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College of Science and Technology

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BOOK OF ABSTRACTS

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1ST INTERNATIONAL CONFERENCE AND RESEARCH SHOWCASE ON SCIENCE, TECHNOLOGY AND INNOVATION
ICRS-STI, 2024
COVENANT UNIVERSITY
NOVEMBER 18-20, 2024

Covenant University, Ota Nigeria
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" Science, Technology and Innovation for Translational Research and Sustainable Development "

BOOK OF ABSTRACT FOR THE 1st INTERNATIONAL CONFERENCE AND RESEARCH SHOWCASE ON SCIENCE, TECHNOLOGY AND INNOVATION

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Paper ID *(2024-05001)*

CAR T CELLS IN SOLID TUMORS: THE BREAST CANCER IMMUNOTHERAPY CHALLENGE

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Abstract

Background: Immune evasion, a defining hallmark characteristic of cancer, enables tumor cells to grow and metastasize undetected, thereby limiting the effectiveness of conventional therapies. **Aim**, **Materials and Methods**: This review looks at the application of CAR T-cell therapy in breast cancer and the challenges posed by the tumor microenvironment (TME) while also exploring the current advancements that enhance CAR-T cell efficacy and Identifying future research directions for overcoming immune evasion in solid tumors like breast cancer. **Results and Conclusion**: Immunotherapy, particularly adoptive T-cell therapy, has emerged as a powerful approach to counteract this mechanism by leveraging the body's own immune cells to recognize and destroy malignant cells. Among these strategies, Chimeric Antigen Receptor (CAR) T-cell therapy has transformed the treatment paradigm for hematologic malignancies, showing unprecedented clinical success. However, translating these outcomes to solid tumors, particularly breast cancer, remains challenging due to a number of factors, such as antigen variability, immunosuppressive tumor microenvironments (TMEs), and specific toxicities. This review provides an in-depth examination of CAR T cell therapy's application in breast cancer, analyzing key breast cancer-associated antigens, the current state of clinical trials, and the specific barriers solid tumor biology poses. We examined advancements in CAR T cell engineering, including dual-targeting receptors, safety mechanisms, and enhanced delivery techniques aimed at improving T cell efficacy within the hostile TME of breast tumors. By highlighting both the promise and limitations of CAR T cell therapy, this review provides valuable perspectives into how this technology can be refined to overcome immune evasion in breast cancer, laying the groundwork for future research and potential therapeutic breakthroughs.

Keywords: Cancer, Breast cancer, Immune system, Immune therapy, T-cells, CAR T-cell therapy

Title of Sub-Theme (African Ancestry and Cancer Genomics.)

Paper ID *(2024-05002)*

Biomarkers of Prostate Cancer in African Black: A Mini Review

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Abstract

Prostate cancer (PCa) is a significant health concern worldwide, with African-Black men experiencing disproportionately higher incidence and mortality rates. The current diagnostic tool, prostate-specific antigen (PSA), has low specificity and high false-positive rates, leading to unnecessary biopsies and patient anxiety. This review analyzes biomarkers specific to African Black populations, highlighting PSA's limitations and exploring alternative markers like PVT1 exon 9, Prostate Cancer Antigen 3 (PCA3), and TMPRSS2- ETS-related gene (ERG) gene fusion. We discussed PCa epidemiology in African Blacks, the influence of genetic diversity on disease progression, and the need for tailored diagnostic approaches. Emerging biomarkers and their potential to improve early detection, risk stratification, and patient outcomes in African Blacks are examined. This review emphasizes validating these biomarkers within African populations and calls for collaborative research efforts to enhance PCa diagnosis and treatment for African Black men.

Keywords: Prostate Cancer, Biomarkers, Prostate Specific Antigen, African Blacks, Non-invasive Diagnosis, TMPRSS2-ERG gene fusion, PVT1 exon 9

Title of Sub-Theme (African ancestry and cancer genomics)

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Paper ID *(2024-05003)*

Antitumoral Effects of Short Chain Fatty Acids in Breast Cancer Cells: A Mechanistic Perspective

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Abstract

Breast cancer has remained a growing cause of death globally, therefore necessitating increased attention towards exploring novel therapeutic strategies for its treatment. Metabolites derived from the body's microbiome have been identified to exhibit antitumor effects in different types of cancer, including breast cancer. Short-chain fatty acids (SCFAs), a distinct group of microbiome-derived metabolites, particularly butyrate, propionate, and acetate, have been recognized for their diverse and distinct potential roles in inhibiting tumor initiation and progression in breast cancer cells. This study identified various mechanisms of action by which SCFAs initiate antitumor properties within the context of breast cell line studies. Systematic review of literature on SCFAs and their tumor inhibition/suppression mechanism in breast cancer cell lines were searched from PubMed, EBSCOhost, and Scopus databases using the search terms ("Breast cancer*" OR "breast neoplasm*" OR "breast carcinoma*" OR "breast tumor*" OR "Triple negative breast cancer*" OR "TNBC*") AND ("Short chain fatty acid*" OR "Propionate*" OR "Acetate*" OR "Butyrate*"). A total of 368 publications were obtained from the preliminary search excluding reviews and were further screened for relevance to study objectives in which 43 papers were retained for this study. The mechanism of action of SCFAs antitumor property to involve driving apoptosis, modulating gene expression, antiproliferation, epigenetic regulation, potentiating of standard chemotherapeutic drugs, signal transduction, regulating metabolism, and driving oxidative stress were elaborated. Therefore, this holistic review of existing literature revealed mechanisms of action of SCFAs in driving antitumor effects in various breast cancer cell lines, including their dose-response effects, and ability to potentiate the effect of other anticancer drugs.

Keywords: Short chain fatty acids (SCFAs), Breast cancer, Sodium butyrate (NaBu), Sodium propionate, Cell line, Tumour Suppressor, HDAC inhibitors.

Title of Sub-Theme (African Ancestry and Cancer Genomics)

Paper ID *(2024-05004)*

Deciphering the tumor microenvironment: strategies to combat therapeutic resistance in cancer

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Abstract

Background: Cancer, a life-threatening disease typified by the uncontrolled proliferation of genetically and epigenetically modified cells, remains one of the leading causes of death globally. Despite the advancement in targeted therapy, immunotherapy, chemotherapy, and radiation therapy, disease progression and multidrug resistance can make cancer treatment ineffective, especially for advanced and metastasized tumors. Recent studies have highlighted the critical role of tumor microenvironment (TME) in mediating cancer drug resistance. The TME comprises a complex network of cells, including immune cells, endothelial cells, pericytes, and cancer-associated fibroblasts (CAFs). Non-cellular elements include the extracellular matrix (ECM) and different cytokines and chemokines. **Aim**, **Materials, and Methods**: In this review, we examined the complex elements of TME, mechanism for accelerating tumor progression and drug resistance, and implication in breast and prostate cancer. We explored the strategies for overcoming TME-induced resistance, emphasizing the recent advances in nanoparticle-based drug delivery, gene editing, advanced technologies, Chinese trado-medicine, and combinatorial therapy approaches. **Results and Conclusion**: Emerging technologies, including single-cell sequencing, artificial intelligence, and machine learning, are also mentioned.

Keywords: Tumor microenvironment, extracellular matrix, cancer-associated fibroblasts, TME-induced resistance, breast cancer, prostate cancer.

Title of Sub-Theme (African Ancestry and Cancer Genomics)

Paper ID *(2024-05005)*

Impact of DARC/ACKR1 rs12075 SNP and Gene Expression on Cancer Prognosis: A Scoping Review and Meta-Analysis

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Abstract

Background: DARC/ACKR1, a chemokine receptor on red blood cells (RBCs), epithelial, and endothelial cells, regulates inflammation, angiogenesis, and leukocyte movement, potentially affecting cancer prognosis. Studies on associations between DARC/ACKR1 polymorphisms—particularly the rs12075 SNP—gene expression and cancer outcomes have shown inconsistent results. **Aim, Materials, and Methods:** This meta-analysis aimed to clarify these associations, especially in breast cancer. Following PRISMA 2020 guidelines, a comprehensive search of PubMed, Google Scholar, Web of Science, EBSCO, and Scopus were conducted for studies published from 1990 to January 21, 2024. Studies on DARC/ACKR1 polymorphisms and gene expression associated with cancer were included. Reviews, case reports, books, and articles unrelated to cancer or DARC/ACKR1 polymorphism or expression were excluded. Pooled odds ratios (OR) or hazard ratios (HR) with 95% confidence intervals (CI) and p-values were calculated, where OR/HR >1 indicated worse prognosis and OR/HR <1 indicated better survival. Eleven studies, including 2,732 breast cancer patients and 3,300 with other cancers, were analysed for rs12075 SNP and DARC/ACKR1 gene expression. **Results and Conclusion:** The genetic model (GG vs AA + AG) suggested a possible link with improved breast cancer prognosis, though not statistically significant (OR = 0.68, 95% CI = 0.41-1.12, p = 0.13). DARC/ACKR1 gene expression on RBCs was associated with a lower risk of breast cancer and better prognosis (OR = 0.49, 95% CI = 0.36-0.66). High heterogeneity was observed in the genetic model (I^2 = 88%) and gene expression across cancers (I^2 = 92%), though no heterogeneity appeared when stratified by breast cancer (I^2 = 0%). Overall, DARC/ACKR1 rs12075 polymorphism and gene expression influence cancer survival outcomes. Future studies on additional genetic models and SNPs in DARC/ACKR1 may provide deeper insights into cancer prognosis.

Keywords: Cancer, DARC/ACKR1, Meta-Analysis, Polymorphism, Gene Expression, Prognosis, Survival.

Title of Sub-Theme (African Ancestry and Cancer Genomics)

Paper ID *(2024-05006)*

Case-Control Study of Butyrylcholinesterase Activity in Nigerian Prostate Cancer Patients

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Abstract

Background: Prostate Cancer (PCa) disproportionately affects African-American men and West Africans, with Nigeria bearing a significant burden. Despite research, the Nigerian population remains understudied, hindering prevention and treatment efforts. Butyrylcholinesterase (BChE) is a cholinergic enzyme that has been indicated as a potential prognostic biomarker and therapeutic option due to its varying activity levels in several disease states including obesity, hyperlipidemia and PCa. It has also been tagged as having a role in cellular proliferation and differentiation, although mechanisms remain unknown.
Aim, **Materials and Methods**: This study aimed to investigate the activity of BChE in Nigerian histologically confirmed PCa patients (n= 92) and age-matched healthy control participants (n=91). The activity of BChE was determined via spectrophotometric analysis
Results and Conclusion: The average activity was 0.71 ±0.39 µmol/min/ml in PCa patients and 2.83 ±1.36 µmol/min/ml in the control group. This activity is reduced in Nigerian PCa patients by 75% as compared to healthy control participants ($P < 0.001$). The activity in healthy control groups however was in the normal range. This study suggests that decreased activity of BChE may be used as a prognostic biomarker of PCa in Nigerian patients. It also suggests that BChE may be implicated in the development of PCa in Nigerian males.)

Keywords: Prostate cancer, Butyrylcholinesterase, Sub-saharan Africa..

Title of Sub-Theme (African Ancestry and Cancer Genomics.)

Paper ID *(2024-05007)*

Assessing Ancestry-Specific Genetic Markers and Vitamin D Levels in Nigerian Prostate Cancer: The Case of ERCC6 and CYP17A1 Variants

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Abstract

Background: Prostate cancer (PCa) is a leading cause of cancer mortality among Nigerian males, with aggressive forms more prevalent in Black populations. Genetic variations in DNA repair genes, such as ERCC6, and androgen-related genes, such as CYP17A1, are implicated in the risk and progression of PCa. Understanding these associations is crucial for identifying molecular-specific biomarkers. **Aim**: This study investigated the association between ERCC6 rs2228528 and CYP17A1 rs4919686 polymorphisms, vitamin D (VD), and androgen receptor (AR) levels in Nigerian PCa patients. **Materials and Methods**: Genotyping of ERCC6 and CYP17A1 polymorphisms was performed using TaqMan real-time PCR assays. VD and AR levels were measured via enzyme-linked immunosorbent assay (ELISA). Statistical analyses were conducted using IBM SPSS Statistics with Version 29 (SPSS29) and R (version 4.4.1) to evaluate the relationships between genetic variants, biomarker levels, and PCa susceptibility. **Results and Conclusion**: The wildtype genotype of ERCC6 rs2228528 was more frequent in cases (37%) compared to controls (30%), while the wildtype genotype of CYP17A1 rs4919686 was less prevalent among cases (46%) than controls (48%), with no significant associations found ($p > 0.05$). VD levels were significantly higher in cases (52.49 ng/mL) than in controls (47.93 ng/mL), while AR levels did not show significant differences ($p > 0.05$). ERCC6 rs2228528 may serve as a potential ancestry-specific biomarker for prostate cancer susceptibility in Nigerian males. The findings suggest that further large-scale studies are warranted to confirm these associations and explore the roles of genetic and environmental factors in PCa risk within African populations.

Keywords: Androgen receptor (AR), Biomarkers, DNA repair genes, Molecular oncology, Genotyping.

African Ancestry and Cancer Genomics

Paper ID *(2024-05008)*

In Silco Discovery of Turmeric (*Curcuma longa*) Phytochemicals as EGLN1 Inhibitors: IC_{50} Prediction and Molecular Docking Analysis

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Abstract

Cervical cancer is the fourth most common cancer among women and the second cause of cancer death in Nigerian women. Egl Nine Homolog 1 (EGLN1), which creates a hypoxic micro-environment enabling the growth and progression of neoplastic cells, is a viable target for therapy. This study screened phytochemicals derived from turmeric (*Curcuma longa*), known for its anti-tumor properties, as potential inhibitors of EGLN1 using molecular docking and machine learning predictions. This study determined the binding affinities of the phytochemicals with EGLN1 and predicted their IC_{50} using machine learning, which may identify potential lead compounds for cervical cancer therapy. The curated library of turmeric phytochemicals (50) was docked with the EGLN1 using bioinformatics software such as Autodock Vina and PyRx. Following the molecular docking studies, a machine-learning model was trained using data from ChEMBL utilizing molecular descriptors for enhanced accuracy. This model was used to predict the IC_{50} of the ligands. A significant number of the ligands showed high affinity for EGLN1 ranging from -5 to -7.9 kcal/mol. The strongest inhibitory potential was demonstrated by Curcumin (-7.9), which was higher than the reference compound, Toptecan (-7.6). The random forest model had a moderate prediction accuracy of 63 %. The model predicted the IC_{50} of curcumin to be 5.6 which is lower than the standard drug Topotecan (6.9). The findings from this study suggested that some phytochemicals from turmeric such as *curcumin* can serve as a potential therapeutic agent in cervical cancer treatment. Further validation is needed to establish their clinical potential.

Keywords: Cervical cancer, *Curcuma longa*, machine learning, therapeutic target

Title of Sub-Theme: African Ancestry and Cancer Genomics

Paper ID *(2024-05009)*

Exploring the Role of MET Gene SNPs in Breast Cancer Susceptibility among Nigerian Women: A Case-Control Study

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Abstract

Background: Breast cancer remains a significant public health challenge globally, with disparities in incidence and outcomes across populations, particularly among individuals of African ancestry. Genetic factors, such as single nucleotide polymorphisms (SNPs), may contribute to these disparities. This study investigated the association of three specific SNPs (rs40239, rs1621, and rs41736) in the MET gene, a known oncogene, with breast cancer risk in Nigerian women. **Aim**, **Materials and Methods**: The association between MET gene SNPs and breast cancer susceptibility among Nigerian women was studied. QuantStudio™ 5 Real-Time PCR System, 96 well-fast 0.1µL PCR plates, TaqMan® Genotyping master mix, and Predesigned TaqMan® SNP Genotyping assays were employed. This involved a case-control study involving 150 participants, comprising 75 breast cancer patients and 75 healthy controls, all of Nigerian ancestry. Genomic DNA was extracted from blood samples of the study population, and SNP genotyping was performed using the TaqMan assay. Allele frequencies, genotype distributions, and odds ratios were calculated to assess the potential association between the selected MET gene SNPs and breast cancer risk. **Results and Conclusion**: The findings revealed no statistically significant association between the examined SNPs and breast cancer susceptibility in the studied population, though the distribution of certain genotypes displayed notable differences between cases and controls. This study did not find a direct association between the studied MET gene SNPs and breast cancer risk in Nigerian women, However, the findings contributed to the growing body of literature on cancer genomics in underrepresented groups. Further research is needed to explore the complex interplay of genetic factors, environmental influences, and lifestyle factors in breast cancer development within African populations

Keywords: Breast cancer, MET gene, Genetic factors, Single nucleotide polymorphisms.

Title of Sub-Theme (African Ancestry and Cancer Genomics)

Paper ID *(2024-05010)*

Assessment of Butyrylcholinesterase Activity in Nigerian Breast Cancer Patients

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Abstract

Background: One-fourth of all incidences of cancer in women today are breast cancer (BC), making it one of the most prevalent types of cancer. Early biomarkers for the identification, detection and management of BC are therefore important. Butyrylcholinesterase (BChE), a soluble enzyme synthesized in the liver and mainly found in the plasma has shown associations with major diseases but remains understudied in African BC populations.**Aim**, **Materials and Methods**: This study assessed BChE activity levels in Nigerian BC patients compared to healthy controls in relation to their age, cancer stage and body mass index (BMI). BChE activity was measured in 100 breast cancer patients and 100 controls by spectrophotometric method. Participant characteristics were described using various forms of descriptive statistics. The Mann-Whitney U test compared BChE level between the patients and the controls and one way ANOVA on BChE variations in terms of stage, age and BMI. Levels of significance were set at 0.05.**Results and Conclusion**: Although higher activity was observed in patients in Stage III, older age groups (68–78 years), and among overweight participants, the analyses revealed no statistically significant difference in BChE activity between breast cancer patients and controls. The findings suggested limited potential for BChE as a standalone biomarker for breast cancer management in the study population, although certain demographic patterns warrant further investigations. BChE's role in BC pathology and management can be further clarified by employing genetic analysis in future research.

Keywords: Breast cancer, Biomarker, Butyrylcholinesterase.

African Ancestry and Cancer Genomics

Paper ID *(2024-05011)*

Bioinformatics and Network Analysis Reveal Prognostic Molecular Signatures and Pathways in HER2+ Breast Cancer Patients Treated with AT-CMF Chemotherapy

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Abstract

Background: HER2-positive (HER2+) breast cancer is characterized by aggressive tumor behavior and variable responses to chemotherapy. Although significant advances have been made, evidence suggests that the potential of HER2 as a therapeutic target extends beyond current clinical applications, with ongoing investigations exploring its role in signaling and immune modulation. **Aim**, **Materials and Methods**: This study employed differential gene expression (DGE) analysis using GEO2R, functional enrichment analysis with Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG), and network analysis with STRING and Cytoscape, to investigate molecular differences between HER2+ and HER2-negative (HER2-) breast cancer in chemotherapy-treated patients. Data from 92 patients were sourced from the GSE50948 dataset (GEO).**Results and Conclusion**: A total of 45 differentially expressed genes (DEGs) were identified, with 19 upregulated and 26 downregulated in HER2+ samples. Notably, ITGB6-LOC100505984 was downregulated and remains underexplored in breast cancer treatment, suggesting potential as a novel target. GO and KEGG pathway enrichment revealed key pathways implicated in HER2-driven oncogenesis, such as p53 signaling, interleukin receptor activity (IL-6, IL-11, IL-27) and hedgehog signaling. Ten hub genes (ERBB2, PGAP3, MIEN1, BCL2, GSDMB, ORMDL3, PGR, CDK12, IRS1, S100A8, MED1, S100A7A) were identified through protein-protein interaction (PPI) analysis calculated with the MCC algorithm. ERBB2, PGAP3 and MIEN1 emerged as the top three significant hub genes associated with cancer progression pathways across multiple data sources, highlighting their potential as prognostic markers and therapeutic targets. This study revealed critical gene biomarkers and pathways that define the unique molecular landscape of HER2+ breast cancer, providing a basis for future validation of these genes as diagnostic or prognostic markers. Further research should explore larger datasets and targeted therapies that modulate these pathways to improve patient-specific outcomes in HER2 breast cancer management.

Keywords: HER2+ breast cancer, Chemotherapy resistance, Differentially expressed genes, Protein-protein interaction network, Bioinformatics analysis

Title of Sub-Theme (African Ancestry and Cancer Genomics.)

Paper ID *(2024-05012)*

MICROBIAL PROFILE OF THE PROSTATE TISSUE AND EXPRESSED PROSTATIC SECRETION ASSOCIATED WITH PROSTATE CANCER PATIENTS

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ABSTRACT

Background: Prostate cancer (PCa) is the second most prevalent cancer in men, particularly affecting those of Black African descent. Nigeria currently has the fourth highest risk for PCa mortality in the world. The microbiome of the prostate has emerged as a critical factor in understanding the aetiology and progression of prostate diseases, such as benign prostatic hyperplasia (BPH) and prostate cancer (PCa). **Aim:** This study was conducted to comparatively characterize the microbiome present in prostate tissue and expressed prostatic secretion (EPS) from patients diagnosed with BPH and PCa. A total of 30 study participants of 15 prostate cancer, 10 benign prostatic hyperplasia, 2 benign stromal hyperplasia and 3 prostatitis subjects.**Material and method:** Samples were collected from the urology clinic of Lagos State University Teaching Hospital Ikeja and analysed to identify and quantify bacterial species, assessing the diversity and composition of the microbial communities. Subjects without prostate cancer were used as control subjects. **Results and conclusion:** By employing cultural and advanced genomic sequencing techniques (16SrRNA gene Sequencing), uro-pathogens were isolated from the samples, and antibiotic susceptibility testing was carried out on these isolates. Prostate tissue and EPS samples from BPH patients demonstrated a higher prevalence of specific bacterial taxa, including *Staphylococcus scuri, Bacillus mycoides, Staphylococcus aureus, Proteus vulgaris, Klebsiella pneumoniae, Pseudomonas aeruginosa, Streptococcus pyogene* and *Bacillus subtilis*. Conversely, PCa patients exhibited an increased presence of pathogenic bacteria such as *Escherichia coli Klebsiella oxytoca, Pseudomonas fluorescens, Citrobacter freudii, Pseudomonas putida, Staphylococcus condimentii*, and *Proteus mirabilis*, which have been implicated in chronic inflammation and carcinogenesis. PCa-associated microbiome displayed reduced microbial diversity compared to BPH, suggesting a possible dysbiosis linked to cancer progression.

Keywords: Benign Prostate Hyperplasia, Expressed Prostatic secretions, Inflammation, Microbiome, Prostate cancer.

Sub-theme: *African Ancestry and Cancer Genomics*

Paper ID *(2024-05013)*

Molecular Docking of Fibroblast growth factor receptors (FGFRs) Inhibitors in Breast Cancer

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Abstract

Background: Dysregulation of FGFR signalling pathways has been noted in breast cancer, this promotes cell proliferation and survival, thereby enhancing tumour growth and resistance to therapies. FGFRs, particularly FGFR1, FGFR2, FGFR3, and FGFR4, are frequently mutated in breast cancer, contributing to tumour aggressiveness and treatment resistance. Notably, FGFR1 mutations occur in approximately 15 % of breast cancer cases, with higher rates in human epidermal growth factor receptor 2 (HER2)-positive and estrogen receptor-positive subtypes, correlating with poor survival outcomes. While several FGFR inhibitors have been approved for other cancers, none are currently available for breast cancer, indicating a critical gap in treatment options. **Aim:** This study evaluated the binding affinities of various compounds as potential FGFR inhibitors, including futibatinib as a standard, against FGFR1-3. **Method:** Various FGFR inhibitors were assessed for their binding affinities to FGFR1-3 using molecular docking techniques. The pharmacokinetic properties of these compounds, including absorption, distribution, metabolism, excretion, and toxicity (ADMET), were also analysed using the pkCSM prediction model. **Result:** The findings revealed that the compounds tagged 2, 3, 4 and 8, namely, 1-[(3R)-3-[4-amino-3-[3-[3-[(3-fluorophenyl)methoxy]phenoxy]prop-1-ynyl]pyrazolo[3,4-d]pyrimidin-1-yl]piperidin-1-yl]prop-2-en-1-one, 1-[(3R)-3-[4-amino-3-[3-[3-[(4-fluorophenyl)methoxy]phenoxy]prop-1-ynyl]pyrazolo[3,4-d]pyrimidin-1-yl]piperidin-1-yl]prop-2-en-1-one, 1-[(3R)-3-[4-amino-3-[3-(4-fluoro-3-phenylmethoxyphenoxy)prop-1-ynyl]pyrazolo[3,4-d]pyrimidin-1-yl]piperidin-1-yl]prop-2-en-1-one, N-[2-[4-amino-3-[3-(3-phenoxyphenoxy)prop-1-ynyl]pyrazolo[3,4-d]pyrimidin-1-yl]ethyl]-N-benzylprop-2-enamide respectively exhibit higher binding affinities than futibatinib, suggesting their potential as effective alternatives. ADMET profiling suggested favourable pharmacokinetic properties for these alternatives. **Conclusion:** The results indicated that the compounds with favourable binding affinities and pharmacokinetic profiles could serve as promising candidates for further development in breast cancer therapy.

Keywords: Breast Cancer, FGFR Inhibitors, Molecular Docking, Pharmacokinetics, Therapy Development.

Title of Sub-Theme: African Ancestry and Cancer Genomics

Paper ID *(2024-05014)*

Investigating the Role of IGF-1 and IGF-1R Genetic Polymorphisms in Prostate Cancer Risk Among Nigerian Men

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Abstract

Background: Prostate cancer (PCa) is the most prevalent cancer in sub-Saharan Africa, with numerous genetic factors significantly influencing the risk and progression of the disease. The insulin-like growth factor (IGF) pathway is crucial for cellular proliferation and apoptosis; dysregulation of this pathway has been implicated in PCa progression. **Aim:** This study investigated the association of single nucleotide polymorphisms (SNPs) in the IGF-1 and IGF-1R genes with plasma levels of IGF-1, IGF-1R, and IGF-BP3 in men from Lagos State, Nigeria. **Method:** A case-control study was conducted involving 75 PCa patients and 75 matched healthy controls. Plasma levels of IGF-1, IGF-1R, and IGF-BP3 were measured using enzyme-linked immunosorbent assay (ELISA). SNP genotyping for IGF-1 (rs6219, rs6220, rs5742694) and IGF-1R (rs2229765) was performed using the TaqMan SNP genotyping assay, with data analysis carried out in R Studio. **Results:** There were no statistically significant differences in the plasma levels of IGF-1, IGF-1R, and IGF-BP3 between the study groups. However, the genotype frequency of the rs5742694 (C/A) SNP revealed a positive association with PCa for the wild-type C/C genotype, while the mutant A/A genotype indicated a negative association ($p < 0.05$). Additionally, the genotype frequency of rs2229765 (A/G) was significantly higher in the PCa cases compared to the control group. Further analysis revealed that the rs5742694 C/C genotype demonstrated a significant difference in IGF-1 levels, suggesting a potential role of this SNP in modulating IGF-1 concentration. **Conclusion:** Our findings suggested that individuals with the A/A mutant genotype (rs5742694) may have a reduced likelihood of developing PCa compared to those with the C/C genotype, who appear to be at an increased risk. In conclusion, genetic polymorphisms in IGF-1R and IGF-1 are associated with differential protein levels in PCa cases versus controls, highlighting potential risk and protective factors among Nigerian men.

Keywords*:* Prostate cancer, IGF-1, IGF-1R, IGF-BP3, SNPs, Genetic polymorphism

Subtheme: *African Ancestry and Cancer Genomics*

SUB THEME: APPLIED MATHEMATICS ML AND AI FOR SUSTAINABILITY

Paper ID *(2024-02001)*

Leveraging Artificial Intelligence to Evaluate Factors Causing Waste in the Construction Industry: Construction Stakeholders Perspectives

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Abstract

The application of Artificial intelligence (AI) in construction processes and procedures holds transformative capability in addressing the essential issues of project waste in construction projects. Hence, the study explores the significance of leveraging AI as a strategy to reduce construction project waste in the construction industry. Structured questionnaires were distributed to construction stakeholders in Gauteng province, South Africa, who are involved in construction activities through systematic random sampling techniques to collect data on the significance of leveraging AI as a strategy to reduce construction project waste in the construction industry. Data collected through the questionnaire were computed through descriptive analysis. Using a statistical data equation, a valid mean item score was determined in the study, and each item was ranked while standard deviations and Cronbach's alpha were established. The study findings indicated that predicting exact material quantities and forecasts require project resources, project design optimisation, simulation of the construction project process, real-time monitoring of in-use construction material and precision in material usage were the leading significance of leveraging AI as a strategy to reduce project waste in the construction industry. The study suggests that to optimise the significance of leveraging AI as a strategy to reduce project waste in the construction industry, AI-driven tools should be integrated to optimise material usage and reduce waste through design simulations, improving project planning and execution from the outset of the project. The study concluded that AI technologies capable of real-time tracking and monitoring of material usage during construction processes and procedures should be implemented to ensure precision and immediate identification of waste, allowing corrective measures to be taken instantly.

Keywords: Artificial intelligence, Construction project waste, Construction industry.

Title of Sub-Theme: Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for Sustainability

Paper ID *(2024-02002)*

Leveraging Artificial Intelligence Drivers for Optimising Supply Chain Management in Construction Project Delivery

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Abstract

The complexity and interplaying processes, unpredictable market conditions, and resource management created gaps for stakeholders to optimise supply chain management in construction project delivery. Unfortunately, these problems continue to affect successful construction project delivery. Therefore, this study explores artificial intelligence drivers for optimising supply chain management in construction project delivery. A structured questionnaire was designed from a literature review and distributed to construction professionals in Durban, KwaZulu-Natal province, South Africa, using systematic random sampling techniques to collect data on leveraging artificial intelligence drivers for optimising supply chain management in construction project delivery. Data from the questionnaire survey were computed and analysed using IBM SPSS version 28 to conduct descriptive analysis (mean and standard deviation) and the Kruskal-Wallis test, while Cronbach's alpha was used to determine data reliability. Hence, the study results established the significance of eighteen identified artificial intelligence drivers. The findings indicated that automated monitoring and evaluation, big data analytics, procurement data analytics, materials requisition safety and security, AI-guided outsourcing and subletting, knowledge-based systems, data warehouse, strategic partnerships, enterprise resource planning, and cloud-based collaborative tools recorded high significance, artificial intelligence drivers for optimising supply chain management in construction project delivery. The study findings provide a better understanding of leveraging artificial intelligence like blockchain, big data analytics, data warehouse, and enterprise resource planning as strategies to meet the increasingly interconnected and digitally driven supply chain linkage to optimise construction project delivery. The study recommends understanding artificial intelligence divers in supply chain management is imperative to optimise supply order cycle management, develop an effective supplier database, integrate automated logistic systems and efficient information feedback systems, and effectively manage people and processes in construction project delivery.

Keywords: Artificial intelligence, Drivers, Project delivery, Supply chain management, South Africa.

Title of Sub-Theme: Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for Sustainability

Paper ID *(2024-02003)*

TRAINING NEURAL NETWORK MODEL USING AN IMPROVED THREE-TERM CONJUGATE GRADIENT ALGORITHM

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Abstract

Background: Deep learning with neural networks has emerged as a dominant approach in machine learning, focusing on optimization algorithms to effectively minimize cost functions. However, there is a pressing need to improve existing optimization methods, particularly in terms of reducing training time, to further enhance the performance and efficiency of deep neural networks.**Aim**, **Materials and Methods**: This study presented a new training algorithm to train a feedforward neural network model. In other to achieve this, a convex combination method to combine the coefficients of Fletcher-Reeves (FR) and Polak-Ribiere-Polyak (PRP) on a three-term conjugate gradient method were used. The algorithm called Three-term PRP-FR Algorithm was implemented from scratch using python programming language alongside some existing optimizers. **Results and Conclusion**: These optimizers were evaluated and compared based on the convergence of these optimizers using the accuracy results on the popularly known digit recognition dataset (MNIST dataset). The proposed algorithm Three-term PRP-FR converged to local minimum of the loss function.

Keywords: Neural Network, Deep Learning, Optimization, Conjugate Gradient Method.

Paper ID *(2024-02004)*

Modelling Credit Card Fraud Data using Supervised Machine Learning Algorithms

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Abstract

Current trends and advances in technology make humans navigate through life increasing challenges. Online transactions are fast becoming major options in the era of digitalization. The banking analogue transaction is gradually becoming obsolete. This has necessitated some form of E-Commerce appraisals to checkmate the increasing rate of frauds and cyberattacks on individuals and organizations. Hackers now leverage E-commerce to access cardholder details to perpetrate financial frauds. There is now a need for credit card companies to safeguard details of cardholders from fraud activities to retain credibility and trust. This paper investigates and recommends some Machine Learning algorithms that help in predicting fraudulent transactions. Fraudulent activities are now checked with technologies using data science with capacity to accommodate large datasets. The Machine Learning algorithms being an integral part of data science can be trained with large datasets for prediction purposes.To detect instances of card fraud, this work adopts supervised machine learning techniques such as Support Vector Machines (SVM), Decision Trees (DT), K-Nearest Neighbours (kNN), Naïve Bayes (NB), and Logistic Regression (LR). It discusses classical fraud methods such as identity theft, skimming, and lost or stolen cards, while acknowledging an increase in new types of fraud due to the changing strategies. Among the proposed models, Naive Bayes proved to be the most accurate in detecting fraudulent activities outperforming most other techniques.

Keywords: Credit card fraud, Data Science, Fraudulent Transaction, Machine learning.

Title of Sub-Theme (Machine Learning.)

Paper ID *(2024-02005)*

Developing Framework for Designing Effective Smart City Architecture to Ease Traffic Flow using Artificial Intelligence (AI)

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Abstract
The persistent traffic congestion on some of our roads, which has led to accidents, was resolved by developing framework for designing effective smart city architecture that uses artificial intelligence (AI) to improve traffic flow. To achieve this perfectly, we checked the characteristics and establish the causes of poor traffic, designed a conventional SIMULINK model, trained Artificial Neural Network (ANN), developed an algorithm that implemented the process**,** designed a SIMULINK model using artificial intelligent (AI) and finally validated and justify the percentage (%) improvement in the reduction of congestion with and without AI for developing a framework for designing effective smart city architecture to ease traffic flow. The results obtained were, the conventional inadequate Traffic Infrastructure that caused poor traffic flow was 20%, on the other hand, when AI was incorporated in the system, it reduces to 18.28% therefore boosting easy traffic flow. The conventional Vehicle Density and Rapid Urbanization that caused poor traffic flow was 15%, when an AI was integrated in the system, it vehemently reduced Vehicle Density and Rapid Urbanization that caused poor traffic flow to 13.69% thereby enhancing free flow of traffic and the conventional Frequent Traffic Incidents and Delayed Response that caused poor traffic flow was 12%, however, when AI was imbibed in the system, it concurrently reduced Frequent Traffic Incidents and Delayed Response that caused poor traffic flow to 10.95%. In conclusion, these results clearly demonstrate that incorporating AI into the system led to a 1.05% improvement in smooth traffic flow. Overall, the use of AI created a more efficient system, enhanced traffic movement and reduced commute time.

Keywords: Smart city, Artificial intelligence, Machine learning, Traffic flow, Artificial neural network

Sub-Theme: *Machine and AI for Sustainability*

Paper ID *(2024-02006)*

Analysis of Rumour Spread Model in Social Media Network

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Abstract

Background: In the age of digital communication, online social networks have transformed the way information is being disseminated, enabling rapid sharing and interaction among users. While this connectivity fosters collaboration and knowledge exchange. It also facilitates the spread of misinformation and rumours, which can have detrimental effects on society.**Aim**, **Materials and Methods**: This study investigated the dynamics of rumour spread in social networks(LiveJournal) through the lens of the SIR(Susceptible-Infected-Recovered) model. The model was analysed using Runge-Kutta fourth order Method (RK4) and Differential Transform Method(DTM). We examine how multiple parameters - specifically α(Stifling Rate), λ(Spreading Rate) and δ(Forgetting Rate) - affect the rumour influence 'R' across different average degrees '$\underline{k}$' **Results and Conclusion**: By analysing the rumour spread process, we present 2D plots that illustrated the relationships between these parameters and the spread dynamics. Our findings provide insights into how parameter adjustments can optimise information dissemination in social networks.

Keywords: SIR Model, Rumour Spreading, Forgetting Mechanism, Runge-Kutta Method, Differential Transform Method.

Applied Mathematics.

Paper ID *(2024-02007)*

Empirical Bayes Inference of COVID-19 Pandemic in Nigeria

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Abstract
The investigation was prompted by the severe global impact of the COVID-19 pandemic. The data were sourced from the Nigeria Center for Disease Control (NCDC) from 28th February 2020 to 17th March 2021. The study assessed the relative risk of confirmed COVID-19 cases and mortality rates across Nigeria using a novel Poisson-Generalized Exponential (PGE) empirical Bayes model based on Bayes' theorem. Our findings indicated that the risk of contracting COVID-19 is highest in the South-West region, while the risk of mortality is highest in the North-Central region. The insights from this study are expected to inform and guide government policies and interventions related to the COVID-19 pandemic in Nigeria. Additionally, this research contributes to the literature by demonstrating the application of the PGE empirical Bayes model in disease mapping.

Keywords: COVID-19, Disease Mapping, Pandemic, Poisson-Generalized Exponential, Relative Risk.

*Subtheme: Applied Mathematics***.**

Paper ID *(2024-01008)*

Normal-Normal Empirical Bayes Inference for Construction of Statistical Process Control Charts

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Abstract
Empirical Bayesian normal-normal distribution model is used to determine the confidence limits and target value for construction of statistical process control charts in this paper. The data collected from the production lines were analysed using R package. The results obtained from the empirical Bayesian (EB) method were compared with the usual classical method. The results indicated a higher variance reduction in the empirical Bayesian approach compared with the classical approach. Also, the quality control charts constructed based on the empirical Bayesian procedure showed a better performance than the classical approach.

Keywords: Control charts, Empirical Bayesian, Confidence limits, Normal-Normal model, Target value.
Mathematics Subject Classification: Primary, 62C. Secondary, 12.

Subtheme: Applied Mathematics

Paper ID *(2024-01009)*

A FACIAL DETECTION SYSTEM FOR AGE DETERMINATION USING CONVOLUTIONAL NEURAL NETWORKS AND LOCAL BINARY PATTERNS

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Abstract

Background: Traditional methods of age determination such as visual inspection and anthropological methods often rely on subjective assessments or cumbersome manual processes. There is a need to develop automated systems that can reliably estimate age from facial images. **Aim**, **Materials and Methods**: Therefore, the research aim at developing automated systems capable of accurately determining an individual's age from facial photos. The development and evaluation of age estimation systems relies on the availability of annotated datasets and standardized test beds for performance assessment including the MORPH dataset, the FG-NET dataset and the IMDB-WIKI dataset with a clear focus on Black individuals. Our study leverages the robust capabilities of Convolutional Neural Networks (ResNet CNNs) combined with the Local Binary Pattern (LBP). **Results and Conclusion**: The result shows the utilization of the ResNet-50 architecture, chosen for its depth and efficiency in learning from extensive datasets without succumbing to overfitting, and highlights the commitment to model reliability and generalizability.

Keywords: Age, Facial, determination, Convolutional, Neural Net, Local binary pattern.

Sub-theme: Applied Mathematics, Artificial Intelligence and Machine Learning for Sustainability.

Paper ID *(2024-02010)*

A Comparative Investigation of Wind Speed Modeling Using KNN and LSTM Models for Sustainable Climate Action and Renewable Energy Forecasting

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Abstract

Background: Wind energy is gaining traction as a sustainable and eco-friendly solution to meet the increasing global energy demand. As one of the fastest-growing sources of renewable energy, accurate wind speed modeling is essential to optimize energy forecasting and enhance the reliability of renewable energy systems. **Aim**: This study assessed the accuracy and performance of two machine learning models—k-Nearest Neighbors (KNN) and Long Short-Term Memory (LSTM)—in forecasting wind speed, utilizing key meteorological variables to improve predictive outcomes. **Materials and Methods**: The analyses were conducted on meteorological data comprising wind speed, air temperature, earth temperature, humidity, and evaporation. Both KNN and LSTM models were applied to this data to compare their performance in terms of Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE). **Results and Conclusion**: The LSTM model outperformed the KNN model, demonstrating a lower RMSE and MAPE 160.3456 and 55.1034 respectively, making it a more effective tool for wind speed forecasting. Furthermore, the study revealed that earth temperature, evaporation, and humidity significantly influence wind speed prediction. This research underscores the value of advanced machine learning techniques in promoting climate action and enhancing sustainable renewable energy forecasting.

Keywords: Wind Speed Modeling, Renewable Energy Forecasting, K-Nearest Neighbors (KNN), Long Short-Term Memory (LSTM), Meteorological Data, Climate Action.

Title of Sub-Theme: Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for Sustainability

Paper ID *(2024-02011)*

Towards Fairness and Efficiency: A Low-Weight Computer-Aided Model for Melanoma Detection with Racial Bias Handling

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Abstract
Background: Melanoma, referred to as the most severe or deadliest form of skin cancer, starts in the melanocytes, which are the cells that produce melanin and the pigment that gives the skin its color. While melanoma accounts for only about 1% of skin cancer, metastatic melanoma in the breast can mimic primary breast cancer, complicating the diagnostic process.It is particularly dangerous because it can spread to other parts of the body if not diagnosed early.
Aim, **Materials and Methods**: Therefore, early detection and treatment are crucial. Given the root of this disease, prevalence in populations with darker skin is limited and literature on this group suffers – it's common to have little to no reference of dark skin images in textbooks, research and even training data, regardless, with this study, we proposed a solution using technology, specifically a light-weight computer-aided machine learning intervention that can primarily neutralize bias and significantly intervene in the diagnosis of melanoma based on the metastasis of melanoma in a clinical image. mAP50 is 0.544, indicating moderate performance. **Results and Conclusion**: A total of 33,000 images were collected and 5,280 sampled, these images were manipulated into high contrast black and white images, to remove color divergence. The accuracy was satisfactory and surpassed mAP50 ~0.54, when manipulated for just brown skin images, it is evident that even further enhancements are required to attain a higher level of diagnostic accuracy in a clinical setting.

Keywords: Computer-aided machine, Machine learning, Melanoma

Title of Sub-Theme: Machine learning and Artificial intelligence for sustainability

Paper ID *(2024-02012)*

BI-DIRECTIONAL LONG SHORT-TERM MEMORY TIME SERIES ANALYSIS OF AUTODESK DAILY STOCK PRICES

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Abstract

Financial investors sometimes get into a pool of indecisiveness due to the fluctuating nature of stock prices within short intervals of time. These fluctuations in the system are characterized with complex nonlinear structures due to sudden changes within the time intervals. This study considered the application of appropriate nonlinear time series models that capture inherent nonlinear attributes of daily stock prices in Autodesk, a leading 3D-design software, in the United States. The stock prices data from 2006 to 2020 was analyzed using the Long Short-Term Memory (LSTM) and the Bi-directional Long Short-Term Memory models (Bi-LSTM), which addressed the vanishing gradient problem in Recurrent Neural Network (RNN). Strong positive correlations were observed among stock prices variables, with a weak negative correlation to trading volume. The Bi-LSTM model outperformed the LSTM model, with lower error metrics when the Root Mean Square Error, Normalized Root Mean Square Error, Mean Absolute Percentage Error were estimated. Specifically, the Bi-LSTM's Mean Absolute Percentage Error (MAPE) ranges from 29-39 %, compared to 28-55.8 % for LSTM, indicating better predictive accuracy. These findings suggested that advanced modeling techniques like Bi-directional LSTM can enhance stock prices forecasting, providing valuable insights for investors and informing investment strategies across the financial market. The findings demonstrated that Bi-directional LSTM is more effective than LSTM in predicting Autodesk's stock prices, and allows better data capture temporal dependencies, leading to more accurate forecasts.

Keywords: Bi-directional, Long Short-Term Memory, Investors, Autodesk.

Title of Sub-Theme Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for sustainable development

Paper ID *(2024-02013)*

Load Balancing Algorithms in Public Cloud Service with Natural Language Processing (NLP)-Driven Techniques

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Abstract

Background: Efficient load balancing in public cloud services is crucial for optimal performance and resource utilization. Traditional methods often struggle with dynamic workload changes, leading to inefficiencies. **Aim:** This study proposed an innovative approach integrating Natural Language Processing (NLP) techniques into load balancing algorithms, allowing for adaptive resource distribution and real-time analysis of system logs and user data. **Method:** The solution was modelled by developing an NLP-driven predictive framework designed to analyze patterns in cloud activity and adjust resource allocation accordingly. **Results and conclusion:** Rigorous testing in a simulated public cloud environment demonstrated that these NLP-enhanced techniques significantly improved response times, lowered latency, and reduced energy consumption. The findings revealed that NLP integration optimized load balancing efficiency and enhances system resilience, setting a new benchmark for public cloud performance.

Keywords – Load Balancing, Natural Language Processing, Public Cloud Platforms

Paper ID *(2024-02014)*

Application of Optimization Techniques in Recommender Systems

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Abstract

Background: The study presents a comprehensive analysis of the application of optimization techniques in recommender systems, aiming to identify and evaluate key methodologies, primary use cases, and emerging trends. **Aim**, **Materials and Methods**: The study adopted a systematic review, focusing on techniques such as Singular Value Decomposition (SVD), Ant Colony Optimization, and Swarm Optimization, among others. It addressed significant challenges faced by recommender systems, including the cold start problem, data sparsity, and scalability issues. Furthermore, the study discussed the trade-offs between accuracy, diversity, and fairness in recommendations, as well as the importance of incorporating contextual and temporal dynamics. Accuracy and cold start challenges were the most common challenges encountered by recommendation systems and the least challenges faced by recommendation systems were bias and scalability. **Results and Conclusion**: Consequently, the study showed that the most widely used optimization technique is Singular Value Decomposition (SVD), which could handle most of the recommendation system problems. The study identified open problems such as optimizing bias and scalability in recommendation systems and also the diversification of optimization to more domains rather than the movie industry.

Keywords: Recommender Systems, Optimization Techniques, Data Sparsity, Cold Start, Accuracy.

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Paper ID *(2024-02015)*

Integrating Artificial Intelligence (AI) into Teacher Training and Career Development in Developing Countries

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Abstract

This research review focused on future fit teacher training and career development in Nigeria as an example of how developing countries can leverage disruptive technologies. Considering the challenges in education that developing countries face including a disconcerting digital divide, a review of some of the biggest challenges into integrating a technology-driven teacher preparation program was conducted. In addition, this review considered the possibilities AI offers for the career development of teachers in Nigeria and other developing countries. In order to show how AI may be gradually integrated into school systems, a framework of durable teacher training and career development for Nigeria and other developing countries was designed within the knowledge domain of artificial intelligence. The study's conclusion emphasized the advantages that Nigeria and other developing countries stand to gain from implementing an AI driven approach for pre-service and in-service training and teacher career development. Additionally, it emphasizes how artificial intelligence may help teachers learn and advance in their careers by allowing them to experiment with and personalize new concepts approaches to teaching and learning during their preparation as future fit teachers.

Keywords: Artificial Intelligence, Future Fit Teacher Training, Lifelong Learning career, Personalized learning; Self-Directed Learning.

Title of Sub-Theme: Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for Sustainability

Paper ID *(2024-02016)*

Application of AI Tools in Leadership and Management for Effective School Feeding Programme Implementation

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Abstract

The implementation of school feeding programme (SFP) play a critical role in addressing learner nutrition, educational outcomes, and well-being. However, effective implementation of SFP often faces challenges related to resource allocation, logistical inefficiencies, learners' data, and the ability to track and evaluate their impact. This paper explored the application of Artificial Intelligence (AI) tools in leadership and management to effectively implement SFP. AI-driven technologies, including predictive analytics, data-driven decision-making, and machine learning, can optimize critical aspects of SFP implementation, such as funds allocation, resource management, food planning, food distribution, and nutritional assessment. By leveraging AI, school leaders can forecast food needs, streamline supply chain operations, and reduce food waste, ensuring that food are delivered on time and meet the nutritional needs of learners. Additionally, AI tools enable real-time monitoring and evaluation of SFP outcomes, providing insights into learner health, academic performance, and SFP effectiveness. The integration of AI tools also facilitates stakeholder engagement, enhances communication, and supports personalized nutrition plans tailored to the specific needs of learners. Ultimately, this paper argued that AI has the potential to transform SFP into more efficient, data-driven, and impactful initiatives, thereby improving the overall health and academic success of learners. Through leadership and AI-enabled management, the sustainable and effective delivery of SFP can be realized on a broader scale.

Keywords: Artificial Intelligence, school feeding programme, leadership, resource management, data-driven decision-making.

Title of Sub-Theme: Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for Sustainability

Paper ID *(2024-02017)*

Third-order p-Laplacian boundary value problem with a resonance of dimension two on the half-line

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Abstract

Boundary value problems with p-Laplacian operators have been studied extensively as a result of their applications in areas such as in non-Newtonian mechanics, nonlinear elasticity, glaciology, blood flow models, etc. The presence of the p-Laplacian operator forces the differential operator to be nonlinear making it impossible for the Mawhin degree theory to be applied directly. We will establish sufficient conditions for the existence of solutions for a class of third-order p-Laplacian boundary value problems at resonance on the half-line with a two dimensional kernel utising the extension of coincidence degree by Ge and Ren and constructing some suitable operators. Our results generalizes and improves some of the known results on p-Laplacian boundary value problems in the literature. An example is provided to demonstrate our result.

Keywords: Half-line, p-Laplacian, resonance, third-order, two-dimension.

Title of Sub-Theme Applied mathematics, Machine Learning and Artificial Intelligence (AI) for sustainability

Paper ID *(2024-02018.)*

A Predictive Analytics-based Conceptual Framework for Enhancing Student Satisfaction in Food Management System: Case Study of Covenant University Cafeteria

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Abstract

Effective management of food availability in university cafeterias is essential for reducing food waste and enhancing student satisfaction. This paper presents a predictive analytics-based conceptual framework tailored for Covenant University's cafeteria food availability management system. The proposed framework leverages advanced machine learning models to predict food availability, forecast food demand, monitor inventory in real-time, and integrate dynamic feedback, enabling a responsive and adaptive food management process. By aligning food preparation with accurate predictions of student demand and incorporating real-time adjustments, this system minimizes overproduction and food shortages. Furthermore, the integration of student feedback and sentiment analysis facilitates continuous improvement in service quality and satisfaction levels. Analysis of the proposed system shows that this predictive approach significantly improves satisfaction and reduces food waste by the accurate prediction food availability for students. The web-based system enables students to log in and browse available meal options, while cafeteria managers can monitor inventory, edit, and delete food items. The framework's implementation highlights its potential as a sustainable and scalable solution for institutional food services, offering insights that can be adapted to similar settings to achieve better operational efficiency and student experience.

Keywords: Predictive analytics, food waste minimization, student satisfaction, university cafeteria management, demand forecasting, machine learning.

Paper ID *(2024-02019.)*

An NLP-based Rhetorical Intent WEIAA Model for Illocutionary Speech Act Analysis of the book of Proverbs in the Bible

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Abstract

The analysis of rhetorical intent within religious texts, such as the Book of Proverbs, provides critical insights into the moral and ethical teachings embedded in such literature. This study introduced the NLP-based WEIAA model, designed specifically for the illocutionary speech act analysis of the Book of Proverbs in the Bible. Rooted in classical speech act theory, this research advanced the computational understanding of rhetorical intent in religious contexts. The proposed WEIAA model encapsulates five primary categories of rhetorical intent including warning, encouragement, instruction, assertion, and advice, which all align with the speech act functions observed in biblical proverbs. To integrate the model, Proverbs were extracted and annotated using a combination of GPT-based language processing techniques for multilabel classification. The annotated dataset served as the foundation for training and evaluating multiple machine learning classifiers, including Logistic Regression, Support Vector Machines (SVM), Random Forest, XGBoost, and LightGBM. Performance comparisons were conducted; LightGBM was identified as the most effective classifier, and subsequently integrated into a user-friendly web-based system that enables real-time analysis of inputted Proverbs for their rhetorical intent. This research contributes to the intersection of Natural Language Processing (NLP), speech act theory, and biblical text analysis by presenting an innovative tool for the multilabel classification of rhetorical intents. The WEIAA model provides an essential framework for future studies on the computational analysis of religious and historical texts, and offers practical applications for scholars, educators, and religious practitioners seeking to deepen their understanding of rhetorical structures in sacred literature.

Keywords: Natural Language Processing (NLP), Biblical Text Analysis, Speech Act Theory, Rhetorical Intent Detection, Multilabel Classifications.

SUB THEME: CLIMATE ACTION AND CIRCULAR ECONOMY

Paper ID *(2024-09001)*

Comparative Analysis of Path Loss Prediction using the Time-Series Approach for at Ku- and Ka-Band for Lagos State, Southwestern Nigeria

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Abstract

Background: Path loss models play a vital role in optimizing base station deployment, estimating radio signal coverage, and characterizing the radio base station to quantify the performance accuracy of the wireless communication networks. The traditional free space path loss model has been considered. However, such a model lacks accuracy in performance. Path loss models based on the time-series method are an alternative approach to the traditional free space path loss model. **Aim**, **Materials and Methods**: This work proposed time-series models such as the single exponential smoothing (SES) and double exponential smoothing (DES) models to predict path loss at the Ku-band and Ka-band, and the accuracy of prediction compared between the SES and DES using the MAPE, MAD and MSD. **Results and Conclusion**: The results showed that at Ku-band, the MAPE, MAD and MSD values of the SES model are 0.3739 (37.39 %), 0.7866, and 11.8051, respectively, with a smoothing constant value of 0.9660. However, the MAPE, MAD and MSD values of the DES model are 0.4106 (41.06 %), 0.8642, and 12.1793, respectively, with a constant value of 1.1075 and 0.0100. At Ka-band, the value of MAPE is 0.1427 (14.27 %), MAD is 0.3171 and MSD is 0.3588 with a smoothing constant value of 1.0600 for the SES model. Likewise, the MAPE, MAD and MSD values for the DES models are 0.1810 (18.10 %), 0.4038 and 0.6518, respectively with a smoothing constants value of 1.0033 and 0.0273, respectively. Based on these findings, the SES model has the least MAPE value which is an indication that the SES model falls into the category of 20 – 50 % at Ku-band and 10 – 20 % at Ka-band indicating that the accuracy of performance of the models are fair and good at Ku-band and Ka-band respectively. In regards to this, it can be concluded that the best model for the prediction of PL for Lagos State is the SES model at Ka-band having the least MAPE value.

Keywords: Ka-band, Ku-band, Nigeria, Path Loss, Time-series Approach.

Title of Sub-Theme: Climate Action and Circular Economy

Paper ID *(2024-09002.)*

Passive Cooling Strategies in High-Rise Structures: A Literature Review on Tropical Climates and its effects on Passive Cooling

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Abstract

Background: Rapid urbanization in tropical regions has accelerated the construction of high-rise buildings, presenting significant energy challenges due to their substantial cooling requirements. This review explores the influence of tropical climates on passive cooling strategies for high-rise buildings, focusing on techniques such as natural ventilation, shading devices, thermal mass utilization, cooling systems, and green infrastructure. The study was guided by three main objectives: first, to analyze existing passive cooling strategies employed in tropical high-rise buildings; second, to examine the challenges and limitations faced in implementing these strategies; and third, to propose optimal approaches for enhancing passive cooling in high-rise structures within tropical climates. **Aim**, **Materials and Methods**: A qualitative approach was adopted, utilizing an extensive literature review. Databases like Google Scholar, Science Direct, and the Covenant University Repository were accessed to gather peer-reviewed articles published between 2010 and 2024. Thematic analysis helped identify recurring themes and common findings, which were then discussed descriptively. **Results and Conclusion**: The findings indicate that passive cooling strategies, including proper building orientation, shading devices, high thermal mass materials, reflective roofs, and natural ventilation, can significantly improve thermal comfort and energy efficiency in tropical high-rise buildings. However, several limitations hinder their effective implementation, such as climatic variability, urban density, occupant behavior, and high initial costs. These challenges highlight the need for adaptable solutions tailored to specific local climates. To optimize the effectiveness of passive cooling strategies, the study recommends adopting an integrated design approach involving collaboration across disciplines, climate-specific adaptations, and supportive policies that encourage sustainable practices. This comprehensive strategy can address existing barriers and enhance energy efficiency in high-rise buildings. By synthesizing current research, the review provides valuable insights into the impact of tropical climates on passive cooling solutions, identifying key areas for further exploration in architectural design and sustainable development practices.

Keywords: Passive Cooling Strategies, Tropical Climate, High-Rise Structures, Sustainability, Literature Review.

Climate Action and Circular Economy

SUB THEME: CYBERSECURITY AND PRIVACY

Paper ID *(2024-01001)*

Word File Integrity Checker Model for Host-Based Intrusion Detection System (WFICM-HBIDS)

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Abstract

In an era where cyber risks are rapidly on the rise, defending the content of data and discerning breaches in computing systems are vital for security purposes. The major goal of this study is to design a Word File Integrity Checker Model for Host-Based Intrusion Detection System (WFICM-HBIDS) by using an uncompromising forward-thinking approach to detect changes to files on host systems. The WFICM-HBIDS uses a Bayesian classifier with file integrity checking techniques and intrusion detection mechanisms, to identify modification or any unauthorized access attempts. An analysis of existing file integrity checking and intrusion detection systems were carried out to access their weaknesses. In this study, data was collected from the KDD Cup '99 dataset which contained system logs and file change records. The data was split into training and testing datasets with the training set containing 25,192 rows and 42 columns, the data underwent several preprocessing and was later fed into a Bayesian classifier which achieved an accuracy of 93.55 %. Other evaluation metrics like f1 score, recall and precision were used where the model achieved 94 %, 93 % and 94 % respectively. The WFICM-HBIDS can be relied upon to identify unauthorized file changes thereby, acting as a secure system against intrusion detection.

Keywords: File Integrity Checker, Host-Based Intrusion Detection System, Cybersecurity, Bayesian Classifier, Intrusion Detection.

SUBTHEME: ONE HEALTH AND FOOD SECURITY

Paper ID *(2024-04001)*

APPLICATION OF COMPUTATIONAL TOOLS IN MEDICINAL PLANT STUDIES

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Abstract

Secondary metabolites have long been usefully sourced from medicinal plants. This critical review was aimed at exploring the potential benefits of computational tools in medicinal plant research with a focus on secondary metabolites found in plants and their pharmacological signifance. With the increasing availability of digital resources and advancements in technology, these resources have become crucial in understanding and harnessing the medicinal properties of plants. Artificial intelligence and molecular docking are currently being used in medicinal plants in the twenty-first century to generate novel medications through precision forecast revealing binding mechanism and affinity ligands to a target macromolecule (usually a protein). Other key computational resources reviewed include AutoDock Vina, Molecular Operating Environment (MOE), Glide, Discovery Studio, SYBYL-X and Swiss Dock Server. These tools have provided a foundation for efficient molecular docking, virtual screening, and pharmacological profiling, helping to streamline the identification of promising compounds from medicinal plants for treatment of diseases such as COVID-19 and Alzheimers. This review highlighted the significant impact of computational tools in medicinal plant research and their future prospects.

KEYWORDS: Artificial intelligence, Medicinal plant research, Machine learning, Molecular docking.

Title of Sub-Theme: *(One Health and Food)*

Paper ID *(2024-04002)*

ALTERATIONS IN ANTIOXIDANT STRESS MARKERS AND BIOCHEMICAL PARAMETERS AMONG DIABETIC PATIENTS IN LAGOS STATE

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Abstract

Background: Elevated free radical production driven by glucose oxidation, oxidative glycated proteins and non-enzymatic protein glycation contribute to the development of type 2 diabetes mellitus (T2DM). **Aim**, **Materials and Methods**: This study investigated the relationship between oxidative stress markers and lipid profiles in individuals with and without T2DM in Lagos, Nigeria. It further examined the influence of lifestyle factors, including diet and physical activity, particularly among diabetic patients. A total of 72 participants were recruited, comprising 36 T2DM patients and 36 non-diabetic controls. Biochemical parameters such as plasma protein, total cholesterol (TC), triglycerides, and high-density lipoprotein (HDL) were assessed in the study participants. Antioxidant markers including superoxide dismutase (SOD), reduced glutathione level (GSH), glutathione-S-transferase (GST); alongside oxidative stress indicators such as nitric oxide (NO) and malondialdehyde (MDA) were analysed using standardised spectrophotometric method. Lifestyle factors related to dietary habits and physical activity levels were collected via participant questionnaires. **Results and Conclusion**: The study found significantly elevated MDA levels ($P < 0.001$) in diabetic patients compared to controls, highlighting MDA's potential as a diagnostic and prognostic marker for T2DM management and as a predictor of diabetic complications. These findings underscore the importance of further research into the effects of dietary choices and physical activity on oxidative stress in diabetic patients, supporting the development of tailored lifestyle interventions to improve patient outcomes.

Keywords: Type 2 Diabetes, Oxidative Stress, Lipid Profile, Antioxidant Markers

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04003)*

BIOCHEMICAL EFFECTS OF CALCIUM-BASED FORTIFIED DIETS ON SOME MONOSODIUM GLUTAMATE-INDUCED INJURY IN SOME ORGANS OF RATS.

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Abstract

Background: Calcium plays a role in preventing and treating osteoporosis. This study focused on assessing how calcium-based diets from calcium and calcium-d-glucarate impact Monosodium glutamate (MSG)-induced organ injury in animals exposed daily to the treatment. **Aim**, **Materials and Methods**: The activities of lactate dehydrogenase (LDH) and adenosine triphosphatase (ATPase) was determined in both the heart and the brain of rats to assess the impact of the diets. The induction was performed before (pre-treatment) and after (post-treatment) the MSG administration via the intraperitoneal route. The rats were sacrificed on the 14th, 28th, and 42nd days of the treatment period to harvest the tissues for analyses. **Results and Conclusion**: All the individually pre-treated diets (MG-28-PrT, Ca-28-MG(PrT), and Ca-28-DG/MG(PrT)) significantly reduced ($P<0.05$) LDH activity in the brain at the 28 days of experimentation. In the normal group (c-14- PrT) the level of LDH is 6.03 ± 3.62 (mg/ml) compared to the group fed with the calcium and calcium D glucarate diet MG/Ca 28 DG PrT which is 3.78 ± 0.48 (mg/ml) there is a reduction in the LDH activities. On the contrary, only the pre-treated combined diet significantly increased ($P<0.05$) the LDH activity in the brain signalling stress between the 28-42 days administration. The activity of magnesium-dependent-ATPase significantly increased ($p<0.05$) in both the heart and the brain of the post-treated rats compared to the control. Therefore, calcium and calcium-D-glucarate based supplements are individually recommended to manage stress and organ injury. In conclusion, calcium-based supplements can improve the activity of magnesium-adenosine triphosphatase in both the heart and the brain.

Keywords: Monosodium Glutamate (MSG), Calcium-D-glucarate, Organ injury, Calcium supplements.

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04004)*

Radioactive Contamination in Geological Arctic Ecosystems of South-west Nigeria

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Abstract

Radioactive contamination in the geological arctic ecosystem within the South-west part of Nigeria has posed a significant environmental and health risks. This review examined the current state of knowledge on radioactive contamination in various geological formations in the region. Naturally occurring radioactive materials (NORMs) such as uranium and thorium are present in soil, water, and sediment samples, with higher concentrations in areas with high geological activity. Human activities such as mining, oil exploration, and nuclear power generation have contributed to elevated levels of radioactive contaminants in the environment. The region's geology, which includes sedimentary, metamorphic, and igneous formations, are significantly influenced in the distribution and future of radioactive contaminants. Soil and sediment samples from areas with high levels of uranium and thorium show evidence of radioactive contamination, with potential health implications for humans and biota. Groundwater samples also show elevated levels of radium and radon, indicating potential health risks for human consumption. This review highlighted the need for further research and monitoring of radioactive contamination in geological arctic ecosystems in southwest Nigeria. The effective management and remediation strategies are necessary to mitigate the environmental and health impacts of radioactive contamination in the region.

Keywords: Radioactive contamination, Geological arctic ecosystems, Southwest Nigeria, Naturally occurring radioactive materials (NORMs), Environmental health risks.

Title of Sub-Theme: One-Health and Food Security

Paper ID *(2024-04005)*

Association of Folate Biosynthesis Enzyme Mutations with Antifolate Drug Resistance in *Plasmodium falciparum* from West Africa

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Abstract: Background: Folate biosynthesis is a crucial metabolic pathway in *Plasmodium falciparum*, involving key enzymes such as GTP cyclohydrolase 1 (GCH1), 6-pyruvoyltetrahydropterin synthase (PTPS), pyrophosphokinase (PPPK), dihydrofolate synthetase (DHFS), and dihydrofolate reductase (DHFR). These enzymes are targets of antifolate drugs, including pyrimethamine and sulfadoxine, integral to malaria treatment. However, gene mutations encoding these enzymes, especially DHFR, have been associated with drug resistance **Aim**, **Materials and Methods**: The study investigated the correlation between mutations in folate biosynthesis enzymes and resistance to antifolate drugs, specifically sulfadoxine, pyrimethamine, and their combination (SP). Data from the MalariaGEN Pf7 and Pf-HaploAtlas were used to identify mutations in GCH1, PTPS, PPPK, DHFS, and DHFR in *P. falciparum* samples from West Africa. Drug response data for pyrimethamine, sulfadoxine, and SP were categorized into resistant, sensitive, and undetermined groups. Bayesian and multinomial logistic regression models were applied to assess the correlation between enzyme mutations and drug resistance, with odds ratios calculated to measure the impact of specific mutations **Results and Conclusion**: The analysis identified significant associations between enzyme mutations and drug resistance. In GCH1, 38 mutations were linked to pyrimethamine resistance, 31 to sulfadoxine resistance, and 34 to SP resistance. PTPS mutations showed associations with 9 mutations for pyrimethamine resistance and 8 for sulfadoxine and SP resistance. PPPK had 42 mutations linked to pyrimethamine resistance, 17 to sulfadoxine resistance, and 20 to SP resistance. In DHFS, 48 mutations were linked to pyrimethamine resistance, 46 to sulfadoxine, and 37 to SP resistance. Lastly, DHFR had 7 mutations associated with pyrimethamine resistance, 8 with sulfadoxine resistance, and 4 with SP resistance. The study showed strong correlations between mutations in the folate biosynthesis pathway and resistance to antifolate drugs in West African *P. falciparum* populations. The high frequency of mutations in enzymes like DHFS and PPPK highlights their potential role in driving resistance. Further studies are needed to explore their functional effects on drug resistance mechanisms

Keywords: *Plasmodium falciparum,* Folate biosynthesis, Antifolate drug resistance, Enzyme mutations, West Africa.
One Health and Food Security

Paper ID *(2024-04006)*

In silico Inhibitory potential of Selected Phytochemicals from *Cymbopogon citratus* on Acetylcholinesterase and Cytochrome P450 monooxygenase.

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Abstract

Background: Acetylcholine esterase (AChE) and cytochrome P450 (CYP450) are major enzymes that confer carbamate insecticides resistance on female *Anophelese gambiae*. The enzyme AChE hydrolyzes acetylcholine to choline and acetic acid. This process is inhibited by insecticides such as carbamates and pyrethroids. The resulting effect of this inhibition is the accumulation of acetylcholine in the synaptic nerve of the mosquito, ultimately leading to its death. Cytochrome P450 enzymes are responsible for detoxifying insecticides and have been shown to be upregulated in resistant female *Anophelese gambiae* **Aim**: This evaluated the inhibitory potential of selected phytochemicals from *Cymbopogon citratus* (lemongrass) extract to AChE and CYP450 *in silico* **Materials and Methods**: Fresh lemon grass was extracted with 95% ethanol and analyzed with Gas Chromatography-Mass Spectrometry (GC-MS) to separate the essential oils present. The resultant compounds were screened virtually against AChE and CYP450 to determine their binding affinities to the respective enzymes. **Results:** The GC-MS chromatogram showed 25 peaks, and the hit compounds identified. The docking results of the hit compounds compared to the standard revealed that the compound Pubchem 91720768 (5-methylhex-2-yl butyl ester) and Carophyllene exhibited higher binding affinities to both AChE at interaction energies of -42.16 and -38.07 respectively and methyl palmitate exhibited interaction energy of -40 with CYP450. Key interactions includes hydrogen bonds and hydrophobic interactions, suggesting a strong potential for these compounds to inhibit enzyme activity. **Conclusion**: This result highlighted the potential of Pub chem 91720768 (5-methylhex-2-yl butyl ester) and Carophyllene as effective inhibitors of AChE and methyl palmitate as effective inhibitor of CYP450. These compounds can be recommended as potential candidates for environmentally safe insecticides. Further i*n vitro* and *in vivo* studies are required to validate the efficacy of these compounds.

Keywords: Acetylcholine esterase, cytochrome P450, female *Anopheles gambiae, Cymbopogon citratus*

Title of Sub-Theme (One Health and Food Security.)

Paper ID *(2024-04007)*

EFFECTS OF BLENDING ON THE OXIDATIVE DRYING PROPERTIES OF ALKYD RESINS OF COMPOSITES OF GROUNDNUT AND SUNFLOWER SEED OILS IN PAINT FORMULATIONS

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Abstract
The increasing demand for eco-friendly, cost effective and sustainable paint products has led to the exploration of plant-based oils as alternatives to petroleum-based feedstocks. Groundnut and sunflower seed oils, rich in unsaturated fatty acids, were selected for their potential to produce high-quality alkyd resins. A 50:50 oil length of composite (blend of groundnut and sunflower) and a single (groundnut) oil were prepared, characterized and used for alkyd synthesis via the alcoholysis route. The resulting alkyd resins from the blend and single oils were used to produce paints which were compared based on their physicochemical properties. In terms of fineness, the values obtained for composite and single alkyd paints appeared similar. However, the composites were higher in acid value (8.22 >4.96) and viscosity (138 s >75 s) but lower in solid content (87.02 % <94.88 %), and density (1.16 g/cm^3<1.19 g/cm^3) than the single oil: The single and composite alkyd paints showed drying times of 72 h and 48 h in the presence of driers and greater than 96 h and 48 h in the absence of driers respectively. This research contributed to the development of sustainable products by providing a framework for optimizing the blending of plant based oils to achieve desired properties in alkyd resin production.
Keywords: Blend of groundnut and sunflower seed oil, alkyd resins, alkyd resin paints and oxidative drying.
Subtheme: One health and Food security

Paper ID *(2024-04008)*

Comparative and Computational Studies on selected Phytochemical constituents of fresh and frozen leaf extracts of *Cymbopogon citratus* against SARS-COV-2 polypeptides.

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Abstract

This global health crisis has spurred extensive research into potential therapeutic agents for pandemics such as COVID-19 pandemic, caused by the SARS-CoV-2 virus. *Cymbopogon citratus* (lemongrass) possess bioactive phytochemicals that may target COVID-19 biomarkers. This study explored pharmacological potential to aid in the development of COVID-19 treatments. It investigated the phytochemical composition and antioxidant activity of fresh (CCE1) and frozen (CCE2) ethanolic extracts of *Cymbopogon citratus* and assess their binding affinities against selected COVID-19 biomarkers. Phytochemical screening assays and gas chromatography-mass spectrometry (GC-MS) were used to identify constituents in CCE1 and CCE2. Total Antioxidant Capacity and ferric-reducing antioxidant power (FRAP) assays were employed to determine antioxidant activity. Molecular docking was conducted to compare binding affinities between standard inhibitors and phytochemicals from CCE1 and CCE2 for key COVID-19 biomarkers. Qualitative phytochemical analyses revealed the presence of flavonoids, alkaloids, cardiac glycosides, coumarins, and anthocyanins in *Cymbopogon citratus*. Alkaloid and flavonoid concentrations for CCE1 were 6.7 ± 0.10 µg QE/ml and 8.05 ± 0.25 µg QE/ml, respectively, and for CCE2 were 17.25 ± 0.25 µg QE/ml and 30.83 ± 0.68 µg QE/ml, respectively. Eugenol was identified as the most abundant compound in both CCE1 and CCE2. Additionally, Caryophyllene and Humulene exhibited higher binding affinities for Helicase than the standard inhibitor. The study concluded that specific phytochemicals in *Cymbopogon citratus* show potential for COVID-19 therapeutic applications.

Keywords: COVID-19, *Cymbopogon citratus*, Lemongrass, Phytochemicals, Molecular docking

Subtheme: One health and Food security

Paper ID *(2024-04009)*

Evaluation of AP2-I Gene Modulation and *In-vitro* Parasite Inhibition by Artemisinin and Chloroquine

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Abstract

Background: The resistance of *Plasmodium falciparum* to antimalarial drugs has been the most significant challenge to the effective control and eradication of malaria. Resistance to the frontline artemisinin-based combination therapies have been observed in some regions threatening its effectiveness against malaria parasites, emphasising the need to discover novel drugs and therapeutic targets with low propensity for resistance. Plasmodial transcription factors (TFs) are gaining significant attention as attractive drug targets. *P. falciparum* Apicomplexan Apetala 2 Invasion TF (PfAP2-I) is crucial for controlling genes involved in erythrocyte invasion.

Aim: This study investigated the expression levels of PfAP2-I in the parasite's blood stage and assessed the gene modulatory effects of Artemisinin (ART) and Chloroquine (CQ) on PfAP2-I. **Materials and Methods:** *Plasmodium falciparum* 3D7 strains were cultured using O+ human erythrocytes in RPMI 1640 culture medium enriched with 10 % human serum inactivated by heat, 50 µg/ml Streptomycin, and 25 mM HEPES buffer. The culture was maintained under standard conditions at 37°C and 5 % CO_2 in an incubator for 48 hours. ART, CQ and their combination were introduced to 96-well tissue culture plates at 1µM, 10µM and 100µM, and incubated for 48 hours. Parasitemia was evaluated microscopically. RNA was extracted and analysed using real-time polymerase chain reaction with primers specific for PfAP2-I and an internal reference gene, PfGAPDH. All assays were performed in duplicates. Data were analysed using Graph pad prism 10 software at $p < 0.05$. **Results and Conclusion:** ART showed a greater reduction in parasite density than CQ and demonstrated higher target binding affinity *in silico*. Relative gene expression analysis showed that PfAP2-I was upregulated prior to treatment, validating its expression in the blood stage. Downregulation of this gene after treatment showed the potential of repurposing ART and CQ to improve their efficacy. These findings suggest that PfAP2-I holds promise as potential antimalarial drug targets.

Keywords: *Plasmodium falciparum*, Drug resistance, Artemisinin, Chloroquine, Drug targets.

Title of Sub-Theme (One health and food security)

Paper ID *(2024-04010)*

In silico evaluation of phyto-compounds from *Annona muricata* fruit-skin for potential interaction with Glutathione-S-transferase e2 and Pyrethroid hydrolase in *Anopheles gambiae*

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Abstract

Background: Insecticide resistance in *Anopheles gambiae*, is rapidly hindering effective vector control and malaria eradication in sub-Saharan Africa's endemic regions, particularly Nigeria. Glutathione-S-transferase e2 (GSTe2) and Pyrethroid hydrolase play specific roles in enabling the rapid detoxification of pyrethroid insecticides, rendering them less potent, thereby enabling mosquito resistance. While synthetic insecticides face resistance concerns, natural plant-derived compounds have continued to show promise as bioactive alternatives with potential insecticidal effects. **Aim**, **Materials and Methods**: Hence, the current study was aimed at leveraging computational procedures to identify the binding strength and inhibitory potential of bioactive compounds found in frozen fruit-skin samples of *Annona muricata* (soursop), against Glutathione-S-transferase e2 (GSTe2) and Pyrethroid hydrolase. Gas chromatography-mass spectrometry (GC-MS) was used to identify principal bioactive compounds in the ethanol-soluble fraction (ESV), and then computational studies were performed to evaluate the binding affinities of identified compounds against target proteins. **Results and Conclusion**: Nine out of 10 compounds tested, exhibited higher binding affinities than the standard [Butylated hydroxyanisole:-3.843 Kcal/mol], with NSC-8882 [Ethyl hexanoate] utilizing the highest binding energy (-6.329 Kcal/mol) to GSTe2. However, all compounds tested against Pyrethroid hydrolase exhibited lower binding energy than the standard [Co-crystal]. It can be inferred that some bioactive compounds found in frozen fruit-skin of *A. muricata* may act as natural inhibitors of GSTe2, offering alternative options for overcoming pyrethroid resistance and providing more effective vector control strategies. Further confirmatory studies are needed to validate the results of this study and ascertain the effectiveness and safety of identified compounds.

Keywords: *Annona muricata*, Glutathione-S-Transferase e2, Insecticide resistance, Pyrethroid Hydrolase, Vector control

Title of Sub-Theme (One Health and Food Security)

Paper ID *(2024-04011)*

AIR QUALITY ASSESSMENT USING A CUSTOM-BUILT MONITOR

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Abstract

This work centred around the investigation of air quality using a custom-built monitor designed to analyse critical pollutants like carbon monoxide (CO), nitrogen dioxide (NO_2), ammonia (NH_3), and volatile organic compounds (VOCs). The initiative involves creating a portable monitoring device with sensors to deliver real-time humidity, temperature, and pressure data. The work valuated pollution levels across various environments through sensor calibration, data validation, and comparison with established monitoring stations. It emphasises the significance of real-time air quality monitoring for public health and environmental sustainability. It emphasises the necessity of proactive measures to combat air pollution and advocate for a healthier future. Temperature readings ranged from 27.44°C to 30.17°C, with an average of 28.73°C, indicating a warm and stable environment. Humidity levels remained constant, with an average of 0.999%. Air pressure fluctuated marginally, with a low of 1009.89 hPa and a high of 1011.65 hPa, settling at an average of 1010.55 hPa. These values suggested stable atmospheric conditions. Pollutant levels exhibited some variability: NO_2 levels ranged from 28.58 to 40.93 ppm with an average of 34.43 ppm. CO levels fluctuate between 2793.50 and 3454.82 ppm, with a mean of 3213.13 ppm. NH_3 concentrations varied from 285.82 to 409.35 ppm, with an average of 335.36 ppm. TVOC levels varied between 2793.50 and 3454.90 ppb, with an average of 3213.13 ppb and smoke concentrations ranged from 13.97 mg/m^3 to 17.27 mg/m^3, with an average of 15.83 mg/m^3.

Keywords: Carbon monoxide (CO), Nitrogen dioxide (NO_2), Air quality, Pollution, Ammonia (NH_3)

Subtheme: One health and Food security

Paper ID *(2024-04012)*

Inhibitory Potential of Natural Compounds on Metabolic Resistance in Anopheles Mosquitoes

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Abstract

Mosquito-borne disease has been the cause of millions of deaths worldwide. Female anopheles mosquito has been implicated as the cause of malaria in humans. The most common approach to eliminate this disease is through vector control. This involves the use of synthetic insecticides for indoor residual spraying, long-lasting insecticide-treated nets, and mosquito repellants. Excessive use of these insecticides has led to the development of resistance by these mosquito populations. Several mechanisms are involved in the development of resistance, the most common being target-site resistance and metabolic resistance. Insecticide resistance in *Anopheles* mosquitoes, primarily due to enhanced metabolic detoxification, poses a significant challenge to malaria control efforts. The overexpression of detoxifying enzymes like cytochrome P450s, esterases, and glutathione S-transferases (GSTs) allows mosquitoes to break down insecticides, reducing their effectiveness. Due to this major setback, novel agents with potential activity against resistant *Anopheles* and/or the capacity to overcome resistance against current WHO-approved insecticides are urgently needed. This review explores natural compounds, particularly plant-derived secondary metabolites, as potential inhibitors of these resistance mechanisms. Compounds such as essential oils, piperine, thymol, and quercetin have shown promise in inhibiting key detoxification enzymes and restoring the efficacy of insecticides. We discuss the mechanisms of metabolic resistance, potential natural inhibitors of metabolic enzymes, and potential integration with existing insecticides. Although promising, challenges remain in the formulation, bioavailability, cost, and scalability of these compounds. This review highlights current research, potential applications, and future directions for using natural inhibitors in malaria vector control to mitigate resistance in *Anopheles* mosquitoes.

Keywords: Anopheles, insecticides, target site-resistance, metabolic resistance

Subtheme: One health and Food security

Paper ID *(2024-01013)*

NOVELIST STRATEGIES ON ASTHMA MANAGEMENT

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Abstract

Background: Asthma is a chronic airway inflammatory disease that disrupts breathing with symptoms of wheezing, cough and shortness of breath. Asthma has no cure, and the intensity of attacks ranges from mild to severe. Nigeria is among the top 10 countries that contribute to over 50% of the global cases of wheezing and asthma. This makes her the country with the most asthma incidence and prevalence in Africa. The incidence of asthma has increased considerably over the last two decades, making it a public health issue that should be paid attention to. **Aim**, **Materials and Methods**: This review looked at the genomic makeup, environmental factors and lifestyle that determine the severity of an attack. It also sheds light on the medication administered based on physiological factors utilised in managing various asthma classes. To access relevant articles from the past decade, keywords pertaining to asthma, asthma management, and relief were searched in Pubmed, Scopus, and Web of Science databases. **Results and Conclusion**: The primary cause of asthma remains the inflammation or blockage of the airways exacerbated by environmental, genetic and lifestyle factors. Asthma is managed by quick-relief medications and long-term medications based on the scenario. Personalised medicine strategies, cytokine pathways inhibiting molecules, molecular genetics and nonpharmacological interventions are novel methods for asthma management. Considering individual genetic and phenotypic variations may enhance treatment efficacy tremendously. exploration of the respiratory and gut microbiomes' role in asthma development and severity presents an emerging frontier for investigation.

Keywords: Asthma, Pathophysiology, Asthma management, Environmental factors, Personalised Medicine.

Title of Sub-Theme (One Health and Food Security)

Paper ID *(2024-04014)*

Molecular Docking, In-vitro and Gene Expression Analysis of MCULE-7146940834: A Promising Antimalarial Candidate

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Abstract

Background: The recent instances of treatment ineffectiveness witnessed in artemisinin-based combination therapy (ACT) have sparked concerns regarding its frontline effectiveness in combating malaria. Resistance to ACT is growing, hence the need to discover new drug targets and develop new drugs that are resistance-free. A small molecule (MCULE-7146940834 - MCL) showed inhibitory potential against *Plasmodium falciparum in silico* but has not been validated *in vitro*. **Aim**, **Materials and Methods**: This study evaluated the IC50 and gene modulatory effects on *Pf*MSP1 and *Pf*CDPK5. The binding energies from the molecular docking study with MCL were -10.2 and -10.3 kcal/mol for *Pf*MSP1 and *Pf*CDPK5, respectively. Parasites obtained from field isolates were cultured in O+ human red blood cells utilizing RPMI 1640 medium, supplemented with 10 % heat-inactivated human serum, 25 mM HEPES buffer, and 50 µg/ml penicillin-streptomycin, within a controlled humidified atmosphere at 37°C, with 4 % CO_2, 3% O_2, and 93% N_2. Subsequently, serially diluted drugs were administered into 96-well microtitre plates and co-incubated with aliquots of the parasite culture medium, maintaining a parasitemia level of 0.2% and a haematocrit of 4% for 72 hours. Parasitemia assessment was conducted via microscopic examination of Giemsa-stained smears. Artemisinin served as the positive control in the experiment, while a drug-free negative control was also included. Gene expression studies were conducted on the test compounds targeting two crucial genes, Merozoite surface protein 1 (MSP) and Calcium-dependent protein kinase 5 (CDPK). All assays, including the test compound (MCL), were performed in duplicates and analyzed utilizing graph pad prism software with a significance level set at $p < 0.05$. **Results and Conclusion**: The IC50 analyses revealed an in vitro IC50 value of 24.68 µM for MCL and 5.006 µM for combining MCL with artemisinin. Relative gene expression (ΔCt) indicated increased expression of MSP and CDPK relative to PfGAPDH. These findings suggest that MCULE-7146940834 could be a promising candidate for an antimalarial drug, making it a valuable compound for further optimization in medicinal chemistry.

Keywords: **Malaria; Merozoite surface protein 1; Small molecules; Calcium-dependent protein kinase; *Plasmodium falciparum***

One Health and Food Security

Paper ID *(2024-04015)*

In silico Screening of *Cassia fistula* extract against *CYP6P4* in *Anopheles gambiae*

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Abstract

Background: *Anopheles gambiae* is a primary malaria vector in sub-Saharan Africa, with significant implications on public health. This mosquito species exhibits diverse breeding habitats and has developed resistance to common insecticides, complicating malaria control efforts. *Cassia fistula* exhibits insecticidal properties, making it a potential natural alternative for pest control. **Aim:** This evaluated the binding affinity of bioactive compounds from *Cassia fistula* as inhibitor of CYP6p4 in *Anopheles gambiae* mosquito using molecular docking. **Method:** This study used GC-MS to identify bioactive compounds in *Cassia fistula* extract and applied *in silico* methods to identify potent CYP6P4 inhibitors from the compounds as a potential insecticide to combat insecticide resistance. The results indicated the existence of 7 compounds in from the extracts with 2 serving as best targets for CYP6P4.Toxicity analysis done on both compounds and compared to existing WHO approved synergist was the same in terms of AMES toxicity, skin sensitisation and hepatotoxicity. **Result:** The 7 compounds extracted from *Cassia fistula*, identified potent inhibitors Benserazide and Mesitylene which belongs to the class of carbohydrazide and aromatic respectively. Benserazide was a better inhibitor with a binding affinity of -6.6 kcal mol^{-1}, when compared to the standard inhibitor of -5.7 kcal mol^{-1}. *Cassia fistula* showed promise as a natural insecticide, further research is necessary to isolate and characterize the specific compounds responsible for its insecticidal effects. This could enhance its application in integrated vector control strategies, balancing efficacy with environmental safety.

Keywords: Insecticides, cytochrome P450, synergist, malaria control, environmental safety
Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04016)*

Investigation of Piperonyl Butoxide-Enhanced Deltamethrin Treatment on *Anopheles gambiae* in Ota, Ogun State

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Abstract

Background: Malaria remains a significant global health burden, with an estimated 249 million cases and 608,000 deaths in 2022. Sub-Saharan Africa is the most affected region. The primary vectors are female *Anopheles* mosquitoes, and their control is increasingly challenged by resistance to insecticides such as organochlorines, organophosphates, carbamates, and pyrethroids. **Aim**: This study investigates the role of piperonyl butoxide (PBO) in enhancing the efficacy of deltamethrin (a pyrethroid) against *Anopheles gambiae* in Ota, Ogun State. Piperonyl butoxide is known to inhibit cytochrome P450 enzymes, which detoxify pyrethroids in resistant mosquitoes. **Materials and Methods**: Two to five-day-old female mosquitoes that had not been blood-fed were exposed to 0.05% deltamethrin alone and another group to deltamethrin with 4% PBO according to World Health Organization (WHO) standards. The Knockdown resistance (kdr) genes were also genotyped to identify resistance mutations. **Results**: The results showed that *Anopheles gambiae* exhibited significant resistance to deltamethrin alone (7.5% mortality). However, the addition of PBO increased deltamethrin efficacy, resulting in an 80.7% mortality rate. Knockdown resistance (kdr) genotyping revealed the presence of the L1014F mutation, indicating kdr-West resistance. **Conclusion**: The findings suggest that incorporating PBO into vector control strategies could improve pyrethroid effectiveness against *Anopheles gambiae*, potentially contributing to better malaria control. Moreover, the increased susceptibility of the sample population to pyrethroids when used alongside PBO suggests the likely involvement of metabolic resistance.

Keywords: *Anopheles gambiae,* deltamethrin, enhanced susceptibility, malaria, piperonyl butoxide,

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04017)*

Effectiveness of pre-planting *Trichoderma* Application in the Biocontrol of *Macrophomina phaseolina* infected Cowpea in the Screenhouse

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Abstract

In Nigeria and West Africa, cowpea is recognised for its economic importance for food and as a forage crop for animals. However, its production is primarily affected by several disease-causing fungi, of which *Macrophomina phaseolina* is a significant pathogen. In the present study, *Trichoderma* was employed as an effective alternative to pesticides, known to negatively affect the environment and biodiversity, to manage the disease in the screenhouse. Three strains *of Trichoderma asperellum* were isolated from the soil. The spore suspensions of the *Trichoderma* strains were prepared, formulated into seven different treatment combinations, and applied to the cowpea potted soil before planting to investigate their biocontrol ability on *M. phaseolina* and assess their effects on cowpea growth performance. The experiment results showed that the cowpea plants treated with the combined and single *Trichoderma* significantly differ in plant height (<.0001), stem girth (<.0001), and leaf number (<.0001) compared to those treated with *M. phaseolina* only. The cowpea treated with Trt3 gave a higher plant height (54.5417) than in *M. phaseolina*-treated cowpea (44.9667). Also, the cowpea treated with Trt7 gave a higher stem girth (0.5446) than in *M. phaseolina*-treated cowpea (0.3333), while the cowpea treated with Trt7 gave a higher leaf number (24.958) than in *M. phaseolina* treated cowpea (8.833). Furthermore, applying the combined and single *Trichoderma* led to significant inhibition of *M. phaseolina* in the cowpea. The pre-planting *Trichoderma* formulations significantly reduced disease incidence and severity in the treated cowpea plants compared to the negative control. This study's pre-planting application of single and combined *Trichoderma* formulations in cowpea planting soil proved an effective strategy for early control of *M. phaseolina*. In conclusion, *Trichoderma* is an effective bioagent for controlling diseases caused by *M. phaseolina* in cowpea and stimulating the overall cowpea performance, thereby contributing to the maintenance of food security.

Keywords: *Trichoderma*, *Macrophomina phaseolina*, food security, biocontrol, bioformulation, plant diseases.

Title of Sub-Theme (One Health & Food Security)

Paper ID *(2024-04018)*

Determining Genetic Variability and Phylogenetic Relationships of African Yam Bean (*Sphenostylis stenocarpa* (Hochst ex A. Rich) Harms.) using rbcL marker

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Abstract

The African yam bean, AYB (*Sphenostylis stenocarpa*), an opportunity legume is valued for food, nutrition, and income security. While the plant plays a crucial role in small-scale farming systems in sub-Saharan Africa, insufficient genomic data hampers the breeding potential of its germplasm. Our recent dataset based on the ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit (*rbcl*) gene maker underscores the utility of nucleotide substitution for deciphering genetic relationships among a subset of AYB accessions. The study investigated the substitution patterns and phylogenetic relationships of 24 accessions of AYB. The *rbcl* genes of the accessions were sequenced using Sanger's technique. The obtained sequence data was analyzed using DnaSP v6.12.03, MEGA11, and descriptive statistics. Transitional base changes of C/T, T/C, A/G, and G/A varied significantly ($p < 0.05$) from transversional substitutions. A high gene diversity of 0.60, in addition to 13 polymorphic sites and 5 haplotypes were recorded for the accessions. Nine accessions including TSs13, TSs24, TSs303, TSs331, TSs334, TSs38, TSs49, TSs67, and TSs98 had variant sequences at 531 nucleotide base positions with a variant frequency of 37.50 %. The estimates of evolutionary divergence between the sequences ranged from 0.00 (TSs4 and TSs24) to 1.38 (TSs1, TSs311 and TSs331). An analysis of the phylogenetic relationship showed a significant degree of genetic diversity with <50 % bootstrap values, indicating the genetic distinctiveness of the accessions. Accessions TSs 333 and TSs 357 were the most genetically distinct accessions with a low bootstrap value of 45%. TSs 303 surprisingly had a very high relationship with the out-group *Vigna unguiculata* (100%). The information presented herein could be leveraged to extend the limited genetic base of AYB through modern mutational breeding methods.

Keywords: Breeding; genetic diversity; mutation; food security; sustainable development

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04019)*

In Silico Evaluation of siRNA-Mediated Targeting of Arginase in Anopheles gambiae as a Novel Vector Control Strategy

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Abstract

Background: The increase in insecticide resistance among Anopheles mosquito populations, the primary malaria vectors, calls for the urgent need for novel vector control strategies. RNA interference (RNAi) offers a promising alternative by allowing for specific gene targeting, with minimizing impacts on non-target organisms. Arginase in *Anopheles gambiae*, an enzyme involved in nitrogen metabolism, presents a compelling target due to its role in reducing parasite development and vectorial capacity. **Aim:** This study evaluated the potential of small interfering RNAs (siRNA) molecules targeting arginase in *An. gambiae* for reducing parasite development thereby reducing malaria transmission. **Materials and Methods:** Using bioinformatics tools, siRNAs were designed to target specific sequences in the *An. gambiae* arginase gene previously identified by multiple sequence alignment (MSA) using Integrated DNA Technologies. These siRNAs were optimized for silencing efficiency by assessing parameters like GC content, potential off-target effects and secondary structure analysis. To further evaluate their efficacy, molecular docking analyses to assess siRNA-mRNA interaction stability, helping to predict their silencing potential were carried out. **Results:** Findings indicated specific target sequences unique to *An. gambiae* and 5 siRNAs that target these sequences. The siRNAs showed favorable secondary structures supporting their feasibility as stable RNAi agents. The siRNAs demonstrated strong binding affinity and potential for effective mRNA degradation, essential for successful gene silencing. **Conclusion:** This research demonstrated arginase as a target gene for RNAi mosquito control strategy offering insights into RNAi-based mosquito control strategies and setting the groundwork for laboratory validation and sustainable RNAi insecticides to combat malaria.

Keywords: RNAi, Arginase, Molecular docking, Anopheles gambiae, Mosquito vector control

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04020)*

The Potential Inhibitory Effects of *Annona muricata* Compounds on Chitin Synthase and N-Myristoyl Transferase in *Anopheles gambiae*

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Abstract

Background: With the growing resistance of *Anopheles gambiae* mosquitoes to the WHO-recommended insecticides, the incidence of malaria is increasing, particularly in Sub-Saharan Africa due to vectors developing mechanisms to avoid being killed by the insecticides. The insecticides are artificially synthesized and can harm non-target organisms causing adverse health effects. There is the need to explore eco-friendly alternatives with novel mechanisms of action that can kill the mosquitoes. Chitin synthase is an enzyme that synthesizes chitin, which aid the development of insect exoskeleton and provides structural integrity. Inhibiting chitin synthase would disrupt proper exoskeleton formation and can cause death of *Anopheles gambiae.* In addition, N-Myristoyl Transferase (NMT) is an enzyme that plays a role in the transmission of malaria parasites by *Anopheles gambiae.* Hence, there is a need to explore potential inhibitors of these enzymes using *Annona muricata* essential oil extract. **Aim:** This study used *in silico* methods to assess, the inhibitory activity of selected bioactive compounds from *Annona muricata* against Chitin Synthase and NMT in *Anopheles gambiae*. **Materials and Methods:** Gas Chromatography-Mass Spectrometry (GC-MS) was employed to separate and identify the bioactive compounds in the essential oil extracted from *Annona muricata*. The identified compounds were then docked against a modelled chitin synthase and NMT in *Anopheles gambiae* using *in silico* methods. **Result and Conclusion:** The molecular docking simulations showed that Ptridecan-6-yl 2-fluoro-6-(trifluoromethyl)benzoate, with binding energy -38.84, had the strongest binding affinity to chitin synthase followed by N,N'-bis(1-phenylethyl)oxamide, with binding energy of -37.57, exceeding that of the standard Diflubenzuron, with binding energy -33.21 While for NMT, none of the compounds showed a stronger binding affinity than the standard. The findings showed that some bioactive compounds in *Annona muricata* could serve as potential inhibitors of chitin synthase in *Anopheles gambiae.* However, *in vitro* and *in vivo* studies need to be carried out to validate its potential, efficacy and safety. Also, further studies are needed to identify potential NMT inhibitors.

Keywords: *Annona muricata, Anopheles gambiae,* chitin synthase, inhibitors, malaria, N-Myristoyl Transferase

Title of Sub-Theme: One Health and Food Security

Paper ID *(2024-04021)*

A SELECTED PHYSICO-CHEMICAL PROPERTIES OF DIFFERENT AQUATIC HABITATS AND THE EFFECT ON WATER HYACINTH MORPHOLOGY

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Abstract

Background: Invasive weeds' continuous infestation of aquatic bodies has become a threat to the health of the aquatic ecosystem and food security. Water hyacinth is an invasive plant of freshwater origin but has been reported to be present in a more saline water environment. **Aim :** This study investigated some physicochemical parameters that could aid in the plants' introduction and morphological characteristics across the different aquatic habitats. **Materials and Methods**: Horiba U-50 probe was used to analyse water parameters such as pH, Temperature, Total dissolve solid (TDS), Turbidity, Electrical conductivity (EC), Dissolved oxygen (DO) and salinity *in situ* across different aquatic habitats (fresh, brackish and marine water). Water hyacinth plants were also harvested to determine the relationship between the physicochemical properties of the water habitats and the plant quantitative morphological traits. **Results and Conclusion**: The results are presented as mean ± Standard deviation. The physicochemical parameters varied significantly ($p<0.05$) across all the different habitats. Temperature (28.61℃), EC (12.92 mS/m), Turbidity (12.58 NTU) and DO (20.99 mg/L) values were relatively higher in the brackish water while the Marine water habitat recorded higher values for pH (6.62), TDS (27.31 mg/L) and Salinity (25.29 ppt). For the morphological characters, Stem length showed a positive significant Correlation with pH and EC (0.05; 0.01 level) and a negative correlation with salinity and TDS at 0.01 level. Root length showed a positive correlation with EC and salinity at 0.05 level while leave width was correlated negatively with pH at 0.05 level. In conclusion, pH and temperature values were within the stipulated ranges (4-10; 25-33℃) required for the introduction and survival of the plant. Additionally, the correlation of some physicochemical parameters with morphological characters indicates abiotic factors influence the morphological formation of plants in their effort to adapt and survive in different aquatic environments.

Keywords: Water hyacinth, Aquatic plant invasion, Physicochemical parameter, Morphological Characteristics, Aquatic health.

Title of Sub-Theme (One health and Food Security)

Paper ID (2024-04022)

In silico Analysis and Phylogenetic Studies of fluted Pumpkin (*Telfairia occidentalis*) ribulose-1,5-bisphosphate carboxylase/oxygenase gene

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Abstract

Ribulose biphosphate carboxylase large (rbcL) is central to the global carbon cycle and is one of the single barcode genes of individual plants that have phylogenetic utility. The rbcL genomic DNA isolation, amplification, purification, and sequencing of Telfairia occidentalis were carried out. In this investigation, fourteen (14) leaves of fluted pumpkin (*Telfairia occidentalis*) were collected from an experimental farm in Covenant University Ota, Ogun State, Nigeria. Thereafter, the ribulose-1,5-bisphosphate carboxylase large gene (rbcL) was amplified using polymerase chain reaction, sequenced, and characterised *in silico*. The amplified fluted pumpkin rbcl gene obtained has a length of about 1100 nucleotides, comprising one intron (54 bp) and one exon (1058 bp). The exon encoded a protein of 350 amino acid residues with a molecular weight of 38.5 kDa and an isoelectric point (pI) of 6.23. The predicted 3D structure of the encoded protein showed it belongs to the ribulose-1,5-bisphosphate carboxylase/oxygenase (Rubisco) large superfamily. BLASTP results showed 98.98% and 98.47% similarity to the Rubisco large subunits of *Cucumis oreosyce* and *Cucumis melo*, respectively. Phylogenetic study indicated that *T. occidentalis* classification within the Cucurbitaceae cannot be ascertained as it was more evolutionarily related to rbcL genes from other plant families than the Cucurbitaceae family but should be further investigated using other molecular markers. This preliminary investigation on the ribulose-1,5-bisphosphate carboxylase/oxygenase gene in fluted pumpkin (rbcL) revealed some peculiar features of the gene and its deduced protein, which could find useful applications in both agricultural and biotechnology industries, especially in genetic engineering.

Keywords: *Telfairia occidentalis*, bioinformatics, ribulose-1,5-bisphosphate carboxylase/oxygenase gene, sequencing, phylogenetics.

Title of Sub-Theme (One Health and Food Security)

SUBTHEME: RENEWABLE ENERGY AND MATERIAL DEVELOPMENT

Paper ID *(2024-07001)*

The Economic and Environmental Impact of Air Methane on Solar Power Generation from an SDG Perspective

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Abstract

Methane (CH_4) is a potent greenhouse gas that significantly impacts climate change and the efficiency of renewable energy sources like solar power. This study explored the economic and environmental consequences of atmospheric methane on solar power generation, with a focus on Sustainable Development Goals (SDGs) 7 (Affordable and Clean Energy) and 13 (Climate Action). Methane emissions, primarily from fossil fuel extraction, agriculture, and waste, amplify global warming and increase air haze, reducing the amount of sunlight available to photovoltaic (PV) systems and lowering their efficiency. Studies have indicated that even slight temperature rises from methane-induced warming can decrease PV output by about 0.5% per degree Celsius, substantially impacting solar generation in methane-heavy regions. Economically, this inefficiency raises the operating and maintenance costs of solar systems, making solar power less affordable. This study employed a mixed-methods approach, incorporating literature review and data analysis from recent global methane monitoring reports. Findings suggested that reducing atmospheric methane emissions could boost solar power efficiency by up to 10% in high-emission areas. The policy implications underscore the importance of methane reduction efforts at global and local levels to enhance solar energy's economic viability. This research indicated that targeted methane reduction strategies can improve climate resilience, increase solar efficiency, and expand access to sustainable energy, supporting the goals of the SDGs.

Keywords: Methane; Solar power efficiency; Greenhouse gases; Climate change; Sustainable development, Renewable energy

Paper ID *(2024-07002)*

The Effect of Pretreatment Methods on the Yield of Sugar from Cassava and Yam Peels, a Precursor for Bioethanol Production

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Abstract

Bioethanol is a renewable source of energy and is of vital importance in the world. It is less harmful to humans and helps solve the insufficiency and non-renewability of fossil fuels while reducing the environmental pollution caused by food wastes. This project aimed to produce bioethanol from cassava and yam peels (food wastes), a sustainable and renewable form of energy. The production of bioethanol was carried out using two different pre-treatment methods; mechanical, which involved grinding of the food wastes and chemical, which involved the use of 5 M nitric acid solution to soak the biomass for 30 min and 50 % (wt/vol) alkaline solution to soak the biomass for 24 hours. The pre-treated cassava and yam peels samples were hydrolysed individually using nitric acid at different concentrations (5 M, 3 M, 1 M, 0.5 M, 0.25 M). It was observed that the acid pre-treated biomasses hydrolysed with 5 M nitric acid produced the highest yield of sugar of 63.83 % glucose from cassava peel and 58.81% from yam peels. This was followed by mechanically pre-treated samples, which gave a glucose yield of 42.81% from cassava peels and 41.37% for yam peel. Alkaline pre-treated samples produced the lowest sugar yields, with 39.10% glucose from cassava peel and 38.01% from yam peel after hydrolysing with 5 M nitric acid. Optimizing and scaling up these processes could potentially help to convert these wastes to sustainable energy resource and mitigate their negative impact on the environment.

Keywords: cassava peel, yam peel, acid pre-treatment, alkaline pre-treatment, hydrolysis, bioethanol,

SUBTHEME: STEM AND GENDER EQUALITY

Paper ID *(2024-08001)*

Enhancing Engineering Education Through the Integration of Biometric Systems: A Systematic Literature Review

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Abstract

Background: The integration of biometric systems in education is an emerging field with the potential to transform pedagogical practices. As technology evolves, the need for innovative approaches to enhance student learning and engagement has become increasingly important. This review synthesized existing research on biometric applications in engineering education, focusing on their effectiveness in improving learning outcomes and addressing challenges in implementation. Key objectives include identifying best practices and exploring the ethical implications associated with the use of biometric technologies in educational contexts.**Aim**, **Materials and Methods**: This review assessed the current landscape of biometric systems in engineering education and their impact on various educational dimensions. The materials include a wide range of peer-reviewed articles, conference papers, and case studies related to biometric technologies in educational settings. The methodology involved systematic keyword searches across multiple academic databases, followed by the selection of relevant studies based on predefined inclusion and exclusion criteria. Data were synthesized to highlight key themes, trends, and insights into the application of biometric systems in the educational context. **Results and Conclusion**: The findings revealed a growing trend in the adoption of biometric systems, particularly in areas such as student authentication and engagement monitoring. Key outcomes indicate that biometric technologies can facilitate personalized learning experiences and improve classroom management. However, challenges related to privacy, ethical considerations, and technical implementation were also identified. The review concludes that while biometric systems hold significant promise for enhancing engineering education, careful consideration of ethical implications and robust policy frameworks are essential for successful integration. Recommendations for future research include exploring the long-term impact of biometric systems on learning outcomes and developing best practices for their ethical use in educational settings.

Keywords: Biometric systems, engineering education, systematic literature review.

Paper ID *(2024-08002)*

FLEXIBLE AND COLLABORATIVE SUSTAINABLE LEARNING ENVIRONMENT FOR MENTALLY CHALLENGED CHILDREN IN LAGOS NIGERIA

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Abstract
Individuals with mental disabilities have faced bias and discrimination throughout history, often being labeled as fools, intellectually impaired, mentally handicapped, and learning disabled. Designing adaptable and sustainable learning environments to promote adaptability, creativity, and student-centered education is becoming increasingly important in the current educational landscape, where there is a growing emphasis on flexible and collaborative spaces. Nigeria is one of the most metropolitan and educationally advanced cities in Africa, therefore the aim was to evaluate flexible and collaborative sustainable learning spaces and environment for mentally challenged children in Southwest Nigeria. The study was carried out with the use of a case study methodology with the schools for the mentally challenged in Lagos State. Results indicated that many facilities did not conform to the flexible learning space and collaborative environment for improved efficiency. Recommendations were made to enhance the learning of challenged children through proper space planning for improved efficiency of educational facilities, in line with the United Nation Sustainable development Goals (SDG) No 4 quality education.
Keywords: Collaborative learning, Flexible learning, mental challenge, Space planning, Sustainable learning environment

Paper ID *(2024-08003)*

Advancements and Challenges in Task Balancing for Multi-task Learning Architectures

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Abstract

Background: Multi-task learning (MTL) has become a valuable approach in deep learning, allowing models to leverage shared knowledge across related tasks to enhance generalization and improve performance. However, maintaining balanced contributions from each task during training presents significant challenges, with differences in task gradients, variable learning rates, and sometimes opposing task objectives that can hinder the model's overall effectiveness.**Aim**, **Materials and Methods**: This review aims to highlight core areas for improvement in scalability, computational efficiency, and task interdependence, emphasizing the need for more robust task-balancing methods within MTL frameworks.**Results and Conclusion**: Findings reveal that while existing balancing techniques address some MTL issues, substantial gaps remain, particularly in scalability, computational efficiency, and task interdependence. This review emphasizes the need for more robust task-balancing methods within MTL frameworks to address these ongoing challenges.

Keywords: Deep learning, Multi-task learning, Task Balancing, Optimisation

Title of Sub-Theme (Applied Mathematics, Machine Learning and Artificial Intelligence (AI) for sustainability)

Paper ID *(2024-08004)*

The Application of Internet Services in the Marketing of Real Estate in the Lagos Property Market.

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Abstract

Background: The application of internet and its services is evident in every sphere of life of which includes real estate. There has been evidence of the usage of social media platform in dealings relating with real estate **Aim**, **Materials and Methods**: This particular study thereby had a much focus outlook to guard against superfluity by laying emphasis on real estate marketing that entailed the sales and let/lease of property. The study engaged 230 estate surveying and valuation firms in Lagos State who were issued structured questionnaires in a cross-sectional survey. Data collected from an over 72% response rate was analysed using descriptive statistics of frequency distribution, Relative Importance Index (RII) and the harmonic mean **Results and Conclusion**: It was revealed that the WhatsApp platform was the most utilized social media platform for both sales and letting/lease of properties in the study area with an incidental reduction in timing period of sales and letting to 0.2182 (21.82%) and 0.3216 (32.16%) of the previous estimated time of transaction respectively. The study lauded the use of the WhatsApp platform while advocating for further research on usage of the very many platforms yet to be utilized.

Keywords: Internet, Marketing, Real Estate, Estate Surveying and Valuation Firms, Lagos

Paper ID *(2024-08005)*

Comparative Performance Analysis of a Refrigeration System Retrofitted with AS and MS condensers using R600a

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Abstract

In this study, an experimental performance analysis of a vapor compression system was conducted using the eco-friendly refrigerant (R600a), which has a negligible global warming potential (GWP), zero ozone depletion potential, and excellent thermodynamic and thermophysical properties. The unique characteristics of isobutane refrigerant make it a promising alternative to tetrafluorocarbon refrigerant (R134a), which has a GWP of 1430, for use in heating, ventilation, and air-conditioning (HVAC) industries. This study evaluated the advantages of hydrocarbon refrigerants in conventional refrigeration systems and examined the comparative effects of selective condenser materials, aluminum steel (AS) and mild steel (MS) on system performance. The results indicate a significant improvement in the system's performance when using an aluminised steel condenser (ASC) at a room temperature of 28 °C. The coefficient of performance (COP) and evaporator temperature increased by 6.8% and 30% respectively with energy reductions of 21.8%.

Keywords: Coefficient of performance, ASC, Global warming potential, HVAC, mild steel

SUBTHEME: SUSTAINABLE BUILT ENVIRONMENT AND URBAN DEVELOPMENT

Paper ID *(2024-03001)*

The Benefits of Information Management Implementation in Project's life cycle in the South African Construction Industry– A Review

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Abstract

Effective information management is crucial for enhancing project outcomes in the South African construction industry. This paper examines the benefits of implementing information management systems throughout the project life cycle, emphasising their role in improving efficiency, collaboration, and decision-making. By optimising data flow and enhancing communication among stakeholders, these systems help minimise misunderstandings and errors, which are common in construction projects. The integration of information management practices facilitates better planning, execution, and monitoring of projects. With real-time access to critical data, project teams can make informed decisions that lead to improved resource allocation and adherence to timelines. Additionally, digital tools foster collaboration among architects, engineers, contractors, and clients, ensuring that all parties remain aligned with project objectives. Furthermore, effective information management enhances risk mitigation strategies. By maintaining comprehensive records and documentation, teams can identify potential challenges early, allowing for proactive measures that reduce disruptions. The review also highlights the importance of information management in ensuring compliance with regulatory standards and industry best practices, thereby promoting safety and sustainability in construction activities. In conclusion, the implementation of information management systems in the South African construction sector not only improves project efficiency but also supports the industry's overall growth and competitiveness. As projects become increasingly complex and demanding, the necessity for robust information management will continue to escalate. This paper underscores the imperative for construction firms to invest in these capabilities, positioning themselves for success in a rapidly evolving market landscape. Embracing information management practices will ultimately enhance project delivery and contribute to a more sustainable construction industry.

Keywords: Information Management, Project Life Cycle, Construction Industry

Title of Sub-Theme (Construction Information Management.)

Paper ID *(2024-03002)*

Building Information Modelling- An Indicator for Effective Communication on the Construction Site

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Abstract

The emergence of Building Information Modelling (BIM) has fundamentally reshaped communication dynamics on construction sites. This study investigated the influence of BIM on effective communication on the construction site. Utilizing IBM SPSS version 26, quantitative data from 182 respondents, derived from a sample of 200 distributed questionnaires, were analysed. Thirteen distinct areas of construction operations prevalent in construction practices underwent rigorous examination through a blend of descriptive and mean-item-score analyses. Results revealed that construction planning, project management, and construction analysis are the most common areas where BIM is used for effective communication on construction sites. BIM facilitates collaborative efforts, enhances communication channels, aids decision-making processes, enables early error detection, and elevates project documentation standards. Ultimately, this study underscores BIM's pivotal role in fostering improved construction accuracy through enhanced comprehension and dissemination of construction information among stakeholders.

Keywords: BIM, Construction Site, Construction Industry, Effective Comunication

Title of Sub-Theme (Digitalised Construction Site Communication)

Paper ID *(2024-03003)*

Urban Planning Strategies in Building Climate Resilience in Badagry, Lagos State, Nigeria

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Abstract

Climate change has become a critical global issue, posing a significant threat to lives and property. Therefore, climate change resilience strategies are crucial as a way to prepare and adapt to the disastrous occurrence. The lack of integration and implementation of climate resilience strategies, and limited stakeholders' engagement are problems to ineffective climate change resilience in some regions. Therefore, the study examined the effectiveness of urban planning strategies towards climate resilience in Badagry. The Social-Ecological Systems Framework (SES) was used as a framework in this study, while the mixed-methods design was adopted. A multi-stage sampling was used to identify the wards within the LGA/LCDA. The population of the selected wards was obtained from the 1991 population (35,676) and projected to 2024 (83,196 at a growth rate of 2.6%). Using a sample ratio of 0.161, 134 residents were sampled from the three (3) wards based on their proximity to the waterside and densely populated areas. The structured questionnaire covered the socio-economic status (age, sex), level of preparedness, awareness of urban planning strategies, existing strategies, level of effectiveness, and stakeholders' participation level in building climate resilience in Badagry. Data obtained were analysed using descriptive statistics. Findings revealed that male respondents are (53%), while female (47%); level of preparedness towards climate change is low; awareness level of urban planning strategies to climate resilience is (21.6%), which is low compared to those that are not aware (78.4%); existing strategies include land use planning, ecosystem conservation, building code and standards; the available existing strategies are effective and stakeholders participation are recognized as important blueprint to be included for sustainable climate resilience in the area. Therefore, there is a need for inclusive planning, policy support, collaborative governance, improved communication, and local content development to enhance climate resilience.

Keywords: Urban planning strategies, Climate resilience, Stakeholders.

Title of Sub-Theme (Climate Action and Circular Economy)

Paper ID *(2024-03004)*

Assessment of Flood-Prone Areas Towards Compliance with Planning Regulations in Ibadan, Oyo State, Nigeria

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Abstract

Flood disasters have escalated destroying properties thereby displacing thousands of people. The assessment of risk management in flood-prone areas in Ibadan necessitated examining the extent of compliance with planning regulations; and the extent of awareness and preparedness of the building-owners against flood events. The resilience Flood Risk Management concept provided the framework. A purposive sampling was used to identify 1,031 buildings that were previously flooded. Twenty percent of the affected buildings were selected systematically, and 206 buildings were sampled. A structured questionnaire that elicited questions on socio-economic (age, income) and compliance with planning regulations (awareness, planning permit) was administered to 206 heads of households of 1,031. Quantitative data were analysed using descriptive statistics. Analysis of Variance at α0.05 was used to examine differences in income and MANOVA was used to determine spatial development. Data collected showed that 71.4 % of the respondents were married people between 30 and 60 years, old and earned an average monthly income of N81,400 ± N10,205, there was no significant difference in the income level of the respondents, and the majority (96.1%) of the building owners were aware of planning regulations, but only 7.3 % complied with the rules. Physical planning regulation constraints included the cost of obtaining a planning permit (22.8 %) and the lack of government contribution (33.0 %). Most (96.6 %) of the building owners were aware of the flood events; 29.6 % were prepared against such events. There are no spatial variations in the level of flood awareness among the building-owners in the flood-prone areas of Ibadan, Oyo State; but there are spatial variations in the level of flood preparedness. Therefore, enhancing flood risk management in Ibadan requires the provision of development guides, awareness, working tools, and training for flood risk personnel.

Keywords: Flood prone areas, Compliance, Planning regulations, Floods

Title of Sub-Theme (Sustainable Built Environment and Urban Development)

Paper ID *(2024-03005)*

Socio-Demographic Determinants of Waste Collection Preferences in Selected Public Housing Estates in Lagos Metropolis

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Abstract

Urban waste management in Lagos, Nigeria, is increasingly becoming problematic due to the city's rapid population growth and the resulting strain on infrastructure. This study explored the socio-demographic determinants influencing waste collection preferences among residents of selected public housing estates in Lagos Metropolis. The research investigated the extent to which factors such as occupation, level of education, and other demographic variables shape the adoption of various waste management systems, including door-to-door collection, community collection points, curbside collection, and informal methods like the Aboki model. A total of 89 respondents were surveyed, and the data was analyzed through crosstabulations to identify patterns in waste collection usage across different socio-economic groups. The findings revealed that full-time employed individuals and self-employed residents exhibit diverse preferences for waste collection methods, with significant reliance on door-to-door and community collection points. Self-employed individuals, in particular, report high use of both formal and informal systems, while students and retirees demonstrated the preference for community collection points over door-to-door services. Primary education respondents have limited access, with all 3 reporting "low" access. Secondary education respondents primarily report "low" (13 out of 26, or 50%) and "very low" (12 out of 26, or 46.2%) access, indicating significant gaps in waste bin availability. Among those with tertiary education, the majority report "very low" access (33 out of 52, or 63.5%). The findings suggested that enhancing formal waste collection services, particularly curbside collection, and optimizing informal systems could improve overall waste management effectiveness in public housing estates in Lagos. This research contributed to a better understanding of the socio-economic factors influencing waste management behavior and offers recommendations for policy development to improve urban sanitation services.

Keywords: Lagos Metropolis, Public housing estates**,** Socio-demographic determinants, Urban sanitation services, Waste collection preferences.

Paper ID *(2024-03006)*

Socio-Economic Characteristics and Housing Preference of Residents in Selected Cities of Ogun State, Nigeria

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Abstract

This study examined the impact of socio-economic characteristics on housing preferences of residents in selected cities of Ogun State, Nigeria. A cross-sectional survey of 203 household heads was carried out with data collected using structured, close-ended questionnaire administered randomly. The independent variable was the socio-economic characteristics which indicators include gender, marital status, education, income, employment type, and household size influence while the dependent variable was housing preference. The results showed significant relationship between higher education status and increased income levels, suggesting that respondents with higher educational attainment tend to experience better financial stability, allowing for more favourable housing options. Similarly, respondents with larger household size expressed great concerns about housing affordability, reflecting the pressures this group face in securing adequate housing. The results also showed a positive correlation between 'other household income earners' and 'household size' (0.176, $p = 0.014$). This indicates there is a direct proportional relationship between income earners and household size. The study concludes that targeted policy interventions, such as affordable housing initiatives, income diversification support, and educational opportunities, are essential to address the affordability issues faced by different socio-economic groups. These findings provide valuable insights for policymakers, urban planners, and housing developers in creating sustainable housing solutions that meet the diverse needs of the population in Ogun State.

Keywords: Affordable housing, Housing characteristics, Housing preference, Socio-economic characteristics, Nigeria

Paper ID *(2024-03007)*

THE PLIGHT OF RESIDENTIAL HOUSE RENTERS IN A CONTRACTED ECONOMY: A LAGOS PROPERTY MARKET OUTLOOK

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Abstract

Background: With real estate cycles being a subset of business cycles, contraction stages are often perceived as short-term, after which a revival of the property market sets in. The worsening Nigerian economy has further complicated the issues of housing supply and affordability in economic nerves like Lagos. **Aim**, **Materials and Methods**: This study examined the fundamental and associated factors contributing to rental housing affordability issues between 2019-2023 in Lagos. This article is produced with the intention of providing a market data update on rental housing price movements for both the mainland and island zones of Lagos, as well as comparing their affordability convenience for income-earners or households based on the rent-income ratio. The study adopted a mixed research design and various data sources were consulted in analyzing the fundamentals, rent and affordability trends.**Results and Conclusion**: The study discovered that affordability convenience ratios for the various income bands had deteriorated further between 2019 and 2023 in Lagos mainland (8%) and island (9%). 67% and 80% of income earners are paying above the optimal 30% of their personal or household income in meeting their rental demand in Lagos mainland and island respectively. The paper suggested the application of fundamental, institutional and environmental strategies to combating the current phenomenon.

Keywords: Housing Affordability, Real Estate Cycles, Rental Housing and Rent-Income Ratio.

Title of Sub-Theme: ***Sustainable built environment and urban development.***

Paper ID *(2024-03008)*

Supply Chain Management Practices and Construction Industry Performance in Lagos State, Nigeria: A Correlate Analysis

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Abstract

Background: Effective supply chain management practices in construction industry requires free flow of information, reliable finance and payments platform, and functional information and communication technology (ICT) infrastructure. The inefficiencies observed in the operations of construction firms and the suboptimal performances in the sector despite the huge potential benefits of application of supply chain management to the sector prompted this study. The primary objective was to examines the aspects of supply chain management practices as it influences construction firms' performances. **Aim**, **Materials and Methods**: The investigates the relationship between construction companies' performance and supply chain management practices to identify aspects of the practices that could be strengthened to improve industry overall performances. Survey research approach was adopted. Closed-ended questionnaire was used for data collection. Twenty-five construction firms were selected for questionnaire administration. Analytical tools include percentages, mean scores, Pearson moment correlation and multiple regression analysis. **Results and Conclusion**: The study observed a strong positive correlation between supply chain management practices and construction industry performances. The results emphasized the importance of building a comprehensive SCM plan that address each component of the practice in order to ensure smooth and effective contribution of various parties and increase the success rate of the SCM in construction industry.

Keywords: developers, housing, supply chain, management, construction.

Title of Sub-Theme: Sustainable built environment and urban development.

Paper ID *(2024-03009)*

Examining users' perspective of surveillance camera purposes in multipurpose properties

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Abstract

Background: Real time surveillance technology in building undoubtedly adds another layer of task to the job of a facilities manager. Apparently, surveillance system in property enhances the safety and security for occupants and visitors. However, it is unclear if occupants of multi-tenanted properties use surveillance camera for other purposes other than security and how significant such purposes to the occupants. Basic objectives of the study are to identify other purposes of use of surveillance camera in multipurpose properties and determine the significance to each purpose. **Aim**, **Materials and Methods**: The study identifies other purposes of use of surveillance camera in multipurpose properties as well as the signficance of the identified purposes to the users. Questionnaires were administered to occupants of multipurpose properties that were selected from the portfolio of real estate firms in Ikeja, Lagos. Data collected was subjected to analysis using SPSS 23.0 tools of frequency, mean values, standard deviation, weighted average and principal component analysis. **Results and Conclusion**: The study confirmed various other purposes of surveillance camera technology in multipurpose properties apart from security related motives such as crime deterrence, crime detection, evidence collection, monitoring of activities, monitoring of goods and service delivery. Furthermore, the principal component analysis affirms the high level of significance attached to the security related motives above the purposes indicated in the responses. The study suggested improvement in perception of importance of surveillance camera particularly as it relates to the purposes perceived as less significant as this would ensure the optimization of use of the tool in the premises.

Keywords: surveillance, camera, occupants, multi-purpose, property, cctv.

Title of Sub-Theme (Sustainable Built Environment and Urban Development.)

Paper ID *(2024-03010)*

User Circulation Preferences in Train Terminals in Lagos State, Nigeria

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Abstract

Background: Train terminals serve as vital nodes within the urban transportation networks by facilitating the seamless movement of millions of passengers daily. However, due to the constant rise in these passenger levels and the increasing complexity of designed train terminals, the facility's functional abilities, overall user satisfaction and passenger circulation experience are often impeded. Although computational models have been created to investigate the cause of problems such as congestion within train terminals, mathematical approaches cannot solely provide sufficient insight into the user-centric dynamics of wayfinding and circulation. This study evaluated passenger circulation preferences with a view to identifying the strategies that enable effective user-centric and improved train terminal layouts. **Aim**, **Materials and Methods**: This study adopted mixed methods research, which involved the distribution of digitalized surveys and questionnaires to collect data from one hundred and fifty users of three existing train stations in Lagos, Nigeria. The train stations include the Babatunde Fashola Station, Mobolaji Johnson Train Station and Ikeja Train Station. The physical characteristics of these train stations were examined through personal observation to evaluate the efficiency of the architectural configuration of the spaces, functionality, and passenger circulation flow. Using descriptive analysis, the data pertaining to the passenger flow was summarized. **Results and Conclusion**: The results show that 64.3 % of the train users are aged between 21 and 30 years, and 61.3 % of the research population use train stations ranging from once to thrice monthly. The physical interviews with the train terminal managers revealed that weekends and public holidays are the busiest periods at the train stations. Common areas of dissatisfaction were found to be accessibility, number and width of escalators/lifts, and ease of wayfinding. Therefore, it is imperative that for improved user circulation within train terminals, factors like convenient train alighting and boarding, information availability and the efficient design of architectural elements should be considered.

Keywords: Circulation, Satisfaction , Terminal , User-centric , Wayfinding.

Sustainable Built Environment and Urban Development

Paper ID *(2024-03011)*

Analysis on the Impact of Biomorphic-inspired forms in Museums: A Literature Review

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Abstract

Biomorphic-inspired forms are design developments applied to building forms to replicate or mimic forms and patterns found in nature. This study examined the impact of biomorphic-inspired forms in museums' architectural design on users' experience. Through a systematic literature review, the research examines how organic, nature-inspired designs influence visitor engagement, health well-being, and sustainability within the built environment. This paper relied on a review of thirty-one relevant articles published between 2014 and 2024 using the Google search engine via the Internet. The data were content analysed, grouped in themes and presented using descriptive approach. The findings indicated that biomorphic forms can increase visual comfort, aesthetic appeal, psychological and physical well-being, and knowledge skills. The research addressed the gap in understanding how nature-inspired architectural forms affect visitors within museum spaces beyond their aesthetic value. The research also highlighted the alignment of biomorphic design principles with Sustainable Development Goals (SDGs), particularly in promoting well-being (SDG 3), supporting interactive learning (SDG 4), and enhancing urban sustainability (SDG 11). This study contributes to the growing body of knowledge on museum design by analysing that adopting biomorphic principles extends beyond aesthetic considerations to create more effective, engaging, and visitor-centered cultural spaces.

Keywords: Biomorphic-inspired forms, Impact, Museums, Organic design, User experience.

Sustainable Built Environment and Urban Development

Paper ID *(2024-03012)*

STRENGTHENING PUBLIC-PRIVATE PARTNERSHIPS FOR AFFORDABLE MASS HOUSING PROVISION IN LAGOS STATE, NIGERIA

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Abstract
Lagos State grapples with a severe housing crisis as its urban population surpasses available affordable housing, leading to overcrowded living conditions and limited amenities. Public-Private Partnerships (PPPs) offer a potential solution to this crisis by leveraging public resources like land and regulations alongside private sector expertise in construction, finance, and management. This research aimed to address this challenge by examining the feasibility and effectiveness of PPPs in delivering high-quality, affordable housing solutions in Lagos. Questionnaires were used to gather perspectives from residents of mass housing schemes and professionals with PPP experience. Analysis of resident responses from PPP estates reveals that on an outright purchase, many cannot afford to own a unit in either of the mass housing schemes. but on a leasehold, which could be monthly or yearly, they can afford it with a good savings culture. Professionals highlight market demand and social needs as key factors shaping PPP arrangements, with roles and responsibilities determined through mutual agreements. In conclusion, emphasis is made on the need for increased collaboration between public and private sectors and flexibility of payment options to improve the availability of affordable housing and increase patronage reducing settlement for substandard living conditions, respectively

Keywords: Affordable Housing, Housing, Housing Provision, Mass Housing, Public-Private Partnership.

Paper ID *(2024-03013)*

Impact of Public-Private Partnerships on Housing Affordability and Accessibility in Abuja

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Abstract

Background: Housing affordability and accessibility are pressing challenges in Abuja, Nigeria, where rapid urbanization has outpaced the availability of adequate and affordable housing. **Aim**, **Materials and Methods**: This study investigated the role of Public-Private Partnerships (PPPs) in addressing these challenges, focusing on how PPP initiatives have contributed to housing solutions for low- and middle-income earners. The research adopted a mixed-method approach, combining surveys, interviews, and document analysis to assess the impact of PPPs on housing delivery in Abuja. **Results and Conclusion**: The findings revealed that while PPPs have facilitated the construction of numerous housing projects, affordability remains a significant concern for 20% of the respondents. Although 40% respondents acknowledged that PPP-developed housing is more affordable than conventional private sector housing, the cost of these units is still beyond the reach of a substantial 20% portion of the population, particularly low-income earners. Additionally, the study highlights from responses of 10% of the respondents, the barriers to housing accessibility, including high land acquisition costs, bureaucratic inefficiencies, and the tendency for PPP projects to be located in distant or less accessible areas of the city which was supported by 20% of the respondents. The study concluded that PPPs hold potential for addressing Abuja's housing needs but require enhanced policy frameworks, better financing mechanisms, and stronger stakeholder collaboration to be truly effective. Recommendations include implementing policies to lower housing costs, improving mortgage options for lower-income groups, and incorporating inclusive, sustainable design in housing developments. In summary, the research underscores the need for a more focused and inclusive approach to PPP housing projects in Abuja to ensure that they not only increase housing supply but also improve affordability and accessibility for all residents.

Keywords: Abuja, Mass Housing, Participation, Public-Private Partnership, Stakeholder Engagement

Sustainable Built Environment and Urban Development

Paper ID *(2024-03014)*

Towards Automation of Building Integrity Tracking: Designing and Implementation of a Wireless Sensor Network Monitoring System

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Abstract

The study provided a robust framework for automated vibration analysis by developing and validating rigorous algorithms. This allowed for timely detection of structural problems and predictive maintenance interventions. The methodology involved hardware development of sensor nodes compromising accelerometers, microcontrollers, and wireless transceivers alongside software creation for data logging and GUI using MATLAB and Microsoft Excel. A simple point-to-point communication topology was adopted, with sensor nodes transmitting directly to a base station equipped with receiver modules and database software for management and presentation. The result obtained showed that, the mean acceleration calculated with a standard deviation of 0.1367 for the x-axis, indicating moderate variability. Similarly, the Y-axis exhibited higher mean acceleration of 0.8250m/s^2, accompanied by a greater standard deviation of 0.5497, suggesting increased variability in vibration data along this axis. Conversely, the Z-axis demonstrated a lower mean acceleration of 10.5900 m/s^2, coupled with a minimal standard deviation of 0.0689, indicating relatively consistent vibration data. Through calculations based on material properties and geometric dimensions, the natural frequency was determined to be approximately 8.68Hz, aligning with theoretical predictions. This agreement underscores the validity and applicability of the developed wireless sensor model for vibration analysis of beams. The statistical parameters obtained from accelerometer data offer valuable understanding into how the beam behaves when subject to dynamic loads.

Keywords: Accelerometer, Automated, Base station, Beam, Sensor, Vibration.

Paper ID *(2024-03015)*

Evaluation of Spatial Design Strategies for Social Interaction in Selected Youth and Culture Centres, Abuja, Nigeria

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Abstract

Youth and cultural centres are designed to meet users' needs and promote youth, culture, and community development. In today's society, there has been a decline in face-to-face interactions due to the prevalence of social networks, resulting in issues such as isolation. Therefore, creating spaces that facilitate quality social interactions is essential, using effective spatial design strategies within these centres. This study aims to evaluate the influence of adopted spatial design strategies on social interaction in selected youth and cultural centres in Abuja, the Federal Capital Territory of Nigeria. To achieve this aim, a mixed-method research (MMR) approach was employed. The qualitative method included a comprehensive literature review, which involved surveying published works by other authors. The quantitative method utilized a structured questionnaire to gather data from users of the selected centres. Data collected from the distributed questionnaires were analyzed using regression analysis to evaluate the relationship between the adopted spatial design strategies and the social interaction behaviours exhibited in the centres, with the assistance of the SPSS software. The findings indicated that certain strategies, such as building circulation, natural lighting, the colour of space, and a sense of direction with some values such as 1.538, 0.223, 0.819, and -0.626 respectively, should be prioritized, as they significantly fostered increased interaction among respondents. Additionally, strategies involving furniture arrangement, ceiling height, size of a space, and natural ventilation with some values such as -0.704, -0.829, 0.202, and -0.243 respectively, require improvement, as improper implementation of these strategies could hinder user interaction. Furthermore, strategies involving building accessibility and interaction with surrounding nature with some values such as -0.004, and -0.151 respectively, also need proper implementation. Overall, the study revealed that the identified spatial design strategies had a direct influence on the social interactions occurring within the centres.

Keywords: Spatial Design Strategies, Spatial Design, Social Interaction, Youth Center, Cultural Center.

Sustainable Built Environment and Urban Development

Paper ID *(2024-03016)*

Bio-Based Multifunctional Polyurethane Coatings for Sustainable Cities: A Review

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Abstract

This review provides an in-depth analysis of bio-based multifunctional polyurethane (PU) coatings, emphasising their potential to enhance sustainability in urban environments. Conventional PU coatings, though widely used for their durability, flexibility, and chemical resistance, rely heavily on petroleum-based raw materials, posing environmental and health concerns. With a growing demand for sustainable solutions in city infrastructure, bio-based PU coatings derived from renewable resources offer a promising alternative, reducing reliance on fossil fuels and minimising environmental impact. This review discussed recent advancements in bio-based PU formulations, highlighting multifunctional properties such as thermal stability, corrosion resistance, antimicrobial activity, UV resistance, and flame retardancy—critical for urban applications in buildings, transport, and public spaces. It examined the synthesis pathways of bio-based PUs, sources of bio-polyols, and cross-linking agents, focusing on their performance compared to conventional coatings. Additionally, the challenges and proposed future research directions to optimise bio-based PU coatings were discussed. The review revealed the invaluable role of bio-based PU coatings in fostering sustainable cities and their alignment with circular economy principles.

Keywords: Biobased, renewable multifunctional, polyurethane, sustainable

Title of Sub-Theme: (Sustainable Built Environment and Urban Development.)

Paper ID *(2024-03017)*

Evaluating Subsurface Geophysical Data for Building Stability Using ERT and MASW: Insights from a Collapsed Structure at Niger Delta University, Amassoma, Bayelsa State, Nigeria.

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Abstract

Background: The structural stability of buildings is influenced by the features of the underlying soil, with geophysical parameters playing a critical part in assessing the suitability of construction sites. These characteristics are especially important in the Niger Delta, which is known for its complex deltaic geological formations. This study focused on a recent building collapse at Niger Delta University, Amassoma. **Aim**: The significance of subsurface conditions investigated through the integration of Electrical Resistivity Tomography (ERT) and Multichannel Analysis of Surface Waves (MASW). **Materials and Methods**: The geophysical surveys encompassing five ERT profiles and three MASW profiles was used in this study. **Results and Conclusion**: The ERT results showed three layered strata with resistivity varying from 0.453 Ωm to 145 Ωm, indicating substantial variations in soil composition and moisture levels. According to MASW data, shear wave velocities ranged from 207 m/s in the topmost loosely compacted layer to 824 m/s in the lowest, more cohesive layer. The topmost layer's soil was also classed as very loose using the Standard Penetration Test (N-value), with results ranging from 8.35 to 10.90, indicating structural instability. These findings highlighted the impact of diverse subsurface conditions on foundation bearing capacity and stability. The study emphasized the importance of doing detailed site-specific geophysical investigations prior to construction to reduce the risks associated with changeable soil qualities. Integration of geophysical approaches with AI and machine learning will aid better characterisation of subsurface, this is encouraged with the goal of improving building resilience to subsurface unpredictability.

Keywords: ERT, MASW, Building subsidence, Resistivity, N-value.

Title of Sub-Theme (Sustainable Built Environment and Urban Development)

Paper ID *(2024-03018)*

Evaluating Efficiency of Sustainable Waste Management Systems in Selected Public Housing in Lagos, Nigeria

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Abstract

Waste management in public housing is one of the attributes that defined a successful housing scheme. Waste management in public housing is one of the attributes that define a successful housing scheme. Many urban cities have embarked on the canvass and implementations of waste management system within its environment. It is important to delve into the environmental and economic impacts of waste processing methods, including resource recovery, waste reduction, and overall system sustainability. This study evaluated the efficiency of a sustainable waste management systems in public housing in Lagos, Nigeria. Using the Lagos State Development and Property Corporation (LSDPC) between 1972 -1992 as case study. The study analysed existing waste management practices in Lagos' public housing, evaluating their effectiveness in diverting waste from landfills, promoting recycling and composting initiatives, and minimizing environmental harm. The study makes comparative of the system with some basic standards for a sustainable waste management system. Quantitative data was collected with a structured questionnaire distributed to 163 residents of 3 selected public housing estates in the state. The data were analysed using descriptive statistics analysis. The result showed that most residents of the selected public housing use private waste disposal systems with no designated areas for disposal, do not engage in waste sorting, and are less aware of avenues for sustainable method of waste disposal provision by government agencies. It is recommended that architects and built environment professionals should try to Integrate waste segregation infrastructure at the design stage. Incorporate designated chutes, bins, or collection points for organic waste, recyclables, and general waste directly into building plans. This promotes resident source separation from the outset, simplifying future collection and processing.

Keywords: Sustainable waste management, Public housing, Lagos State, Built environment.

Title of Sub-Theme : Sustainable Built Environment and Urban Development

Paper ID *(2024-03019)*

An Investigation on Phytoremediation of Particulate Matter: A Case Study of Student's Hostels in Northeastern Nigeria

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Abstract

Students spend a significant amount of time indoors, therefore long-term exposure to indoor air pollution in hostels poses serious health risks. The decline in the Indoor Air Quality (IAQ) level in university hostels is a growing problem. This study measured the concentration of particulates as indoor air pollutants in five (5) university hostels in northern Nigeria to investigate the effectiveness of indoor plants as botanical bio-filters in reducing these pollutants. A quantitative research design combined a structured checklist and measuring instruments. The Particulates ($PM_{1.0}$, $PM_{2.5}$ and PM_{10}) were measured using an Air Quality Monitor (TUYA WIFI) across five selected hostels, and five indoor plant species were tested for their air-purifying capacity. The indoor environmental condition was revealed to have a mean air temperature of 32.23°C and relative humidity of 94.33%. However, before the introduction of indoor plants, the mean concentration of $PM_{1.0}$, $PM_{2.5,}$ and PM_{10} was found to be 24.67 µg/m³, 38.68 µg/m³ and 48.23 µg/m³ respectively. When the indoor plants were introduced, there was a reduction in the mean concentrations of $PM_{1.0}$, $PM_{2.5}$ and PM_{10} by 21.68%, 16.96%, and 14.31% respectively. Inferential analysis revealed no significant differences in pollutant concentrations across hostels ($P > 0.05$). The study recommends the use of indoor plants as biofilters for improved indoor air quality in university hostels.

Keywords: Hostels, Indoor Air Quality, Indoor Plants, Particulate Matter, Phytoremediation.

Paper ID *(2024-03020)*

Factors Affecting the Adoption of Smart Building Technologies in Nigeria

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Abstract
The construction industry in Nigeria is experiencing a shift towards smart building technologies, though their adoption remains limited due to several barriers. This study investigated the current adoption level of smart building technology in the Federal Capital Territory (FCT) of Nigeria, Abuja. The study aims to assess the current level of adoption of smart building technologies and also to examine the barriers to the adoption of these technologies in Abuja. The study used a convenience sampling technique to select a sample of 64 construction professionals. Descriptive statistics such as frequencies, percentages, and means (MIS) were used to analyse the data. The findings indicated moderate adoption of smart building technologies, especially safety and security Management systems, sensors and IoT devices, smart lighting, and security systems with MIS of of 4.38, 4.29 4.28 and 4.26 respectively. High cost of materials, risk and uncertainty in implementing new technologies, and inadequate power supply with MIS of 4.59, 4.28 and 4.27 are the primary barriers. Other challenges include the unavailability of sustainable and intelligent materials and a lack of promotion and awareness. The study concludes that the adoption rates of smart building technologies vary, though there is a strong inclination towards the adoption of these technologies. It is recommended that tax incentives be introduced for manufacturers and importers of smart building technologies to reduce the current cost of these technologies. Enlightenment and the creation of an enabling environment are also recommended for overcoming the barriers associated with the adoption of smart building technologies in Nigeria.

Keywords: Construction 4.0, Energy Efficiency, Intelligent Buildings, Internet Of Things, Sustainable Buildings

Title of Sub-Theme: Sustainable Built Environment and Urban Development

Paper ID *(2024-03021)*

Exploring the sustainability and usage of timbers on construction projects

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Abstract.

Timber has proven from time immemorial to be useful and sustainable construction material for a number of structures, including buildings and boats. However, it has been opined that timber usage is limited in modern construction. This study therefore investigated timber's acceptance and usage in Nigeria. The objectives include to examine the acceptability of timber in Nigeria; to determine the level of timber's sustainability; to establish the challenges of timber on construction projects; and to proffer solutions to eventual elimination of timber usage on construction projects. Questionnaire survey was employed to elicit information from construction professionals using purposive sampling technique in Lagos State, Nigeria. The sample size was 150 with a 63% response rate. Data were analyzed with descriptive tools. Findings revealed that timber was accepted in Nigeria particularly for its sustainable properties; timber's sustainability is high; there are also severe challenges for timber; and the most suitable solution for timber usage is to promote sustainable timber certification programs. The study concluded that sustainability of timber can be maximized for energy efficiency. It implied that building components can incorporate timber to improve the energy efficiency of a building. It is recommended that construction stakeholders should also improve on the acceptability of timber for their projects. This can be done by amplifying the sustainability advantages of timber in construction projects.

Keywords: Acceptance, Challenges, Timber, Sustainability, Solutions.

Title of Sub-Theme: Sustainable Built Environment and Urban Development

Paper ID *(2024-03022)*

A Review on Fire Safety in Postgraduate Hall of Residence Covenant University Ota, Nigeria

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Abstract

Background: For ages, the human species has benefited from fire. Many wonderful improvements to life, like cooking, heating, smoke detection, and landscape management, have been made possible by the capacity to control and regulate fire. Nevertheless, if it is not handled appropriately, it can become extremely dangerous to people, property, and the environment. Many building occupants lack the knowledge to manage situations of fire outbreak. Negligence and lack of training are amongst the major factor of fire outbreak in buildings **Aim**, **Materials and Methods**: The study is a case study of the Post Graduate Residential Hall of Covenant University Ota, Ogun state. This study assessed the knowledge of the hall occupants on fire safety awareness, identification, utilization, and availability of firefighting equipment. A questionnaire survey was used to assess the students understanding on fire safety awareness at their place of residence **Results and Conclusion**: The findings showed that the hall of residence has fire extinguisher and hose reel available. Other firefighting equipment are inadequate or unavailable. The study showed that the students lacked the ability to operate the firefighting equipment and also identify fire emergency exits and mustering points. A total of 102 students respondents indicated interest in attending fire safety training if provided. Therefore, it is advised that effective fire safety protocols and practices can reduce the risk of accident and potentially save lives. Information, education, and training are seen to be the most important interventions.

Keywords: Awareness, Covenant University, Fire Safety, Fire Outbreak, Postgraduate Hall.

Sustainable Built Environment and Urban Development

Paper ID *(2024-03023)*

Municipal Solid Waste Burning and Particulate Matter Emissions Impact on Public Health and the Environment in Lagos and Ota, Nigeria

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Abstract

Burning of Municipal Solid Waste (MSW) in urban cities is identified as a source of air pollution. Studies have documented the adverse health effects of emissions from MSW burning on human health and the environment. In Lagos and Ota, fine Particulate Matter ($PM_{2.5}$), emissions from burning of MSW have not been fully investigated. Therefore, this study was aimed to characterize Organic Municipal Solid Waste (OMSW), and determine the levels of $PM_{2.5}$ emitted at selected Solid Waste Disposal Sites (SWDS) and Control Locations (CL) in Lagos and Ota, Ogun State, Nigeria. A representative sample of 25kg OMSW waste was collected, weighed, sorted, and reweighed. The percentage composition of each waste types was calculated, while $PM_{2.5}$ samples were collected using a high-volume air sampler Model (SLE-FPS 105) on glass-fiber filters (47mm) and determined by gravimetry. The OMSW (%) composition for the first and second year was 47.8±8.5 and 48.8±9.6. Furthermore, $PM_{2.5}$ (µg/m^3) annual average concentration for the first and second year was 732±230 and 926±340 at SWDS, while 493±170 and 945±180 was at CL. The $PM_{2.5}$ levels in the SWDS and CL were 80-fold higher than the World Health Organization (WHO) permissible limit of 5µg/m^3. This result indicated appreciable quantities of OMSW in the SWDS and the levels of $PM_{2.5}$ emitted were capable of causing negative health impacts on the exposed population and the environment. Hence, a reviewed policy context, which should involve waste sorting at the point of waste generation, to increase the use of OMSW as an energy resource or biomass manure for agricultural purposes for food security is strongly recommended. Also, the practice of burning MSW as a waste reduction strategy in SWDS should be prohibited.

Keywords: Organic Municipal Solid Waste, Particulate Matter, Air Pollution, Solid Waste Disposal Sites

Paper ID *(2024-03024)*

Principal Project Management Techniques for Managing Construction Projects in South Africa

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Abstract

Background: Managing construction projects is becoming more difficult and complex. However, construction organisations are still negligent in the full utilisation of the fundamental Project Management Techniques (PMTs) for construction management. This has resulted in ineffectiveness, bad financial management, and inadequate project planning, scheduling, and control. Hence, there is a dire need for performance improvement.**Aim**, **Materials and Methods**: This study, therefore, explored the PMTs used in managing construction projects in South Africa. A structured questionnaire was utilised to gather the field data. Respondents included 155 construction practitioners in Gauteng, province. Convenient sampling was used to choose the respondents. Descriptive and principal component analyses were adopted for data analysis.**Results and Conclusion**: Four clusters were developed: time/schedule-driven techniques, cost management, quality and man-management, and exploratory techniques. It was concluded that the use of PMTs has received increased attention. However, there is still more to do for full adoption. The revelation of the factors will assist decision-makers in construction organisations in making constructive improvement efforts and designing the relevant interventions to enhance the use of PMTs. By validating the four clusters, this study contributed to the conversation on using PMTs in construction projects. Therefore, this study suggests giving the techniques in the clusters enough thought for project performance improvement.

Keywords: Construction industry, Project management techniques, Principal component analysis, South Africa.

Paper ID *(2024-03025)*

Flexible Exhibition Spaces and Their Role in Enhancing Curatorial Practices and Urban Development

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Abstract

This study examined how flexible exhibition spaces in museums not only advance curatorial practices but also contribute positively to urban development. In the context of modern cities, museums serve as cultural hubs that drive community engagement and urban revitalization. This study explored how adaptable exhibition spaces facilitate innovative curatorial approaches, enriching both the museum experience and the entire urban environment. Thematic analysis of carefully selected literature from Google Scholar and Research Gate with a preference for peer-reviewed papers and those published within the last five years was done. The study identified essential features of flexible exhibition spaces, including modular walls, movable partitions, and sophisticated lighting and climate control systems. These elements empower curators to design exhibitions that cater to diverse audiences and themes, fostering creativity and inclusiveness. The findings indicated that such adaptability not only enhances the visitor experience but also attracts a broader demographic, thereby increasing tourism for the cities where these museums are located and stimulating local economies. Additionally, the study explored the broader impact of flexible museum spaces on urban development. By creating dynamic and engaging cultural destinations, museums contribute to the social and economic vitality of their surrounding areas. The study also addresses the logistical challenges and maintenance demands of flexible spaces, proposing strategies to optimize their benefits. The ideas drawn out from this study equips museum professionals, urban planners, and architects with valuable insights to advocate for and integrate flexibility in the design of exhibition spaces in museums to support curatorial innovation and promote sustainable urban growth

Keywords: Museums, Flexible Exhibition Spaces, Curatorial Practices, Urban Development.

SUBTHEME: THE FOURTH INDUSTRIAL REVOLUTION

Paper ID *(2024-06001)*

Integrating Artificial Intelligence (AI) into Information Management Systems (IMS): A Paradigm Shift for the South African Construction Industry

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Abstract

Integration of Artificial Intelligence (AI) across various sectors has significantly transformed business operations and decision-making processes. In the construction sector, AI holds the potential to enhance efficiency, improve decision-making, and streamline project management. Hence the construction industry must understand the benefits of applying AI to IMS. This study investigated the integration of AI into IMS in the South African construction industry. The study employed a descriptive survey method, targeting construction professionals in the Gauteng Province, to assess the feasibility and potential benefits of integrating AI into the construction information management system. A total of 74 structured questionnaires were distributed and completed through Google Forms. The gathered data was analysed using the IBM Statistical Package for Social Science (SPSS) version 20. Analytical methods included the Mean, Standard Deviation, and Relative Importance Index (RII), while Cronbach's alpha was employed to measure the reliability of the survey. Findings revealed that IMS in the South African construction industry can be improved by the following AI technologies: Blockchain, BIM, Smart Robotics, Automation, and Machine learning. The study also revealed that, integrating AI into IMS in the SACI enhances client satisfaction, data quality, decision-making, and competitiveness, with an overall high level of importance, as indicated by the total mean score of 3.97 and RII of 79.45 %. This study contributed to academic discussions on AI in construction and provided practical insights for industry stakeholders to enhance their information management practices.

Keywords: Artificial Intelligence (AI), Construction Industry, South Africa, Information Management System (IMS), and Technology.

Title of Sub-Theme (The 4th Industrial Revolution.)

Paper ID *(2024-06002)*

A Systematic Review on In-Memory Processing Techniques for Genomics Data: Computational Strategies, Efficiencies and Challenges

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Abstract

Background: Genomic data processing has become vital in bioinformatics due to the vast amount of sequencing data generated by modern technologies. Computer Scientists and Computational biologists have developed solutions that allow in-memory processing of large-scale data for efficiency and to attain maximum speed. **Aim**, **Materials and Methods**: A systematic review on the application of in-memory processing techniques to Genomics data to highlight the computational strategies, efficiencies and the challenges for future research was done. The research questions were formulated to understand what areas of Bioinformatics have applied in-memory processing strategies, and what areas require more focus. To achieve this, 1529 articles from PubMed and Scopus databases were retrieved and finally 22 relevant articles were selected based on the study's inclusion and exclusion criteria. **Results and Conclusion**: This study revealed that in-memory processing has been effectively applied to genomic computations, especially in tasks like sequence alignment, analysis, and data storage optimization. Several studies leverage memory-friendly formats like Apache Arrow, and tools such as the PIM-Assembler, and Apache Spark for scalability and flexibility. Some studies adopted MapReduce for parallel processing. Algorithmic fine-tuning in genomic computations includes parallelization and adaptive alignment. Specialised hardware like ReRAM was used to improve sequence alignment. Computational efficiency was significantly enhanced by reducing disk I/O operations and integrating energy-efficient algorithms, but the infrastructure demands are high, with configurations ranging from 8GB RAM and 2 nodes to 1TB RAM across multiple cores. The application of in-memory techniques to genomic data processing offers significant advantages. However, the challenges remain in balancing memory efficiency with accuracy when applying custom technological implementations (non-existing frameworks). Strategic deployment techniques are also needed when deploying to a cloud-based environment for resource and cost management. This advancement can be taken up for further study in the field.

Keywords: Computational Genomics, In-Memory Processing, Bioinformatics, Big Data.

The 4th Industrial Revolution

Paper ID *2024-06003)*

ARCHITECTURE IN THE AGE OF AI: TOKENIZATION, CULTURAL HERITAGE, AND THE SIXTH INDUSTRIAL REVOLUTION

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Abstract:
The convergence of the Fourth, Fifth, and Sixth Industrial Revolutions is transforming architecture through advanced technologies like AI, blockchain, and tokenization. This study examined the potential to redefine architectural practices and cultural preservation, focusing on tokenizing the Ijaw Stilt House, a Nigerian heritage structure, within an "AI Factory" framework that bridges tradition and digital innovation. The intersection of the Fourth, Fifth, and Emerging Sixth Industrial Revolutions is transforming architecture, with technological advancements in artificial intelligence (AI), blockchain, and tokenization challenging traditional architectural practices and the profession's societal role. This paper aimed to investigate the concept of an "AI Factory" with a focus on tokenizing the Ijaw Stilt House, a culturally significant architectural form from Nigeria's coastal heritage. The study examined the application of AI and blockchain technologies in tokenizing indigenous structures, specifically exploring the Ijaw Stilt House which the use of a quasi-survey of AEC professionals. Through an interdisciplinary lens, the research addressed the implications of integrating these technologies within architectural education and practice, outlining their potential for enhancing cultural preservation and educational development. The research presents a strategic framework for architecture's adaptation in a digitally driven era, offering pathways for architects, educators, policymakers, and cultural advocates to align with the capacities of the Sixth Industrial Revolution. This framework emphasizes the importance of using AI and tokenization to preserve cultural integrity and heritage while maintaining architecture's relevance and influence in shaping urban and cultural landscapes.

Keywords: AI Factory, Tokenization, Cultural Heritage Preservation, Smart Architecture, Architectural Innovation

Title of Sub-Theme: FOURTH INDUSTRIAL REVOLUTION

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