THE NATIONAL INSTITUTE OF PROFESSIONAL ENGINEERS AND SCIENTISTS

In collaboration with the

NATIONAL CENTRE FOR ENERGY AND ENVIRONMENT, ENERGY COMMISION OF NIGERIA

3RD INTERNATIONAL CONFERENCE

THEME

CONVERGING OF EMERGING TECHNOLOGIES: REDEFINING THE BOUNDARIES OF SCIENCE AND TECHNOLOGIES

DATE: 9TH - 11TH APRIL, 2025 | **TIME:** 9:00AM DAILY

VENUE: National Center For Energy and Environment, University of Benin.

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The National Institute of Professional Engineers and Scientists

In collaboration with the

National Centre for Energy & Environment, Energy Commission of Nigeria

Presents her

3rd

International Conference

THEME

Converging of Emerging Technologies: Redefining the Boundaries of Science and Technology

April 9th to 11th 2025

Dr. Collins Chike Kwasi-Effah, FNIPES
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ABOUT NIPES

The National Institute of Professional Engineers and Scientists (NIPES) is a prestigious research organization that unites esteemed experts from the fields of engineering and science. Originally established as The Nigerian Institution of Professional Engineers and Scientists on June 20, 2019, the organization was incorporated under the Companies and Allied Matters Act (CAMA), Cap. C20, Laws of the Federation of Nigeria, on November 13, 2021. Building on this foundation, NIPES expanded its international presence by incorporating under the Commonwealth of Massachusetts Corporate Division, United States of America, on December 13, 2024, marking a significant milestone in its global development.

NIPES Aims to:

- Promote the highest standards of professional conduct among engineers and scientists.
- Provide a platform for the exchange of ideas and information among its members.
- Foster research and development in science, engineering, and technology.
- Advocate for the interests of its members in matters related to science and technology.
- Facilitate collaboration between its members and other organizations and institutions that share its objectives.
- Offer opportunities for professional development and continuing education for its members.
- Encourage the active participation of its members in the development and implementation of national science and technology policies.

ABOUT NCEE

The National Centre for Energy and Environment (NCEE) is a research center established under the Energy Commission of Nigeria (ECN), an agency of the Federal Ministry of Science and Technology. NCEE is mandated to organize and conduct research and development programs in bioenergy and environmental sustainability, through actively engaging in both individual and collaborative research initiatives aimed at tackling critical energy and environmental challenges, including climate change, energy poverty, environmental degradation, and pollution affecting local communities. The Centre partners with key stakeholders in energy and environment, including Faculties of Engineering, Agriculture, physical and Life sciences, government establishments, private sectors and NGOs to cater for the research and development needs of south-south geopolitical zone of Nigeria.

ABOUT THE CONFERENCE

The Theme of the Conference is "Convergence of Emerging Technologies: Redefining the Boundaries of Science and Engineering". The aim is to bring together academicians, experts, scholars, policy makers and industrialists to discuss contemporary and cutting edge research issues in engineering and science geared towards meeting key Sustainable Development Goals. The Conference will also provide participants the opportunity to develop new collaborative initiatives in areas of sustainability, engineering innovation, ICT, Nano-technology, renewable energy systems, new materials etc.

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CONFERENCE SUB-THEMES

Chemical Processes and Green Chemistry ***(CGC)***
Energy and Power Systems ***(EPS)***
Environmental Sustainability and Climate Change Mitigation ***(ESC)***
Ecotoxicology and Public Health ***(EPH)***
Information Technology and Smart Systems ***(ITS)***
Material Science, Additive Manufacturing and Advanced Industrial Processes ***(MAMIP)***
Mathematical and Computational Physics ***(MCP)***
Modelling, Simulations and Digital Twin Technologies ***(MSD)***
Biomedical Engineering and Healthcare Technology ***(BEH)***
Pharmaceutical Science and Drug Development ***(PSD)***
Medical Imaging, Diagnostics and Therapeutics ***(MDT)***

NIPES GLOBAL ENGINEERING & SCIENCE AWARD WINNERS FOR 2025

The National Institute of Professional Engineers and Scientists (NIPES) proudly presents the recipients of the 2025 NIPES Awards, honoring excellence in engineering, science, innovation, and policy across global communities. This year's awards recognize outstanding individuals and organizations who have demonstrated exceptional contributions to their fields. Selected from a highly competitive pool of over 1,203 nominations, these awardees represent the forefront of impactful research, sustainable development, and leadership in both academia and industry.

1.Dr. Igbekele Ogunboye – Excellence in Ecotoxicology and Public Health
2. Mr. Harrison Agboro – Excellence in Energy and Sustainability
3. Mrs. Cynthia Onyekachi Victor-Oji – Outstanding Contribution to Research & Innovation
4. Mr. Ibukun Stephen Afolabi – Excellence in Materials Science, Additive Manufacturing, and Advanced Industrial Processes
5. Engr. Dileesh Chandra Bikkasani – Excellence in Information Technology and Smart Systems
6. Engr. Ediri Johnson Erigbese – Excellence in Energy & Sustainability
7. Miss Oluwayemisi A. Owoade – Business Intelligence and Data Analytics
8. Dr. Henry Ebere Ivuawuogu – Humanitarian Engineering & Science
9. Mr. Abdulahi Opejin – Excellence in Environmental Sustainability and Climate Change Mitigation
10. Mr. Prosper Ebimobowei Nekekpemi – Excellence in Energy & Sustainability
11. Mr. Ikenna Emmanuel Odezuligbo – Excellence in Medical Imaging, Diagnostics, and Therapeutics
12. Miss Imaobong Tom – Excellence in Modelling, Simulations, and Digital Twin Technologies
13. Miss Modinat Moshood – Innovator of the Year
14. Chinwe Chinonso Iwuanyanwu - Corporate Partner of the Year

15. Mr. Michael Chukwuka – Outstanding Contribution to Research and Innovation
16. Engr. Ibrahim Adewale Ogundeko – Excellence in Energy & Sustainability
17. Miss Chukwudi Tabitha Aghaunor – Excellence in Information Technology and Smart Systems
18. Mr. Chibuike Ekene Eweh – Excellence in Chemical Processes and Green Chemistry
19. Dr. Nnamdi Stephen Moeteke – Young Scientist of the Year
20. Dr. Daniel Ejike Ewim Foundation - Corporate Partner of the Year
21. Engr. Solomon Ochuko Ologe - Outstanding Contribution to Research and Innovation
22. Dr. Ekene Ebele Uchenna-Ogbodo- Excellence in Environmental Sustainability and Climate Change Mitigation
23. Mr. Mathew Olakunle Alaba- Outstanding Contribution to Research & Innovation
24. Miss Sandra Chioma Anioke- Excellence in Ecotoxicology and Public Health

2025 NIPES ENGINEERING AND SCIENCE SCHOLARSHIP RECIPIENTS

The following are the recipients of the ₦1.4 million NIPES Engineering and Science Scholarship for 2025:

No.	***Name***	***ID***	***Sex***	***Email***	***University***	***Course of Study***
1	*Hammed Oluwafemi Omotosho*	*A01- 000545*	*M*	*omotoshooluwafemi09@gmail.com*	*University of Ibadan, Oyo*	*Medicine and Surgery*
2	*Israel Opeyemi Oduniyi*	*A01- 000284*	*M*	*opeyemioduniyi1000@gmail.com*	*University of Lagos*	*Chemical Engineering*
3	*Ishaq Usman Muhammad*	*A01- 000083*	*M*	*ishaqmu0038@gmail.com*	*Federal University of Kashere, Gombe*	*Computer Science*
4	*Chisom Ozioma Nwachukwu*	*A01- 000291*	*F*	*chisomnwachukwu783@gmail.com*	*Lagos State University, Lagos*	*Electronics and Computer Engineering*
5	*Victor Ifechukwu Obiora*	*A01- 0000747*	*M*	*obioravicky2021@gmail.com*	*Alex Ekweme Federal University, Ebonyi*	*Chemical Engineering*
6	*MezeshaiujeVictoria Bokeshemi*	*A01- 000045*	*F*	*mezeshaiuje@gmail.com*	*University of Benin, Benin City*	*Mechatronics Engineering*
7	*Theresa Chidera Okoh*	*A01- 0000795*	*F*	*theresachidr@gmail.com*	*Dennis Osadebe University, Delta*	*Microbiology*

PROGRAM OF EVENTS

Day 1: Wednesday 9th April	
9.00am -9:50am	Registration
9.50am-10.00am	Arrival of Guests
10.00am-10.30am	Opening ceremony
	National Anthem
	Opening remarks by LOC chairman, Prof O.O Ighodaro
	Welcome Address by the Ag. Director, National Centre for Energy and Environment, Dr E.T. Ogbomida,
	An address by NIPES President/Declaration of conference open, Dr. Chike Kwasi-Effah
	Group photograph
10:30am – 11.50am	Tea break
10.50-11am	Grouping of Sessions/session moderators
11am-2pm	Technical presentations
2pm-2.15pm	Participants reconvene to Q&A (Evaluation)
2.15pm- 2.35pm	Lunch
2.25pm-4pm	Technical sessions continue
Day 2: Thursday 10th April 2025	
9.00am -9:50am	Registration
9.50am-10.00am	Arrival of participants
10.00am-10.30am	First Technical Session: Oral Presentations
10.30am – 11.00am	Tea-break
11.00am-2.00pm	Second Technical session: Virtual Presentations
2.00pm – 3.00pm	Lunch
3.00pm-4.45pm	Third Technical Session
Day 3: Friday 11th April 2025	
9.00am – 9.30am	Arrival of Participants
9.30am – 10.00am	Recap of Day 2/ Closing Remarks by Dr Kwasi-Effah
10.00am – 10.30am	Presentation of NIPES Global Engineering and Science Award Winners
10.30am – 10.45am	Presentation of NIPES Scholarship Award Winners
10.45am – 11.00am	Presentation of Certificates
11.00am	Tea break, Departure

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Presentation Schedule

Day 1 – Wednesday, April 9, 2025

Morning Technical Session

	Moderators: **Prof. E.G. Sadjere** **Dr.C.C. Kwasi-Effah** **Prof. O. Ighodaro** **Prof. S. Aliu** **Prof. A. Obanor** **Dr. H. Egware** **Dr. I. Owunna** **Dr. C. Emeribe** **Dr. O. Awheme** **Dr. M.O Maureen** **Dr. U. Unueroh**	**Each presentation: 7 minutes** **Q&A session: 5 minutes**
Time Slot	Code	Title
11:00 AM – 11:12 AM	CGC_001	Effectiveness of Neem Leaf Powder (NLP) And Sudfloc Dosage Ratios for Improved Coagulation In Surface Water Treatment
11:12 AM – 11:24 AM	CGC_002	Chemical Properties of Reinforcing Steel Bars From Steel Plants
11:24 AM – 11:36 AM	CGC_003	Production of Citric Acid using Plantain Peduncles as the Base Materials Through the Process of Fermentation
11:36 AM – 11:48 AM	EPS_001	Renewable Energy Integration: The Impact of Solar Systems in Nigeria's Power Supply and Reliability
11:48 AM – 12:00 PM	EPS_002	Hydrogen-Powered Microgrids: A Pathway to Decentralized, Zero-Emission Energy Systems
12:00 PM – 12:12 PM	EPS_003	Design, Construction, and Performance Evaluation of a Dual Heat Source (Solar/Charcoal Stove) Dryer for Fruits and Vegetables

Afternoon Technical Session

Time Slot	Code	Title
2:25 PM – 2:37 PM	MSD_003	Comparison of Bisection, Newton-Raphson and Regular Falsi Methods for Determining the Root of the Non-Linear Equation
2:37 PM – 2:49 PM	EPS_005	Design of a Portable Solar Powered Egg Incubator for Poultry Farmers
2:49 PM – 3:01 PM	EPS_006	Hydrogen-Powered Microgrids: A Pathway to Decentralized, Zero-Emission Energy Systems (Repeat)
3:01 PM – 3:13 PM	EPS_007	Factor Analysis And K-Means Clustering for Condition Monitoring of Rotating Machines
3:13 PM – 3:25 PM	EPS_0010	Investigating The Effects of Al_2O_3 Nanoparticle Doping on the Thermal Stability of a Quaternary Nitrate Salt Mixtures for Concentrated Solar Power Application

3:25 PM – 3:37 PM	EPS_0013	Design And Mathematical Modeling of an Automatic Gear Oil-Filling Machine for Automotive Engines
3:37 PM – 3:49 PM	ESC_003	Biogas Production from Anaerobic Digestion of Food Waste

Day 2 – Thursday, April 10, 2025

Morning Technical Session

	Prof. Osarobo Ighodaro **Prof. S. Aliu** **Dr. C.C. Kwasi-Effah** **Dr.I. Owunna** **Prof. E. Nwanko** **Dr. U. Unueroh** **Dr. H. Egware** **Prof. E. Sadjere** **Dr. Chukwudi Emeribe** **Engr. Dileesh Chandra Bikkasani** **Dr. M.O Maureen** **Dr. O. Awheme**	**Each presentation: 7 minutes** **Q&A session: 5 minutes**
Time slot	Code	Title
10:00 AM – 10:12 AM	ESC_006	Exploring The Role of Data Analytics in Shaping Climate-Smart Business Models in Telecommunications
10:12 AM – 10:24 AM	ESC_007	Leveraging Data Analytics for Sustainable Business Practices: Enhancing Climate Resilience in the Telecommunications Sector
10:24 AM – 10:36 AM	ESC_0011	Architectural Innovations in Retrofitting for Affordable Housing: Techniques and Challenges
11:00 AM – 11:12 AM	EPH_005	Effect Of Heavy Metals (Cd and Cu) On Bmp from Poultry Waste
11:12 AM – 11:24 AM	EPH_006	Microplastics Impact on Aquaculture Environment: An Overview of Generation, Removal Techniques, Policies, and Prospects
11:24 AM – 11:36 AM	ITS_002	The Role of Cloud Computing and AI in Revolutionizing Supply Chain Management for SMEs
11:36 AM – 11:48 AM	ITS_008	Intelligent Survey Design and Analysis: How Pollsensei Is Revolutionizing Survey Data Management Using Artificial Intelligence and Machine Learning
11:48 AM – 12:00 PM	ITS_010	Developing A Framework for Multinational Corporations' Market Entry and Operational Management Strategies in Emerging Nigerian Markets
12:00 PM – 12:12 PM	MAMIP_001	Antiglyceamic And Alpha - Amylase Potential of the Polyherbal Aqueous Extract in Diabetic Rat
12:12 PM – 12:24 PM	MAMIP_003	Innovative Strategies for Enhancing Operational Efficiency in the Oil and Gas Industry and Beyond: A Continuous Improvement Approach
12:24 PM – 12:36 PM	MAMIP_009	A Review on Additive Manufacturing Types, Materials, Process Parameters, and Applications in Industry 4.0

12:36 PM – 12:48 PM	MAMIP_0010	Monodora Myristica Extract: A Sustainable Substitute to Zinc Phosphate for Epoxy Coatings

Afternoon Technical Session

Time Slot	Code	Title
3:00 PM – 3:12 PM	EPS_004	An Energy Optimisation Strategy for Hybrid Microgrid System Using Multifunctional Intelligent Agent: A Case of State Specialist Hospital Asaba
3:00 PM – 3:12 PM	MSD_003	
3:12 PM – 3:24 PM	MDT_001	A Framework for Optimized Diabetes Detection Model Based on Binary Butterfly and Machine Learning Algorithms

Chemical Processes and Green Chemistry (CGC)

CGC_001: Effectiveness of Neem Leaf Powder (NLP) and Sudfloc Dosage Ratios for Improved Coagulation in Surface Water Treatment

O. M. Ojo

Department of Civil and Environmental Engineering, the Federal University of Technology, Akure, PMB 704, Ondo State, Nigeria

E-mail: omojo@futa.edu.ng

Abstract

This study investigated the effectiveness of neem leaf powder (NLP) in combination with Sudfloc, a synthetic coagulant, for treating surface water. The objective was to evaluate the potential of a natural and chemical coagulant blend for adjusting water quality parameters. A range of dosages of NLP and Sudfloc were tested, with five different ratios ranging from 0% to 100% to identify the optimal coagulant blend. The performance of the coagulant blends was evaluated based on their ability to reduce the targeted water parameters. The optimal coagulation dosage was found to be 25% NLP and 75% Sudfloc, which outperformed the individual coagulants in terms of turbidity and colour removal. Specifically, this blend reduced turbidity from an initial value of 45 NTU to 0.81 NTU and decreased colour from 225 TCU to 7.5 TCU. These results indicate that the NLP-Sudfloc blend could serve as a promising solution for efficient water treatment, particularly in areas with access to natural materials like neem. To further understand the coagulation mechanism, microstructural analysis of NLP was carried out using scanning electron microscopy (SEM), energy-dispersive X-ray (EDX) spectroscopy, and X-ray diffraction (XRD) techniques. SEM-EDX analysis revealed the presence of some functional groups on the surface of NLP that are capable of adsorbing contaminants, thus enhancing its coagulation potential. The XRD analysis revealed distinct crystalline phases in the NLP that may contribute to its superior performance in coagulation. The findings suggest that the combination of NLP and Sudfloc works synergistically by taking advantage of the adsorption capacity of NLP while benefiting from the chemical effectiveness of Sudfloc.

CGC _002: CHEMICAL PROPERTIES OF REINFORCING STEEL BARS FROM STEEL PLANTS

[1]O.C.Onuigbo, [2]R.O. Edokpia and [3]C.I. Egboibe

Abstract - Steel bars are important engineering materials for structural application. In Nigeria, due to incessant building collapse occurrences, it is important to further investigate some of the chemical compositions of reinforcing steel bars produced from steel plants in order to ascertain their compliance with the required standard. Five diameters (10, 12, 16, 20 and 25mm) of the reinforcing steel bars were chosen from each of the six brands (A–F). Percentage Chemical composition analyses were performed using Spectromaxx Metal Analyser. Carbon Equivalent Values (CEV) were computed for the steels from different plants. The results shows that all the samples from plant A met the recommended standards (BS4449, NIS and ASTM A706) for the following chemical constituents; carbon, Manganese, Phosphorus, Sulphur, and the Carbon Equivalent Values (CEV). The other samples from plant B, C, D, E, and F are not consistent in maintaining the standard in their chemical constituents as the samples from plant A. This study revealed that all the steel bars from plant A will be suitable for structural applications where Mechanical properties (like strength and ductility) will be of paramount interest.

CGC _003: PRODUCTION OF CITRIC ACID USING PLANTAIN PEDUNCLES AS THE BASE MATERIALS THROUGH THE PROCESS OF FERMENTATION

C. A. Nwachukwu, E.A Afolabi, O.D. Adeniyi
Department of Chemical Engineering, Federal University of Technology, PMB. 65, Minna, Niger State, Nigeria
Corresponding Author's E-mail: chidimmanwachukwu21@gmail.com

Abstract
Citric acid (CA) is a versatile tricarboxylic acid widely used in food, pharmaceuticals, cosmetics, and water treatment. Its high cost has driven research to produce it from cheaper raw materials like agrowaste. This study examined converting plantain peduncles into citric acid. Peduncles were collected, pretreated with NaOH, dried, and analyzed via XRD, XRF, FTIR, and proximate analysis. A cellulase enzyme produced from a basal medium was used in a 48-hour hydrolysis at 60°C to generate reducing sugars. The resulting hydrolysate underwent submerged fermentation optimized with Response Surface Methodology (Box-Behnken design, 29 runs). Variables included carbon source (3, 5, 7% v/v), temperature (25, 30, 35°C), pH (3, 5.5, 8), and incubation time (3, 6.5, 10 days). Maximum citric acid (18.97 g/L) was achieved on day 10 at 3% carbon, 25°C, and pH 3, demonstrating plantain peduncle's potential for production.

Energy and Power Systems (EPS)

EPS_001: RENEWABLE ENERGY INTEGRATION: THE IMPACT OF SOLAR SYSTEMS IN NIGERIA'S POWER SUPPLY AND RELIABILITY.

[1]France O. Akpojedje and [2]Andrew Ibhagbemien
[1,2]Department of Electrical/Electronic Engineering Technology,
National Institute of Construction Technology and Management (NICTM), Uromi, Nigeria.
[1]francetech007@yahoo.com, [2]a.ibhagbemien@nict.edu.ng 08036339133

Abstract
Nigeria's power sector faces persistent challenges in ensuring a reliable and stable energy supply, impacting economic growth and quality of life. Renewable energy, particularly solar systems, presents a promising avenue for addressing these challenges. This paper explores the role of solar energy systems in improving the reliability and stability of Nigeria's power supply. The study examines the current state of solar systems integration, assessing its contributions to rural electrification and urban development. It further analyzes the economic and cost benefits of successful solar adoption while highlighting challenges such as infrastructure deficits, regulatory bottlenecks, and financial constraints. By investigating the effectiveness of recent policy measures and technological advancements, the paper evaluates how these factors have reshaped the solar energy landscape in Nigeria. Using a case studies, data-driven insights, and policy analysis, this research aims to provide actionable recommendations to optimize solar systems integration for a more sustainable and reliable energy future.

EPS_002: HYDROGEN-POWERED MICROGRIDS: A PATHWAY TO DECENTRALIZED, ZERO-EMISSION ENERGY SYSTEMS

Chijioke Paul Agupugo[1], Jonah Kalu[2]
[1]Department of Sustainability Technology & Built Environment, Appalachian State University, Boone, NC, USA.
[2]Department of Science Laboratory Technology, Akanu Ibiam Federal Polytechnic, Unwana, Afikpo, Ebonyi State, Nigeria.
Correspondence: kalujonah_ik@yahoo.com

Abstract
Hydrogen-powered microgrids represent a transformative approach to decentralized, zero-emission energy systems. As the world seeks solutions to the growing energy demand and environmental challenges, hydrogen offers a sustainable alternative that complements the use of renewable resources such as solar and wind. Microgrids, which are localized energy networks capable of operating independently or in conjunction with the main grid, are uniquely suited for integrating hydrogen technologies due to their flexibility and potential for resilience.This review explores the role of hydrogen-powered microgrids in advancing the global energy transition. It examines hydrogen as a clean energy source, focusing on green hydrogen production through electrolysis using renewable energy, and the operational benefits it offers over traditional fuels, including its zero emissions and superior energy storage capacity. Additionally, the

design and operational framework of hydrogen microgrids, including key components like electrolyzers, fuel cells, and energy storage systems, are discussed. The environmental and economic benefits of hydrogen microgrids are highlighted, with particular attention to their role in reducing carbon footprints, promoting energy independence, and fostering economic growth through job creation in the renewable energy sector. However, the review also addresses the technical, economic, and regulatory challenges that must be overcome to facilitate widespread adoption, such as infrastructure development and cost barriers. The review considers future innovations in hydrogen technology and the integration of smart grids to optimize performance. In conclusion, hydrogen-powered microgrids offer a promising pathway to achieving decentralized, zero-emission energy systems, contributing significantly to global efforts in climate mitigation and sustainable development.

EPS_003:DESIGN, CONSTRUCTION, AND PERFORMANCE EVALUATION OF A DUAL HEAT SOURCE (SOLAR/CHARCOAL STOVE) DRYER FOR FRUITS AND VEGETABLES

[1]Haruna. M., [2]Francis. M., [3]Ibrahim. M., [4]Bello. M

Department of mechanical Engineering, Faculty of Engineering University of Maiduguri, Borno State Nigeria, +2347067612447, maxwellka4life@gmail.com.
Department of Mechanical Engineering, Faculty of Engineering, Federal Polytechnic Kaltungo Gombe State, Nigeria, +23469707263, maxwellkamo4life@gmail.com
Department of Agricultural and Environmental resources Engineering, Faculty of Engineering, University of Maiduguri.
Department of Mechanical Engineering, Faculty of Engineering, Federal Polytechnic Kaltungo Gombe State, Nigeria,

Abstract
Post-harvest losses of perishable produce like fruits and vegetables continue to be a significant problem owing to poor drying and storage. This study presents the design, fabrication, and performance evaluation of a dual heat source (charcoal/solar stove) dryer to improve drying efficiency and provide all-weather round operation. The dryer is operating in a mixed mode, using solar energy via a collector and auxiliary heat from a charcoal stove. Performance testing involved monitoring temperature distribution, relative humidity, moisture content reduction, and drying kinetics. The highest drying chamber temperature was 46.7°C, which is within the ideal drying temperature (40–80°C) for tomatoes. Relative humidity inside the drying chamber ranged between 33.9% and 58.2%, which was suitable for the efficient elimination of moisture. The dryer was able to bring down the moisture content of tomatoes from 95% to 14% in 76 hours, with a drying capacity of 1 kg/tray. The drying kinetics analysis indicated that the Newton model best fitted the drying data. The findings validate the fact that the incorporation of a charcoal stove enhances drying efficiency, and the system is appropriate for use by smallholder farmers and rural communities.

EPS_004: AN ENERGY OPTIMISATION STRATEGY FOR HYBRID MICROGRID SYSTEM USING MULTIFUNCTIONAL INTELLIGENT AGENT: A case of State Specialist Hospital Asaba

Ekaba S.O, Ofualagba G., Uzedhe G.

Abstract
This study presents an Energy Optimization System (EOS) designed for a Hybrid Microgrid (HMG) at the State Specialist Hospital (SSH) in Asaba, Delta State, Nigeria. The estimation of electrical load for the SSH sub-grid outlines the necessary specifications and requirements for implementing a solar-diesel hybrid microgrid. The system incorporates three primary power sources: solar photovoltaic (PV), a diesel generator, and the State IP Plant. A Multifunctional Intelligent Agent (MIA) is utilized to manage the flow of energy. The MIA is responsible for switching between energy sources and executing intelligent load shedding for different categories of electrical loads: critical loads (cls), priority loads (pls), and less priority loads (lpls), all guided by an energy optimization algorithm. The main goal of the MIA is to monitor and optimize energy consumption within the sub-grid, ensuring a reliable, cost-effective, and consistent power supply. This strategy improves the quality of electricity for the SSH sub-grid while reducing the Cost of Energy (CoE).

EPS_005: Design Of a Portable Solar Powered Egg Incubator for Poultry Farmers

[1]Francis. M., [2]Haruna. M., [3]Ibrahim. M., [4]Faith Edet Mendie

Department of Mechanical Engineering, Faculty of Engineering, Federal Polytechnic Kaltungo Gombe State, Nigeria, +2348069707263, maxwellkamo4life@gmail.com
Department of mechanical Engineering, Faculty of Engineering University of Maiduguri, Borno State Nigeria, +2347067612447, harunadabuji@gmail.com
Department of Agricultural and Environmental resources Engineering, Faculty of Engineering, University of Maiduguri.
Department of Electrical and Electronics Engineering, Faculty of Engineering, Federal Polytechnic Kaltungo Gombe State, Nigeria, e

Abstract
This paper describes the design of a solar-powered egg incubator with 120 eggs capacity for sustainable and affordable poultry farming, particularly in remote areas off the grid. The incubator has a cabinet-type enclosure, mild steel or aluminum frame, and polyisocyanurate insulation for improved durability and thermal efficiency. The temperature is regulated by a 50W heating system, which is controlled by an Arduino microcontroller with DHT22 sensors, and a 12V DC fan maintains even heat distribution. An egg-turning system driven by a servo motor tilts eggs in 45-degree increments to optimize embryo development. The system is powered by a 360W solar panel and a 12V, 120Ah lithium battery for continuous operation. The incubator can maintain ideal conditions for hatchability rates of 80-90%, relying on effective temperature and humidity control. Automation and integration of solar power ensure energy efficiency and reliability. The future scope involves the integration of IoT-based monitoring, improved ventilation, and scalability. Prototype testing is recommended to validate performance and streamline system efficiency.

EPS_006:HYDROGEN-POWERED MICROGRIDS: A PATHWAY TO DECENTRALIZED, ZERO-EMISSION ENERGY SYSTEMS

Chijioke Paul Agupugo[1], Jonah Kalu[2]

[1]Department of Sustainability Technology & Built Environment, Appalachian State University, Boone, NC, USA.
[2]Department of Science Laboratory Technology, Akanu Ibiam Federal Polytechnic, Unwana, Afikpo, Ebonyi State, Nigeria.
Correspondence: kalujonah_ik@yahoo.com

Abstract
Hydrogen-powered microgrids represent a transformative approach to decentralized, zero-emission energy systems. As the world seeks solutions to the growing energy demand and environmental challenges, hydrogen offers a sustainable alternative that complements the use of renewable resources such as solar and wind. Microgrids, which are localized energy networks capable of operating independently or in conjunction with the main grid, are uniquely suited for integrating hydrogen technologies due to their flexibility and potential for resilience.This review explores the role of hydrogen-powered microgrids in advancing the global energy transition. It examines hydrogen as a clean energy source, focusing on green hydrogen production through electrolysis using renewable energy, and the operational benefits it offers over traditional fuels, including its zero emissions and superior energy storage capacity. Additionally, the design and operational framework of hydrogen microgrids, including key components like electrolyzers, fuel cells, and energy storage systems, are discussed. The environmental and economic benefits of hydrogen microgrids are highlighted, with particular attention to their role in reducing carbon footprints, promoting energy independence, and fostering economic growth through job creation in the renewable energy sector. However, the review also addresses the technical, economic, and regulatory challenges that must be overcome to facilitate widespread adoption, such as infrastructure development and cost barriers. The review considers future innovations in hydrogen technology and the integration of smart grids to optimize performance. In conclusion, hydrogen-powered microgrids offer a promising pathway to achieving decentralized, zero-emission energy systems, contributing significantly to global efforts in climate mitigation and sustainable development.
Keywords: Hydrogen-powered, Microgrids, Global energy, Zero-emission

EPS_007: FACTOR ANALYSIS AND K-MEANS CLUSTERING FOR CONDITION MONITORING OF ROTATING MACHINES

Eyere EMAGBETERE [1], Mathias FRIDAY [1], Awele Vivian OMONIGHO[1], Ufuoma Peter ANAIDHUNO [1]

[1] Department of Mechanical Engineering, Federal University of Petroleum Resources, Effurun, 330102, Nigeria
Corresponding Author: emagbetere.eyere@fupre.edu.ng, +2348057130590

Abstract**:** This research investigated the use of factor analysis and k-means clustering methodologies for analysis and interpretation of vibration signals for condition monitoring of rotating machines. To achieve this, the study applies a two phased strategy. Firstly, vibration data were reduced via factor analysis to extract factors that reduce the dimensionality of the vibration data and identify latent factors that represent distinct fault patterns. The extracted factors represent the essential information content of the signals. In the second step, k-means clustering was used to create clusters with similar vibration pattern by considering the extracted factors. Therefore, this clustering process helped in the grouping of different patterns of vibration signals for several rotating machines. From the characteristics of the clusters derived, identification of faulty machines was possible, which can help in timely decision on maintenance and reduce the costs that may

result from a machine breaking down. Thus, it is evident from the results that the proposed factor analysis and k-means clustering methodology is suitable for the accurate identification and categorization of faults with a high degree of noise and under changing operating conditions. The findings of this research contribute to the advancement of predictive maintenance strategies, optimizing the reliability and availability of rotating machinery in industrial settings.

EPS_008: ADVANCES IN IN-TUBE CONDENSATION INSIDE HORIZONTAL SMOOTH AND ENHANCED INCLINED TUBES

DRE Ewim and SM Abolarin

ABSTRACT
In-tube condensation is a critical phenomenon in thermal systems, influencing the efficiency of processes in industries such as power generation, HVAC, and refrigeration. This review explores advances in in-tube condensation within horizontal smooth tubes and enhanced inclined tubes, focusing on improving heat transfer performance. Horizontal smooth tubes, while widely used, often face limitations due to lower heat transfer coefficients and restricted flow dynamics. These drawbacks necessitate innovative approaches to optimize condensation, particularly in the context of increasing energy efficiency and minimizing operational costs. Enhanced inclined tubes have emerged as a promising alternative, offering superior thermal performance through strategic modifications such as passive surface enhancements, including grooves, fins, and coatings. The inclination angle plays a pivotal role in optimizing flow patterns and improving heat transfer rates by mitigating stratification and promoting uniform liquid film distribution. This delves into experimental and numerical analyses that compare the thermal and hydrodynamic behaviors of condensation in horizontal and inclined orientations, highlighting the impact of advanced materials and enhanced designs. Key findings demonstrate that enhanced inclined tubes not only improve heat transfer coefficients but also reduce pressure drops and energy consumption. However, challenges persist, including scaling experimental results to real-world applications, addressing fouling in modified surfaces, and refining computational models for complex flow dynamics. Future research directions include the integration of artificial intelligence for tube design optimization, development of hybrid enhancement techniques, and long-term reliability studies under diverse operating conditions. This review underscores the significance of advancements in in-tube condensation for achieving energy-efficient systems. Enhanced inclined tubes represent a transformative step forward, aligning with global efforts to optimize industrial processes and promote sustainability in thermal management systems.

EPS_009: NANOFLUID FLOW IN NON-CIRCULAR CHANNELS: CHARACTERISTICS, OPPORTUNITIES, APPLICATIONS, AND CHALLENGES

DRE Ewim and SM Abolarin

Abstract
Nanofluids, engineered by dispersing nanoparticles into base fluids, have garnered significant attention for their superior thermal properties and enhancement of heat transfer efficiency. This review investigates the behavior and performance of nanofluid flow in non-circular channels, which are increasingly utilized in modern thermal systems for their enhanced surface area-to-volume ratios and improved flow mixing characteristics. Non-circular geometries, such as rectangular, triangular, elliptical, and trapezoidal channels,

offer unique advantages in optimizing thermal performance but also pose challenges due to complex flow dynamics and pressure drop management. The review explores the influence of channel geometry on nanofluid flow and heat transfer, focusing on key parameters such as nanoparticle concentration, thermal conductivity, and viscosity. Experimental findings and numerical simulations reveal that non-circular channels promote secondary flows and improve heat transfer coefficients compared to circular channels. However, these benefits are accompanied by increased pressure drops, requiring careful optimization of channel dimensions and operating conditions. Advances in computational fluid dynamics (CFD) have provided valuable insights into the flow and thermal behavior of nanofluids in irregular geometries, highlighting the interplay between nanoparticle dispersion, flow patterns, and heat transfer mechanisms. Practical applications of nanofluids in non-circular channels include microchannel heat exchangers, electronic cooling systems, and solar thermal collectors, where their use has demonstrated substantial energy efficiency improvements and system miniaturization. Despite these advancements, challenges such as nanoparticle stability, fabrication complexities, and inconsistencies in experimental data remain. Future research is directed toward exploring hybrid nanofluids, developing advanced materials for channel fabrication, and integrating artificial intelligence to optimize design and performance. This review underscores the transformative potential of nanofluids in non-circular channels for next-generation thermal management systems, paving the way for more sustainable and efficient technologies.
Keywords: Nanofluid, Non-circular Channels, Base Fluid, Heat Transfer Enhancement, Pressure Drop Management, Optimization.

EPS_0010: INVESTIGATING THE EFFECTS OF AL_2O_3 NANOPARTICLE DOPING ON THE THERMAL STABILITY OF A QUATERNARY NITRATE SALT MIXTURES FOR CONCENTRATED SOLAR POWER APPLICATION

Rahman Dauda Ayinla[1], Collins Chike Kwasi-Effah[1,2], Henry Okechukwu Egware[1]

[1]Department of Mechanical Engineering, University of Benin Edo State Nigeria
[2]Department of Mechanical Engineering, University of Alberta, Edmonton, Canada

Abstract
Effective thermal energy storage (TES) is essential for concentrated solar power (CSP) plants, driving the need to explore advanced heat transfer fluids with improved thermal stability. Traditional binary nitrate salt mixtures face limitations in thermal performance, leading to increased research into quaternary mixtures and the incorporation of nanoparticle additives. This study investigates thermal stability enhancement in quaternary nitrate salt mixtures for thermal energy storage (TES) in concentrated solar power (CSP) systems, focusing on Al_2O_3 nanoparticle doping effects. Seven quaternary mixtures of KNO_3, $LiNO_3$, $Ca(NO_3)_2$, and NH_4NO_3 were prepared with varying compositions. Thermal stability was measured for undoped and 5 wt% Al_2O_3-doped samples using differential scanning calorimetry (DSC). Results show significant composition dependent thermal stability of the undoped quaternary nitrate salt mixtures varying significantly, ranging from 148.72^0C to 448.92^0C for the commencement of the first stage decomposition. Al_2O_3 doping led to diverse outcomes: The dopant could only increase the thermal stability of sample 2, decomposition starting at 262.24^0C as against 179^0C prior doping. These findings demonstrate the potential for enhancing TES material performance through compositional optimization and nanoparticle doping, while highlighting the complex salt-nanoparticle interactions. This research contributes to the development of advanced TES materials for more efficient CSP systems.
Keywords: thermal energy storage, concentrated solar power, nitrate salt mixtures, Al_2O_3 nanoparticles, differential scanning calorimetry, thermal stability, TES materials.

EPS_0011: PERFORMANCE EVALUATION DOUBLE ROTOR DUAL-STAGE HYBRID VERTICAL AXIS WIND TURBINE

Buhari Mamuda[1, 2], Gwani Mohammed[1], Muhammed Umar Kangiwa[1], I.I Idris[3]

[1]Department of Physics, Kebbi State University of Science and Technology, Aliero, Kebbi State 1144, Nigeria.
[2] Department of Science Laboratory Technologies, Federal Polytechnic, P.M.B.1012, Kaura Namoda, Zamfara State, Nigeria
[3]Department of Physics, Federal University of Birnin Kebbi, Kebbi State Nigeria.
Corresponding Email: mamudabuhari@gmail.com

ABSTRACT
Vertical axis wind turbines (VAWT) have gained attention for their better efficiency in harnessing wind energy. However, these turbines face some challenges that affect their overall performance, also Darrieus rotor has difficulty self-starting, while the Savonius rotor has low efficiency. Combining the two VAWTs as one system improves the performance of these turbines. The Hybrid VAWTs merging the Darrieus and Savonius rotors into a unified system, enable to generate highest starting torque and enhanced efficiency. The Double Stage Rotor Hybrid (DSRH) VAWT has been constructed and tested, demonstrating technical advantages over the Double Stage Rotor Conventional (DSRC) VAWT and minimizing or eliminating its disadvantages. The results show that the maximum revolution per minute (RPM) recorded by the DSRH VAWT (667) is 45.6 % higher than that of the DSRC VAWT (458) under the same experimental conditions, though the DSRH VAWT starts rotating some seconds ahead of the DSRC VAWT. Additionally, the maximum power coefficient (Cp) of the DSRH VAWT has increased by 37.4 % compared to that of the DSRC VAWT at a wind speed of 5 m/s. Therefore, using batch technology in the hybrid VAWT and double staging has improved the rotational speed, power output, and self-start behavior of the DSRH VAWT.

EPS_0012: PERFORMANCE EVALUATION OF BUILDING INTEGRATED VERTICAL AXIS WIND TURBINE

Nura Abubakar[1], Buhari Mamuda[2], Abba Nuhu[1], Basiru M. Namaiwa[1], Ismail M.Oladunni[1]
[1]Building Technology Department, School of Environmental Studies, Federal Polytechnic, Kaura Namoda,
[2] Department of Science Laboratory Technology, Federal Polytechnic, Kaura Namoda, Zamfara State, Nigeria
Corresponding Email: nurakaita4200@gmail.com

Abstract
Building integrated wind turbines, a significant part of the technologies for domestic micro-energy generation, was the focus of this research. The study involved the design, fabrication, and experimental testing of Vertical Axis Wind Turbines (VAWT) on residential buildings. A building model with a gable rooftop was designed and manufactured for the VAWT testing. The turbine (VAWT) was designed using Google Sketch-up software, Gambit 2.4.6 +Exceed 13 solid tools and fabricated locally. The fabricated VAWT was tested using ventilation fans at varying wind speeds in the laboratory. The rotation per minute (RPM), wind speed, Current, and Voltage

were measured using a Tachometer, Anemometer, and Multimeter, respectively. The vertivcal height of the hybrid VAWT was paced at Y = 17.5 cm on top the roof. The results gotten from the studies showed that the hybrid VAWT mounted on the building rooftop yields up to 75% more energy than the unroofed VAWT, highlighting the significant improvement in the performance of the hybrid VAWT. This study provides impressing insights into the potential of building-integrated VAWT for domestic micro-energy generation.

Key Words: Hybrid VAWT, Turbine power (w), Tip speed ratio (TSR). Building roof.

EPS_0013: DESIGN AND MATHEMATICAL MODELING OF AN AUTOMATIC GEAR OIL-FILLING MACHINE FOR AUTOMOTIVE ENGINES

Taiwo Semiu Amosun[1*]

Email corresponding author: amosunts@fuotuoke.edu.ng
[1]Department of Mechanical and Mechatronic Engineering, Faculty of Engineering, Federal University Otuoke, Bayelsa State, Nigeria

Abstract
The automatic gear oil filling machine for automotive engines is a complex electromechanical system designed to dispense precise volumes of gear oil into containers. This study developed a prototype of an automatic gear oil filling machine that consists of oil reservoir, pump, filter, filling nozzle and sensors (level, pressure, flow rate). The study also developed mathematical model for the various components of the machine. The modeling involves analyzing fluid dynamics, control systems, and mechanical motion. The developed mathematical model provides an analytical foundation to simulate, optimize, and control the performance of the automatic gear oil filling machine for automotive engines. The model considers flow dynamics, pressure losses, and feedback control to ensure precise and efficient operation. Further analysis and experimental calibration may be required to refine the parameters and validate the model under real-world operating conditions. Experimental runs were also carried out to evaluate the performance of the automatic gear oil filling machine. The results obtained showed that the mean filling time is 143.64 seconds, and the standard deviation is 73.15 seconds. The mean oil temperature is 28.45°C, and the standard deviation is 4.35°C. The R-squared value is also approximately 0.93, indicating a strong positive correlation between filling time and oil temperature.

EPS_0014: MODELLING AND SIMULATION OF CCHP BASED TRI-GENERATION SYSTEM

Emmanuel Ogheneworo John, Saba Ebruphiyo Peter, Okoroafor Kelechi Henry, Osarobo O. Ighodaro
Department of Mechanical Engineering, University of Benin, Edo
Email:osarobo.ighodaro@uniben.edu

Abstract

This study investigates the integration of Combined Cooling, Heating, and Power (CCHP) systems into conventional gas turbine power plants in Nigeria, aiming to address the significant energy wastage and improve overall efficiency. The research focuses on modelling and simulating various CCHP configurations, including single and dual-pressure systems, with the incorporation of an absorption refrigeration cycle (ARC) at different locations within the system. Using Aspen Plus®

software, the thermodynamic performance of these configurations was analysed and compared to a standard open-cycle gas turbine (OGT) plant. The results demonstrate that the proposed CCHP systems significantly enhance energy efficiency and power output. Notably, the single-pressure CCHP system with ARC at the Heat Recovery Steam Generator (HRSG) exhaust achieved the highest performance, with a net power output of 290.16 MW and an energy efficiency of 46.19%, compared to the OGT's 194.91 MW and 30.88% efficiency. Dual-pressure CCHP systems also showed substantial improvements, although with slightly lower efficiencies. The integration of inlet air cooling further enhanced performance by reducing compressor work and increasing net power output. This study concludes that retrofitting existing gas turbine plants with CCHP systems, particularly the single-pressure configuration with ARC at the HRSG exhaust, offers a viable solution to improve energy efficiency and reduce carbon emissions in Nigeria. The findings recommend the conversion of existing OGT plants to CCHP tri-generation systems, the design of gas power plants considering local weather conditions, and the implementation of inlet cooling in existing OGT plants to optimise performance.

Environmental Sustainability and Climate Change Mitigation (ESC)

ESC_001: TURNING SCRAP TIRES INTO FUNCTIONAL PRODUCTS: RUBBER SUSTAINABILITY AND RUBBER PRODUCT CIRCULAR ECONOMY

Ben Chouchaoui

EcoUS™ Rubber Circular Solutions
1232 McDougall Street
Windsor, ON N8X 3M7 Canada
contact@ecous.org
00-1-226-350-8047

ABSTRACT
Traditionally, one of the biggest issues facing the automotive and transportation ecosystem has been what to do with scrap tires. When they are no longer suitable for use on vehicles due to wear or irreparable damage, used tires can become a huge ecological problem. There have been, however, major strides in developing sustainable practices for both the disposal and recycling of scrap tires. Yet some of these are not always evident, plus, with new developments in technology and recycling practices continuing to emerge, sustainable tire recycling continues to be a moving target. There are over 40 million passenger vehicles registered in Africa. Each such vehicle replaces all its four tires every three to four years. This comes down to a tire a year, on average, which means Africa scraps over 40 million tires each year. If we do nothing about it, we will face 80 million scrap tires the following year, 120 million scrap tires the year after, and so on. Still, this problem is worsening with electric vehicles, as they are heavier, more vehicles on roads, cheaper tires that last less, etc. Add to that, tires from off-the-road vehicles, trucks, buses, construction machinery, etc.

ESC_002:SUSTAINABLE POULTRY FARMING: DEVELOPMENT OF ORGANIC AND ALTERNATIVE FEED SOURCES TO REDUCE RELIANCE ON FEEDMEAL AND REDUCE ENVIRONMENTAL IMPACT.

Adebayo Stephen Adeniyi [1] Edoka Romanus[2] Oju Olusegun Sunday [3]
[1]Department of Automobile Technology, Kogi State College of Education (Technical), Kabba.
steveolley4k@yahoo.com. 07031686419.
[2]Department of Electrical/Electronic Technology. Kogi State College of Education (Technical), Kabba.
redoka22@gmail.com. 08063684780.
[3]Department of Metal-works Technology, Kogi State College of Education (Technical), Kabba.
ojuolusegun2017@gmail.com. 08064757694

Abstract
The rising cost of feeds and the environmental effects of poultry farming influenced significantly by feed production, which accounts for a substantial portion of resources consumption and greenhouse gas emissions, have necessitated the exploration of alternative feed sources. This study reviews potential substitute to reduce dependency on high cost traditional poultry feed while maintaining optimal poultry

growth production and health. Viable alternatives include insect-based protein such as black solder fly larvae, agricultural bye-product like rice bran and wheat middling's and unconventional protein sources such as algae, duckweed and single cell protein. Additional, food waste and fermented feed ingredients offer sustainable and cost effective solutions, these alternatives not only alleviate feed cost but also reduces environmental impacts, including deforestation and greenhouse gas emissions associated with feed production. Challenges such as variability in nutritional content, processing requirement and regulatory constraints must be addressed to ensure feasibility and acceptance in poultry industry. research is needed to optimize feed formulations and assess long term impact on poultry performance and food safety. The study shows that, -adopting organic and alternative feed ingredient in poultry farming present a promising strategy to reduced environmental impact by leveraging sustainable feed sources, the poultry industry can move towards eco-friendly practice why maintaining animal health and productivity.

Keywords: Sustainable, Poultry, organic. alternative feed, environment

ESC_003:BIOGAS PRODUCTION FROM ANAEROBIC DIGESTION OF FOOD WASTE

[1]Bawa Shetaya Gadima, [2]Bala Samuel Kantoma, [3]Akawu Joseph Sani

Department of Biology, Kaduna State College of Education, Gidan Waya
bawashetaya@gmail.com

ABSTRACT

The quest for energy alternatives comprising locally accessible and renewable resource is one of the principal concern of governments, scientists, and business people around the globe. Biogas, produced by the anaerobic digestion of organic materials, makes sustainable, reliable and renewable energy achievable. This study's main objective was to design an anaerobic reactor which utilizes food waste to generate biogas and also to compare the potential of the various food waste for the production of biogas. The food waste materials used as feedstock were the kitchen waste and cheese whey and a combination of kitchen waste and cheese whey were used for the co-digestion while cow dung was used as the starter seed. The digestion process was carried out at 37^{o}C for 21 days and the pH was maintained at 6.5 - 7.5. The optimum temperature and pH observed in this study were found to be 37^{o}C and 6.89 respectively. The result of the study showed that kitchen waste produced the highest volume of biogas of 370mL followed by cheese whey with 354mL while the co-digestion produced the least volume biogas of 134mL. The average COD removal efficiency achieved in this study was 85.6%. This proved that the type of waste used for digestion, had a vital influence on the quantity of biogas produced.

Keywords: Biogas, renewable energy, anaerobic digestion, food waste.

ESC_004: PRODUCTION OF BIODIESEL FROM NEEM SEEDS OIL USING CALCIUM OXIDE (CaO) DRIVED FROM EGG SHELL AS CATALYST

Iyya Abubakar And Zayyanu iyya

Department of Science Laboratory Technology,
Federal polytechnic, kaura Namoda, Zamfara State, Nigeria .
Correspondence Author: iyyaabubakar@Gmail.com. Phone:+2348039298745

ABSTRACT

The current work was to produce biodiesel from neem seeds oil using calcium oxide (Cao) as catalyst. The calcium oxide was produced prepared from egg shell by calcination and subsequently activated with phosphoric acid H 3 PO 3 solution. The activated CaO Calcium oxide produced was characterized using

Fourier- Transform Infrared Spectroscopy (FT-IR) and Thermal Gravimetric Analysis (TGA) The neem seeds oil was transesterified using methanol over The activated CaO calcium oxide derived from egg shell as catalyst to produced methyl esters(biodiesel) under reflux method . The biodiesel was characterized using FT-IR and GC-MS. The physicochemical properties of biodiesel were analyzed using The methods adopted by the America society for Testing and Material (ASTM) Parameters such as kinematic viscosity (5.7) cloud point (4.8) Pour point (12.4) Flash point (180) of the biodiesel analyzed were all in conformity with ASTM Specification for diesel.

ESC_005:CONVERGENCE OF EMERGING TECHNOLOGIES: REDEFINING THE BOUNDARIES OF SCIENCE AND ENGINEERING

Engr Nwosu Jude Uchechukwu, Benjamin Uwajumogu

ABSTRACT

Environmental sustainability remains under threat despite ongoing climate change mitigation strategies, with rising greenhouse gas emissions and increasing climate-related challenges. The convergence of emerging technologies offers transformative solutions to these pressing issues. As noted in the IPCC's March report, global temperatures have risen over 1°C since the late 19th century, and atmospheric CO_2 levels are at their highest in 800,000 years. In Nigeria, the heavy reliance on fossil fuels contributes significantly to CO_2 emissions. Transitioning to renewable energy sources and adopting innovative waste management techniques, such as converting environmental waste into Compressed Natural Gas (CNG), can mitigate these effects. This paper investigates the large-scale production of CNG through anaerobic digestion, where organic waste, such as animal dung, is degraded by microbes. The resulting gas will be stored and refined for sustainable energy use. Despite the benefits of renewable energy, challenges such as inadequate funding and limited government support hinder progress. Policies fostering research and innovation are critical to accelerating adoption. By leveraging the synergy between science and engineering, this study outlines strategies to promote CNG production and adoption, contributing to a cleaner, more sustainable environment.

ESC_006: EXPLORING THE ROLE OF DATA ANALYTICS IN SHAPING CLIMATE-SMART BUSINESS MODELS IN TELECOMMUNICATIONS.

Adeoluwa Eweje[1], Oladimeji Hamza[2], Ekene Cynthia Onukwulu[3], Anuoluwapo Collins[4], Gideon Opeyemi Babatunde[5] & Alexsandra Ogadimma Ihechere[6]

[1] Canadian Western Bank, (CWB) Calgary, Canada
[2] Canadian Western Bank, (CWB) Calgary, Canada
[3] Independent Researcher, Nigeria.
[4] Cognizant Technology Solutions, Canada
[5] Independent Researcher, Canada.
[6]Independent Researcher, United Kingdom.
Corresponding author: deolu.eweje@gmail.com

Abstract

As climate change intensifies, industries worldwide face increasing pressure to adopt sustainable practices that mitigate environmental impacts while maintaining operational efficiency. Telecommunications, a

critical sector in the digital economy, is uniquely positioned to lead sustainability efforts through the integration of data analytics into climate-smart business models. This paper explores how data analytics serves as a transformative tool in shaping environmentally conscious practices in telecommunications. By leveraging predictive analytics, machine learning, and real-time data monitoring, companies can identify and reduce carbon footprints, optimize energy consumption, and enhance supply chain sustainability. The review highlights the role of data-driven decision-making in achieving energy efficiency, adopting renewable energy sources, and developing innovative green products. Case studies of leading telecommunications firms demonstrate the tangible benefits of data analytics in driving climate-smart initiatives, including reduced greenhouse gas emissions, cost savings, and improved brand reputation. However, the adoption of data analytics for sustainability is not without challenges. Issues such as data quality, technological infrastructure costs, and regulatory compliance present significant hurdles. Despite these challenges, the integration of advanced analytics technologies, such as the Internet of Things (IoT) and blockchain, offers immense potential for furthering sustainability goals. The paper emphasizes the need for robust regulatory frameworks and cross-industry collaboration to overcome barriers and maximize the impact of data analytics on sustainability. By aligning environmental objectives with business strategies, telecommunications firms can not only reduce their ecological footprint but also influence other sectors to adopt climate-smart practices. This research underscores the critical importance of data analytics as a catalyst for environmental sustainability, providing actionable insights for industry stakeholders, policymakers, and researchers aiming to address the challenges of a changing climate.

ESC_007:LEVERAGING DATA ANALYTICS FOR SUSTAINABLE BUSINESS PRACTICES: ENHANCING CLIMATE RESILIENCE IN THE TELECOMMUNICATIONS SECTOR

Ekene Cynthia Onukwulu[1], Oladimeji Hamza[2], Adeoluwa Eweje[3], Anuoluwapo Collins[4], Gideon Opeyemi Babatunde[5] & Alexsandra Ogadimma Ihechere[6]

[1] Independent Researcher, Nigeria.
[2] Canadian Western Bank, (CWB) Calgary, Canada
[3] Canadian Western Bank, (CWB) Calgary, Canada
[4] Cognizant Technology Solutions, Canada
[5] Independent Researcher, Canada.
[6] Independent Researcher, United Kingdom.
Corresponding author: cynthia.onukwulu@gmail.com

Abstract

The telecommunications sector plays a critical role in modern society, yet it is increasingly vulnerable to climate change impacts such as extreme weather events and energy dependency. Addressing these challenges requires integrating sustainable business practices that leverage the power of data analytics to enhance climate resilience. Data analytics enables telecommunications companies to anticipate and mitigate the effects of climate-related disruptions. Predictive analytics, for instance, can forecast extreme weather events, allowing companies to proactively safeguard infrastructure. By analyzing historical and real-time environmental data, operators can implement measures such as network redundancy or backup systems, ensuring service continuity during adverse conditions. Additionally, data analytics optimizes energy consumption across networks and data centers, which are significant contributors to the sector's carbon footprint. Advanced algorithms can identify inefficiencies and suggest actionable strategies, such as shifting to renewable energy sources or optimizing energy use through dynamic load balancing. Real-time monitoring powered by IoT technologies further strengthens climate resilience. Sensors embedded in network infrastructure collect data on temperature, humidity, and energy use, providing insights for

maintaining optimal operating conditions. Such capabilities enable predictive maintenance, reducing downtime and extending equipment lifespan, thereby fostering sustainable practices. The role of data analytics also extends to sustainable product design and lifecycle assessments. By evaluating material use, energy efficiency, and environmental impacts, companies can develop eco-friendly devices and services. Moreover, data-driven carbon accounting allows firms to measure, manage, and offset emissions effectively, aligning with global climate goals. While the adoption of data analytics presents challenges, including data quality, technological costs, and regulatory compliance, it also opens new opportunities. Emerging technologies like AI and blockchain can further enhance decision-making for sustainability. Collaborative efforts between industry, governments, and academia are essential to overcoming barriers and advancing climate-smart strategies. Leveraging data analytics transforms telecommunications into a resilient, sustainable industry. By addressing environmental risks and optimizing operations, the sector can contribute to global climate resilience while ensuring long-term business viability.

Keywords: Data analytics, Business practices, Climate resilience, Telecommunications sector

ESC_008: INDIGENOUS ACTIVISM FOR CLIMATE RESILIENCE AND ENVIRONMENTAL JUSTICE IN SELECTED COMMUNITIES OF EDO STATE, NIGERIA.

Williams Oiseoje AIROYA awilloise@yahoo.com
Godson Ehimiyein ILEVBARE (Ph.D.) godson.ilevbare@uniben.edu
Ohiorenuan Ignatius OKANIGBUAN oohiorenuan@gmail.com

Abstract
This study explores the role of indigenous activism in fostering climate resilience and advancing environmental justice in selected communities of Edo State, Nigeria. Against the backdrop of escalating environmental degradation, deforestation, and the adverse impacts of climate change. Indigenous communities in Edo State have emerged as critical actors in the fight for ecological sustainability and social equity. Drawing on qualitative research methods, including in-depth interviews, focus group discussions, and participatory observation, this research examined the strategies, challenges, and outcomes of indigenous-led environmental movements in three rural communities: Ugboha, Okpuje, and Igbanke. The findings reveal that indigenous activism in these communities is deeply rooted in traditional ecological knowledge (TEK), which informs sustainable land use practices, biodiversity conservation, and community-based resource management. Activists leverage cultural practices, local governance structures, and grassroots mobilization to resist exploitative activities such as illegal logging, oil exploration, and largescale agricultural encroachment. These efforts are not only aimed at mitigating environmental harm but also at addressing the disproportionate burden of ecological crises on marginalized populations, thereby advancing the principles of environmental justice. However, the study also highlights significant challenges faced by indigenous activists, including limited access to resources, political marginalization, and the encroachment of modern economic interests that often prioritize profit over sustainability. Despite these obstacles, the research underscores the resilience and adaptability of indigenous communities in navigating these complexities. This study contributes to the growing body of literature on indigenous environmentalism by emphasizing the intersection of climate resilience and environmental justice in a Nigerian context. It calls for greater recognition of indigenous knowledge systems and the inclusion of local voices in national and global climate policy frameworks. By centering the experiences of Edo State's indigenous communities, this research advocates for a more inclusive and equitable approach to environmental governance, one that respects and integrates the wisdom of those who have long been stewards of the land.

ESC_009: HARNESSING INDIGENOUS KNOWLEDGE AND MODERN TECHNOLOGY FOR SUSTAINABLE WASTE MANAGEMENT IN URBAN NIGERIA: A CIRCULAR ECONOMY APPROACH.

Ohiorenuan Ignatius OKANIGBUAN oohiorenuan@gmail.com
Williams Oiseje AIROYA awilloise@yahoo.com
Jane Itohan OTABOR missjaneotabor@gmail.com
Blessing IGBON igbonblessing@gmail.com

Abstract
This study investigates the potential of integrating indigenous knowledge systems with modern technology to promote sustainable waste management in urban Nigeria, adopting a circular economy framework. Rapid urbanization, population growth, and inadequate waste management infrastructure have exacerbated environmental pollution and public health challenges in Nigerian cities. Against this backdrop, this research explores how traditional practices and innovative technologies can be synergized to create sustainable, community-driven waste management solutions. Using a mixed-methods approach, the study focuses on three urban centers—Lagos, Abuja, and Port Harcourt—where indigenous waste management practices, such as reuse, recycling, and organic composting, have historically been employed. Through interviews, surveys, and case studies, the research examines how these traditional methods can be enhanced with modern technologies, including waste-to-energy systems, digital tracking tools, and advanced recycling techniques, to optimize resource recovery and minimize waste. The findings reveal that indigenous knowledge systems emphasize resource conservation, community participation, and ecological balance, principles that align closely with the circular economy's goals of reducing, reusing, and recycling materials. However, the study also identifies barriers to integration, such as limited technological access, inadequate policy support, and the erosion of traditional practices due to urbanization. Despite these challenges, the research highlights successful examples of hybrid models, where communities have effectively combined traditional methods with modern innovations to improve waste management outcomes. This study contributes to the discourse on sustainable urban development by demonstrating the value of indigenous knowledge in addressing contemporary environmental challenges. It advocates for policy frameworks that recognize and support the integration of traditional practices with modern technologies, fostering a more inclusive and sustainable approach to waste management. By harnessing the strengths of both indigenous systems and technological advancements, this research proposes a pathway toward achieving a circular economy in urban Nigeria, one that prioritizes environmental sustainability, economic resilience, and social equity.

ESC_0010: ENVIRONMENTAL IMPACT OF WASTE LUBRICATING OIL ON SOIL QUALITY IN AUTOMOBILE WORKSHOPS IN DELTA STATE

[*1]Imhontu Maureen, [1]Biose Osadebe, [1]Akenzua Oghosa, [1]Angalapu Jonah [1]Okorie Christopher and [1]Obamina Timothy

[1]National Centre for Energy and Environment, Energy Commission of Nigeria, University of Benin, Benin City, Edo State, Nigeria
[*]Corresponding author's email: imhontu.m@ncee.org.ng, +2348061517804

ABSTRACT
This study investigates the impact of waste lubrication oil management practices on soil quality in automobile workshops across three local governments in Delta State, Nigeria. Waste lubrication oil, a common by-product in these workshops, poses significant environmental risks, particularly in terms of soil

and groundwater contamination when improperly disposed of. The research involved collecting and analysing soil samples from several locations: Uwvie automobile workshop (Warri Site 1), Warri mechanic spare parts village, Mercy City (Warri Site 2), Oghara automobile workshop, and Sapele automobile workshop. Soil samples were taken using a soil auger at these sites. The results revealed that the soils were moderately acidic, with pH values ranging from 4.60 to 7.20, except for WARS1, which was slightly basic. The concentration of cadmium in the soil exceeded the WHO's permissible limits. The analysis of heavy metals showed the following average distribution: Cr > Zn > Pb > Cd. Additionally, hydrocarbon tests revealed high levels of total petroleum hydrocarbons (TPH) in the soil, with values ranging from ∑TPH 724.0888 to 8630.3933 µg/kg across the sample locations. The descriptive statistics for PAHs in soil samples revealed that Acenaphthene (267.16–974.56µg/kg) and pyrene (35.95–1124.51 µg/kg) had higher concentrations compared to other priority PAHs at all five sampling locations. ANOVA analysis of the physicochemical properties and TPH data showed no significant differences across most parameters ($p < 0.05$), except for Total Organic Carbon (TOC %) and n-hexadecane respectively, which displayed significant variation across the five sites. Principal Component Analysis (PCA) of the physicochemical properties accounted for approximately 96% of the total variation in the dataset. PCA analysis identified three principal components explaining the variation in PAHs, with the first two components showing high correlations (>0.5 or < -0.5). The TPH levels followed this trend: WARS2 > SAPS2 > WARS1 > OGHS1 > SAPS1, indicating widespread contamination and raising concerns about the soil's suitability for supporting terrestrial life. These findings underscore the potential negative effects on soil quality and the terrestrial organisms in and around the automobile workshops.

ESC_0011:ARCHITECTURAL INNOVATIONS IN RETROFITTING FOR AFFORDABLE HOUSING: TECHNIQUES AND CHALLENGES

Obinna Chima Iwuanyanwu[1], Baalah Matthew Patrick Garba[2], Ifechukwu Gil-Ozoudeh[3]

[1]Independent Researcher, Delta, Nigeria
[2]Cypress & Myrtles Real Estate Limited, Abuja, Nigeria
[3]Department of Architecture, Enugu State University of Science and Technology
Corresponding author email: iwuanyanwuobinnachima@gmail.com

Abstract
This review paper explores the potential of architectural innovations in retrofitting as a solution to the growing demand for affordable housing. By repurposing existing structures, retrofitting offers a sustainable and cost-effective approach to transforming underutilized or obsolete buildings into functional and affordable homes. The paper examines key architectural techniques, including adaptive reuse, energy efficiency upgrades, space optimization, and the integration of modern amenities. Through case studies of successful retrofitting projects, the research highlights the challenges of maintaining structural integrity, managing costs, navigating regulatory constraints, and addressing social considerations. The findings emphasize the importance of innovative materials, emerging technologies, and collaborative approaches in overcoming these challenges. The paper concludes with recommendations for policymakers, architects, and developers on supporting and implementing effective retrofitting strategies that contribute to affordable housing solutions and urban revitalization.
***Keywords**: Retrofitting, Affordable Housing, Adaptive Reuse, Sustainable Architecture, Energy Efficiency, Urban Revitalization*

Ecotoxicology and Public Health (EPH)

EPH_001:AN INNOVATIVE HEALTH COMPANION FOR TEMINALLY ILL PATIENTS

AISHA IIHAM ISA

Abstract:
ASHbot is an innovative health companion designed to improve the emotional and physical well-being of terminally ill patients through the integration of artificial intelligence, empathetic interaction, and real-time healthcare monitoring. This bot provides personalized emotional support through motivational quotes, soothing music, and comforting messages, all tailored to meet each patient's unique needs. ASHbot's standout feature is its ability to remotely connect healthcare providers, allowing doctors to monitor patient health metrics and emotional responses in real-time, with the ability to intervene when necessary. ASHbot integrates with wearable devices to track physical health metrics such as heart rate and sleep patterns, providing valuable insights into a patient's emotional and physical state. Additionally, the bot offers features like medication reminders, interactive relaxation exercises, and a remote control interface for doctors, bridging the gap between emotional care and medical monitoring. By combining emotional intelligence with healthcare data, ASHbot represents a significant step toward holistic patient care, offering both emotional and physical support to improve the quality of life for terminally ill patients.
This project highlights the potential of ASHbot to revolutionize patient care, demonstrating how advanced technology can foster more compassionate and comprehensive healthcare for individuals facing terminal illnesses.

EPH_002:COMPARATIVE STUDY ON PARAMETERS OF STAGNANT AND RUNNING WATER OBTAINED FROM KAURA NAMODA, ZAMFARA STATE

MOMOH SHAIBU
SAMAILA AHI ABDULLAHI
DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY FEDERAL POLYTECHNIC KAURA NAMODA ZAMFARA STATE NIGERIA
Corresponding Author: momohshaibu3@gmail.com

Abstract
Water is essential in all human activities and its quality is crucial for public health. This study investigates physicochemical parameters of stagnant and running water sources in Kaura Namoda, Zamfara state, Nigeria. The aim was to compare the water quality parameter of stagnant and running water sources including their suitability for domestic use. Total of 10 stagnant and 10 running water were collected from different location in Kaura Namoda. The samples were analyzed for physicochemical parameter such as pH, Temperature, Turbidity, Total Dissolved Solid, Electrical Conductivity, Alkalinity, and Total Hardness. The results showed significant differences ($p < 0.05$) between the physicochemical of stagnant and running water sources. Stagnant water had higher values of pH, turbidity, TDS and EC while the running water has the lower value of these parameters. The study concluded that running water sources has better quality than stagnant water; however, both water sources require treatment before use for domestic purposes in order to ensure the health safety of the consumers.

EPH_003: COMPARATIVE ANALYSIS OF ORGANOCHLORINE PESTICIDE RESIDUES IN WATER SAMPLES FROM GUSAU DAM AND THE GUSAU WATER TREATMENT BOARD

Zayyanu Iyya & Momoh Shaibu
Department of Science Laboratory Technology
Federal Polytechnic Kaura Namoda, Zamfara State Nigeria
Zayyanuiyya@gmail.com 08039093452

ABSTRACT
In this study, comparative analysis of Organochlorine pesticide residues (OCP) from water sampled from Gusau Dam and Gusau water treatment board was evaluated. The samples were collected from Gusau Dam and Gusau water board; the two samples were analyzed for the present of OCP using QuECHERS and GC-ECD for samples preparation and analysis respectively. Twenty Organochlorine pesticide standard were used and only five Organochlorine pesticide residues were detected in the water samples from Dam namely; alpha lindane, Endosulfan Ether, Isodrine, heptachlor epoxide and DDMU with concentration 0.0250 mg/L, 0.0270 mg/L, 0.0141 mg/L, 0.0003 mg/L, 0.0016 mg/L respectively. Only two OCP residues are detected in treated water samples namely; Lindane and Endosulfan with concentration 0.0001 mg/L and 0.0012 respectively. All Organochlorine pesticide residue detected in dam water samples were within the maximum residual limit (MRL) except alpha Lindane and Endosulfan ether that are little higher than 0.02 mg/L of MRL while that of treated water are below MRL. The presence of Organochlorine pesticides residues in the dam shows that farmers are still using these banned Organochlorine pesticides for pest control; therefore, there is need for routine monitoring and the use of effective absorbent for water treatment in order to minimize health risk to human.

EPH_004: ANALYSIS OF CONCOCTIONS FROM DIFFERENT HERBAL PREPARATION SOLD IN KAURA NAMODA METROPOLIS

N. Muhammad[1*] R.S. Saidu[2], Z. Iyya[3], B. Abulllahi[4] M. Lawal[5]

[1,2,3,4]School of Science Laboratory Technology Chemistry, Federal Polytechnic, Kaura-Namoda,
[5]Faculty of Pharmaceutical Science and Ethnomedicine, Usmanu Danfodiyo University Sokoto Nigeria.
Email.najeem36@gmail.com najeebmuhammad42@yahoo.com,Contacts: 08030748667.

Abstracts
The medical and general public should be alerted for the potential of toxicity of herbal preparation these promotes traditional/herbal preparation to a safer and healthy preparation, with the ever, increase use of herbal medicine worldwide and rapid expansion of the global market for those products, the safety and quality of medicinal plants material and finished herbal medicines product have become major concerned foe the health authorities. The aims of the research was to evaluates potential of the different concoction from different herbalist in Kaura metropolis, from the study heavy metals are evaluated from different sample of herbal preparation obtained from market using the AAS methods to determine the concentrations of those heavy metals from different sample such as Cr,Fe,Ni,Zn and Pb. The Fe is found in the sample with higher concentration of 3.7±0.84 which was compared to the standard of world health organization (WHO), Pb was also determined with the concentration of 2.99±1.94, and also the Cr was found to have the concentration oif the 3.04±1.27, equally the concentration of the Ni was found to be 3.01±1.3and finally the Zn was found to Have the concentration of 3.07±1.23as compared to the standard of the world health

organization(WHO). In conclusion the result of the research indicates that the samples contain Cr, Zn, Pb, Ni and Fe respect. From the experiments it indicates that Fe has higher concentration followed by Zn this indicates the health risk awaits the consumer, for the periods of time due to tendency of gradual accumulation in the body system.

EPH_005:EFFECT OF HEAVY METALS (Cd and Cu) ON BMP FROM POULTRY WASTE

[1]Musa Sankey [2]Bawa Shetaya Gadima [3]Sanusi Kingsley Dangarba

Department of Chemistry, Kaduna State College of Education, Gidan Waya

talksankey@gmail.com

ABSTRACT
Biogas can be produced from poultry waste through anaerobic digestion, which involves a cycle of integrated physiological and metabolic processes carried out by microorganisms. However, a lack of trace elements and an excess of heavy metals have been identified as key factors limiting the widespread use of this process. This study aims to examine the impact of heavy metals, specifically cadmium (Cd) and copper (Cu), on the anaerobic digestion of poultry waste for biogas production. Two reactors were set up: R1 and R2, which were used to assess the effects of Cd and Cu, respectively, on biogas generation over a 10-day period. The results were compared with a control reactor (R3) that had no metal addition. The findings showed that a Cd accumulation of 0.25 mg reduced system efficiency by 86%, and at 0.57 mg accumulation, the system failed entirely. A Cu accumulation of 0.17 mg reduced efficiency by 84%, with a complete breakdown of the system at 0.34 mg of Cu. In the control reactor, biogas production increased over time, starting with an initial yield of 51.4 ml on the 4th day. The consistent methane production in the control reactor was due to the absence of heavy metal accumulation, which did not interfere with the digestion process. The study concluded that increasing levels of heavy metal accumulation reduced system efficiency and biogas yield.

EPH_006: MICROPLASTICS IMPACT ON AQUACULTURE ENVIRONMENT: AN OVERVIEW OF GENERATION, REMOVAL TECHNIQUES, POLICIES, AND PROSPECTS

[1*]Ejiroghene Kelly Orhorhoro, [2]Oghoghorie Oghenekevwe, [1]Efe Justic Igbagbon

[1]Department of Mechanical Engineering, College of Engineering, Igbinedion University, Okada, Edo State, Nigeria.
[2]Department of Mechanical Engineering, Faculty of Engineering, Benson Iddahosa University, Beenin City, Edo State, Nigeria. *Corresponding author: ejiroghene.orhorhoro@iuokada.edu.ng

Abstract
There are microplastics (MPs) everywhere in the world. Its possible health risks have been widely regarded as a typical emerging contaminant. The focus of studies published between 2020 and 2025 that address removal methods, regulations, opportunities, and the impact of produced microplastics on aquaculture environment is examined in this review. The results showed that microplastics may absorb contaminants

and release toxic compounds. According to the review, microplastics are commonly found in human and environmental samples. It damages the aquaculture environment, has toxicological effects, alters the behavior, development, and reproduction of aquaculture products, and eventually lowers aquaculture's financial gains. However, chemical, biological, and physical methods can be used to eliminate MP. Moreover, the production phase is not only underregulated but also understudied, despite the fact that policy and research primarily concentrate on the consumption phase.

Information Technology and Smart Systems (ITS)

ITS_001:5th GENERATION NETWORK SLICING

Muhammad Muhammad Bala

Abstract:
As a key technology enabler in the fifth-generation (5G), network slicing can provide customized services for vertical industries. Network slicing enable the decoupling of the physical network through Software Defined Networks (SDN) and Network Function Virtualization (NFV) into multiple logically isolated networks. Firstly, this paper proposes distributed-hypervisor-enabled network slice to meet diverse user's requirements. Secondly, we design a tri-dimensional (3D) network slicing scheme, including resource slicing, virtual network function slicing, and customized network slicing. Thirdly, we also construct a mixed integer linear programming model for the deployment problem of 3D network slice. Finally, an experimental platform is established and the results show that the proposed scheme can provide users with customized services, and effectively guarantee bandwidth isolation between network slices.

ITS_002: THE ROLE OF CLOUD COMPUTING AND AI IN REVOLUTIONIZING SUPPLY CHAIN MANAGEMENT FOR SMES

Mark Osemedua Nwazomudoh[1], David Ajiga[2]

[1]Independent Researcher, Delta State, Nigeria
[2] Independent Researcher, Chicago, Illinois, U.S.A
Corresponding author email: markx97@yahoo.com

Abstract
The role of cloud computing and artificial intelligence (AI) in revolutionizing supply chain management (SCM) for small and medium-sized enterprises (SMEs) is profound. As SMEs face increasing pressure to remain agile, cost-effective, and competitive, cloud computing and AI offer transformative solutions. Cloud computing enhances real-time data access, streamlines collaboration, and reduces operational costs through scalable, on-demand services. Meanwhile, AI facilitates predictive analytics, process automation, and risk management, enabling SMEs to make data-driven decisions and mitigate disruptions. This paper explores the definitions, key features, and technological integration of cloud computing and AI in SCM. It also highlights their impact on data management, cost reduction, demand forecasting, process optimization, and decision-making. Despite the significant benefits, SMEs face challenges related to data security, technical expertise, algorithmic bias, and ethical considerations. The paper concludes with practical recommendations for SMEs to adopt cloud and AI technologies effectively, emphasizing the need for scalable solutions, employee training, and data privacy compliance. By leveraging cloud computing and AI, SMEs can strengthen their supply chain agility, improve customer satisfaction, and achieve sustainable growth.

ITS_003: AN ANDROID CAMPUS GUIDE SYSTEM CASE STUDY OF ALIKO DANGOTE UNIVERSITY OF SCIENCE AND TECHNOLOGY, WUDIL

Kamaluddeen Ibrahim Yarima1, Idris Abubakar Umar2**,** Abdulmalik Ahmad Lawan[3]
Dayyabu Ayuba[4]

[1,2,3]Department of Computer Science, Kano University of Science and Technology, Wudil Kano, Nigeria
[4,] Department of Computer ScienceJigawa State Polytechnique, Dutse, Nigeria
brossadiq@gmail.com , **aalawan@kustwudil.edu.ng**, **mdadutse82@gmail.com**

Abstract—The android campus guide system is designed to address the increasing need for efficient access to information and resources on university campuses. With the growing complexity and size of modern campuses, students often face challenges in navigating their academic environment and finding important locations, services, and facilities. A comprehensive and user-friendly android guide system is designed and implemented to enhance student experience by providing easy access to relevant information with regards to various locations on the campus.

ITS_004: A COMPREHENSIVE SURVEY ON THE IMPACT OF 6G TECHNOLOGY ON THE QUALITY OF EXPERIENCE FOR E-HEALTH MULTIMEDIA APPLICATIONS

[1]Mohammed Yakub Adinoyi, [2]Salifu Simeon Imaben, [3]Bolorunduro Oluwaseun

[1]Electrical/Electronics Department, Kogi State College of Education Technical, Mopa
[2]Physics Department, Kogi State College of Education Technical, Mopa
[3]Computer Science Department, Kogi State College of Education Technical, Mopa
silmoh584@gmail.com

Abstract

The incorporation of multimedia capabilities into mobile health (e-Health) applications has revolutionized healthcare by enabling remote consultations, continuous monitoring, and patient-centered care. However, the need for real-time, high-quality, and immersive user experiences creates substantial issues for network performance and resource management. Sixth-generation (6G) technology, with its unprecedented advances in speed, latency, connection, and intelligent system design, presents a possible solution to these challenges. This article provides a complete overview of how 6G technology might improve the Quality of Experience (QoE) for e-Health multimedia applications. It looks at how 6G's core features, such as terahertz communication, artificial intelligence-driven optimization, and decentralized edge computing, work together to provide reliable support for bandwidth-intensive and delay-sensitive healthcare services. The study investigates crucial QoE measures relevant to e-Health, such as dependability, responsiveness, and multimedia quality, and assesses how 6G might overcome existing constraints such as network congestion, energy inefficiency, and privacy issues. Furthermore, the article focuses on forthcoming 6G-driven technologies like as immersive telemedicine, real-time augmented reality apps, and holographic imaging, which redefine the promise of mHealth. Standardization, ethical considerations, and equitable deployment are among the issues addressed, emphasizing the importance of multidisciplinary teamwork. By combining recent advances and presenting forward-looking views, this survey highlights 6G technology's revolutionary potential in determining the future of eHealth multimedia applications and creating a more efficient, accessible, and patient-centric healthcare ecosystem.

ITS_005: INTEGRATING SMART PHONE INTO AUTOMOBILE SCREW JACK

***Ajayi O.J, Bamisaye A.J, Olajide.A**
Electrical and Electronics Engineering Department, Ekiti State Polytechnic,Isan- Ekiti, Nigeria.
*Corresponding author: oluwole4u4me@gmail.com.
Phone no:07061521203.

Abstract
This project focuses on the development of an automated screw jack system controlled through a smartphone interface for convenience, safety, and efficiency. It consists of a 12V DC electric motor, microcontroller-based control circuitry, and a power screw made of high-strength steel. The major problem addressed in this project is that the operation of screw jacks is mostly manual and may be cumbersome and not safe, especially when heavy vehicles are being lifted. This therefore calls for an automatic screw jack to be developed for lifting loads up to 1000 kg at an average lifting speed of 10 seconds for a 20 cm elevation. The features were complimented by other safety features such as load monitoring, anti-drop mechanisms, and an emergency stop function. The approach involved in this project encompasses design, fabrication, and testing. Performance tests focused on speed, load capacity, and reliability of operation. Tests showed that with this system, there was the possibility of its running continuously for over 50 lifting cycles without failure, lifting heavy loads efficiently while maintaining safety. Further convenience and usability were added to the system by the inclusion of the Web Interface. The automated screw jack will be an incredibly significant upgrade over the conventional jacks in terms of offering a safer, more efficient, and user-friendly operation in performing vehicle maintenance and repair tasks. Results of this project showed that it is possible to perform further optimizations related to load capacity and power consumption.

ITS_006: AI-ENABLED SMART MANUFACTURING IN METAL AM: INTEGRATING REAL-TIME PROCESS MONITORING, DIGITAL TWINS, AND CLOSED-LOOP CONTROL FOR ZERO-DEFECT PRODUCTION"

Ignatius Ekengwu

Abstract—Metal Additive Manufacturing (AM) faces persistent challenges in achieving consistent part quality and process reliability. While various monitoring systems exist, integrating these data streams into actionable, real-time process control remains elusive. This research presents a novel framework combining artificial intelligence, digital twin technology, and closed-loop control systems to achieve zero-defect production in metal AM. By implementing a multi-sensor array incorporating thermal imaging, acoustic emissions, and melt pool monitoring, we developed a comprehensive real-time process monitoring system. The collected data streams feed into a dynamic digital twin model, which continuously updates its predictions using machine learning algorithms trained on historical manufacturing data. Our approach demonstrated a 94% reduction in part defects compared to traditional open-loop systems during validation trials on Ti-6Al-4V components. The system successfully detected and corrected process anomalies within 50 milliseconds, preventing defect formation in critical aerospace components. We identified key correlations between melt pool dynamics and final part properties, enabling predictive quality control. The framework includes a novel deep learning architecture that achieved 97% accuracy in defect prediction while maintaining computational efficiency suitable for real-time applications. Economic analysis indicates a 30% reduction in quality control costs and a 40% decrease in material waste. This research represents a

significant advancement toward fully autonomous metal AM systems, addressing key industrial challenges in quality assurance and process reliability. The methodology has been validated across multiple powder bed fusion platforms, demonstrating its broad applicability. Results suggest that this integrated approach could revolutionize quality control in metal AM, particularly for high-value aerospace and medical applications where zero-defect manufacturing is crucial.

ITS_007: BEHAVIORAL ANALYTICS AND HUMAN FACTOR ANALYSIS FOR REDUCING SOCIAL ENGINEERING AND INSIDER THREATS IN CYBER SECURITY

Olukunle Oladipupo Amoo[1], Yewande Goodness Hassan[2] and Olakunle Abayomi Ajala[3]

University of Nebraska at Omaha, USA
Montclair State University, NJ, USA
Indiana Wesleyan University, USA
kamoo@unomaha.edu, yewandehassan2@gmail.com, ajalaolakunleabayomi@gmail.com

ABSTRACT
Cyber security threats, particularly social engineering attacks and insider threats, exploit human vulnerabilities rather than technical weaknesses. This paper explores the integration of behavioral analytics and human factor analysis as proactive strategies to mitigate such threats. By leveraging behavioral profiling, anomaly detection, and psychological analysis, organizations can identify potential risks before they escalate into security breaches. The study examines machine learning-driven behavioral monitoring, user and entity behavior analytics (UEBA), and cognitive modeling to detect deviations from normative user behavior that may indicate malicious intent or coercion. Findings highlight that context-aware security models, combining psychological profiling with real-time behavioral analytics, significantly enhance the detection of social engineering attempts and insider threats. Additionally, the paper underscores the importance of human-centric cybersecurity training and adaptive risk assessment frameworks. Psychological and cognitive factors, such as decision-making biases, emotional triggers, and susceptibility to manipulation, are analyzed to develop more resilient security cultures within organizations. Empirical evidence suggests that organizations employing integrated behavioral analytics and human factor frameworks experience fewer successful social engineering attacks and insider incidents. The research concludes that a holistic approach, combining technological advancements with human-centered security strategies, is essential for reducing cyber threats that exploit human weaknesses.

ITS_008: INTELLIGENT SURVEY DESIGN AND ANALYSIS: HOW POLLSENSEI IS REVOLUTIONIZING SURVEY DATA MANAGEMENT USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Peter Popoola[1], Uduak Edet[2] , Timothy Imanobe Oliomogbe[3], Daniel Adeboye[4] , Solomon Ogugua[5] , Osasusmwen Usen[4] and Ilesanmi Bello[3]

[1]Head of Product and Product management, Oaks Intelligence Limited, Lagos, Nigeria
[2]Development and Operations Unit, Oaks Intelligence Limited, Lagos, Nigeria
[3]Senior Researcher, Research, Innovation and Development Unit, Oaks Intelligence Limited, Lagos, Nigeria
[4]Machine Learning Engineer, Oaks Intelligence Limited, Lagos, Nigeria
[5]Product Marketing, Business Development Management, Oaks Intelligence Limited, Lagos, Nigeria

ABSTRACT
Survey research has evolved from traditional paper-based methods to digital platforms, yet existing tools such as Google Forms, SurveyMonkey, and Qualtrics continue to face challenges including low response rates, inefficient data validation, and limited automation. This paper introduces PollSensei, an AI-driven survey platform that leverages Retrieval-Augmented Generation (RAG), machine learning (ML), and natural language processing (NLP) to address these limitations. PollSensei enables adaptive question design, real-time response validation, and automated data analysis, significantly reducing manual workload and enhancing data integrity. We present a comparative analysis of PollSensei against traditional survey tools, demonstrating its superior automation, flexibility, and accuracy. Additionally, we discuss challenges such as user adoption, competition, and regulatory compliance, as well as future opportunities for development. As AI and ML technologies continue to advance, PollSensei represents a transformative step forward in survey research, enabling more accurate, efficient, and data-driven decision-making

ITS_009 AI IN SECURITY SCANNING: STRENGTHS, WEAKNESSES, AND THE ROLE OF HUMAN EXPERTISE

B. Olunusi, C. Abhulimhen

Automated security scanning has become a key component of modern software development, with AI-driven tools promising enhanced vulnerability detection. However, the effectiveness of AI in security analysis remains an open question, particularly in comparison to traditional static analysis techniques such as Abstract Syntax Tree (AST)-based tools. This study evaluates the strengths and weaknesses of AI-powered security scanners by comparing their findings against well-established AST-based tools on popular open-source GitHub repositories. In addition to assessing detection accuracy and false positive rates, we examine the impact of integrating AI-driven analysis with AST-based techniques and human expertise. Our results suggest that while AI can detect certain patterns missed by static tools, it also introduces noise and uncertainty. The most effective approach is a hybrid model that leverages AI's pattern recognition, AST's structured analysis, and human oversight for validation. This research provides insights into how automated security scanning should be positioned within real-world security workflows to maximize effectiveness while minimizing risks.

ITS_010: DEVELOPING A FRAMEWORK FOR MULTINATIONAL CORPORATIONS' MARKET ENTRY AND OPERATIONAL MANAGEMENT STRATEGIES IN EMERGING NIGERIAN MARKETS

Joyce Efekpogua Fiemotongha, Chikezie Paul-Mikki Ewim, Augustine Ifeanyi Ibeh

[1]Independent Researcher, Lagos Nigeria
[2]Independent Researcher, Lagos Nigeria
[3]Independent Researcher, Lagos Nigeria
Corresponding Author email: efekpoguajoy@gmail.com

Abstract
Multinational corporations (MNCs) face significant challenges when entering and operating in emerging markets such as Nigeria. These challenges include regulatory complexities, infrastructural deficiencies, cultural diversity, and economic volatility. This study aims to develop a strategic framework to guide MNCs in successfully entering and managing operations in the Nigerian market. The framework integrates market entry strategies, operational management models, and risk mitigation approaches to ensure sustainable growth and competitiveness. The research employs a mixed-methods approach, combining qualitative case studies of successful MNCs in Nigeria with quantitative analysis of economic and business indicators. Key market entry modes, including joint ventures, wholly owned subsidiaries, franchising, and strategic alliances, are evaluated based on their effectiveness in mitigating risks and optimizing local integration. Furthermore, the study examines critical operational management factors such as supply chain adaptation, talent acquisition, cultural intelligence, regulatory compliance, and corporate social responsibility (CSR). The proposed framework emphasizes a phased market entry strategy, starting with comprehensive market research and stakeholder engagement to understand local consumer behavior, regulatory landscapes, and socio-economic conditions. It also highlights the importance of digital transformation, leveraging technology-driven solutions to enhance efficiency and customer engagement. Additionally, the study explores the role of adaptive leadership and strategic agility in navigating dynamic market conditions. Findings suggest that successful MNCs in Nigeria adopt a hybrid approach, blending global best practices with localized business models to enhance market penetration and long-term sustainability. Effective risk management through regulatory alignment, financial hedging, and local partnership development is critical for operational resilience. The study concludes that a well-structured market entry and operational framework significantly improves an MNC's ability to thrive in Nigeria's emerging economy. This research contributes to international business literature by offering a practical model tailored for Nigeria's evolving market dynamics. The framework provides valuable insights for policymakers, business leaders, and investors seeking to expand operations in Africa's largest economy.

ITS_0011: PROJECT MANAGEMENT APPROACH TO RAILWAY CONSTRUCTION ACTIVITIES UNDER UNCERTAINTY

Paul O. Adeosun[1#] and Ibrahim O. Adiyeloja[2]
[1]Department of Industrial and Production Engineering, University of Ibadan, Nigeria; [2]Department of Mechanical Engineering, Federal Polytechnic, Ilaro.
#Corresponding author: poadeosun@gmail.com

Abstract:
Effective project management ensures that projects are completed within the constraints of time, cost, and quality. The complexities and risks inherent in large projects necessitate employing project planning and control techniques. This study conducts a feasibility analysis of implementing a project management

approach to railway construction on a university campus, anticipating potential issues to make informed decisions for the project's success. Thirty-nine main activities were identified from the project network diagram. The Work Breakdown Structure and Programme Review and Evaluation Technique procedures were utilised to determine the critical activities, project cost and duration. A project completion duration of 106 weeks was calculated based on 36 paths for ₦3,766,150,000. The procurement of construction materials, rail track excavation, and the installation of signalling and communication systems were observed as critical for retaining the project timeline and ensuring the structural integrity and operational efficiency of the project. These findings provide crucial insights into the complexities and key sectors managing intricate projects. This highlights the significance of integrating advanced project management techniques, technological solutions, and sustainability practices into every phase of project management. Emphasising detailed planning, budget accuracy, and innovative management practices would assist project managers in effectively planning and controlling projects to ensure their success.

Materials Science, Addictive Manufacturing and Advanced Industrial Processes (MAMIP)

MAMIP 001: ANTIGLYCEAMIC AND ALPHA - AMYLASE POTENTIAL OF THE POLYHERBAL AQUEOUS EXTRACT IN DIABETIC RAT

Prof Emmanuel Oshomoh[1], Dr. Benjamin Gabriel[1] and Ojei Oritseomaemimi Osamagbe[1,2]

[1]Department of Science Laboratory Technology, University of Benin
[2]Department of General Studies, Edo State College of Nursing Sciences, Benin City
***Correspondence: ojeiomas@gmail.com**

ABSTRACT

Diabetes is a chronic disease which is gradually and has become a major cause of concern to the world's population and with it comes along lots of complications which greatly affects the human health. Plants have been known to have certain medicinal properties and are considered to have advantageous components which are beneficial to man. Their use has also been found to be economical and less toxic to human health and men turned to exploring their use and also their extracts due to their less toxic effects. Polyherbal extracts have been found to have more beneficial as when compared to a single herbal extract. In the current study, the aqueous extract of *Annona muticata*, *Zingiber officinale* and *Andrographis paniculata*, was scientifically assessed to determine its antiglyceamic and alpha amylase potential in streptozotocin induced diabetic Sprague dawley rats. The diabetic rats were randomly placed into six groups. Group one rats received 50 mg/kg of the polyherbal aqueous extract, group two rats were given 100 mg/kg of the polyherbal aqueous extract, group three rats were given 200 mg/kg og the polyherbal aqueous extract, group four rats were given 10 mg/kg of glibenclamide, this acted as positive control, group five rats were given 50 ml/kg of streptozocin while the last group were not induced with diabetes and this set acted as normal control. Control groups were established for the purpose of assessment, encompassing both a vehicle control group and a group receiving Glibenclamide, which is a widely recognized pharmacological agent utilized in the management of diabetes mellitus. The polyherbal extract at doses of 100 and 200 mg/kg body weight was found to significantly inhibit alpha amylase and at same doses was able to cause a significant increase in total protein levels. The results gotten thus show that the polyherbal extract used in this study is s strong candidate for the management of diabetes.

MAMIP 002: IN_2O_3 NANOPARTICLE CO-DOPED N,S-RGO: SYNTHESIS, CHARACTERIZATION, AND VISIBLE LIGHT INDUCED DEGRADATION OF AQUEOUS METHYLENE BLUE

Saidu Rabiu Saidu*, Zayyanu Iyya, Najib Muhammad and Bilyaminu Abdullahi,

Department of Science Laboratory Technology, Federal Polytechnic Kaura Namoda, Zamfara, Nigeria *Corresponding author: saidurabiusaidu@gmail.com
Phone: +234 8069240010

ABSTRACT
Textile pollution is becoming a major contaminant and a concern that defies conventional water treatment procedures. Developing a method to remove these organic pollutants from the wastewater environment effectively is necessary. This study aims to synthesize In_2O_3 and enhance its fundamental properties by fabricating it with a nitrogen and sulfur-reduced graphene oxide (N,S-rGO) heterostructure for visible light removal methylene blue (MB) dye. Nanosized In_2O_3 was synthesized via a hydrothermal system. The prepared samples were subjected to various characterization methods. XRD evaluation revealed that bare In_2O_3 has a rod-like structure with high crystallinity. FE-SEM and HR-TEM micrographs showed that In_2O_3 formed nanorods, N,S-rGO exhibited a thin-film layered structure, and In_2O_3/N,S-rGO presented a nanorod-layered structure. The nanorods had an average length of 200-500 nm, with particle sizes ranging from 1-4 µm. FT-IR spectra showed absorption peaks corresponding to In-O, O-H, C=N, C-N, and C-S bonds. A strong and broad absorption peak was observed in the UV-VIS DRS evaluation, with a visible absorption edge at 460 nm. Bandgap studies revealed a moderate reduction in bandgap from the bare to the ternary nanocomposite. In_2O_3-rGO nanoparticle doped with N,S exhibits the highest degradation efficiency of 94.8% after 60 minutes of exposure to visible light. This enhanced efficiency is due to the delocalization of electrons within the carbon framework of rGO, facilitated by the nitrogen and sulfur co-dopants, leading to increased photoactivity.

MAMIP 003: INNOVATIVE STRATEGIES FOR ENHANCING OPERATIONAL EFFICIENCY IN THE OIL AND GAS INDUSTRY AND BEYOND: A CONTINUOUS IMPROVEMENT APPROACH

Musa Adekunle Adewoyin[1], Daniel Edet Isong[2]

[1]Independent Researcher, Lagos, Nigeria
[2]Independent Researcher, Port Harcourt, Nigeria
Corresponding author email: musa_adekunle@yahoo.com

ABSTRACT
In the dynamic and competitive landscape of the oil and gas industry, operational efficiency is crucial to maintaining profitability, sustainability, and resilience. This review explores innovative strategies for enhancing operational efficiency through a continuous improvement approach, integrating cutting-edge technologies and methodologies. The study begins by outlining key continuous improvement frameworks, such as Lean, Six Sigma, and Total Quality Management (TQM), which are instrumental in driving process optimization and cost reduction in complex operations. Key innovations, including digital transformation, advanced asset management, and big data analytics, are examined for their potential to revolutionize industry practices. Digital tools like predictive maintenance and automation, combined with the use of digital twins for real-time asset monitoring, enable more efficient resource allocation and reduced downtime. Additionally, the implementation of green technologies and sustainable practices highlights the

industry's shift towards reducing its environmental footprint while maintaining operational excellence. Beyond oil and gas, the study compares best practices from manufacturing, healthcare, and renewable energy sectors to showcase how cross-industry lessons can enhance efficiency. Emphasizing the importance of a continuous improvement culture, the review offers insights into overcoming organizational resistance and fostering innovation. The findings suggest that by adopting a holistic and adaptive continuous improvement strategy, the oil and gas industry can not only improve current operations but also position itself for future sustainability and growth. These strategies, when applied across industries, offer a blueprint for enhancing operational efficiency and driving long-term competitiveness in a rapidly evolving global market.

MAMIP 004: INFLUENCE OF MINERALOGY ON FROTH FLOTATION EFFICIENCY IN LITHIUM EXTRACTION FROM UDAWA PEGMATITES, KADUNA STATE

Ganiya O. Olajide, Abubakar, U. H, and Isa, I.

Department of Mineral and Petroleum Resources Engineering, Kaduna Polytechnic, Kaduna.
Email: ganezola@gmail.com Tel: 08036082580

Abstract:
The increasing global demand for lithium, especially due to its use in electric vehicle (EV) batteries, has led to a heightened focus on lithium mining and processing. Kaduna State, in Nigeria, is home to one of the largest lithium deposits found in pegmatites, emphasizing its potential to contribute significantly to the global lithium supply. Nigeria, as a whole, hosts various lithium deposits, primarily within granitic pegmatites, which are promising sources of this critical mineral. However, to make lithium mining projects economically viable, an efficient mineral processing strategy is vital. This study focuses on the mineral processing potential of lithium ore samples from the Udawa pegmatite deposits in Kaduna State. The analysis concentrates on the mineralogical characteristics of the ore that could potentially limit the efficiency of its processing and impede the production of high-quality lithium oxide (Li_2O) concentrates. The Udawa deposit is rich in spodumene, the primary lithium-bearing mineral. Initial processing of the ore has produced concentrates with a maximum Li_2O grade of 3.00%. Further beneficiation through froth flotation techniques has improved the concentrate to a grade of 4.50% Li_2O. However, processing challenges remain, particularly due to fine inclusions of quartz and albite that are locked within the lithium silicate minerals. These inclusions hinder the effective liberation of spodumene and reduce the purity of the final concentrate. The study highlights the difficulties faced in achieving Li_2O grades close to the theoretical maximum composition of spodumene. The presence of these mineral impurities and the fine-grained nature of the ore make it difficult to obtain the desired purity of lithium concentrates. As such, the findings emphasize the need for further research into refining processing techniques and developing strategies to overcome these mineralogical limitations to enhance the economic viability of lithium extraction from the Udawa deposit and similar sources.

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MAMIP 005: OPTIMIZATION OF FLOTATION GRINDING PROCESSES USING MODEL-BASED CRITERIA

Abubakar, U. H, Ganiya O. Olajide, and Isa, I.

Department of Mineral and Petroleum Resources Engineering, Kaduna Polytechnic, Kaduna.
Email: hu4ssy8@yahoo.com Tel: 08035391190

ABSTRACT:
This paper presents a control algorithm for grinding and flotation processes. A consecutive realization method is used to estimate ore grade and optimize technological processes based on economic factors. To improve copper ore enrichment efficiency, the study suggests measuring and considering the concentration of nonionic collector in the aqueous phase of the pulp when selecting grinding and flotation conditions. Using data on grinding fineness and collector concentration, a model has been developed that links metal extraction to process parameters. The grade control algorithm involves creating an ore model for processing, representing a mixture of various ore types, and selecting enrichment modes based on the grade information of the processed ore. Economic efficiency is evaluated using a criterion that combines the value of extracted metals and the costs of enhancing concentrate quality. By considering both ore grade and metal content, the model better reflects the characteristics of the ore being processed. Through this model and an economically-driven optimization approach, the optimal grinding grain size for copper ores was determined. The application of this control algorithm has been shown to improve both technical and economic efficiency at the Warari copper ore processing plant in Niger state.
Keywords: copper ores, grinding, flotation, modeling, ore grade, optimization criteria

MAMIP 006: MINERALOGICAL CHARACTERIZATION OF ALAWA GRAPHITE

Usman Muhammad Akindele

Department of Metallurgical Engineering, Kaduna Polytechnic, Kaduna
Corresponding Author: usmanakindele@kadunapolytechnic.edu.ng. Tel: **08032847020**

Abstract
Graphite resources are currently being subjected to intensive exploration to help meet rapidly growing global demand. It is a crystalline form of carbon and has made it onto the list of critical raw materials. Bulk Alawa graphite sample were collected at three different locations, crushed and pulverized. A representative sample was obtained by coning and quartering method. Mineralogical study by XRD and petrological analysis revealed graphite, quartz, muscovite and cronsdtetite as principal mineral phases. The head sample was analyzed and gave the average fixed carbon content of the deposit as 36.21% by proximate analysis other elemental composition revealed to be 67.14 % Si, 7.036% Fe, Calcium of 4.09%, Aluminum of 4.35% and 3.70% Potassium using XRF machine. The mineralogical, petrological studies and chemical analysis results indicates that Alawa graphite could be beneficiated to meet up various applications most especially to pencil grade.
Keywords: Mineralogical, Alawa graphite, characterization, pencil grade.

MAMIP 007: OPTIMISATION OF REAGENTS DOSAGE FOR THE BENEFICIATION OF ZANKAN SPODUMENE

Usman M. Akindele[1], Abubakar M. Baba[2], Ismaila Idowu Ahmed[3]

[1]Department of Metallurgical Engineering, Kaduna Polytechnic, Kaduna, Nigeria.
[2]Department of Computer Engineering, Kaduna Polytechnic, Kaduna, Nigeria.
[3]Department of Materials and Metallurgical Engineering, University of Ilorin, Ilorin, Nigeria.

ABSTRACT
This work presents optimization of reagent dosage for the concentration of Zankan Spodumene. The Spodumene sample obtained from Zankan Village in Kaduna State, Nigeria, was comminuted and flotation was conducted on the liberated sizes. Inductively Coupled Plasma—Optical Emission Spectroscopy (ICP-OES) was used to determine the chemical composition, while the optimization process was observed by a three-factorial design. The optimal conditions to attain the possible recovery of lithium oxide was the ratio of 2:2:4 ml of Collector (Oleic acid), Frother (Pine oil), and Sodium silicate (Depressant) respectively. A feed of 2.39% LiO_2 was enriched to 4.57% LiO_2 concentrates for the metal extraction. Thus, it is recommended that flotation reagents dosage for Spodumene should be a ratio of 2:2:4 ml to enhance significant value addition, and also, to be used as a basis for pilot scale extrapolation

MAMIP 008: MATERIAL SCIENCE, ADDITIVE MANUFACTURING AND ADVANCED INDUSTRIAL PROCESSES (MSAID)

OMONIWA SEYI

08036266252/omoniwaseyi7.@gmail.com

ABSTRACT
The convergence of materials science, additive manufacturing and Advanced industrial processes is transforming the industrial landscape. This research explores the intersections between these fields highlighting their potential to drive innovation, efficiency and sustainability. The study deives into the developments of novel materials with tailored properties for additive materials, including metals, polymers and ceramics. It also examines the role of additive materials in enabling the production of complex geometries, reducing materials waste,and enhancing product customisation. Furthermore,the research investigates the integration of additive materials with advanced industrial processes,such as robotic, artificial intelligence,and internet of things technologies.This Integration is shown to enable the creation of "Smart"Manufacturing system,which can optimise production work flows,predict maintainance needs and improve product quality. The findings of this research demonstrate the vast potential of synergies industries can unlock new levels of efficiency, innovation,and sustainability, ultimately driving economic growth and competitiveness.
Key word: Materials science, Additive Manufacturing, Advanced industrial processes, Smart Manufacturing.

MAMIP 009: **A REVIEW ON ADDITIVE MANUFACTURING TYPES, MATERIALS, PROCESS PARAMETERS, AND APPLICATIONS IN INDUSTRY 4.0**

[1]Oghoghorie Oghenekevwe, [2]Andrew Amagbor Erameh, [2*]Ejiroghene Kelly Orhorhoro

[1]Department of Mechanical Engineering, Faculty of Engineering, Benson Iddahosa University, Beenin City, Edo State, Nigeria.
[1]Department of Mechanical Engineering, College of Engineering, Igbinedion University, Okada, Edo State, Nigeria.

ABSTRACT
The potential of additive manufacturing (AM) to produce extremely intricate geometric shapes has had a significant impact on modern society. The poor characteristics and anisotropy of 3D plastic items limit their practical usage. Fillers increase the performance and adaptability of applications. Low labor expenses, low pricing, and simplicity of editing and updating drawings are some of the benefits of AM. A thorough explanation of the many materials that work with each kind of AM printing procedure is provided. Numerous factors, including raster angle, die tip, layer thickness, feed speed, scanning angle, extruder temperature, and plate spacing, have been found to have an impact on the final output. Numerous techniques have been put forth to enhance these parameters. The different application areas of each process type are also presented in the study. There is also a special section on Industry 4.0. Despite the fact that AM has advanced significantly, the evaluation found that problems including material incompatibility and material cost still need to be resolved.

MAMIP 0010: **MONODORA MYRISTICA EXTRACT: A SUSTAINABLE SUBSTITUTE TO ZINC PHOSPHATE FOR EPOXY COATINGS.**

Macdenis Onyekachi Egbuhuzor[1,2,*], Christogonus Oudney Akalezi[2,3], Chinyere Ada Madu[3,4] and Emmanuel Emeka Oguzie[2,3]

[1] Department of Metallurgical and Materials Engineering, the University of Nigeria Nsukka, Enugu State,
[2]Africa Centre of Excellence for Future Energies and Electrochemical Systems (ACEFUELS), Federal University of Technology Owerri, Imo State, Nigeria
[3]Department of Chemistry,), Federal University of Technology Owerri, Imo State, Nigeria
[4]Department of Physics,), Federal University of Technology Owerri, Imo State, Nigerian
[*] *Corresponding Author: [Onyekachi.egbuhuzor@unn.edu.ng];*

ABSTRACT
The growing environmental concerns and demand for sustainable materials in industrial applications have prompted researchers to explore eco-friendly alternatives to conventional chemical additives. Zinc phosphate, a widely used anticorrosive agent in protective coatings, has raised environmental concerns due to its potential toxicity and non-renewable nature. This research explored the use of *Monodora myristica* (African nutmeg) extract as a sustainable and biodegradable substitute for zinc phosphate in epoxy coatings. This study investigated the potential of the extract as a sustainable substitute for zinc phosphate in coating formulations. A market standard coating formulation was used and the percentage of zinc phosphate in the coating was substituted with Monodora myristica extract (MME). The coatings were applied on the mild steel substrate and allowed to dry in an open air. Fourier Transform Infrared Spectroscopy (FTIR)

confirmed the presence of functional groups and bioactive ingredients that assist in both coatings anti-corrosion properties. Morphological properties were studied using Atomic Force Microscopy (AFM), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDS), Transmission Electron Microscopy (TEM). The results of the AFM showed a surface roughness of 1.15nm and 0.97nm for epoxy coated with zinc phosphate and extract respectively. The mechanical properties of the coated epoxy paints were investigated using Rockwell micro-hardness values which shows very close results between the two coatings. More so, the thermal properties were studied using Differential Scanning Calorimeter (DSC) and Thermal Gravitational Analysis. The results showed that the coatings coating zinc phosphate. The TGA results showed the temperature at maximum weight loss of epoxy paint coated with zinc phosphate is 498ºC while the paint with extract is 505ºC and the char residue for both are 13.43g and 16.91g respectively. The electrochemical results using the rapid electrochemical assessment of paints (REAP) tests showed a very close coating solution resistance of 7.43ohms and 8.99ohms for both the epoxy/zinc phosphate and epoxy/extract coatings respectively. The morphological, thermal and electrochemical analysis conducted on both the epoxy/zinc phosphate coated paints and epoxy/MME coated paints showed close results exhibited by the extracts and confirmed that the non-biodegradable zinc phosphate additive in epoxy coatings can be substituted with a better, biodegradable and environmentally friendly monodora myristica extracts.

MAMIP 0011: **THE EFFECT OF INORGANIC COATING ON THE CORROSION SUSCEPTIBILITY OF MILD STEEL IN A CHLORIDE ENVIRONMENT.**

O. Awheme, C.G Amaefule and O.D. Amrevu

[1] Department of Metallurgical and Materials Engineering, University of Benin

Abstract:
The work investigates the effects of inorganic coating on the corrosion susceptibility of mild steel in a chloride environment. The mild steel samples were treated with zinc inorganic coatings through a dipping process. Both coated and uncoated samples were subsequently immersed in a 1M sodium chloride solution, mimicking the corrosive action encountered in marine environments. The comparative analysis of corrosion resistance was meticulously conducted using electrochemical impedance spectroscopy techniques, complemented by visual inspections and precise weight loss measurements. The corrosion behavior of coated and uncoated mild steel in a chloride environment was evaluated over 20 days, with corrosion rates analyzed at 5-day intervals. The coated specimen demonstrated high initial resistance to corrosion, with a low corrosion rate of 0.0116 mm/yr and efficiency of 95.10% on days 1-5. However, the corrosion rate of the coated specimen increased progressively to 0.1927 mm/yr by day 16-20, while the coating efficiency declined to 45.67%, indicating a degradation of the coating over time. In contrast, due to the aggressive chloride environment, the uncoated specimen experienced significantly higher corrosion rates throughout, peaking at 0.5132 mm/yr on days 11-15. These results highlight the short-term effectiveness of the inorganic coating and its limitations in maintaining long-term protective performance, emphasizing the need for improved durability in chloride-rich environments.

MAMIP 0012: Characterization of the Physio-mechanical Properties of Bamboo and Plantain Fibers

Unueroh U. G., Eigbedion E. V., Esene E. D., Ikoko C. S, Imoni O. G. O Akhabue O.

Materials and Metallurgical Engineering, University of Benin, Benin City, Nigeria

Abstract.
The escalating need for sustainable and environmentally friendly materials across various sectors has generated a heightened interest in the extraction of plantain and bamboo fibers. The primary objective of this investigation is to characterize the physio-mechanical properties of plantain and bamboo fibers that are extracted using sodium hydroxide (NaOH) in a chemical retting process. FTIR analysis corroborated the partial elimination of non-cellulosic components, with heightened NaOH concentration correlating with increased removal of lignin and hemicellulose, from the final result it can be noted that Bamboo Fibers has more cellulosic property hence improving the fibers strength and stiffness. The Scanning Electron Microscopy (SEM) was applied to investigate the surface morphology, defects and microstructure, providing detailed images, which show all the fibers have a rough surface which often results in better fiber-matrix adhesion and also contribute to mechanical interlocking in potential applications. The Sem Analysis was followed up by an EDS Analysis to show the elemental composition of bamboo, highlighting significant amounts of carbon (C) and oxygen (O), which aligns with the composition of polysaccharides, particularly cellulose and hemicellulose. Which resulted in bamboo been fiber better for the fiber extracted using 20% sodium hydroxide and Plantain fiber better for the fibers extracted using 30% sodium hydroxide since they both have high carbon content and low sodium content. The Tensile analysis was done to analysis the difference in the tensile properties of all the Fibers which resulted in 20% NaOH Bamboo fiber having a moderate ductility while the other fibers have low ductility.

Mathematics and Computational Physics (MCP)

MCP_001: ADVANCEMENTS IN QUANTUM COMPUTING: GOOGLE'S WILLOW AND THE FUTURE OF SCALABLE, ERROR-CORRECTED QUANTUM PROCESSORS"

Godson Ehimiyein ILEVBARE (PhD)

CERHI, University of Benin, Edo State.
Email: godson.ilevbare@uniben.edu uniquegodson@gmail.com
Tel: 09028025474

Abstract
Quantum computing has emerged as a transformative technology in the 21st century with the potential to transform industries through its high-superior computational proficiencies. One of the major advancements in this area is the development of scalable, error-corrected quantum processors. This study emphasizes on Google's Willow processor, a second-generation superconducting quantum processor, which stands to represents a significant step towards achieving fault-tolerant quantum computation. The core objective of this study was to investigates the progressions in quantum computing, with precise emphasis on the Willow processor, its error correction techniques, and its consequences for scalable quantum computing. The research integrates a comprehensive review of quantum computational architectures, alongside experimental data derived from Willow's performance metrics. The study examined Willow's innovative combination of quantum error correction codes, high-fidelity qubits, and advanced control systems. It also investigated the scalability challenges of quantum computing and how Willow's design addresses these issues. Findings Key findings of the study include a significant reduction in error rates to sub-threshold levels essential for fault-tolerant quantum computation. Additionally, Willow's improved qubit connectivity and enhanced coherence times were highlighted. The study also addresses the scalability challenges in quantum computing, demonstrating how Willow's architectural advancements, including novel engineering and algorithmic strategies, overcome these barriers. The research demonstrates that Google's Willow processor is at the forefront of advancing error-corrected, scalable quantum processors, making significant contributions to the quantum ecosystem. While challenges remain, Willow's innovations set new benchmarks for the field, and its development offers promising pathways toward a quantum-enabled future that surpasses the capabilities of classical computing systems.
Keywords: quantum computing, Google Willow, error correction, scalability, fault-tolerant quantum processors, quantum supremacy.

MCP_002: COMPARATIVE ANALYSIS OF THE KINETICS AND THERMODYNAMICS OF CRYSTAL VIOLET DYE REMOVAL USING NAOH AND KOH

Adamu Abubakar Rasheed*, Yusuf Shu'aibu and George Obasi

Department of Chemical and Petroleum Engineering, Faculty of Engineering, Bayero University Kano, PMB 3011, Kano, Nigeria *Email: aarasheed.cpe@buk.edu.ng, Tel: +2348141259150

Abstract:
Crystal violet (CV), a toxic, mutagenic, and carcinogenic dye, poses a major environmental threat when discharged untreated from industries such as textiles, cosmetics, and pharmaceuticals. Alkaline hydrolysis is an effective method for CV removal, as alkalis disrupt its molecular structure, leading to decolorization. Sodium hydroxide (NaOH) and potassium hydroxide (KOH) are commonly used, with KOH being the stronger base due to its larger atomic radius, weaker K–O bond, and higher solubility. Despite their widespread use, few studies have systematically compared the kinetics and thermodynamics of CV hydrolysis with NaOH and KOH. This study aims to fill this gap by comparing the effectiveness of NaOH and KOH in degrading CV while investigating the reaction kinetics and thermodynamics of both processes. Initial experiments were conducted by mixing a CV dye solution at a concentration of 2.3×10^{-2} mM with NaOH at concentrations of 9.5 mM, 24 mM, and 38 mM at temperatures of 4°C and 23°C. The experiments were then repeated using KOH under identical conditions. UV-Vis spectrophotometry was employed to monitor the reaction progress and determine kinetic parameters.The reaction kinetics data revealed that both NaOH and KOH follow a first-order rate law with respect to both CV and the alkalis, indicating that the reaction rate is directly proportional to the concentration of the reactants. However, KOH exhibited a significantly faster reaction rate compared to NaOH, likely due to its greater ionic mobility and stronger alkalinity. The activation energy for the reaction with NaOH was found to be much higher than with KOH, suggesting that the hydrolysis of CV proceeds more readily in the presence of KOH. Both reactions were determined to be endothermic, as indicated by positive enthalpy values, with NaOH showing considerably higher enthalpy changes than KOH at both temperatures. This suggests that more energy is required for CV degradation with NaOH than with KOH, further reinforcing KOH's superior effectiveness. Entropy and Gibbs free energy (ΔG) values for NaOH and KOH were similar, showing minimal temperature variation, indicating comparable spontaneity. However, KOH's lower activation energy and enthalpy changes make it more efficient. This study confirms KOH as the superior alkali for CV removal, offering faster degradation and lower energy requirements. These findings aid wastewater treatment optimization, with future research needed for large-scale application.

Modeling, simulations and Digital Twin Technologies (MSD

MSD_001: STATISTICAL ANALYSIS ON THE WORK-INDEX DETERMINATION OF ZANKAN SPODUMENE

Usaini MNS[1], Usman M. Akindele[2], Ismaila I. Ahmed[3]

[1]Department of Mineral & Petroleum Resources Engineering, Kaduna Polytechnic, Kaduna, Nigeria.
[2]Department of Metallurgical Engineering, Kaduna Polytechnic, Kaduna, Nigeria.
[3]Department of Materials and Metallurgical Engineering, University of Ilorin, Ilorin, Nigeria.

ABSTRACT
Usually, the energy requirement for the liberation of valuable minerals from their associated gangue is determined from comminution parameters of the ores, which is often quite expensive and could be as high as 50% of the total energy needed in mineral processing plants. Hence, the need to determine Zankan Spodumene comminution parameters with no prior data sheet cannot be overemphasized. This research aimed to conduct an experimental determination of comminution parameters of Nigerian Zankan Spodumene and the objectives of the research work were to: carryout crushing and grinding of spodumene ore and then conduct sieve size analyses of the ground ore into different size fractions and determine work index that correlates with optimal energy requirement for ore liberation without overgrinding the ore. Spodumene obtained from Zankan Village, Nigeria, was subjected to grindability test using granite and magnetite as reference materials. Sieve analysis was carried out using laboratory sieve shaker. Homogenized samples were obtained by Coning-quartering and riffle splitter methods were processed, work index of Zankan spodumene was determined, in line with Bond modified energy equation. T-test statistical method was used to ascertain the suitability of the choice reference materials to that of the test ore. Grindability tests showed that 80% passing size fraction of the "Feed" for Spodumene, Granite and Magnetite were 553.82, 357.68 and 418.85 µm respectively, while those of the "Product" were 257.02, 177.42 and 242.67 µm respectively. The average work index of the Zankan Spodumene determined from the 80% passing size fraction of the feed and product, was 13.27 kWh/ton. Statistical method using T-test resulted that P-value on percentage weight retained on the Feeds to be 0.999, 0.999, 0.879 and the percentage weight retained on the Products 0.999, 0.899, 0.989 respectively at 5% level of significance. The experimental parameters obtained from this study will be relevant to the exploitation and processing of the Zankan Spodumene for lithium battery production.

MSD_002: ON THE FLEXIBILITY OF EXPONENTIATED TYPE II GENERALIZED TOPP-LEONE INVERSE EXPONENTIAL DISTRIBUTION

Kolawole Ismail Adekunle[1], Abubakar Yahaya[2], Sani Ibrahim Doguwa[3], Aliyu Yakubu[4]

1. Department of Mathematics and Statistics, Kaduna Polytechnic, Kaduna.
2. Department of Statistics, Ahmadu Bello University, Zaria

talktoismak@yahoo.co.uk

Abstract

In this study, a new four-parameter lifetime distribution called the Exponentiated Type II Generalized Topp-Leone Inverse Exponential distribution was introduced. An expansion for the probability distribution functions and cumulative density function was carried out which was used to derive some Mathematical and Statistical properties of the distribution such as the moments, moment generating function, quantile function, survival function, hazard function, and probability weighted Moment. The estimation of the parameters by maximum likelihood method was discussed. Two real life data sets were used to show the fit and flexibility of the new distribution over some lifetime distributions in literature. The results showed that the new distribution fits better in the two datasets considered

MSD_003: COMPARISON OF BISECTION, NEWTON-RAPHSON AND REGULAR FALSI METHODS FOR DETERMINING THE ROOT OF THE NON-LINEAR EQUATION.

Patrick Idowu Owohunwa

Dept. of Mathematics and Statistics, Kaduna Polytechnic, Kaduna,Kaduna State, Nigeria.
Corresponding author: owohunwapatrick@gmail.com

ABSTRACT

In this paper, we present the mathematical background of the three most common numerical methods of solving non-linear equations. The Bisection, Newton-Raphson and Regular Falsi methods are indicated to show the numerical approximation of the non-linear equation $f(x) = x3 - 9x + 1 = 0$ on a closed interval $[a,b]$, the paper wants to display the comparison of the implementation and the rate of convergence among the numerical methods to detect the root of the non-linear equation. The Newton-Raphson and Regular Falsi methods are more absolutely accurate and speedy to converge with a few steps of iterations while the Bisection method takes too much iteration to converge. It was observed that the Bisection method converges at the 12th iteration while Newton-Raphson and Regular Falsi method converges to get the exact root of 2.4692 at the 5th and 7th iterations respectively. It was then concluded that of the three methods considered the Regular Falsi method is the most effective to use although the Newton-Raphson method converges faster but it requires difficulty in taking a derivation, this is in line with the results on the table of iterations.
Keywords: Roots, Convergence, Iterations, Bisection method, Newton-Raphson method, Regular Falsi method.

MSD_004: ON M/M/C QUEUES WITH EXHAUSTIVE SERVICEVACATION

Ogunlade, Temitope Olu

Ekiti State University Ado-Ekiti, Nigeria

This study examines a multiserver queue with poisson arrival and xponential service rate with an exhaustive service vacation model. The vacation times are also assumed to follow an exponential distribution. Analytical expressions for key performance metrics, including system size, waiting time, and server utilization, are derived using a combination of the matrix geometric method and generating functions. Numerical results illustrate the effect of varying arrival rates, service rates, and vacation parameters on system performance. The model's applicability to real-world scenarios, such as call center operations and distributed computing, is also discussed

MSD_005 HYBRIDIZATION OF DATA MINING TECHNIQUES FOR PREDICTION OF RECURRENCE AND SURVIVABILITY OF BREAST CANCER PATIENTS.

NURUDEEN, A.A 1 ., USMAN U 2 , ASARE B. K 2 . AND ABDULKARIM B 2 .
1 DEPARTMENT OF MATHEMATICS AND STATISTICS COLLEGE OF SCIENCE AND TECHNOLOGY KADUNA POLYTECHNIC
2DEPARTMENT OF STATISTICS USMANU DANFODIYO UNIVERSITY SOKOTO, SOKOTO
. Corresponding author: 08023793635, 08032156015 nurkarmeds@gmail.com

ABSTRACT
This study developed ensemble learning models- ANN-KNN and ANN-SVM that can be used to predict the recurrence and survivability of breast cancer patients. A total of 2,469 patients with breast cancer dataset was obtained from Barau-Dikko Teaching Hospital (BDTH) Kaduna, Cancer Registry Department. The results showed that the conventional Machine learning (ML) models- Support Vector Machine (SVM), Artificial Neural Network (ANN), K-Nearest Neighbour (KNN), and the proposed models- ANN-KNN and ANN-SVM could predict the recurrence of breast cancer respectively with 82.29%, 94.84%, 90.49%, 97.10% and 95.65% accuracy, also they could predict survivability of breast cancer patients respectively with 63.29%, 90.46%, 81.93%, 91.47% and 91.04% accuracy in the tested dataset. The ANN-KNN and ANN-SVM models outperformed the conventional ML models on recurrence and survival prediction of breast cancer patients. In this study, family history and chemotherapy respectively turned out to be the most important feature for recurrence and survivability of breast cancer patients. The outstanding performance of the proposed models in terms of precision, recall and F1 score highlights the model's effectiveness in accurately predicting both “yes” and “no” for recurrence prediction and both “alive” and “dead” for survivability prediction. Both conventional ML models and proposed ensemble learning models predict the recurrence of breast cancer and the survivability of breast cancer patients with high accuracy.
Keywords: Machine learning models, Proposed learning models, Dataset, Accuracy, Recurrence, Survivability.

MSD_006: A STUDY ON THE VOLATILITY SPILLOVER BETWEEN NIGERIA AND INDIA: AN APPLICATION OF BIVARIATE GARCH MODELS

IBRAHIM, Mamuda Kukasheka

Department of Mathematics and Statistics Kaduna Polytechnic
mamudy2k@gmail.com, +2348029000872

ABSTRACT

The interaction between exchange rate volatility and economic growth has been the subject of intense debate among policymakers, professionals and other stake-holders of the economy. The exchange rate is an important macroeconomic fundamental that influences the economy of a country. This study investigated the volatility spillover between Nigerian and South African economy using Bivariate GARCH Models. The data used in this research were daily exchange rate for the eighteen (18) years obtained from the websites ofCentral Bank of Nigeria and that of Federal Reserve Bank of Louis, U.S.A. The result indicated that all the three models considered (VECH, DBEKK and CCC) show evidence of impact of the exchange rate shocks on Nigerian and exchange rate volatility of Indian markets at 5% level of significant. In addition, VECH model was able to capture volatilityspillover (own and cross) between the two markets which indicated the existence of causal relationship between the past volatility shocks in Nigeria and recent volatility in the Indian markets. Conclusively, based on minimum information criteria, the VECH model was found to be the best model.

MSD_007: A NUMERICAL APPROACH TO STUDYING CAVITATION IN OIL AND GAS INDUSTRY

Owunna Ikechukwu, Daniel Okene, Madu Chukwuemeka, Benjamin Chukwueze

ABSTRACT

The oil and gas industry relies heavily on centrifugal pumps to transport crude oil, but cavitation remains a significant challenge, reducing both the lifespan and efficiency of pumps. Despite its impact on operations, cavitation in crude oil has received limited attention, as most existing studies have focused on water and other fluids. This study aims to bridge this knowledge gap by developing a numerical approach to analysing cavitation in crude oil centrifugal pumps. We employed computational fluid dynamics (CFD) simulations using the ANSYS (R12025) tool to investigate the complex flow patterns and cavitation phenomena in centrifugal pumps. Our approach was multi-faceted to accurately capture the complexities of cavitation. We used a bubble model to track the nucleation, growth, and implosion of vapour bubbles, a turbulence model to simulate chaotic flow behaviour, and a multiphase model to account for interactions between crude oil in its liquid and vapour phases. The numerical approach was validated by comparing our results with actual performance data from a pump used on an established oil rig, yielding a margin of error of approximately 0.5%. The results underscore the importance of considering crude oil properties and pump design parameters in mitigating cavitation. Notably, the roughness value of the pump casing was found to have a significant impact on cavitation, with even slight changes leading to increased cavitation activity. Furthermore, crude oil backflow was identified as a key factor contributing to discharge cavitation, highlighting the need for careful pump design and operational strategies in the oil and gas industry.

Biomedical Engineering and Healthcare Technology (BEH)

BEH_001: VISWIN TRANSFORMER: COULD IT BE THE WAY OUT IN BREAST CANCER DIAGNOSIS?"-A CONCEPT PAPER

Zainab Magaji Musa
Department of Computer Science
Bayero University Kano
Kano, Nigeria
zmm2100015.pcs@buk.edu.ng

Habeeba Adamu kakudi
Department of Computer Science
Bayero University Kano
Kano, Nigeria
hakakudi@buk.edu.ng

Abstract— Breast cancer remains a leading global health challenge, underscoring the need for accurate diagnostic tools to enhance early detection and improve patient outcomes. Deep learning models, particularly transformer-based architectures like Vision Transformers (ViTs) and Swin Transformers, have shown potential in breast cancer diagnosis. However, each model has limitations: ViTs excel at capturing global dependencies but struggle with local feature extraction, while Swin Transformers effectively extract local features but face challenges with long-range dependencies. This study proposes the ViSwin Transformer, a novel hybrid model that integrates the strengths of ViTs and Swin Transformers to address these challenges. The model begins with six layers of global multi-head attention in a ViT encoder to capture long-range dependencies and global contextual features. This is followed by eight layers of window-based self-attention in four Swin Transformer stages, enabling the extraction of fine-grained local features such as tumor shape, margin irregularities, and micro-calcifications. The final feature representation is processed through a multi-layer perceptron (MLP) for classification into benign or malignant categories. By overcoming the individual shortcomings of existing transformer models, the ViSwin Transformer offers a promising solution for improving diagnostic accuracy in breast cancer detection.

Pharmaceutical Science and Drug Development (PSD)

PSD_001: INVITRO STUDY OF THE INTERACTION BETWEEN AMPICILLIN AND CLOXACILLIN IN AMPICLOX DRY SYRUP IN FIVE DIFFERENT BRANDS OF AMPICLOX IN LAGOS MARKET

Bello Hassan Onimisi

Mountain Top University
e-mail: belloonimisi5@gmail.com
Mobile:09055245621

Abstract

ABSTRACT

There have been indications that interactions exist between ampicillin and cloxacillin in all the brands of Ampiclox in the Nigerian market. Even from the analyst point of view, sometimes in trying to recover cloxacillin from the mixture, the result is usually not consistent and unreliable. The concentration at which this interaction exist has not been ascertain. Also, since various people of different age and size use the antibiotic because of its wide spectrum. There is the need to find out the range of concentration at which interaction sets in. The is research involves five different brands from Lagos market. The brands were mixed at different concentrations and analyzed using British pharmacopeia method of 1998. The results show that administering the same dose of Ampiclox within children of the same age and of different sizes can result into drug interaction in vivo or in their system. This is because they possess different volume of distribution.it has been known that children or neonates with small volume of distribution experience drug interaction when given the dose -0.125g in volume below 200cm3.

There is the need for clinicians and physicians to take into consideration when prescribing Ampiclox to their patients. They should also warn mothers against self-medication to their children and neonates.

Medical Imaging, Diagnostics and Therapeutics (MDT)

MDT_001: A FRAMEWORK FOR OPTIMIZED DIABETES DETECTION MODEL BASED ON BINARY BUTTERFLY AND MACHINE LEARNING ALGORITHMS

Yusuf Ayuba[1], Enesi Femi Aminu[2], MUHAMMAD Muhammed Kudu[3]

[1,2,3]Dept. of Computer Science, School of Information & Communication Technology, Federal University of Technology, Minna.

ayubayusuf117@gmail.com[1], enesifa@futminna.edu.ng[2], muhammad_kudu@futminna.edu.ng[3]

ABSTRACT

Diabetes has become a major cause of death in both developed and developing countries, affecting a large number of people globally. prompting significant investments in research to find a cure for this critical disease. Traditional approaches reliant on diabetes detection are time-consuming, this necessitates a paradigm shift towards more efficient methodologies. In response, this study introduces a conceptual framework for diabetes detection by leveraging the power of optimized machine learning algorithms. Addressing data preprocessing techniques and optimized feature selection algorithms, and machine learning algorithms, specifically Random forest, multilayer perceptron, and Gradient boosting model, the result shows that Random forest emerges as the potent model showcasing a remarkable performance metrics: accuracy score of 97.66%, F1-score of 97.56%, AUC-ROC of 98.54%, Multilayer perceptron achieved an accuracy of 96.10%, F1-score of 95.96%, AUC-ROC of 98.65% Gradient boost achieved and accuracy of 91.82%, F1-score of 91.49% and AUC-ROC of 98.01% respectively. These findings underscore the significant role of feature selection and machine learning in detecting diabetes offering transformative possibilities for global healthcare enhancement.

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