonian fluid with shear thinning behavior. To improve the accuracy in predicting the viscosity of nanolubricants, the ANN model was designed having input variables among temperature, solid volume fraction and shear rate. In the first phase, temperature and solid volume fraction were taken as input variables, and in the second phase shear rate was introduced as an additional input parameter. The entire data was split into 70:30 proportions for the training and testing phases of the ANN model. The testing results of ANN revealed better accuracy than the proposed correlation in terms of average values of Root Mean Square Error (RMSE) and  $R^2$ .

International Communications in Heat and Mass Transfer,2020,ISSN-0735-1933

### 97. A robust image encryption framework based on DNA computing and chaotic environment

Mousomi Roy, ShouvikChakraborty, Kalyani Mali, Deepayan Roy, SankhadeepChatterjee

#### Abstract

Digital images belong to one of the most important and frequently transmitted data categories are the inevitable part of the modern data communication systems. Images contain several sensitive and private data and therefore unauthorized access to these data can be very costly. Recent technological advancements allow us to process, store, and conveniently transmit digital images and it demands robust image security schemes for reliable and fearless operation. Images are not like other data like text, audio, etc. and sometimes, conventional image encryption systems are not always suitable for these applications. Therefore, in this work, a novel robust image encryption framework is designed that is based on DNA computing and chaos theory. The low dimensional chaotic map is used in this work to reduce computational overhead and make the system simpler. In this work, the chaotic logistic map and the chaotic Zaslavsky map are used in two different

phases. DNA computing helps to effectively encode the actual pixel values on which DNA operations can be applied. The total process is secured by an additional scrambling approach. An elaborative study of the performance of the proposed system is presented in this work and the obtained results are encouraging enough to adopt the proposed approach for real-life applications.

Microsystem Technologies, 2021, ISSN-1432-1858

## **98. Indian Sign Language Classification (ISL) using Machine Learning**

**SubhalaxmiChakraborty, Nanak Bandyopadhyay, PiyalChakraverty, SwatilekhaBanerjee, Zinnia Sarkar, SwetaGhosh**

### **Abstract**

Communication is crucial for human as it plays most vital role. People with hearing or speaking disabilities need a way to communicate with other people of the society and vice versa. This paper presents a novel methodology in classifying the English Alphabets shown via various hand gestures in The Indian Sign Language (ISL) using Mediapipe Hands API, launched by Google. The objective of using this API is to detect 21 landmarks in each hand along with their x, y and z coordinates in 3D space. Due to the scarcity of proper dataset available on the internet for ISL, at the very beginning, we have created a dataset having a size of 15000, per English character, each consisting of the coordinates of 21 landmarks recognized by Mediapipe Hands API. From the literature, we found that prediction has been done for The American Sign Language and other foreign sign languages using Mediapipe API effectively. The novelty of our proposed work lies in using the same API for the Indian Sign Language. In this paper, we have discussed a comparative analysis of different classification algorithms like Support Vector Machine (SVM), Random Forest, Knearest neighbors (KNN), Decision Tree and other algorithms in terms of accuracy with the highest accuracy among all being 99%. It is relevant to mention in this connection that the classification of the Indian Sign Language (ISL) using Mediapipe API is faster than the other conventional methods and outperforms in computational capability. This model can be used in web applications, mobile applications, desktop applications and in many more places.

AmericanJournal of Electronics &Communication, Vol. I (3), Pg. 17-21 (2021)

[doi.org/10.15864/ajec.1304](https://doi.org/10.15864/ajec.1304)

## **99. Fake Note Detection using Machine Learning Techniques**

**SubhalaxmiChakraborty, SoumyadipBanerjee, Biman Kumar Singha, SayaniGhati**

### **Abstract**

In recent scenario detection of fakenote has become a genuine problem in the area of the financial sector as per the of various countries. In this paper, we have proposed a machine learning model that is capable of eradicating the fake note problem. In this paper, we have used a dataset of fake note images having a size of 1500. Hence exhaustive experiments have been conducted using various machine learning algorithms for proper authentication of the banknote. Here we considered K-Nearest Neighbour, Naive Bayes and random forest classifier technique yielding various result in terms of accuracy, precision and recall and f-score. It is observed that the K- nearest neighbour technique shows better performance compared to the other applied algorithm having an accuracy of 99%. Moreover, it is observed that it gives a result on determining whether a note is fake or real by output 0 when the note is fake and it gives output 1 when the note is real. Hence Knearestneighbour gives there result more accurately than other classifiers. The rules are given by machine learning classifier techniques also tested and found that they are accurate enough to be used for prediction and compare their performance to see which classifier performs best on determining the fakenote and showing their performance by bar-graphrepresentation.

American Journal of Electronics &Communication, Vol. I (3), Pg. 22-29 (2021)

## **100. Segmentation of text lines using multi-scale CNN from warped printed and handwritten document images**

**ArpitaDutta, ArpanGarai, SamitBiswas, Amit Kumar Das**

### **Abstract**

Paper documents are ideal sources of useful information and have a profound impact on every aspect of human lives. These documents may be printed or handwritten and contain information as combinations of texts, figures, tables, charts, etc. This paper proposes a method to segment text lines from both flatbed scanned/camera-captured heavily warped printed and handwritten documents. This work uses the concept of semantic segmentation with the help of a multi-scale convolutional neural network. The results of line segmentation using the proposed method outperform a number of similar proposals already reported in the literature. The performance and efficacy of the proposed method have been corroborated by the test result on a variety of publicly available datasets, including ICDAR, Alireza, IUPR, cBAD, Tobacco-800, IAM, and our dataset.

International Journal on Document Analysis and Recognition (IJDAR), <https://doi.org/10.1007/s10032-021-00370-8>, pg 1-15 (2021)

## **101. Computer Vision Based Optical Document Layout Analysis: A Compatible Survey**

**SanjuktaMishra, DebkumarChowdhury**

### **Abstract**

Computer vision based document image layout analysis refers to the generic algorithms and robust techniques. These algorithms and robust techniques are applied to images of documents to obtain a computer-readable description from pixel data. A document image analysis algorithm includes Optical Character Recognition (OCR) software that recognizes characters in a scanned document. OCR makes it possible for the user to edit or search the document's contents. In the field of document image layout analysis, two types of problems may occur – physical and logical analysis of the document. Several heuristics, grammar based algorithms and rule based algorithms is applied here. In this paper we performed an In-depth survey on various methods (for layout detection) in order to classify the graphical area, paragraph text area, sub-paragraph text area etc. within a document image without using the Optical Character Recognition (OCR) software.

International Journal of Innovative Knowledge Concepts, Vol. 7, Special Issue 1, ISSN : 2454-2415 (UGC CARE – I Listed Journal)

## **102. A New DNA sequencing alignment methodology using the Longest Common Subsequence technique**

**DebkumarChowdhuryet. al**

### **Abstract**

The goal of this paper is to perform DNA sequence alignment using the Longest Common Sub-sequence Algorithm to obtain the longest common subsequence from the two strings X and Y for matching DNA in molecular biology etc. This paper would seek to establish the differences between the 2 species DNA and thereby conclude on their genetic similarity. The paper will be implemented in terms of space and time using the optimized longest common subsequence algorithm. This paper acts as a bridge between computer science and genomics, exploring the interdisciplinary area of computational biology and helping us to consider the very fundamental concepts of life and our relationship with other species.

American Journal of Applied Mathematics and Computing, Vol 1, Issue 3, DOI: DOI.ORG/10.15864/AJAMC.131

### **103. IoT-cloud based healthcare model for COVID-19 detection: an enhanced k-Nearest Neighbour classifier based approach**

**RajendraniMukherjee,AurghyadipKundu,IndrajitMukherjee,Deepak  
AshishKhannaand Mohammad Shorfuzzaman**

**Gupta,PrayagTiwari,**

#### **Abstract**

COVID - 19 affected severely worldwide. The pandemic has caused many casualties in a very short span. The IoT-cloud-based healthcare model requirement is utmost in this situation to provide a better decision in the covid-19 pandemic. In this paper, an attempt has been made to perform predictive analytics regarding the disease using a machine learning classifier. This research proposed an enhanced KNN (k NearestNeighbor) algorithm eKNN, which did not randomly choose the value of k. However, it used a mathematical function of the dataset's sample size while determining the k value. The enhanced KNN algorithm eKNN has experimented on 7 benchmark COVID-19 datasets of different size, which has been gathered from standard data cloud of different countries (Brazil, Mexico, etc.). It appeared that the enhanced KNN classifier performs significantly better than ordinary KNN. The second research question augmented the enhanced KNN algorithm with feature selection using ACO (Ant Colony Optimization). Results indicated that the enhanced KNN classifier along with the feature selection mechanism performed way better than enhanced KNN without feature selection. This paper involves proposing an improved KNN attempting to find an optimal value of k and studying IoT-cloud-based COVID - 19 detection.

COMPUTING (Springer), 2021 Apr 30 : 1–21

### **104. A bi-stage feature selection approach for COVID-19 prediction using chest CT images**

**ShibaprasadSen, SoumyajitSaha, SomnathChatterjee, SeyedaliMirjalili, Ram Sarkar**

#### **Abstract**

The rapid spread of coronavirus disease has become an example of the worst disruptive disasters of the century around the globe. To fight against the spread of this virus, clinical image analysis of chest CT (computed tomography) images can play an important role for an accurate diagnostic. In the present work, a bi-modular hybrid model is proposed to detect COVID-19 from the chest CT images. In the first module, we have used a Convolutional Neural Network (CNN) architecture to extract features from the chest CT images. In the second module, we have used a bi-stage feature selection (FS) approach to find out the most relevant features for the prediction of COVID and non-COVID cases from the chest CT images. At the first stage of FS, we have applied a guided FS methodology by employing two filter methods: Mutual Information (MI) and Relief-F, for the initial screening of the features obtained from the CNN model. In the second stage, Dragonfly algorithm (DA) has been used for the further selection of most relevant features. The final feature set has been used for the classification of the COVID-19 and non-COVID chest CT images using the Support Vector Machine (SVM) classifier. The proposed model has been tested on two open-access datasets: SARS-CoV-2 CT images and COVID-CT datasets and the model shows substantial prediction rates of 98.39% and 90.0% on the said datasets respectively. The proposed model has been compared with a few past works for the prediction of COVID-19 cases. The supporting codes are uploaded in the Github link: <https://github.com/Soumyajit-Saha/A-Bi-Stage-Feature-Selection-on-Covid-19-Dataset>.

Applied Intelligence, pp.1-16, DOI: <https://doi.org/10.1007/s10489-021-02292-8> (2021)

### **105. Android Controlled Home Automation**

**PankajKapoor,SuryadiptaSarkar,Dr.SudiptaBasuPal,KunalMahato**

#### **Abstract**

This paper is based on the concept of smart home automation. This paper aims to fulfil the needs of every person, especially the elderly or disabled ones, and it saves electricity at the same time. This system follows the home automation system concept and comes with a low cost and wireless network-based system. Features included in this system will change the standard of living at home. This entire system will have remote access by a smartphone. At the same time, the system is made a safety control with a low voltage activation method. This system comes with a voice mode and realtime video streaming through an "Android application." It also helps the user to control the switches manually. This system is entirely user friendly, cost-efficient, and easy to install. The proposed system's prototype implementation is evaluated based on the criteria considered after the requirement analysis for an adequate home automation system.

American Journal of Electronics & Communication, Vol. I (3), pp.12-16, May, 2021

## **106. Improving Spectrum Utilization in Elastic Optical Networks for Multicast Traffic Demands**

**PanchaliDattaChoudhury**

### **Abstract**

Elastic optical networks (EONs) have a scalable and flexible mini-grid architecture compared to the conventional fixed-grid wavelength division multiplexing optical networks. In EONs, there is scope to optimize optical resources. In this paper, the primary target is to increase spectrum utilization efficiency for traffic demands. The approach presented here is a grooming, routing and spectrum assignment technique for multicast traffic demands in elastic optical networks for static type of traffic demands. The simulation results show better spectrum utilization.

American Journal of Electronics & Communication, Vol. II (1), 10-12, July 2021

## **107. Information Retrieval from Microblogs During Disasters: In the Light of IRMiDis Task**

**MoumitaBasu, KripabandhuGhosh, SaptarshiGhosh**

In last few years ,microblogging sites like Twitter have been evolved as a repository of critical situational information during various mass emergencies. However, messages posted on microblogging sites often contain non-actionable information such as sympathy and prayer for victims. Moreover, messages sometimes contain rumors and overstated facts. In such situations, identification of tweets that report some relevant and actionable information is extremely important for effective coordination of post-disaster relief operations. Thus, efficient IR methodologies are required to identify such critical information. Additionally, cross-verification of such critical information is a practical necessity to ensure the trustworthiness. To this end, we organized the 'Information Retrieval from Microblogs during Disasters (IRMiDis)' shared task with the FIRE conference for consecutive 3 years (2016, 2017 and 2018). In each year's track, we have given task associated with extraction of a specific situational information to aid post-disaster relief operation and asked the participants to propose methodologies. Our present study provides a brief description of the tasks (research problem) given in these tracks, a summary of methodologies of all submitted runs and finally a brief description of our proposed methodologies to address the research problems of IRMiDis track.

SN Computer Science (Springer), 1(1), p.61,2020.







# **A DECISION MODEL FOR SELECTING BEST RELIABLE RELAY QUEUE FOR COOPERATIVE RELAYING IN COOPERATIVE COGNITIVE RADIO NETWORKS: THE EXTENT ANALYSIS BASED FUZZY AHP SOLUTION.**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

In this paper, authors have selected relays using extent analysis based fuzzy AHP technique over other AHP techniques as this technique not only registers the ambiguity and fuzziness of the judgment creators but also provides better time complexity than other fuzzy AHP methods.

*Wireless Networks*, Springer

# **RELIABLE BEST RELAY SELECTION FOR SECONDARY TRANSMISSION IN CO-OPERATION BASED COGNITIVE RADIO SYSTEMS: A MULTI-CRITERIA APPROACH.**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

In this correspondence, the selection technique of Reliable Best Relay based on fuzzy logic is proposed for secondary transmission in multi-user cooperative cognitive radio systems. This fuzzy logic-based innovative solution for secondary data transmission is not complex, practicable, and less time consuming. Hence, it can be easily developed into application programs and can be utilized for real-time systems.

*Journal of Mechanics of Continua and Mathematical Sciences*

# **A NOVEL BEST RELAY SELECTION PROTOCOL FOR COOPERATIVE COGNITIVE RADIO SYSTEMS USING FUZZY AHP.**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

Currently, Fuzzy analytic hierarchy process (FAHP) proves to be an advantageous scheme for multiple criteria decision-making (MCDM) in fuzzy conditions. This paper provides FAHP-based relay node selection scheme that prioritizes the fuzziness of the decision makers during the relay node selection procedure.

*Journal of Mechanics of Continua and Mathematical Sciences.*

# **A COMPARATIVE STUDY ON COGNITIVE RADIO IMPLEMENTATION ISSUES**

**J.S. BANERJEE, K KARMAKAR**

## **ABSTRACT**

Cognitive Radio (CR) is a comparatively new technology which is based on the revolutionary idea that provides solution to the underutilization of spectrum and spectrum scarcity problem. In this paper we describe different existing implementation of CR in reconfigurable platform and make a comparative study of them.

*International Journal of Computer Applications.*

# **ARCHITECTURE OF COGNITIVE RADIO NETWORKS**

**J.S. BANERJEE, A. CHAKRABORTY, K KARMAKAR**

## **ABSTRACT**

Today's wireless networks are characterized by fixed spectrum assignment policy. The spectral scarcity and the inefficiency in the spectrum usage necessitate a new communication paradigm to exploit the existing wireless spectrum, opportunistically. This book chapter is focused on cognitive radio network, architecture of the CR, and its relevance in the wireless and mobile Ad Hoc networks.

*In N. Meghanathan & Y.B.Reddy (Ed.), Cognitive Radio Technology Applications for Wireless and Mobile Ad Hoc Networks, Hershey PA: IGI Global.*

# **FUZZY BASED RELAY SELECTION FOR SECONDARY TRANSMISSION IN COOPERATIVE COGNITIVE RADIO NETWORKS**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

In this paper we propose a new fuzzy logic-based decision-making procedure for relay selection unlike to many existing works where Signal-to-Interference-plus-Noise Ratio (SINR) is considered as the only parameter for relay selection. The underlying decision criterion considers SINR with some other important parameter like Relative Link Quality (RLQ) of the relay node from destination & Reliability of the relay node.

*In Advances in Optical Science and Engineering, Springer, Singapore*

# **RELAY NODE SELECTION USING ANALYTICAL HIERARCHY PROCESS (AHP) FOR SECONDARY TRANSMISSION IN MULTI-USER COOPERATIVE COGNITIVE RADIO SYSTEMS**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

In this paper, we have proposed a very new relay selection scheme based on the decision-making technique of analytical hierarchy process (AHP). Unlike many existing works where signal-to-interference-plus-noise ratio (SINR) is considered as the only parameter for relay selection, here the underlying decision criterion considers SINR at secondary destination (SD) as well as reliability and relative link quality (RLQ) of the relay node from destination.

*In LNEE-Advances in Electronics, Communication and Computing, Springer, Singapore*

# **A FUZZY AHP-BASED RELAY NODE SELECTION PROTOCOL FOR WIRELESS BODY AREA NETWORKS (WBAN)**

**S PAUL, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

This paper provides a Fuzzy Analytical Hierarchy Process (FAHP) based relay node selection scheme that prioritizes the vagueness of the decision makers during the relay node selection procedure. The proposed scheme can intensively meet both of the requirements of WBAN i.e., enhanced reliability of the communication systems and optimum consumption of power.

*In 4th International Conference on Opto-Electronics and Applied Optics (Optronix), IEEE*

# **THE EXTENT ANALYSIS BASED FUZZY AHP APPROACH FOR RELAY SELECTION IN WBAN**

**S PAUL, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

A revolutionary technology in the field of healthcare monitoring system to manage illness for maintaining wellness by concentrating on prevention and early detection of disease are popularly known as Wireless Body Area Networks (WBAN) which is highly localized wireless networks along with different sensors placed in the human body or surface mounted on the particular places of the body. This paper provides FAHP using the Extent Analysis scheme for relay node selection that prioritizes the vagueness of the decision-makers during the relay node selection procedure.

*In Cognitive Informatics and Soft Computing Springer, Singapore*

# **A DECISION FRAMEWORK OF IT-BASED STREAM SELECTION USING ANALYTICAL HIERARCHY PROCESS (AHP) FOR ADMISSION IN TECHNICAL INSTITUTIONS**

**O SAHA, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

In this paper we have proposed a new application of Analytical Hierarchy Process (AHP) based decision making method invented by T Saaty, for Information Technology (IT) -based stream selection during admission in engineering or technical colleges where rank, class XII or equivalent exam marks, science related projects, and coding proficiency are considered as the selection parameters.

*In 2017 4th International Conference on Opto-Electronics and Applied Optics (Optronix), IEEE*

# **A FUZZY AHP APPROACH TO IT-BASED STREAM SELECTION FOR ADMISSION IN TECHNICAL INSTITUTIONS IN INDIA**

**O SAHA, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

This paper provides a Fuzzy Analytical Hierarchy Process (FAHP) based stream selection scheme that prioritizes the vagueness of the decision makers during the stream selection procedure. Here authors considered entrance examination rank, class XII or equivalent exam marks, science related projects, and coding proficiency as the selection parameters for Information Technology (IT)-based stream selection during admission in engineering or technical colleges in India.

*In Emerging Technologies in Data Mining and Information Security (pp. 847-858) Springer, Singapore*

# **SOUTH ASIAN COUNTRIES ARE LESS FATAL CONCERNING COVID-19: A HYBRID APPROACH USING MACHINE LEARNING AND M-AHP**

**S GUHATHAKURATA, S SAHA, S KUNDU, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

In this paper, the authors have determined this uneven distribution of COVID-19 deaths with the help of some possible factors, which are the prime cause of such variability among the different nations. This paper presents the significance of these factors through analysis of the data corresponding to each of these factors from 165 different countries. On the basis of the relationship between the factors and their significance on the concerned countries' death toll, we have labelled each factor's risk index using the multiple analytical hierarchy process (M-AHP), as it provides several experts' views instead of a single expert's opinion.

*Computational Intelligence Techniques for Combating COVID-19, Springer*

# **SMART FARMING & WATER SAVING BASED INTELLIGENT IRRIGATION SYSTEM IMPLEMENTATION USING IOT**

**S BISWAS, LK SHARMA, R RANJAN, S SAHA, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

Our chapter's significant contribution is to identify the predicted amount of water is required for a particular field for particular time duration, as all the water consumption details of the field is stored in the cloud. Hence, it is possible to find out using the Artificial Intelligence-Machine Learning (AI-ML) tool and can be accessed through our web and mobile application the day-wise or month-wise or season-wise water consumption requirement. Again, the moisture content of the soil is measured by the soil moisture sensor, which triggers the pump via the microcontroller when the moisture content in the soil goes below the threshold.

*Recent Trends in Computational Intelligence Enabled Research, Elsevier*

# **ANDROID THINGS: A COMPREHENSIVE SOLUTION FROM THINGS TO SMART DISPLAY AND SPEAKER**

**R ROY, S DUTTA, S BISWAS, J.S. BANERJEE**

## **ABSTRACT**

Currently, it is one of the biggest concerns of research for making the smart world to control and operate each and every device embedded in various systems through the Internet. In this paper, the authors prepare a detailed review report on Android Things. Though it is a very trendy topic, still a very few research findings are available presently.

*In Proc. Int. Conf. IoT Inclusive Life (ICIL), Springer*

# **WBAN: A SMART APPROACH TO NEXT GENERATION E-HEALTHCARE SYSTEM**

**I PANDEY, H.S. DUTTA, J.S. BANERJEE**

## **ABSTRACT**

Wireless Body Area Network (WBAN) is one of the type of wireless communication technologies which is used as an underlying network architecture for different types of sensors to mitigate different medical and non-medical aspects. It is applicable for various domains such as healthcare, sports, and military and defense. The sensors are used to collect information related to their health condition by efficiently using the WBAN architecture. For the standardization of WBAN, a task group has been established namely IEEE 802.15.6. Next generation smart healthcare system is introduced initially by WBAN that creates a new paradigm in the healthcare system. In this research work, authors have presented a state-of-art survey about various features of WBAN specifically communications, sensors, applications, requirements, standards & protocol, and security aspects.

*In 3rd International Conference on Computing Methodologies and Communication (ICCMC), IEEE*

# **INFLUENCE OF PROCUREMENT DECISIONS IN TWO-PERIOD GREEN SUPPLY CHAIN**

**KARTICK DEY, SUBRATA SAHA**

## **ABSTRACT**

This paper focuses on optimal retail pricing and procurement decision of a retailer, and wholesale pricing and product's greening level decision of a manufacturer under two-period supply chain frameworks. In manufacturer-Stackelberg vertical game setting, three procurement scenarios are considered. It is found that the product greening level cannot achieve its optimum level if the retailer and manufacturer remain strict to imply the conventional single period procurement decision. If the retailer decides to build up strategic inventory then the supply chain members receive higher profits and the manufacturer can invest more in improving product greening level. The consumer also receives product at its highest greening level. If the retailer procures products in a single lot to satisfy demand of two selling consecutive periods, then consumer receives the product at its lowest greening level and the manufacturer receives lowest amount of profits among three procurement scenarios. If the retailer participates with the manufacturer's green supply chain initiatives then the retailer can receive highest amount of profit, but the greening level of the product reaches at its lowest level. Therefore, the retailer's participation does not always motivate the manufacturer to produce greener product. Overall, the retailer's procurement decision is a key factor for the green supply chain initiatives of the manufacturer.

**Journal of cleaner production, 2018 - Elsevier**

# **STRATEGIC INVENTORY: MANUFACTURER VS. RETAILER INVESTMENT**

**ILKYEONG MOON, KARTICK DEY, SUBRATA SAHA**

## **ABSTRACT**

This paper presents a two-period supply chain model under demand induced by selling price and investment effort in the presence of strategic inventory. We compared six different scenarios to identify optimal pricing decisions. An incremental quantity discount contract was applied to verify supply chain coordination. Our findings show that manufacturer-investment efforts cannot always persuade the retailer carrying strategic inventory to maintain harmony among supply chain participants; however, retailer-investment efforts can promote harmony when strategic inventory is used. The retailer's decision to carry strategic inventory is catastrophic from the perspective of supply chain coordination, but benign for the decentralized supply chain.

**Transportation Research Part E: Logistics and ..., 2018 - Elsevier**

# **GREEN MANUFACTURING IN A DECENTRALIZED SUPPLY CHAIN**

**SANI MAJUMDER, SUBRATA SAHA, KARTICK DEY**

## **ABSTRACT**

This study analyzes the influence of power structure on pricing, greening decisions, and profits of the channel members in a decentralized supply chain. In order to identify the characteristics of the optimal greening level and the profits of the supply chain members, three different models are developed and analyzed under manufacturer-Stackelberg, retailer-Stackelberg, and vertical Nash game settings. Results from the present study suggest that both the retailer and manufacturer prefer their respective leaderships. But the sales volume is higher in Nash game structure. However, consumer gets more benefits under the retailers' leadership.

Recent Advances in Intelligent Information Systems and Applied Mathematics. ICITAM 2019. Studies in Computational Intelligence, vol 863. Springer, Cham

# **THE IMPACT OF STRATEGIC INVENTORY AND PROCUREMENT STRATEGIES ON GREEN PRODUCT DESIGN IN A TWO-PERIOD SUPPLY CHAIN**

**KARTICK DEY, SANKHADIP ROY, SUBRATA SAHA**

## **ABSTRACT**

This study analyses the impact of power structures and strategic inventory on the development-intensive and marginal-cost-intensive green product types under three procurement strategies. The results suggest that (i) in the manufacturer-Stackelberg game, the retailer retains strategic inventory to earn higher profits. The retailer's decision improves profit for the manufacturer and greening level of the product; (ii) for the marginal-cost-intensive green product, the power structures and procurement strategies cannot make any impact on the greening level and the retailer cannot build up strategic inventory under retailer-Stackelberg game; (iii) under the Nash game, the procurement decision creates conflict between the supply chain members for marginal-cost-intensive green products; (iv) if the retailer does not maintain strategic inventory or procures product in a single lot, then the manufacturer prefers to produce marginal-cost-intensive products and retailer prefers to sale development-intensive products to receive maximum profits under manufacturer- Stackelberg game. The optimal preferences are concurrent under retailer-Stackelberg game, but not under the Nash game; (v) single-period equilibrium solutions may exhibit sub-optimal characteristics, but two-period planning canlead to exemplary outcomes in the perspective of the greening level and profits of the supply chain members.

International Journal of Production ..., 2019 - Taylor & Francis

# **DYNAMIC VERSUS STATIC REBATES: AN INVESTIGATION ON PRICE, DISPLAYED STOCK LEVEL, AND REBATE-INDUCED DEMAND USING A HYBRID BAT ALGORITHM**

**KARTICK DEY, DEBAJYOTI CHATTERJEE, SUBRATA SAHA, ILKYEONG MOON**

## **ABSTRACT**

Joint determination of price, rebate, investment in preservation technology, and order quantity is a complex task for retailers today. To help retailers, this paper presents an investigation on a replenishment policy for deteriorating products that focused on the choice between dynamic and static rebates under the price, displayed stock level, and rebate-induced demand. With the objective of maximizing the retailer's profit, six different models were formulated under static and dynamic environments to identify optimal price-and-rebate pair and preservation technology investment policy. Optimal control theory was employed to determine the rate of dynamic rebate. A hybrid bat algorithm (HBA) is developed to find solutions for the proposed non-linear optimization problems. The efficiency of the proposed algorithm was verified with standard test functions. Price sensitivity, the nature of the product, and display stock elasticity were found to be decisive parameters for a retailer's rebate strategy. Dynamic rebate on initial price of the product can significantly improve the profit of the retailer. The retailer's investment decision was also significantly influenced by the nature of the product. Sensitivity analyses were carried out to offer managerial insights.

Annals of Operations Research, 2019 - Springer



# **THE CINEMATIC ADAPTATION OF CHITRA BANERJEE DIVAKARUNI'S THE MISTRESS OF SPICES**

**SAYANTIKA CHAKRABORTY BOSE, SAPTORSHI DAS**

## **ABSTRACT**

This paper endeavors to study award-winning writer Chitra Banerjee Divakaruni's first full-length novel, *The Mistress of Spices*, that adopts a rather complex strategy for portraying diasporic identity, and elaborates on the success or failure (as analysed in the course of the paper) of the cinematic adaptation of the same. Named one of the best books of the 20th Century by the *San Francisco Chronicle*, the heroine Tilo provides spices, not only for cooking, but also for the homesickness and alienation that the Indian immigrants in her shop experience. The multi-dimensional themes of the novel primarily focus on the inner conflict between duty and love in Tilo's life and the issues relating to the survival of the immigrant Indians in America. However, the cinematic rendition of the novel by director Mayeda and the scriptwriter Chadha bears a different look altogether, leaving the audience with a clear understanding that the adaptation is the film makers' personal and political opinion not only about the novel but also about immigrant identity. Granted that in adaptation, a literal transposition of the novel is impossible, as diverse mediums of expressions are employed. However, in a successful cinematic adaptation of a literary text the resemblances have to be clearly distinguished. Unfortunately, *The Mistress of Spices* - the film - at times appears to be completely divorced from its original text. While the novel beautifully reflects myriad shades of magical realist elements, the film prefers to ignore most of them, while also considerably minimising the ignoble reality of immigrant life that has been depicted in the novel. The film makers, rather, focus on a passionate love story, which brings together and blends together the East-West cultural dichotomies. At the end, the film leaves behind an aftertaste of a cosmetic display of Indian culture to impress the first world viewers. Yet, honestly enough, although Chadha and Berges' film omits issues of cultural conflicts and imbues the film with shallow exoticism, it successfully reflects a visually appealing amalgamation of the East and the West.

*International Journal of Recent Research in Social Sciences and Humanities (IJRSSH): July - September 2016. ISSN: 2349-7831*

# **SOCIAL MEDIA AND ENGLISH LANGUAGE**

**SAPTORSHI DAS, SAYANTIKA BOSE CHAKRABORTY**

## **ABSTRACT**

Can we imagine a life without Facebook, WhatsApp or Instagram? I guess, most of us cannot. For many of us, our lives are fuelled by social media. Staying in touch with people, keeping pace with the happenings around us, celebrity gossip.... None of it would be possible without the blessing that social media is. Social media has totally revolutionized the ways of interaction and communication in myriads of ways. The important question that this paper raises is whether this shift away from real life communication towards a more virtual sort has had a significant impact on the way we converse in English or write in the language. Moreover, if the answer is yes, then the paper endeavors to identify the ways and areas where the influence is more pronounced.

*IAETSD Journal for Advanced Research in Applied Sciences: July 2018. ISSN: 2394 - 8442.*

# **IMMIGRATION, DIASPORA AND HOME: DOES LIFE GIVE A SECOND CHANCE?**

**SAYANTIKA CHAKRABORTY BOSE, SAPTORSHI DAS**

## **ABSTRACT**

What is migration? Is it bad? Is it good? How does it affect the immigrant? Is the consequence of migration a feeling of displacement? Or does it differ individual to individual? As no two personalities are alike, as no two mindsets are the same, as no two human backgrounds are similar, what after effects does an act of migration have? It's a globally heard saying that home is where the heart is... So, how does the heart take a suddenradical shift in location and life? And why do individuals migrate, leaving behind their comfort zones? And since when have people been doing it, this moving from one place to another? Added to the notion of migration is this widely used term in the modern era (maybe earlier too but on a lesser scale than when diasporic literature became a raging trend), 'diaspora'. So, 'migration' and diaspora': Are their connotations and denotations similar? Are they interlinked? Or are they simply synonymous? Let us explore, and maybe attempt to define and demarcate migration and diaspora: their essences, nuances and effects on the human mind, personality and culture.

*International Research Journal of Management, Sociology and Humanities: June 2019. ISSN:2277 - 9809*

# **NALAYANI: AN IMMORTAL SAGA OF FEMININITY AND FEMINISM**

**CHAKRABORTY BOSE SAYANTIKA, SAPTORSHI DAS**

## **ABSTRACT**

Certain women in literature have never failed to intrigue us. The nuances of their personality, the myriad shades of their characters, the things they say and they do, everything about them paves the wave for their glory, and for the kind of fame which lasts not only for one lifetime but goes on to inspire generations and generations of women after them. What they leave behind is a legacy, a legacy of good deeds, good thoughts, and brave acts. One such character - maybe not so well known, maybe not so extensively written about - is Nalayani from the Mahabharata, who is known to be the quintessential 'pativrata' woman of the Indian society. Nalayani is the ideal doting wife to a husband, who is handicapped and depends on her for all his needs, yet treats her harshly. And yet, she serves him with all her mind, heart, body and soul, going to the extent of carrying his brokenweek feeble form to the brothel for the fulfilment of his physical pleasures. This paper highlights why this woman is not only a doting quintessential wife, 'pativrata', but is also an epitome of feminism. This paper highlights both, femininity and feminism, in the character of Nalayani.

*International Journal of English & Literature, Trans Stellar Journals: April 2019. ISSN: 2249 - 6912*

# **THEME OF EXILE IN LITERATURE DOWN THE AGES**

**CHAKRABORTY BOSE SAYANTIKA, SAPTORSHI DAS**

## **ABSTRACT**

What is it that one singularly remarkable feature setting literature apart as an art form? Is it only about a reflection of the society that the author hails from? What if he is born somewhere and he settles down elsewhere? What he writes, is no longer a reflection of the society he hails from. So, what happens to literature when an author is forced into exile? What feelings come into his works? What pain? What pleasure? And how is it manifested through his works - characters and themes?

Does the genre 'exile literature' have an existence? Are authors who go into exile then deemed 'exile authors'? Reaching a consensus about 'exile literature' as a genre or category runs into a number of problems. But how does literature change as an art form in exile? How is it any different from other forms of literature?

The works of writers which are considered to belong to the category 'exile literature' often have little in common. Similar experiences like being severed from your country of origin or loss of home and language do not, of necessity, find their way into literary texts. But they are very often manifested in myriad ways. The pain of moving to new lands, the awe of taking in new surroundings, the courage in encountering diverse adversities, the sense of alienation gradually giving way to acceptance and adaptation, are all reflected in theme of exile, with powerfully impressive protagonists battling against all odds on foreign grounds, and emerging triumphant.

*International Journal of Humanities and Social Science Invention: September 2017. ISSN:2319 – 7722.*

# **WOMEN AND MARRIAGE IN DIASPORA, ON BOTH SIDES OF THE BORDER**

**DAS SAPTORSHI DAS, ISA MISHRA, SAYANTIKA BOSE CHAKRABORTY**

## **ABSTRACT**

India is homeland. We are steeped in the country, its history and its ways since birth. Women in India, we identify with. We understand their plight. We perceive their pain. We are aware of their strengths. And we know their weaknesses and threats. Across the Border, Pakistan, however, is a different story altogether. Pakistan has always been a very favourite, very interesting and very enthusiasm-provoking topic of conversation in India. But as women ourselves, we would like to believe that we the women in India have also wondered what life of a Pakistani woman is like. What is marriage like in Pakistan? Does the wife get respect? Is she treated like an equal? What transitions in life does marriage bring for her? Is life of a married woman across the border, the same story of adjustment, compromise and sacrifices as in the life of a married woman back home in India? In this paper, we endeavor to find an answer to this intriguing question through the woman protagonist featuring in one of the eleven short stories written by the Pakistani author, Syrinna Haque, compiled in Sand in the Castle. Sara, in Home and the Facade, provides us with a realistically and poignantly keen insight on the life of a married woman across the border; while, also highlighting how life is not much different on this side of the border too, through the character of Dimple, in the veteran Indian author, Bharati Mukherjee's work, Wife. There is a whole world of difference between what we, women, seek in marriage, and what we eventually get. Both, Sara and Dimple, are very realistic manifestations of this fact of life and the world, especially when they have to relocate outside their respective countries, leaving everything they hold dear to their hearts behind, to be with their husbands. This paper focuses specifically through Sara and Dimple on the changes life brings when married outside the country. Key Words: Women, Husband, Home, Happiness, Adjust, Pain.

*TEST Engineering and Management Journal: May 2020. ISSN: 0193 – 4120*

# **BYE- BYE BLACKBIRD: A REFLECTION OF THE STRUGGLE FOR FEMALE AUTONOMY AGAINST A RIGID SYSTEM OF PATRIARCHY**

**CHAKRABORTY BOSE SAYANTIKA, SAPTORSHI DAS, MOHOR BANERJEE**

## **ABSTRACT**

I am a married woman. I am also a working woman. I love what I do. And I am actually paid to do what I love. Yet, every day I return home from work with a heavy heart. No. My workplace poses no threats. Although many working women across the world would disagree with me; but fortunately, I am not one of them. My greatest threat is my returning home to my in-laws and tolerating their snide comments on my being out all day. The men in the house can do it. That is not a problem. But my going and staying out to work is a matter of domestic debate. I usually don't retaliate. But I cannot help brooding over, from time to time, how unfair life still is towards women. When you really think about it, the fact that women all over the world are still fighting for equal rights defies all logic. Humans have mastered flight, walked on the moon and created the internet but women still can't be trusted to make autonomous decisions about their own bodies, be guaranteed freedom from violence or harassment or get paid the same amount as men for doing the same damn work. From time to time, many women have voiced their disgruntlement over the gender inequality. Anita Desai is one such powerful and persuasive voice among the writers, endeavoring in all her works to reflect the how the female autonomy strives to prove its existence in a strictly patriarchal cultural pattern. This paper seeks to refer to one of her novels, *Bye, Bye Black Bird* (1971) to highlight the way man-woman relationships are bedeviled by cultural encounters. The novel deals with alienation of an English lady, Sarah, married to Adit, an immigrant from India, who spends her days wallowed in the guilt of committing a mistake of marrying an Indian in her own society. In spite of being a woman from the so-called advanced west, she is quiet, meek and submissive; while Adit, behaves most of the time, like a typical Indian male, conservative, rigid and patriarchal. Through Sarah, Desai draws our attention to the annihilation of self that marriage involves for a female, through a recurring theme of insecurity, fragmentation, homelessness and the quest for identity among different communities across the world

*Solid State Technology Journal: October 2020. ISSN: 0038 - IIIX.*

# **PSYCHOLOGICAL FACTORS AFFECTING THE QUALITY OF ONLINE LEARNING**

**DAS SAPTORSHI, ISA MISHRA, SAYANTIKA BOSE CHAKRABORTY**

## **ABSTRACT**

Encompassing some of its unique features, online education has given a new perception of learning processes. This reality prompted research into the features of online learning environments that affect students' learning experiences, and many features were discovered as a result of this initiative. However, most studies only look at one or a few of these variables, and the findings may be conflicting. In this review, the authors include most of the aspects found in the literature in an integrated model in order to decide which aspects have the greatest effect on students' satisfaction and understanding. This research study is aimed to identify the psychological factors affecting online learning and discuss those factors in a compressive way. Identifying the aspects of online learning requires a number of fundamental concerns that are extremely relevant to educators today. "What are the factors that lead to the glory of online learning?" is the main issue. Two main variables must be defined on priority basis for addressing research questions. Such as, 1) assessing the final outcome and 2) determining the way used by students to learn by utilizing suitable educational resources. The dimensions we investigated in this study were students' mood, affect, motivation, and experience of using an Online Learning Tool. To help us assess these variables, we performed a survey using validated items from previous related research work. Our study was focused on an exploratory factor analysis (EFA).

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# **A COMPACT CIRCULARLY POLARIZED ISOSCELES TRIANGULAR MICROSTRIP PATCH ANTENNA WITH PARASITIC ELEMENTS FOR MULTIBAND APPLICATION**

**M. SHAW, N. MANDAL AND M. GANGOPADHYAY**

## **ABSTRACT**

In this research paper, a isosceles triangular radiating patch with two triangular coplanar parasitic elements has been used to design a compact circularly polarized (CP) microstrip patch antenna that can be used for (2.320-2.345 GHz) satellite digital audio radio systems (SDARS), (2.30-2.39 GHz) wireless broadband (WiBro), LTE 2300 (2.3-2.4 GHz), and WIMAX (2.50-2.69 GHz) application band. Corners of the two parasitic element along with a portion of driver patch has been cut and optimized to obtain CP characteristics of the antenna with broadside radiation pattern. A slot is also introduced and optimized on the radiating patch to improve the impedance matching. Frequency band generated by the antenna is (2.09-2.64 GHz) having impedance bandwidth of ( $S_{11} \leq -10$  dB) 550 MHz 23.25% and two 3-dB axial ratio (AR) bandwidth of 5.1% (2.29-2.41GHz) and 1.54% (2.58-2.62 GHz). The size of proposed antenna is  $56 \times 52 \times 3.2$  mm<sup>3</sup> in which, FR4 material has been used as dielectric substrate and thin copper plate as radiating patch and ground. Before physical fabrication, HFSS ver13 software has been used to design and analyzed the proposed antenna. It has been found that the measured results of fabricated antenna and simulated results are closely matching.

*Microwave and Optical Technology Letters, vol. 62, no.10, pp.3275-3282, 2020, doi:10.1002/mop.32445.*

# **A LOW PROFILE MINIATURIZED CIRCULAR MICROSTRIP PATCH ANTENNA FOR DUAL-BAND APPLICATION**

**M. SHAW, N. MANDAL AND M. GANGOPADHYAY**

## **ABSTRACT**

A low profile Circular Microstrip Patch Antenna (CMPA) with radius 5 mm has been designed to generate two resonant frequency bands that can be used for WLAN 5.2 (5.15–5.25) GHz, Wi-Fi(5.725–5.850) GHz and Dedicated Short-Range Communications (DSRC) (5.85–5.925) GHz application bands. The designed antenna has been slitted with two slits and a stub has also been attached resulting in an additional resonant band alongside the primary resonant band. Also, primary resonant frequency shifted from 7.22 GHz to 5.87 GHz yielding about 18.7% antenna miniaturization. Frequency bands generated by the designed antenna are (5.15–5.25)GHz and (5.71–6.01) GHz having peak gain 2.3 and 4.9 dB with broadside radiation pattern. Asquare shape FR4 substrate having dimension  $32 \times 32 \times 3.2$  mm<sup>3</sup> and very thin copper sheet for radiating patch and ground has been used in the proposed antenna, which can fulfill the requirement of smaller antenna with dual band application. Simulation software HFSS ver.13 has been used to design and analyze the proposed antenna. Very good matching has been obtained between simulated and measured results.

*Frequenz, vol.74, no.9-10, pp.333-349, 2020, doi: 10.1515/freq- 2020-0003.*

# **A COMPACT POLARIZATION RECONFIGURABLE STACKED MICROSTRIP ANTENNA FOR WIMAX APPLICATION**

**M. SHAW, N. MANDAL AND M. GANGOPADHYAY**

## **ABSTRACT**

In this paper, a stacked microstrip patch antenna with polarization reconfigurable property has been proposed for worldwide interoperability for microwave access (WiMAX) application. The proposed antenna has two substrate layers: upper and lower layers with two radiating patches connected with the coaxial probe. Without the upper layer the lower square-shaped substrate layer having regular hexagonal radiating patch with probe fed acts as a linear polarized antenna with impedance bandwidth for ( $S_{11} \leq -10$  dB) is 370 MHz 10.56% (3.32–3.69 GHz) cover WiMAX (3.4–3.69 GHz) application band. The hexagonal radiating patch is perturbed with an optimum rectangular slot to enhance the impedance bandwidth of the antenna. The lower substrate layer having hexagonal patch with the same probe position is stacked with the upper square-shaped substrate layer with same sized square patch and the upper patch soldered with the coaxial probe. The overall stacked antenna generates a circularly polarized band when the opposite corner of the top square radiating patch of the upper layer is truncated with optimum size. In order to generate another circularly polarized band and to improve the input impedance matching of the stacked antenna, the top radiating patch is perturbed with two slots and a slit. The stacked circularly polarized antenna generates impedance bandwidth of 12.75% (3.23–3.67 GHz) for ( $S_{11} \leq -10$  dB) with two circularly polarized bands (3.34–3.37 GHz) and (3.66–3.70 GHz) as per (axial ratio  $\leq 3$  dB) for WiMAX application. Therefore, the proposed antenna can be used as linearly polarized or dual band circularly polarized according to requirement.

*International Journal of Microwave and Wireless Technologies, pp.1-16, 2020, doi:10.1017/S175907872000 1567.*

# **DUAL BAND TRIANGULAR PATCH ANTENNA FOR LAND & MARITIME MILITARY COMMUNICATION SYSTEM AND WLAN 5.8GHz APPLICATION**

**D. CHAKRAVORTY, S.K. SINGH, P. SINGH, I. ROY, A. BANERJEE, M. SHAW, AND M. GANGOPADHYAY**

## **ABSTRACT**

In this research paper, a Microstrip Triangular Patch Antenna (MTPA) with (80mm, 55mm, 39mm) size is designed for Land and Maritime military communication system (4990–5000) MHz and WLAN 5.8GHz (5725–5850) MHz. The antenna is coaxially probe fed with relative permittivity ( $\epsilon_r$ ) 4.4 and height is 1.6mm. The above said antenna generate two resonance modes between (4941–5068) MHz, bandwidth (2.54%) with center frequency 5004.5 MHz and (5723–5862) MHz, bandwidth (2.4%) with center frequency 5792.5 MHz.

*2017 8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), Vancouver, BC, 2017, pp. 506-508, doi: 10.1109/IEMCON.2017.8117227*

# **CIRCULAR MICROSTRIP PATCH ANTENNA WITH U-SLOTS FOR MULTI BAND APPLICATION**

**M. SHAW, B. DEB AND N. MANDAL**

## **ABSTRACT**

In this research work a Circular Microstrip Patch Antenna designed and the circular patch of the antenna slotted with U-slots that enabled it to generate five resonant bands for penta band application. The antenna had excited using coaxial probe with proper probe position. From 1GHz to 5GHz frequency range over which the designed antenna had been investigated and within this frequency range the antenna generated multiple resonant bands with center frequency 1.02GHz, 1.66GHz, 2.55GHz, 3.7GHz and 4.93GHz. HFSS commercial software used to simulate the above said antenna for evolution of input impedance, S11, Gain and Radiation Pattern.

*2018 2nd International Conference on Electronics, Materials Engineering & Nano- Technology (IEMENTech), Kolkata, 2018, pp. 1-3, doi: 10.1109/IEMENTECH.2018.8465227.*

# **TRIPLE BAND V-SLOTTED PENTAGONAL MICROSTRIP PATCH ANTENNA**

**M. SHAW, S. KUNDU, T. GHOSH, S. DAS, S. MITRA AND M. GANGOPADHYAY**

## **ABSTRACT**

In this paper a pentagonal patch with each sides 15mm had been used to design a triple band microstrip-patch antenna. The radiating pentagonal patch in this antenna had been slotted with two V-slots due to which it generated three resonating bands with center frequencies 2.32GHz, 2.80GHz and 4.40GHz respectively. A rectangular ground plane of (35X48)mm dimension had been used and a coaxial probe used to excite the designed antenna. The antenna had been evaluated between 0.5GHz to 5GHz frequency range in order to determine Input impedance, Gain, S11 and radiation pattern using HFSS simulation software.

*2018 9th IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York City, NY, USA, 2018, pp. 288-290, doi:10.1109/UEMCON.2018.8796697.*

# **A SIMPLE STAR SHAPED MICROSTRIP PATCH ANTENNA FOR PENTA BAND APPLICATION**

**M. SHAW, D. CHAKRAVORTY, S. ISLAM AND M. GANGOPADHYAYA**

## **ABSTRACT**

In this research paper a simple Star shaped microstrip patch antenna has been designed for penta band application. Proper placement and positioning of the co-axial probe leads to the production of five resonant frequency bands by the designed antenna. The above said antenna investigated between 1 to 5GHz frequency range, generated five resonant bands with center frequency 1.64GHz, 2.21GHz, 2.99GHz, 3.43 GHz and 4.25GHz. The designed antenna is simulated using HFSS commercial software for evolution of S11, Radiation pattern, Gain and input impedance.

*2018 2nd International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech), Kolkata, 2018, pp. 1-3, doi: 10.1109/IEMENTECH.2018.8465178.*

# **V-SLOTS CIRCULAR MICROSTRIP PATCH ANTENNA FOR TRIPLE BAND APPLICATION**

**M. SHAW, S. MITRA AND M. GANGOPADHYAY**

## **ABSTRACT**

A circular microstrip patch antenna with radius 15mm had been designed to generate three resonating frequency bands with centre frequencies 2.129GHz, 2.6425GHz and 3.2205GHz respectively. Patch of the antenna had been slotted with three V slots. Along with this, the patch and ground of the antenna had been shorted using metallic post of radius 0.63mm. Size and position of three V-slots and post position had been optimized to generate three resonating frequency bands for triple band application. Co-axial probe of inner conductor radius 0.63mm and outer conductor radius 1.45mm was used to excite the antenna. The said antenna had been investigated over 1-4GHz frequency range using HFSS version 13 simulation software. Input impedance, Gain and radiation pattern of the antenna was evaluated over 1-4GHz frequency range.

*2018 IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), Vancouver, BC, 2018, pp. 1276-1278, doi: 10.1109/IEMCON.2018.8615047.*

# **A SIMPLE MINIATURIZED WIDEBAND EQUILATERAL TRIANGULAR MICROSTRIP PATCH ANTENNA AUTHORS**

**M. SHAW AND M. GANGOPADHYAY**

## **ABSTRACT**

A simple, very small equilateral triangular microstrip patch antenna (ETMPA) having sides 15mm with an I-slot of optimum length and position on the radiating patch has been designed to generate a wide frequency band. Impedance bandwidth generated by the antenna is 610MHz 10.8%, (5.34-5.95GHz) for ( $S_{11} \leq -10$  dB) having broadside radiation pattern with peak gain of 1.66dB. The designed antenna covers Weather Radar application band (5.35-5.45)GHz, Radiolocation and Military application band (5.47-5.57) GHz, Maritime Radar application band (5.57-5.65)GHz, WLAN-Europe (5.470-5.725)GHz, Wi-Fi 5.8(5.725- 5.850)GHz and Dedicated

Short-Range Communications (DSRC) band (5.850-5.925)GHz. FR4 material having relative permittivity ( $\epsilon_r$ ) 4.4 and loss tangent ( $\tan \delta$ ) 0.02 has been used as dielectric substrate and thin copper sheet used as radiating patch and ground in the designed antenna. Prior to physical fabrication and measurement, the proposed antenna has been designed and analyzed using commercial High Frequency Structural Simulator (HFSS) ver13 software. Good matching has been observed between measured and simulated results.

*2020 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), Vancouver, BC, Canada, 2020, pp. 1-7, doi: 10.1109/IEMTRONICS51293.2020.9216337*



# IMPROVING DETECTION OF MELANOMA AND NAEVUS WITH DEEP NEURAL NETWORKS

ANANJAN MAITI & BISWAJOY CHATTERJEE

## ABSTRACT

Machines can acknowledge the images of skin lesion as well as the disease compared to an experienced dermatologist. These might be executed by giving a proper label forth provided images of skin lesion. Within the proposed study researchers have examined various frameworks for detection of skin cancer as well as classification of melanoma. The current research includes a unique image pre-processing technique and modification of the image followed by image segmentation. The 23 texture and ten shape features of the dataset are further refined with feature engineering techniques. The improved dataset has been processed inside a Deep Neural Network models by binary cross-entropy.

The dataset passes through several mixes of multiple activation layers with varying features and optimization techniques. As an outcome of the study, researchers have selected a useful, timesaving model to find an image as melanoma or even nevus. The model was evaluated with 170 images of MED NODE and 2000 images of ISIC dataset. This improved framework achieves a favorable accuracy of 96.8% with few noticeable epochs which concern other 12 machine learning models and five deep learning models. In the future, certainly there can be an investigation with several classes of skin cancer with an improved dataset.

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# COMPUTER-AIDED DIAGNOSIS OF MELANOMA: A REVIEW OF EXISTING KNOWLEDGE AND STRATEGIES

ANANJAN MAITI, BISWAJOY CHATTERJEE, AMIRA S. ASHOUR AND NILANJAN DEY

## ABSTRACT

Computer-aided diagnosis (CAD) systems are the best alternative for immediate disclosure and diagnosis of skin diseases. Such systems comprise several image processing procedures, including segmentation, feature extraction and artificial intelligence (AI) based methods. This survey highlights different CAD methodologies for diagnosing Melanoma and related skin diseases. It has also discussed types, stages, treatments and various imaging techniques of skin cancer. Currently, researchers developed new techniques to detect each stage. Extensive studies on melanoma cancer detection were performed by incorporating advanced machine learning. Still, there is a high need for an accurate, faster, affordable, portable methodology for a CAD system. This will strengthen the work in related fields and address the future direction of a similar kind of research.

*Current Medical Imaging, Volume 16, Number 7, 2020, pp. 835-854(20) DOI: <https://doi.org/10.2174/1573405615666191210104141>*

# **PREPROCESSING OF SKIN CANCER USING ANISOTROPIC DIFFUSION AND SIGMOID FUNCTION**

**KARTIK SAU ,ANANJAN MAITI AND ANAY GHOSH**

## **ABSTRACT**

Skin cancer is one of the atrocious diseases observed in the western part of the world due to exposure to the ultraviolet (UV) rays approaching from the sun- and human-made tanning beds. The survival rate of skin cancer is very high if it is detected at an early phase and treated surgically. To detect it, preprocessing of affected skin lesion images is essential.

Here, we are representing a technique for preprocessing of skin lesion via contrast enhancement followed by anisotropic diffusion and sigmoid function. In this method, we critically normalized the skin lesion images followed by removing Gaussian noise and preserving some feature by anisotropic diffusion. For more improvement of it, we applied sigmoid function in the spatial domain of the skin lesion image. Here, we critically consider different parameters of anisotropic diffusion and sigmoid function. This innovative method has been successfully used in various low contrast affected skin lesion images. All most in all the cases, it gives the satisfactory results in terms of MSE PSNR, and SSIM values. This proposed method can be used to improve the quality of low contrast images in medical science, satellite imaging, and different industries. The said technique can be applied successfully in various applications.

*Advanced Computational and Communication Paradigms pp 51-61, DOI: 10.1007/978-981-10-8237-5\_6*

# **SKIN CANCER CLASSIFICATION THROUGH QUANTIZED COLOR FEATURES AND GENERATIVE ADVERSARIAL NETWORK**

**ANANJAN MAITI, BISWAJOY CHATTERJEE AND K. C. SANTOSH**

## **ABSTRACT**

Early interpretation of skin cancer through Computer-aided Diagnosis (CAD) tools reduced the intricacy of the treatments as it can attain a 95% recovery rate. Skin cancer lesion involves many arrangements of pixels which could question further with different contemporary ideas. Melanoma skin lesion has wide clinical texture, shape and different color features. Color components are less used. To frame up with Computer-aided Diagnosis system, scientists adopted various Artificial Intelligence (AI) designed to receive the best classifiers among these diverse features. This investigation covers traditional color based texture, shape and statistical features of Melanoma skin lesion and contrasted with suggested methods and approaches. This comprehensive study explored possibilities of 24-bit color and decreased series of color with 156 colors. The quantized color feature set of 4992 traits were pre-processed before training the model. The experimental images have combined images of Naevus (1500), Melanoma (1000) and Basal Cell Carcinoma (500). The proposed methods handled issues like class imbalanced with Generative Adversarial Networks (GAN). The recommended color quantization method with synthetic data generation increased the accuracy of the popular machine learning models as it gives an accuracy of 97.08% in Random Forest. The proposed model preserves a decent accuracy with KNN, Adaboost and Gradient Boosting.

*International Journal of Ambient Computing and Intelligence (IJACI) 12(3) DOI: 10.4018/IJACI.2021070104*

# **CLASSIFICATION OF MELANOMA THROUGH FUSED COLOR FEATURES AND DEEP NEURAL NETWORKS**

**ANANJAN MAITI, HIMADRI SHEKHARGIRI, BISWAJOY CHATTERJEE, VENKATESAN RAJNIKANTH, FUQIANSHID, NILANJAN DEY**

## **ABSTRACT**

Skin malignancy is a catastrophic health problems witnessed in Europeans and western area of the world because of the changes in the ozonelayer. Ultraviolet (UV) rays common threats for the human health. Scientists have studied on Computer-Aided Diagnosis (CAD) scheme to ease interpretation detection of melanoma. There are several variations of features of the lesions and different Artificial Intelligence (AI) based design participates in an essential role for building CAD system. This study has refined skin lesions with diffusion and dull razor technique. Lesion images have taken for color-based shape and texture feature extraction. Scientists have found new fused color features are effective for melanoma and nevus classification. It has discovered details of 2000 images from ISIC (database archive) helped to build improved feature set. These features were analyzed through various 12 machine learning models as highest accuracy of 93.9%. Proposed Deep Neural Network (DNN) has reached 95.8% accuracy within few epochs. This model was assessed specific limits which were discussed in the results section. In future this exercise will motivate investigators to experience with color features and its variations with other AI based models

*Information Technology and Intelligent Transportation Systems L. C. Jain et al. (Eds.) IOS Press, 2020, doi: 10.3233/FAIA200049*

# **INVESTIGATION OF DATASET FROM DIABETIC RETINOPATHY THROUGH DISCERNIBILITY-BASED K-NN ALGORITHM**

**RAJESH PRASAD SARKAR AND ANANJAN MAITI**

## **ABSTRACT**

Diabetic retinopathy (DR) is a retinal vascular disease that affects 10 % people connected with diabetic patients, and it could make humans blind. It is observed that appropriate screening and early identification of the illness can aid affected patients. Thus, computational recognition for DR health issues is undoubtedly demanded to apprehend the illness precisely in initial phase. The role of this study is to assess the dataset from the diabetic patients. The dataset is certainly utilized for setup of this smart solution that is obtained from the offered sources via the Internet. The initial K-Nearest Neighbor (k-NN) algorithm enhanced with instance weights considering that an added specification to identify the class of the instance. Here we have given weights that work with the construct of the data set and presented priority-based class discernibility. Here, the value of K is figured out through criterion similar to average density. The modified K-NN algorithm is implemented efficiently to analyze the dataset. The outcome of this classification technique demonstrates a useful alternative as it is better than an original K-NN algorithm to assist the diabetic patients. In future, it will support diabetic retinopathy victims to evaluate various characteristics of the illness

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# THE EFFECT OF DIFFERENT FEATURE SELECTION METHODS FOR CLASSIFICATION OF MELANOMA

ANANJAN MAITI AND BISWAJOY CHATTERJEE

## ABSTRACT

Features of skin cancer have a certain impact on Computer- aided Diagnosis (CAD) systems. Researchers had used different techniques to experience with patterns. The Melanoma lesion could also be identified with different texture, shape, and clinical features. The proposed study has used 22 features of Texture, 12 features of shape. The study has exposed three Feature Selection (FS) techniques like Gradient Boosting (GB), Particle swarm optimization (PSO), and statistical approach. The features are evaluated with these methods and highlighted the effectiveness of each feature for the classification of Melanoma.

Selected key features have less than the cost of computation. The reduced feature set can make classification better than per the selection of the model. The Random Forest has the highest performance based on accuracy as it got the highest accuracy of 97.1 (%) on GB feature sets. Decision Tree and K Nearest Neighbors have shown a decent accuracy of 96.8 (%) and 93.3 (%) on GB feature sets. The study rewards upcoming explorations to select an effective subset of features for Machine Learning and Deep Learning Techniques.

*ISSIP 2020: Recent Trends in Signal and Image Processing pp 123-133, DOI: 10.1007/978-981-33-6966-5\_13*

# AN IMPROVED K-NN ALGORITHM THROUGH CLASS DISCERNIBILITY AND COHESIVENESS

RAJESH PRASAD SARKAR AND ANANJAN MAITI

## ABSTRACT

The K-Nearest Neighbor (K-NN) is a primarily chosen method when it comes to the object classification, disease interpretation, and various other fields. In numerous cases, K-NN classifier uses the only parameter as K value, which is the number of nearest neighbors to decide the class of the instance and this appears to be insufficient. Within this study, we have looked at the initial K-Nearest Neighbor algorithm and also proposed modified K-NN algorithm to identify various ailments. Enhancing precision of the initial K-Nearest Neighbor algorithm, this specific suggested method consists of instance weights as an added parameter to determine the class of the example. This study presented a novel technique to assign weights, which utilizes the information from the structure of the data set and assigns weights to every instance relying on the priority of the instance in class discernibility. In this approach, we have included an additional metric “average density” together with “discernibility” to calculate an index which is used as a measure also with the value of K. The practice results obtained from UCI repository reveals that this classifier carries out much better than the traditional K-NN and preserve steady accuracy.

*Recent Developments in Machine Learning and Data Analytics pp 445-454, DOI:10.1007/978-981-13-1280-9\_41*

## **PARTIAL FACE RECOGNITION USING IMAGE FUSION**

**SANJUKTA BHATTACHARYA, ANANJAN MAITI, SAMHITA DAS AND SHRISTEE GANGULY**

### **ABSTRACT**

Several biometric partial face recognition researches have been performed by many scientists. In this chapter, a novel technique has been recommended, which acknowledges students face to speed up the attendance procedures in a classroom. Students' partial pictures have been used to prepare the image set, and preprocessed different partial faces to gray-level images. Initially, the technique like discrete wavelet transform has been used to obtain local features. Afterward, the effectiveness of the approach has been improved by employing image fusion with the averaging method. The fusion technique along with the correlation technique was executed to the contrast between the fused images, and the test images were selected from the entire image set. Results revealed practically 90% of the instances that were matched. The acceptance rate on an overall analysis has been found to prevail between 86.67% and 87.5%.

*The Internet of Everything: Advances, Challenges and Applications, <https://doi.org/10.1515/9783110628517-003>*

## **CRYPTOGRAPHIC SCHEME USING THE BIOLOGICAL PROPERTIES OF DNA- RNA - A REVIEW**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, SOURAV SAHA**

### **ABSTRACT**

Security is a fundamental and significant requirement of data transmission today. Technological advancement is moving very fast in order to find new cryptographic algorithms. DNA cryptography is a new promising area in the field of information security. It combines the classical concept of cryptography with that of the genetic properties of DNA and RNA to achieve a robust encryption mechanism.

## **A NOVEL ENCRYPTION TECHNIQUE USING DNA ENCODING AND SINGLE QUBIT ROTATIONS**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, HAREKRISHNA CHATTERJEE**

### **ABSTRACT**

In today's world security has become a major threat over the transmission channel. To overcome this DNA cryptography is used to encrypt and transfer the message from sender to receiver over a secured communication network. This paper focuses on the encryption and decryption of the message using DNA encoded sequences and discusses the cryptographic applications of single qubit rotations from the view of one-way trapdoor functions. For encryption quantum public key is used and for decryption the concept of classical private key is used. The mapping between integer numbers and quantum states is done using one way trapdoor function.

# **DESIGN OF A QUANTUM ONE WAY TRAPDOOR FUNCTION**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY**

## **ABSTRACT**

Of late security has become a key concern of data transmission mechanism over a communications channel. In an asymmetric cryptographic system, a public key is shared across an insecure medium. This makes the data exchange vulnerable to potential threat from various attackers. This paper proposes the design of a one-way trapdoor function built upon a quantum public key and a classical private key-based encryption–decryption technique of the secret message. The mapping between numbers used in the classical paradigm and their corresponding quantum states is established through the proposed quantum one-way trapdoor function.

# **QUANTUM KEY DISTRIBUTION PROTOCOL FOR KNAPSACK CRYPTOSYSTEM**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

## **Abstract**

The major threat in data communication in present day is security. To reduce the threat caused in the communication channel quantum cryptography is emerging as a replacement to its classical counterpart. This paper focuses on a quantum key distribution protocol for the knapsack cryptosystem using a one- way trapdoor function by qubit rotation. The protocol exploits a qubit in superposition state for a single bit message communication. The security of the protocol is owing to the fact that any random quantum state cannot be replicated.

# **KNAPSACK ENCODING FOR SECURED QUANTUM KEY DISTRIBUTION PROTOCOL**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Quantum cryptography has of late opened up the possibilities of exploiting the characteristics of quantum mechanics in the realm of network security. An interesting problem in cryptography is the distribution of the encryption key between the two parties involved in communication. This paper proposes a secure quantum key distribution protocol using the properties of super increasing knapsack sequences. The mapping from the knapsack sequences to the quantum states is achieved by rotating a three-bit quantum tuple.

## **A NOVEL QUANTUM DNA CIPHER USING FERMAT NUMBERS**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

### **ABSTRACT**

Security threats have been a part of today's world and to lessen these threats cryptographic model that is based on the underline concept of the DNA sequence given by Watson-Crick and the randomness of Fermat numbers may be thought of as an alternative. The paper is based on the encryption and decryption of a message string over a distribution channel using DNAencoded sequences and Fermat numbers. The key for encryption and decryption is obtained by rotating a quantum bit tuple. The mathematical formulation of both encryption and decryption processes have been computed and an analysis of the possible threats to the cryptosystem has been performed in this paper.

## **A CRITICAL SURVEY OF QUANTUM SESSION KEY EXCHANGE USING VARIOUS ENCODING SCHEMES**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

### **ABSTRACT**

Of late, secure data communication has become a fundamental challenge for the researcher's indomain of cryptography and network security. Technological advancement is moving very fast in order to threaten conventional cryptographic algorithms. Quantum cryptography is a new promising area in the field of information security. It combines propositions of quantum computing with classical cryptography to ascertain the safety of information exchange. Various encoding schemes, such as use of genetic properties of DNA, super-increasing knapsack sequences have recently been explored to protect the quantum key distribution procedure from different types of security concerns. This paper presents a critical review of the Quantum Session Key Exchange procedure in the light of certain encoding schemes.

## **A SECURED QUANTUM KEY EXCHANGE ALGORITHM USING FERMAT NUMBERS AND DNA ENCODING**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

### **ABSTRACT**

To address the concerns posed by certain security attacks on communication protocol, this paperproposes a Quantum Key Exchange algorithm coupled with an encoding scheme based onFermat Numbers and DNA sequences. The concept of Watson-Crick's transformation of DNA sequences and random property of the Fermat Numbers is applied for protection of the communication system by means of dual encryption. The key generation procedure is governed by a quantum bit rotation mechanism. The total process is illustrated with an example. Also, security analysis of the encryption and decryption process is also discussed.

# **A NATURE INSPIRED DNA ENCODING TECHNIQUE FOR QUANTUM SESSION KEY EXCHANGE PROTOCOL**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Security is today's foremost concern over the transmission channel. To lessen this security threat DNA based cryptography has emerged as an alternative to encryption of the data and exchanging of message between the sender and the receiver over a secured communication channel. Quantum superposition of states guarantees security against threats on any quantum communication channel. Again, DNA code set provides a way of encoding a binary text to its equivalent nucleotide bases. The idea of using quantum computing and DNA code set to perform the quantum session key exchange is that each pattern has its own unique properties and so, using a scheme that applies both is more secured than using any one alone. This is a nature inspired technique, in which a plain text in binary coded form is transformed to its DNA equivalent sequence that is given a Watson-Crick's transformation to obtain a first level of encoded message. This message is further encrypted using key that is obtained by a quantum session key exchange protocol to prevent from the common threats in the transmission channel. Moreover, using our protocol, sender and receiver can easily detect the intervention of any Attacker over the transmission network by calculating the error in the channel.

# **GÖDEL CODE ENCODING FOR QUANTUM KEY DISTRIBUTION PROTOCOL USING DNA MAPPING**

**PARTHA SARATHI GOSWAMI, TAMAL CHAKRABORTY, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Abstract Security is today's foremost concern over the transmission channel. Quantum computing is a very potent tooling the research of a secure communication channel. Gödel Code encrypts a number that is allocated to each alphabets of the message thereby obtaining a sequence of natural numbers that signifies a sequence of symbols. The mapping between the plain text to Gödel code is done by a DNA sequence. The idea of using quantum computing and DNA code set encoded with Gödel's numbers to perform the quantum key distribution scheme is that each qubit pattern has its own unique properties and so, using a scheme that applies both scores over a scheme that uses any one alone. In this paper a plain text is first transformed to its DNA equivalent sequence that is further encoded using Gödel Code to obtain a first level of encoded message. This message is then encrypted using a key that is obtained by a quantum key distribution protocol to guard against the threats in the transmission channel. Moreover, using this protocol, sender and receiver can easily detect the intervention of any Attacker over the communication network by calculating the quantum bit error rate in the channel.



# **GSM BASED WATER QUALITY MONITORING AND NOTIFICATION SYSTEM**

**SOUMI BHATTACHARYA, SANJULA CHATTERJEE, ANUSHKA DE, AMIT CHOWDHURY, AKAASH GUPTA, KOUSHIK SARKAR**

## **ABSTRACT**

Water is one of the major components of the environment and greatest gifts by nature to us. But we human beings have used it in such an uncontrolled manner that getting pure water has become a great challenge nowadays. Hence, it is high time to start monitoring of water qualities continuously so that necessary steps can be taken immediately. Water quality depicts chemical (pH, DO etc), biological (BOD, COD etc) and physical (turbidity, temperature etc) characteristics of water. The traditional water quality monitoring system where water quality parameters are checked manually by taking to laboratories is a tedious, inefficient and costly process which fails to meet the needs of today's fast paced life. In our project, three water quality parameters (pH, temperature, turbidity) are checked continuously and value can be shown in Blynk application. Moreover these values can be monitored by sending system specific character as message to a particular number. Whenever, any one (or all) of the water quality parameters crosses optimal range then user will be notified by an alert message as well as notification by the Blynk application.

*International Journal on Emerging Trends in Electronics & Communication Engineering (Vol. 4, Issue 1 –2020)*

# **CELL PHONE JAMMER**

**HIRAK DAS, SAIKAT JANA, SAYANTAN BHATTACHARJEE, SOHAM SIL, KOUSHIK SARKAR**

## **ABSTRACT**

In this study, we have proposed a general review of some of the effective jamming techniques used in wireless communication systems, as well as effective jamming migration techniques. Dissimilar cellular- systems process signals differently, and yet, all cell-phone-networks use radio-signals that can be interrupted or, even, blocked, completely. This highlights the design of a simple, low-cost mobile-phone-jammer and aims to present a solution for the problem of inappropriate-use of the cell-phones in restricted and prohibited- areas. The jamming is done by the releasing of noise (signal) of the same- frequency which is used by mobile-service-provider to destruct or cancel the user-signal. Its a device that transmit signal on the same frequency at which the GSM system operates, the jamming becomes success when the mobile phone's signal gets disabled in the region where the jammer is placed. The tactical commanders exercise control of their forces by using RF communications, the enemy has interest in the communications. This interest comes from the fundamental area of denying the successful transport of the information from the sender to the receiver.

At present the cell phone jammer are becoming civilian products rather than electronic warfare devices, because of the rising number of the mobile phone, users need to disable mobile phones in specific places where the ringing of cell phone would be disruptive. These places include temples, class rooms, libraries, seminar halls, meeting rooms, and other places where silence is appreciated. There are five types of jammers are known to be developed. Once the driver's cell phone is detected, a low-range jammer deactivates it leaving other passenger's cell phones and call will drop.

*International Journal on Wireless, Networking & Mobile Communication Innovations Vol. 3, Issue 1 - 2019*

# **A REVIEW ON BIOMETRIC SECURITY SYSTEM: FINGERPRINT RECOGNITION AND SPEECH RECOGNITION TECHNOLOGY**

**SANJULA CHATTERJEE, ANUSHKA DE, BISHAL GHOSH, KOUSHIK SARKAR**

## **ABSTRACT**

Biometric is the science and technology of measuring and analysing physical characteristics of a person such as DNA, eye retina, iris, fingerprints, hand measurement, facial pattern, voice pattern etc. There are so many systems available for but that systems are not so reliable. Of all these systems, fingerprint biometric system is the most widely used because of its low cost, high efficiency, high matching speed, and relatively high matching accuracy. Fingerprint biometric system in verifying a legitimate user, numerous government and private organizations are using this system for security purpose. Speech recognition systems are the efficient alternatives for devices where typing becomes difficult. With growth in the needs for embedded computing and the demand for emerging embedded platforms, it is required that the speech recognition systems (SRS) are available on them too. This paper focuses on fingerprint recognition and speech recognition. In this survey we present an overview of various biometric methods for security, its utilization, challenges, and opportunities and introduces the recent issues underlying the biometrics.

*International Journal of Recent Advances in Signal & Image Processing Vol. 3, Issue 1 - 2019*

# **LTE IN UNLICENSED SPECTRUM AND IN-DEVICE COEXISTENCE WITH WI-FI**

**SHREYANJIT GUPTA, SAPTARSHI ROY, ANKIT KUMAR CHARAN, KOUSTAV MAJUMDER, KOUSHIK SARKAR**

## **ABSTRACT**

The rising traffic in the licensed band now used for LTE is concreting the way for LTE in unlicensed spectrum, which has been planned to permit cellular network operators to divest some of their data traffic by accessing the unlicensed 5 GHz frequency band. In this paper we supply an introduction to the current methods which can put into practice LTE in the unlicensed spectrum, namely LTE-U, LAA, MulteFire and LWA and we furnish a relative study about them. We also reveal about 'in-device coexistence' and how it can solve the interference between Wi-Fi receiver and LTE RF receiver concurrently.

*International Journal on Wireless, Networking & Mobile Communication Innovations* Vol. 3, Issue 1 - 2019

# **IMAGE MANIPULATION AND DETECTION**

**SURANJOY LODH, ARKA DAS, KOUSHIK SARKAR**

## **ABSTRACT**

Digital images have been used in a growing number of applications as it has experienced tremendous growth in recent decades. Nowadays, several software's are available that are used to manipulate images so that the image looks like as original. Images are used as authenticated proof for any crime and if these images do not remain genuine then it will create a problem. Detecting these types of forgeries has become serious problem at present. Concurrent with the rapid development of computers and computer programmers is the growing risk that pictures-particularly photographs-will lose their traditional credibility as it becomes easier to manipulate them as well as our perception of their contents. It is often impossible to see whether a picture is manipulated or authentic. This paper presents a discussion about the design of classifiers between doctored and original images and discussion on some of the image manipulation detection techniques for the better approach for its future research.

*International Journal of Recent Advances in Signal & Image Processing* Vol. 3, Issue 1 -2019

# **REVIEW ON BACK CONTACT SCHOTTKY BARRIER OF CDTE SOLAR CELL**

**KOUSHIK SARKAR, SAPTARSHI BASU, ABHIRUP MAJUMDAR, SHRITI SHAW, ANKUSH DEBNATH, SUKANYAGUPTA**

## **ABSTRACT**

The presence of a back-contact barrier always affects the current-voltage characteristics of thin-film CdS/CdTe/metal solar cells initially by impeding hole transport, a current-limiting effect generally referred to as "rollover." In this case, the CdS/CdTe solar cell with a CdTe/metal back-contact barrier is modeled by two exactly opposite polarised diodes in series. Analytic simulations are engulfed to the measured current-voltage curve, the voltage distribution between the two diodes is shown under different conditions, and the back-contact barrier height is extracted from them. Room-temperature barrier heights exceeding 0.5 eV will always result in consequent fill-factor reduction. The back contact on CdTe based solar cells is responsible for the non-idealities in the cell characteristics. Numerical modelling of the thin film cells supports this expectation, a simple model can elaborate all quantitative and qualitative non-idealities like rollover and roll-factor loss in  $I-V$  curves, the shape and frequency totally dependence of CV curves. A more elementary way to get convinced by the need of the back contact is the use of monochromatic light which invade this contact. For CdTe, this comes to the light of at around 840 nm. The effect of the light in this wavelength region on the  $I-V$  characteristics is studied in this paper. It was observed that the  $I-V$  curves were only affected by photons within this wavelength region. This can be described by the creation of a new charge carrier distribution in the adjacent contact.

*International Journal of Current Research in Embedded System & VLSI Technology* Vol. 3, Issue 2 - 2018

# CHALCOGENIDE SOLAR CELLS

**NILADRI DAS, SWAGNIK GANGULY, RAHUL DAS, SAYAN KOLAY, KOUSHIK SARKAR**

## ABSTRACT

In this article the authors reviewed the current status of the chalcogenide thin film solar cells, so that the efficiency of the existing cells can be enhanced. We have discussed briefly about the techniques involved for maintaining the thickness of these cells as attenuated as possible. Chalcogenide thin-film solar cells are based on absorber materials like CdTe, Cu (In,Ga)Se(II) and Cu<sub>2</sub>ZnSn (S,Se)(IV). Copper ores can be a chief constituent of these cells since they are available abundantly in nature and they serve greatly for this purpose. The general aspects, current workings and the research highlights are analyzed in detail. Finally, the drawbacks and the future scope for the cells are also discussed vividly

*International Journal on Recent Advances in Industrial Electronics & Electrical Engineering* Vol. 2, Issue 2 - 2018

# A REVIEW ON EFFECT OF CDS WINDOW LAYER IN CDTE SOLAR CELL

**KOUSHIK SARKAR, SREYASHI GHOSH, BHASKAR DUTTA, SREELEKHA CHATTERJEE, SOUVIK GAIN, SEERIN JAHAN**

## ABSTRACT

Present world is suffering from serious pollution is resulted from fuel. Thus, we use nonpolluting solar energy as solution of it. CdTe having bandgap 1.5eV is now regarded as leading material as cost effective photovoltaics (PV). For the difference in bandgap of CdS and CdTe, CdS is selected as window layer. The methods- Closed space sublimation (CSS), Physical vapour deposition (PVD), Vapour transport deposition (VTD) are used to produce CdTe cell. Temperature had an adverse effect on efficiency of solar cell. CdS was for a long-time considered being essential in achieving higher efficiency. The CdS have various methods such as Electro deposition, thermal evaporation, spray, chemical bath deposition. For efficient thin film solar cell transparent conductive oxide (TCO) are needed as front side contact. BSF is used to reduce the back-surface recombination velocity in solar cell. The performances of the cell with ZnTe, BSF have shown better stability than other cells.

*International Journal on Emerging Trends in Modeling, Simulation & Scientific Computing* Vol. 2, Issue 2 - 2018

# SLEEPY CHAUFFEUR DETECTION AND ALERT TECHNIQUES FOR ROAD SAFETY

**HIMEL GHOSH, SAYAK CHATTERJEE, ANTIK GANGULY, SHREETAMA KARMAKAR, KOUSHIK SARKAR**

## ABSTRACT

The most startling of the contemporary problems is the sleepiness of chauffeur which causes lots of car accidents. Prevention of those impending accidents by detecting and alerting the sleepy chauffeur is vital, otherwise that would lead to loss of lives and various traumas along with severe injuries. The slumber or sleep may be caused by huge stress, pressure, relentless work load or alcoholism, for which sleep deprivation occurs and the chauffeur while driving gets drowsy. So far, considerable amount of systems has been developed to detect drowsiness of drivers, most of which mainly depend on image processing algorithms using cameras. Some of them also incorporate artificial intelligence and machine learning based algorithms. This paper presents a review of the existing systems and also proposes an easy and cheap system using sensors and Arduino, capable of detecting sleepiness and generates siren alarm and send alert message to take precautionary measures.

*International Journal on Recent Innovation in Microelectronics and Microcontroller's Applications* Vol. 1, Issue 1 - 2018

## **A REVIEW ON SOLAR CELL**

**K. SARKAR**

### **ABSTRACT**

Solar cell, also known as photovoltaic cell that specifically converts the energy of light into electrical energy through the photovoltaic cell, creating electrical energy through the photovoltaic impact. The overwhelming majority of solar cells are manufactured from silicon with expanding productivity and bringing down cost as the materials range from amorphous to polycrystalline to crystalline silicon frames. Not at all like batteries or fuel cells, solar cells don't use chemical reaction or require fuel to produce electric power and unlike electric generators, they don't have moving parts.

*Global Journal of Ecology, Environment and Alternate Energy Technologies* Vol. 1, Issue 1 - 2018

## **A REVIEW ON AIRBORNE EARLY WARNING & CONTROL SYSTEM (AEW&CS), INDIA**

**KOUSHIK SARKAR, SAURAV RANJAN, RAJIV KUMAR JHA**

### **ABSTRACT**

This paper deals about the INDIAN AEW&CS system and their role in IAF to counter threats from different enemies, especially from neighbors like Pakistan and china. As India is modernizing its defense forces especially in terms of force projection, network centric warfare capability, information and cyber warfare, and intelligence capabilities. AEW&CS too are a part of this process to bridge the gaps in our defense vulnerabilities. As we know air force plays a crucial role in security of any country, so it must be powerful enough to counter threats and destroy them. Airborne system acts as a force multiplier in this. The necessities of these type of system led our scientists to develop system which can detect enemies early and warns IAF and help them to make country safe, AEW&CS is result of that. In this paper we get almost all information about the working, their role, advantages and their disadvantages also. This paper is completely based on the present uses and future scope of AEW&CS system.

*International Journal on Emerging Trends in Electronics & Communication Engineering* Vol. 2, Issue 2 – 2018

## **A REVIEW: THIN-FILM CdTe/ CdS SOLAR CELL TECHNOLOGY**

**K. SARKAR**

### **ABSTRACT**

The CdTe/ CdS photovoltaic reports a photovoltaic technology that is implemented on the use of Cadmium Telluride, a thin film semiconductor fabricated to transform solar energy into electrical energy. The working principle of the solar cell and also the comparison of the cell with Silicon based solar cell is highlighted in this underlying review paper. The advantage and disadvantage is further culminated. The present works and also the future scopes is kept on the main focus through heat treatment of the solar cell which further may increase the efficiency of the solar cell. But despite of the huge experiment every technique implemented so far suffers from some kind of limitations. So a significant effort is needed for further success in CdS/ CdTe field.

*International Journal on Emerging Trends in Electronics & Communication Engineering* Vol. 2, Issue 1 - 2018

## **A REVIEW OF PAPER BATTERY-A REVOLUTIONARY ENERGY SOURCE**

**KOUSHIK SARKAR, VIKRAMADITYA JHA, ROBIN SHAW, MD SAHIL**

### **ABSTRACT**

This paper gives a complete vision on this revolutionizing and valuable solution for energy source through paper batteries associated provides a detailed analysis of same. The paper battery is a flexible, ultra-fine energy storage and production device. The combination of carbon nano tubes with a standard sheet of cellulose- based paper results in the formation of the paper battery. It is known as both a high-energy battery and Super capacitors because its combine two components that are separate in traditional electronics. The properties like long-term steady power production as well as bursts energy are possible due to this combination. In future, paper batteries provide power to the long run generation of electronics, medical devices, hybrid vehicle, giving radical new style and medical technologies because of biodegradable, lightweight and non-toxic nature. This paper will give a brief review of construction and working principle of paper batteries. It aimed at understanding and analyzing the advantages, limitation, and various application of paper batteries. This paper additionally aims at present research and future scope of paper batteries.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 1 - 2018*

## **A REVIEW ON INDIA'S POTENTIAL OF SOLAR ENERGY**

**KOUSHIK SARKAR, SOUMYA RAI CHOWDHURY, ANTIK DUTTA**

### **ABSTRACT**

In few last decades Indian government has taken several steps to reduce the use of fossil fuels-based energy while promoting renewable generation. Solar energy constitutes the most abundant renewable energy resource available on earth. Solar energy, being a clean renewable energy resource, can be used for industrial as well as domestic purposes with added advantage of low maintenance cost. With the recent developments in technology solar energy harnessing equipments are easily available in the market. Most of the developed countries are switching over to solar energy as one of their primary renewable energy source. One of the major steps taken by the Government of India and State Governments in order to meet the growing needs of energy in India is National Solar Mission. The objective of this Mission is to establish India as global leader in solar energy, by creating the policy conditions for its diffusion across the country as soon as possible. The Mission is a major initiative to promote ecologically sustainable growth while addressing India's energy security challenge. This Mission also contributes to the global effort to meet the challenges of climate change. The objective of present study is concentrate on role, situation and developing solar energy in India to recognize the Investment and Potential Opportunities in social and economic field for achievements of sustainable energy.

*Global Journal of Ecology, Environment and Alternate Energy Technologies Vol. 1, Issue 1 - 2018*

# Optimal Designing of Higher Efficiency Chalcogenide Thin Film Solar Cell

**Koushik Sarkar, Sudipta Banerjee, A.K. Chakraborty and K.K. Ghosh**

## **Abstract**

Efficiency and performance of a solar cell greatly depends on physical processes on junction in addition to device material characteristics and size. In the present work, attempt is made to explore a better designing of solar cell with some trade-offs and compromise amongst different parameters to obtain maximum power output and better efficiency. Chalcogenide based CdTe thin film solar cell is studied for the purpose. The proposed structure takes care of dealing against relatively low band gap of window material and its lattice mismatch with the absorber. Efficiency as high as 26.6% and power output to the level of (0.266 W/10 cm<sup>2</sup>) has been observed in our numerical simulation with PC1D. The result thus convincingly proves the superiority of our designed structure over conventional structures.

*IEEE Conference Published in: 2017 - 4th International Conference on Opto-Electronics and Applied Optics (Optronix), Optimal Designing of Higher Efficiency*

# A REVIEW ON ARTIFICIAL INTELLIGENCE TECHNOLOGIES

**Koushik Sarkar, Sukanta Saha, Saumadeep Basu, Sagnik Biswas**

## **ABSTRACT**

Over the last 50 years Artificial Intelligence (AI) has been an active topic and has seen many breakthrough technologies. This paper reviews Artificial Intelligence technologies and achievements in different sectors such as medical, automation, security etc. This includes how AI is used in Big Data challenges also how IBM Watson and other such tech is used to help us in different sectors. This paper includes a organized information about Artificial Intelligence and how it is affecting our life. Our aims in this introduction are, firstly, to place these contributions in the context of the foundations of AI and its importance. It also considers the different parts of Artificial Intelligence such as Machine Learning, Deep Learning, Argumentation and how all of these technologies are working together to change our future.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 2 - 2018*

# 5G TECHNOLOGY: A REVIEW

**Koushik Sarkar, Tandra Pain, Amrita Mukherjee, Mehnaz Parveen**

## **ABSTRACT**

In the generation of cloud computing and prominent development of the devices the massive need for faster error free data transmission can become a reality with 5G networking system. While comparing the characteristics of the previous generations, this review of 5G technology, talks about the main features of 5G and its working principal. It also includes the advantages and drawbacks of the highly anticipated 5G technology. 5G mainly incorporates Massive MIMO networking, Nanotechnology and device to device communication mediums. It's been in development for awhile, but the 3GPP has officially standardized its first specification. The 5G was said to be the ultimatum in mobile wireless technology; where 6G is already in the works. The testing of 5G networks are about to happen throughout 2018.

*International Journal on Wireless, Networking & Mobile Communication Innovations Vol 2, Issue 1 - 2018*

# **A REVIEW ON ENERGY HARVESTING FROM VARIOUS NON-CONVENTIONAL SOURCES**

**K. SARKAR**

## **ABSTRACT**

At present, scarcity of energy is an imperative problem where traditional energy sources are contracting progressively. So men have been rushing for renewable energy sources and researchers have come up with the idea of energy harvesting from our immediate environment. Sunbeams, wind, heat, mechanical stress, RF waves are readily available in the nature and energy is being extracted from these and put into use. This paper principally portrays different schemes of obtaining energy from ambient nature along with their operating principle, pros and cons, usages and impending possibilities. Apart from the above mentioned sources, energy harvesting from human power and other sources viz. Nano materials, Biological Parasitic, Atomic Particle motion are also taken into consideration in this text. This document explores different aspects of modern technologies like Wireless Sensor Nodes (WSNs), Micro Electro- Mechanical Systems (MEMS) which needs to be supplied limitless energy. Existing batteries are not suitable to provide the required power for the lifetime of these systems. Energy is available everywhere and if this energy is harnessed and channelized properly, this will help to provide limitless power to these device.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 1 - 2018*

# **A REVIEW ON EVOLUTION OF LIGHT**

**KOUSHIK SARKAR, BINAY JAISWAL, MANISH KUMAR, KAMINEE SINHA, SUBHAM KR ROUT**

## **ABSTRACT**

There was a gradual change seen in the development of light bulbs from the incandescent to the LEDs. With the advancement in the technology various changes was observed and finally it lead to the betterment of the society. Now we have the best efficiency light bulbs which could keep away from darkness and providing a way towards more sustainable future. This revolution has paved a way for the issues like radiating light poverty and promoting connected lighting.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 2 - 2018*

# **A REVIEW ON HYDROGEN: THE FUTURE FUEL**

**KOUSHIK SARKAR, RAHUL DAS, AFIFA SHADAN, MD IRFAN**

## **ABSTRACT**

Present paper deals with the use of hydrogen as fuel and with its future aspects too. Due to increase in dependency in non-renewable energy resources, there has been studies and interest in using a cleaner and more eco-friendly approach to consuming energy and one such approach is hydrogen fuel, combination of oxygen from air and water through electricity produces hydrogen fuel cell. Hydrogen can be produced by variety of technologies, such as chemical, biologic, electrolytic, and photolytic. Hydrogen can be produced from methods like gasification, electrolysis, and hydrogen fuel cells etc. Hydrogen fuel cells functions best with the help of proton exchange membranes fuel cells (PEMFC). PEMFC is type of fuel cell being developed mainly for transport applications, as well as for stationary fuel cell application. Their distinguishing features include lower temperature/ pressure ranges (50 to 100 C) and a special proton conducting polymer electrolyte membrane. The major application of polymer electrolyte membrane fuel cells focuses on transportation primarily because of their potential impact on the environment e.g. the control of emission of the greenhouse gases.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 2 - 2018*

# **A REVIEW ON AN ATM WITH AN EYE**

**KOUSHIK SARKAR, SOUVIK DEY, SUDIPTA KUNDU, RAJIB NASKAR**

## **ABSTRACT**

Iris recognition system has proved its biometric security rules in various high risk sectors like flight, border patrol and defense. Banking sector has to accept this system because of its strength and the advantages. It provides cutting costs and making processes easier. The technology started out as newness however due demands in the banking sector characterized by decreasing profits it became a necessity. The use of Biometric ATM's based on iris recognition technology has providing a safe and paperless banking environment. A biometric system provides automatic recognition of an individual based on some sort of unique feature or characteristic controlled by the individual. Biometrics gained lot of attention over recent years as a way to identify individuals. The developments in technology have made it possible to use biometrics in applications where it is required to establish or confirm the identity of individuals. The use of biometric for identification purposes requires that a particular biometric factor be unique for each individual that it can be readily measured, and that it is invariant over time. Human iris on the other hand as an internal organ of the eye and as well protected from the external environment, yet it is easily visible from within one meter of distance makes it a perfect biometric for an identification system with the ease of speed and automation. The iris is a thin circular diaphragm, which lies between the cornea and the lens of the human eye.

*International Journal of Current Research in Embedded System & VLSI Technology* Vol. 3, Issue 1 – 2018

# **EFFECT OF PINHOLE AND ITS RECOVERY IN CDS/CDTE SOLAR CELL THROUGH FABRICATION SIMULATION**

**K SARKAR, K K GHOSH**

## **ABSTRACT**

The performance of a solar cell is affected by pinhole formation during the deposition of the very thin cadmium sulfide (CdS) film. Insertion of a zinc oxide (ZnO) buffer layer between the top transparent conducting oxide and the window layer can help in the recovery of the performance of the pinhole-affected cadmium sulfide/cadmium telluride (CdTe) solar cell. The authors have made a deeper study about pinhole formation and its effect through modeling and simulation to investigate the influence of the pinhole on cell performance and its recovery. Both surface recombination and trap-assisted tunneling recombination in the cadmium sulfide/cadmium telluride interface region have been considered separately to investigate thoroughly the effect of a pinhole on the space-charge region and open-circuit voltage (VOC). An efficiency  $\eta$  of 18.67%, an open-circuit voltage VOC of 0.656 V, a short-circuit current ISC of 0.368 A and a fill factor of 76.7% after insertion of the buffer layer have been achieved. However, a poor performance ( $\eta$  of 2.55%, VOC of 0.184 V, ISC of 0.302 A) has been exhibited by the pinhole-affected cell.

Nanomaterials and Energy

# **THE REVIEW ON IRIS SCANNING AND RECOGNITION**

**KOUSHIK SARKAR, JAYDEEP KUMAR, SAYANDEB CHOUDHURY, ABHINANDAN CHAKRABORTY, PRIYANKA BHARATI**

## **ABSTRACT**

Biometric is the process of individual identification through physical features that is unique to one like fingerprint, voice, iris pattern, etc. among all other biometrics, iris recognition is considered to be the most accurate and reliable. Besides the fact that the iris pattern varies from person to person, it is not even same for two eyes of the same individual. Externally accessible, non-modifiable, constant rich source of data is the key to individual identification, security solutions and internal physical information. The foundation processes to this system is image capturing, localization, segmentation and template matching through various algorithms and techniques which are discussed in this review paper.

*International Journal of Current Research in Embedded System & VLSI Technology* Vol. 3, Issue 1 - 2018



# **SIMULATING A SOLAR CELL AT VARIED SCHOTTKY HEIGHTS IN VARIOUS BSFS AND ABSORBER THICKNESSES**

**K SARKAR, K K GHOSH NANOMATERIALS AND ENERGY**

## **ABSTRACT**

The performance of a solar cell is greatly affected by the Schottky barrier at the back contact. For a standard modelling of a good solar cell, care is to be taken on the fabrication of the back surface field (BSF) giving rise to the Schottky barrier. The authors have undertaken an exhaustive study through modelling and simulation to investigate the photocarrier dynamics at different Schottky barrier heights at the back contact for different combinations of material thicknesses of BSF as well as absorber layers. The study achieved the highest efficiency  $\eta$  of 18.48%, open-circuit voltage  $V_{oc}$  of 0.6641 V, short-circuit current  $I_{sc}$  of 0.343 A and fill factor of 81.44% for 0.1  $\mu\text{m}$  absorber and 1 nm BSF layer thickness. As a conclusive remark on the investigation, it may be asserted that for simultaneous ultrathin films of both the BSF and the absorber layers, the performance of the solar cell was almost independent of the Schottky barrier height.

# **A REVIEW ON BPSK MODULATION TECHNIQUES AND DEMODULATION SCHEMES**

**KOUSHIK SARKAR, TANWISHA KANJILAL, SUDARSAN BASU**

## **ABSTRACT**

High data-rate is desirable in many recent wireless multimedia applications. Modulation techniques have concerned increasing attention in optical wireless communications. In this paper, we implemented a Binary Phase Shift Keying (BPSK) modulator and demodulator for a digital communication. This is a review paper, in which we discussed about the basic components of Digital Communication process and the various techniques of Transmission and Receiving of Digital data bits. Since, in today's world, error-free data transmission with proper or approximate accurate Synchronization covers a wide area of scientific researches, we put concern about the transmission of error free data or less error containing data from the transmitter end to the receiver end but using various modulation techniques like Hamming Code, Cyclic Code, BCH Codes, Reed-Solomon Codes and others. As the PSK output signal is in suspended strip line, two BPSK modulators can be easily combined together to work as QPSK modulator.

*International Journal on Emerging Trends in Electronics & Communication Engineering Vol. 2, Issue 2 - 2018*

# **A REVIEW ON HEART BEAT SENSOR USING ARDUINO ATMEGA 328**

**KOUSHIK SARKAR, MADHURA MUKHERJEE, ANKITA SAHA, PRATITI SAHA, ARKA PAUL, SHALINI SARKAR**

## **ABSTRACT**

Our paper deals with heart rate detection using microcontroller (Arduino Atmega328). Heart rate is estimated as number of times the heart beats per minute. Diverse physiological conditions, for example, excessive physical workload, workload tensions, extra focus required to complete assigned official work, concentration, and the dynamic condition of the autonomic nervous system is reflected in the heart beat rate. Heart beat can be estimated either by the ECG waveform or by pulse sensing. It depends on the muscular extension and compression of a conduit as blood is constrained through it by withdrawals of the heart at standard interims. This rhythmic expansion and contraction can be detected from areas where the artery is closed to skin such as near the finger tips.

*International Journal on Recent Innovation in Microelectronics and Microcontroller's Applications Vol. 1, Issue 1 - 2018*

## **REVIEW ON WIRELESS POWER TRANSMISSION**

**KOUSHIK SARKAR, SOUVIK CHAKRABORTY, AYAN BHATTACHARJEE, SURAJIT BHADRA, ARPAN MANNA, SUBHADIP HALDAR**

### **ABSTRACT**

The aim of this review work is to give an overview of recent researches and development in the field of wireless power transmission. We have also cited several aspects relating to history of wireless power transmission systems along with the present day scenario of power transmission systems and also some of the developmental changes in it. This study also focuses on the applications, advantages & disadvantages in this field. The basic design and implementation of Wireless power system has also been given. This paper as a whole illuminates all the efficient method proposed for transmitting power without wires, to give a safe and sound communication system.

*International Journal of Advanced Trends in Microwave Engineering and Emerging Technology* Vol. 1, Issue 1 - 2018

## **EFFECT OF TCO, BSF AND BACK CONTACT BARRIER ON CDS/CDTE SOLAR CELL: MODELING AND SIMULATION**

**K SARKAR, K K GHOSH, N K.MANDAL**

### **ABSTRACT**

We have commenced an in-depth study through modeling and simulation to investigate the performance of a CdTe solar cell at different Schottky barrier heights for different combinations thicknesses of BSF as well as window layer and front contact oxide layer (TCO). The inter relation between BSF layer and back contact schottky barrier height has been focused. Effect of the BSF layer regarding the tunneling of charges has been investigated. In the present paper, we achieved in our study the highest  $\eta$  of 18.39%, Voc of 0.591 volt, Isc of 0.411 amp for 0.1  $\mu\text{m}$  absorber and 1nm BSF layer thickness in presence of higher schottky barrier (0.6eV) with higher doping concentration of absorber layer. Thinning of the layers have always been better in terms of performance and cost. But it brings pinhole formation problems what we excluded here in our present work.

*J.Mech.Cont & Math. Sci., Vol.-13*

## **A REVIEW ON BIO GAS**

**KOUSHIK SARKAR, VISHAL MANDAL, BHASKAR DUTTA, SOUVIK GAIN**

### **ABSTRACT**

The paper introduces biogas production and utilization methods that are suitable for providing continues operation of exiting biogas plants. Using biogas technologies the Eco-friendly Atmosphere can be built as it does not require any change or transformation of agriculture structure. Using biogas technologies energy-crisis in many rural areas can be solved. It is very cost effective also. This paper mainly focuses on generation of energy using waste disposal, animal dung, Marine Macro Algae, waste paper etc. we can create complex biogas production and utilization system by developing variants, so that both the energy and waste disposal goals can achieved together. Further research has to be done for better outcome.

*International Journal on Emerging Trends in Electronics & Communication Engineering* Vol. 2, Issue 2 - 2018

# **A REVIEW PAPER ON: ORGANIC LIGHT EMITTING DIODE (OLED) TECHNOLOGY AND APPLICATIONS**

**KOUSHIK SARKAR, SUVANKAR SAHA, SUJIT KUMAR THAKUR, GOURAV MUKHERJEE, DHIMAN BAIDYA**

## **ABSTRACT**

With the sweeping down of time the display technology has advanced through much of its high levels. Display technology plays out an important role in our lives in wide spectrum. Various stages have evolved in the tiny world of display technology and today it's the widest and yet a gloomy area to discover a lot. First cathode ray tube, then LED, LCD, and then we reached at a bright terminus where we have discovered the future of display technology that is OLED. OLED's display is really uncommendable and even there is no angle related issues or contrast or backlight related issues. It's almost defect less or we may say it's almost the perfect discovery, finding in unclear world of display technology. It is basically a paper where we basically put our earnest effort to bring out the display qualities of OLED in lime light. We have basically focused on all it's quality like it's HDR, backlight, motion blur, refresh rate etc in much brief. Unlike other flat panel displays OLED has a wide viewing angle (up to 160 degrees), even in bright light and the power consumption is only up to 2 to 10 volts. This low consumption of power provides maximum efficiency and helps to minimize heat and electricity interference in electronic devices.

*International Journal of Advanced Trends in Microwave Engineering and Emerging Technology* Vol. 1, Issue 1 - 2018

# **A REVIEW ON FREE SPACE OPTICAL COMMUNICATION**

**KOUSHIK SARKAR, SAIKAT MONDAL, DEBASMITA PAL, ABHIRUP ROY, RUMELA BISWAS**

## **ABSTRACT**

Free Space Optical Communication (FSO) is an emerging cost-efficient method of communication which uses light pulses (mainly lasers) to transmit data. This system has the advantages of high bandwidth, high data rate of 2.5 Gbps, easy installation and license-free spectrum. In spite of many of its benefits, it is very much dependent on weather conditions and gets degraded by atmospheric turbulence and scintillation. In this paper, we have given an overview on Free Space Optical Communication by including some literature survey based on some scholarly journals. The main working principle and setup of FSO system, and its performance under atmospheric turbulence have also been discussed. Also the advantages, disadvantages, applications, current researches going on and future scope of FSO communication have been mentioned.

*International Journal on Emerging Trends in Electronics & Communication Engineering* Vol. 2, Issue 1 - 2018

# **A REVIEW ON LI-FI**

**KOUSHIK SARKAR, RIKTAM BASAK, SATYAKI BANERJEE, KAUSTUV DUTTA, AMIT MAJUMDER**

## **ABSTRACT**

This Paper explores a new wireless communication method known as Li-Fi or Light Fidelity which was proposed by Harald Haas. It is used for illumination for data transmission or light as a medium of communication. It uses normal LED lights having variation in its intensity which has speed, a human eye cannot follow. As this technology spectrum which comprises a wide range of frequencies, from the infrared through visible, down to ultraviolet spectrum for communication can produce a theoretical speed of 10 Gbps. So, it's a much more better technology for data transmission compare existing Wi-Fi. Further research has to be done for better outcome.

*International Journal on Emerging Trends in Electronics & Communication Engineering* Vol. 2, Issue 1 - 2018

# **NON-UNIFORM QUANTIZED DATA FUSION RULE FOR DATA RATE SAVING AND REDUCING CONTROL CHANNEL OVERHEAD FOR COOPERATIVE SPECTRUM SENSING IN COGNITIVE RADIO NETWORKS**

**A. CHAKRABORTY, J.S. BANERJEE, A. CHATTOPADHYAY**

## **ABSTRACT**

In this paper, a pretty new concept of non-uniform quantized data fusion (N-QDF) rule reducing control channel data overhead has been proposed for energy detection based cooperative spectrum sensing scheme in cognitive radio networks. A holistic simulation study has been done in this very paper where the performance of variable bit NQDF scheme is compared with different uniform bit i.e., 2, 3, 4, 5 QDF, with respect to different parameters to validate our proposed scheme.

*Wireless Personal Communications, Springer.*

# **MALICIOUS NODE RESTRICTED QUANTIZED DATA FUSION SCHEME FOR TRUSTWORTHY SPECTRUM SENSING IN COGNITIVE RADIO NETWORKS**

**A. CHAKRABORTY, J.S. BANERJEE, A. CHATTOPADHYAY**

## **ABSTRACT**

Accuracy in spectrum sensing is very much required in cognitive radio network, which is a revolutionary paradigm to drift the spectrum underutilization problem. To enhance the detection performance in presence of shadowing or fading multiple SUs cooperate among themselves. But the collaboration and so the detection process is severely affected by the presence of some harmful secondary users known as Malicious users. The proposed approach in this paper has intelligently excluded these malicious users from the decision making process and thus improves the efficiency of the system.

*Journal of Mechanics of Continua and Mathematical Sciences*

# **A HYBRID DOUBLE LAYERED TECHNIQUE FOR THE BEST RELIABLE AND OPTIMAL RELAY SELECTION IN COOPERATIVE COGNITIVE RADIO NETWORKS BASED ON MULTIPLE-AHP AND GREY RELATIONAL ANALYSIS**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

The authors offer a new hybrid relay selection framework in this correspondence that integrates two distinct MCDM, or multiple criteria decision-making, methods, namely M- AHP (Multiple - Analytical Hierarchical Process) and GRA (Grey Relational Analysis).

*Journal of the Institution of Engineers (India): Series B, Springer.*

# **NON-UNIFORM QUANTIZED DATA FUSION RULE ALLEVIATING CONTROL CHANNEL OVERHEAD FOR COOPERATIVE SPECTRUM SENSING IN COGNITIVE RADIO NETWORKS**

**A. CHAKRABORTY, J.S. BANERJEE, A. CHATTOPADHYAY**

## **ABSTRACT**

In this correspondence, the authors propose a nonuniform quantized data fusion (N-QDF) rule alleviating control channel overhead for energy detection based cooperative spectrum sensing scheme in cognitive radio systems. Though soft or quantized data fusion (QDF) technique carries few-bit overhead from each user but it prescribes an improved solution between detection performance and complexity. Again higher-bit QDF provides greater detection probability than lower-bit QDF, due to the loss of more information in lower-bit QDF. In this paper, we derive a non-uniform quantized data fusion (N-QDF) rule that simultaneously enhances the detection probability for a given false alarm probability & higher bit QDF with minimum control channel overhead.

*In 7th International Advance Computing Conference (IACC), IEEE*

# **A COOPERATIVE STRATEGY FOR TRUSTWORTHY RELAY SELECTION IN CR NETWORK: A GAME-THEORETIC SOLUTION**

**J.S. BANERJEE, A. CHAKRABORTY, A. CHATTOPADHYAY**

## **ABSTRACT**

Through this communication, the authors propose a cooperative and new framework for relay selection within the Cognitive Radio (CR) System, utilising the Stackelberg game-theoretic method. The collaboration is dependent on the Secondary Users' (SUs) reliability when they are chosen as a relay.

*Wireless Personal Communications, Springer, (Press)*

# **FUNDAMENTALS OF SOFTWARE DEFINED RADIO AND COOPERATIVE SPECTRUM SENSING: A STEP AHEAD OF COGNITIVE RADIO NETWORKS**

**J.S. BANERJEE, A. CHAKRABORTY, A.**

## **ABSTRACT**

This chapter is focused on software defined radio, its architecture, limitations, then evolution to cognitive radio network, architecture of the CR, and its relevance in the wireless and mobile ad-hoc networks. Additionally, an overview of Cooperative Spectrum Sensing (CSS), its classification, components, challenges, and Cooperative Relay are discussed.

*In Handbook of Research on Software-Defined and Cognitive Radio Technologies for Dynamic Spectrum Management (pp. 499-543). IGI Global*

# **MODELING OF SOFTWARE DEFINED RADIO ARCHITECTURE & COGNITIVE RADIO, THE NEXT GENERATION DYNAMIC AND SMART SPECTRUM ACCESS TECHNOLOGY**

**J.S. BANERJEE, A. CHAKRABORTY, A.**

## **ABSTRACT**

Software Defined Radio (SDR) and Cognitive Radio (CR) are the very paradigms for wireless communication, in which either a network or a wireless node reconfigures its transmission or reception parameters to communicate efficiently, avoiding interference with licensed or unlicensed users. This chapter is focused on software defined radio, its architecture, its limitations, evolution to cognitive radio network, architecture of the CR, and its relevance in wireless and mobile ad-hoc networks.

*In M.H. Rehmani & Y. Faheem (Ed.), Cognitive Radio Sensor Networks: Applications, Architectures, and Challenges (pp. 127-158). Hershey PA: IGI Global.*

# **AN ADVANCE Q LEARNING (AQL) APPROACH FOR PATH PLANNING AND OBSTACLE AVOIDANCE OF A MOBILE ROBOT**

**A. CHAKRABORTY, J. S. BANERJEE**

## **ABSTRACT**

The goal of this paper is to improve the performance of the well-known Q learning algorithm, the robust technique of Machine learning to facilitate path planning in an environment. Until this time the Q learning algorithms like Classical Q learning (CQL) algorithm and Improved Q learning (IQL) algorithm deal with an environment without obstacles, while in a real environment an agent has to face obstacles very frequently.

*International Journal of Intelligent Mechatronics and Robotics (IJIMR).*

# **IMPACT OF MACHINE LEARNING IN VARIOUS NETWORK SECURITY APPLICATIONS**

**J BANERJEE, S MAITI, S CHAKRABORTY, S DUTTA, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

This paper represents a converged exposition of machine learning approach on various network security applications specifying the possible future scope and detailed outcome of the researches on the basis of intrusion detection, analysis of malware behavior, internet traffic classification, and other security aspects. The complexity of the respective algorithms and the challenges of using them for network security applications are also discussed which would help in understanding the current scenario and the future prospects.

*In 3rd International Conference on Computing Methodologies and Communication (ICCMC), IEEE.*

# **MULTI-ROBOT MOTION PLANNING AMIDST DYNAMIC OBSTACLE**

**D BANERJEE, CG MAJUMDER, S ROY, A CHAKRABORTY, A KONAR**

## **ABSTRACT**

This paper provides a modern approach to multi-robot motion planning in a given world map amidst both static and dynamic obstacles. The distributed method for multi-robot motion planning has been realized with particle swarm optimization algorithm. The experimental results show that the variation in the path deviation from optimal trajectory of the mobile robots increases with the increase in the number of dynamic obstacles. But here we have presented an approach which minimizes the probability of collision of the robots with the obstacles.

*In International Conference on Recent Trends in Information Systems, IEEE.*

# **FACIAL EXPRESSION RECOGNITION FOR HUMAN COMPUTER INTERACTION**

**J CHATTOPADHYAY, S KUNDU, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

Facial expressions consisting of various emotions play a significant role in interpersonal relations. Emotion detection from various expressions of the face can be performed broadly in three major steps which involve face detection-normalization, extraction of features and classification. An automated facial expression detection methodology has been introduced by the authors in this letter. Here, after face detection and normalization we extract three different types of facial features: Geometric, Texture and Structural. Based on these extracted features we employ SVM classifier to separate the face expressions which includes Happy, Sad, Disgust, Angry, Surprise and Fear.

*In International Conference on Computational Vision and Bio Inspired Computing, Springer, Cham.*

# **APPLICATION OF MACHINE LEARNING IN APP-BASED CAB BOOKING SYSTEM: A SURVEY ON INDIAN SCENARIO**

**P SAHA, S GUHATHAKURATA, S SAHA, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

Authors have studied the existing research papers related to online cab booking systems and tried to put all their proposed solutions in this paper. Different authors have proposed different ideas to make the existing system more feasible. Some of the notable features are fleet utilization, bargaining facility, trip recording, etc. The authors have also discussed all the possible implementations of these features. In addition to the above-mentioned features, we have also discussed the possible solutions to some existing problems like single point failure, low availability of cabs, etc.

*In Applications of Artificial Intelligence in Engineering, Springer, Singapore.*

# **A NOVEL APPROACH TO PREDICT COVID-19 USING SUPPORT VECTOR MACHINE**

**S GUHATHAKURATA, S KUNDU, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

An unexpected outbreak of 2019 Coronavirus disease (COVID-19) in Wuhan, China, led to a massive catastrophe across the world. The majority of the COVID-19 patients are getting diagnosed with pneumonia in their early stages. Over 22,00,000 confirmed cases have shown various ranges of symptoms, but the most predominant set includes fever, cough, and shortness of breath. The predominant set of symptoms, coupled with other critical symptoms, a prediction process has been devised in this paper to check whether a person is infected with COVID-19 or not. Based on the crucial impact of the symptoms, we have applied the support vector machine classifier to classify the patient's condition in no infection, mild infection, and serious infection categories. We have achieved an accuracy of 87% in predicting the cases.

*In Data Science for COVID-19 (pp. 351-364). Elsevier, Academic Press.*

# **A NEW APPROACH TO PREDICT COVID-19 USING ARTIFICIAL NEURAL NETWORKS**

**S GUHATHAKURATA, S SAHA, S KUNDU, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

We used an Artificial Neural Network (ANN) to categorise the patient's health into three categories based on the importance of these attributes: no infection, moderate infection, and severe illness. We predicted the instances with an accuracy of 84.7 percent.

*Cyber-Physical Systems: AI and COVID-19, Elsevier, (Press)*

# **SOUTH ASIAN COUNTRIES ARE LESS FATAL CONCERNING COVID-19: A FACT-FINDING PROCEDURE INTEGRATING MACHINE LEARNING & MULTIPLE CRITERIA DECISION-MAKING (MCDM) TECHNIQUE**

**S GUHATHAKURATA, S SAHA, S KUNDU, A CHAKRABORTY, J.S. BANERJEE**

## **ABSTRACT**

In this paper, the possible factors have been represented that determine this uneven distribution of COVID-19 deaths. The significance of the factors has been presented in this paper after the data analysis of the factors from 165 different countries. Based on the correlation of the factors and their critical impact towards the concerned countries death toll, the risk index of each factor has been labeled using analytical hierarchy process (AHP)-based MCDM, i.e., multiple criteria decision-making technique

*Journal of The Institution of Engineers (India): Series B, Springer.*



# **OPTIMIZING THE ROLE OF ORGANIZATIONAL COMMITMENT: A QUALITATIVE STUDY IN THE SCHOOL EDUCATION SECTOR**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

**Purpose:** The purpose of this paper is twofold: first, to find out the factors that affect organizational commitment in the school education sector and second, how these factors might be modified to judge organizational commitment of the school teachers.

**Design/methodology/approach**

This study was conducted using qualitative interviews with two sets of school teachers – government and government-affiliated schools and private schools in and around Kolkata city. The sample size was 40. The data triangulation method was applied for optimal verification of the result. Then the pattern of concordance author– coder pair was tested using Cohen’s kappa. **Findings:** This study investigated eight factors expected to influence organizational commitment. Out of these eight factors, five factors were found – “on employees’ perception and need achievement,” “cognitive abilities of the employees,” “assessment of the employees,” “factors related to personality” and “organizational factors which influence organizational commitment” – which qualitatively exert more influence on organizational commitment.

**Practical implications:** The authors proposed that the concept of organizational commitment and its application in the academic sector might be modified to optimize the role of organizational commitment and to enhance the credibility of the teachers. A comprehensive organizational commitment model that has been proposed is expected to gain future direction of organizational commitment research. The parameters of the study can be used in the school sector, as well as in the corporate sector through proper improvisation, and it is expected that the corporate sector will be benefited. It is because the factors that were selected for the study are also relevant to the corporate sector.

**Originality/value:** This is a conceptual-type paper. The factors that were selected had an effect on the organizational commitment of the school teachers and these factors can also be applied in corporate sector to improve their level of commitment.

# **ANTECEDENTS AND CONSEQUENCES OF ORGANIZATIONAL COMMITMENT IN SCHOOL EDUCATION SECTOR**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL, DR. RABIN MAZUMDER**

## **ABSTRACT**

**Purpose:** The purpose of this study is to study the attitude of the employees toward organizational commitment and its impact on organizational effectiveness and, second, to develop a strategic model for organizational commitment and organizational effectiveness. **Design/methodology/approach:** A conceptual model was suggested to determine the variables influencing school teachers’ organizational commitment and the role of organizational commitment to organizational efficiency with prosocial behavior as the moderating variable. Structural equation modeling was used to investigate the relationship between suggested factors using a sample of 298 state and private school teachers in and around a metropolitan city of India.

**Findings:** The results of this study showed that, except performance appraisal and assessment of the employees, employee personality and relationship with coworkers, all other constructs significantly affected organizational commitment. The positive influence of organizational commitment to organizational effectiveness was also moderated by prosocial behavior.

**Demography** exerted a significant impact on organizational commitment.

**Originality/value:** Organizational commitment is comparatively a new topic of research, and in the school education sector, little work was conducted. Hence, the results can be generalized to gain the future direction of organizational commitment in educational research, and it can also be improvised in the corporate sector.

# **ORGANIZATIONAL COMMITMENT OF WORKING WOMEN: THE ROLE OPTIMIZATION**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

The purpose of this paper is to explore the factors that affect organizational commitment among working women and secondly, how these factors might be reshaped to judge organizational commitment of the working women. This study was conducted from 40 respondents using qualitative interviews with working women. For optimal verification of the result data triangulation was enforced which was followed by testing Cohens kappa to establish the pattern of concurrence between author and coder. The authors suggested that the approach of organizational commitment and its implications on the working women during this pandemic might be reconciled to enhance the level of commitment among them. The domains of this research can also be implemented among other genders in corporate, educational and healthcare sectors through adequate improvisation and it is expected that all the sectors will be profitable. Keywords: Organizational commitment; Working women; Psychological wellbeing and loneliness; Family responsibilities; Cohen's kappa; India.

*International Journal of Management Practice. (InderScience Publishers, ISSN:1741-8143). (Scopus-Indexed Journal). Accepted for publication (07.07.2021).*

# **WOMEN IN INFORMATION TECHNOLOGY: HOW ORGANIZATIONALLY COMMITTED THEY ARE**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

The study's aim is to look into the factors that influence organizational commitment among working women in the Information Technology (IT) industry, as well as how these factors can be used to determine organizational commitment among women in the IT industry. Working women from seven IT companies in Kolkata were interviewed qualitatively for this report, which included 35 participants. For maximum substantiation of the result data triangulation was established which was followed by testing Cohen's kappa to justify the pattern of synchronism between author and coder. Six constructs were identified in this study that are expected to affect working women's organizational commitment in the IT sector. The constructs were motivation towards work, role of emotional intelligence, importance of incentives, impact on psychological wellbeing and loneliness, organizational culture, and family duties and responsibilities. More than 85% of the respondents complied to the constructs incorporated in the study which influence organizational commitment of working women in IT industry.

*Name of the book: Cyber Intelligence & Information Retrieval. Springer: Singapore (DOI 10.1007/978-981-16-4284-5, ISBN 978-981-16-4283-8). (In press)*

# **ANTECEDENTS TO AND EFFECT OF ORGANIZATIONAL COMMITMENT IN SCHOOL EDUCATION SECTOR: A QUANTITATIVE STUDY**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

The research tried to focus on the attitude of the employees toward organizational commitment and its impact on employee effectiveness and secondly, to develop a strategic model for organizational commitment and employee effectiveness. This quantitative study was conducted on 182 school teachers from government and government affiliated schools and private schools in and around Kolkata city, India. Confirmatory factor analysis and structural equation modeling was implemented to fulfill the objectives. Organizational culture, leadership qualities, incentives, training, prosaically behavior and employees effectiveness were some of the factors which had a direct and positive relationship with organizational commitment. Not much research was conducted on organizational commitment in the Indian context and especially on education sector. The results can be generalized to increase the commitment level among the teachers, to gain the future direction of organizational commitment in the field of research and it can also be improvised in the corporate sector.

*Conference name: Management Doctoral Colloquium & VGSOM Research Scholars' Day, organized by Vinod Gupta School of Management on 14-15 March, 2018 at Indian Institute of Technology, Kharagpur(IIT, KGP).*

# **FACTORS INFLUENCING OPTIMIZATION OF ORGANIZATIONAL COMMITMENT: A QUALITATIVE STUDY IN THE SCHOOL EDUCATION SECTOR**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

The purpose of this paper is to find out, firstly, the factors which affect organizational commitment in the school education sector and second, how these factors might be modified to judge organizational commitment of the school teachers. The study is being conducted using qualitative interviews with two sets of school teachers, i.e. - government and government affiliated schools and private schools in and around Kolkata city. The sample size is 40. The data triangulation method will be applied for optimal verification of the result. Then the pattern of concordance author- coder pair will be tested by using Cohen's kappa. The study investigated eight factors expected to influence organizational commitment. Out of these eight factors we have found five factors, i.e. - "On employees" perception and need achievement, "Cognitive abilities of the employees;" "Assessment of the employees;" "Factors related to personality" and "Organizational factors which influence organizational commitment;" which qualitatively exert more influence on organizational commitment. The authors proposed that the concept of organizational commitment and its application in the academic sector might be modified to optimize the role of organizational commitment and to enhance the credibility of the teachers. A comprehensive organizational commitment model that has been proposed is expected to gain future direction of organizational commitment research,

*Conference name: National Conference in Expanding Frontiers of Applied Psychology, organized by Department of Applied Psychology, University of Calcutta, India on 3-4 March, 2017 at the University of Calcutta.*

# **A QUALITATIVE ANALYSIS ON THE INFLUENCE OF FACTORS ON ORGANIZATIONAL COMMITMENT AMONG THE SCHOOL TEACHERS**

**ROOPREKHA BAKSI MAITI, DR. SHAMINDRA NATH SANYAL**

## **ABSTRACT**

**Purpose:** The purpose of this paper is to find out the factors which affect organizational commitment in the school education sector and second, how these factors might be modified to judge organizational commitment of the school teachers.

**Method:** The study is being conducted using qualitative interviews with two sets of school teachers, i.e. - government and government affiliated schools and private schools in and around Kolkata city. The sample size is 40. The data triangulation method is applied for optimal verification of the result. Then the pattern of concordance author-coder pair is tested by using Cohen's kappa.

**Results:** The study investigated eight factors expected to influence organizational commitment. Out of these eight factors we have found five factors, i.e. - "On employees' perception and need achievement;" "Cognitive abilities of the employees;" "Assessment of the employees," "Factors related to personality" and "Organizational factors which influence organizational commitment," which qualitatively exert more influence on organizational commitment.

**Implications:** The authors proposed that the concept of organizational commitment and its application in the academic sector might be modified to optimize the role of organizational commitment and to enhance the credibility of the teachers. A comprehensive organizational commitment model that has been proposed is expected to gain future direction of organizational commitment research.

*Conference name: 1st IEM Convention, 2017, organized by Department of Business Management, Institute of Engineering & Management, Kolkata on 24-25 November, 2*

## **PH DEPENDENT TUNABLE PHOTOLUMINESCENCE OF POLYANILINE GRAFTED GRAPHENE OXIDE (GO-PANI)NANO-COMPOSITE**

**P.K.DAS ET.AL.**

### **ABSTRACT**

Polyaniline (PANI) grafted Graphene Oxide (GO), GO-PANI nano composite exhibits interesting pH dependent tunable photoluminescence. Exciting at 230 nm, a single emission band at 345 nm is observed and this band is shifted from UV to blue region by decreasing the pH less than 3. Aqueous dispersion of GO-PANI (pH=4.6) shows dual fluorescence at 345 nm and 405 nm upon excitation at 280 nm indicating the presence of two emissive moieties. At pH<3, single fluorescence peak at 410 nm is observed by exciting GO-PANI at 280 nm, whereas the emission band is centered at 345 nm when pH is more than 5. Instead of the peaks at 230 nm and 280 nm in alkaline region, a peak at 250 nm has been obtained in the excitation spectra (at pH<3) monitored at 410 nm. This observation suggests the formation of a new ground state species. The presence of this species is further supported by a fluorescence lifetime components at 410 nm. From the luminescence behavior of GO-PANI and electronic characteristics of GO and PANI at low pH, one may consider the formation of the species as a result of charge transfer interaction between GO and PANI.

*Journal of Luminescence, Vol. 181, 138 (2017) SCI.*

## **THE MAGNETO ELECTRON STATISTICS IN HEAVILY DOPED NIPI STRUCTURES**

**P. K. DAS, J. PAL, M. DEBBARMA AND K. P. GHATAK**

### **ABSTRACT**

In this paper we study the Electron Statistics in Heavily Doped *N* Type-Intrinsic-*P* Type-Intrinsic structures of non-linear optical, tetragonal and opto-electronic materials in the presence of magnetic quantization. It is found taking such heavily doped structures of Cd<sub>3</sub>As<sub>2</sub>, CdGeAs<sub>2</sub>, InAs, InSb, Hg<sub>1-x</sub>Cd<sub>x</sub>Te, In<sub>1-x</sub>Ga<sub>x</sub>As, yP<sub>1-y</sub> as examples that the Fermi energy ( $E_F$ ) oscillates with inverse quantizing magnetic field ( $1/B$ ) and increases with increasing electron concentration with different numerical magnitudes which is the signature of respective band structure. The numerical value of the Fermi energy is different in different cases due to the different values of the energy band constants.

*Journal of Nano Science and Nano Technology, 21, pp- 6183 (2021), SCIE, MSCI, WEB OF SCIENCE*

## **DIMENSION DEPENDENT DENSITY-OF-STATES FUNCTION AND THE RADIATION LAWS**

**P.K.DAS AND K. P. GHATAK**

### **ABSTRACT**

The concept of dimension dependent density-of-states function (DOS) is vital in the area of nanoscience and nanotechnology. In this paper we show that the same concept leads to the simple and compact derivations of the 3D, 2D and 1D Planck's radiation laws in one hand and its two dimension dependent extremes namely Rayleigh-Jeans and Wien's laws on the other hand. Besides we have also studied the 3D, 2D and 1D Stefan-Boltzmann laws in this context.

*Journal of Nano Science and Nano Technology, Vol. 19, 2909 (2019) SCIE, MSCI, WEB OF SCIENCE.*

# INFLUENCE OF INTENSE ELECTRIC FIELD ON THE SCREENING LENGTH IN OPTO-ELECTRONIC MATERIALS

P.K.DAS ET.AL.

## ABSTRACT

In this paper we study the screening length (SL) in opto-electronic materials in the presence of intense electric field by formulating the new dispersion relation. It has been found taking  $n$ -InAs,  $n$ -InSb,  $n$ -Hg $_{1-x}$ Cd $_x$ Te,  $n$ -In $_{1-x}$ Ga $_x$ As  $y$  P $_{1-y}$  lattice matched to InP, as examples that the SL decrease with increase in electron concentration for all types of materials. The results for the two band model of Kane are greater than the same of the three band model of Kane. The influence of spin orbit splitting constant for perturbed three band model of Kane enhances the numerical values of the SL as compared with the perturbed two band model of Kane and the variations are totally band structure dependent. The Screening Length for all the materials becomes more or less constant with the electric fields up to a certain values of the external electric field (depending on the values of the constants of the energy band structure of a particular material) and then decreases smoothly with increasing electric field, which reflects the variation of the density state function (DOS), since the Screening Length in any material under any physical condition is directly influenced by the corresponding (DOS) function for the whole range of the electric field. The variation for with respect to electric field is in conformity with the corresponding variation of the DOS versus electric field. We observe that the Screening Length decreases with increasing alloy composition for In $_{1-x}$ Ga $_x$ As  $y$  P $_{1-y}$  lattice matched to InP and Hg $_{1-x}$ Cd $_x$ Te in accordance with both perturbed three and two band models of Kane. Under strong magnetic quantization the SL oscillates with inverse quantizing magnetic field.

Materials Focus , 7, 390 (2018) ESCI.

# CAN PHOTONS AFFECT THE ENTROPY?

P. K. DAS, P DUTTA, A HALDER, R BHATTACHARJEE, KP GHATAK

## ABSTRACT

In this paper an attempt is made to study, the entropy in the presence of intense light waves in heavily doped (HD) III-V and optoelectronic materials on the basis of newly formulated electron dispersion relations within the frame work of  $k \cdot p$  formalism. We have also investigated the entropy under magnetic quantization and also in quantum wells (QWs) and nano wires (NWs) respectively. It is found taking HD InSb, InAs, Hg $_{1-x}$ Cd $_x$ Te and In $_{1-x}$ Ga $_x$ As  $y$  P $_{1-y}$  lattice matched to InP as examples III-V, ternary and quaternary compounds that the entropy increases with increasing electron concentration and decreasing film thickness in different spiky manners, since the coincidence of Fermi energy with the sub-band energy leads to the step functional dependence of the density state function and this fact is being reflected in the quantized variations of the entropy with the said variables. The entropy increases with increasing electric field and decreasing alloy composition respectively. The numerical values of entropy with all the physical variables are totally band structure dependent for all the cases. The most striking features are that the presence of poles in the dispersion relation of the materials in the absence of band tails creates the complex energy spectra in the corresponding opto-electronic HD NWs and the effective electron mass exists within the band gap which is impossible without the concept of band tailing. The well-known classical result of entropy for non-degenerate bulk semiconductors having parabolic energy bands has been obtained as a special case of our generalized formulation and thus confirming the compatibility test. The content of this paper finds four important applications in the field of quantum effect devices of nanoscience and nanotechnology.

Materials Focus, Vol. 6, 133 (2017) ESC

# HEAVILY DOPED SINGLE QUANTUM WELLS AND THE EFFECTIVE MASS

P K DAS, P DUTTA, A HALDER, J PAL, N DEBBARMA, S DEBBARMA, K P GHATAK

## ABSTRACT

In this paper we study the Effective Mass (EM) in Heavily Doped (HD) Single Quantum Wells (QW) of Nonlinear Optical, III–V, II–VI, IV–VI, stressed materials, Te, GaP, PtSb<sub>2</sub>, Bi<sub>2</sub>Te<sub>3</sub>, Ge, Gallium Antimonide on the basis of newly formulated electron dispersion laws. It appears taking HDs n-type Cd<sub>3</sub>As<sub>2</sub>, CdGeAs<sub>2</sub>, InAs, InSb, GaAs, Hg<sub>1-x</sub>Cd<sub>x</sub>Te, In<sub>1-x</sub>Ga<sub>x</sub>As<sub>y</sub>P<sub>1-y</sub>, P-CdS, PbSe, uniaxial strained InSb and Ge that the EM increases with increasing surface electron concentration per unit area and decreasing film thickness in various manners which are totally band structure dependent. The EM exists in the band gap for the said HD materials as considered here and in many cases the EM depends on the size quantum numbers.

*Materials Focus 6 (2), 167-218 (2017) ESCI.*

# GATE CAPACITANCE IN QUANTUM METAL-OXIDE-SEMICONDUCTOR FIELD-EFFECT TRANSISTOR DEVICES OF TECHNOLOGICALLY IMPORTANT MATERIALS

P. K. DAS ET. AL.

## ABSTRACT

The Heisenberg's scientific theory of quantum science since its beginning has been proved to be instrumental in unlocking varied vital quantum phenomena. In what follows the Heisenberg's scientific theory has been used to derive the expressions for the gate capacitance in Quantum MOSFET Devices manufactured from completely different technologically vital nonstandard materials by formulating the 2D electron statistics under very low temperature so that the Fermi function tends to unity. For numerical computations we take Cd<sub>3</sub>As<sub>2</sub>, the best quality very high mobility semiconductor and non-linear optical (e.g., CdGeAs<sub>2</sub>) compounds from which quantum MOSFET devices are made of by using all types of anisotropies of band structures in addition to splitting of bands due to large fields of the crystals inside the frame work of Kane's matrix methodology that successively generates new two dimensional electron energy versus wave vector relation for both low and very large externally applied electric field of force respectively. Under many special conditions, the corresponding statistics and therefore the gate capacitance for the quantum MOSFETs, whose  $e-k$  equation ( $e$  is carrier energy and  $k$  is the 2D wave vector) are defined by various models of III–V semiconducting samples originally derived by Kane create special cases of our extended formalism. It's been found taking quantum MOSFETs of CdGeAs<sub>2</sub>, InAs, InSb, Hg<sub>1-x</sub>Cd<sub>x</sub>Te and In<sub>1-x</sub>Ga<sub>x</sub>As<sub>y</sub>P<sub>1-y</sub> lattice matched to InP that the gate capacitance at the electrical quantum limit will exhibit monotonic increasing function with changing field at the surface, the applied voltage at the gate for each of the compounds and therefore the actual results have one to one correspondence with the energy band constants showing an inclination of asymptotic results at comparatively large values of the independent variables for all the cases. The gradient rates for all curves change from one material to a different material. With decreasing alloy composition, the gate capacitance will increase for each of quantum confined MOSFETs made of various alloy compounds. For the aim of coherent presentation we've got conjointly planned the periodical Fermi energy at high field of force limits and gate voltage for few quantum confined MOSFETs.

*Advanced Science, Engineering and Medicine 11, 1161 (2019), Elsevier, Research Gate*

## THE DENSITY-OF-STATES FUNCTIONS IN QUANTUM DOTS

PK DAS ET. AL.,

### ABSTRACT

In this paper we study the Density-of-States Functions (DOS) in Quantum Dots (QDs) of  $n$ -GaP, IV–VI semiconductors,  $n$ -GaSb, Te,  $p$ -InSb,  $p$ -CuCl and stressed  $p$ -type materials respectively. The DOS functions for all the materials in this case are series of non-uniformly distributed Dirac's Delta functions at specified quantized points in the respective energy axis. The spacing between the consecutive Delta functions are functions of energy band constants and quantization of the wave vector space of a particular material. The crossing of the Fermi level by the size-quantized levels in QDs would have much greater impact on the redistribution of the carriers among the allowed levels, as compared to that found for 2D and 1D system respectively. The quantum signature of QDs on the electronic properties is rather prominent as compared to the same from 2D and 1D nano-structures. Finally it may be noted that it is the band structure which changes in a fundamental way and consequently all the physical properties of all the electronic materials changes radically leading to new physical concepts.

*Advanced Science, Engineering and Medicine 11 (10), 907 (2019), Elsevier, Research Gate*

## SCREENING LENGTH, TERAHERTZ FREQUENCY AND OPTO ELECTRONIC COMPOUNDS

P.K. DAS ET. AL, (2021)

### ABSTRACT

In this chapter we study the influences of size quantization, magnetic quantization, cross-fields configurations and inversion layers on the Screening Length (SL) in opto-electronic compounds. We note that the screening length oscillates with inverse quantizing magnetic field under magnetic quantization due to SdH effect, exhibits quantum jumps with nano-thickness under size quantization and changes with alloy composition, electron statistics and electric field in various manners for different types of opto-electronic compounds as considered here. All the results in the absence of terahertz frequency have further been plotted to exhibit the mathematical compatibility in this context.

*(IN LECTURE NOTES IN ELECTRICAL ENGINEERING), SPRINGER (SCOPUS)(IN THE PRESS)*

## ELECTRON ENERGY SPECTRA IN QUANTIZED STRUCTURES

P. K. Das and K. P. Ghatak

### ABSTRACT

In this chapter we study the Electron Energy Spectra (EES) in quantum wells (QWs) of heavily doped (HD) non-linear optical and III-V materials by formulating HDEES in each case respectively considering all the specialties of the energy band constants of the said compounds. It is noted that the complex EES in many cases in HDS, instead of real one, occurs from the existence of the essential poles in the corresponding EES in the absence of band tails. The EES in QWs is Quantized 2D closed surfaces. We have studied the density –of-states function and the electron effective mass exists in the band gap only due to the heavy doping which is otherwise impossible. Under certain limiting conditions all the results for all the models get simplified the well-known results of an isotropic parabolic energy bands which exhibit the mathematical compatibility of our present generalized analysis

*Topics In Current NanoScience, Editors: E. Meletis, C. Politis and W. Schommers, in the series "Foundations of Natural Science and Technology" of World Scientific, USA (2021) (IN THE PRESS)*



# THE ELASTIC CONSTANTS IN OPTO-ELECTRONIC MATERIALS UNDER TERAHERTZ FREQUENCY

P.K.DAS ET. AL, (2021)

## ABSTRACT

In this chapter we study the carrier contribution to the 2nd and 3rd order elastic constants ( $C_1$  and  $C_2$ ) in opto-electronic materials in terahertz frequency by taking the bulk of various opto- electronic compounds. The influence of magnetic quantization, 1D quantization and 2D quantization has also been studied in this context. It appears that both  $C_1$  and  $C_2$  changes with wave length, intensity, electron statistics, alloy composition and nano thickness in different ways for all the opto-electronic compounds as considered here and the influence of quantization of band state is also being apparent from all the figures.

(IN LECTURE NOTES IN ELECTRICAL ENGINEERING), SPRINGER (SCOPUS) (IN THE PRESS)

# INFLUENCE OF TERAHERTZ FREQUENCY ON THE ELASTIC CONSTANTS IN 2D SYSTEMS

P. K. DAS ET. AL. (2021)

## ABSTRACT

We investigate the influence of terahertz frequency on the elastic constants in extremelydegenerate (ED) 2D systems taking quantized films (QFs) and accumulation layers (ALs) of non- linear optical, tetragonal, ternary, quaternary, III-V, II-VI, IV-VI and strained compounds respectively. It has been found taking ED QFs and ALs of specific materials of the important 2D electronic compounds as examples that the elastic constants ( $C_1$  and  $C_2$ ) change with nano-size of the said QFs and the two dimensional carrier statistics per unit area in different oscillatory ways. The influence of electric field for both the limits in inversion layers of non-parabolic materials has also been studied. Besides,  $C_1$  and  $C_2$  are in nice agreement with our suggestive relationships for determining them experimentally.

(IN EMERGING TRENDS IN TERAHERTZ ENGINEERING AND SYSTEM TECHNOLOGIES, SPRINGER, p-59-106)

# THE CARRIER STATISTICS, TERAHERTZ FREQUENCY, EXTREMELY DEGENERATE OPTO-ELECTRONIC MATERIALS AND ALL THAT

P. K. DAS ET. AL. (2021)

## ABSTRACT

In this chapter we study the Carrier Statistics (CS) in quantized extremely degenerate III-V, ternary, quaternary and tetragonal compounds respectively. We have also investigated the influence of photo-excitation and electric field on the Fermi energy. We note by taking various types of opto-electronic materials as examples that the Fermi energy oscillates with inverse magnetic field due to SdH effect, changes with changing electric field, light intensity, wave length and alloy composition in different ways which are totally energy band constants dependent.

(IN EMERGING TRENDS IN TERAHERTZ ENGINEERING AND SYSTEM TECHNOLOGIES, SPRINGER,p- 107-140)

# THE DIFFUSIVITY MOBILITY RATIO IN QUANTUM WIRE SUPERLATTICES

P. K. DAS ET. AL.,

## ABSTRACT

The importance of superlattices of non-parabolic semiconductors is already well known in the field of Nano technology since its inception. We study the diffusivity mobility ratio (DMR) in quantum WirGaAs / Ga $1-x$ Al $x$  As, CdS / CdTe, PbTe / PbSnTe and HgTe / CdTe super-lattices with graded interfaces by formulating the appropriate electron statistics per unit length in each case. We also investigate the DMR in Quantum Wire Effective Mass Super-lattices of the said materials by deriving appropriate 1D Dispersion Relation. It appears that the DMR increases for both types of SLs as considered in this chapter with decreasing film thickness and increasing electron concentration per unit length respectively, although the numerical values are totally band structure dependent.

*Quantum Wires: An Overview, NOVA, USA (2020)*

# THE EINSTEIN'S PHOTOEMISSION FROM HEAVILY DOPED QUANTUM WIRES

P. K. DAS ET. AL.,

## ABSTRACT

In this chapter we will study the Einstein's Photoemission (EP) from Heavily Doped (HD) quantum wires (QWs) of non-linear optical, III-V, II-VI, Gallium Phosphide, Germanium, Platinum Antimonide, stressed, IV-VI, Lead Germanium Telluride, Tellurium, II-V, Zinc and Cadmium diphosphides and Bismuth Telluride respectively by formulating the respective expressions of EP in each case. The influence of quantum confinement is immediately apparent from figures (1), (4), (7), (10), (13), (16), (19), (22) and (25) since the EP depends strongly on the thickness of the quantum-confined materials in contrast with the corresponding bulk specimens. The EP decreases with increasing film thickness in an oscillatory way with different numerical magnitudes for HD QWs. It appears from the aforementioned figures that the EP exhibits spikes for particular values of film thickness which, in turn, depends on the particular band structure of the specific material. Moreover, the EP from HD QWs of different compounds can become several orders of magnitude larger than of bulk specimens of the same materials, which is also a direct signature of quantum confinement. This oscillatory dependence will be less and less prominent with increasing film thickness. From figures (3), (6), (9), (12), (15), (18),

(21) and (24) we conclude that the EP increases with increasing degeneracy and also exhibits spikes. For bulk specimens of the same material, the EP will be found to increase continuously with increasing electron degeneracy in a non-oscillatory manner. The figures (2), (5), (8), (11), (14), (17), (20) and (23) illustrate the dependence of the EP from quantum-confined materials on the normalized incident photon energy. The EP increases with increasing photon energy in a step like manner for all the figures. The appearance of the discrete jumps in all the figures is due to the redistribution of the electrons among the quantized energy levels when the size quantum number corresponding to the highest occupied level changes from one fixed value to the others. With varying electron degeneracy, a change is reflected in the EP through the redistribution of the electrons among the size-quantized levels. It may be noted that at the transition zone from one sub band to another, the height of the peaks between any two sub-bands decreases with the increasing in the degree of quantum confinement and is clearly shown in all the curves. It should be noted that although, the EP varies in various manners with all the variables as evident from all the figures, the rates of variations are totally band-structure dependent.

*Quantum Wires: An Overview, NOVA, USA (2020)*

# **COMPLEMENTARY DUAL-OUTPUT UNIVERSAL GATE IN QUANTUM DOT CELLULAR AUTOMATA**

**RATNACHAKRABARTY, N K MANDAL**

## **ABSTRACT**

Quantum dot Cellular Automata (QCA) is a very important nanotechnology which plays a pivotal role for the implementation of the circuits in the nano level. In QCA Majority AND and OR gates are used basically to implement the circuits in operation. In this paper a unique iGate is implemented which can operate in both AND and NAND operation.

*2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON) (Scopus Indexed)*

# **A NOVEL DESIGN OF FLIP-FLOP CIRCUITS USING QUANTUM DOT CELLULAR AUTOMATA (QCA)**

**RATNA CHAKRABARTY, DIPAK KUMAR MAHATO, ABHISEKH BANERJEE, SAYANTANI CHOUDHURI, MOUMITADEY, N. K. MANDAL**

## **ABSTRACT**

As the device dimension is shrinking day by day the conventional transistor based CMOS technology encounters serious hindrances due to the physical barriers of the technology such as ultra-thin gate oxides, short channel effects, leakage currents & excessive power dissipation at nano scale regimes. Quantum Dot Cellular Automata is an alternate challenging quantum phenomenon that provides a completely different computational platform to design digital logic circuits using quantum dots confined in the potential well to effectively process and transfer information at nano level as a competitor of traditional CMOS based technology. This paper has demonstrated the implementation of circuits like D,T and JK flip flops using a derived expression from SR flip-flop. The kink energy and energy dissipation has been calculated to determine the robustness of the designed flip-flops. The simulation results have been verified using QCA Designer simulation tool.

*2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC) (Scopus Indexed)*

# **DESIGN OF 2'S COMPLEMENT OF 4-BIT BINARY NUMBERS USING QUANTUM DOT CELLULAR AUTOMATA**

**RATNACHAKRABARTY, DIPAK KUMAR MAHATO, ABHISEKH BANERJEE, MOUMITADEY, N.K. MANDAL**

## **ABSTRACT**

Quantum Dot Cellular Automata is an emerging field in the domain of nanotechnology where circuits are designed in the nano level which are compatible to the circuits designed in traditional CMOS technology. Quantum Dot Cellular Automata gives a new dimension of ideas of designing basic gates in digital electronics with minimum hardware complexity. Transistor based CMOS designing faces many challenges due to the device dimension and leakage current but in QCA, quantum cells are in nano scale that contains quantum dots which help to transfer the information without any leakage current. This paper has demonstrated the design of 2's Complement of 4-bit binary numbers using layered and majority gate based Quantum Dot Cellular Automata. The calculation of kink energy has determined the stability of the circuit. The simulation results have been generated and verified using the QCA Designer tool.

*2018 2nd International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech) (Scopus Indexed)*

# **DESIGN OF BINARY TO GRAY CODE CONVERTER FOR ERROR CORRECTION IN COMMUNICATION SYSTEMS USING LAYERED QUANTUM DOT CELLULAR AUTOMATA**

**RATNACHAKRABARTY, DIPAK KUMAR MAHATO, ABHISEKH BANERJEE, N.K. MANDAL**

## **ABSTRACT**

Due to the expeditious growth of digital industry, the transistor based CMOS technology endures serious challenges due to the scaling of the device dimensions at nano scale. Quantum Dot Cellular Automata is an emerging domain in the province of nanotechnology that uses quantum dots to process and transfer information which works on the combined postulates of quantum mechanics and cellular automata to overcome the disputes of the transistor technology. This paper has demonstrated the use of Layered T gate for designing binary to gray code converter based on Quantum Dot Cellular Automata. The paper has also presented the application of binary to gray code converter for error corrections in communication systems. The proposed design is superior as compared to the existing designs in terms of cell count, area and latency. The layout has been generated and functionality of the design has been verified using the QCA Designer simulation tool.

*2018 2nd International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech)(Scopus Indexed)*

# **DESIGN OF MASTER SLAVE FLIP FLOP IN QUANTUM DOT CELLULAR AUTOMATA (QCA)**

**RATNACHAKRABARTY, N.K. MANDAL**

## **ABSTRACT**

Quantum Dot Cellular Automata or QCA is one of the promising quantum computational platforms in the field of nanotechnology to overcome the constraints of transistor based CMOS circuits. In this paper Master Slave flip-flop has been designed using SR flip-flop in the field of quantum dot cellular automata which is normally used in digital circuit to overcome the limitations of JK flip-flop i.e. the race-around conditions. According to design of the circuit, kink energy, complexities of the design have been calculated to find out the robustness of the circuit. The relation between the distances of two nearest quantum dots, temperature effect and the number of cells allowed in one clocking zone have also been derived in this work.

*4th International Conference on Electronics, Materials Engineering & Nano-Technology, IEEEconference, October, 2020 (Scopus Indexed)*

# **DESIGN OF A CONTROLLABLE ADDER-SUBTRACTOR CIRCUIT USING QUANTUM DOT CELLULAR AUTOMATA**

**RATNACHAKRABARTY, N.K. MANDAL**

## **ABSTRACT**

Quantum Dot Cellular Automata (QCA) is a new paradigm in Nanotechnology that has grown much interest in the past few years. As the digital circuit's dimension have been reducing at a fast pace, basic components of a CMOS based transistor less circuit size has to be decreased accordingly. But it leads to certain unavoidable problems. Here comes the benefit of QCA, as it can be used efficiently in far smaller chips. This paper proposed a new concept of Controllable Layered Adder and Subtractor circuit which is the basic building block of any arithmetic and logic design using QCA. The design specifies that without making any change the same circuit provides two different outputs by the application of different clock pulses to a particular cell. Proposed design idea is suitable for Adder and Subtractor designs where combine output is required in nano scale level. The design approach is applied in a two bit multiplier based ALU circuit as an application. Estimation of Kink Energy, effective area, Operation cost, Area Utilization Factor and latency has been done to the circuits.

*IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, p-ISSN:2320-3331, Volume 12, Issue 4 Ver. II (Jul. – Aug. 2017) (UGC recognized)*

# DESIGN AND SIMULATION OF A TRISTATE BUFFER CIRCUIT IN QUANTUM DOT CELLULAR AUTOMATA

RATNACHAKRABARTY, N.K. MANDAL

## ABSTRACT

Quantum dot Cellular Automata (QCA) is an emerging technology that offers a radical change in the design era at nano-level. QCA based design is advantageous over macro level for its extremely low power requirement, high packaging density and high speed of operation. QCA is a suitable replacement of semiconductor based transistor and CMOS technology. This paper proposes a new approach towards QCA based nanotechnology design with an input controlled Tri state buffer circuit of Fan out of three logic gates. The paper comprises the explanation about power dissipation of a QCA cell and energy calculations for the designed circuit. Robustness of the buffer circuit is verified by displacement of an important cell known as device cell. In majority voter device cell transfers the input information to the output. All the simulations and design has been done using QCA Designer tool.

*IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727, Volume 21, Issue 2, Ser. II (Mar - Apr 2019), PP 11-22 [www.iosrjournals.org](http://www.iosrjournals.org) (UGC recognized)*

# DESIGN OF CONVOLUTION ENCODER USING QUANTUM DOT CELLULAR AUTOMATA

RATNACHAKRABARTY, SHUVADIPSUTRADHAR, SAYANTI JANA, ARGHO DUTTA, NIRANJAN KUMAR MANDAL

## ABSTRACT

Convolution code is a channel coding technique for error free transmission. Convolution coding is executed by taking definite input bits, where the bits are stored in the fixed number of shift registers and the operations are equivalent to convolution of two bits with modulo 2 adders. In this encoding process, the messages are generated by sliding the Boolean functions to the input data stream. For generation of convolution code, the information or the message is passed through n bit linear finite state shift register. Quantum-dot cellular automata (QCA), having minute size, very fast switching speed is used for the design of convolution encoder circuit for quick response to the inputs. The QCA cell registers are utilised here by arranging themselves in linear fashion to get the convolution code of the input message bits stream.

*International Journal of Information and Coding Theory, 2020 Vol.5 No.3/4, pp.227 – 238*

# DESIGN OF ENCODER CIRCUIT USING LAYERED NAND AND NOR GATES IN QUANTUM DOT CELLULARAUTOMATA

RATNACHAKRABARTY, NIRANJAN KUMAR MANDAL

## ABSTRACT

Quantum dot cellular automata or QCA represents a new methodology of quantum computing with the potential for higher performance over existing devices. It adds necessary features such as enhanced speed, smaller size and lower power consumption in comparison to existing CMOS based technology. Based on this study the proposed paper designed three different kinds of encoder circuits using QCA technology. Following paper used layered 2-input NAND gate and NOR gates to design 4 to 2 encoder, priority encoder and octal to binary encoder circuits. The paper also showed the cell count, area, length, breadth & latency calculations for the designed encoder circuits. Proposed circuits are compared with the previously suggested designs in terms of area consumption and cell count. All the circuits designed without majority gate circuit. Potential energy for the designed circuits also calculated to check the stable output and reliability of the circuits.

*International Journal of Nanoscience and Nanotechnology (IJNN) Volume 17, Issue 1, March 2021 (Scopus Indexed)*

# **IMPACT OF DEMONETIZATION ON THE ECONOMIC PARAMETERS THAT AFFECT THE GROWTH OF NONPERFORMING ASSET OF INDIAN BANKS**

**SANJOY LAHA AND PROF. RABIN MAZUMDER**

## **ABSTRACT**

The demonetization decision by the government of India affected almost all service sectors of Indian economy, out of which the banking sectors were affected the most. Due to demonetization bulk amount of old currency notes of INR 500 and INR 1000 were deposited to banks; that not only increased the capital base of banks, but those un-used cash boosted the liability of loan disbursement. Again the reducing interest rates, providing account opening facility and issuing loan to the depositors by banks without judging their repayment ability resulted a chance of increasing number of defaulters and the value of nonperforming assets. Considering the scenario, the present research work tried to focus on the impact of demonetization towards the movement of nonperforming assets of Indian banks. A multivariate regression analysis was performed by considering income, expenditure and net profit ratio as internal and the percentage change of India's GDP, inflation and foreign exchange rate as external independent variables towards the net nonperforming assets changes of Indian public and private sector banks as dependent variable from financial year 2016-17 to 2018-19. Though the outcome of the study revealed that demonetization helped to reduce the nonperforming asset values in short run but in long run it would stimulate the growth of nonperforming assets.

# **WAITING TIME: THE EXPECTATIONS AND PREFERENCES OF PATIENTS IN A PAEDIATRIC OPD**

**SENGUPTA, M., CHAKRABARTI, S., & MUKHOPADHYAY, I**

## **ABSTRACT**

Quality healthcare and satisfaction are gradually emerging as important areas, which need much attention. The factors of patient satisfaction have been identified under varied conditions globally. In the Indian context, one key patient satisfaction factor has been attributed to waiting time. Long waiting time has been one of the major reasons of patient dissatisfaction and assumes significance when associated with paediatric events. The following study has successfully identified key attributes, which are associated with long waiting times within paediatric outpatient department (OPD) settings. The possible implications of the long waiting periods have been recorded through semi-structured interviews, and further in-depth analysis of individual factors were carried out to predict the probable outcomes.

The qualitative exploratory study design has helped to understand the perception of parents'/care givers (in case of neonates and toddlers) and adolescents, thereby successfully highlighting the need for further study in the patient satisfaction domain involving paediatric population. The various implications which the waiting time has on them have been taken into consideration. The inter-related themes have been identified after analyzing the interviews. These substantiate the fact that designing innovative mitigation strategies on proper and timely communication, updated technological know-how, improvising hospital protocols for better operational processes and coordination among the staff can go a long way in enhancing the patient/parent experience within OPD settings.

# **CONFLICT MANAGEMENT IN HEALTH CARE SECTOR: AN INDIAN SCENARIO**

**SENGUPTA, M., CHAKRABARTI, S., MUKHOPADHYAY, I**

## **ABSTRACT**

Aspects of conflicts have been found to be pervasive in nature. The interactions of different professionals and teams lead to differences in opinion. In health care settings, these differences might be pronounced due to a variety of stressful environmental factors resulting in conflict. In most health care settings, though a few aspects of conflicts resulted in positive outcomes, most of these conflicts have negative consequences. The dismissal of all possible conflicting scenarios from health care settings will be imprudent for the managers and administrators. It is thus imperative for the different health care stakeholders to identify the key issues which are precursors of conflict. This paper reviews the different conflict types which are normally found in the health care settings, determine and pinpoint the possible conflict antecedents, associated costs and the possible mitigation strategies which could be readily used in healthcare settings. It especially focuses on the Indian scenario and attempts to cover all these aspects from the Indian viewpoint so as to design innovative, cost effective conflict management approach in healthcare settings.

*International Journal of Education and Management Studies*, 8(1), 153-161 (2018)

# **CHALLENGES ENCOUNTERED BY HEALTHCARE PROVIDERS IN COVID-19 TIMES: AN EXPLORATORY STUDY**

**SENGUPTA, M., ROY, A., GANGULY, A., BAISHYA, K., CHAKRABARTI, S., MUKHOPADHYAY, I**

## **ABSTRACT**

Healthcare establishments are unique and complex. The Indian healthcare system comprises of public and private healthcare establishments. Different challenges are encountered by the healthcare professionals in their daily operations. The sudden emergence of COVID-19 posed a new threat to the already burdened healthcare system. The pandemic changed the healthcare paradox with newer workplace and societal challenges faced by the healthcare personnel. The purpose of this study is to identify the antecedents of workplace and societal challenges faced by the healthcare personnel.

Our study conducted in Kolkata and other adjoining areas of West Bengal included respondents who volunteered for individual in-depth interviews. The sample size was kept at  $n = 20$  after due technical considerations. Freelist and pile sorting was done to generate clusters.

The qualitative study identified five constructs with 18 items under workplace challenges and three constructs with five items under societal/community challenges. Workplace challenges included resource availability, adequacy and allocation, financial issues, perceived managerial ineffectiveness, inconsistent guidelines and perceived occupational stress, while societal/community challenges included dread disease, social adaptiveness and challenges related to essential services. A salience threshold was established and the multidimensional scaling provided four major clusters: financial support and sustainability, adaptive resilience, infection risk mitigation and healthcare facility preparedness.

Suggestive actions for the identified challenges were summed as enhanced production of diagnostic kits through public-private partnership models and industrial production reforms. Enhanced testing facility for COVID-19 will help to identify new cases. Financial stresses need long-term sustainable alternative that will avoid pay cuts and unemployment. Treatment regimen, diagnostic protocols, waste disposal guidelines should be worked upon and leading national agencies be consulted for technical support, research and development.

*Journal of Health Management*, 23(2), 339-356 (2021)

## **POLICIES, PRACTICES AND EXPENDITURE- A COMPARISON OF HEALTHCARE MODELS AND THEIR IMPACT IN DEVELOPING AND DEVELOPED ECONOMIES**

**SENGUPTA, M., ROY, A., CHAKRABARTI, S., MUKHOPADHYAY, I.**

### **ABSTRACT**

The various aspects of health and wellbeing in the global arena have been found to be closely intertwined to one another. Despite the different levels of progress which have been achieved by countries across the globe, there is still dearth of a single satisfactory global health policy or practice which will address most of the issues which concerns the global health care facility. It is thus clear that though health care is of global concern, yet the absence of a single multifaceted policy or protocol make things difficult for both developed and developing countries which at times, end up with unnecessary expenditures which only meet the short term requirements. The recent years have seen reformations in the health care sector of lower and middle income countries including China and India. While there have been alterations in the policies of high income countries like USA, yet there is still a significant gap which exists between the conventionally implemented policy and the all-round multi-disciplinary, independent and competent policy. Most of these reformations across the countries revolve around the social insurances schemes to be considered as the possible solution provider for every citizen including the economically deprived sections. The following paper attempts to address the aspects of health care in the following manner. The initial sections highlight the conventional health care practices and policies of the three representative countries of the world namely India, China and USA which belong to lower middle, upper middle and high income countries according to the recent World Bank classification. The average health care expenditure and corresponding practices of these countries are compared and researched in details. Finally, the possible avenues of conflicts in the health care regime is being discussed in relation to the conventional practices and suitable mitigation strategies are worked upon to establish a minimum healthcare benchmark for the standard of care which is the entitlement of every person belonging to the globalized borderless economy.

*4<sup>th</sup> Globsyn Management Conference-Research Seminar: Globsyn Business School, Kolkata (Best paper award - 20<sup>th</sup> Dec '19)*

## **SPECTRUM AND ANALYSIS OF VARIOUS SOCIO-CULTURAL THEMES LEADING TO NON-ADHERENCE OF ANTITUBERCULAR TREATMENT IN AN INDIAN CLINICAL SETUP**

**SENGUPTA, M., CHAKRABARTI, S., MUKHOPADHYAY, I.**

### **ABSTRACT**

Tuberculosis (TB) has been a major threat to the global society. The conventional drugs which are available have been able to treat the sensitive strains of the causative organism *Mycobacteria tuberculosis*. As far as the development in the field of medical sciences is concerned, the results are promising as TB can be successfully cured and its spread controlled if appropriate treatment regimen is followed. However, in spite of the developments made in the field of medicine, the TB menace is still prevalent and incident rates are significantly increasing every year. The scenario is profoundly grim when the Indian context is reviewed. Despite the availability of treatment in both the government and private facilities, the numbers of cases are significantly increasing posing a serious challenge for the government and healthcare professionals. Adherence and lack of compliance to the treatment regimen is a serious problem of this area. It is thus imperative to understand the possible socio-cultural causes of non-adherence in order to design and develop suitable interventional strategies. In an attempt to understand the lacunae between the available medical treatment and the ethical, cultural and social considerations of the common man, we conducted qualitative semi structured in depth interviews with a few patients and healthcare personnel. The key themes were identified and refined independently by two different researchers to avoid any kind of interview related bias. The themes identified were Negligence and priority, superstition and Non-scientific beliefs, Administering Multiple Medicine branches, Transportation and associated costs and Protection and privacy from associated stigma. These themes were further discussed and a few recommendations were made. They include enhancement of communications between the healthcare professional and the patients, training of the paramedical and allied staffs, mass awareness through circulation of online flyers, awareness amongst school and college goers regarding the disease and its effective medical intervention leading to successful monitoring of treatment in an effective manner.

*Sustainable development and value based perspective (SDVP-18): MDI Murshidabad (7<sup>th</sup> -8<sup>th</sup> September 2018)*



## **WHEN THE GOING GETS TOUGH, THE TOUGH GETS GOING –A STUDY ON HEALTHCARE, SOCIETAL AND FINANCIAL CHALLENGES FACED BY SURVIVORS OF COVID-19**

**SENGUPTA, M., ROY, A., CHAKRABARTI, S., MUKHOPADHYAY, I.**

### **ABSTRACT**

COVID-19, the eponymous event of the 21<sup>st</sup> century that changed the course of humanity produced a barrage of situations and problems previously unheard of and experienced. It covered social, economic, political, health and many other underlying spheres of human life. The survivors who overcame this great pandemic were witness to a myriad of problems and challenges in the dimensions of healthcare, finance and aspects of social life.

The main objective of this study was to assess the economical, societal and healthcare fallouts of the survivors. We recruited 40 participants and conducted semi-structured interviews. The inclusion criteria were adult patients (>18 years) who suffered COVID-19 infections and recovered successfully. We identified three main themes and eight subthemes. This is one of the pioneering studies that identified the aftermath and multidimensional impact of COVID-19 on the survivors.

*UEM MARCON 2020. (publication by Routledge, UK)*

## **HUMAN GRANULOCYTE PROTEINS CONSTITUTE THE MAJOR ANTIMYCOBACTERICIDAL PROTEINS AND ENHANCE THE KILLING OF MYCOBACTERIA WITHIN MACROPHAGES**

**SENGUPTA, M., PATI, R., MEHTA, R. K. SONAWANE, A.**

### **ABSTRACT**

The pathogenic bacteria have been found to reside within the macrophages wherein they are controlled by the later. However, the recent data has shown that human granulocytes play an important role in regulating innate immunity during tuberculosis as a result of the different granulocyte proteins they contain within them. In this study, we have isolated and identified a few proteins from human granulocytes and checked its efficacy against *M. smegmatis* and *M. bovis* BCG respectively. Using the gel overlay assay and the colony forming units (CFU) assay, we showed that out of the three identified proteins, i.e. hemoglobin, lactoferrin and lipocalin, lactoferrin has been found to be a potential antimycobactericidal molecule. These proteins were identified through MALDI-TOF mass spectrometry analysis. Extracellular addition of these proteins in different doses to the mouse macrophage RAW 264.7 and human monocyte cell line THP-1 showed significant reduction in intracellular mycobacterial survival without any significant cytotoxicity on the cell lines. An ESAT-6 family member protein Rv2346c of *Mycobacterium tuberculosis* has been cloned and expressed in a nonpathogenic host *M. smegmatis* which has more survival in mouse macrophages (RAW 264.7) and human monocyte macrophage (THP-1) by inducing host cell death upon infection and also upregulated production of nitric oxide (NO), reactive oxygen species (ROS), catalase and superoxide ions respectively. Macrophages treated with Lactoferrin significantly enhanced cell viability by reducing the percentage of apoptotic cells and reduced oxidative stress damage to host cells. These data demonstrate that human granulocyte proteins may play a very important role in mediating intracellular killing of mycobacteria within macrophages thereby inducing host cell viability.

*BIOSPECTRUM 2018 publication at Contemporary Medical Biotechnology Research for Human Health" by Elsevier*

# **CONFLICT DYNAMICS IN THE INDIAN HEALTHCARE: AN EXPLORATORY STUDY**

**SENGUPTA, M., ROY, A., CHAKRABARTI, S. MUKHOPADHYAY, I.**

## **ABSTRACT**

The phenomenon of conflict is largely complex and dysfunctional. In the Indian healthcare context, demands and expectations are manifold as a result of a large population of patients who are being catered by only a handful of healthcare professionals.

The purpose of this exploratory study is to understand the different factors of patient satisfaction which serve as primers for the healthcare conflict in the Indian scenario. The identification of the causes of dissatisfaction and understanding their relationship with healthcare conflicts will go a long way in conflict management.

*Conflict dynamics in the Indian Healthcare: An exploratory study, Health communication virtual research forum, Academy of communication in healthcare (ACH), USA. - (26th -27th June '2020)*

# **AN EFFICIENT DEEP LEARNING STRATEGY: ITS APPLICATION IN SCLERA SEGMENTATION**

**SUMANTA DAS, ISHITA DE GHOSH, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Neural networks require normalized inputs which are generally small floating point numbers. Convolution Neural Networks (CNNs) use filters that are applied to multiple layers of a color image. A technique is used in this paper to reduce the input size by converting three layers of a RGB-color image to a single matrix with floating point values at each cell. This conversion preserves the distribution of colors and inherently normalizes the input data for Deep Learning Framework such that the data is meaningful. Objective is to reduce the number of trainable parameters in a U-Net framework and increase its efficiency. The process is implemented and tested for segmentation of sclera regions from eye images using the SBVPI data-set. It shows considerable reduction in number of trainable parameters and better results in less computation time. Practically, the model executes four times faster by reducing the number of trainable parameters to one-sixteenth. It also shows increase in cross-validation F1-score to 0.939 for U-Net.

*Conference: 2020 IEEE Applied Signal Processing Conference (ASPCON), Kolkata, India Published in: IEEE, IEEE Xplore, DOI: 10.1109/ASPCON49795.2020.9276712*

# **IMAGE RETRIEVAL USING COLOR CORRELOGRAM BASED ON PERCEPTUAL COLOR CLUSTERING**

**ISHITA DE, SUMANTA DAS, PINTU GORAI**

## **ABSTRACT**

Image retrieval using color correlogram is common in literature. Reduced color space increases efficiency for calculating color correlogram. A color clustering algorithm called perceptual color clustering is proposed in this work. It maps RGB color space to a small number of distinct colour groups according to similarity of colors as perceived by human eye. An RGB is converted to gray-like image using this algorithm. Images in reduced color space are used for image retrieval experiments using color correlogram. Experimental results show that color correlogram with proposed clustering method performs better than color correlogram without clustering and color correlogram with K-means clustering algorithm.

*Conference: 2012, UGC National Symposium on Emerging Trends in Computer Science, ETCS, Barrackpore, India  
Published in: BRSNC, ISBN: 978-81-921808-2-3*

# DEEP AGE ESTIMATION USING SCLERA IMAGES IN MULTIPLE ENVIRONMENTS

SUMANTA DAS, ISHITA DE GHOSH, ABIR CHATTOPADHYAY

## ABSTRACT

Human age estimation from images using machine learning techniques is a challenging task. Due to physical aging process, color and texture of sclera, a protective outer layer present in human eye, get changed. In this work, we present an exploratory study to find the effectiveness of using sclera region of eye images for age estimation. It employs a modified form of deep neural network model VGG-16. The model is trained and tested by SBVPI dataset, in which the images are acquired with high-end cameras. The model is also tested using images acquired by a mobile camera fitted with a macro lens. The work gives the best mean-absolute-error of 0.06 and the encouraging results lead us to conclude that sclera images can be used as an effective modality for human age estimation. It is a pioneering work in the sense that the idea of using sclera for the purpose has not been explored before.

2021, ICCET (International Conference on Computing in Engineering & Technology), DBATU, Lonere, Maharashtra.

Published in: "Advances in SPRINGER Intelligent Systems and Computing (AISC)", Springer, Singapore, and DOI: 10.1007/978-981-16-2008-9\_9

# SSBC 2020: SCLERA SEGMENTATION BENCHMARKING COMPETITION IN THE MOBILE ENVIRONMENT

MATEJ VITEK, ABHIJIT DAS, Y. POURCENOUX, A. MISSLER, C. PAUMIER, SUMANTA DAS, ISHITA DE GHOSH, ET AL.

## ABSTRACT

The paper presents a summary of the 2020 Sclera Segmentation Benchmarking Competition (SSBC), the 7th in the series of group benchmarking efforts centered around the problem of sclera segmentation. Different from previous editions, the goal of SSBC 2020 was to evaluate the performance of sclera-segmentation models on images captured with mobile devices. The competition was used as a platform to assess the sensitivity of existing models to i) differences in mobile devices used for image capture and ii) changes in the ambient acquisition conditions. 26 research groups registered for SSBC 2020, out of which 13 took part in the final round and submitted a total of 16 segmentation models for scoring. These included a wide variety of deep-learning solutions as well as one approach based on standard image processing techniques. Experiments were conducted with three recent datasets. Most of the segmentation models achieved relatively consistent performance across images captured with different mobile devices (with slight differences across devices), but struggled most with low-quality images captured in challenging ambient conditions, i.e., in an indoor environment and with poor lighting.

Conference: 2020 IEEE International Joint Conference on Biometrics (IJCB), Houston, TX, USA Published in: IEEE, IEEE Xplore, DOI: 10.1109/IJCB48548.2020.9304881

# **AN EFFICIENT DEEP SCLERA RECOGNITION FRAMEWORK WITH NOVEL SCLERA SEGMENTATION, VESSELEXTRACTION AND GAZE DETECTION**

**SUMANTA DAS, ISHITA DE GHOSH, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Sclera recognition is a promising ocular biometric modality because of contact-less, gaze- independent image acquisition in visible light. Moreover, it is unaffected even if the subjects are wearing contact lenses in eyes. However, it is a difficult task because several steps are required, each of which must be performed accurately and efficiently. In this work, sclera recognition is performed in the following steps, namely, segmentation of sclera region, extraction of sclera vasculature pattern, detection of gaze direction and finally comparison of two vasculature patterns for matching and recognition. The proposed segmentation model DSeg is based on well-known deep learning model UNet and reduces model complexity by creating a Knowledge Base of sclera and non-sclera colors. DSeg is a lightweight and environment-friendly model, which outperforms UNet in terms of speed, efficiency and accuracy. Two rule-based unsupervised vessel extraction methods require prior sclera segmentation and exhibit competing recognition performance to a supervised deep model for vessel extraction, which does not require prior sclera segmentation. A novel deep recognition model is proposed which compares two vessel structures taking into account their affine- transformation, and produces a single Boolean output to decide whether the structures match or not. The model does not require post logic in the matching process. The model is further improved to detect errors in prediction. We achieve best recognition rates with low false- acceptance-rates for two sets of training and validation, using the publicly available dataset SBVPI and the best achieved AUC score is 0.98.

*Journal Publisher: 2021, Published in Signal Processing: Image Communication, Elsevier, DOI: 10.1016/j.image.2021.116349*

*Journal Metrics: Cite Score 6.3, Impact factor: 3.256. Indexed in SCI, SCIE, Scopus since 1989*

# **SCLERA IMAGES AS A NEW MODALITY FOR DEEP HUMAN AGE ESTIMATION**

**SUMANTA DAS, ISHITA DE GHOSH, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Ageing has a significant effect on the sclera region of human eye. In this paper, we explore sclera images as a modality for automated estimation of human age. At first we give a brief review on state-of-the-art work on human age estimation using images. After that we propose three different age estimation techniques employing deep learning models. The objectives are estimation of exact-age of a subject, classification of subjects into different age-groups, and prediction of non-adult or underage subjects. Extensive experiments are done and results on two datasets are presented, a mobile dataset in unrestricted environment MASDUM, and a high-quality dataset in restricted environment SBVPI. We achieve best results with mean- absolute-error of 0.05 for exact-age estimation, accuracy of 0.92 for age-group classification, and accuracy of 0.89 and 0.87 for prediction of non-adult subjects below 18 and 21 years of age respectively. Ageing has a significant effect on the sclera region of human eye. In this paper, we explore sclera images as a modality for automated estimation of human age. At first we give a brief review on state-of-the-art work on human age estimation using images. After that we propose three different age estimation techniques employing deep learning models. The objectives are estimation of exact-age of a subject, classification of subjects into different age- groups, and prediction of non-adult or underage subjects. Extensive experiments are done and results on two datasets are presented, a mobile dataset in unrestricted environment MASDUM, and a high-quality dataset in restricted environment SBVPI. We achieve best results with mean- absolute-error of 0.05 for exact-age estimation, accuracy of 0.92 for age-group classification, and accuracy of 0.89 and 0.87 for prediction of non-adult subjects below 18 and 21 years of age respectively.

*Journal Publisher: 2021, Communicated to Digital Signal Processing, Elsevier.*

*Journal Metrics: Cite score 6.3, Impact factor 3.381. Indexed in SCI, SCIE, Scopus since 1991*

# **A NOVEL SCLERA DATASET, ENHANCED SCLERA SEGMENTATION AND PERFORMANCE EVALUATION OF SCLERA BIOMETRIC FRAMEWORK WITH CROSS-DATASET EXAMINATION**

**SUMANTA DAS, ISHITA DE GHOSH, ABIR CHATTOPADHYAY**

## **ABSTRACT**

Ocular bio-metrics remained dominated on iris modality for years. Iris datasets contain eye images in front gaze mostly acquired with near infrared light component. Sclera images are easily acquired in visible spectrum. Off angle eye gaze shows prominent sclera vasculature which are more significant for the modality. The modality is already explored with datasets in constrained environment, but its application to unrestricted mobile use remains a challenge due to lack of suitable datasets. Our contribution is a novel multi-angle sclera dataset prepared using multiple mobile cameras fitted with macro lens under indoor and outdoor lighting conditions with manual markup for sclera and vasculature for effective training and evaluation. Multiple available sclera datasets are tested on an enhanced sclera segmentation model (UnetRGB) with better results than state-of-the-art. Sclera recognition model (DeepR) is also tested with the datasets to report much better results. The work also attempts to test generality of trained models by cross-dataset examination on high-quality and mobile datasets. Our results prove immense capability of the sclera recognition framework to generalize in multiple environments.

*Journal Publisher: 2021, To be communicated within 15<sup>th</sup> august 2021, to Signal Processing:Image Communication, Elsevier  
Journal Metrics: Cite Score 6.3, Impact factor: 3.256. Indexed in SCI, SCIE, Scopus since 1989*

# **IN-DETAIL ANALYSIS ON CUSTOM TEACHING AND LEARNING FRAMEWORK**

**SUBHABRATA SENGUPTA, ANISH BANERJEE, SATYAJIT CHAKRABARTI**

## **ABSTRACT**

In the field of Information recovery, the primary goal is to discover importance just as the most significant data as for certain inquiries. In any case, the primary issue with respect to recovery has consistently been that the pursuit region is tremendous to such an extent that it has gotten hard to recover relevant data productively. It has been seen that the conventional ontological authoritative data causes superfluous additional CPU cost, while the client inquiries, for the most part, focus on a particular space. What's more, another difficult issue in such manner is the key expression extraction from the question which has likewise a significant job for pinpointing looking to a particular recovery space. By centering, these restrictions and difficulties, we have focused on our data recovery framework, especially towards assessment question recovery so as to take into account the interest of different assessment-related inquiries. The inquiry data has been composed according to the ontological relationship among different classes and a characteristic language parser will be utilized during key-phrase extraction for proficient recovery of inquiries most ideally requested as for the level of importance to the questions. Open learning analytics (OLA) is a moderately new part of learning analytics (LA) which rose because of the developing interest for self-sorted out, organized, and long-lasting learning opportunities. In this paper, we present the goal - question - indicator (GQI) approach for PLA and give the applied, structure, usage and assessment subtleties of the pointer motor segment of the open learning analytics platform (OpenLAP) that draws in end- clients in the pointer age process by supporting them in defining objectives, offering conversation starters, and self-characterizing pointers.

*International Journal of Computer Applications*

# **PREDICTION OF FUTURE CAREER PATH USING DIFFERENT MACHINE LEARNING MODELS**

**SUBHABRATA SENGUPTA, ANISH BANERJEE, SATYAJIT CHAKRABARTI**

## **ABSTRACT**

The main purpose of this paper is to examine the strength and weaknesses of student based on their performance in different exams. Students are classified using the K Means classification algorithm and decision tree. The proposed model will help teachers to comprehend their students well and will also assist the students to get their most serviceable job. The data mining technique is capable of analyzing relevant results is used over the students' information to produce relevant correlations and produce different aspects to understand more about the students. The paper proposes a model based on classification approach in finding an enhanced evaluation method for students and predict the placement prospects.

*IEMIS 2020: 2<sup>nd</sup> International Conference on Emerging Technologies in Data Mining and Information Security*

# **RELEVANT INFLUENCE OF SEMANTIC WEB FRAMEWORK ON SMART E-LEARNING ENVIRONMENT**

**SUBHABRATA SENGUPTA, ANISH BANERJEE, SATYAJIT CHAKRABARTI**

## **ABSTRACT**

E-Learning systems have unbound prospects to deliver unmatched effective learning services and feedback assistance than what it is presently offering through mediums like online tutoring, or other electronic educational management services. Different stages and application potentials of Semantic Web technology and its architecture can be applied at different sectors and phases of the E-Learning framework to amplify the quality and versatility of services. Features of Semantic Web have been explored in the sectors with respect to instructors to plan, analyze and execute their tasks and also in making a sustainable system that interprets the structure of distributed, self-organized, and self-instructed online learning to monitor its influence on performance. The main objective of this work is to study how electronic and online learning frameworks can be improved and enhanced by the influence of semantic web technologies in understanding and simplifying concept clarification and description, reusable learning objects (LOs), and benefits of the applying ontology in describing the learning materials for a better and more efficient learning system.

*International Journal of Emerging Technologies in Learning*

# **EDUCATIONAL DATA MINING AND STUDENTS' ACADEMIC PERFORMANCE PREDICTION**

**SUBHABRATA SENGUPTA, ANISH BANERJEE, SATYAJIT CHAKRABARTI**

## **ABSTRACT**

The progress of a country strongly depends on the education system of the country. There is a drastic change in the education system across the whole world. Data mining methods and techniques plays an important role in the today's world and it is used for decision making in education system to make decisions related to the students' academic status. Presently dropping of students has increased with the higher education. This situation is directly related with the fame of the institute. Various students' information is being maintained with different values. As data insertion and retrieval processes are going on with this existing system, there are no scopes of intelligence related with the various existing system models. Data mining is used for sorting the educational problem by analyzing the students' performance using the techniques like Linear Regression, Logistic Regression, and Artificial Neural Network. In this research, the paper mainly focused in Random Forest algorithm to measure the performance of the students. Educational Data Mining (EDM) is used to obtain the new style to discover various intelligent paths to predict different semantic knowledge.

*International Conference on Computational Intelligence, Data Science and Cloud Computing*

# **NEW PV METROLOGY FOR PERFORMANCE APPRAISAL OF POLY SILICON PV MODULES IN EASTERN INDIAN CLIMATIC ZONE**

**DEBASHIS MAJUMDAR ,DR. SUDIPTA BASU PAL AND DR. RAJIV GANGULY**

## **ABSTRACT**

An appropriate number of series-connected supercapacitors (SC) forming an SC bank has been used for the first time as the load to PV generators in course of their electrical characterization. Exhaustive estimates of standard PV parameters along with figures of merits like Fill-factor (FF) and performance ratio (PR) have yielded consistent results under naturally varying levels of insolation and ambient temperature prevalent in West Bengal of India. Regression analysis of selected PV parameters has indicated values above 0.997 for poly-Si PV modules which currently constitute the only essential building blocks for PV arrays in the Indian subcontinent. Work is in progress for the adoption of this simple, user-friendly, and easily scalable I-V plotter in PV Indian industries and field trials.

*Renewable Energy and Power Quality Journal (RE&PQJ), ISSN 2172-038 X, Volume No.19, September 2021. (Scopus Indexed Journal)*

# **COMPARATIVE RELIABILITY ANALYSIS OF PV MODULES UNDER TROPICAL CONDITIONS**

**D. MAJUMDAR, S. B. PAL AND R. GANGULY**

## **ABSTRACT**

Reliability estimation of photovoltaic (PV) modules is an essential aspect of selecting the technology of PV modules by PV manufacturers. The authors of this paper use a few figures of merit (FOM) to perform the "Reliability Analysis" of PV modules. The FOM of PV modules of various wattages and produced by different technologies are measured. The authors have done all the experiments in open roof-top atmosphere conditions at different insulations and temperatures.

*2021 Innovations in Energy Management and Renewable Resources (52042), Kolkata, India, 2021, pp. 1-5, doi 10.1109/IEMRE52042.2021.9386742.*

# **A COMPARATIVE STUDY BASED ON LONG SHORT-TERM MEMORY NETWORKS FOR ASSESSING PHOTOVOLTAIC POWER**

**D. MAJUMDAR, M.BHATTACHARJEE, S. B. PAL, S.CHATTERJEE AND R. GANGULY**

## **ABSTRACT**

Among the various types of renewable energy sources (RES), the photovoltaic (PV) generators play a very significant role in the production of electrical power, as the technology of these generators has been well perceived for a long period. These generators have been trusted to be environment-friendly. In this paper, mainly photovoltaic (PV) system- generated power has been designed and installed for energy production. This paper aims to present a solar power predictive analysis using deep neural networks (DNNs). A variant of recurrent neural network (RNN), namely long short-term memory (LSTM), has been used to model a photovoltaic (PV) grid- connected array output and approximate the generated power. A new algorithm is proposed for assessing the PV power for different array setups. An extensive comparative study using the DNN techniques is performed for evaluating different types of grid-connected array setups. This study is beneficial for the reader and useful for engineers and researchers interested in DNNs applied to solar photovoltaic systems data generation.

*Advances in Intelligent Systems, Computing, Vol. 1349, COMPUTATIONAL INTELLIGENCE IN PATTERN RECOGNITION, 978-981-16-2542-8, 510900\_1\_En (11), 2021.*

# **VIRTUAL ASSISTANT BASED EMOTION RECOGNITION SYSTEM**

**SUDIPTO KUMAR MONDOL, DEBDEEP CHAKRAVARTI, DIBYAROOP BOSE, SANJIB BHATTACHARYA, SOURISH DUTTA, PRATIK DEY**

## **ABSTRACT**

Emotions are universal and extend beyond boundaries of language, literature, religion, age, etc. Communicating with people is not just about transmitting information or a message but also expressing your emotions. Emotional state of a person can be recognized by speech, text and facial expression. In this project, the main objective is: Given any speech input such as a word/phrase/sentence/audio/facial expression, the machine should be able to give a percentage of various emotions that constitute the input. In this project, various complex algorithms and techniques have been utilized to implement emotion detection based on text, speech and facial data. Facial expression recognition is the part of facial recognition which is gaining more importance and need for it increases tremendously. Though there are methods to identify expressions using machine learning and Artificial Intelligence techniques, this work attempts to use deep learning and image classification methods to recognize expressions and classify the expressions according to the images. Various datasets are investigated and explored for training expression recognition models; these are explained in this paper. Inception Net is used for expression recognition with Kaggle (Facial Expression Recognition Challenge) and Karolinska Directed Emotional Faces datasets. Final accuracy of this expression recognition model using Inception Net v3 Model is 35%.

*UEMCOS – 2020*



## **REVIEW & COMPARISON OF FACE DETECTION TECHNIQUES**

**SUDIPTO KUMAR MONDAL AND PROF DR.INDRANEEL MUKHOPADHYAY AND SUPREME DUTTA**

### **ABSTRACT**

Automatic object detection is a common phenomena today. To detect an object first thing is captured, is the image of the object. Now in an image categorically different types of objects are possible. Here we are considering human face as a most common object. Day by day the number of application based on face detection are increasing. So the demand of highly accurate and efficient face detection algorithm is on the high. In this paper, our motive is to study different types of face detection techniques and compare them. Various face detection techniques like using Haar-like cascade classifier, Local Binary Pattern cascade classifier, Support Vector Machine-Based face detection methods are compared here. All these techniques are compared based on time, accuracy, low light effect, people with black face and with false object and based on memory requirement.

*E-HACON – 2019*

## **REAL-TIME OBJECT DETECTION COMPARATIVE STUDY**

**SUDIPTO KUMAR MONDAL, SANHITA DEY, SOUMYAJIT DEY**

### **ABSTRACT**

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos. In this domain of object detection, it includes many detecting methods, such as face detection and also pedestrian detection. Object detection has applications in huge areas of computer vision, which includes image retrieval, video surveillance. Deep Neural methods in object detection using one-stage processes generally include different versions of YOLO and SSD. The paper which we are publishing here we are comparing some of the image detection algorithms. In this project we are going to develop a system for visually impaired people for assisting them in their daily work and give them a freelifelife.

*UEM GREEN – 2021*

## **MOBILE APPLICATION BASED MODIFIED SCREENING AND ASSESSMENT TOOLS FOR CHILDREN WITH AUTISM**

**Arpita Mazumdar, Biswajoy Chatterjee, Mallika Banerjee, Irfan Bhati**

### **ABSTRACT**

The researchers have focused on mobile application of screening tool to profile a child according to the degree of autism as per Indian Scale for Assessment of Autism (ISAA) with some modification. The work also emphasizes on practical implementation of various educational assessment tools viz. Indian Portage guide, BASIC-MR (Behavioral Assessment Scales for Indian Children with Mental Retardation) Part A, (FACP) Functional Assessment Checklist for Programming to assess children with autism in form of mobile application. The aim of this study is to enhance easiness, to improve accuracy, to monitor the child's progress and to make the whole process a time efficient one.

*International Journal of Interactive Mobile Technologies (iJIM) Vol 13, No. 8 (Aug 2019). Indexed in SCOPUS*

# MOBILE APPLICATION BASED EARLY EDUCATIONAL INTERVENTION FOR CHILDREN WITH AUTISM - A PILOT TRIAL

ARPITA MAZUMDAR, MALLIKA BANERJEE, BISWAJOY CHATTERJEE, SAYAN SAHA AND GAURI SHANKAR GUPTA

## ABSTRACT

**Purpose:** To design and development of a mobile application for pre-school readiness of children with autism and also to identify their learning pattern.

**Methodology:** Based on strong foundation of functional academics, we have developed a mobile application for providing an early educational intervention program to the children with autism. Three successive software trials have been conducted among 31 children with autism of age group of three to 10 years. The mobile app has been provided to educators and parents and they have been allowed to supervise the children during their learning phase for eight to 10 weeks. The imprint of learning pattern is recorded and learning progress profile is generated for individual child. Results: Data analysis of learning progress profile shows that 90% of the participants preferred drag and drop or simple touch approach over conventional methods practiced during classroom teachings. More than 84% of the children are found to adapt pre-requisite skills for writing like scribbling, tracing, dots joining, copying, etc. after using the app on their tablet who are reluctant to hold pencil and paper otherwise. Twenty-five percent of the participants are reported to reciprocate the greeting etiquettes in class such as greeting teachers and their peers.

**Conclusions:** The mobile application made a valuable contribution to early intervention program for children with autism by imparting appropriate learning opportunities readily available to them. Performance metrics underlying each activity form a strong base of identification of learning patterns and formulation of revised individualized education plan (IEP).

*DISABILITY AND REHABILITATION: ASSISTIVE TECHNOLOGY*

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*<https://doi.org/10.1080/17483107.2021.1927208>*

# BANK EMPLOYEES PERCEPTION ON TECHNOLOGY ADOPTION IN BANKS: AN EMPIRICAL STUDY ON TWO MAJOR PRIVATE BANKS

AJAY KUMAR GANGULY

## ABSTRACT

With the recent advancement and adoption of state of the art mobile and internet technologies in different banks, the financial sector specially banking industry has undergone massive changes all over the world. The technological waves are reshaping the total banking landscape and the environment of the banking sector has gradually become highly aggressive today in Indian context also. The present research paper mainly focuses on the employees' [of the banking industry] perception towards the adoption of new internet and mobile technologies in banks. The paper is mainly designed to evaluate the awareness level of the technologies offered by the banking sector and overall perception of employees on these technological offerings. The paper also tries to exhibit the employees' perception on technological adoption in the banking sector. A well-structured questionnaire has been designed and an extensive survey was undertaken among 100 employees of ICICI Bank & Axis Bank of North 24 Parganas District of West Bengal. Some useful, relevant descriptive statistics are used in this study. On the basis of this study, it is found that, almost all the employees, of these two Private Banks, found the overall performance of tech-banking as satisfactory.

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*Multidisciplinary*

*Peer Reviewed Refereed Quarterly Journal]*

*ISSN : 2581-9925, Impact Factor: 6.340, Volume 03, No. 01, January - March, 2021, pp.139-145 IJEMASSS is Indexed and Included in: COSMOS Foundation & Electronic Journal Library EZB, Germany; International Scientific Indexing (ISI) || General Impact Factor (GIF)*

# **THE STUDY OF SALES PERSONNEL'S' APPRAISAL METHODS AND THEIR EFFECTIVENESS IN PRESENT TECHNOLOGICALLY VIABLE ENVIRONMENT OF ICICI BANK LTD**

**AJAY KUMAR GANGULY, Dr. SUBRATA CHATTOPADHYAY**

## **ABSTRACT**

**Introduction:** Performance evaluation quantifies the subjective and quantitative parts of occupation execution. In the presence of a carefully structured system of appraisal, people will tend to judge the work-performance of others, including subordinates, naturally, informally and arbitrarily.

**Purpose:** This study provide appraisal feedback of employees and thereby serve as vehicles for personal and career development and allow the management to take effective decision against drawbacks for the well-being of the employee's [especially sales personnel] development. The main aim of the study is to find out the effectiveness of performance appraisals' tools and techniques & development programme conducted at technologically viable ICICI Bank Ltd. and not only that there is an effort to identify the influence of the effectiveness of the appraisal tools on the satisfaction level of the employees [especially sales personnel] of the ICICI Bank LTD.

**Methodology:** In this study, we were adopting convenience sampling and data were collected from 100 employees of ICICI Bank through structured questionnaire. Here we were using different statistical tools are used like spearman's Correlation and Anova. It was found that, the awareness level of employees regarding the tools used in performance appraisal methods should be increased so that employees are getting concerned about their assignments.

**Findings:** Result indicates a positive correlation between the promotion is purely based on appraisal and the rating helps to fix increment and also the organization provide additional benefit for the development of working conditions and also found out that there is no significant relationship between the effectiveness of appraisal & development programme and satisfaction.

*Published in IEM Journal*

# **EFFECT OF SOCIAL MEDIA INFLUENCERS ON PURCHASE INTENTION IN SHOPPING OF ELECTRONIC GOODS**

**UMAMA NASRIN HAQUE, RABIN MAZUMDER**

## **ABSTRACT**

Social media and the internet play an important role in assisting consumers to get the particular items they are looking for. Social media influencers have emerged as a dynamic third party endorser. Social media influencers are regularly in touch with their followers by constantly updating them about the latest information. With platforms like Facebook, Twitter, Instagram and YouTube, social media influencers are strategically used to promote about the product or services to their online followers. This study is intended to explore the effectiveness of social media influencers with a focus on source credibility, source attractiveness and meaningful transfer. The main aim of this study is to examine the effect of social media influencers on purchase intention with a focus on shopping of electronic goods. The research study is based on Primary data which is collected through questionnaire. Suitable questionnaire was used based on the objectives of the study. The items of the independent and dependent variables were measured based on five point Likert Scale ranging from strongly disagree, disagree, neutral and agree to strongly agree. The measurement of the relationship of the study was subjected to rigorous data processing and analysis using relevant computer software tools. Descriptive as well as Inferential Statistics were used. Structured Equation Modelling (SEM) was conducted on the data in order to understand a set of relationship between one or more independent variables and between one or more dependent variables. All hypotheses are found to be supportive. Mediating effect of customer attitude is also observed. Results in this study suggests that respondents who have a favorable attitude towards social media influencers will generally have the motive to purchase the influencer's endorsed product. From a managerial implication perspective, this study offers marketers several practical opinions in selecting the particular social media influencer in order to gain competitive advantage in the industry. Hence, marketers should select the appropriate social media influencer in order to increase purchase intention of the consumers.

*International Journal of Psychosocial Rehabilitation*

# **A STUDY ON RELATIONSHIP BETWEEN CUSTOMER LOYALTY AND CUSTOMER TRUST IN ONLINE SHOPPING**

**UMAMA NASRIN HAQUE, RABIN MAZUMDER**

## **ABSTRACT**

In the recent time, the online market environment is quite competitive and the organizations have to make sure to focus on continuously meeting the current and also the potential needs of the customers. The number of consumer buying online, and doing transaction online is increasing and the amount being spent by online buyers has been on the rise. If the customers have trust in the brand, they are more likely to be loyal towards that particular brand. Customer loyalty is primarily achieved by satisfying customer's expectations. In online shopping, since the products are intangible, it is important to build trust among the customers. Organizations need to understand thoroughly the consumer behavior and consumer needs in order to create and implement effective customer retention strategies. This study attempts to study the relationship between customer loyalty and customer trust in online shopping since trust is the glue that holds the customer relationship together in the current competitive market. Data are collected through the structured questionnaire. The results of this study legitimate the idea that trust of the customer acts as a mediating factor which enhances the loyalty of the customer in regards to the further purchase and consumption of the particular product or service. The implications of the study will help in the managerial perspectives and also research perspectives.

*International Journal of Online Marketing*

# **POSITIONING OF PRIVATE LABEL BRANDS OF MEN'S APPAREL AGAINST NATIONAL BRANDS**

**PRITHA GHOSH, SUBRATA SAHA, SHAMINDRA NATH SANYAL & SWATI MUKHERJEE**

## **ABSTRACT**

The article argues that apart from price competition with other underlying factors differentiate the customers' perception of the national brand (NB) and private label brand (PLB). The data collected across various brands indicate that respondents prefer NBs for their reputation, stock adequacy, and sizes over PLBs' price benefits. Rough set theory, analysis shows that the maximum one-to-one correspondence exists between the brand's reputation, the fabric quality, and the information quality for a product with each brand, irrespective of the brand type. The C4.5 decision tree analysis and multilayer perceptron theory show that the reputation and quality of the fabric are also accountable for selecting PLB over NB, besides price. The choice of colors is the conspicuous attribute of a PLB choice, followed by ease of availability in online stores. The study demonstrates that retailers should focus more on brand image and brand repositioning than keeping price gaps to satisfy young customers.

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# **A MOBILE USER AUTHENTICATION TECHNIQUE IN GLOBAL MOBILITY NETWORK**

**SUDIP KUMAR PALIT, MOHUYACHAKRABORTY**

## **ABSTRACT**

Anonymous user authentication always is a paramount job in global mobility network (GLOMONET). In GLOMONET, a mobile user can move from one place to another place causes changes of mobile network from one to another. As authentication server can authenticate only its registered users, it cannot verify other mobile users. Furthermore, in global mobility network, communication channel is public. An adversary of the network can get access of all transmitted messages over the channel. In such a situation, several network security attacks can be initiated by an adversary to decrypt the messages. Therefore, mobile users as well as network provider's information may come in risk. A robust anonymous user authentication and key agreement technique required to ensure the protection of such information. Several authentication protocols have been designed in GLOMONET in recent years. Unfortunately, most of them are unprotected against various network security attacks. Therefore, in this paper, we proposed a rigid authentication protocol in GLOMONET to overcome all the deficiencies of the previous work. Performance analysis of our protocol shows that it is reliable and even more effective compared to other existing protocols.

# **A SURVEY ON COMPARISON ANALYSIS BETWEEN EEG SIGNAL AND MRI FOR BRAIN STROKE DETECTION**

**SNEHASIS BHATTACHARJEE**

## **ABSTRACT**

Encephalogram (EEG) provides the recordings of the brain and is used for detecting the brain diseases. In this paper, a detailed study has been carried out for a few applications in detecting brain diseases by EEG and MRI. In addition, a detail comparison study is made between EEG and MRI. This paper has been arranged in two phases out of which, in the first phase, a detailed study has been carried out for EEG processing. The next phase consists of a comparison study of the detection of brain diseases by both EEG and MRI.

*Proceedings of IEMIS 2018, Volume 3, January 2019, DOI:10.1007/978-981-13-1501-5\_32*

# **ONLINE GROCERY SHOPPING!! NEW FUTURE IN INDIA? FACTORS INFLUENCING THE BUYING BEHAVIOR OF THE CUSTOMERS SHOPPING ONLINE**

**PRITHA DAS, DR. UDIT CHAWLA, DR. SUBRATA CHATTOPADHYAY**

## **ABSTRACT**

Happy customer effectuates happy retailers and fruitful business. From last few decades online grocery shopping has relished robust development and hence have become one of the most interesting topics to be explored by the researchers. After the entire world is undergoing the great misery being caused by deadly COVID-19 pandemic, people are involuntarily compelled to stay back at their home, which made online shopping of groceries and business of such retailers touch new heights. Traditional shopping differs from general online shopping as well with respect to its nature of variability and perish ability as compared to other products. With rising attention, on the part of the researchers and leaping momentum of online grocery shopping, retailers and producers are required to understand the needs, perceptions and perceptions of their customers towards it to satisfy them to fullest and improve their business. From the study seven different factors have been found to be affecting the buying behavior of the customers shopping groceries online, these are, 'Entertainment', 'Location and Quantity Constraint', 'Product Performance And Psycho Social Risk', 'Technology Driven', 'Financial Risk', 'Pandemic Arisen Factors' and 'Ease of Shopping'. It has been found out that factor 'Pandemic Arisen Factors' and 'Technology Driven' significantly impacts on consumers purchasing online.

# ASPECT BASED SENTIMENT ANALYSIS FOR DEMONETIZATION TWEETS BY OPTIMIZED RECURRENT NEURAL NETWORK USING FIRE FLY-ORIENTED MULTI-VERSE OPTIMIZER

SAMIK DATTA, SATYAJIT CHAKRABARTI

## ABSTRACT

In this paper, it is proposed to understand the opinion of the public regarding the policy of demonetization that is implemented recently in India through Aspect-based Sentiment Analysis (ABSA) that predicts the sentiment of specific aspects present in the text. The major aim is to identify the relevant contexts for various aspects. Most of the conventional techniques have adopted attention mechanisms and deep learning concepts that decrease the prediction accuracy and generate huge noise. Another major disadvantage with the attention mechanisms is that the sentiment related to few context words alters with various aspects, and hence it cannot be concluded from itself alone. This paper adopts the optimized deep learning concept for performing the ABSA for demonetization tweets. The proposed model involves various phases such as pre-processing, aspect extraction, polarity feature extraction, and sentiment classification. Initially, the different demonetization tweets collected from the Kaggle dataset are taken. Pre-processing is done with the help of four phases like stop words removal, punctuation removal, lower case conversion, and stemming from minimizing the data to its reduced

format. This pre-processed data is further performed with aspect extraction to extract the opinion words. These extracted aspect words are converted to the features with the help of polarity score computation and Word2vec. The weight of the polarity scores is optimized using hybridization of two meta-heuristic algorithms like FireFly Algorithm (FF), and Multi-Verse Optimization (MVO), and the new algorithm is termed as Fire Fly-oriented Multi-Verse Optimizer (FF-MVO). Further, combined features are subjected to a deep learning algorithm called Recurrent Neural Network (RNN). As a modification to the existing RNN, the hidden neurons are optimized by the hybrid FF-MVO, FF-MVO-RNN classifies the positive and negative sentiments. Finally, the comparative analysis of different machine learning algorithms proves the competent performance of the proposed model.

**Keywords:** Aspect-based sentiment analysis; demonetization tweets; recurrent neural network; fire fly oriented multi-verse optimizer; aspect extraction; sentiment classification; Vader sentiment intensity analyzer; word2vec; weighted polarity score.

# REVISITING HOTEL BRANDS IN WEST BENGAL: AN ASSESSMENT FOR CONFIDENCE BUILDING OF LEISURE TOURISTS AMIDST COVID 19 PANDEMIC

DR. DEBASISH BATABYAL, PRATIM CHATTERJEE, NAMRATA CHAKRABORTTY, DR. SHATRAJIT GOSWAMI, VANDITAHAZRA

## ABSTRACT

Hospitality Industry in India is considered as Sunrise Industry as it has registered a huge potential for future growth. The tourism and hospitality sector is having a steady growth and accounts for 7.5 percent of the country's GDP. According to India Brand Equity Foundation (IBEF), 4.2 crore jobs were created in tourism and hospitality sector as of 2019 which was 8.1 percent of the total employment of the country. Though the hospitality sector has the potential to be the major reason behind the growth of the economy, yet the COVID-19 pandemic has wrecked this as never before. Now it is critical whether the hospitality industry in the study area will move ahead or drop down by losing the market share. In this unparallel and unforeseen situation of low occupancies and higher fixed costs, correct and cost-effective brand strategies are not only essentials but imperative as well. This article is an attempt to build confidence of popular hotel brands in selected cities and hill stations of tourism importance in West Bengal. An opinion survey is conducted for identifying areas and issues of confidence building for selected hotels with wide ranging facilities and services. An effort is also put forward to move towards quality of life (QOL) in hotel branding. Principal component analysis, structural equation modeling (SEM) and ideographic ranking methods are used as quantitative tools for measuring data.



## **ASSESSING THE CHOICE OF SUPPLEMENTARY ACCOMMODATION FOR THE NEW NORMAL URBAN AREAS IN WEST BENGAL, INDIA**

**DR. DEBASISH BATASYAL, PRATIM CHATTERJEE, DR. ABHIJIT PANDIT, DR. SHATRAJIT GOSWAMI, DHARMENDRA KUMAR**

### **ABSTRACT**

**Objectives:** To measure the factors responsible for or contributing to the choice of accommodation in urban areas during and immediately after COVID 19 pandemic, with an increasing importance of location and its shifting perception for confidence building and future marketing.

**Method:** Principal Component Analysis and Chi-Square tests are found useful for analyzing the primary data collected from the urban areas in West Bengal **Results:** COVID 19 risk perception and resultant behavior could not supersede purchasing power in the study area while location is playing a critical role. This study also projected a sustainability-safety-sustainability diaspora exhibiting future trends for supplementary accommodation sector with new-normal sustainability orientation in the area.

**Practical Implications:** COVID 19 measures with more investments does not enhance confidence among urban dwellers in the study area, rather price and location play critical role with new COVID 19 orientation for supplementary accommodations.

**Social Implications:** Risk perception, safety measures and actual availing of accommodation services are experiencing a wide gap as never before owing to this COVID 19 outbreak. This study focuses on this area with a future scope for supplementary accommodation.

**Value:** This study redirects the future marketing, financial and entrepreneurial policy issues for supplementary accommodation sectors

*Journal of Contemporary Issues in Business and Government, 2021*

## **STATIONARY AND NON-STATIONARY GROWTH OF INBOUND AND DOMESTIC TOURIST ARRIVALS IN INDIA: AN EMPIRICAL STUDY FROM 1990 TO 2018**

**DR. DEBASISH BATASYAL, DR. SHATRAJIT GOSWAMI, PRATIM CHATTERJEE, DR. ABHIJIT PANDIT, BANIRATNA PADHI**

### **ABSTRACT**

Though continuous increase in tourist arrivals is the common form of presenting potentiality of tourism industry, there are many more issues involved in which stationary and non stationary states critically important for policy issue and future direction. This direction is also useful for contextualizing and comparing true and fair condition of tourism industry in a large country like India with 28 states and 8 UTs. The present article is a descriptive approach to analyze and exhibit stationary and non-stationary growth of domestic and international tourist arrivals in India in the light of the present context of COVID 19 outbreak for setting the future policy issues and recommendations.

*Palarch's Journal of Archaeology of Egypt/Egyptology, 2020*

# **MEASURING INBOUND TOURISM ATTRACTION EFFICIENCY OF INDIA FOR POLICY ISSUES AND RECOMMENDATION AMIDST COVID 19 PANDEMIC**

**DR. DEBASISH BATASYAL, PRATIM CHATTERJEE**

## **ABSTRACT**

Design/Methodology/Approach: Input oriented Data Envelopment Analysis (DEA) is used for the analysis of the data under the study.

Purpose: To measure the inbound tourism attraction efficiency of Indian states and UTs. To contribute to the policy issues during and after COVID 19 pandemic.

Findings: It answers whether the Indian states and UTs are harvesting maximum tourist arrivals by managing its diverse range of physical attraction features and human resources effectively. Interestingly, some of the leading states are found lagging while some non-leading states register greater efficiency of receiving more inbound tourists.

Research limitations: Andaman Nicobar Islands, Lakshadweep, Dadra Nagar Haveli and newly established Ladakh have not been considered in the study. However, Ladakh is included in erstwhile Jammu and Kashmir in this study due to non-availability of data. Some pollution deterrents are also not found for all states.

Practical Implications: This work is based on a model for all available secondary data. This measure directly contributes to the most lucrative segment of quality inbound tourism with sustainable development.

Social implications: This work is important for tourism and hospitality industries in India and all the countries of origin of foreign tourists visiting India.

Originality: This work is based on all available secondary data sources of the government of India. This will contribute to various stakeholders in travel and tourism in India at various levels. Further extension of this model is possible for future research and policy issues

*Journal of the Social Sciences, 2020*

# **REVISITING ALTERNATIVE TOURISM AND EXCURSION DESTINATION MARKET IN INDIA: AN ASSESSMENT AMIDST COVID 19 PANDEMIC**

**DR. DEBASISH BATASYAL, PRATIM CHATTERJEE, BANIRATNA PADHI**

## **ABSTRACT**

COVID 19 attack has more adverse impacts on economic and social set up than ecology and environment. Drastic reduction in physical accessibility and actual mobility is seemed to be a gray area for the travel industry, if the situation remains unchanged. Loss of employment, lowering of income and more life-risk associated with travelling and overnight accommodation Indians are expected to spend less on tourism as a noticeable trend as never before. Travel and tourism practices are seemed to be directed towards the unorganized or uninstitutional unprofitable market segments from VFR to alternative and responsible tourism. With loss of capital and provision for health and safety measures many travel houses, hotels and other principal suppliers have been operating at break-even level. Most of the experts are in favor of rejuvenating tourism and hospitality industry through India's domestic tourism segment as it helped rejuvenation immediately after economic meltdown during 2008-2009. Again, maintaining such level for a longer period of time is very hard for larger hotels with huge fixed costs. Present article is an attempt to explore and critically analyze the new product or package tour formulation strategy amidst these COVID 19 pandemic situations

*DogoRangsang Research Journal, 2020*

# **SYNTHESIS, PROPERTIES OF GRAPHENE OXIDE-METAL OXIDE MIXED NANOCOMPOSITES AND THEIR APPLICATIONS – REVIEW**

**PAMPIMAJUMDER, KAKOLIDUTTA, PARTHADUTTA**

## **ABSTRACT**

Graphene oxide-metal oxide mixed nanocomposites have attracted extensive attention in recent days because of the large surface area of graphene moiety which offers sufficient space to accommodate different nanomaterials preventing agglomeration of nanocomposites. These composites can improve the unique properties of graphene and induce new properties such as high dye adsorption capacity, extended light absorption range, enhanced charge separation and transportation properties, photocatalytic performance, sensitivity in chemical and biological sensors etc. In this review, we will briefly discuss different synthetic strategies, properties and various applications of graphene oxide based metal oxide nanocomposites.

*Int. J. Adv. Sci. Eng. Vol.5 No.3 1032-1039 (2019) 1032*

# **FORECAST MODEL DEVELOPMENT OF SOME SELECTED WHOLESALE PRICE INDEX OF INDIA USING MLP**

**DIPANKAR DAS, DR. SATYAJIT CHAKRABARTI**

## **ABSTRACT**

The work proposes a Multilayer-Perceptron-based forecasting model for some selected wholesale price indexes of India. We chose the wholesale price index of sixty individual items in the "manufacture of food products" category for the research work. The items were first analyzed and grouped based on the similarities of the extracted features. We computed the linearity and curvature features of each index and grouped the indexes into four categories. We developed the forecasting model for all thirty-six WPIs of the largest group - i.e., the indexes having positive linearity and negative curvature features. The proposed Multilayer-Perceptron obtained high accuracy (i.e., MAPE  $\leq$  ten) for thirty-three out of thirty-six indexes, outperformed four regression models - linear, quadratic, cubic, and exponential models, and two other popular models - ARIMA and Simple Exponential Smoothing in terms of average MAE and MAPE values.

*International Conference on Computational Intelligence, Data Science and Cloud Computing (IEM-ICDC) 2020*

**Reference:** Das D., Chakrabarti S. (2021) Forecast Model Development of Some Selected Wholesale Price Index of India Using MLP. In: Balas V.E., Hassani A.E., Chakrabarti S., Mandal L. (eds) *Proceedings of International Conference on Computational Intelligence, Data Science and Cloud Computing. Lecture Notes on Data Engineering and Communications Technologies*, vol 62. Springer, Singapore. [https://doi.org/10.1007/978-981-33-4968-1\\_18](https://doi.org/10.1007/978-981-33-4968-1_18)

# **FORECASTING OF THE WPI OF TEXTILES IN INDIA: AN NEURAL APPROACH**

**DIPANKAR DAS, DR. SATYAJIT CHAKRABARTI**

## **ABSTRACT**

The research work proposes an alternative forecasting approach based on Multilayer-Perceptron (MLP) for the wholesale price indexes of the individual items of "manufacture of textiles" in India. For each of the twenty-five indexes under this category, the proposed MLP employed the autocorrelated lagged values of the series as input. Again, for each index, the number of neurons in its (model's) hidden layer is optimized using hyperparameter tuning. The model exhibited high accuracy (i.e., MAPE  $\leq$  ten) for most of the indexes - twenty-four out of twenty-five indexes and also manifested superior performances than two popular and well known time series forecasting approaches - ARIMA and Holt-Winters when compared individually using three accuracy metrics - MAPE, RMSE, and Theil's U.

*6th International Conference on Emerging Applications of Information Technology (EAIT 2020)*

**Reference:** Das, D., & Chakrabarti, S. (2021, February 25-27). *Forecasting of the WPI of Textiles in India: An Neural Approach*. 6th International Conference on Emerging Applications of Information Technology (EAIT 2020), West Bengal, India

# **A QUANTUM STUDY ON DIGITAL IMAGE NOISES AND THEIR IN-DEPTH CLUSTERIZATION**

**DEBKUMAR CHOWDHURY**

## **ABSTRACT**

In this paper, we represented a detailed survey of various type of noise and its applications. Image processing is a field of study and research where we process raw images with the help of various functions or the input can be any parameter of the picture that we need to process. Noise as we all know as Unwanted Signal is responsible for Degradation of pictures in terms of Quality and Detailing. The primary source of noise can be when we capture a picture, due to slow shutter speed, temperature. Some noises are beneficial for us like noise is used in posterization, Sharpness and in Dither. So, implementing an efficient noise removal technique is the utmost need today to harness each and every required detail.

*International Conference on Opto-Electronics and Applied Optics (Optronix), Kolkata, IEEE, Xplore*

# **An Atomic Technique for Removal of Gaussian Noise From A Noisy Gray Scale Image Using LowPass-Convolutd Gaussian Filter**

**DEBKUMAR CHOWDHURY**

## **ABSTRACT**

During Acquisition of an image using some digital devices we often observe various types of noises. Between them, one of the major types of noise that we often found is the Gaussian noise. When an image contains Gaussian noise, it produces several impurities which are very difficult to detect and eliminate. As a part of the image restoration process, removal of Gaussian noise from a digital image is always a matter of challenge. Before removal of Gaussian noise, we need to convert the digital image into a greyscale image which may contain different percentages of Gaussian noise. Throughout the last few decades, lots of Gaussian noise removal filters or algorithms have been proposed in different international conference papers and acclaimed journals. But a very few of them were successful as far as detecting and eliminating of Gaussian noise from a digital image is concerned. Moreover, these proposed methods also contain several drawbacks and pitfalls which are creating obstacles regarding the generation of the enhanced output image. In this paper, we propose a unique and atomic technique for removal of Gaussian noise from a digital noisy image which is not only capable of detecting and eliminating Gaussian noise, present in the digital image but also capable of generating an enhanced output image. We also try to establish that our proposed method is giving much better result in comparison to other popular filters or algorithms. In order to do that we have invoked a comparative study in experimental results and analysis portion of these paper by calculating PSNR, MSE and RMSE.

*International Conference on Opto-Electronics and Applied Optics (Optronix), Kolkata, IEEE, Xplore.*

# **ERADICATION OF SALT AND PEPPER NOISE FROM A TUMOROUS MRI IMAGE USING SNPRB FILTER**

**DEBKUMAR CHOWDHURY**

## **ABSTRACT**

Apart from different types of noises which can be represented by categories of modelling style, we have considered a model of addictiveness and salt and pepper type of noise which belongs to impulse category in this outline. We introduce a newly built linear filterization methodology for the eradication of salt and pepper type of noise from a noisy image to achieve restoration over a degradable image. We named our methodology as SNPRB filter which is fundamentally used to deduct above mention noise category from a tumorous image, present inside the human brain and our methodology has produced a positive, desirable and effective result as we observe after experimental result and analysis. In comparison with other pre-existing concepts, our proposed invention generates a far more accurate result as we perform our methodology over multiple data set of some kind and varying noise intensities over our collected data set.

*International Conference on Opto-Electronics and Applied Optics (Optronix), Kolkata, IEEE, Xplore.*

# **INTROSPECTING E-COMMERCE PLATFORM FOR ARTS AND CRAFTS OF BENGAL**

**ARUNAVA DALAL AND DR. SUBRATA CHATTOPADHYAY**

## **ABSTRACT**

Arts and crafts form an inevitable lineage of culture and tradition. The artisans and craftsmen of West Bengal, an eastern state of India, are highly skilled and their finesse of artwork is adored all over the world. This is envisaged by the huge demand for their creation in the Trade Fairs nationally and internationally. However, there is no comprehensive e-commerce platform that can provide an online marketplace and promote their artistry to the world in a digital environment. Hence the need for a sustainable marketplace for these artisans belonging to the weaker socio-economic strata of the society. The paper explores the feasibility of the same, the opportunities and challenges therein, the demand perspective, logistics, pricing, and promotion parameters. It tries to formulate a viable logistics model and tries to explore the business channels which can result in a seamless connection of the skilled yet unprivileged and unrepresented to those who have a good admiration and fascination for their creation. The study strives to find out the aggregator model which would be apt for putting the brilliant creations on the global platform.

*ICBPO 2020 ( International Conference on Building Positive Organizations - Challenges and Opportunities for a Sustainable Future, organized by Christ (Deemed to be University), Delhi.*

# **UNSUPERVISED LEARNING BASED EVALUATION OF PLAYER PERFORMANCES**

**BOSE, A., MITRA, S., GHOSH, S.,PATRA, T., CHAKRABARTI, S.**

## **ABSTRACT**

The game of cricket is one of the most popular sports in India right now, with the centre of attraction being the Indian Premier League. The paper designed a model using the available data of the league and assessed each player's strength on the field. The data gathered from reliable websites was cleaned and analysed through cluster space maps based upon certain proposed formulas. A thorough research on players' statistics with different unsupervised clustering algorithms in machine learning and deep learning models was documented and compared through silhouette scores. They were classified based on their strength according to bowlers, batsmen and all-rounders. A comparative study of machine learning algorithms with its deep learning counterparts using neural networks was also shown. The paper depicts how the models perform on the given dataset and conclude with the most effective model. Given a dataset of players and their individual statistics, the paper can classify a player according to his role in a particular team hence improving the chances of the team selection to be more effective for that particular match.

*Innovations in Systems and Software Engineering, 2021  
Indexed: SCI*

# **CAPSNET-VGG16 ARCHITECTURE FOR CASSAVA PLANT DISEASE DETECTION**

**BOSE, A., GHOSH, D., BANERJEE, A.,GANGULY, P., CHAKRABARTI, S.**

## **ABSTRACT**

In the era advanced agricultural informatics and artificial intelligence, researchers and agronomist have tried to keep a check on the quality and yield of production as increasing demand for food in the future is something to worry about both in terms of quality and sustainability. CNN has been the preferred choice in the area due to its vast image processing abilities but, it misses out on few parameters like taking the spatial relationship into account, being non-robust towards affine transformation, etc. Here Capsule network comes into play which possesses these traits and might have a chance to produce better results, thus enhancing the food production and cultivation sector.

*Lecture Notes on Data Engineering and Communications Technologies, 2021  
Indexed: SCOPUS*

## **FRAMEWORK FOR APPRAISAL OF TWENTY-TWENTY LEAGUE PLAYERS**

**MITRA, S., PATRA, T., GHOSH, R., GHOSH, S., BOSE, A.**

### **ABSTRACT**

In the following paper, we propose to design a framework, which uses concrete data source to analyze the player statistics. Data collected from various websites is filtered according to each player and their corresponding T-20 statistics. A rank system on the basis of playing statistics of each player is devised through our proposed algorithm. The proposed algorithm then categorizes the players according to their roles in the team. This categorization leads to better implementation of strategies according to pitch type. We broadly classify the players with respect to the predominant pitch type and create an ideal model for each pitch type. Hence, the best playing eleven can be shortlisted on the basis of a proposed framework consisting of the roles assigned by the model. It illustrates the probabilistic best playing eleven.

*Advances in Intelligent Systems and Computing, 2020*  
*Indexed: SCOPUS*

## **INTERNAL ORGANIZATIONAL SECURITY**

**AZIZ, R., SENGUPTA, S., BOSE, A.**

### **ABSTRACT**

The triad of CIA, i.e., confidentiality, integrity and availability, are the key principles that are essential for any security system. It deals with confidentiality, which makes sure that no unauthorized person can access the system, integrity, which keeps the track of data such that it does not change in any manner and that its authenticity is maintained, and availability, such that it is readily accessible to those it is intended to. The most endangered areas of a given system are the location of the server and the places from where it can be accessed, the virtually secured region of an organization like the workplace where all the data available to its employees are kept and the last is the mind of the employees which, however limited, can be crucial. It may happen that an employee having limited data at his/her disposal becomes a major security threat. The tally and threat of the attacks of this nature are increasing with every new security measure being placed into action. The attackers are deploying new methods to break into the institutional structure. Therefore, it is necessary to look into all the possible threats so that the attacker has very limited to no access to the internal physical infrastructure. The aim of the following paper is to help new and existing organizations in developing a physical security system which will look into the internal security from all angles.

*Advances in Intelligent Systems and Computing, 2020*  
*Indexed: SCOPUS*

## **SECURING AIR-GAPPED SYSTEMS**

**SARKAR, S., CHAKRABORTY, A., SAHA, A., BANNERJEE, A., BOSE, A.**

### **ABSTRACT**

A security measure which involves isolation of a computer or a network in order to prevent it from establishing an external connection, such a security measure is called air gapping. If we are able to physically segregate a computer in such a way that it becomes incapable of connecting wirelessly or physically with other computers network or devices, then that computer is an example of an air-gapped computer. Since air-gapped computers are neither connected to the Internet nor other networks that are connected to the Internet, this makes hacking such computers quite difficult. If we are able to cut off any connection to the computer, then only we can guarantee that no third party would be able to access the client. The object of this paper is to verify the feasibility of air gapping.

*Advances in Intelligent Systems and Computing, 2020*  
*Indexed: SCOPUS*

## **DRIVEN BY THE NEED FOR A RELIABLE AND COST-EFFECTIVE LED DRIVER**

**DASGUPTA, A., BOSE, A., GUHA, S., ...MUKHERJEE, S., SAHA, S.**

### **ABSTRACT**

An LED driver is an electrical device that helps in the regulation of power to an LED or to an array of LEDs. The LED driver adapts to the requirements of the LED, by supplying a continuous quantity of power to the LED when its electrical properties vary. LEDs are as a matter of fact sensitive to the voltage used to power them (i.e., the current changes a lot with a little change in voltage). To avert the LED from becoming unstable due to voltage changes, an LED driver is necessary. An LED driver is a self-contained power supply which has outputs that are affianced to the electrical characteristics of the LED or to the array of LEDs. LED drivers may offer to dim by means of pulse width modulation circuits and may have different channels for separate control of different LEDs or LED arrays. Without the most suited driver, the LED may become hot and unstable, therefore, cause poor performance or failure. This paper presents a novel approach to the design of a LED Driver using various power transistors, power MOSFETs, operational amplifier and feedback circuits. The experimental results demonstrate the power delivered to the LED at different supply voltages upholding the performance of the driver circuit proposed.

*Advances in Intelligent Systems and Computing, 2019*  
*Indexed: SCOPUS*

## **SMART IRRIGATION: IOT-BASED IRRIGATION MONITORING SYSTEM**

**DASGUPTA, A., DARUKA, A., PANDEY, A., .MUKHERJEE, S., SAHA, S.**

### **ABSTRACT**

The project aims at autonomous monitoring of irrigation system in both large- and small-scale plantation estates with a view to eradicating the manual system which involves personal liability concerns and the ignorance of the field workers. Even sometimes the experienced people cannot assure how much fertilizers or water must be used for the maximum yield. Hence, our system will monitor the temperature, humidity, moisture content of the soil and other physical factors like presence of major pollutants in air like PM2.5, PM10, CO, NOx. The factors and the crop yield are compared with dataset of past surveys and will try to predict whether irrigation is necessary or not. With the help of this information, the rate of releasing water from pumps is decided and fed to a microcontroller system which supervises and controls the whole irrigation system. Besides, there is also provision to monitor plant growth in both longitudinally and horizontally.

*Advances in Intelligent Systems and Computing, 2019*  
*Indexed: SCOPUS*

## **HEART TRACER - THE ROUTE TO YOUR HEART**

**DUTTA, A., BANERJEE, A., BOSE, A., ...RANA, T.K., BHATTACHARYYA, S.**

### **ABSTRACT**

Nowadays heart disease is a bell on every possible door. A medical electronics unit has been developed citing the problems of general mass of people. Round the clock this multifunction electronic device monitors, records and indicates alarming heart situation of the user. It also prescribes emergency as well as regular medicines based on the recorded heart data. This data puts light on a thought where users themselves can trace their heart and can take immediate measures of emergencies or visiting a doctor. The unit even determines how a person can push his/hers working boundary or control their work intensity for a healthy life style. To put the long story short we have planned a device which can reach out to the general mass, is their 24 hour aid and are useful to keep their heart out of possible troubles.

*8th Industrial Automation and Electromechanical Engineering Conference, 2017*  
*Indexed: SCOPUS*

# **DESIGN AND DEVELOPMENT OF AN INTELLIGENT HOME AUTOMATION AND SECURITY SYSTEM**

**AKASHMOHTA, ARINDAM RAY, ANKURITA CHATTERJEE, AVIJIT BOSE**

## **ABSTRACT**

Urban households are predominated by nuclear families, often with all members working. This leaves not only the household and related property in danger, but also those members of the same who are in need of continuous care and monitoring. This creates the need to develop an integrated product that will provide easy control, monitoring and security services, along with a highly reliable remote access system which will be deliverable as a complete set, ready to be installed right away. In our research we presented a novel approach to Intelligent Home Automation technology which ensures security from breaches and includes voice-based control over appliances and operations, in-household monitoring using image processing, as well as controlling of fans and lights according to the temperature conditions and presence of a user. It is based on Android and uses the Arduino platform, both of which are free and open source systems. In this paper, a system called Intelligent Home Automation and Security System using Remote web application that is based on GSM and Wi-Fi modules is proposed and prototyped. First the hardware design is described and then the supporting software implementation is described.

*IJCSN International Journal of Computer Science and Network, 2016*  
*Indexed: Google Scholar*

# **REAL-TIME ADAPTIVE TRAFFIC CONTROLLING SYSTEM USING UNSUPERVISED LEARNING**

**AVIJIT BOSE, ANISH BANERJEE, DEBANJAN GHOSH, PRANITA GANGULY, DEBOJYOTI SAHA, SATYAJIT CHAKRABARTI**

## **ABSTRACT**

In the period of innovative headways and mechanization, made conceivable by the wide-range utilization of Machine Learning, brilliant boulevards with an automated traffic lighting framework are the following most potential result that can cause a significant change in the day by day life traffic scenarios of the metropolitan. This paper talks about the broad utilization of two explicit object detection algorithms, to be specific YOLOv3 & YOLOv4, to process the live video feed of lanes, frame by frame and decide the blockage alongside the nearness of a crisis vehicle dependent on the expressed algorithms and make the traffic lights work in like manner. Tweaked preparing of the model makes the framework to be totally natural and mouldable. After blending this with a microcomputer and cloud benefits, a dependable and maintainable answer for the metropolitan can be accomplished.

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