

FAPSCON24/CHM/001  
PHYTOCHEMICAL SCREENING AND GC-MS ANALYSIS OF BIOACTIVE COMPOUNDS  
PRESENT IN METHANOLIC EXTRACTS OF 60 DAYS OLD NIGERIAN *VIGNA RADIATA*  
STEM

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ABSTRACT

Most bioresources are being wasted in the farm. The stem of *Vigna radiata*, a newly introduced plant in Nigeria, is the plant's part that is considered as waste product after the harvest of the seeds. For the exploration of the bioactive content of the Nigerian *Vigna radiata* stem (N $Vr$ S), which will unfold a new ways of its utilization, a preliminary phytochemical screening was conducted on 60 days old N $Vr$ S in this research, which revealed the presence of steroids as the major compound present in the stem with a value of 14.035 %. Tannins, phenols and cardiac glycosides also showed appreciable values of 9.427 %, 5.034 mg/kg and 4.229 % respectively. The remaining 8 bioactive compounds assayed showed values that are less than 3 %. Further confirmation of the bioactive compounds present was also conducted on the methanolic extract of the 60 days old N $Vr$ S using GC-MS which generated 62 peaks covering an area of 100%. The spectrum obtained when matched with NIST/NBS spectral database revealed the presence of 57 compounds with squalene as the major compound present covering peak area of 21.13 %. Other compounds identified with significant concentrations are 9-Octadecenoic acid (Z)-2,3-dihydroxypropyl ester, 13-Octadecenal (Z)- and Carbonic acid but-2-yn-1-yl eicosyl ester. These bioactive compounds identified have various reported therapeutic properties which when incorporated in the formulation of other chemical products may yield potent results. Hence, revealing new ways of utilization of *Vigna radiata* stem.

FAPSCON24/CHM/002  
ASSESSMENT OF SOME HEAVY METALS IN CROPS GROWN AROUND SOME  
DUMPSITES IN IMO STATE

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ABSTRACT

Accumulation of heavy metals in waste dumpsites affect the soil and release concentrated leachate to the environment which further enters the food chain. These heavy metals result in serious health and environmental problems. The objective of this study was to ascertain the level of concentration of heavy metals (Zinc, Iron, Cadmium and Lead) crop samples grown around three (3) selected waste dumpsites (Amaraku, Amauzari and Anara) in Okigwe zone of Imo state. Samples were collected from an area with no trace of dumpsite which served as control. The Crop samples were collected from the selected dumpsite, digested and the heavy metal concentrations were determined using Agilent FS240AA Atomic Absorption Spectrophotometer (AAS). The level of metals in the crop ranges Pb: 0.61-0.13mg/kg, Fe: 54.10-27.85mg/kg, Zn: 4.32-3.58mg/kg and Cd: 4.12-1.55mg/kg. The values of all the metals analyzed for crop from the dumpsites were higher than those from the control except for Iron whose control sample had higher concentration than that of sample A and C. The mean concentration of some of the heavy metal analyzed in the leachate and crop grown around the selected dumpsites were found to be high as compared

to Food Agricultural Organization (FAO) and World Health Organization (WHO) permissible limits. The ANOVA result revealed that the p-value for the heavy metals analyzed (Pb, Zn, Fe and Cd) were less than 0.05 which implies significant difference.

**Keywords:** Heavy metals, Crops, A.A.S., F.A.O., W.H.O.

FAPSCON24/CHM/03

**UV-VISIBLE SPECTROPHOTOMETRIC DETERMINATION OF THE STABILITY CONSTANTS AND GIBB'S FREE ENERGIES OF CADMIUM (II) AND TITANIUM (IV) COMPLEXES OF 8-HYDROXYQUINOLINE LIGAND**

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**ABSTRACT**

In this study, we focused on the determination of the stability constants and Gibb's free energies of cadmium (II) and titanium (IV) complexes with 8-hydroxyquinoline ligand using a combination of spectroscopic and potentiometric techniques. UV-Visible spectrophotometry was employed to monitor changes in the absorbance of the metal-ligand complexes as a function of ligand concentration and pH. Potentiometric titrations measure changes in the electrode potential upon the addition of the ligand to the metal ion. From the results obtained, the stability constant values (K) of Cd (II) and Ti (IV) metal complexes with 8-hydroxyquinoline ligand were determined to be  $2.76 \times 10^5$  and  $6.83 \times 10^6$  L.mole.<sup>-1</sup> where as the Gibb's free energies  $\Delta G$  for Cd<sup>2+</sup>/Ox<sup>-</sup> and Ti<sup>4+</sup>/Ox<sup>-</sup> complexes were determined to be -31.04 and -35.97 KJ mol<sup>-1</sup> respectively. The Log K value for Cd<sup>2+</sup>/Ox<sup>-</sup> complex was 5.44 while Log K value for Ti<sup>4+</sup>/Ox<sup>-</sup> metal complex was 6.83. Since  $K > 1$ , it shows that the formation of the product was favored. The negative values of  $\Delta G$  for both [TiO(Ox)<sub>2</sub>] and [Cd(Ox)<sub>2</sub>] complexes were an indication that the reactions were spontaneous, feasible and irreversible. The results obtained were in good agreement with the certified values obtained by the previous researchers on similar complexes and stable metal complexes formed.

**Keywords:** Stability constant, 8-hydroxyquinoline ligand, Gibb's free energies and potentiometric techniques

FAPSCON24/CHM/004

**COMPARATIVE PHYTOCHEMICAL DETERMINATION OF COMPONENTS OF GONGRONEMA LATIFOLIUM (UTAZI) LEAF USING ETHANOL AND WATER**

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**ABSTRACT**

Diabetes is a chronic disease caused by excess glucose in the blood as a result of insulin

deficiency in the body. This disease is managed with some drugs, usually synthetic anti-diabetic drugs which comes with severe damaging effects. Anti-diabetic drugs from plant sources proposed to be more effective with lesser or no side effects to the body. *Gongronema latifolium* (Utazi) leaf is one of the plant suspected to possess anti-diabetic properties. This study was conducted on nano-encapsulation of *gongronema latifolium* leaf extract using chitosan for treatment of diabetes. The qualitative screening and quantitative phytochemical components of the plant leaf were conducted using standard analytical methods and gas chromatograph, after the crude extraction of the air-dried plant leaf with ethanol and water. The results of the phytochemical analysis showed that the plant leaf contains 21.771% + 0.892 of tannin, which is highest followed by 12.838% + 0.853 of flavonoids and the least secondary metabolite was oxalate (0.0945mg/100 + 0.027) The quantities of cardiac glycosides and hydrogen cyanide were 12.049% + 1.032 and 4.570 mg/100 + 0.279 respectively. The results of the comparative analysis of the alkaloids contents indicated that morphine (26.242µg/mL + 0.786), was more in aqueous extract, while quinine (12.909µg/mL + 0.404), was more in ethanol extract. The flavonoids content showed the presence of ribalinidine (22.411µg/mL + 1.893), resveratrol (8.7220 µg/mL + 0.178), and catechin (5.0723µg/mL + 1.400) respectively, which are anti-diabetic flavonoids in the ethanol. The implication of the results of the analysis is that *Gongronema latifolium* (Utazi) leaf extract contains reasonable quantities of anti-diabetic metabolites which can be isolated and used for the production of anti-diabetics drugs for management of diabetes

 **FAPSCON 2024**  
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**FAPSCON24/CHM/005**  
**PHYSIOCHEMICAL AND HEAVY METAL ANALYSIS PROFILE OF WASTE WATERS OF**  
**SEWAGE AND LEACHATE OBTAINED FROM THE SEWAGE WASTE TANK,**  
**UNIVERSITY OF NIGERIA NSSUKA AND 1<sup>ST</sup> MARKET DUMP SITE IFITE AWKA**

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**ABSTRACT.**

This work is carried out to investigate the level of contamination in sewage waste water sample from the sewage waste water tank University of Nigeria Nsukka, Enugu State and Leachatte waste water sample from waste dump site at 1<sup>st</sup> Market Ifite Awka Anambra State, both located in the South-Eastern region of Nigeria. A physiochemical analysis using different parameters and heavy metal analysis using atomic absorption spectrophotometer (AAS) were conducted on each sample and the results obtained were used to compare with standard result of World Health Organization (WHO) and Federal Environmental Protection Agency (FEPA). The results from the parameters used revealed that turbidity, colour, chemical oxygen demand (COD), biological oxygen demand (BOD), chloride ion, total solid were significantly high comparing with WHO and FEPA results, pH was moderately low for sewage sample but very low and acidic for leachatte sample. The analysis carried out on heavy and toxic metal with reference to these metals cobalt, lead, arsenic, cadmium, chromium also revealed that none of these metals concentrations met the standard requirement, they all exceeded the permissible limits. Implication of these results show that these waste waters do not meet the standard requirement to be considered fit for disposal and hence should undergo treatment before disposal. There is gross need for these waste waters to be treated to avoid public health and agricultural menace that can emanate from them.

**Key words:** waste water, sewage, leachate, physiochemical, heavy metal.

**ISOLATION, STRUCTURAL ELUCIDATION AND ANTI-MICROBIAL SCREENING OF  
THE FRUIT OF *MOMORDICA CHARANTIA***

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**ABSTRACT**

*Momordica charantia* of the family *Cucurbitaceae* which is used traditionally for medicinal purposes was investigated with the aim of establishing the ethnomedicinal claims on the fruit. The chloroform and methanol extracts had antibacterial and antifungal activities against the test organisms – *Bacillus sp*, *E. coli*, *Enterobacter aerogenes*, *Klebsiella pneumonia*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *S. albus*, *Salmonella sp*, *Staphylococcus aureus*, *Aspergillus flavus*, and *Candida albican*. The minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) of the two extracts confirmed that they were active at very low concentrations. The chloroform and methanol extracts were subjected to Thin layer and preparative Thin layer chromatography to separate the pure compounds from the active classes. The pure compounds from the extracts were subjected to structural elucidation using spectroscopic instruments (FTIR, UV-visible, H<sup>1</sup>-NMR, C<sup>13</sup>-NMR and GC-MS. Ethyl icosanoate was the pure chloroform extract while (26E, 34Z)-42-(heptadecanoyloxy)-16, 24, 25-trimethyl-41-oxodotetraconta-26, 34-dienoic acid was the pure methanol extract.

**Keyword:** *Momordica charantia*, ethnomedical, extracts, organisms, instruments.



**Conference & Exhibition**

FAPSCON24/CHM/007

**DISAZO DYES DERIVED FROM ANILINE AND 2-NAPHTHOL AND THEIR  
APPLICATIONS ON FABRICS AND SEED GERMINATION BIOASSAY.**

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**ABSTRACT**

Azo dyes are widely used for dyeing fabrics. In this study, synthesis and application of some novel disazo dyes derived from aniline and 2-naphthol on Dr Flannel's worsted wool, fine worsted wool, cotton, polyester, acrylic fiber and nylon and their seed germination bioassay are described. The dyes were synthesized via stepwise double diazotization of aniline using sodium nitrite in an acid (HCl) medium and coupling the diazonium salt solution produced with 2-naphthol to give an intermediate monoazo compound. The monoazo intermediate was subjected to further diazotization reaction and coupling with aniline and 4-aminophenol to give two disazo dyes. The synthesized dyes were subjected to thin layer chromatography- to determine their retardation factor- and their weights and percentage yields determined. The fastness properties accessed using the grey scale of dyed fabrics indicated excellent grades for the dyes to heatfastness and lightfastness while they showed very good to good washfastness. Additionally, results of seed germination bioassay indicated that the chemically synthesized disazo dyes have no toxic effect on the growth of *zea mays* seeds. Overall, the synthesized disazo dyes are promising candidates for dyeing fabrics across a spectrum of shades with good fastness properties and no adverse effect on the environment.

**Keyword:** Dye, synthesis, fastness, toxic, environment.

FAPSCON24/CSC/001

**MACHINE LEARNING SENSITIVE AND OBSCENE CONTENT BLOCKER WITH  
PARENTAL CONTROL FOR ONLINE DIGITAL SAFETY FOR CHILDREN**

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**ABSTRACT**

Our children are exposed to lot of sensitive and obscene content in the open internet in today's digital world. This openness has drastically exposed our children to much serious sensitive and obscene content which can have a serious detrimental impact on them. To mitigate the exposure to such content, a Machine Learning Sensitive and Obscene Content Blocker with Parental Control for Online digital Safety for our children has been developed and tested. By employing supervised machine algorithms, this paper explores the design, development, and evaluation of a comprehensive filtering system that is aimed at identifying and blocking sensitive and obscene content for children digital safety. The objectives of the study include a developed machine learning system that can send a real-time short message system (sms) and also an e-mail message to a parent or guardian or any other designated individual responsible for the children safety informing them when their children has opened an obscene and sensitive content, a developed machine learning system that kept log of obscene and sensitive content when network is unavailable and send notification when network is restored. Adopted methodology for this research work is the object oriented analysis and design methodology (OOADM) since it consists of processes to enable us analyze the existing system and devised means to develop our new system. The study utilized Anaconda Jupiter Notebook as its development environment, python as its programming language and then SQLite as the Database Management System (DBMS). The machine learning Sensitive and Obscene Content blocker serves as a powerful tool to protect our children from harmful online content, promoting a safer and more secure digital environment. This paper further provides valuable insights into the development and implementation of Machine Learning Content blocking and their role in enhancing our children digital safety.

**Keywords:** Sensitive, obscene, machine learning, blocking, digital safety, Parental control

FAPSCON24/CSC/002

**IMPACT OF EMPOWERING NIGERIA WOMEN USING ICT AND TOOLS**

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**ABSTRACT**

The importance of main streaming gender in information and communication technology (ICT) for development progress cannot be over emphasized. It has been show for various research records that slightly over half of the women who work with companies are the least confident of the other members about their ability. This attitude has contributed in workforce. This attitude can be remedied by empowering women through practice and training in computer technologies to create an arena where women can canvas about computer technology with both their male and female and colleagues to model

and help change the thinking of women about computers and to increase the confidence and capabilities of women using computer.

**KEYWORDS:** women, Network, Internet, NGO, ICT, Entrepreneurs, Telecommunication

**FAPSCON24/CSC/003**

**HYBRID INTELLIGENT MODEL DEVELOPMENT FOR CONTRACT LITIGATION**

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**ABSTRACT**

The study's background focuses on the difficulties encountered in contract litigation as a result of the amount and complexity of related legal papers. Conventional techniques for analyzing legal texts are frequently labour-intensive and prone to mistakes, which can cause inefficiencies and possible problems in court cases. A rising number of people are interested in automating and enhancing the accuracy of legal document analysis by utilizing cutting-edge technologies like deep learning and natural language processing (NLP). Nevertheless, there may be a void in the literature for thorough solutions specific to contract litigation because current methods do not adequately capture the complex contextual information found in legal texts. By integrating BM25, a convolutional neural network (CNN), and a bidirectional long short-term memory (BiLSTM), this study seeks to close this gap. By combining the advantages of BiLSTM for sequential dependency modelling, CNN for local text pattern recognition, and BM25 for effective information retrieval, this hybrid approach improves the system's capacity to evaluate legal documents more accurately and contextually. To give legal practitioners a strong tool for expediting document analysis, extracting important information, and making defensible legal choices in contract disputes, the project aims to design and assess this integrated model. Furthermore, to improve access to justice and develop technology-assisted legal analysis, the study intends to investigate the practical implications and difficulties of using such technology in actual court settings.

**Keywords:** Legal document analysis, Natural language processing (NLP), Deep learning, Hybrid model

**FAPSCON24/CSC/004**

**THE ROLE OF NETWORK MONITORING AND ANALYSIS IN ENSURING OPTIMAL NETWORK PERFORMANCE**

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**ABSTRACT**

Network monitoring and analysis are significant components in successfully functioning networks because they offer real-time data and information about the performance of the network. The following literature review gives an overview on how network monitoring tools have developed, speaking of the shift from simple availability and connection tests, to the use of Machine Learning and Artificial intelligence. To support the provided key areas of concern, an analytical overview of performance indicators like uptime, response time, packet loss, and bandwidth are provided with live examples of their importance in a network. Present-day approaches are discussed, with focus made on the most popular service solutions such as SolarWinds, Nagios, or PRTG. Network Monitor is provided and examined through case studies illustrating its efficient usage in various contexts. The paper also examines the latest methods improving the effective monitoring of the network, the security aspects, the problems arising

from the increasing trends in scalability, integration, and varied forms of cyber threats. Possible advances, specifically automation and ai solutions are proposed as crucial for combating these challenges. This review has highlighted the necessity to have strong monitoring process in managing a complex network to address the emergent technology needs in the future.

**Keywords:** network, monitoring, performance, machine learning, artificial intelligence

**FAPSCON24/CSC/005**

**ETHICAL IMPLICATIONS IN THE IMPLEMENTATION OF HYBRID AI MODELS FOR PERSONALIZED NEWS AND CONTENT DELIVERY: A SURVEY AND ANALYSIS**

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**ABSTRACT**

A personalized news recommendation system extracts news set from multiple press releases and presents the recommended news to the user. The contemporary information landscape is characterized by an influx of data and a growing demand for personalized content experiences. Personalized content delivery has become essential to cater for individual preferences and interests. Hybrid AI models in the context of news and content delivery is a system which combines the strengths of different AI techniques to create a dynamic and personalized user experience by combining both collaborative filtering-based and content-based filtering methods. The integration of hybrid AI models in personalized news and content delivery systems introduces profound ethical considerations that demand scrutiny. This paper explores the dynamic realm of Hybrid AI Models tailored for the delivery of personalized news and content and conducts a comprehensive survey and analysis to unravel the ethical implications associated with the implementation of these models including user privacy, algorithmic bias, transparency, and societal impact. A mixed-methods research approach is adopted. This approach combines both qualitative and quantitative methods to provide a comprehensive understanding of the ethical landscape and implementation challenges in personalized news and content recommendation system.

**Keywords:** Hybrid AI model, Personalized News, Recommendation System

**FAPSCON24/CSC/006**

**ADVANCED DEEP LEARNING TECHNIQUES FOR AUDIO-VISUAL PATTERN ANALYSIS IN LARGE DATASET**

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**ABSTRACT**

In the era of digital transformation, the exponential growth of multimedia data has fundamentally reshaped industries ranging from entertainment and surveillance to healthcare and autonomous systems. As devices capable of capturing high-quality audio and video become ubiquitous, the challenge of efficiently processing and analyzing this vast volume of data to extract meaningful patterns and insights

has become increasingly critical. This research addresses this challenge by proposing a hybrid model designed to enhance analysis of patterns in both audio and video streams. The model integrates advanced feature extraction and deep learning methodologies to improve the accuracy and efficiency of pattern recognition tasks. The hybrid model employs Convolutional Neural Networks (CNNs) to capture spectral patterns from audio and combines this with CNNs for spatial feature extraction and Long Short-Term Memory (LSTM) networks for temporal analysis in video data. By merging these features in a multi-input architecture, the model provides a richer context for pattern recognition. The implications of this research are substantial, as the hybrid model's ability to process and integrate multi-modal data paves the way for advancements in real-time analysis and scalability for larger datasets. Ultimately, this work contributes significantly to the field of multimedia data analysis by providing a novel and effective approach for recognizing and identifying complex patterns in both audio and video data, with the potential to transform various industries reliant on such data.

**Keywords:** Large-Scale Data, Pattern Recognition, Audio Analysis, Video Analysis, Feature Extraction, Deep Learning

FAPSCON24/CSC/007

**DEVELOPMENT AND EVALUATION OF A MACHINE LEARNING-BASED DIAGNOSTIC TOOL FOR KIDNEY STONES IN THE NIGERIAN HEALTHCARE SYSTEM**

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**ABSTRACT**

Kidney stones are a significant public health issue in Nigeria, with high prevalence rates. However, the lack of an efficient diagnostic tool has been a major challenge. This study aimed to address this gap by developing and evaluating a machine learning (ML)-based diagnostic tool for kidney stones in the Nigerian healthcare system. The researchers utilized a comprehensive dataset comprising patient medical histories, laboratory tests and imaging data to train and validate the ML models. Using cross-validation techniques, the study demonstrated that the developed ML models achieved exceptional sensitivity and specificity, exceeding 90%, in predicting the presence of kidney stones. The ML-based diagnostic tool offers benefits such as early detection of kidney stones, personalized treatment planning, and insights into the epidemiology of kidney stones in Nigeria. The study concludes that the use of ML models is a highly effective approach for kidney stone diagnosis and recommends its widespread incorporation to improve diagnostic reliability and patient outcomes in the Nigerian healthcare system.

**Keywords:** Machine Learning, Kidney stones, diagnostics, Nigeria

FAPSCON24/CSC/008

**DEVELOPMENT OF MACHINE LEARNING MODEL FOR THE DETECTION AND MITIGATION OF DISTRIBUTED DENIAL-OF-SERVICE (DDOS) CYBER THREATS IN SMART GRID SYSTEMS**

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**ABSTRACT**

The Smart Grid enhances the electric grid's reliability and efficiency through the extensive use of digital information and control technologies. However, its reliance on digital infrastructure makes it susceptible



to cyberattacks, notably Distributed Denial-of-Service (DDoS) attacks, which can disrupt operations and potentially cause blackouts. This research presents a hybrid algorithm that integrates Support Vector Machine (SVM), K-Nearest Neighbors (KNN), and Naïve Bayes methods to detect DDoS attacks within the Smart Grid's communication infrastructure. Utilizing the CICIDS2019 dataset and employing the Adaptive Software Development methodology, the algorithm was implemented in Python programming language within a Jupyter Notebook environment. The hybrid model achieved an accuracy rate of 80.12%, outperforming each individual model. This research demonstrates the effectiveness of the hybrid approach in improving the detection and mitigation of DDoS attacks, thereby enhancing the security and reliability of Smart Grids.

**Keywords:** smart grid, DDoS, cyber security, hybrid algorithm, SVM, KNN, Naïve Bayes, hybrid algorithm

**FAPSCON24/CSC/009**

**MACHINE LEARNING REVOLUTION AS A SOLUTION TO WAR AGAINST MONEY LAUNDERING IN NIGERIA**

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**ABSTRACT**

This paper examined the effectiveness of machine learning (ML) Models on the ongoing war against money laundering in Nigeria. In advanced economies, the rise of machine learning has revolutionized the way financial institutions and governments combat illegal financial activities emanating from mobile money transactions. By using advanced algorithms and data analysis techniques, machine learning has proven to be an effective tool in identifying suspicious financial transactions and patterns, thereby helping authorities take proactive rather than reactive measures in preventing fraudulent transactions. This study aimed to address the research gap in the use of reactive approach by Nigeria government, where the prevalence of money laundering has risen in recent years, and explored how ML techniques can be utilized to enhance the country's efforts in combating this financial crime. The datasets for this study were obtained from kaggle website that contains fraudulent transactions on money laundering, which was used to train, validate and test the ML models. Logistic regression (LR) was used as the baseline model and was compared with Random forest and sparse autoencoder (SAE) neural network. The results indicate that LR classifier still showed reasonable performance but did not outperform the other models. Among all the measures, SAE neural network model exhibited outstanding performance, with over 90% prediction accuracy. The amount of money transferred and location of transactions emerged as top features for predicting money laundering transactions in online money transfers. These findings suggest that further research is needed to enhance the logistic regression model, and sparse autoencoder neural network should be explored as potential tool for law enforcement agencies and Nigeria financial institutions to proactively detect money laundering activities.

**Keywords:** Machine Learning, Revolution, Money Laundering, Algorithms, Artificial Intelligence

**FAPSCON24/CSC/010**

**DEVELOPMENT OF A DEEP LEARNING-BASED CYBER SECURITY FRAMEWORK FOR SECURING DIGITAL SUPPLY CHAIN MANAGEMENT**

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**ABSTRACT**

Digital Supply Chains (DSCs) represent a sophisticated, value-driven, and efficient process where suppliers, partners, companies, and dealers interact through the exchange and generation of information.

Their inherent complexity and interconnectedness, however, also render them highly susceptible to cyberattacks. This research proposed an innovative deep learning framework designed to **enhance** the security and resilience of these critical networks. Utilizing advanced machine learning techniques, the framework aims to proactively identify anomalies, forecast emerging threats, and effectively manage cyber incidents. A hybrid deep learning model was crafted and assessed using the Feature-Driven Development (FDD) methodology alongside a Kaggle dataset. The evaluation revealed a notable enhancement in detection accuracy, reaching 80.12%, compared to traditional methods. This study advances the development of robust cybersecurity strategies to protect digital supply chains.

**Keywords:** digital supply chain, cyber security, deep learning, anomaly detection, threat prediction, FDD, Kaggle

**FAPSCON24/CSC/011**

**DEVELOPMENT OF A HYBRID INTELLIGENT INTRUSION DETECTION AND PREVENTION SYSTEM FOR ENHANCING SECURITY IN THE INTERNET OF MEDICAL THINGS**

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**ABSTRACT**

The Internet of Things (IoT) revolutionizes everyday life by connecting physical objects through the internet. Healthcare is a prime beneficiary of this technology. The Internet of Medical Things (IoMT) leverages IoT to remotely monitor patient data, facilitating improved diagnosis and treatment. It has revolutionized healthcare, enabling remote patient monitoring and improved diagnosis. However, the interconnectedness of medical devices also creates vulnerabilities for cyberattacks, posing significant risks to patient safety. This research proposes a hybrid intelligent intrusion detection and prevention system to safeguard IoMT environments. By combining Support Vector Machine, K-Nearest Neighbors, and Naïve Bayes algorithms, the system effectively detects network intrusions and anomalies in sensor data. Using the Feature-Driven Development (FDD) methodology and Python programming, we developed and evaluated the system on a Kaggle dataset. Results demonstrate a significant improvement in detection accuracy compared to individual models, achieving an accuracy rate of 80.12% with the hybridized approach.

**Keywords:** IoMT, cybersecurity, intrusion detection, machine learning, SVM, KNN, Naïve Bayes

**FAPSCON24/CSC/012**

**AI APPLICATIONS IN CYBERSECURITY AND THREAT DETECTION**

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**ABSTRACT**

The rapid advancement of artificial intelligence (AI) has significantly transformed the field of cybersecurity and threat detection. AI technologies, such as machine learning, deep learning, and natural language processing, have become essential tools in identifying and mitigating cyber threats in real-time. These technologies enable the analysis of vast amounts of data, allowing for the detection of patterns and anomalies that may indicate potential security breaches. AI-powered systems can adapt to new and evolving threats, offering proactive defense mechanisms that traditional security measures may fail to provide. This paper explores the various AI applications in cybersecurity, including intrusion detection systems, threat intelligence platforms, and automated response mechanisms. Additionally, it examines the challenges and ethical considerations associated with AI in cybersecurity, emphasizing the need for robust

frameworks to ensure the effective and secure deployment of AI-driven solutions. The integration of AI in cybersecurity not only enhances the ability to detect and respond to threats but also offers a scalable and efficient approach to safeguarding digital assets in an increasingly complex and interconnected world.

**Keywords:** security, cyber security, AI-powered, patterns, anomalies

**FAPSCON24/CSC/013**

**DEVELOPMENT OF A REINFORCEMENT LEARNING-DRIVEN PERSONALIZED TREATMENT RECOMMENDATION SYSTEM FOR CHRONIC DISEASES**

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**ABSTRACT**

Chronic diseases, such as diabetes, heart disease, and cancer, pose a significant challenge to healthcare systems globally, requiring personalized and adaptive treatment approaches. Traditional disease management strategies often fail to account for individual patient characteristics, disease progression, and dynamic treatment responses. Reinforcement learning (RL), a branch of machine learning, offers a promising framework for developing personalized treatment recommendation systems that can continuously learn and adapt to optimize patient outcomes. This paper presents the development of an RL-driven personalized treatment recommendation system for chronic diseases. The proposed system employs a reinforcement learning framework to learn optimal treatment policies by considering patient-specific data, including clinical history, biomarkers, and treatment records. The RL algorithm is designed to balance exploration of new treatment options and exploitation of proven effective treatments, continuously updating the recommendations as the patient's condition evolves. The successful development and deployment of this RL-driven personalized treatment recommendation system have the potential to significantly improve the management of chronic diseases, leading to better patient outcomes, enhanced clinical decision-making, and reduced healthcare costs.

**Keywords:** Reinforcement Learning, Personalized Treatment, Chronic Diseases, Adaptive Decision-Making, Interpretability, Healthcare Informatics

**FAPSCON24/CSC/014**

**COMMUNICATION TECHNOLOGY AND THE ICT REVOLUTION: TRANSFORMING SOCIETIES AND ECONOMICS**

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**ABSTRACT**

The advent of Information and Communication Technology (ICT) has revolutionized societies and economies worldwide, reshaping the way individuals communicate, interact and conduct business. This paper explores the profound impact of ICT on various aspects of society and the economy. It delves into the transformative power of communication technologies, such as the internet, mobile devices, and social media platforms, in fostering connectivity, knowledge dissemination and socio-economic development.. The ICT revolution has accelerated globalization by bridging geographical barriers and facilitating

instantaneous communication access borders. It has empowered individuals, businesses, and governments with unprecedented access to information, enabling enhanced decision-making processes and fostering innovation and creativity. Moreover, ICT has democratized access to education, healthcare, and financial services, narrowing the digital divide and empowering marginalized communities. In the economic realm, ICT has catalyzed the emergence of digital economies characterized by e-commerce, online marketplaces, and digital payment systems. These developments have disrupted traditional business models spurring entrepreneurship and job creation while transforming supply chains and consumer behavior. The ICT revolution has however, also presents some challenges, including digital inequality, privacy concerns, cybersecurity, threats, and the erosion of traditional social structures. Addressing these challenges require comprehensive policy frameworks that promote digital inclusion, protect privacy rights and enhance cybersecurity measures. In conclusion, communication technology and the ICT revolution are driving transformative changes in societies and economies worldwide. By harnessing the potential of ICT responsibly and inclusively, stakeholders can unlock new opportunities for sustainable development and human progress in this digital age.

**Keywords:** communication technology, ICT REVOLUTION, economic growth, high income, middle income

**FAPSCON24/CSC/015**

### **ENHANCING IOT DEVICE SECURITY: A HYBRID FRAMEWORK UTILIZING MACHINE LEARNING AND K-MEANS CLUSTERING MODELS**

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**ABSTRACT**

The modern era is characterized by the widespread use of Internet of Things (IoT) devices, which connect a variety of physical devices to the internet and allow for seamless communication and data transfer. However, the increasing reliance on IoT devices has also led to concerns about their security. In order to address these concerns, the researchers proposed a framework that integrates machine learning and K-means clustering models to address the increasing concerns around the vulnerability of IoT devices. By utilizing machine learning algorithms, the framework can continuously learn and adapt to new threats, thereby creating a robust defense mechanism. Additionally, the inclusion of K-means clustering models allows for the identification and grouping of similar devices to improve overall network security. To evaluate the performance of the framework, a series of experiments on a dataset of real-world IoT device data was conducted. The results demonstrate the effectiveness of this approach in detecting and preventing security threats in IoT devices. The framework was compared with existing methods and its superiority in terms of accuracy and efficiency was shown. The study concludes that the use of machine learning and K-Means clustering models can effectively detect and prevent security threats in IoT devices, making them more secure and trustworthy for everyday use.

Keyword: Machine Learning, K-Means Clustering, Models, IoT Device

**FAPSCON24/CSC/016**

### **LEVERAGING NLP AND DEEP LEARNING FOR PHISHING DETECTION AND ANTI-PHISHING TRAINING IN NIGERIA: A FOCUS ON LOCALIZED TACTICS AND CULTURAL FACTORS**

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#### **ABSTRACT**

Phishing attacks remain a significant cybersecurity threat globally, with developing nations like Nigeria facing unique challenges due to localized tactics and cultural factors. This paper presents a novel

approach to phishing mitigation in Nigeria, leveraging Natural Language Processing (NLP) and Deep Learning techniques to enhance both automated detection and user training. Our research addresses the gap between technical solutions and human-centered approaches by developing an integrated framework tailored to the Nigerian context. We first analyze a corpus of Nigeria-specific phishing attempts, identifying linguistic patterns and cultural references commonly exploited by attackers. Using this data (1,000,230 Urls, and locally relevant data), we trained a deep learning model capable of detecting localized phishing content with high accuracy. The model's architecture incorporates attention mechanisms to focus on contextually relevant features, improving performance on Nigeria-specific threats. NLP techniques was employed to analyze the linguistic patterns, content, and context of phishing emails, websites, or messages. A Hybrid Deep learning models- recurrent neural networks (RNNs) and transformer-based models (BERT), was trained on large datasets of phishing and legitimate samples to learn discriminate features and classify new instances. Building on this technical foundation, we design a dynamic anti-phishing training program that adapts to individual user behavior and local phishing trends. The system employs NLP to generate culturally relevant simulated phishing scenarios, providing users with realistic and engaging learning experiences. We evaluate the effectiveness of this integrated approach through a large-scale study involving Nigerian internet users across diverse demographic groups. Our results demonstrate significant improvements in both automated phishing detection rates and user resilience to social engineering tactics. precision: 0.89, Recall: 0.94, f1-score: 0.92, support 185, and F1 Score: 1.00 This research contributes to the field by showcasing the potential of combining advanced AI techniques with culturally informed strategies to create more effective, localized cybersecurity solutions. The proposed framework offers a model for addressing phishing threats in other regions with distinct cultural and linguistic landscapes.



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**A LITERATURE REVIEW ON CURRENT STATE OF THE ART TECHNIQUES FOR THE DETECTION OF BOTNET AND MANAGMENTS**

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**ABSTRACT**

Today, cyberspace has witnessed a surge in sophisticated attacks, with botnets standing out as one of the popular attack models for cybercrime. A botnet is a network of compromised computers that are controlled by a single entity, known as the botmaster. The aim of this conference paper was to present a literature review on current state-of-the art techniques applicable for the detection of botnet, identify drawbacks, and recommend solutions. The methodology used was a top down approach, beginning with data collection of articles from index journals such as Scopus, Google Scholar, Research Gate, and Web of Science. These papers were critically studied considering techniques, work done, contribution to knowledge and results. The findings from the paper were applied to build the argument of the research and research gap identified. Suggestions such as need for a data model which considers emerging botnet features, advancement in machine learning algorithm and clear success metrics were all made as solution to facilitate a reliable model for botnet classification in real-time. Recommendations were made on the need to adopt the proposed solution in modeling future botnet frameworks for a reliable cyber security solution.

**Keywords:** botnet, cyber security, algorithms, threat, data structure, data collection, research gap

**FAPSCON24/CSC/018**

**EMPOWERING NIGERIA'S WORKFORCE FOR THE 4 TH INDUSTRIAL REVOLUTION: LEVERAGING ARTIFICIAL INTELLIGENCE TO BRIDGE THE SKILLS GAP**

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**ABSTRACT**

The role of artificial intelligence in the global economy cannot be overemphasized as it has revolutionized every field of human endeavor with ground-breaking innovative solutions. It is important to state that artificial intelligence (AI) is the key driving force of the Fourth Industrial Revolution with the combination and integration of digital, biological, and physical technologies. Artificial Intelligence is central to this transformation, propelling economic growth, increasing productivity, and stimulating innovation. This paper examines how AI can improve and can be adopted into the Nigerian economy and workforce by integrating and leveraging AI tools in various sectors of the economy as they could be deployed to bridge the skills gap in the labour force, making it a more competitive player in the global digital economy. This paper highlights how Nigeria can leverage artificial intelligence to bridge the skills gap in its labour force and position itself as a more competitive player in the global digital economy. It provides a deep analysis of the current state of the labour market in Nigeria, identifying key challenges and opportunities for AI integration. The report highlights the important sectors where AI can be effectively utilized, such as oil and gas, education, agriculture, Banking and manufacturing, and offers practical, actionable recommendations for the successful implementation of it across various industries, aiming to enhance productivity, drive innovation, and promote sustainable economic growth.

**Keywords:** workforce, artificial intelligence, digital economy, Industrial Revolution, AI integration

**FAPSCON24/CSC/019**

**DEVELOPMENT OF A FRAMEWORK FOR AN OPTIMIZED SIGNAL STRENGTH DIFFERENCE FOR METROPOLITAN WI-FI LOCATION ESTIMATION.**

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**ABSTRACT**

This study presents an Optimized Signal Strength Difference (OSSD) framework for indoor location estimation using Wi-Fi signals. The OSSD framework improves upon traditional Signal Strength Difference (SSD) methods by using three access points (APs) instead of two, increasing accuracy and fault tolerance. The framework employs a client/server architecture and terminal-assisted approach to collect signal strength fingerprints from the APs. Testing in an office corridor with three TP-Link wireless APs achieved a 93% success rate in locating objects in real time. The OSSD framework demonstrated fault tolerance, maintaining performance even when one AP failed. Results showed a location precision of over 90% at 2.0 meters and an average median error distance of 0.92 meters. The OSSD framework offers advantages over traditional SSD methods, including improved accuracy and fault tolerance. It can be deployed to augment existing Wi-Fi location estimation methods and is suitable for various applications requiring uninterrupted operation in a metropolitan setup, such as healthcare, retail, and industrial settings. Overall, the OSSD framework provides a reliable and accurate solution for indoor location estimation using Wi-Fi signals.

**Keywords:** Location, WI-FI Signals, Signal Strength, Fault Tolerance and Estimation

**FAPSCON24/CSC/020**

**ONLINE MEDICAL RECORD INFORMATION MANAGEMENT SYSTEM WITH SMS AND EMAIL NOTIFICATION**

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**ABSTRACT**

This paper looks at developing an online medical record information management system with SMS and email notification. Existing medical record information systems lack SMS and email notification. Hence, doctors, other medical workers and, patients find it difficult to access medical records without physically visiting the hospital. Online medical record management system enables doctors, other medical workers

and patients to manage schedules and exchange medical information online using SMS and email notification. Object-Oriented Analysis and Design Methodology was used in the development. HTML, CSS, JavaScript and PHP were used for coding at the front-end. MySQL was used at the back-end. AE-FUNAI Federal teaching hospital Abakaliki was used as a case study. The system gives room for doctors and other medical workers to schedule appointment with patients via SMS and email notification. Patients in turn can also book appointment with the doctor or other medical workers via SMS and email. Appointment reminder and confirmation are also gotten through SMS or email. Rescheduling of is done through the SMS or email. Laboratory examination test results could also be sent through the same means. This system therefore builds a database of patients' medical records that facilitate easy access to patient's record from any location in the world. It helps doctors to offer the best quality of medical care to patients since they can easily view the patients' medical records online give patients updates regarding the schedules using SMS or email. The system also helps patients to obtain quality medical care by enabling them to easily share their medical records with their new doctors incase thy travelled to a new location

**Keywords:** medical Records, Notification, SMS, appointment, Patients medical workers

**FAPSCON24/CSC/021**

**ADDRESSING CHALLENGES OF HEATH CARE LABELING AND CLASSIFICATION THROUGH LITERATURE REVIEW**

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**ABSTRACT**

Health care labeling and classification are essential for accurate diagnosis, treatment, and care delivery, yet they face significant challenges such as inconsistencies in labeling, data integration issues, and variations in classification standards. This review addresses these challenges by exploring recent advancements in the field, focusing on how artificial intelligence (AI) and machine learning (ML) can enhance consistency and accuracy in healthcare data labeling and classification. Through a systematic literature review of studies published between 2015 and 2023, the review identifies key obstacles, including inconsistent labeling practices, limited data interoperability, and difficulties integrating data from multiple sources. The review also examines the use of AI and ML technologies to automate and standardize labeling processes, along with the role of big data analytics and electronic health records (EHR) in improving classification accuracy. Solutions proposed include adopting unified labeling standards, enhancing interoperability across systems, and leveraging advanced AI and ML models for scalable, consistent data classification. These advancements aim to address the pressing need for improved data management and classification in healthcare, ultimately enhancing patient care and outcomes.

**Keywords:** healthcare labeling, classification, artificial intelligence (AI), machine learning (ML), data interoperability, electronic health records (EHR)

**FAPSCON24/CSC/022**

**A DEEP CLUSTERING APPROACH FOR MEDICAL IMAGE CLASSIFICATION IN HEALTHCARE**

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### ABSTRACT

Medical image classification is essential for diagnosing and treating diseases. This paper introduces a deep clustering approach tailored for medical image classification, employing Mobile-Net for feature extraction alongside a Clustered-Based Neural Network (CBNN) for classification. Mobile-Net, a lightweight convolutional neural network, effectively extracts rich, discriminative features from medical images. These features are clustered using CBNN, enhancing classification accuracy and efficiency. The methodology consists of a two-step process: first, training the Mobile-Net model on a comprehensive dataset of medical images to capture relevant features; second, feeding these features into the CBNN, which organizes them based on inherent similarities for classification. This clustering approach reduces intra-class variability and boosts the classifier's discriminative capabilities. Experimental results reveal that this deep clustering method significantly outperforms traditional deep learning models in classification performance. The proposed system is rigorously evaluated using medical image datasets, demonstrating high accuracy and robustness across various medical conditions. This approach offers a promising solution for efficient and accurate medical image classification, particularly in resource-limited healthcare settings.

**Keywords** Medical Image Classification Deep, Clustering, Mobile-Net, Clustered-Based Neural Network (CBNN), Feature Extraction, Healthcare Technology!



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### INTEGRATING AI AND INNOVATIVE TECHNOLOGIES FOR ENVIRONMENTAL PRESERVATION: SUSTAINABLE SOLUTIONS TO CLIMATE CHANGE

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### ABSTRACT

This paper explores the critical intersection between artificial intelligence (AI), innovative technologies, and environmental preservation, focusing on the development of sustainable solutions to address the challenge of climate change. The primary objective of this study is to investigate how AI-powered technologies and other innovative approaches can be strategically employed to enhance environmental monitoring, optimize resource management, and drive informed, data-driven decision-making processes that are crucial for mitigating the devastating impacts of global warming and environmental degradation. The research methodology employed in this work involves a comprehensive analysis of diverse AI applications, innovative technological solutions, and their potential to tackle environmental issues. The study utilizes a range of analytical tools, including machine learning algorithms, predictive modeling, and optimization techniques, to uncover innovative solutions that can contribute to the long-term preservation and protection of our planet, as well as the well-being of current and future generations. The analysis and findings of this paper demonstrate the transformative potential of integrating the predictive capabilities, pattern recognition, and optimization abilities inherent to AI, as well as the power of innovative technologies to address environmental challenges. By strategically applying these AI-powered and innovative solutions, the study aims to provide practical recommendations for policymakers, environmental organizations, and technology innovators on how to effectively utilize these tools to address the critical challenges posed by climate change and environmental sustainability. The results of this research offer valuable insights into the synergistic relationship between artificial intelligence, innovative technologies, and environmental preservation, paving the way for the development of sustainable solutions that can contribute to the conservation, restoration, and responsible management of our planet's natural resources and ecosystems.



**Keywords:** Artificial Intelligence (AI), Environmental Sustainability, Climate Change, Environmental Monitoring, Resource Management, Data-driven Decision-making

**FAPSCON24/GLY/001**

**SEQUENCE STRATIGRAPHY FRAMEWORK OF COASTAL SWAMP TO OFFSHORE  
DEPOBELT OF THE NIGER DELTA BASIN NIGERIA**

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**ABSTRACT**

Sequence stratigraphy of coastal swamp to offshore depobelt of the Niger Delta Basin were studied to erect stratigraphic framework, reservoir and source rocks potentials within the oil wells. Biostratigraphic data (foraminifera and palynology), wireline logs data were used in this study. The research methods applied are delineation of biozones from the biofacie data, erection of sequence stratigraphic framework and establishing genetic correlation across the wells. Six Foraminifera zones (F9500 to F9800) and ten Palynology zones (P740 to P880) were identified. Seven sequence boundaries (SB) 12.1 Ma to 4.1Ma which mark the onset of marine flooding and turnarounds from progradational facies to retrogradational facies during sequence buildup were delineated. Seven maximum flooding Surfaces (MFS) 12.8Ma to 3.9 Ma which characterized by marker shales, high faunal abundance and diversity were identified and correlated along the strike line of two wells base on their key stratigraphic surfaces which showed sediments thickening from landward to basinward region. Three SPDC depositional cycles were delineated. The delineated sequences comprises of lowstand system tract (Progradational packages), Transgressive system tract (Retrogradational packages) and High stand system tract (Aggradational packages) which reflect depositional systems deposited during different phases of sea level rise and fall. These two wells were deposited within the Agbada Formation and Mid-Miocene to early Pliocene Epoch. This research has enhance stratigraphic resolution of the reservoir units of the wells within these depobelts, and their depositional geometry for further studies in the Niger Delta Basin.

**Keywords:** Sequence Stratigraphy, Biostratigraphy, Miocene, Pliocene, Niger Delta Basin.

**FAPSCON24/GLY/002**

**GEOPRESSURE AND GEOTHERMAL REGIMES IN THE EASTERN PARTS OF THE  
SHALLOW OFFSHORE, NIGER DELTA: IMPLICATIONS FOR EXPLORATION SUCCESS  
AND DRILLING SAFETY**

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**ABSTRACT**

The assessment of geopressure and geothermal regimes is important for successful hydrocarbon

exploration and ensuring drilling safety. This study focuses on the JK-001 and KI-001 wells in the shallow offshore regions of the Niger Delta, employing advanced industry-standard to predict pore pressures and analyze the corresponding geothermal gradients. The study highlights the necessity of integrating post-drilling well testing data with pressure and temperature profiles to determine true exploration success, beyond initial hydrocarbon indications from logs, mudlogging or drill cutting shows. Through detailed analysis of the well data using industry software, including pretest data from offset wells JK-1B and KI-1B, the research identifies relationships between reservoir pressures, geothermal gradients, and their influence on well productivity. The modelling considered a pressure range of 255 to 345 bars and corrected reservoir temperatures of 80-90 °C (over a regional geothermal gradient of 22 – 89°C). The reservoir thickness was an average of 110 m, of 200 – 300 mD permeability, over a drainage area of 200 acres. Fluid parameters were based on a gas gravity of 0.8 (sp. gravity), oil gravity of 35 API and water salinity of ±20,000 ppm. Dietz shape factor of 30.26 was determined by the X-Y (length - width) of the reservoir as shown by well test data. Sensitivity testing further reveals that variations in reservoir pressures and temperature gradients can significantly impact the success of exploration wells, underscoring the need for precise pressure-temperature prediction and geopressure modeling in well planning. The findings indicate that merely detecting hydrocarbons during initial drilling phases is insufficient to declare exploration success. Well testing and data integration, considering the unique geopressure and geothermal characteristics of the region, are essential for validating productive reservoirs. This study provides a framework for enhancing drilling safety and optimizing exploration strategies in geopressure environments.

**Keyword:** P-shale, P-reservoir, Heat capacity, Well test, Fluid gradients

**FAPSCON24/GLY/003**

**EVALUATION OF FOUNDATION SOILS OF SOME COLLAPSED BUILDINGS USING  
GEOPHYSICAL AND GEOTECHNICAL METHODS IN PARTS OF ANAMBRA STATE,  
NIGERIA**

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**ABSTRACT**

Sustainable engineering facilities require adequate knowledge of the subsoil that host the foundation in order to avoid frequent collapse incidents as prevalent in the study area. A combination of geophysical (Vertical Electrical Sounding, VES) and geotechnical (Cone Penetration Test, CPT) methods were employed in checking the foundation soils of twelve (12) collapsed buildings, four sites each from the three senatorial zones in Anambra State. In Anambra north senatorial zone, the geoelectric sections show five (5) to six (6) varying layers made up of topsoil, dry sand, shale, water-saturated sand, clay and ironstone with moderate CPT (20 - 60 kg/cm<sup>2</sup>) values except in one of the sites where lignite seam was intersected and resistivity values of 20 - 6434 Ωm. In Anambra central senatorial zone, topsoil, dry sand, shale/mudstone, water-saturated shaly sand, silty shale, sandy shale and water saturated sand were revealed with CPT values of 5 - 40 kg/cm<sup>2</sup> and resistivity values of 1 - 774 Ωm. In Anambra south senatorial zone, topsoil, shale, clay, dry sand, clayey sand, water-saturated sand and shaly sand were the identified layers with CPT values of 5 - 35 kg/cm<sup>2</sup> and resistivity values of 182-3065 Ωm. The predominance of clayey, silty and shaly/muddy soils with low resistivity and CPT values and the presence of lignite seam in the north could have contributed to the building failures in the State. Raft foundations with foundation depth beyond 2.0 m is recommended when considering multi-floor buildings in the study area.

**Keywords:** Foundation, Collapse, Subsoil, Vertical Electrical Sounding, Cone Penetration Test

FAPSCON24/MTH/001

GENERALIZED TECHNIQUE FOR CONSTRUCTING THE CLOSED FORM OF THE GENERATING FUNCTIONS OF CERTAIN CLASSES OF SEQUENCES

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ABSTRACT

We develop a generalized technique for constructing the closed form of the generating functions of sequences of the form

$f_{m+1} = k(f_m + m^k)$  for all  $m \geq 0, k > 0$  and  $f_0 = 0$  and  $f_{m+1} = k(f_m + (m-1)^k)$  for all  $m \geq 1, k > 0$  and  $f_1 = 0$  using method of differencing in generating function. Also, the techniques of generating functions were applied to solve some important problems of recurrence relations. The findings of this study provide generalized technique and fast method of obtaining the closed form of the generating functions of sequences of the form

$f_{m+1} = k(f_m + m^k)$  for all  $m \geq 0, k > 0$  and  $f_0 = 0$  and  $f_{m+1} = k(f_m + (m-1)^k)$  for all  $m \geq 1, k > 0$  and  $f_1 = 0$ .

**Keywords:** Generating function, recursive sequence, closed form, Sequence of numbers and differencing in generating function.

FAPSCON24/MTH/002

OPTIMALITY CONDITIONS FOR THE RELATIVE CONTROLLABILITY OF SEMILINEAR FRACTIONAL STOCHASTIC INTEGRO-DIFFERENTIAL SYSTEMS WITH DISTRIBUTED DELAYS IN THE CONTROL IN BANACH SPACES

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ABSTRACT

In this work, Systems of Semilinear Fractional Stochastic Integro-differential Systems with Distributed Delays in the Control in Banach Spaces of the form given as System (1.1) were presented for Optimality Conditions analysis with a view to: obtain and establish necessary and sufficient conditions for the system to be Optimal Controllable, the existence and form of the Optimal Control if it exists. From the results, we have stated and established the necessary and sufficient conditions for the existence of an Optimal Control of the system, and the system is Optimally Controllable. The form of the Optimal Control was obtained and established. Uses were made of the context of the game of pursuit, the intersection property of two compact set functions, the controllability standards, the concept of limit of sequences in a compact set function and the continuity property of the reachable set. The mild solution of the system was cultivated and the set functions upon which our study hinges were extracted from the mild solution. Uses were made of the variation of constant formula, the Unsymmetric Fubini theorem, the Lebesgue Stieltjes sense of integration and the definition of the  $n \times m$  matrix function  $H^*(s, \beta)$ . This work contributes to knowledge by having extended the concept of controllability and/or optimal optimal controllability of the Systems of Semilinear Fractional Stochastic delay Integro-differential Systems with one point Control to the Systems of Semilinear Fractional Stochastic Integro-differential Systems with Distributed Delays in the Control. Thirdly, the form of an optimal control of such a system was established.

**Keywords:** Semi linear, Distributed Delay, Optimality Conditions, Controllability and Signum Function.

**FAPSCON24/MTH/003**  
**NEW EXACT SOLUTIONS OF AN ILL-POSED BOUSSINESQ EQUATIONS VIA DOUBLE REDUCTION THEORY**

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**ABSTRACT**

In this work, we use the Lie symmetry analysis, conservation laws and double reduction methods to study the ill-posed Boussinesq equation which arises in shallow water waves and non-linear lattices. As a result, several new exact solutions are obtained.

**Keywords:** Double reduction theory, conservation laws, Lie symmetry method, associated symmetry

**FAPSCON24/MTH/004**  
**THE RATIONAL POLYHEDRON ON AN  $n \times m$  BOARD WITH SOME APPLICATION ON INTEGRAL POLYHEDRAL**

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**ABSTRACT**

In this paper the authors carried some studies to investigate the rational polyhedron and the integer linear program that is equivalent to its linear program relaxation such that the optimal solution is maintained within the feasible region. However, the field of integer programming has achieved great success in academic and business world. The main goal of this paper is to gather similar requirements and policies from different problems in different field to form a new general model. In addition, we discussed the general linear programming technique and the convex hull of the integral linear program vectors in  $P$  with  $P_I$  as the integer hull. Furthermore, we constructed the case where both integer linear programming problem and linear programming problem are feasible and having an optimal objective for integer linear program and optimal solution for linear program relaxation. Finally, we applied it to combinatorial problems to obtained an optimal objective for the integer linear program that is less than or equal to the optimal solution of a linear program relaxation.

**Keywords:** *Integer-programming models; combinatorial structures; rational polyhedron; feasible region.*

**FAPSCON24/MTH/005**  
**MACHINE LEARNING APPROACH FOR MODELING AND PREDICTING STOCK MARKET DYNAMICS**

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**ABSTRACT**

This research seeks to contribute to the evolving landscape of financial forecasting by proposing an innovative and comprehensive machine learning framework for modeling and predicting stock market dynamics, while considering the impact of beta on model performance. With the unprecedented growth of financial data and the increasing complexity of global markets, traditional models are often limited in their ability to capture the intricate patterns and volatilities inherent in stock price movements. The primary objective of this research is to develop a robust and adaptive machine learning model that leverages advanced techniques in data analysis, feature engineering, and algorithmic optimization, while accounting for the effect of beta, to enhance the accuracy and reliability of stock market predictions. The study will explore a diverse range of machine learning methodologies, including but not limited to deep learning, ensemble methods, and reinforcement learning, to extract meaningful insights from historical market data and adapt to changing market conditions, with particular attention to how beta influences the performance of these methodologies.

**Keywords:** Machine learning, Beta, volatilities, future engineering, algorithmic optimization, ensemble, deep learning, reinforcement learning.

FAPSCON24/MTH/006

**SOLUTIONS TO SYSTEMS OF ANOMALOUS TRIPLE-VARIABLE SIMULTANEOUS EQUATIONS: ONE LINEAR, ONE QUADRATIC AND ONE CUBIC, WITHOUT USING THE USUAL FACTOR OR LONG DIVISION METHOD**

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**ABSTRACT**

*In this study we introduce the Anomalous Triple-Variable Simultaneous Equations, One Linear, One Quadratic and One Cubic otherwise described as a system of 'Vicious Circle'. We obtained the remainder roots ( $rr$ ),  $\alpha_2$  and  $\alpha_3$  provided that  $\alpha_1$  is a known factor of any cubic function. These remainder roots ( $rr$ ) can be obtained without using the usual long division of the polynomial. In past,  $f(x)$  is divided with  $x-\alpha$  to obtain another function and its remainder,  $g(x) + R$ . Present result shows no remainder term and that  $f(x) = g(x)(x-\alpha)$  where  $g(x)$  is always a quadratic function. Since only a factor is needed as take-off grant for the system, being proffered we now have the 'remainder function' always in quadratic form. Therefore by using the sum of the remaining roots and their products, (ie:  $k_2 + k_3 = b$  and  $k_2 k_3 = c$  where  $b, c$  are constants.) We arrived at such complete results for all cases of cubic functions. This guarantees that any cubic function:  $f(x) = g(x)(x-\alpha) \rightarrow g(x) = (x-k_2)(x-k_3)$ , hence  $f(x) = (x-k_1)(x-k_2)(x-k_3)$ . The multiplier effect of this result will no doubt ameliorate in its application in both ODE and PDE with respect to cubic order Differential Equation (DE) problems.*

**Keywords:** Anomalous Systems: 'Vicious Circle', Triple Factors, Remainder roots/function

FAPSCON24/OTH/001

**DESIGN AND CONSTRUCTION OF A WIRELESS SENSOR NETWORK (WSN) BASED**

**SMART FARM SYSTEM FOR IRRIGATION AND FLOOD MONITORING**

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**ABSTRACT**

Agriculture is one of the most important sectors that accounts for economic growth in the developing countries of the world. Many developing countries are now focusing on agricultural led development, yet the sector is not without challenges including climate changes, drought, flooding to mention but a few. This results in poor yield of agricultural products. This work shall develop a robust smart system to enhance both irrigation and flood monitoring and control, leveraging on Wireless Sensor Networks (WSNs) to boost agricultural production. In the system's implementation, Arduino based instrumentation, integrated with temperature, soil moisture and water level sensors shall be adopted to monitor the agricultural environment, while reporting the status wirelessly through the Radio Frequency (RF) modules to the base station. The base station shall evaluate the received data and either activates or deactivates the irrigation or drainage pump using specified threshold values. This work shall be validated by using an experimental test bed, which shall be used for field experiments, data collection and evaluation. The results of this work shall highlight the potentials of WSN technology in monitoring and control of both irrigation and flooding within the farm and in turn boost the productivity.

**KEYWORDS:** Arduino, Wireless Sensor Network, Smart Farm System, Irrigation, Flood Monitoring



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**FAPSCON24/OTH/  
002**

**BUILDING NIGERIAN SKILLS AND CAPABILITIES FOR THE 4TH INDUSTRIAL  
REVOLUTION (4IR)**

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**ABSTRACT**

The 4th Industrial Revolution (4IR) is transforming the global economy, driven by technological advancements in artificial intelligence, blockchain, robotics, and the Internet of Things. Nigeria, with its large youth population and growing economy, has a great potential of leveraging the opportunities presented by the 4IR. However, to fully harness its potential, Nigeria must develop the necessary skills and capabilities to compete in an increasingly automated and technology-driven world. This paper examines the current state of Nigeria's workforce and education system, identifies key skills and educational gaps, and proposes strategies for building the necessary skills and capabilities to thrive in the 4IR. These strategies include investing in Science, Technology, Engineering and Math (STEM) education, promoting vocational training, skill acquisition and lifelong learning, and fostering public-private partnerships to support innovation and entrepreneurship. By building a skilled and adaptable workforce, Nigeria can key into the benefits of the 4IR and achieve sustainable economic growth and development. Furthermore, it emphasizes the role of government policies and initiatives in creating an enabling environment for 4IR adoption. By building Nigerian skills and capabilities, the country can unlock its potential, drive economic growth, and participate fully in the 4IR.

**KEYWORDS:** 4th Industrial Revolution, Artificial Intelligence, Economic Growth, Entrepreneurship, STEM

FAPSCON24/OTH/003

**AI APPLICATION TO RENEWABLE ENERGY GENERATION FOR OPTIMAL POWER  
PERFORMANCE IN NIGERIA**

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**ABSTRACT**

This article explores the prospects of Renewable Energy generation through the application of AI for optimization of alternative energy generation in Nigeria. Renewable energy sources (RES) is gradually gaining ground in many parts of the world partly due to their mostly green nature and also the tendency to reduce maintenance cost. To a certain extent, Nigeria is not totally left behind in the use of renewable energy resources. The reality in the country power supply has persistently called for alternative energy to reduce load on the national grid. One of the challenges of renewable energy sources as alternative to conventional energy generation from non-renewable sources is unpredictability of energy production because of their dependency on time and season which makes dependability more difficult. Artificial Intelligence as a branch of technology has revolutionized many areas of human endeavor and has the capacity for prediction of trends of production that avail the proper evaluation of performance and better management of resources which lead to an overall improved efficiency. This article therefore discusses the involvement of artificial intelligence in optimization of renewable Energy generation in the area of sources prediction, system design and regulated distribution of the generated and stored energy. This will definitely help in planning of grid connectable Microgrids and standalone systems for better performance, in view of current electricity situation in Nigeria and the benefits of growing our use of renewable energy alternatives with involvement of artificial intelligence.

**KEYWORDS:** Renewable Energy, Artificial Intelligence, Optimal Power Performance, Alternative Energy



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FAPSCON24/OTH/004

**BUILDING NIGERIANS SKILLS AND CAPABILITIES THROUGH TECHNOLOGY FOR  
SUSTAINABLE DEVELOPMENT**

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**ABSTRACT**

The rate at which the Nigerian Youth is increasing by the day is an informat to the government of the day to improve upon and increase technological base education for skills and capabilities building for the youth. The main objective of this paper is to examine the way Nigerians Skills and Capabilities can be built through technology for sustainable development focusing on exraying types of technologies and how they can transform into self reliance venture for sustainable development for the nation. Technology plays a pivotal role in advancing sustainable development by offering innovative solutions to address global challenges while promoting economic growth, social equity, and environmental stewardship through building Nigerians skills and capabilities. This paper explores the transformative potential of technology across various sectors, including renewable energy, agriculture, healthcare, and education, in advancing the Sustainable Development Goals (SDGs) set forth by the United Nations. By harnessing renewable

energy sources, implementing precision agriculture techniques, and leveraging healthcare and education technologies, societies can mitigate climate change, enhance food security, improve health outcomes, and op<sup>0</sup> democratize access to knowledge and learning opportunities. The Triple Bottom Line theory was adopted as a holistic approach that balances economic, social, and environmental considerations. However, the widespread implementation and effectiveness of sustainable technologies are hindered by significant barriers, including the digital divide, resource constraints, and inadequate policy frameworks. To overcome these challenges, suggestions were proposed, emphasizing the importance of promoting access and affordability, investing in research and development, strengthening policy frameworks, and fostering interdisciplinary collaborations. By implementing these suggestions and adopting a holistic approach that balances economic, social, and environmental considerations, stakeholders can unlock the full potential of technology to create a more sustainable and resilient future for generations to come.

**Keywords:** Sustainable development, Technology, Environmental sustainability, Social sustainability, Economic sustainability

**FAPSCON24/OTH/005**

**THE ROLE OF RENEWABLE ENERGY USE IN COMBATING CLIMATE CHANGE IN NIGERIA - WITH MAJOR FOCUS ON IHIALA LG AREA OF ANAMBRA STATE**

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**ABSTRACT**

Nigeria has for many years, relied on petrol for transportation and energy fuel. With charcoal and kerosene following, in order of usability amongst Nigerians. However, CO<sup>2</sup> emissions from burned petrol has adversely affected the Nigerian population in countless spheres and has skyrocketed Nigeria's place in the list of world's most polluted countries. Furthermore, in recent times, this has left Nigeria's climate to suffer and it's raised major concerns on the security of her agriculture and economic future etc. However, the acceptance and adoption of renewable energy against contemporary unrenewable energy source in majorly urban regions, has not only minimized pollution, but has also checked adverse climate change in these regions. This research seeks to explore a clear-cut relation between the usability of renewable energy and a better climate across the 36+ states of the federation. It also seeks to explore how leveraging renewable energy sources can contribute to national economic development. Renewable energy sources that include: solar energy, wind energy, hydro fuel and biogas fuel.

**Keywords:** Renewable energy, Nigeria, climate, pollution, economic development.

**FAPSCON24/OTH/006**

**INVESTIGATING THE RELATIONSHIP BETWEEN SKILL ACQUISITION IN FASHION DESIGNING AND THE DEVELOPMENT OF 4IR CAPABILITIES AMONG FASHION DESIGNERS IN DELTA STATE, NIGERIA**

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**ABSTRACT**

This study explored the relationship between skill acquisition in fashion designing and the development of 4IR (Fourth Industrial Revolution) capabilities among fashion designers in Delta State, Nigeria. It was guided by three research questions and one null hypothesis testing the significance of the relationship between skill acquisition and 4IR capability development. Employing a correlational research design, the study focused on Delta State, known for its vibrant fashion industry. The population consisted of 784 registered fashion designers, from which a sample of 392 was selected using stratified random sampling. Data were collected using a structured questionnaire that was validated by experts in fashion design and educational research, with a reliability coefficient of 0.85 established through a pilot study. The questionnaire was administered to the sampled designers, achieving a 90% response rate. Data analysis involved descriptive statistics to summarize skill acquisition and 4IR capabilities, and Pearson's correlation analysis to test the hypothesis. The findings revealed that while many designers had achieved moderate to high levels of skill acquisition, the development of 4IR capabilities remained limited, with a positive correlation between the two variables. The study concluded that enhancing skill acquisition was crucial for fostering 4IR capabilities and recommended targeted training programs, increased access to 4IR technologies, and supportive policies to bridge the capability gap and strengthen the fashion industry in Delta State.

**Keywords:** Skill Acquisition; 4IR Capabilities; Fashion Designing; Delta State

 **FAPSCON24/OTH/007**  
**COMPARISON OF DIFFERENT PROPAGATION MODELS FOR WIRELESS  
COMMUNICATION SYSTEM**  
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**ABSTRACT**

This paper gives insight on some of the propagation models in wireless communication systems used for distribution of signal propagation by the network providers. As signals propagates from the transmitter to the receiver, there are some theoretical and physical characteristics that may pose as obstacles on its path, such as reflection, absorption or scattering and diffraction. Radio propagation models can be broadly categorized into two types, the empirical or statistical models and the deterministic models. The empirical model are based on data collected from real-world measurements and are often used to predict radio wave propagation in a specific environment or scenarios, this includes linear and cubic measurements of cost 231 Hata model, Ericsson model, Erceg model, Standford University Interim (SUI), Free space propagation model, lognormal shadowing model, ECC-33 model etc. the deterministic models are the theoretical equations and laws in existence such as Maxwell's equations, laws of reflection, diffraction and scattering.

**Keywords;** propagation models, wireless communication, empirical and deterministic models.

**FAPSCON24/PHY/001**  
**GROWTH AND CHARACTERIZATION OF COPPER ALLOYED CADMIUM OXIDE THIN  
FILMS BY SOLUTION GROWTH DEPOSITION TECHNIQUE**

by  
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**ABSTRACT**

Copper alloyed cadmium oxide (Cu:CdO) thin films were successfully deposited on the pre-treated non-conducting microscopic glass substrates at the temperature range between 50°C to 60°C using solution growth techniques. The effect of deposition time, pH value and copper ions concentration. The structural, morphological, compositional and optical properties of the films were examined via X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray (EDX) and spectrophotometer respectively. The optical results revealed that the films have high absorbance in Ultra Violet (UV) region which decrease towards the Near Infra-red (NIR) region. The films have low transmittance in Ultra Violet (UV) region but high transmittance within Near Infra-red (NIR) region. The thin films also have low reflectance around the NIR region and maximum reflectance at the UV region. The deposited films have optical band gap energy range from 2.25 – 2.70 eV for variation on dopant concentration, 2.25 – 2.60 eV for variation in pH value and for variation in 1.95 – 2.30 eV dip time. Energy dispersive X-ray (EDX) result showed that Cadmium, Copper and Oxygen were deposited. Scanning electron microscopy (SEM) images revealed that the films are in clusters of different particle sizes and shapes. X-ray diffraction result revealed cubic structural phase of cadmium oxide. XRD result also showed that increase in dip time, pH value and dopant concentration led to increase in average crystallite size and improved structure. Dislocation densities and micro strain values decreased with increase in pH value, dip time and dopant concentration. The films have wide energy band gap which can be used for optoelectronic and thermoelectric device fabrication. From our findings, films grown at different deposition time, dopant concentration have high absorbance in the ultra violet region (UV). These films are good materials for window coating in the temperature regions of the world, (like in Nigeria) because all the harmful ultra violet (UV) rays will be absorbed by such films when used to coat the windows. This is a good substitute of the conventional costly air conditioner. Most of our grown thin films have high transmittance values at near infra-red (NIR). These films are good materials to coat the windows of our poultry where infra-red rays will be transmitted in high proportion to heat the young chicks instead of using kerosene stoves and lamps.

**Keywords:** Growth Deposition Technique, Copper Alloyed Cadmium Oxide, Near Infrared



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**FAPSCON24/PHY/  
002**

**STRUCTURAL AND OPTICAL PROPERTIES OF BLACK VELVET TAMARIND  
DOPED MAGNESIUM SULFIDE THIN FILMS GROWN BY SOL-GEL TECHNIQUE**

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**ABSTRACT**

The properties of CdS thin film crystals doped with locally grounded black velvet tamarind (VT) shell and deposited using a sol-gel method were investigated in the work to determine their suitable area of applications. Freshly prepared solutions of sodium silicate, tartaric acid, cadmium chloride and thiourea were the precursors used, while solution drops of the locally prepared grounded black velvet tamarind shells served as dopant. The grown crystals were subjected to thermal annealing at temperature of 104 °C and subsequently characterized to investigate their structural, optical and compositional properties for device applications. X-ray analysis showed that all the deposited chalcogenide thin film crystals have crystalline structures and average crystallite sizes, dislocation densities and micro-strains. The films CdS and VT/CdS have average crystallite size, dislocation density and micro-strain in the range 9.64-21.14 nm,  $2.22 \times 10^{-3}$  -  $37.02 \times 10^{-3} \text{ nm}^{-2}$  and 8.878- 30.402 respectively. The EDS results showed that the target elements, S, Cd, in addition to C and O were detected in the deposited thin films. The CdS and VT/CdS have high absorbance in the VIS region but decreased in NIR regions. VT doping increased its values to the range 0.6-1.15 for 1 drop VT/CdS then decreased it to 0.3-0.6 for 3 drops VT/CdS in the two regions. The transmittance was low but increased with wavelength and number of VT drops. The bandgap energies were 2.4 eV, 2.22 eV, 2.3 eV and 2.35 eV for un-doped CdS, 1, 2 and 3 drops VT/CdS films respectively.

These properties exhibited by the films as a result of doping with VT dopant made them suitable for solar cells, photo-thermal devices, high temperature and high power, as well as, many other optoelectronic device applications.

**Keywords:** Cadmium, Sulfide, Sol-Gel, Velvet Tamarind, Bandgap, Opto-Electronics

**FAPSCON24/PHY/003**

### **GLOBAL ELECTRICITY GENERATION: THE ROLE OF HYDROCARBON RESOURCES**

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#### **ABSTRACT**

Globally, electricity is important because it is at the heart of economic development and industrialization. Electricity cannot be stored in a very large quantity, necessitating a constant source of generation. Hence, this work aims at identifying the global sources of electricity generation in the major regions of the world, associated problems and the way forward. Globally, hydrocarbon constitutes over 60% of generated electric power with coal and natural gas playing major roles. Natural gas is replacing oil in power generation and there are prospects that it will also replace coal in future. The main source of electricity in Asia pacific is coal while in Africa; it is a combination of natural gas and coal. The Middle East is more than 90% dependent of oil and gas for generating electricity while Europe is a typical example of a continent that has leveraged on a mixed energy source. Over dependence on hydrocarbon for electricity generation is not ideal in the face of its non-renewable nature and environmental concerns but there seems to be no immediate substitute. Renewable, green and mixed energy sources are recommended but the scale of production remains a daunting challenge in a world of rising electric power demand.

**Keywords:** Energy, renewable, power, region, coal, natural gas.

**FAPSCON24/PHY/004**

### **TREND OF GLOBAL AND AFRICAN PROVED OIL AND GAS RESERVES: A REVIEW**

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#### **ABSTRACT**

The global oil and gas reserve is estimated at about 1729.7billion barrels and 196.9trillion cubic meter respectively at the end of 2018. These vast natural resources are not evenly distributed in the world; some countries have abundance while others have little or nothing. In this paper, the regional distribution of oil and gas reserves in the world is presented with special focus on Africa. The global percentage share, growth trends and Africa's quota are reviewed. The world's oil and gas reserves data shows that the Middle East has the largest share of 48.3% and 38.4% respectively while Europe has the least shares of less than 1% and 2% respectively. For the Commonwealth of Independent States, the global oil share is less than

10% and the gas share is almost 32%. Africa holds about 7.2% and 7.3% shares of global oil and gas reserves respectively. The major petroleum producing countries which hold about 85% and 90% of oil and gas reserves in Africa are Nigeria, Angola, Algeria, Libya and Egypt. Libya has the largest oil reserve of more than 48 billion barrels while Nigeria has the largest natural gas reserve of more than 5 trillion cubic meter. The future growth prospect for oil and gas reserves in Africa is most likely to emerge from the small new players especially in East and Southern Africa. More exploratory activity is therefore recommended in these regions due to the recent interesting discoveries made in recent times.

**Key Word:** Europe, North America, Middle East, Nigeria, Egypt, Libya.

FAPSCON24/PHY/005

### DEPTH TO MAGNETIC SOURCES ESTIMATION IN NIGER DELTA AREA USING SOURCE PARAMETER IMAGING

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#### ABSTRACT

Source Parameter Imaging (SPI) is a technique grid-based method for estimating magnetic source geometries, dip, susceptibility contrast and depth to magnetic basement, where the depth results are independent of the magnetic inclination and declination. In this study, high resolution aeromagnetic data covering Degema and Olobiri area in Niger Delta region of Nigeria. After Regional-to-Residual separation, the Residual contour map showed predominant tectonic trend in the NE - SW, NW – SE and N-S directions. The result of the SPI analysis estimated 2.03km as depth to shallow causative magnetic bodies. The highest sedimentary thickness of about 8.41 km was recorded for deep lying magnetic bodies found around the southern region of the area. These are associated with magnetic basement surface and intra basement discontinuities like faults and fractures. The tectonic trend and the sedimentary thickness suggest probable representation of a hydrocarbon rich area.

**Keywords:** Niger Delta, Aeromagnetic Data, Depth to Basement, Source Parameter Imaging.

FAPSCON24/PHY/006

### DETERMINATION OF PATHLOSS EXPONENT OF 4G LTE SIGNAL IN URBAN AND RURAL ENVIRONMENT OF SOUTHERN NIGERIA (ASABA IN DELTA STATE AND ONITSHA IN ANAMBRA STATE)

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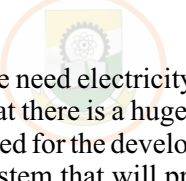
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ABSTRACT

We investigated the radio frequency channel behavior based on extensive measurements of signal strength and other propagation parameters up to 1200 m from the base stations, adopting single sector verification technique in wet and dry season in urban and rural environments of Delta and Anambra States in Nigeria. The measurements were carried out at 800 MHz bands using Sony Ericson Test Mobile System (TEMS) phones and global positioning system connected to a laptop equipped with TEMS software and cell refs of the base stations in the studied areas. The estimated pathloss values were compared with four commonly used propagation models namely: Erceg, Cost-231, Ericson, and Standard University Interim (SUI). SUI model presented a better agreement with the measured pathloss based on root mean square error (RMSE) metrics analysis in all the considered environments in both seasons. Modification of the SUI model was carried out by including the pathloss exponent which performed better in predicting the pathloss compared with commonly used SUI propagation models. Climatological parameters such as pressure, temperature and relative humidity at ground surface over all the monitored environments were obtained between 2022 and 2023. These data were used to compute the refractivity gradient, effective earth radius (k-factor, and geoclimatic factor for the studied area. Results show that using the standard value of 1.33 for k-factor in the investigated environments, the required height of antenna for line-of-sight communication link setup may not be achieved. This may result in overestimation or underestimation of the link budget needed for rural environments in Southern Nigeria environment.

 **FAPSCON24/PHY/007**  
**ELECTRICITY GENERATION FROM SOUND, AN APPROACH TO BOOSTING RENEWABLE ENERGY, THE OWERRI DANCE CLUB SCENARIO.**  
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 **ABSTRACT**  
We need electricity on a regular basis to run all our appliances and carry out our daily work. We all know that there is a huge scarcity of energy everywhere. Life without electricity is difficult. Energy is the basic need for the development of the modern world. To meet the regular demand for energy, we need to design a system that will produce electricity without destroying nature. Random sound energy in the dance club can be treated as a source of electric power after its efficient conversion using a suitable transducer. In this project, piezoelectric transducers are used for the conversion of sound to electrical energy. Many supercapacitors store the electric energy produced by many piezoelectric transducers, which is subsequently added to and amplified using voltage multiplier and adder circuits. To store this energy, a rechargeable DC battery was charged using the resulting electric power. With the suggested conversion circuit, it was discovered that a small DC battery could be entirely recharged with a medium sound source. Integrating the said technology in energy generation and usage, would help protect our environment.

**Keywords:** Sound energy, Piezoelectricity, Dance club, Owerri

**FAPSCON24/PHY/008**  
**STATISTICAL STUDY OF THE SOLAR WIND AND COSMIC RAY PARAMETERS IN FORBUSH EFFECTS AND INTERPLANETARY DISTURBANCES (FEID) FROM 1957-2019**

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ABSTRACT

This study presents a comprehensive statistical analysis of solar wind and cosmic ray parameters within the context of the Forbush Effect and Interplanetary Disturbance (FEID) phenomenon spanning from 1957 to 2019. The solar wind parameters under investigation include maximum solar wind speed ( $V_{max}$ ), maximum solar wind temperature ( $KT_{max}$ ), and minimum solar wind temperature ( $KT_{min}$ ). Concurrently, cosmic ray parameters such as maximal range CR density variations ( $M_{agn}$ ), maximum daily cosmic ray count ( $D_{MinM}$ ), maximum daily cosmic ray count ( $D_{max}$ ), equatorial component of the CR vector anisotropy ( $A_{xym}$ ), and range of the north-south component variation of the CR vector anisotropy ( $A_{zrange}$ ) are examined. Through careful data collection and preprocessing, we assess the temporal trends, variability, and interrelationships among these parameters over the study period. Descriptive statistics unveil the central tendencies and dispersions within the datasets, while time series analysis elucidates long-term trends, seasonal patterns, and potential cyclical variations. Furthermore, correlation analysis investigates the associations between solar wind parameters and cosmic ray fluxes, shedding light on the complex dynamics of interplanetary interactions. Event analysis identifies significant solar events, such as solar flares and coronal mass ejections, and their impacts on solar wind and cosmic ray parameters, particularly during Forbush Effect events. Additionally, spatial analysis, where applicable, offers insights into regional variations and gradients in FEID parameters. The findings of this study contribute to a deeper understanding of space weather phenomena and their implications for Earth's magnetosphere and atmosphere.

**Keywords:** Forbush decrease, Interplanetary disturbance, cosmic ray, solar wind



Conference & Exhibition

FAPSCON24/PHY/009

**STATISTICAL STUDY AND ANALYSIS OF THE PARAMETERS IN FORBUSH EFFECTS AND INTERPLANETARY DISTURBANCES (FEID) DURING SOLAR CYCLES 23 AND 24**

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ABSTRACT

A comprehensive statistical analysis of Forbush Effects and Interplanetary Disturbances (FEIDs) parameters during Solar Cycles (SCs) 23 and 24, spanning from 1996 to 2019 was performed. We performed a comprehensive statistical analysis of Forbush Effects and Interplanetary Disturbances (FEIDs) parameters during Solar Cycles (SCs) 23 and 24, spanning from 1996 to 2019. The goal is to elucidate the temporal variations, interrelationships, and trends of key FEID parameters, thereby enhancing our understanding of solar-terrestrial interactions and space weather dynamics. The research utilizes data from the FEID database maintained by IZMIRAN, along with sunspot numbers (SSNs) from the Royal Observatory of Belgium. Key parameters analyzed include  $B_{max}$  (maximum interplanetary magnetic field intensity),  $V_m B_m$  (product of solar wind velocity and interplanetary magnetic field intensity),  $B_{z_{min}}$  (minimum value of the southward component of the interplanetary magnetic field (IMF)),  $B_{z_{min}}$  to  $B_m$  (ratio of  $B_z$  minimum to  $B$  the maximum value of the interplanetary magnetic field), and

$ABz_{max}$  (maximum absolute value of the  $Bz$  component of the IMF) to explain the variations, interrelationships, and trends in these parameters and their impact on space weather and cosmic ray intensity (CRI) variations. Comprehensive statistical techniques, including time series analysis, correlation analysis, and trend analysis, were employed to examine the nearly two-and-a-half decades of data. The analysis reveals significant temporal variations and correlations among FEID parameters across SCs 23 and 24. During SC 23, a strong negative correlation was observed between  $B_{max}$  SC 24 exhibited a weaker positive correlation. Similarly,  $Bz_{min}$  showed a strong inverse relationship with SSNs in SC 23, contrasting with a weaker positive correlation in SC 24. Time series analysis indicated that SC 24 generally exhibited higher  $B_{max}$  values and more pronounced fluctuations in  $Bz_{min}$  and  $B_{max}$  exhibited heavy-tailed distributions, indicating significant outliers and extreme values. The study underscores the importance of continuous monitoring and detailed statistical analysis to improve space weather forecasting and mitigate the impacts of solar disturbances on technological systems and human activities in space and on Earth.

**Keywords:** *Forbush decrease and Forbush Effect; interplanetary disturbance; data analysis; geomagnetic index, solar wind, cosmic ray.*

**FAPSCON24/PHY/010**

**COMPARATIVE ANALYSIS OF HALO AND NON-HALO CORONAL MASS EJECTIONS  
(CMES) ACROSS SOLAR CYCLES 23 AND 24.**

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**ABSTRACT**

This research presents a detailed comparative analysis of the properties of Halo and Non-Halo Coronal Mass Ejections (CMEs) across solar Cycles 23 and 24. By examining key parameters such as linear speed, speed at 20 solar radii (20Rsun), mass, and Central Position Angle (CPA), and their correlations, this study highlights the variations in CME characteristics between the two cycles. The findings reveal that Halo CMEs in cycle 24 exhibit higher linear speeds and broader mass distributions compared to Cycle 23, indicating more energetic events in the later cycle. Non-Halo CMEs, however, show reduced kinetic energy and mass in Cycle 24. The analysis also uncovers significant correlations between these parameters, providing insights into the dynamics of CME propagation and their potential impact on space weather forecasting.

**Keywords:** Coronal Mass Ejections (CMEs), solar activity, sunspot, solar cycle, and solar storm

**FAPSCON24/PHY/011**

**A O SERPENTIS STAR PHOTOMETRIC STUDY**

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**ABSTRACT**

An observations of AO Serpentis eclipsing binary star of right ascension of 239.58, declination of 17.27, using 0.4 m SBIG Telescope at the Las Cumbres Observatory (lco.global) facility located at Goleta, California, USA. The observation time was for 60 second using visual (V), blue (B) and red (R) filters. The photometric analysis was done using SAOImage Viewer (DS9) and IRIS software which enabled us to plot the light curve. Determination of primary and secondary eclipse are determine from the analysis. We also found that duration of totality of primary eclipse is 0. We also found that depth of primary eclipse for the V-filter is 1.30, B-filter is 0.9 and R-filter is 0.8. Temperature estimate using the B-V index indicates that the star has a temperature in the range 8500 – 10950 K indicating that AO Ser may be classified as A2 star. These classifications agreed with others in the literature.

**FAPSCON24/PHY/012**

**A STATISTICAL ANALYSIS OF THE OBSERVED PARAMETERS OF THE HALO CMEs FOR CYCLES 23 AND 24**

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**ABSTRACT**

We analyzed the following parameters of the halo – CMEs: the linear speed, initial speed, fastest speed, 20R, acceleration, mass, kinetic energy and force for cycles 23 and 24. Generally, all the speed parameters correlate positively and strongly in both cycle 24, the cycle 24. But the plot of the linear and initial speeds against 20R, differs and also indicates a very weak but positive correlation between the parameters of both cycles 23 and 24. Mass correlates positively and strongly with K.E and force which is in agreement with the work of Onuchukwu, (2018).The histogram distribution plots of the log-log plot of the linear speed (LS) km/s, initial speed, fastest speed, Acceleration, kinetic energy and force all indicates a log normal distribution for both cycles. Cycle 23 has higher speed than cycle 24 generally. Both cycles were concentrated more at about 2.5 – 3.1 km/s speed and cycle 24 peaked at point 83 while cycle 23 peaked at point 92 respectively. The Acceleration plots for both cycles peaked almost at the same point 44 m/s<sup>2</sup> for cycle 23 and 45 m/s<sup>2</sup> for cycle 24. The histogram distribution plot for mass showed the same trend for both cycles 23 and 24. The plot for the mass and the MPA both skewed towards the right side indicating large mass and MPA that is aligned within 15.83 kg to 15.70 kg and 1.92 – 2.64 degrees for cycle 23 and 1.61 – 2.7 degrees for cycle 23 and cycle 24 respectively, for mass, cycle 23 peaked at 86 value while that of cycle 24 peaked at 104 value and cycle 23 peaked at 185 value while that of cycle 24 peaked at 174 value for MPA.

**FAPSCON24/PHY/013**

**INTRODUCING CITIZEN SCIENCE PROJECTS TO THE PHYSICS DEPARTMENT**

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### ABSTRACT

Citizen science allows the public to actively participate in scientific research. The Pan-African Citizen Science e-Lab (PACS e-Lab) was established to engage Africans in citizen science and soft astronomy research, with the goal of advancing space research and exploration, as well as enhancing space education and outreach. In collaboration with various international organizations focused on astronomy research, education, and outreach, PACS e-Lab runs several projects, including asteroid searches, exoplanet photometry, research writing for peer-reviewed publications, astrophoto visual development, and Amateur Radio contact with astronauts aboard the International Space Station (ARISS). We have been actively involved in many of these initiatives through our collaboration with PACS e-Lab and intends to introduce these projects to the department. This partnership with PACS e-Lab will provide students in the department with practical experience in physics and astronomy.

**Keywords:** Citizen Science, Asteroid Search, Exoplanets, Astronomy Education, Astrophotography

FAPSCON24/STA/001

### APPLICATION OF LOG-LINEAR MODEL FOR FOUR DIMENSIONAL CONTINGENCY TABLE IN ANALYSIS OF STUDENTS ANXIETY IN MATHEMATICS

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### ABSTRACT

The study applied log-linear mode for four contingency table in analysis of anxiety in mathematics among Nigerian students. The objectives are: to compare the log-linear models and select the best model, to determine whether mathematics anxiety level among university students is related to gender, course of study and mathematics performances using log-linear model and to examine the association between genders, department of the students, their first semester mathematics performance using the log-linear model. The population of the study is comprised of the undergraduate university students in Delta State, Nigeria. A total of one hundred and eighty (180) respondents constitute the sample size of the study and the data were collected using structured schedule. The independent model stated as:  $\log(\mu_{ijkl}) = \lambda + \lambda_i^M + \lambda_j^A + \lambda_k^G + \lambda_l^D$  was found to be the best model out of the models under consideration as it has the least AIC and BIC values. And the null hypothesis  $H_0$ , which states that there is no relationship among the variables under study was not rejected as the  $p$ -value is greater than the critical value as revealed by the goodness-of-fit test statistic table for the best model. This indicates that mathematics anxiety among university students is independent of their gender, department and performances in mathematics.

**Keywords:** Log-linear models, Contingency table, Mathematics anxiety, AIC, BIC.

FAPSCON24/STA/002

### A NEW AND EFFICIENT APPROACH FOR ESTIMATING PROBABILITIES OF MISCLASSIFICATION AND DISCRIMINATION

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**ABSTRACT**

This study adopted a new and efficient approach for estimating probabilities of misclassification and discrimination for three populations via Edgeworth series distribution. Real-life anthropometric dataset was used, consisting of three populations of school learners (Nursery, Primary, and Secondary) and four variates each (Height, Head Circumference, Shoulder Width and Elbow Height). A computer programming language codes were written via R-Studio package to solve the numerous numerical problems posed in the study. The result of the study revealed that for the real-life dataset, the total optimum probability of misclassification suggested that the model has a relatively low probability of misclassifying observations across all populations whereas the total error of misclassification indicated that the model misclassified approximately 4.86% of the observations across all populations. Hence; in overall, these metrics concluded that the model performed well in classifying observations, with a low probability of misclassification and a low error rate. Since the findings conclude that the model performs well in classifying observations, with a low probability of misclassification and a low error rate for the real-life dataset, further studies should compare the performance of the LDA model with other classification algorithms, such as logistic regression, decision trees, or random forests, to determine if another approach yields better results. It is recommended that more research is needed to examine how small sample sizes affect parameters using three populations.

**Keywords** Anthropometric, ESD (Edgeworth series distribution), Optimal probability, Normal distribution, R-studio codes

**INVESTIGATION OF EDGEWORTH SERIES DISTRIBUTION (ESD) AND NORMAL DISTRIBUTION (ND) FOR THREE POPULATIONS: AN OBJECTIVE APPRAISAL** FAPSCON24/STA/003

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**ABSTRACT**

This study was an objective appraisal of Edgeworth Series Distribution and Normal Distribution for three populations. The optimum probabilities of misclassification for the Edgeworth Series Distribution (ESD) were computed with  $\mu_1 = 0, \mu_2 = 1, \mu_3 = 1$  and  $\sigma = 1$  with  $\lambda_4$  being the skewness factor within the interval (0.00625, 0.4), being in 14 intervals as  $6.25 \times 10^{-3}, 1.25 \times 10^{-2}, 2.5 \times 10^{-2}, 0.025, 0.05, 0.085, 0.12, 0.155, 0.19, 0.225, 0.26, 0.295, 0.33, 0.365$  and 0.4. The apparent probabilities of misclassification for the (ESD) and Normal Distribution (ND) were also examined when the means  $\mu_1, \mu_2$  and  $\mu_3$  are known and when the parameters are estimated from the samples. Three independent samples of simulation size of 200 each were configured at each value of the skewness factor  $\lambda_4$  from three populations ( $\pi_1, \pi_2$  and  $\pi_3$ ) whose distributions are of ESD with the respective parameters:  $(\mu_1 = 0, \sigma_1 = 1), (\mu_2 = 1, \sigma_2 = 1)$  and  $(\mu_3 = 1, \sigma_3 = 1)$  Employing the ESD and ND classification rules, the proportion misclassified in  $\pi_1, \pi_2$  and  $\pi_3$  were obtained and repeated for small samples ( $n = 4, 8, 12, 16, 20, 24, 28$ ). The study revealed that the results of the simulation size of 200, which compared the performance of the Edgeworth Series Distribution (ESD) and Normal Distribution (ND) methods averaged over small samples for estimating probabilities of misclassification across different populations and skewness levels varied across populations and skewness levels, but their variations were relatively close between the two methods, indicating that both methods performed

similarly. Again, the study revealed that the probabilities of misclassification across all populations were relatively high. Hence, the study recommended among others that further research should replicate this study to improve both ESD and ND methods in order to reduce the misclassification rates.

**Keywords;** Misclassification, Discrimination, ESD, ND, Skewness

**FAPSCON24/STA/004**

### **THE LAPLACE DISTRIBUTION WITH APPLICATIONS USING ECONOMETRIC DATA**

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#### **ABSTRACT**

This study investigated the Laplace Distribution (LD) using selected econometric data to explore its flexibility. The study specifically looked at comparing the LD with other Laplace variants (Transmuted Laplace, Alternative Laplace, and Asymmetric Laplace) using secondary data. This study utilized secondary data from reputable published sources, including voltage drop data from Montgomery et al. (2015) on missile flight, rent variation data from Weisberg (2005) covering agricultural land in Minnesota, and unemployment rate data in Nigeria from 1970 to 2021 sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin 2022. Performance was evaluated using the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Mean Squared Error (MSE). The LD had the lowest AIC (613.636) and BIC (609.226), and the lowest MSE (2343.761), while the Asymmetric Laplace distribution showed the highest MSE. These results suggest that the LD offers better predictive accuracy and adaptability, making it a powerful statistical tool for modelling diverse data characteristics.

**Key Words:** Extended Laplace Distribution; Probability Density Function; Cumulative Density Function; Akaike Information Criterion; Bayesian Information Criterion.

**FAPSCON24/STA/005**

### **ENHANCING GLOBAL RELEVANCE OF THE NIGERIAN POLYTECHNIC SYSTEM**

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#### **ABSTRACT**

The study examined how to reposition the Nigerian Polytechnic system for global relevance, competitiveness in learning, and technical transfer, using two polytechnics in Delta State as case studies. Data were collected via questionnaires and analyzed using chi-square tests of independence, homogeneity, and mean ranking. Findings revealed major challenges including the lack of efficient technical equipment, poor power supply, and obsolete machines, which were consistent across locations. Learning outcomes were found to be independent of polytechnic admission policies. Despite efforts to fulfil their vision and mission statements, polytechnics have not succeeded in making graduates self-reliant. The study recommended that stakeholders provide adequate training facilities and a reliable power supply to improve learning outcomes and skill acquisition.

**Keywords:** *Polytechnic education, skill acquisition, technical transfer, learning outcomes, Test of homogeneity*

FAPSCON24/STA/006

**ASSESSING THE TRANSITION FROM GRADUATION TO EMPLOYMENT FOR NIGERIAN HND GRADUATES: A SURVIVAL ANALYSIS APPROACH**

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**ABSTRACT**

This study evaluated the transition from polytechnic education to first employment using survival analysis of Nigerian HND graduates. It focused on a cohort from three Polytechnics in Delta State, Nigeria, collecting data via an online survey with a structured questionnaire. The data were analyzed using Cox regression and Kaplan Meier survival analysis techniques, with variables including age, marital status, gender, and location. The Cox regression revealed that age was statistically significant ( $\beta = -0.189$ ,  $p = 0.038$ ), indicating that younger graduates are more likely to secure their first employment sooner. The Kaplan Meier analysis showed that the mean survival time to first employment was approximately 2.6 years for graduates aged 23-26, about 3.5 years for those aged 27-30, and nearly 4 years for those aged 31 and above. Overall, the average time to first employment was around 3.5 years, suggesting most graduates from the 2019 cohort found employment between 2021 and 2022. The study concludes that age significantly influences the duration of unemployment after graduation.

**Keywords:** *Survival Analysis, HND Graduates, Employment Transition, Cox Regression, Kaplan Meier Analysis.*

FAPSCON24/STA/007

**MULTIPLE REGRESSION MODELING ON THE IMPACTS OF PER CAPITA INCOME, NATIONAL SAVINGS AND PURCHASING POWER PARITY ON NIGERIA ECONOMY FROM 2007-2023**

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**ABSTRACT**

This study examines the impact of Per Capita Income, National Saving and Purchasing Power Parity on Nigeria economy from 2003 - 2023. The objectives of the study include finding out percentage change on the GDP that is accountable by the selected variables, itemizing the respective impacts of the selected variables on the economy and finding out correlation between the GDP and the selected variables. The statistical methods adopted multiple regression and correlation analysis. The data were collected from National Bureau of Statistics NBS, and World Bank. R programming, Microsoft Power BI, and Excel were used for data analysis. The finding of the shows that 76.9% increase in movement in GDP was caused by the independent variables investigated. The regression model predicts that the value of the GDP will

increase by 0.768, 0.7984 and 0.02554 for every increase in Per Capita Income, National Saving and Purchasing Power Parity, respectively. The study also showed that only National Saving has significant impact on the GDP. This was evident in the P-value of 0.0934. The finding also shows that there was a strong positive relationship between GDP and Per capita income.

**Keywords:** *National Income, GDP, Purchasing Power Parity, National Saving, Per Capita Income.*

**FAPSCON24/STA/008**

**STATISTICAL ANALYSIS ON THE RELATIONSHIP BETWEEN LIFE EXPECTANCY AND  
ECONOMY GROWTH IN NIGERIA (2000 - 2023)**

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**ABSTRACT**

Increase in life expectancy is a key indicator to measure the economic development of a country. Higher income per capita means better access to health services provided by public or private sectors. This study examines the relationship between Life Expectancy and Economy growth of Nigeria from 2003-2023. The statistical methods adopted regression and correlation analysis. Data for life expectancy at birth was obtained from the World Bank and United Nations Development Programme (UNDP) whereas that of income per capita were from the National Bureau of Statistics NBS and IMF. Microsoft Excel, Power BI, and R- programming were used for visuals and data analysis. According to the analysis of the results based on regression and correlation on cross-section data, life expectancy at birth is found as a determinant of the economic growth. The model predicts the Life Expectancy to increase by 0.022416 per unit increase in the GDP. The study recommends that more measures should be taken to improve the economy growth as it has a positive impact on the life of the people.

**Keywords:** *Life expectancy, Per Capita Income, Purchasing Power Parity, National Saving, mortality rates.*

**FAPSCON24/STA/009**

**UNLOCKING ACADEMIC POTENTIAL: THE ROLE OF LECTURE ATTENDANCE AND  
READING TIME IN TERTIARY INSTITUTIONS**

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**ABSTRACT**

Academic performance among tertiary students is influenced by a variety of factors, with lecture attendance and reading time being two critical components. This cross-sectional study investigates the relationship between these two variables and students' academic performance, seeking to uncover how consistent lecture attendance and dedicated reading habits contribute to unlocking academic potential. Utilizing a stratified sampling approach, a sample of 300 students was drawn from three faculties in a tertiary institution, ensuring proportional representation across departments and courses. Data was collected through structured questionnaires, focusing on lecture attendance patterns, reading hours, and overall academic performance measured through grade point averages (GPAs). The findings reveal a strong positive correlation between lecture attendance and academic performance, highlighting that

students who regularly attend lectures tend to achieve higher GPAs. Similarly, students who dedicate more hours to reading outside of class show significantly better academic outcomes. However, the study also identifies a complex interplay between the two variables, suggesting that while both lecture attendance and reading time are important, their impact on academic performance may vary depending on individual study habits and motivation levels. This research contributes to the existing body of knowledge by providing empirical evidence on the role of these key factors in enhancing academic achievement among tertiary students. The study's findings can inform institutional policies makers aimed at improving student engagement and academic success through targeted interventions that encourage regular attendance and effective study practices. Future research should explore the moderating effects of socio-demographic factors as regard attendance and reading strategies.

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### **COMPARISON OF SEVERAL METHODS FOR REGULARIZATION**

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#### **ABSTRACT**

In this study, Ridge, Lasso and Elastic Net Regression performance were compared as a regularization method to determine the model that will be better to handle multicollinearity in a dataset especially, in the area of health. Four different datasets were employed to study the features of the model. 80% of data was used in train set to make prediction while 20% was used in test set. Variance inflation factors (VIF) was employed to dictate multicollinearity in the dataset. The Statistical analysis result of this study shows that the models used in this analysis performed equally expect in second dataset where there is little multicollinearity with little or no difference in the model performance. Hence any of the model can be used especially in area of health where there are high multicollinearity present in datasets.

**Key Words:** Multicollinearity, Variance Inflation Factor, Ridge, Lasso, Elastic Net Regression

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### **EXPLORING THE EFFECTIVENESS OF FOUR CRITERIA FOR DISCRIMINANT ANALYSIS: A COMPARATIVE EVALUATION**

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#### **ABSTRACT**

This study focused on comprehensive evaluation of four criteria for discriminant analysis procedure which includes Fisher, Welch, Bhattacharyya and Mahalanobis distance. The objectives of the study were

to evaluate the performance of each criteria based on classification accuracy, to ascertain the best fitted discriminant criteria, to evaluate the performance of each criteria based on addition of outliers to the original dataset and ascertain the consistency performance of each criteria based on simulated data for large sample sizes. The R- software package is employed for the data analysis. The analysis was conducted on original dataset (n=50) and on subsequent data. The real data was simulated five times with sample sizes n as 200, 500, 1000, 3000 and 7000. The null hypothesis assumption of homogeneity of covariance matrix was equally satisfied. The result of the study revealed that Fisher, Welch, Bhattacharyya criteria showed 86.7 percent (86.7%) accuracy rate. The finding also showed that in outlier detection that these criteria outperformed others with an accuracy rate of 87.5 percent (87.5%) and Mahalanobis demonstrated more efficient and best fit model having AIC value of 70.69 and BIC value of 91.37. Further findings from simulated data for various sample sizes revealed that Mahalanobis is consistently better than other criteria under this study. The study also highlighted the importance of considering trade-offs between computational complexity and interpretability when selecting criteria, acknowledging potential variability on dataset and study context. This work will be useful to researchers and practitioners to select the most appropriate criteria for their specific datasets and research objectives.

**Keywords:** Discriminant Analysis, Fisher Criterion, Welch Criterion, Bhattacharyya Distance Criterion, Mahalanobis Distance Criterion, Classification Accuracy, AIC, BIC, Outliers, Simulation

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**EFFECT OF FINANCIAL PAYMENT INNOVATIONS ON FINANCIAL DEEPENING IN NIGERIA**

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**ABSTRACT**

This study assessed the effect of financial payment innovations on financial deepening in Nigeria from 2009 to 2023, using secondary data from the Central Bank of Nigeria. Key variables examined include Automated Teller Machines (ATM), Point of Sale terminals (POS), mobile payments (MBP), and web-based payment platforms (WEP) were used as proxies for financial innovations. The values of these variables were log-transformed to linearize and reduce the effect of outliers in the data. On the other hand, financial deepening was measured as ratio of broad money supply (M2) to GDP and ratio of credit to the private sector (CPS) to GDP. Employing the Autoregressive Distributed Lag (ARDL) model, the study estimated both short and long run effects of these products of financial innovations on financial deepening. The findings revealed that ATM had significant negative on financial deepening when expressed as ratio of money supply to GDP had significant positive effect when expressed as ratio of private sector credit to GDP. It also showed significant positive effect of POS on financial deepening for both models. The study further showed that MBP and WEP had significant positive effect on financial deepening. From these outcomes, the study concluded that financial innovation is a strong determinant of financial deepening in Nigeria. It therefore recommended optimizing ATM operations to prevent liquidity drains. Investments in ICT infrastructure should be upscaled in order to deepen the efficiency and deployment of POS systems, in addition to promoting mobile and web payment platforms so as to enhance inclusion. In addition, continuous monitoring and stakeholder collaboration are essential to maximize the benefits of financial payment innovations in deepening Nigeria's financial sector.

**Key words:** Financial Deepening, Financial Innovation, Private Sector Credit, Money Supply, GDP

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**THE COMPARISON BETWEEN PREDICTIVE ACCURACY OF ARIMA (0, 1, 0) AND FUZZY TIME SERIES MODELS IN FORECASTING RENEWABLE ENERGY CONSUMPTION IN NIGERIA.**

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**ABSTRACT**

Both ARIMA (0, 1,0) and Fuzzy time series models are valueable tools in Time Series analysis and forecasting, each with its unique strengths and applications. Combining the strengths of the two approaches enhanced the accuracy and robbustness of time series forecasting . This study aimed to evaluate and compare the effectiveness of two forecasting models: ARIMA (0,1,0) and Fuzzy Time Series in predicting renewable energy consumption in Nigeria. The results indicated a clear distinction in the predictive accuracy and suitability of these models for the given dataset. In this research the comparison of predictive accuracy between the ARIMA (0,1,0) model and the Fuzzy Time Series model revealed that the Fuzzy Time Series model significantly outperforms the ARIMA model. The Fuzzy Time Series model demonstrated much lower error metrics, including a Mean Squared Error (MSE) of 1.1924 compared to 242.9566 for the ARIMA model. Additionally, the Fuzzy Time Series model had a higher R-squared value of 0.8263, indicating that it explains approximately 82.63% of the variance in the data, whereas the ARIMA model had a negative R-squared value of 0.742, indicating a poor fit and predictive accuracy when compared to fuzzy time series. The Fuzzy Time Series model demonstrated superior predictive accuracy, with significantly lower error metrics such as an MSE of 1.1924 and an RMSE of 1.092. In conclusion, the Fuzzy Time Series model was recommended for future applications in predicting renewable energy consumption in Nigeria due to its superior performance across all evaluated metrics.

Keywords: ARIMA (0, 1, 0), Fuzzy Time Series, Chen's Algorithm, Dickey-Fuller test, Jarque-Bera test, Ljung-Box test.