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BOOK OF ABSTRACTS

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0.0.1 Application of Machine Learning in Process Monitoring

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ABSTRACT: In today's manufacturing industry, there is a shift towards digitalization and integrating machine learning with large and complex data to tackle the challenges of high dimensionality and large sample sizes. This integration aims to improve the efficiency of production processes and cost savings for companies and ultimately to improve the quality of products produced. One important application of machine learning in manufacturing is in control charts for monitoring the manufacturing process. A control chart is a vital tool in Statistical Process Control to monitor industrial processes and distinguish between special and common causes of variations. The implementation of a control chart involves plotting control charting statistics with decision lines to determine whether there is a process shift in the quality characteristic of interest. Machine learning algorithms have the potential to enhance the effectiveness of control charts by providing accurate predictions and real-time monitoring of shifts in the process parameters. Numerous studies are available, where machine learning methods have been adopted to enhance the efficiency of control charts. In this presentation, we will look at some existing studies that involve a fusion of machine learning and control charting techniques. The presentation will also highlight the challenges faced in this fusion and the future directions of using machine learning in making control charts an effective process monitoring tool.

0.0.2 Designs on strongly-regular graphs

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ABSTRACT: Some particularly nice graphs are the strongly-regular graphs. Their edges and non-edges form the associate classes of an association scheme. The corresponding Bose–Mesner algebra (linear combinations of the adjacency matrices) has three common eigenspaces, one of which is V_0, which consists of the constant vectors. In classical work on design of experiments, the experimental units are grouped into b blocks of size k. This corresponds to the strongly- regular graph consisting of b complete graphs of size k, with no edges between them. There are three common eigenspaces. One is V_0; one consists of vectors which are constant on each block and whose entries sum to zero (it has dimension $b-1$); the third is the orthogonal complement of these two, which has dimension $b(k-1)$. In some other experiments, the experimental units are all pairs of individuals who have to undertake a given task together. If all such pairs are used exactly once each, then the set of pairs forms a triangular association scheme. If there are n individuals then there are $N = n(n-1)/2$ such pairs. The corresponding Bose–Mesner algebra has three common eigenspaces.

One is V_0; one consists of linear combinations of the indicator vectors of individuals, constrained so that the entries sum to zero (it has dimension $n-1$); the third is the orthogonal complement of these two, which has dimension $N-n$. In both cases, we assume that the variance-covariance matrix C of the responses to the experiment is an unknown linear combination of the matrices of projection onto these eigenspaces. Two types of block design are particularly important. In balanced block designs, the variance of the estimated difference between any two treatments is the same, no matter what the eigenvalues of C are. In orthogonal block designs, the linear combination of responses which gives the best unbiased estimator of any difference between treatments does not depend on what the eigenvalues of C are. Such designs are often said to have commutative orthogonal block structure. In this talk I will give some constructions for balanced designs and some for designs which have commutative orthogonal block structure, in each scenario. This is joint work with P. J. Cameron (University of St Andrews) and D. Ferreira, S. S. Ferreira and C. Nunes (Universidade de Beira Interior).

0.0.3 Post-stratification for Estimation of the Population Mean with Sub-sampling the Non-respondents under Simple Measurement Error Model

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ABSTRACT: In this paper, we have proposed an estimator for the population mean in post-stratification when there is unit non-response applying Hansen and Hurwitz (1946) method of sub-sampling the non-respondents. Since in human surveys response (measurement) error frequently occurs, we have used a simple response model to derive and examine the proposed estimator where response error occurs in both the respondent and non-respondent groups. We have compared this estimator theoretically under a super population model with ordinary Hansen and Hurwitz estimator and observed that the performance of the two estimators depends on the nature of the combination of total variability of the population and the total variability of the non-respondent group. Under the measurement error model, it is seen that variance of the observed value of the variable of interest consists of the variance of the true value, the variance of the measurement error and the covariance between the measurement error and the true value.
KEY WORDS: Post-stratification, sub-sampling, non-respondents, Mean, Response error

0.0.4 New tests for the multivariate skew normal distribution hypothesis

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ABSTRACT: The multivariate skew normal (MSN) family of distributions extends the normal one by incorporating a shape parameter. It provides probability models for datasets owning moderate degrees of skewness. This talk is about the problem of formally testing the null hypothesis that a random sample follows a MSN distribution when parameters are unknown. Testing hypotheses in the presence of unknown shape parameters usually requires both the replacement of the unknown parameters by efficient estimators and the use of parametric bootstrap for approximating critical values. The implementation of this technique might be computational expensive when studying the size and power properties of the tests by simulation methods. Such computational burden becomes even heavier when parameter estimations are obtained by numerical techniques, as is the case of the MSN distribution. Furthermore, the use of parametric bootstrap does not ensure that the true type I error probability will preserve the nominal test size for finite sample sizes. In order to circumvent these problems, for testing the MSN distribution hypothesis, on the basis of some probability properties, data are transformed to variates following approximately univariate skew normal and gamma distributions. The skew normal and gamma distribution hypotheses are then validated by using the general approach for goodness of fit testing introduced by Chen and Balakrishnan (1995). The performance of these procedures is assessed by Monte Carlo simulation. The results indicate that this approach renders statistical tests for the MSN distribution that preserve the fixed test size under the simulation settings considered; meanwhile, the existing tests for this problem struggle to control the type I error probability.

0.0.5 Conjunction probability of smooth stationary Gaussian fields

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ABSTRACT: In this talk, we firstly recall the motivation and some results on the distribution of the maximum of Gaussian field such as: Euler characteristic method, Rice method and the asymptotic formula for the case of non-convex index domain. Then we will present a relevant problem, so-called conjunction probability, founded by Worsley and Friston. We provide the asymptotic formula for the conjunction probability and compare it with the heuristic approximation given by the Euler characteristic method.

0.0.6 ADVANCING NATIONAL DEVELOPMENT THROUGH MACHINE LEARNING

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ABSTRACT: Machine learning (ML) stands at the forefront of technological innovation, poised to significantly impact national development agendas across the globe. This talk aims to delve into the transformative potential of ML in addressing key socio-economic challenges faced by nations worldwide. Despite strides in technology and data availability, persistent issues such as poverty, healthcare disparities, and environmental degradation continue to hinder progress. Traditional approaches to national development often lack scalability and predictive capabilities, leading to suboptimal outcomes. Machine learning presents a paradigm shift, offering governments and organizations the ability to leverage data-driven insights for informed decision-making and proactive intervention strategies. By harnessing ML algorithms to analyse vast and diverse datasets, nations can forecast trends, optimize resource allocation, and drive sustainable development initiatives more effectively than ever before. Historically, national development efforts relied on manual data analysis and heuristic-based decision- making processes, which were constrained by human biases and limited scalability. Machine learning, however, offers a data-driven approach that adapt and evolve over time, revolutionizing how nations approach development challenges. Through predictive analytics, ML models forecast economic indicators, optimize healthcare delivery, and enhance education outcomes, among other applications. Preliminary studies and real-world implementations demonstrate the impact of ML on various aspects of national development, from economic forecasting to healthcare management and beyond. Looking to the future, the integration of machine learning into national development agendas holds immense promise for driving sustainable growth and societal well-being. This talk serves as a catalyst for dialogue and collaboration, bringing together stakeholders from academia, government, and industry to explore innovative strategies for leveraging machine learning in enhancing national development efforts and building a brighter future for all.

0.0.7 A general maximal projection approach to uniformity testing on the hypersphere

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ABSTRACT: And my abstract reads as follows: We propose a novel approach to uniformity testing on the d-dimensional unit hypersphere S^{d-1} based on maxi-

mal projections. This approach gives a unifying view on classical uniformity tests of Rayleigh, Bingham, as well as links to measures of multivariate skewness and kurtosis. We derive the limiting distribution under the null hypothesis using limit theorems for Banach space valued stochastic processes and present strategies to simulate the limiting processes by applying results on spherical harmonics theory. The behaviour under contiguous and fixed alternatives of the test statistic is examined and consistency of the procedure is shown for some classes of alternatives. The theoretical findings and empirical powers of the procedures are evaluated in a broad competitive Monte Carlo simulation study.

0.0.8 Comparison of some test statistics for testing regression coefficients under the Logistic ridge, Liu and KL regression model: methods and simulations

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ABSTRACT: Ridge, Liu and Kibria- Lukman regression are methods that have been proposed to solve the multicollinearity problem for both linear and non-linear regression models. This paper studies different Ridge, Liu and Kibria-Lukman regression z-type tests of the individual coefficients for logistic regression model. A simulation study was conducted to evaluate and compare the performance of the test statistics with respect to their empirical sizes and powers under different simulation conditions. Our simulations allowed us to identify among the proposed tests, which ones maintain type I error rates close to the 5% nominal level, while at the at same time showing considerable gain in statistical power over the standard Wald z-test commonly used in logistic regression model. Our paper is the first of its kind in comparing the z- type tests for these different shrinkage approaches to estimation in logistic regression. The results will be of value for applied statisticians and researchers in the area of regression models.
Keywords: Empirical power; Kibria-Lukman regression; Logistic regression; Liu regression; Ridge regression, Simulation study; Type I error rate

0.0.9 Response Envelope for Efficient Multivariate Linear Regressions with Information Complexity

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ABSTRACT: This study delves into Sufficient Dimension Reduction (SDR), a powerful method for extracting valuable insights from high-dimensional data. The overarching goal of the study is to evaluate the effectiveness of the response envelope model in reducing the standard error associated with estimated regression coefficients in multivariate linear regression. To enhance the response envelope's performance, especially in terms of balancing overfitting and underfitting risks when choosing the envelope dimension, a novel variant of the information complexity (ICOMP) criterion: the Inverse Fisher Information Matrix (IFIM) version, referred to as ICOMP(IFIM) has been successfully introduced. This is the first instance of such an introduction in the literature on envelope models. To demonstrate the advantages of the response envelope model over the traditional multivariate linear regression model, two well-known benchmark datasets: the Berkeley Guidance Study dataset by Tuddenham and Snyder (1953) and the cattle weight study dataset by Kenward (1987) were utilized. The efficiency gains and optimal dimension selection using ICOMP(IFIM) in comparison to the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were assessed. The results clearly indicated an enhanced efficiency, as evidenced by reduced standard errors in estimated coefficients for both datasets. The envelope model consistently outperforms the standard multivariate linear regression (MLR) estimators in both cases. Notably, in the Berkeley Guidance Study, intriguing differences emerge between the envelope model and the conventional model regarding the height of boys and girls at ages 12, 13, and 14, providing valuable insights into age-related height differences. Furthermore, the analysis of the cattle weight data reveals a distinct treatment effect on cattle weight, with the divergence becoming apparent from week 12. This underscores the significance of the response envelope model in uncovering subtle distinctions in data patterns. In summary, this research has highlighted the effectiveness of the response envelope model as a valuable tool for dimension reduction and coefficient estimation, particularly in the context of big data analyses with multivariate response.
Keywords: Multivariate linear regression, Dimension reduction, Sufficient Dimension reduction, Envelope model, Information Complexity

0.0.10 Predicting Daily Energy Use in Homes: A New Approach using Sliced Inverse Regression Method

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ABSTRACT: This study addresses the challenge posed by unsupervised statistical learning in electricity smart meter data. It employs sliced inverse regression (SIR) to improve electricity load billing profiling and automation. The objectives include transforming the smart meter data (SMD) into a supervised learning problem, reducing SMD data effectively for visualization and modelling via SIR, building predictive models for daily electricity consumption loads using sliced inverse regression ordinary least square (SIR-OLS) hybridization, and introducing a shrinkage SIR-OLS method (SSIR-OLS) for variable selection. SIR was applied to the data with ($h = 5$) slices for dimension reduction where h is the number of slices, and marginal dimension tests were used to identify the optimal number of SIR estimated sufficient predictors. Ordinary least squares regression (OLS) and least absolute shrinkage and selection operetor LASSO-SIR were employed for modeling mean electricity load and variable selection, respectively. The study obtained SIR estimated basis vectors in the central subspace, with the first sufficient predictor showing a significant correlation with electricity load. Comparison between SIR-OLS cases I and II revealed potential overfitting in case I. The prediction plot displayed a good alignment of predicted and observed mean electricity loads, highlighting SIR-OLS's outstanding predictive accuracy. Overall, this research underscores the effectiveness of sliced inverse regression in enhancing dimension reduction regression for electricity billing and profiling through smart metering. The SIR-OLS model, regardless of an intercept, emerged as the optimal choice for accurately predicting daily electricity consumption/load profiles while preserving data granularity. Additionally, the SSIROLS model excels in identifying specific days crucial for predicting customers' average load profiles.
Keywords: Slicing, Shrinkage, Sufficient Dimension Reduction, Central Subspace, smart meter data, data granularity

0.0.11 LASSO-ICOMP: Adaptive Regression Shrinkage and Variable Selection via the Lasso with Information Complexity

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ABSTRACT: This study provides a data-adaptive remedy for four concerns that have dogged the use of the classical least absolute shrinkage and selection operator (LASSO): (i) LASSO uses cross validation for choosing the shrinkage parameter (λ), which is machine-dependent, arbitrary, and non data- adaptive, (ii) LASSO variable selection is, therefore, often inconsistent, (iii) LASSO has no grouping property, consequently, it tends to select only one variable from a group of highly correlated variables, and (iv) in the $p > n$ case, the LASSO selects at most n variables. This could be a limiting factor if the true model consists of more than n variables. The development in this study, called LASSO-ICOMP, begins with the introduction of the scale invariant information complexity (ICOMP: Bozdogan, 1987) with weight modifications as a data-adaptive alternative to the somewhat arbitrary choice of the regularization term λ_1 in LASSO. The basic intent of this novel proposal in regression regularization and shrinkage is to utilize information-theoretic measure of dependence and complexity among variables in high-dimensional multivariate statistical modelling and data mining tasks to circumvent the identified shortcomings of LASSO. Two high dimensional data examples including colon cancer and the Riboflavin (Vitamin B2) production rate data sets were analyzed to show the utility, flexibility, and versatility of our approach. Although the classical LASSO competes favourably with the proposed LASSO-ICOMP on test prediction performances using both data sets, the latter conveniently circumvented the identified snag of the LASSO in terms of true model selection consistency and grouping effect.
Keywords: Regression, Shrinkage, Information Complexity, Covariance Complexity.

0.0.12 $\triangle_2$-Convergence and uniform Distribution of Double sequences in Lacunary Sense

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ABSTRACT: In this paper, we introduced and studied $\triangle_2$-Convergence of non-negative real valued double sequence with respect to the usual partition of $[0,$. We have also shown that every convergent double sequence is $\triangle_2$-Convergent, however the converse is not true. Apart from this, some basic properties of - Convergence as well as by using any double lacunary sequences as a partition of non-negative real numbers, double lacunary uniform distribution were defined. Finally we established some inclusion relations between uniform distribution modulo 2 and double lacunary uniform distribution and proved some interesting results.
Keywords: -Convergence, double sequence, Uniform distribution, lacunary sequence.

0.0.13 PERFORMANCE MEASURE ON AN IMBALANCED SAMPLING DISTRIBUTION FOR MULTI-CLASS PROBLEMS

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ABSTRACT: Learning and classification are the two processes in data classification, the test data is used to estimate the accuracy of the classification rules. The pre-classified samples are used by classifier-training system to control the set of variables to be used for proper discrimination. In this study, confusion matrix was used to derive the measurement metrics. These metrics were used to examine the influences of harmonic mean of precision and recall in the process of adjusting the inherent sampling distribution in order to offer the prediction of the magnitude of flood along the Foma-river. The accuracy of the classification wasapproximately 81%, which demonstrated a very high correct predictionandexplained how significant the variables are. However, due to the imbalanced sampling distribution in

the study, the accuracy of the classification cannot be suitable for the flood prediction. The confusion matrix was used to generate the measurement metrics that harmonized the mean of precision and recall in the process of adjusting the imbalanced sampling distributionin solving the multiclass problems.The study was able to realise a 10% error in classification rule, resulting from the harmonization of the precision value (0.8026) and the recall value (0.6386). The error reduction is related to variables that were falsely predicted to be correct in accuracy value (0.8071), which was elicited by the differenceinthe F1-score value (0.7081).In addition, the study has been able to elaborateon the derivation of multi-class metrics and its application to address the problem of imbalanced data classification.

Keywords: Data mining, Machine learning, Classifier,Confusion matrix,Measurement metrics

0.0.14 A New Convoluted Parametric Distribution for Analyzing Bimodal Longitudinal Survival Data

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Abstract: Longitudinal survival data often exhibit complex patterns, such as bimodality, which challenge traditional statistical models. This research proposes a novel approach to modeling such intricate data structures through the introduction of a new convoluted parametric distribution. The proposed distribution combines the flexibility of parametric models with the ability to capture bimodal survival patterns, making it particularly well-suited for the analysis of complex longitudinal survival data. The framework on which this research will be carried out is the T- R{Y} framework to generate a new continuous distribution from existing distributions. The proposed new probability distribution that will be developed in this research work will be able to capture the variability in bimodal longitudinal survival and medical data. We derive the mathematical formulation of the proposed distribution and assess its properties through simulations, demonstrating its efficacy in accurately capturing bimodal features. The distribution is then applied to real-world longitudinal survival datasets, showcasing its superior performance compared to existing models. Additionally, we provide a comprehensive comparison with other parametric and non-parametric approaches to highlight the advantages of our proposed method in handling bimodal longitudinal survival data. The implications of this research extend to various fields, including medical research, epidemiology, and engineering, where the analysis of bimodal longitudinal survival data is crucial

for informed decision-making. The introduced convoluted parametric distribution serves as a valuable tool for researchers and practitioners seeking robust and accurate models to gain deeper insights into the dynamics of complex survival processes.
Keywords: T-R{Y} framework, Cumulative Density Function, Quantile function, Survival function

0.0.15 MULTIPLE REGRESSION ANALYSIS OF THE IMPACT OF SOME SELECTED MACRO – ECONOMIC VARIABLES ON THE GROSS DOMESTIC PRODUCT (GDP)

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ABSTRACT: The economy of many nations is dwindling with the recent happenings in the globe. This development has made macro-economic variables unpredictable and volatile. Understanding the interrelationships between GDP and key macroeconomic variables is pivotal for navigating economic challenges, fostering sustainable growth, and enhancing overall economic stability. This study employs multiple linear regression analysis to investigate the relationship between Gross Domestic Product (GDP) as the dependent variable and four prominent macroeconomic indicators—namely, inflation rate, interest rate, exchange rate, and the all-share index—as independent variables. Utilizing a robust dataset spanning historical records of GDP and corresponding data on inflation rates, interest rates, exchange rates, and stock market performance, this research evaluated the quantitative impact and significance of these variables on GDP. The model obtained is GDP = 22.995 – 0.265INF – 2.452INT + 0.75EX + 0.323ASI. The analysis revealed compelling results indicating a statistically significant relationship between GDP and the selected macroeconomic factors. The findings suggested that inflation rate, interest rate, and exchange rate exhibit varying degrees of influence on GDP, with inflation rate demonstrating a moderately negative impact, while interest rate and exchange rate display positive associations with GDP fluctuations. It is recommended that policymakers should consider adopting measures to manage inflationary pressures while utilizing interest rate and exchange rate policies strategically to stimulate economic growth.
Keywords: Inflation rate, Interest rate, Exchange rate, Gross Domestic Product

0.0.16 INVESTIGATING THE PREDICTIVE PERFORMANCE OF BVAR AND BVEC MODELS UNDER THE SUBJECTIVE PRIOR

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Abstract: Bayesian VAR models are used for structural and computational analysis of macroeconomic variables. Subjective prior is used in shrinking (tackling) the models' parameters thereby curtailing the problem of parameter proliferation associated with the models. The subjective prior fully reflects the researcher thought prior to the data and the associated hyperparameters are chosen to reflect this researcher's thought. The predictive performance of these models; BVAR and BVEC was evaluated using the forecasting assessment; the Root Mean Squared Forecast Error and Average of Log Predictive Likelihood. Also, the study utilizes both simulated and real life data in which the values of the prior were subjectively chosen as 0.1, 0.01, 0.001 and 0.0001. It was discovered among others that BVEC Model has a better and robust forecasting performance than BVAR model. BVEC Model should be considered when forecasting the main macroeconomic variables of Nigeria because it possesses a better predictive ability than the BVAR model. Also, it predicts the direction of change in the chosen macroeconomic variables. Therefore, in forecasting and evaluating main macroeconomic variables of an emerging economy like Nigeria, BVEC model with subjective prior should be considered.
Keywords: Hyperparameters, Predictive Performance, BVAR and BVEC Models, Forecasting Accuracy

0.0.17 THE EXPONENTIATED GENERALIZED INVERSE LOMAX POISSON MODEL WITH AN APPLICATION TO LIFETIME DATA

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ABSTRACT: When we generalize a lifetime distributions a more flexible and tractable distribution always evolved for applied statisticians. By compounding the

exponentiated Inverse Lomax and Poisson distributions, a new continuous distribution is obtained, called the exponentiated Inverse Lomax Poisson distribution. The new model extends the Inverse Lomax distribution and some other distributions and it is quite flexible to analyze both positively and negatively skewed data. Various structural properties of the new distribution are derived including explicit expressions for the ordinary and incomplete moments, generating and quantile functions, mean deviations, Lorenz and Bonferroni curves, reliability, Renyi and Shannon entropies, and their moments. The estimation of the model parameters is carried out using maximum likelihood. The potentiality of the new model is illustrated by means of a real data set.

Keywords: Incomplete moments, Lorenze and Bonferroni curves, quantile functions, Maximum likelihood

0.0.18 The Inverse Lomax Odd Exponentiated-Weibull distribution: A Regression Approach

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ABSTRACT: Log-Inverse Lomax Odd Exponentiated Weibull distribution (Log-ILOEWD) was fitted to HMO-HIV+ data alongside others comparators. These comparators are the Log-Odd Lindley Half logistic distribution (Log-OLHLD) by Eliwa et. al., (2021) and Log-Topp leone Odd Loglogistic Weibull Disribution (Log-TOLLW) by Brito et. al. (2017). The depended variable, y_i is the observed survival time (in months) with censoring indicator censi (0 = alive, 1 = death), is modeled with two covariates: the history of drug use, x_{i1} (1 = yes, 0 = no) and the ages of patients, x_{i2} . This data is from hypothetical HMO-HIV+ study as reported by Hosmer et. al. (2011). This data is also available in R package as Bolstad2. Given that the Log-ILOEWD regression model has the lowest AIC and BIC statistics values among the two regression models (Log-OLHLD and Log-TOLLWD), we may infer that the Log-ILOEWD regression model yields a superior fit. At the 1% level, the regression parameters are determined to be statistically significant. The computed regression parameters indicate that drug-using people have shorter lifespan than non-drug-using people. Furthermore, people's lifetimes get shorter as they get older.

Keywords: Hiv, Inverse Lomax, Survival Regression

0.0.19 A NEW POISSON-MIXED MODEL: ITS PROPERTIES AND APPLICATION IN MODELLING COUNT DATA

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Abstract: In this paper, a new mixture distribution for count data, namely the two-parameter Poisson-Rama (TPPR) distribution is proposed. The TPPR distribution is a flexible alternative for analysing count data, especially when there is over-dispersion in the data. Some properties of the proposed distribution are derived, such as, the moments. The unknown parameters of the TPPR distribution are estimated by using the maximum likelihood estimation. Application of the distribution is carried out on three datasets. Based on the results, it is shown that the proposed distribution provides a better fit compared to the Poisson, and a better alternative to the negative binomial, and Generalized Poisson-Sujatha distributions for count data.
Keywords: Count data; Poisson-Rama distribution; Over-dispersion; Mixture distribution; Maximum likelihood estimation

0.0.20 On the New Exponentiated-Sujatha Distribution and its Applications

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Abstract: In this article, we present a new distribution called the new Exponentiated-Sujatha distribution. This is an extension from one-parameter Sujatha distri- bution by Shanker (2016) is developed using Exponentiation method. Some of its statistical properties like: reliability function, hazard rate function, reversed hazard rate function, cumulative hazard rate function, moments, moment gen- erating function, entropy, and order statistics of the proposed distribution were established. In the same vein, the estimation of parameters of the distribu- tion is found based maximum likelihood technique. Then, the applicability and tractability of the distribution is tested on two numerical illustrations. There- fore, the new distribution performance supersedes and has better fits than other extant distributions considered.
Keywords: Cumulative Hazard, Entropy, moments, Monte Carlo, Reserved Hazard Rate, Sujatha distribution

0.0.21 Formulation of Linear Model from One-Way Classification Model

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Abstract: In this study, we present a way of formulating linear model from One-Way classification called Completely Randomized Design (CRD). This classification consists only treatment and the formation is done by taking both elements in rows and columns as response variable. In the same vein, the number of n-trial, slope, predictor and regression parameters were obtained within the system. Meanwhile, an illustration is carried out to validate the formulation.
Keywords: Design, Predictor, Randomized, Response variable, Treatment

0.0.22 Analysis of Employee's Compensation: An Application of Panel Data Using Least Square Dummy Variable (LSDV) Model Approach

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ABSTRACT: This research was conducted to estimate compensation of employee using panel data. The estimation method is based on iterative algorithm that calculates least square dummy variable (LSDV) estimates. The data used in this work were secondary data sourced from National Bureau of Statistics (NBS) from 1998 to 2023. The variables considered were compensation of employee as the dependent variable, fixed capital, prices of goods, tax and surplus as the independent variables. The data were analyzed using (STATA 13). The results obtained revealed that F-value of 3874.05 was statistically high suggesting the overall model was good fitted. The R^2 -value of 0.9989 was also high which indicated that 99.89% of the total variation was accounted for by the independent variables included in model while the remaining 0.11% unexplained was accounted for by the white noise. Again, all the differential intercept coefficients have negative signs and several differential slope coefficients have negative signs as well, which implied that they were negatively related to compensation. Again, the result revealed that compensation is not statistically significantly related to fixed capital, price, tax and surplus. Which means, though compensation is indirectly affected by the independent variables, they are not the

bases for determination of employee's compensation. However, none of the differential slope coefficients is statistically significant at 0.05 level of significance. This indicated that the effects of individual time periods never contributed meaningfully in determination of compensation of employee. Of all the three differential intercept coefficients only was statistically significant. The slope coefficient of fixed capital was –0.9999979 for power sector; for telecommunication sector it was –1.0000123, that of transportation sector was –3.0000179 and – 0.9999386 for education sector. This however, suggested that the effects of individual sectors were indirectly in the determination of compensation of employee. Finally, since none of the differential slope coefficients was statistically significant, it means that none of the slope coefficients is different from the slope coefficient of the base/comparison group (power sector), hence, compensation of employees in seems to be the same across the sectors under review.

Keywords: Compensation, Dummy Variable, Panel data, Fixed Effect and Employee.

0.0.23 DURABILITY OF LATERITIC SOIL-ROCK FLOUR MIXTURES STABILISED WITH LIME FOR PAVEMENT CONSTRUCTION

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ABSTRACT: The combined effect of rock flour-lime addition on the durability characteristics of lateritic soil was investigated. In the study, Moisture Content, Particle size distribution, Atterberg Limits, Specific Gravity tests, and durability tests were carried out on samples of lateritic soil-rock flour mixtures with lime and at concentrations of 0, 0% rock flour and lime, 3, 2.5% RF and lime, 6, 5% RF and lime, 9, 7.5% RF and lime and 12, 10% RF and lime by dry weight of soil. Result obtained shows the average moisture content of the Tropical Clay in its natural state was 10.28 %, the Tropical Clay contain high proportions of clay-silt fractions (75.0%) and classified as A- 7-6, having Liquid Limit of 50.55%, Plastic Limit of 27.33% and Plasticity Index of 23.22%. The addition of rock flour and lime caused the Plastic Limit to decrease to 18.83%, the Liquid limit to 27.25% and plasticity index to 8.42% when mixed with 12, 10% RF and lime respectively. The resistance to loss in strength increased as rock flour (RF) and lime content increased to a value 3.816% (12% rock flour and 10% lime for BSL), 7.108% (12%RF and 10% lime for WAS) and 8.331% (12% RF and 10% lime for BSH). The recorded loss in strength was less than the maximum 20% allowable loss in strength.

Keywords: Durability, lateritic soil, rock flour, lime, pavement

0.0.24 Modeling Nigeria mortality with Lee-Carter mortality model and its extensions

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ABSTRACT: Mortality modelling in recent time has dominated the center stage of demographic discussion in the world due to its usefulness not only in forecasting but for determination of longevity risk which is very crucial for actuarial usage. The research work aim at modelling Nigeria mortality using Lee-Carter model and its extensions. We model Nigeria data with Lee-Carter models, proposed a new model along Lee-carter mortality model and compared the results. From the analysis, it was observed that the proposed model produce a better curve than Lee-Carter model. The goodness and robustness of the models were also computed. It was observed the proposed model produced good fit to the Nigeria mortality data.
Keywords: Lee-Carter, P-Spine, Mortality, Forecasting, Aike Information

0.0.25 LONGEVITY RISK AND MORTALITY PROJECTION IN NIGERIA, APPLICATION OF BI-BILINEAR REGRESSION MODEL

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ABSTRACT: Mortality forecasting is an important aspect in mortality modelling as it helps in the computation of longevity risk not only for the provision of old-age goods also in the determination of actuarial bond pricing. However, most of the mortality developed were based on mortality experience of this nations that are quite differ from the one experience in the developing or third world Nations. This countries relied on the Life table Constructed using mortality experience of the Developed Nations which may be problematic in making decision for old age usage and in actuarial computation. This research work proposes a new mortality model to forecasting and construct life table for insurance Usage using Nigeria mortality data. Bi-bilinear poison regression model was proposed along Lee-Carter mortality

model. It was observed that the proposed model performs better than Lee-Carter model using various errors of measurement.
Keywords: Longevity, Forecasting, Bi-bilinear, Life Table, Actuarial

0.0.26 Analysis and Prediction of Naira to Dollar Exchange Rate Movement using Finite Markov Chain Approach

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ABSTRACT: In this study, a first order finite Markov chain model was applied on the historical data of the closing prices of exchange rate of Nigeria naira to the US Dollar, in order to ascertain the state and transient distributions of the exchange rate movement. The study explored the long run behavior of the exchange rate and also determined the expected first return time of various states. The closing daily exchange rate data of 1043 trading days from the first day of the year 2020 to the last day of December 2023 were utilized for the analysis. The closing daily exchange rates exhibit three different states - appreciating state, depreciating state, and stable state. The initial state vector and transition probability matrix, which were used to predict the behaviour of the exchange rate, were obtained from inspection of numbers of transitions from one state to another. Microsoft Excel and R packages were employed to obtain the state distributions of the exchange rate movement and higher order transition probability matrices. The result shows that in the long run, irrespective of the current state, the exchange rate will appreciate with probability 0.4607473 (46%), depreciate with probability 0.3273349 (33%) and remain stable with probability 0.2112009 (21%).
Keywords: Markov chain, Exchange rate movement, long run distribution, state probability, prediction

0.0.27 ASSESSMENT OF THE VALIDITY OF ASSUMPTION OF ZERO NET MIGRATION IN ESTIMATION OF ADULT MORTALITY USING PRESTON INTEGRATED APPROACH

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ABSTRACT: This study examines the implication(s) of ignoring net migration in estimation of adult mortality from non-stable population using the Preston (1983) integrated method and proposes a method of assessing presence of net migration in a study data. In deriving the model for estimation of adult mortality from non-stable population, Preston (1983) has assumed that the study population is closed to migration, that is, the net migration is zero or negligible. However, in most developing countries this assumption is not necessarily true. In this study, the method proposed for assessing the need for adjustment for net migration is the ratio (AF) of the observed proportion of mid-period population reported as aged x years ($c(x,t)$) when net migration is not zero to the corresponding proportion when net migration is zero ($\hat{c}(x,t)$). The Preston (1983) approach to estimation of adult mortality is to relate characteristics of the observed population to some life table functions and using this relationship to obtain estimate of the implied level of adult mortality. The results indicate that when net migration is actually zero, the ratio AF is equal to one and different from one when net migration is not zero. Data on age- sex distribution of populations of three selected developing countries were used to illustrate the methods. It has therefore, been recommended that when this ratio is not one an adjustment should be made for net migration.

Keywords: Adult Mortality, Non-stable population, Life Table Functions, Adjustment factor and net migration

0.0.28 THE BIVARIATE POWER FUNCTION DISTRIBUTION

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ABSTRACT: The Power function distribution is one of the distributions that are characterized with bathtub shape hazard rate function. Distributions with bathtub shape hazard rate function are usually preferred to when modeling survival or failure time datasets. In this article, we developed the bivariate density function of Power function distribution using the cumulative hazard rate function. The bivariate density function derived takes into cognizance the dependent structure which incorporates the positive quadrant dependence, and negative quadrant dependence, respectively. Some of the distributional properties of the new bivariate distributions were considered.
Keywords: Power function distribution, cumulative hazard rate function, Dependence structure, Survival function

0.0.29 A MODIFIED FRIEDMAN TEST FOR ANALYSIS OF RANDOMIZED COMPLETE BLOCK DESIGN

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ABSTRACT: Friedman test is a non-parametric test that is robust to the departures of normality since it does not depend on the assumption of normality. However, although not readily acknowledged, Friedman test is constrained by the assumption of homogeneity of variance and whenever this assumption is not met, there is generally a loss in the power. In this work, a modified Friedman test that is based on permutation procedure was proposed for the analysis of randomized complete block design (RCBD). The empirical type-I-error rates and powers of the proposed test were compared with that of Friedman test for normal/non-normal errors under equal/unequal variances. The results obtained showed that the modified Friedman test was more robust in terms of type-I-error and more powerful than Friedman test in analysing RCBD for normal/non-normal errors under equal/unequal variances. Hence, the modified Friedman test is highly recommended for the analysis of RCBD.

Keywords: Friedman test, Randomization test, Type-I-error, Power, Analysis of variance, Randomized complete block design.

0.0.30 PEARSON PRODUCT MOMENT OF CORRELATION COEFFICIENTS (Γ_{xy}) AS QUANTITATIVE TEST USED IN ARCHITECTURAL RESEARCH

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ABSTRACT: This paper explores Pearson Product Moment of Correlation Coefficient as Quantitative data measure in architectural research under the following headings: its basic introduction, its aim, research design, discussions, and conclusions. It is a parametric test tool that measures the degree of linearity between two vectors of data. Use of this analysing instrument among architectural researchers is widespread where research involves correlation of two variables with normal distribution of scores. Drawing on a systematic review of published literature, the paper was based on twenty published articles across the globe on architectural researches. It however reveals that its application among Architectural researchers has surfaced the field under pure correlational studies for decades, transformed into mixed research designs of varying forms and now extends more of futuristic mixed research designs. It found to be categorized as moderately difficult compared to other complex correlational tests where non normal distribution was observed among non-parametric tests or where multivariate studies are required among parametric tests; and that these challenges have persisted and are escalating unabated among beginners due to their inability to select the most effective statistical method, which could have been simply avoided by understanding the characteristics of each method and the list of requirements to inform the statistics.
Keywords: Pearson correlation coefficient, measure of relationship, architectural research, parametric test and normal distribution

0.0.31 Supportive Manifold Subspace Representation for Robust Face Image Clustering

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ABSTRACT: Subspace clustering techniques have found wide application in facial image clustering due to their effectiveness in resolving the challenges of high dimensional data. However, most existing methods still face challenges related to noise distortion and overlapping subspaces, leading to reduced clustering performances. To address this problem, this paper proposes a novel method that uses a supportive manifold learning strategy to induce data manifold via two representative structures. The first is a low-rank structure learned directly from the original data, and the second is an affinity matrix, which is derived through a k-symmetric nearest neighbour graph. Through the incorporation of a dual regularization term, both structures are allowed to adaptively guide themselves towards robust clustering without the necessity for spectral post-processing. The effectiveness of the proposed method is validated through experiments conducted on the ORL benchmark datasets, where it consistently outperforms state-of-the-art methods across six standard metrics.
Keywords: Face Clustering, Subspace Clustering, Image Representation

0.0.32 Spatial Dynamics of Traders Groups in an Informal Financial Market: A Case Study of Sokusile Market Place

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ABSTRACT: This study explores the spatial dynamics of informal traders within financial markets a case study of the Sokusile marketplace. The impact of the COVID-19 pandemic amongst traders was amplified competition for spatial resources, reflecting an ethos akin to "survival of the fittest." The pandemic substantially disrupted various income streams, prompting individuals to explore alternative avenues for financial sustenance, notably through engagement in informal trading

activities. We employed a multi-method approach for analyzing traders' spatial patterns and these methods included hotspot analysis, k-means clustering, geostatistics, and topological data analysis (TDA) persistence diagrams. Hotspots analysis was used to assess the spatial concentration of trading activities and also for visualization of potential spaces where traders compete to control. K-means clustering was used to identify unique trader groupings highlighting different compositions and distributions of the traders. Again, geostatistics was used to gain a critical understanding of spatial patterns and variability of traders' activities within this financial market. TDA persistence diagrams offered topological features of the financial market. By utilizing these methods we gained critical insights on the formation of traders groups and the dynamics of spatial competition in the informal financial market. Insights from this research will help market players, regulators, and policymakers successfully control and oversee the intricate nature of the informal financial market environment.

Keywords: Spatial dynamics, Informal financial market, Geostatistics, Persistence diagram, Topological data analysis

0.0.33 Selection of N-Point D- and A-Optimal Exact Designs Using Genetic Algorithm

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ABSTRACT: In the search for optimal designs in industrial experiments, situations like non-linearity and non-differentiability often arise that defy classical optimisation algorithms. In this study, Genetic Algorithm (GA) was used to select n-point D- and A- optimal exact designs in regular and irregular experimental regions for standard regression models. Before the application of GA in the selection of the optimal designs, requirements such as design region, optimality criterion, design size, population size, crossover and mutation probabilities were specified. Based on these specification, GA selected n-point D- and A-optimal exact designs by iteratively applying three operators; selection, crossover and mutation probabilities, on an initial population of designs generated from a specified design region. Metrics such as relative efficiency of the D- and A-optimality criteria were used to determine the performance of GA compared to those obtained from existing algorithms. Results obtained show that GA compares well and even better, with the line search algorithm, Fedorov algorithm, modified Fedorov algorithm, k-exchange algorithm and the computer algorithm reported in the literature in the search for D- and A-optimal designs. The study recommends, among others, that GA should be used for the selection of optimal designs when the model comprise of more than two factors.

KEYWORDS: Algorithms; A-optimal designs; D-optimal designs; Exact-designs; Genetic- Algorithm; Optimal-designs

0.0.34 Modern Parent's Awareness, Perception and Consenting to Female Genital Mutilation (FGM) in Shomolu local government, Lagos, Nigeria

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Abstract: This research investigates Modern Parent's Awareness and Perception as well as Consenting to Female Genital Mutilation (FGM) in Shomolu local government, Lagos, Nigeria. The major objectives of this study are; to determine whether there exists any significant relationship between parents' educational level and their awareness of FGM in Nigeria, to examine the association between parents' awareness and perception of Female Genital Mutilation (FGM) in Nigeria, to examine the relationship between parents' awareness and their consenting to Female Genital Mutilation (FGM) in Nigeria. The study employs a descriptive research design, utilizing a questionnaire as the primary research instrument. Statistical tools employed include: ANOVA, to test the relationship between parents' educational level and awareness; Friedman Statistic to test association between parents' awareness and perception; Correlation to test the relationship between parental awareness and parental consent. The findings indicate significant associations which were revealed through statistical analyses, showing a correlation between parents' levels of education and their awareness of FGM, a strong link was found between parental awareness and perception of FGM, as well as a strong relationship between parental perception and parents consenting to the practice. Conclusions drawn from the study underscore the importance of parental education in influencing awareness levels of FGM. Furthermore, the research highlights the significant roles of awareness and perception in shaping individuals' attitudes towards and consenting to FGM.

Keywords: Female Genital Mutilation (FGM), Modern Parents, Correlation, Analysis of Variance (ANOVA), Friedman

0.0.35 COMBATING THE MULTICOLLINEARITY IN BELL REGRESSION MODEL: SIMULATION AND APPLICATION

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ABSTRACT: Poisson regression model has been popularly used to model count data. However, over- dispersion is a threat to the performance of the Poisson regression model. The Bell regression model (BRM) is an alternative means of modelling count data with over-dispersion. Conventionally, the parameters in BRM are popularly estimated using the method of maximum likelihood (MML). Multicollinearity posed challenge on the efficiency of MML. This study developed a new estimator to overcome the problem of multicollinearity. The theoretical, simulation and application results were in favour of this new method. **Keywords**: Bell regression, Liu, Multicollinearity, Poisson regression, Ridge

0.0.36 A Robust Principal Component Analysis for Estimating the Parameters of Economic Growth in Nigeria in the Presence of Multicollinearity and Outlier

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Abstract: This study examined economic growth (RGDP) in relation to internal debt (INDT), external debt (EXDT), interest rate (RINR), exchange rate (REXR) and trade openness (OPEN) in the presence of multicollinearity and outlier as an assumption violation. A principal component regression analysis combined with robust M, S, MM estimators was adopted on quarterly data from 1986 to 2023 gathered from Central Bank of Nigeria were used to simultaneously address the problems. Exploratory data analysis (EDA) evidently revealed linear relationship among the variables under investigation. The diagnostic carried out using variance inflation factor and Grubb's test ascertained the presence of multicollinearity and outlier in the data set. The principal component analysis revealed that INDT and EXDT accounts for 38.4 and 29.2 percent of the variance and as such their

component PINDT and PEXDT were chosen to reduce the collinearity. Also, a robust M-estimation method results revealed that the impact of PINDT, PEXDT, RINR, REXR and OPEN on the RGDP were positive and significant for PEXDT and OPEN on the RGDP. Specifically, PINDT, PEXDT, RINR, REXR and OPEN increased the Nigeria's economic growth to the turn of 0.10, 0.02, 0.04, 0.06 and 3.01 percent respectively during the period under consideration. Consequently, combining principal component with M-estimator of weighted bisquare with 4.685 turning and median centered as scale was revealed as the most efficient estimation technique that jointly addressed the two identified assumptions violation. This was based on predictive power of the fitted model that revealed M-estimator had minimum root mean square error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), bias proportion when compared with the S- estimator and MM-estimator respectively. Therefore, it be concluded that economic challenges witnessed during the period under study greatly affected the identified determinants which in turn translated to the economic growth. Hence, a robust principal component regression analysis and M-estimation technique remain the best and unbiased technique for modeling and estimating the parameters of a linear model when multicollinerity and outliers were jointly present in the data set.

Keywords: Economic Growth, Internal Debt, External Debt, Interest Rate, Exchange Rate, Trade Openness, Multicollinearity, Outlier, Principal Component and Robust Estimators

0.0.37 MODELING AND FORECASTING OF NIGERIA TAX REVENUE USING SARIMA AND HOLT WINTERS MODELS

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ABSTRACT: Accurate projections of tax revenue are crucial for effective fiscal management and economic planning by governments. However, the existing models for forecasting Nigeria's tax revenue lack appropriateness and precision. This research focuses on the utilization of SARIMA and Holt Winters to model and forecast tax revenue in Nigeria. The study incorporates quarterly tax revenue data spanning from January 1990 to December 2022. Augmented Dickey-Fuller tests indicate the necessity of first differencing to achieve series stationarity. The SARIMA (0,1,1)(1,0,1) 4 model is selected based on the lowest Akaike Information Criterion, demonstrating superior accuracy. Diagnostic testing further confirms the model's appropriateness. Also, the Holt-Winters multiplicative model proved more suitable than the additive model for forecasting, demonstrating its sufficiency. The

performance evaluation of the best-fitted models involves in-sample forecasting, utilizing an 80% training set and a 20% validation set to assess forecast accuracy. The research findings reveal that SARIMA $(0,1,1)(1,0,1)_4$ excels in accurately and precisely forecasting tax revenue in Nigeria. Consequently, the study recommends the application of the SARIMA model for forecasting tax revenue in Nigeria.
Keywords: Holt-Winters, SARIMA, Forecasting, Tax Revenue, Nigeria

0.0.38 THE COMPARISON OF THE PERFORMANCE OF DIFFERENT ESTIMATION METHODS IN ARIMA MODELLING

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Abstract: Missing observation in time series is a phenomenon that introduces anomalies and distort the flow of the sequence of observations in a time series data, thereby making it difficult to carryout necessary analysis. To overcome this problem, several methods have been introduced in the literature for handling missing observations prominent among which is estimation method. However, identifying the most suitable and appropriate estimation method is a challenge as accurate estimation of missing data is crucial for maintaining reliable records and making informed business decisions. This paper therefore focuses on identifying the appropriate method of estimating missing observation in autoregressive integrated moving average (ARIMA) model by comparing the performance of mean imputation, linear interpolation and Kalman smoothing methods through empirical and simulation studies. The results of both the empirical and simulation studies show that Kalman smoothing method produced the best estimate and forecast performance compared to the mean imputation and linear interpolation methods.
Keywords: Missing observation, Autoregressive integrated moving average, Estimation methods, Forecast performance, Time series data

0.0.39 AN EMPIRICAL COMPARISON BETWEEN THE REGULARIZATION TECHNIQUES IN THE PRESENCE OF MULTICOLLINEARITY

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ABSTRACT: Regularization techniques are regression methods developed to improve model performance and address issues such as overfitting. Among regularization techniques to overcome the problem of inaccurate estimation of the regression coefficients created by multicollinearity comprises: Ridge Regression (RR), Least Absolute Shrinkage and Selection Operator (LASSO), Elastic - Net Regression (ENR), Fused LASSO Regression (FLR) and Adaptive LASSO Regression (ALR). The performance of Ridge Regression and LASSO–type estimators in the presence of multicollinearity are compared using Root Mean Square Error (RMSE) and Akaike Information Criterion (AIC) values of each method in estimating the diabetes dataset. The results reveal that Elastic-Net has the lowest RMSE and AIC among the regularization techniques. It indicates that Elastic - Net Regression outperformed Ridge Regression (RR), LASSO Regression (LS) and two LASSO–type estimators under study in the presence of multicollinearity.
Keywords: LASSO; Elastic -Net Regression; Ridge Regression; Multicollinearity; Regularization Techniques; Root Mean Square Error

0.0.40 A clustering approach for recommending suitable LSP in mobile network

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Abstract: Network service request for voice and Internet may differ across locations. Network service providers are encouraged to conduct a quarterly check to identify the service plan mostly sought for in a particular location of coverage so as to improve quality of service through promotions, advertisements and awareness talks. In this work, a model that identifies and recommends the location service plan for network providers is proffered. The 3-task model extracts data as quarterly av-

erages on voice and Internet subscription it goes ahead to cluster the extracted data using affinity propagation machine learning and classifies the clusters into linguistic variables using the mean of the respective clusters. Using a dataset obtained from the Nigerian Bureau of Statistics on mobile telecommunication for three quarters in 2021, obtained results show that the model was able to identify states with heavy as well as low subscription rates (voice and Internet) across the states. Mtn, Airtel and Glo mobile network providers recorded equal voice and internet subscription rates across the states while 9Mobile showed signs of improvement in voice and Internet subscription for some states.

Keywords: Telecommunication, network service, clustering, machine-learning, subscription, affinity propagation, tariff plans

0.0.41 Estimation in Third-Order Orthogonal-Array Composite Designs with Missing Observation

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ABSTRACT: Missing observations which may occur in the cause of carrying out experiment constitute one of the major sources of error in experimental result. In this work, the effect of one missing observation in the various design portions (factorial (f), axial (a) and center (c)), on the precision of parameter estimates, and maximum prediction variance of third-order orthogonal-array composite designs (OACDs) are examined. This is done for $4 \leq k \leq 6$ factors using $1 \leq n_r \leq 5$ center points at different distance of a non-zero co-ordinate in an additional design point from the center (i.e., values of α). The results showed that missing a factorial and axial point had significant effect on OACDs while missing a center point had little or no effect on the precision of the parameter estimates and maximum prediction variance.

Keywords: Missing observation, Third-order model, Response surface design, Parameter estimates, maximum prediction variance

0.0.42 ROBUST ESTIMATION METHOD FOR PANEL DATA MODEL WITH HETEROSCEDASTICITY, SERIAL AND SPATIAL CORRELATIONS

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ABSTRACT: The panel corrected standard error (PCSE) estimator commonly used to estimate panel data models with heteroscedasticty, serial correlation and spatial dependence have been reported to be inefficient. Given the poor performance of the PCSE, the kernel based nonparametric estimators has been suggested as a better alternative. In this study, the error structure of the PCSE was modified with the introduction of two new kernel functions to smoothing out the effects of heteroscedasticity, serial correlation and spatial dependence and consequently improved the standard error .The Parzen kernel and Turkey-Hannings kernel estimators were selected and a non-linear weight was defined for the two kernel functions. The performances of these two new kernel functions were compared with traditional kernel functions- the truncated kernel and the Bartlett kernel in addition to the PCSE. Using a Monte-Carlo simulation data with varying levels of heteroscedasticity, serial and spatial correlations, varying spatial weight matrix specification and varying cross-sectional and time dimensions, the performances of these estimators were determined using absolute bias (AB), residual variance (RVar), and the root mean squares error (RMSE).The results from the study confirmed the superiority of the kernel based nonparametric approach over the PCSE, .From the results, the Tukey-Hannings kernel was generally more preferred than the Bartlett kernel for small sample sizes, narrow spatial weight matrix specifications and for short panels N>T). Also, the Parzen kernel estimator performed better than the Bartlett kernel for long panels (N>T) and wider spatial weight matrix specifications .However, from the results, the traditional kernel estimators (Bartlett kernel) performed better than the Turkey-Hanning and Parzen kernels generally for large sample sizes, wider spatial weight matrix specifications and for short panels. Also, the Bartlett kernel also performed better for long panels (N>T), but the performance was however restricted to narrow spatial weight matrix specifications.And finally the results from the study showed that the performance of the different estimators were influenced by the panel type, the size of the cross-sectional and time dimensions and the specification of the spatial weight matrix. The study therefore concludes that in the presence of heteroscedasticity, serial correlation and spatial dependence, the kernel based estimators performed better than the PCSE. That the two new kernels functions introduced performed better than the traditional kernel functions in some

cases and that the performance of the different estimators were greatly influenced by the magnitude of heteroscedasticity, serial correlation and spatial dependence, the panel type, size of the cross-sectional and time dimensions as well as the specifications of the spatial weight matrix The study therefore recommended that the Bartlett, Turkey-Hanning and the Parzen kernel functions are better estimators for panel data models with heteroscedasticity, serial correlation and spatial dependence but that considerations should be given to the panel types, cross-sectional and time dimensions and specifications of the spatial weight matrix in the choice of these estimators

KEYWORD: Panel Data, heteroscedasticty, serial correlation, spatial Dependence, kernel estimators

0.0.43 APPLICATIONS OF SOME CLASSICAL DISTRIBUTIONS IN MODELING LIFETIMES DATASETS WITH VARYING SHAPES

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ABSTRACT: Statistical distributions are used in various fields such as reliability engineering, survival analysis, computer science, and social sciences, among others, in modeling specialized data. The Exponential and Weibull distributions are more widely used in practice than the Gamma distribution. Both Gamma and the Weibull distributions have the same number of parameters and have some advantages over the conventional Exponential distribution in that they possess varying hazard rate shapes. The nature of Exponential, Weibull, and Gamma distributions have been studied using different graphs of their probability density functions and cumulative distribution functions. The expressions for some of their properties, including hazard and survival functions have been presented. Five data sets with varying shapes ranging from right- skewed to left-skewed were considered in the analysis. The total time on the test (TTT) plot has shown that some data sets possessed increasing, decreasing, unimodal, and bathtub failure rates. The performance of the competing models was assessed using some Goodness-of-fit measures and the results have shown that in some cases exponential distribution provides a better fit than the Weibull and Gamma distributions most especially when the data sets skewed to the right

whereas in other cases Weibull and Gamma distributions provided a better fit than the exponential distribution.
Keywords: Exponential distribution, Weibull distribution, Gamma distribution, hazard rate

0.0.44 Ratio Estimation of Population Mean by Multivariate Calibration Weightings in Stratified Double Sampling

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ABSTRACT: This study proposed a new ratio estimator for estimating population mean in stratified double sampling using the principle of multivariate calibration weightings. The bias and Mean Square Error (MSE) expressions for the proposed estimator are obtained under large sample approximation. Analytical results showed that under certain prescribed conditions, the new estimator is more efficient than all related existing estimators under review. The relative performances of the new estimator with a corresponding Global Estimator were evaluated through a simulation study. Numerical and simulation results proved the dominance of the new estimator.
Keywords: efficiency, global estimator, means square error, multivariate calibration weightings, ratio estimator

0.0.45 Ratio Estimators for Population Means with Two Auxiliary Parameters

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Abstract: In this work, a new class of ratio estimators with two known auxiliary variable parameters for the estimation of population means under a simple random sample without replacement using the calibration weighting method was proposed. The calibrated weight was obtained using a new calibration constraint, which includes the known standard deviation of the auxiliary variable. The biases and mean square errors of the proposed estimators were derived and compared with those of the existing modified ratio estimators in Upadhyaya & Singh (1999), Singh (2003), Lu & Yan (2014), and Yan & Tian (2010). The results showed that the proposed estimators perform better than the existing ratio estimators.
Keywords: Ratio Estimation, Population means, Auxiliary Variable, Calibration weight, Relative Efficiency

0.0.46 Effect of Growing and Storage Conditions of Cashew Nuts in Oke Ogun area of Oyo State, Nigeria

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Abstract: The effect of growing and storage condition of cashew nuts need to be studied because Cashew nuts is a good source of protein, fiber, healthy fats and globally consumed. Technical investigation on the study condition of cashew nuts in Oke-Ogun area of Oyo State, Nigeria was carried out by means of distributing 300 questionnaires during field trip to the respondents. The main aim of this paper is to investigate the challenges facing people in Oke-Ogun are facing while storing the cashew nuts. The paper used primary data and the responses from the target population were run and analyzed using a Statistical software called Statistical Package for Social Sciences (SPSS), version 21. The adopted statistical methodology were Descriptive Statistics and Pearson Chi-Square Test. Most of the respondents participated in this survey averagely produced between 7 kg and 11 kg yield of cashew nuts per year. People in Oke-Ogun area of Oyo State preferred using sealed jar container to store their cashew nuts. Also, the target population preferred using 24.9^oC and 24^oC as the average temperature and humidity for storing cashew nuts. The paper revealed that people in Oke-Ogun area preferred using 2 years to store their cashew nuts. The Pearson's chi-square test was used to investigate this issue and the results showed that: People in Oke Ogun area of Oyo State are really facing challenges with the storage of their cashew and they do normally experienced pests/diseases problems with their cashew nuts. There was a specific standards that people in Oke-Ogun area of Oyo State must follow when growing and storing their cashew.

Keywords: Cashew nuts, Storage condition, Oke-Ogun, Anacardium occidentale L, Pearson's chi-square test

0.0.47 A Logistic Regression Analysis of Risk Factors of Cardiac Arrhythmia: A Case Study Fex Heart Specialist Hospital, Onitsha, Anambra State

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ABSTRACT: This research work examines the risk factors associated with cardiac arrhythmia using logistic regression analysis. The data for the analysis were collected from Fex Specialist Hospital Onitsha and analyzed using binary logistic regression. The results of the analysis show that several factors affect the cardiac arrhythmia. These factors include sex, chest pain type, resting blood pressure level, serum cholesterol level and maximum heart rate are the main significant risk factors. Also, we classified the observations of arrhythmia into a particular category of those having the disease and those that do not have the disease. The study also contributes to a better understanding of the disease and provides valuable information for diagnosis and treatment decisions.
Keywords: Logistic regression, odd function, cardiac arrhythmia, heart rate

0.0.48 EFFECT OF CASHLESS POLICY ON THE ECONOMIC GROWTH OF FIVE WEST AFRICAN COUNTRIES USING AUTOREGRESSIVE LAG MODEL

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Abstract: This paper evaluated the effect of cashless policy on the economic growth of Nigeria, Ghana, Liberia, Gambia and Sierra Leone using Autoregressive Lag Model. Data was obtained from the Central Banks of these countries from 2012 to 2022 to illustrate the procedures using EView and STATA software. The results revealed that Nigeria has the highest average economic growth of 6.99E+12 while Sierra Leone has the least economic growth of 4.25E+09. It also showed that the cashless policy has long-run relationship with the gross domestic product. It further revealed that mobile money and automate teller machine have significant influence on the gross domestic product of the five West African countries.
Keywords: cashless policy, Central bank, autoregressive lag, long-run relationship and automated teller machine

0.0.49 The Effect of Nonlinear and Linear Damping on the Dynamic Buckling of a Quadratic Model Elastic Structure

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ABSTRACT: The study is concerned with the analytical investigation of the dynamic buckling with nonlinear and linear damping of a quadratic model elastic structure that was struck by a step load. The analysis uses regular perturbation techniques and asymptotic expansions of the relevant variables in the problem. The study analyses the effects of the various problem parameters: nonlinear, linear damping and imperfections. All results are strictly asymptotic in nature.
Keywords: Nonlinear and linear damping, quadratic model structure, step load, dynamic buckling

0.0.50 Ensemble learning models for stock price prediction

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ABSTRACT: This research delves into the predictability of stock prices through the utilization of ensemble learning algorithms. Given the dynamic and often unpredictable nature of the stock market, the ability to comprehend and accurately forecast stock prices holds paramount importance for researchers, stock traders, and institutional investors alike. Employing a diverse array of ensemble learning techniques, including stacking, bagging, Gradient Boost, Catboost, Random Forest, and XGBoost, we meticulously analyzed financial data spanning multiple companies. By integrating key input variables such as Open, Low, and High prices, alongside supplementary features like moving averages, our objective was to refine predictive accuracy. Rigorous evaluation, including metrics such as mean absolute error and absolute percentage error, was employed to gauge model performance. Our comprehensive analysis across 30 datasets consistently showcased the superior predictive capabilities of the Stacking Regressor over other models. These findings hold significant implications for investors and financial analysts, furnishing invaluable insights into the effective prediction of stock prices and facilitating informed investment decision-making.
Keywords: Ensemble learning, Financial data, Predictability, Stacking Regressor, Stock prices

0.0.51 EVALUATING THE FORECAST PERFORMANCE OF ARMA-GARCH AND ST-GARCH USING NIGERIAN GROSS DOMESTIC PRODUCTS

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Abstract: It is undisputed that evaluating the forecast performance of the series under examination is crucial for policymakers, investors, academics, and end users. Utilizing Nigeria's GDP as a base, this study compares the forecast performance of ARMA-GARCH with ST-GARCH. Three ST-GARCH classes vis-à-vis ET-GARCH, EST-GARCH, and LST-GARCH—are taken into consideration. The gross domestic product of Nigeria was employed for empirical investigation after the appropriate theoretical and mathematical frameworks had been derived. Its stationarity as well as its descriptive statistics were investigated. After that, a number of created programs and Statgraphics Centurion statistical analysis software helped to finish the entire investigation. The outcomes demonstrated that while hybrids of EST-GARCH and LST-GARCH performed better than ARMA-GARCH, LST-GARCH performed the best. Because of the analysis's superiority over EST-GARCH and LST-GARCH, ARMA-GARCH can be employed instead and still produce findings that are commensurately good.

Keywords: Gross domestic products, ARMA, GARCH, ET-GARCH, EST-GARCH, and LST- GARCH

0.0.52 Analytical Hierarchy process (AHP) an ideal Multi Criteria Decision-Making tool for Researchers, Managers and Policy Makers

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Abstract: An organized methodology is used by the Analytic Hierarchy Process (AHP) to aid in decision-making in complex scenarios with many criteria and options. It is used in decision making in: problem solving, effectiveness and efficiency, risk management, innovation and growth, adaptability to change, accountability and responsibility, personal growth, and quality of life. Decisionmaking is fundamental to human existence because it enables individuals and communities to successfully navigate life's challenges, achieve their goals, and yield favorable outcomes. It is important to keep in mind that decisionmaking is not always a straight line. The analytical hierarchy process (AHP) is utilized by a wide range of stakeholders, including managers, researchers, and policy makers.Its versatility can be advantageous in a wide range of disciplines, including project management, supply chain management, human resources, urban planning, environmental management, health care, financial management, product development, quality management, education, risk management, and energy planning.Furthermore, because of its versatility and methodical approach, AHP can be employed in almost any case where multiple criteria need to be considered, like in statistical and mathematical research.Making decisions is essential for a variety of reasons, including problem resolution, reaching objectives, effectiveness and efficiency, risk management, creativity and growth, flexibility and growth, accountability and responsibility, and personal development.Individual relationships and excellence.

Keywords: AHP Decision making, researchers Pairwise comparison, Priority, policy making

0.0.53 COMPARISON OF MODELS (SARIMA, ARFIMA AND SARFIMA) GIVEN LONG MEMORY

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ABSTRACT: One of the greatest challenges faced in data analysis is fitting the most appropriate model to a dataset. In reality, miss-specification of model has resulted in several wrong decisions in data science. This work compares the efficiency of modelling a time series with seasonal long memory properties with SARIMA, ARFIMA and SARFIMA models. Global average temperature data was used for the purpose of this illustration. The temperature data displayed signs of long memory as the ACF plot decayed slowly on further scrutiny, using the Hurst exponent produced by R/S analysis we confirmed the presence of long memory. The ACF also displayed an exponential decay and a sin qua sin movement indicating that the model is not stationary in trend and may be seasonal. Test for stationarity and seasonality were done to confirm these assertions from the plot. Finally, the AIC and BIC was used to evaluate the efficiency of all three models and the result shows that, in the presence of seasonality and long memory, the SARFIMA model was more efficient.
Keywords: long memory, SARIMA model, ARFIMA model and SARFIMA model stationarity

0.0.54 MODELLING THE EXCHANGE RATE VOLATILITY USING ARCH, GARCH AND EGARCH MODELS EVIDENCE FOR NIGERIA

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ABSTRACT: Exchange rates are important financial problem that is receiving attention globally. This study investigated the modelling the exchange rate volatility using ARCH, GARCH and EGARCH models by using monthly average exchange rate data The result from all the models shows that volatility was persistent (i.e exceed 1) indicating GARCH (1,1),(1,2),(2,2) models variance are not stationary

but for ARCH(1,1),(1,2), EGARCH(1,1)(1,2)(2,2) models (i.e below 1) indicating the variance is stationary. ARCH and EGARCH models show the existence of statistically significant, the ARCH (1,1),(1,2),and EGARCH(1,1)(1,2)(2,2) models are found to be the best models, they have all the parameters of the variance being significant and with lower information criteria. Test of normality for the residuals of the models established indicated that they are not normally distributed, while the Q-test for serial correlation indicates that the residuals of the models suffers no serial correlation. .The study recommended that the monetary authority of Nigeria should carefully monitor the aspect of exchange rate and government policy should restrict all transaction in Naira only.

Keyword: volatility, ARCH, GARCH, EGARCH, VARIANCE, EXCHANGE RATE, NIGERIA

0.0.55 Random periodic solutions for a class of hybrid stochastic differential equations

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Abstract: We present the existence and uniqueness of random periodic path for stochastic dynamical systems generated by random switching stochastic differential equations (SDEs). These class of SDEs arise as concrete models in molecular dynamics, biochemistry, climatology, wireless communications, financial mathematics, biological and artificial neural networks, etc. Random periodic processes are inevitable in these class of stochastic dynamical systems due to the nonlinearity of their processing and the presence of time dependent applied current. In our investigation, we employed Lyapunov second method and the theory of M-matrices, which are verifiable in terms of the coefficients of the SDE and the switching rates.

Keywords: Random periodic paths; stochastic differential equations with random switching; stochastic flows; M-matrices

0.0.56 Influence Matrix Approach for detection of Influential Subsets in Linear Regression

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ABSTRACT: The Cook's distance measure is a popular diagnostic tool for influence measure in linear regression diagnostics. Many authors have studied it and the main area of implementation has been the use of it for single-case detection of influential observations. In this work we propose a standardized version of it, and extend the single-case form to flag influential groups or subsets. The proposed method uses diagonal and off-diagonal elements of a normalized influence matrix Z. The main diagonal elements of Z consist of the standardized univariate Cook statistics and the off-diagonal elements consist of statistics that can be useful to identify influential groups or subsets. A scattergram of the off-diagonal components of Z is drawn and bounds (lower and upper bounds) are imposed on it. These bounds form the main artillery for detecting influential subsets. Off-diagonal elements of Z that fall outside the bounds or limits serve as indicators of influential subsets or groups and play an important role in selecting the corresponding values of Y that make up the influential groups. One of the glaring merits of the approach is that it facilitates the identification of influential subsets that would be lost if only the main diagonal entries of Z are explored. The method is effective and computationally easy to apply especially where more complex methods are difficult to implement, be-cause of their high computational demands. Analysis of well-known real-life data sets in linear regression diagnostics are used to demonstrate the application, effectiveness and usefulness of the proposed method.
Keywords: Index plot, Influence matrix, Influential observations

0.0.57 ESTIMATING STATISTICAL POWER FOR A TWO-FACTOR ANOVA DESIGN WITH MISSING DATA THROUGH MULTIPLE IMPUTATION

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Abstract: Missing data is a common issue in experimental research that can undermine the statistical power and validity of results. Procedures for estimating

statistical power for a two-sample t-test for incomplete data have been documented in the literature. This study extends the existing procedures to more than two samples. A power estimation formula is derived for a two-factor ANOVA model with missing values addressed through multiple imputation (MI). The within- imputation variance from Rubin's rules was substituted into the power calculation formula. Experimental data on the antifungal properties of plant extracts was analyzed in a two-factor design using SPSS version 27. Statistical power was investigated at 8%, 16%, and 40% levels of missingness; 0.2, 0.5, and 0.8 effect sizes and 20, 30, 40, and 100 number of imputations. The study reveals that the number of missing observations, the effect size, and the number of imputations have an impact on statistical power in a two-factor ANOVA design; as effect size and the number of imputations increase, statistical power increases but decreases with higher missingness. The power analysis presented in this study can be extended to higher ANOVA models.
Keywords: Multiple Imputation, Statistical Power, ANOVA, Incomplete Data, Estimation

0.0.58 Philosophy and Its Symbolic Logic: Where lies Meaningfulness?

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Abstract: Discourses in the physical sciences just like in the social sciences are generally constructed upon the assumption that reliable knowledge can be generated and disseminated, that a measure of objectivity is achievable. This assumption requires that knowledge must be reproducible or replicable; and that if the procedure is clear, unambiguous and devoid of ambiguity, it must be reliable. To make this kind of pursuit possible, symbolic logic was developed between Aristotle and modern logicians to erase ambiguity, uncertainty and subjective interests. Interestingly, there are increasing interests in, and defence for the recognition of subjective dimensions of human encounters with knowledge generation in the twenty-first century. But this growing trend is consistently challenged by the need for and relevance of trans- culturally valid knowledge (because without knowledge and standards of assessment that cut across different societies, the possibility of intercultural exchanges in the forms of business, trade, communication, and other inter-national possibilities may be inexistent). This calls for reconciling human search for objective knowledge and subjective knowledge. Can objective knowledge be shown to admit of subjectivity? By means of philosophical analysis and criticism, this paper argues that objective knowledge of the symbolic logic type is meaningless without subjective

interjection, that it is impossible to make sense (meaning) of the abstractions of symbolic without human subjective meaning. We argue that despite the significance of objectivity, contexts or particular situations, which universalised structures generally do not concern itself with is necessary for holistic knowledge articulation and dissemination.
Keywords: symbolic logic; objective; subjective; meaning; intercultural; abstraction

0.0.59 Portfolio Selection and Optimal Financial Investment in a Developing Economy

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Abstract: This study considers Portfolio selection for an optimal financial investment in a developing economy (Nigeria). Such investment criteria as return, risk, annual dividend and liquidity are considered. Linear Programming model was applied to the data collected on return, risk, annual dividend and liquidity from the 2023 annual reports of Zenith bank, UBA, Fidelity bank, TOTAL, and Nigerian Breweries. The ratio of each company's return, risk, annual dividend and liquidity to the total for each of these parameters are used to formulate the objective functions and the constraint equations. The result revealed the best stocks to invest in and the amount of wealth required for such investment.
Keywords: Investment, Portfolio, Management, Linear programming, Developing economy

0.0.60 Project Management Analyses In A Poultry Farm: Critical Path Analysis Approach

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Abstract: This research work explored the application of Critical Path Analysis (CPA) in the production cycle of broiler chickens, aimed at identifying bottlenecks and inefficiencies that could be mitigated to enhance productivity and profit, mability. Broiler chicken production, a critical component of the global agricultural sector, demands efficient management of various stages, including breeding, hatching, growing, and processing, to meet the increasing demand for poultry meat. The research utilized CPA, a time-tested project management tool traditionally applied in construction and manufacturing industries, to map out the critical and non-

critical activities within the broiler production cycle. By identifying the longest path through these sequential activities, the study highlighted the minimum time required for a complete production cycle and pinpointed stages where delays could extend overall production time. This approach allowed for the precise identification of bottlenecks that impede productivity, such as the brooding phase and health management practices, which are critical for ensuring the growth and survival of broiler chickens. Through a comprehensive analysis, the study revealed that optimizing critical activities within the production cycle can significantly reduce the time to market, improve animal welfare, and increase profitability. The findings suggested that investments in advanced environmental control technologies during the brooding phase and the implementation of robust health management protocols can address identified inefficiencies.
Keywords: Critical Path Analysis, production cycle, Network Analysis, Activities, Float

0.0.61 Applications of Replacement Model in a Transport company

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ABSTRACT: The research examined the implementation, and evaluation of a replacement model tailored to the specific needs of GIGM Transport Company, one of the leading provider of inter-city transportation services in Nigeria. The study addressed the critical need for strategic vehicle replacement strategies to optimize fleet management, improve operational efficiency, and enhance sustainability performance within the company. Practical implementation of the replacement model within GIGM Transport Company provided valuable insights into the challenges, processes, and outcomes of applying theoretical concepts to real-world scenarios. The empirical findings provided concrete evidence of the model's effectiveness and guide recommendations for future research and practice. The study concluded by emphasizing the importance of evidence-based decision-making, stakeholder collaboration, and continuous monitoring and adaptation in achieving sustainable and efficient fleet management practices within GIGM Transport Company and similar transport companies.
Keywords: Replacement model, Maintenance, Repair, Replacement policy

0.0.62 The Variance Ranking Approach of obtaing Initial Basic Feasible Solution for a Transportation Problem

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ABSTRACT: This study developed another method of solving an Initial Basic Feasible Solution for a Transportation Problem called the Variance Ranking Approach. Results from the numerical examples showed that the Variance Ranking Approach method is an efficient method and reaches optimality with fewer iteration. When compared with other methods, the Variance Rank method does better in finding IBFS than the North-West corner method, Row Minima method, Column Minima method, Least Cost method and Vogel's Approximation method. Finally, using the U-V method for checking numbers of iteration to optimality, the new method outperform others in terms of time it takes to converge to optimal solution.
Keywords: Variance Ranking, Initial Basic Feasible Solution, Transportation Problem, optimality test

0.0.63 A COMPARATIVE ANALYSIS OF THE PERFORMANCE OF PENALIZED REGRESSION TECHNIQUES IN THE PRESENCE OF MULTICOLLINEARITY

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ABSTRACT: Multicollinearity is a common issue faced by statisticians and machine learning practitioners when building predictive models. This study aims at comparing the performance of the Penalized regression techniques (Lasso, Ridge and Elastic Net) in the presence of multicollinearity using real-life and simulated datasets . Also, this study compared the accuracy, precision, and recall scores of each technique using evaluation metrics such as mean squared error, root mean squared error and R-squared. The outcome of this study using real-life datasets on 442 diabetes patients measured on 10 baseline predictor variables and one measure of disease progression showed that the Ridge regression performed better than Lasso and Elastic net and while using simulations with sample size of n=2000 and 5000 independent variables, it was discovered that Lasso and Elastic Net models demonstrate superior performance compared to ridge. Comparing the results of the

two methods, It was concluded that Ridge model performs better in comparing the performance of penalized regression models with multicollinearity since real- world datasets give more reliable and better results than simulated datasets.
Keywords: Penalized regression techniques, Multicollinearity, Diabetes patients, Real-life and simulated datasets

0.0.64 Definitive Screening Composite Minimax Loss Designs for Second-Order Models

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ABSTRACT: In this study, based on definitive screening composite designs (DSCDs) of Zhou and Xu (2016), definitive screening composite minimax loss designs (DSCMDs) robust to one missing design point were constructed using the minimaxloss of efficiency criterion. The newly constructed designs were compared with some existing second-order response surface designs such as: central composite designs (CCDs), orthogonal array composite designs (OACDs), orthogonal array composite minimax loss designs (OACMs), and definitive screening composite designs (DSCDs)) based on the D- and Ds - optimality criteria for $4 \leq k \leq 6$ factors. The results showed that DSCMDs generally performed better than some of the existing response surface designs considered in this study.
Keywords: Second-order models; Definitive screening designs; Minimaxloss criterion; D-optimality criterion; Generalized scaled deviation

0.0.65 Parameter Estimation in Gaussian Mixture Models using Microsoft Excel

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Abstract: The problem of misclassification in components scenarios is studied in this work. It involves identifying any components from which each group element is drawn and estimating the parameters of these groups including their respective mixture weights. These problems were modeled as a Gaussian mixture model while the expectation-maximization algorithm (EM) was used in the estimation of the parameters to enable us to identify the group where each group element is drawn from. Six datasets of varying lengths were used in this work. For components mixture, we used the weights of 1000 students, the weights of 200 babies at birth, and

306 Haberman's Cancer Survival datasets. For components mixture, we used 90 Immunotherapy datasets, 150 Fisher-iris datasets, and 151 Teaching Assistant Evaluation datasets. From the results, our proposed classification Algorithm (using EM) returned a relative classification efficiency of 56% over the three other existing classification methods, namely, logistic regression, discriminant method, and support vector machine. The logistic regression method (LRM) returned 33% relative efficiency, the support vector machine (SVM) returned 11% while the discriminant analysis method (DAM) had 0% relative classification efficiency. **Keywords**: ■ Mixture Model ■ Gaussian Mixture Model ■ Expectation-Maximization ■ Classification

0.0.66 A novel technique for generating families of continuous distributions

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Abstract: In this paper, we present the generalized flexible-G family for creating several con- tinuous distributions. Our new family features are that it adds only two extra shape parameters to any chosen continuous distribution and is not derived from any par- ent distribution that currently exists. Several special cases of this family are provided. The family's model parameters are estimated using the maximum likelihood estimation method. A simulation study is conducted to assess the consistency of the maximum likelihood estimates. The generalized flexible log-logistic, a specific case of our novel family, is applied to both patient's analgesia and reliability data in order to illustrate the significance of the family. The generalized flexible log-logistic outperforms several competitive models provided in this paper. Furthermore, the generalized flexible log- logistic performs better than traditional distributions such as the BurrXII, Gumbel, and Weibull models.
Keywords: New flexible-G; Generalized flexible-G; Family of distributions; Continuous distributions; Maximum likelihood estimation

0.0.67 Multinomial Logistic Regression Analysis of Malaria and Some Socio Related Diseases: A Case Study of General Hospital Zuru and General Hospital Wasagu

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ABSTRACT: Over the years, the harm caused by malaria di sease in Nigeria have attracted interventions from the government and other stakeholders including Ministry Of Health, World Health organization(WHO),United Nations International Children's Fund (UNICEF) and United States Agency for International Development (USAID) among others. Malaria as a common epidemic in Nigeria, has counterparts that requires Intervention, it's on this basis that this research aim to compare malaria, with typhoid, anemia, peptic ulcer disease, hepatitis and hypertension among others. Multinomial logistic regression method was used for the analysis. Wald test and odd ration tests were performed on the regression coefficients. The findings of the research work indicated that malaria is not the only threat in the two communities following the results obtained from two General Hospitals namely, General Hospital Zuru and General Hospital Wasagu. At general hospital Wasagu, a total number of 4,717 cases were recorded having typhoid to be recorded as the highest with 3,597, followed by malaria with 494, anemia with 341 and hepatitis with 207. In General Hospital Zuru, 4,432 cases were recorded, Malaria was recorded the highest with 1,593 cases followed by Typhoid with 1,477 cases, PUD with 663, HTN with 386, Anemia with 63, and Hepatitis with 247. Following these results, it can be note that on each of the two General Hospitals, Malaria has at least one counterpart disease if not more than one. A total of 9,149 cases were recorded from the two General Hospitals. If these cases should be treated as priorities we will have an optimum solution in our health sector.

Keywords: Logistic Regression, Malaria, Typhoid, Anemia, Peptic Ulcer, Hepatitis, Hypertension

0.0.68 BAYESIAN ESTIMATION OF EXPONENTIATED WEIBULL AND LOG LOGISTIC MODEL USING LAPLACE APPROXIMATION

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ABSTRACT: Bayesian inference is a powerful statistical methodology that facilitates the updating of probabilities for hypotheses as new evidence becomes available. This study delves into the realm of Bayesian estimation by applying Laplace's approximation to the Exponentiated Weibull and Log Logistic models, both vital in survival and reliability analysis. Through secondary collected data and simulation techniques, the models were scrutinized to uncover parameter estimates, model fit, and comparative performance. The Exponentiated Weibull model yielded parameter estimates such as beta, signifying skewness, and log. Sigma, indicating scale. Employing the Laplace Approximation method, alongside the Sampling Importance Resampling (SIR) technique, revealed insightful results. The Log Logistic model exhibited parameter estimates for beta and log. Sigma, while also showcasing favorable Deviance and Log Posterior values. A decisive comparison, facilitated by the Deviance Information Criterion (DIC), favored the Log Logistic model, indicating superior fit and balance between complexity and goodness of fit. This study showcases the prowess of Bayesian estimation through Laplace approximation in analyzing complex survival and reliability models, ultimately recommending the Log Logistic model for a more accurate representation of the given dataset.
KEYWORDS: Bayesian Estimation, Exponentiated Weibull, Log Logistic Model, Laplace Approximation, Sampling Importance Resampling (SIR) technique

0.0.69 COMPARATIVE ANALYSIS OF THREE CHILDHOOD KILLER DISEASES OF UNDER-FIVE CHILDREN IN BAUCHI

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ABSTRACT: This study analyzed a count data to determines and compared the deaths due to three childhood killer diseases (Malaria, Pneumonia and Measles)

of under-five children, a case study of Bauchi Specialist Hospital, using data from the medical record department of the hospital on number under-five mortality from 2015-2022. The objective of this study is to determine and compare the mortality prevalence of the three childhood killer diseases of under-five children. The result of the work reveals which among the diseases has the highest number of mortalities, will also show which gender group has the highest mortality and also show whether mortality is independent of gender or years or year of occurrence.
KEYWORDS: Children, Chi-Square, Killer Diseases, Malaria, Pneumonia, Measles

0.0.70 A Computerized Agro-Distribution Framework

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ABSTRACT: According to UNICEF, about 67% of children in the age range of 6 months to 2 years are undernourished (UNICEF, 2023). This is attributed to our food system which includes all aspects of feeding and nourishment. The current strategies adopted in our existing food system e.g. farming, processing, food supply chain, production and distribution affect the health of the people and call for proper distribution of agricultural products and services from where they are produced to where they are needed by the final consumers. This paper therefore presents a computer-based framework for agro-distribution of products and services. It handles prompt distribution of agricultural products and services to help manage food crisis which is one of the Sustainable Development Goals (SDGs). Majority of agricultural firms in third world countries suffer lack of proper management of resources including information about products, services, latest agricultural developments, delay in decision making and improper synergy between producers and prospective buyers. This is due to improper documentation of agricultural accomplishments, failures and feedback, absence of cost effective agricultural information dissemination system for training farmers and extension workers, improper use of ICT and big data tools in dispersing agricultural knowledge and latest technologies. The proposed framework handles proper dissemination of agricultural information leading to effective distribution of products and services. The framework ensures proper advertisement and linkage of consumers to the desired producers so as to manage the food crisis and poor industrialization confronting third world countries. It manages the distribution of agricultural products from local government to state and federal levels and hence recommends the agricultural products to be imported and exported. The application that demonstrates this framework is available at: https://github.com/Ogbodiya/George-.
Keywords: Agro-distribution, food security, big data, ICT Tools, food crisis

0.0.71 Inverted Dagum Distribution: Properties and Application to Lifetime Dataset

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Abstract: This article presents the introduction of a novel univariate probability distribution termed the inverted Dagum distribution. Extensive analysis of the statistical properties of this distribution, including the hazard function, survival function, Renyi's entropy, and quantile function of the distribution of the order statistics, was conducted. Parameter estimation of the model was performed utilizing the maximum likelihood method, with the consistency of the estimates validated through Monte Carlo simulation. Furthermore, the applicability of the proposed distribution was demonstrated through the analysis of two real datasets.
Keywords: Dagum distribution, maximum likelihood estimation, inverse transformation, probability density function, cumulative distribution function

0.0.72 DEVELOPMENT OF DEEP LEARNING MULTI–LAYER PERCEPTRON MODEL USING NEGATIVE BINOMIAL REGRESSION APPROACH FOR WAITING TIME PREDICTION

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ABSTRACT: Evidently queuing model has been very useful in identifying appropriate levels of staff, equipment, and beds along with in making decisions about resource allocation and the design of new services as well as Waiting Time (WT) estimation and predictions. However, the traditional Queuing Theory approach has been known not to be sufficient in real life applications because the methodology is limited, for instance, unrealistic assumptions of the time distribution it requires to do queuing analysis. Thus, the goal of this study is to develop deep learning multi – layer perceptron model using negative binomial regression approach for waiting time prediction and examine the existing used ML algorithms for WT prediction at different sample sizes of queuing and make an essential tools for responsive actions for any organization (i.e. healthcare centers) reporting long waiting times. The study sets to follow Monte Carlos Stimulation process and utilization of real-life data. Sequel to the developed multi-layer poisson regression (MLP- PR) and

following the shortcomings of poisson regression to account for overdispersion in count data as well as to regularize the problem of over-fitting in MLP approach, this pursues to introduce a Novel Multi-Layer Perceptron Negative Binomial Regression (MLP-NBR) for WT Prediction. The Novel model is expected to handle problem of overdispersion, autocorrelation and over-fitting more effectively compare to the MLP-PR.
Keywords:

0.0.73 Effect of Poverty on Malnutrition in Rural Development Using Iogistic Regression Model (A Case Study of Jigawa State)

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Abstract: Hunger among under special populace is broad generally in low and center pay networks in Jigawa State. Malnourished youngsters are frequently experiencing longer and serious sicknesses and have a higher danger of dying and have postponed engine advancement, lower psychological capacity, and helpless school execution. As per NDHIS 2018) 15%, 18% and 22% under five youngsters were squandered, hindered, and underweight separately in Jigawa State. Astounding upgrades have been seen on numerous areas in Jigawa State like enhancements in horticulture, instruction, wellbeing, financial and mechanical areas. The main aim of this work is to identify and examine the correlation relationship of nutritional status of under-five children in Jigawa state using ordinal logistic regression model in relation to Women Childbearing Age (15-49) years. This investigation utilize the Jigawa State Nourishment information in NDHIS 2018. Also, SPSS is use as measurable bundle for examination of information separated. Results shows that among 26v640 considered kids 22%, 72% and 6% were living in metropolitan, rustic, and Semi-country networks separately. The mean Z-scores tallness for-age, weight-for-age and weight-for stature were - 1.01, - 1.18 and - 0.87 separately and the predominance of hindering, underweight and squandering was 20.1%, 22.8% and 12.3% individually. The Coordination's investigation, utilizing chi square and single direction ANOVA test uncovered that period of youngsters, birthweight, space of home, abundance list, instruction of mother and family head, Mother's BMI, admittance to latrines and drinking water showed critical relationship with every one of the three markers of unhealthiness. In multivariate examination utilizing various straight relapses model showed that age and birth weight of kids was a huge indicator of hindering, underweight and squandering keeping other powerful factors at consistent.
Keywords: Malnutrition, stunting, underweight, wasting and under-five children

0.0.74 Exploring a Multi-Objective Continuation Method for Regularization Path Computation in Deep Neural Networks

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Abstract: The pursuit of sparsity in deep neural networks (DNNs) is driven by its potential to enhance numerical efficiency, model interpretability, and robustness. In the realm of linear models, a well-established concept is the regularization path, which connects the sparsest solution, characterized by zero weights via the L1 norm, with the non-regularized solution. Recently, efforts have been made to extend this notion to DNNs by treating empirical loss and sparsity (L1 norm) as conflicting criteria within a multiobjective optimization framework for low-dimensional DNNs. However, due to the non-smooth nature of the L1 norm and the large parameter space, this approach proves computationally demanding for high-dimensional DNNs. In response, we introduce an algorithm designed to efficiently approximate the entire Pareto front for the stated objectives. We demonstrate convergence in deterministic scenarios and provide numerical illustrations utilizing both deterministic and stochastic gradient methods.
Keywords:

0.0.75 Evaluating the Groundwater Reservoir Quality in F.C.T Abuja and its Health Implication Using Statistical Approaches

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ABSTRACT: This paper highlights the standard of groundwater sources its effects on health in FCT, Abuja. Hand dug well and borehole water samples were collected from three locations Abaji, Kwali, and Gwagwalada F.C.T. Abuja. The samples collected from those locations were analysed using SPSS. The test results obtained and recorded with reference to physical, chemical and biological procedures was done in accordance with WHO & NGSDWQ standard. The physical tests done includes colour, turbidity and Total Dissolved Solid TDS. All parameters with respect

to physical tests were recorded for all the samples. The chemical results show that the PH value ranges from 6.68-7.37 which indicates alkalinity. The water hardness of hand dug wells ranges from 14-370 with an average value of 187 which indicates moderately hard water. Test results also show value above World Health organization (WHO) admissive limit and Nigeria Standard for Drinking Water (NGSDWQ). The chemical parameters obtained from the tests results shows that Ec, BOD, COD, HCO 3 , CO3, SO 4 , CL, NO 3 , Ca and heavy metals including Pb, Cd, Cu, Fe, Mn, Zn and Ca in all the other waters samples collected and analysed were within the allowable limits. The analysis of variance (ANOVA) shows that there was a significant difference in Total Bacteria Count (TBC) in those locations with respect to borehole samples collected at P>0.05. Analysis of variance also shows that there was a significant difference in Fe, Mn, Cu and Cd between the well in those locations. The analysis done has revealed that regular routine monitoring by concerned authorities should be adhered to ensure compliance and safety among many other recommendations for further research.
Keywords:

0.0.76 A Markovian Model for Rainfall Pattern in Owerri Area of Imo State, Nigeria

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ABSTRACT: Inadequate knowledge of some weather parameters in the Owerri area for cropping and storage of some agricultural products is addressed in this paper. The work centers on the estimation of the mean first passage times and mean recurrence times of rainfall in the Owerri area. A three-state, first-order Markov chain model was employed to examine these weather parameters for the area. Monthly rainfall data spanning from 1987 to 2022 were used for the evaluation of the method. Results show that the mean recurrent times for dry-dry, wet-wet, and rain-rain in the area are 4.4248, 5.2910, and 1.7094 respectively with a weather cycle of about 11 days. In the long run, the area is expected to experience 23%, 18%, and 59% of the months to be dry, wet, and rainy respectively. Root crop and perishable crop farmers are encouraged to take advantage of these results to optimize their output.
KEYWORDS: Equilibrium probabilities; Markov chain; Mean first passage times; Mean recurrence times. Rainfall.

0.0.77 Data Analytics of Non-Clinical COVID-19 Preventive Measures

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Abstract: This study investigates the public interest and awareness surrounding non-clinical COVID-19 pre- ventive measures, including Hand sanitizer, Face mask usage, Social distancing, and Lockdown implementation, on the trends of the pandemic. With the recent global pandemic persisted, un- derstanding public engagement with preventive measures beyond medical interventions is crucial for effective public health communication. Through Google Trends analysis, we explored methods such as correlation matrix, variance inflation factor, and eigenvalue for multicollinearity detection; Breusch–Pagan, White and Breusch–Godfrey tests were utilized. The result shows that Face mask and Lockdown were negatively correlated with the COVID-19 trends, whereas negligible associa- tion were found for Hand sanitizer and Social distancing trends. Furthermore, no multicollinearity is detected, the condition indices are less than 10, this indicating no variable having two or more variance proportion greater than 0.5 or more. This results explored the temporal variations, dis- parities, and correlations between these preventive measures and the pandemic's progression. The findings shed light on the public's awareness, compliance, and behavioral shifts towards these preventive measures over time, offering insights for policymakers and public health authorities in guiding effective strategies to mitigate the spread of COVID-19.
Keywords: COVID-19, Multicollinearity, Heteroscedasticity, Non-Clinical Preventive measures, Google Trends

0.0.78 Mathematical Analysis of Malaria-Cholera Co-infection in the Presence of Treatment

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Abstract: This paper presents a new mathematical model comprising fourteen (14) compartments to study the dynamics of malaria and cholera co-infection in a population. Initially, sub-models for malaria and cholera are examined separately, followed by the integration into a combined co- infection model. Stability analysis is conducted for each model variant, assessing the existence of disease-free and endemic equilibrium points. The Basic Reproduction Number R_0 is calculated using the Next Generation Matrix Method, indicating stability when below unity ($R_0 < 1$) and instability when exceeding unity ($R_0 > 1$). Numerical analysis demonstrates that increasing treatment rates for the exposed class reduces the spread of malaria and cholera by decreasing the population size of exposed and infected individuals while increasing the recovered population size.

Keywords: Disease free equilibrium, Reproduction number, Stability, Malaria, Cholera, Malaria/Cholera Co-infection.

0.0.79 On the Selection of Best Approximating Transformation Amongst Competing Transformations in Time Series Modeling

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ABSTRACT: The focus of this study is to propose a method of selecting best approximating transformation amongst competing transformations in Time series modeling. The study utilized forecast accuracy measure (FAM) from the fitted model and summary statistics of the residuals for the comparison. The study series (X_t) was obtained from the Federal Road Safety Corps Port Harcourt, Rivers State on the number of road traffic accidents for the period January 1, 2013 to December 31, 2022. Regressing the natural logarithm of the periodic standard deviation on the natural logarithm of the periodic averages of the original series yielded regression coefficient $\beta = 0.808$. Consequently, test of the significance of regression coefficient suggested that the study series admit three competing transformations, namely, Square Root, Log transformations and including the Exact transformation. The result of the analyses suggest AR (1) using square root transformation, and ARMA (1, 1) using exact and log transformations respectively as the tentative model that describes the Time series data. However, on further examination of the model residuals based on the summary statistics and forecast error, it was observed that ARMA (1, 1) produced better fit for most of the time points with minimum variation using log transformation. It is therefore recommended that when a study series admits more than one transformation with $0.8 \leq \beta \leq 1.0$, the $\log_e$ transformation should be considered as the best approximating transformation.

Keywords: Approximating Transformation, Periodic Averages and Standard Deviations, Residuals, Forecast Accuracy Measure, ARMA Models

0.0.80 Resonance Effect Exhibited by Tumor Microenvironmental Factors on Tumor Growth modeled by Correlated Colored Noises

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Abstract: The tumor response to the resonance effect exhibited by some non-immunogenic micro- environmental factors within the tumor site modeled by additive and multiplicative colored Gaussian noises is investigated. Using the Novikov theorem, Fox approach and the Ansatz of Hanggi, an analytic expression approximate Fokker-Planck equation for the time evolution of probability density $p\left(x,t|x',t'\right)$ is obtained. Numerical results reveal that the resonance effect exhibited by some non-immunogenic microenvironmental factors within the tumor site may be one of the factors responsible for their double edge effect of either promoting or inhibiting tumor growth.
Keywords: Langevin equation, Fokker-Planck Equation, Colored Noise, Tumor microenvironment

0.0.81 An Intrusion Detection System based on Enhanced CNN Architecture on the IoTID20 Dataset

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Abstract: Intrusion Detection System (IDS) is a combination of software and hardware utilized to monitor and identify anomalous activities within a network or device. Literature reported the use of IDS to provide extra layer of defence in an Internet of Things (IoT) environment. IoT being an intelligent network that provide ac-

cessibility of its devices through unprotected network. As a result, IoT network is subjected to various security vulnerabilities and malicious attacks. Research shows that there's a need for an intelligent IDS. This study aims to address these security challenges by improving the effectiveness and efficiency of Intrusion Detection Systems (IDSs) through the introduction of a novel Convolutional Neural Network (CNN) model. To test the effectiveness of the model an IoTID20 dataset is utilized. Accuracy is used as an evaluation metrics. The results of the experiment shows that the proposed CNN model achieved 98.98% accuracy. The accuracy recorded outperforms the existing results in the literature.
Keywords: Convolutional Neural Network, Internet of Things, Intrusion Detection Systems

0.0.82 A RANDOM FOREST ANALYSIS OF THE STOCK PRICE TRENDS OF THE NIGERIA STOCK EXCHANGE MARKET

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ABSTRACT: Random forest regression is one of the mostly used algorithms to solve regression problems due to its lack of complexity and extremely greater accuracy. Random forest is majorly useful for predictive and comparative measures. This study examines the stock price trends on the Nigerian stock exchange market using historical market data by partitioning the dataset into train set and test set and also considering various time periods. The random forest model was also validated using a robust methodology, such as cross-validation, to ensure its generalizability. Results show that the improved forest achieved through cross-validation with grid search has a slight improvement in predictive accuracy when compared to the initially created model. This improvement suggests that the hyperparameter adjusted through grid search contributed to enhancing the model performance. In conclusion, it is essential to note from the study that the random factor involved in selecting data for each tree in a random forest prevent the result from being consistently the same. Therefore, even if the entire algorithm describe in this study is repeated, it is likely that slightly different metrics will be obtained for the resulting model.
Keywords: Random forest Regression, Stock Market, Stock price, Grid search, Cross validation

0.0.83 LOG-LINEAR ANALYSIS OF HIERARCHICAL MODELING OF THE RISK FACTORS OF HYPERTENSION IN SOME SELECTED HOSPITAL IN KEBBI STATE

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Abstract: The aim of the study is to understand the interactions and contributions of different risk factors of hypertension by fitting log-linear models, testing for main and interaction effects, evaluating goodness-of-fit measures, and checking the inferential relationships among the variables in some selected hospitals in Kebbi State. The data-set made up of 405 justifiable cases of four risk factors. Cell counts and residuals investigated the correlation between observed and expected frequencies for various combinations of risk factors. goodness-of-fit measures, and making inferences about the relationships among the variables. The data-set consisted of 405 valid cases of four risk factors. Cell counts and residuals examined the match between observed and expected frequencies for different combinations of risk. The analysis was done with the use of SPSS software. There was a strong fit of the log-linear models to the data. Extremely small p- values showed a high level of statistical significance and a perfect fit. The K-Way and Higher- Order Effects analysis explaint the significance of different orders of effects. The outcome revealed that first, second, and third-order effects had high statistical significance, while fourth- order effects proved insignificant. Backward elimination statistics were used to purify the model by removing non-significant variables. The iterative procedure helped discovered the most thrifty and interpret-able model. The goodness-of-fit tests conducted on the final model confirm its suitability, with both the likelihood ratio test and the Pearson test yielding high p-values. These results revealed a strong fit between the model and the observed data.
Keywords: Hierarchical Modeling, Hypertension, Risk factors, Log-linear

0.0.84 A BAYESIAN TECHNIQUE ON SCALE PARAMETER OF LOG GAMMA DISTRIBUTION UNDER QUADRATIC, SE AND WB LOSS FUNCTIONS

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Abstract: In this paper, Inverse Chi Square and Inverse Gamma are used to estimate scale parameter of Log Gamma Distribution. For best results, three measures of loss functions; Quadratic, Squared Error and Weighted Balance loss functions are compared. The results showed that as the estimate of scale parameter decrease so increase in the estimate of shape parameter. However, Inverse chi square prior was observed to perform better than Inverse Gamma prior while posterior risk for QLF out performed that of SELF and WBLF respectively.
Keywords:

0.0.85 EXAMINING THE RELATIONSHIP BETWEEN SOCIAL MEDIA USAGE AND UNETHICAL BEHAVIORS, INCLUDING CYBERBULLYING, AMONG UNIVERSITY UNDERGRADUATES

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ABSTRACT: In recent years, there has been a paradigm shift in communication, networking, and information dissemination among people occasioned by the widespread adoption of social media platforms. Despite the numerous benefits social media offers, its dynamic nature characterised by instant communication, vast networks, and user- generated content, raises questions about the ethical implications of online interactions especially for undergraduate students. This study investigated the relationship between social media usage and unethical behaviours among undergraduate students of the University of Nigeria, Nsukka (UNN). We employed a non-experimental approach, utilising a quantitative design and deductive techniques to gain insights into the data collected through a structured questionnaire. Correlation, chi-squared tests, and ANOVA were used to explore the associations between social media usage and unethical behaviours. The correlation coefficient of ($r = -0.028$) obtained revealed a weak negative relationship between social media usage and unethical behaviour, which suggests that social media usage does not have a strong impact on unethical behaviour among undergraduate students. A chi-square test of independence was subsequently conducted to further investigate the relationship. The test yielded a chi-square statistic of 9.27 ($p = 0.413$). As the p-value exceeded the conventional threshold of 0.05, it failed to reject the null hypothesis, indicating no statistically significant association between social media use and exam malpractice. An ANOVA was employed to compare the means of cyberbullying exposure across different social media usage categories, the ANOVA results showed no significant difference ($F = 16.29$, $p = 0.178$) in cyberbullying experiences across varying social media usage patterns.
Keywords: Social Media, undergraduate, unethical, usage, cyberbullying

0.0.86 Comparative Analysis of Long Short-Term Memory (LSTM) Neural Networks Variants in Multivariate Time Series Forecasting

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Abstract: This study investigates the performance of various distinct variants of Long Short-Term Memory (LSTM) neural networks—single LSTM, bidirectional LSTM, and stacked LSTM—in forecasting multivariate time series. The investigation assesses their capacity in capturing temporal dependencies and forecast. Two distinct datasets were used to facilitate this investigation,: a simulated dataset comprising two variables representing daily returns and a real dataset containing daily official Naira exchange rate prices against three different currencies. Both sets of data were split into two subsets: the in-sample data, which were used for model estimation and the out-of-sample data, which were used for out-of-sample prediction evaluation. The data underwent preprocessing and formatting for LSTM input before training LSTM architectures. Furthermore, forecasting precision of the models were evaluated and compared through the use of Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE) performance metrics. The results revealed that the stacked LSTM consistently outperformed both single LSTM and bidirectional LSTM models across both datasets, demonstrating its efficiency in financial time series forecasting.
Keywords: Multivariate time series, Long Short-Term Memory (LSTM), Forecasting, Performance metrics

0.0.87 ASYMPTOTIC EFFICIENCY OF TRANSFORMED MAXIMUM LIKELIHOOD ESTIMATOR FOR TWO-PARAMETER LOGNORMAL DISTRIBUTION ON NOISE POLLUTION CONTAMINANTS

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Abstract: Environmental noise contaminant observables sourced from three different generator plants of 2000kva capacity in Ibadan industrial layout were fitted using a two-parameter lognormal distribution. This paper proposes the transformed

maximum likelihood estimator for 2P-LND providing an extension to the log- likelihood function for accomodating a multifactor structure to suiting independent estimate of the parameters of the distribution for the three different plants considered. This new approach validated the asymptotic theory of uniformly minimum variance unbiased estimator among its peer estimators for both fixed and random effect model of observable contaminants from their respective noise levels was affirmed by Kolmogorov-Smirnov one sample test at level of significance as the null hypothesis of the lognormal distribution being appropriate for the generator noise levels could not be rejected.

Keywords: Likelihood function, Lognornal distribution, Noise pollution levels

0.0.88 A STUDY OF LOGNORMAL DISTRIBUTION FOR MONITORING MEASUREMENT OF BLOOD PRESSURE LEVELS IN OWO METROPOLITAN AREA

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Abstract: This study aimed to investigate the distribution of blood pressure measurement levels in a population of Owo metropolis and determine if it followed a two-parameter lognormal distribution modelling with unbiased methods of maximum likelihood and moments. The study used the Kolmogorov-Smirnov one- sample test to evaluate the goodness of fit of the lognormal distribution to the data. The results of the analysis showed that blood pressure measurement levels significantly followed a two-parameter lognormal distribution with the method of maximum likelihood as a better estimator (minimum variance), indicating that the distribution of blood pressure measurements can be accurately modelled using this type of distribution. The study found that the lognormal distribution accurately captures the skewed shape of the data, with the majority of measurements falling on the lower end of the scale and a long tail extending towards higher values. The mean and standard deviation of the distribution were used to describe the central tendency and variability of the data, respectively. These findings have important implications for healthcare professionals, as they can use this information to better understand the distribution of blood pressure measurements in the population of Owo township and suburbs, and also identify individuals who may be at risk for hypertension or other cardiovascular conditions. The study also recommends that healthcare professionals use the lognormal distribution to model blood pressure measurements, pay attention to the long tail of the distribution, monitor and track blood pressure regularly, and also consider individual factors when assessing an individual's blood pressure measurements. Overall, the findings of this study contribute to a better understanding of the distribution of blood pressure measurements and pro-

vide insights into how this information can be used to improve healthcare outcomes. The study also highlights the importance of regular monitoring of blood pressure and individualized healthcare interventions to prevent and treat hypertension and other cardiovascular conditions.

Keywords: Blood pressure levels, 2-P Lognornal distribution, Maximum likelihood, Mothod of moments

0.0.89 Utilizing CART Classification Decision Tree Model to Examine Unemployment Trend in Nigeria

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Abstract: This particular study utilizes CART classification decision tree models to examine thirty - three years of unemployment information in Nigeria, derived from the World Bank along with the International Labour Organization. The research confirms the usefulness of the CART design for learning the complicated dynamics of unemployment in Nigeria through thorough statistical tests, like the Breusch Pagan test for heteroscedasticity, the ADF device root test for stationarity and also the BDS test for nonlinearity. Important elements including household income, the industry sector in addition to education are identified and also highlighted their importance in determining unemployment rates. Results demonstrated the sequence of unemployment rates is stationary yet nonlinear, highlighting the complicated nature of unemployment dynamics. CART models display substantial predictive accuracy, discover considerable predictors of unemployment, and also offer insights for policy formulation. This research plays a role in the literature by introducing a novel approach to examining unemployment rates in Nigeria and stresses the need for innovative analytical methods to tackle socioeconomic challenges.

Keywords: CART Classification, Decision Tree Model, Examination, Machine Learning, Unemployment Trend

0.0.90 Optimization and Analysis of MV-Optimal Semi-Latin Squares: A Study of Canonical Efficiency and Multiplicity Factors

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Abstract: This research aims to delve deeper into the realm of MV-optimal semi-Latin squares, as identified within the context of constructing and evaluating designs of order six with block size three. The study will concentrate on optimizing MV efficiency measures while exploring the influence of canonical efficiency factors and multiplicity on the design's performance. Utilizing statistical evaluation techniques, the research will analyse a subset of semi-Latin squares to identify patterns, characteristics, and strategies for achieving MV optimality. By focusing on MV efficiency as a primary criterion, the study seeks to contribute to the understanding of optimal design construction methodologies and their applications in various fields, including experimental design, combinatorial optimization, and statistical analysis.
Keywords: MV-optimal design, semi-Latin squares, canonical efficiency

0.0.91 COMPARATIVE STUDY OF MEMORY-TYPE CONTROL CHARTS FOR MONITORING COVID-19 INFECTIONS IN NIGERIA

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Abstract: Similar to other parts of the world, the outbreak of COVID-19 in Nigeria has necessitated the development of effective monitoring and control strategies to mitigate its spread. Our study aims to compare and evaluate the performance of memory-type control charts, specifically the Exponentially Weighted Moving Average (EWMA) chart and the Cumulative Sum (CUSUM) chart for monitoring COVID-19 infections in Nigeria. The study collects and preprocesses COVID-19 data from official health records, testing data, and epidemiological reports in Nigeria. It then applies the EWMA and CUSUM control charts to assess their performance in detecting changes, identifying outbreaks, and providing actionable insights and evaluates statistical measures such as false positive rates, false negative rates, average run lengths, and power of detection to determine the superiority of memory-type control charts. The findings indicate that the EWMA chart, particularly with lower lambda values, is effective in detecting shifts in infection rates, outperforming the CUSUM chart. Recommendations include implementing the EWMA chart

with lower lambda values as a monitoring tool, continuously evaluating and optimizing control chart parameters, integrating real-time data analysis, considering contextual factors specific to Nigeria, and conducting further research to explore additional influencing factors. The study contributes to the advancement of statistical process control for infectious diseases, provides insights for enhancing monitoring and control systems, and has practical implications for public health authorities and policymakers in Nigeria and similar settings worldwide. **Keywords**: Control charts, COVID-19 monitoring, Memory-type control charts, Exponentially Weighted Moving Average (EWMA), Cumulative Sum (CUSUM)

0.0.92 Enhanced Methods for Multicollinearity Management in Stochastic Frontier Analysis Estimation

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Abstract: This study proposes a new estimator called "Weighted Principal Component Analysis Estimation for Stochastic Frontier Analysis" (PCA-SFA), which leverages principal component analysis (PCA) techniques to correct the assumption violation of multicollinearity within the classical stochastic frontier analysis (SFA) model. Monte Carlo Simulation study was conducted to evaluate the efficacy of the proposed estimator. Results indicate that the PCA-SFA estimator outperform SFA models that overlook the violations of multicollinearity assumption. **Keywords**: Stochastic Frontier Analysis, Multicollinearity, Assumption Violations, Correction Methodologies

0.0.93 On Application of Time Series Model to the Monthly Reported Cases of Malaria in Nsukka Medical Centre, Enugu State, Nigeria (2015-2023)

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Abstract: In this study, a time series model is used to statistically analyze reported malaria cases in Nsukka Medical Centre from 2015-2023. In the course of this study, we identified a time series model, estimated the parameters, checked for the best model for prediction and made forecasts. The ACF and PACF plots cut off after lag 1. From the ACF and PACF, we obtained ARMA (1, 1) model. Furthermore, BIC (Bayesian information criterion), AIC (Akaike Criterion) and Schwartz were used in the model selection and ARMA (1, 0) was selected as the best model. Moreover, the test of model adequacy was conducted using Ljung-Box test and the result showed that the model is adequate. Forecast was made for January - December, 2024 using the model. It was noticed that the forecast showed a downward trend from January - December, 2024. The forecast results showed that the model can be good in monitoring malaria cases within and outside vicinity of Nsukka, Enugu State, Nigeria.
Keywords: Auto regressive, Box-Jenkins, Forecasting, Malaria, Moving average

0.0.94 TWO WAY CONTINGENCY TABLE ANALYSIS FOR CASUALTY DUE TO ROAD TRAFFIC CRASHES

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ABSTRACT: Road traffic crash is an event on the road that is wished never to occur. Much more scared and worrisome is casualty due to road traffic crash. As a nation it is important to know where casualty due to road traffic crash occurs the most for appropriate interventions. This study aimed at investigating whether there is significant relationship between geo political regions in Nigeria and outcome of road traffic crash, where the target outcome is the casualty due to road traffic crashes. Data on number of casualties and non-casualties for each geopolitical region of Nigeria from the year 2016 to 2022 was collected and presented in a contingency table. Pearson Chi Square test and Likelihood Ratio Chi Square test for independence were used to determine whether there is relationship between the geopolitical

region and outcome of road traffic crash. Result revealed that there is significant relationship between the two categorical variables. To determine significant associations in the contingency table, 15 possible local tables were derived from the contingency table, and odds ratio as a measure of association was employed. Results revealed that significantly, the odds ratio for each of the 15 possible local tables is not equal to 1. Conclusively, the geopolitical region with the least casualties due to road traffic crashes in Nigeria is South East. Higher than South East region is South South region. Higher than South South region is South West Region. Higher than South West region is North West region. Higher than North West region is North East Region. The geopolitical region with the greatest casualties due to road traffic crash in Nigeria is North Central. Generally, the Northern region of Nigeria suffered higher casualties than the Southern region. More attention needs be given to stop the higher casualties suffered in the Northern region of Nigeria, and particularly, in the North Central region.

Keywords:

0.0.95 MODELLING THE IMPACT OF INTEREST RATE, INFLATION RATE AND EXCHANGE RATE ON THE NIGERIA ECONOMY: 1990 – 2022

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Abstract: The study focuses on developing Autoregressive Distributed Lag (ARDL) model to examine the impact of real interest rate, CPI inflation rate and real effective exchange rate on the Nigerian economy for the period of 1990 – 2022. Gross domestic product was used as proxy for Nigeria economy. Data used for the study was obtained from World Bank website. Due to the fact that ordinary least square (OLS) resulted in a spurious regression, Phillip-Perron unit root test was conducted and ardl-bound testing was used to examine the presence of cointegration. The result of unit indicated that interest rate was stationary at level while gross domestic product (gdp), inflation rate, and exchange rate were integrated of order one I(1). The result of ardl-bound test revealed the presence of cointegration jointly among the variables. The short-run model indicated that, on the short-run, inflation rate and its pass value and exchange rate and its pass value had negative and significant impact on Nigeria economy. Also, a negative coefficient of error correction term revealed that there may be a long-run impact from interest rate, inflation rate and exchange rate to Nigeria economic growth. The lon-run model showed negative impact from interest rate, inflation rate and exchange rate on the Nigeria economy

although the coefficient of real effective exchange rate was not statistically significant. Consequent upon this, the study therefore recommended among others; good policy on stable interest rate, inflation rate and exchange rate that will brings about positive influence on the Nigerian economy.
Keywords: Modelling, Ordinary least square, Autoregressive distributed lags, Exchange rate, Interest rate, Inflation rate, Economy growth

0.0.96 ANALYSIS OF THE ANNUAL STREAMFLOW TRENDS AND VARIABILITY EFFECTS OF SHIRORO RESERVOIR ON THE PEOPLE OF SHIRORO LOCAL GOVERNMENT AREA, NIGER STATE. NIGERIA

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Abstract: The main objective of this study is to investigate the trend and effects of the annual streamflow of Shiroro reservoir. One of the effects of streamflow variability is the flooding menace which has now become a recurrent annual disaster in Shiroro local government area, Niger state. In 1999 and 2003, when Shiroro reservoir spilled, some villages and communities were completely submerged under water. Deaths occur, valuables lost, farm lands devastated, while hundreds of thousands of persons were displaced. Data on annual streamflow for a period of twenty-five (25) years (1996 – 2020) was obtained from the Meteorological Station at Shiroro. The data was analysed using the Extreme Value Theory (EVT). Equation $X_T = 3468.5 + 1341(0.81y_T - 0.405)$ was developed and forecasts for the return periods of 5, 10, 50, 100, and 150 years was made. The results showed an upward trend and threats of annual flood and flooding activities flood. It is therefore recommended that more dams be constructed to harvest the flood water and that Shiroro reservoir be dredged and well channeled so as to reduce depth of runoff during the full wet seasons. Predictions to utilize the potential usage of the reservoir effectively were also made.
Keywords: Dam, Flooding, Reservoir, Streamflow, and Variation

0.0.97 Computing proton stopping power ratio on CT image domain using machine learning approach

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Abstract: A model and machine learning approach for computing proton stopping power ratio (SPR) on CT image domain is presented. The model is developed using empirical relationship between CT numbers and SPR. The presented method is compared with other popular existing methods for computing SPR. Tissue classification is also used to improve the estimation accuracy. The method gives good result with modeling RMSE of 0.38%, low bias with mean error close to 0.00% and exhibited more robustness as observed from the testing errors.
Keywords: Stopping power ratio, Proton therapy, Machine learning, Mathematical model

0.0.98 Mathematical model on estimating relative electron density and effective atomic number using CT image

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Abstract: A model for estimating relative electron density and effective atomic number for human tissues is proposed. The model is compared to some of the popular existing models. The study focused on the use of this quantities for computing radiation therapy treatment values. The model is easy to implement and showed good performance on estimating these two quantities using theoretical values of the CT numbers (which is computed using linear attenuation coefficients); it gives modeling error of 0.32% for relative electron density and 1.66% for effective atomic number.
Keywords: Mathematical model, Relative electron density, Effective atomic number, Empirical computation.

0.0.99 Stochastic Comparison of lifetimes of series and parallel Systems with Dependent Heterogeneous Weibull-Rayleigh Distributed Components under Random Shocks

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ABSTRACT: Several strategies for the analysis of coherent systems in reliability theory have been studied by different researchers. Here, based on majorization order and symmetry or asymmetry functions, we carry out stochastic comparisons of lifetimes of two series (parallel) systems with dependent Weibull-Rayleigh components under random shocks. Hazard rate ordering and likelihood ratio ordering is utilized as an applicable tool for the study and comparison of the selected systems. The parallel and series systems with shared components are studied by their corresponding surviving probabilities from random shocks on their reliability. The theoretical findings show that the weaker heterogeneity of shape parameters in terms of the weak majorization order results in the larger reliability of series and parallel systems and indicate that the more heterogeneity among the transformations of surviving probabilities from random shocks according to the weak majorization order leads to larger lifetimes of the parallel system.
Keywords: Stochastic order, reliability systems, Weibull-Rayleigh distribution, Archimedean copula, Random shock

0.0.100 A BOX-JENKINS ARIMA APPROACH FOR INFANT MORTALITY RATE IN MAIDGURI

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ABSTRACT: The research utilizes the ARIMA model to conduct a comprehensive time series analysis on infant mortality rates in Maiduguri, revealing both trend and seasonality. For both genders, there's a recent fluctuation in trends. Autocorrelation and partial autocorrelation functions are employed to determine the model's order. The data were transfigured into stationary by differencing once after which ADF and KPSS were to confirm the stationary status. several tentative models

were fitted and assessed for best fit; using the AIC, BIC and HQIC criteria. The chosen models, ARIMA (1,1,1), is validated through diagnostics and employed for forecasting. Forecasts for 2025 indicate an unstable trend for males and stability for females. Recommendations include enhancing delivery channels and community-based services, particularly in high-mortality areas, emphasizing girl-child education through religious and traditional leader advocacy campaigns.
Keywords: assess, child, death, fitted, order

0.0.101 MULTIPLE-SET SPLIT FEASIBILITY PROBLEMS FOR ASYMPTOTICALLY PSEUDO-NONSPREADING MAPPINGS IN HILBERT SPACES

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Abstract. In this paper, we introduce a new class of asymptotically pseudononspreading mappings and demon- strate its relationship with the existing related families of mappings. Again, demiclosedness principle for the mapping as well as the convexity and closedness of its fixed point set are established. Also, we propose and inves- tigate a new iterative algorithm for solving multiple-set split feasibility problem for the new class of mappings. In particular, weak and strong convergence theorems for solving above problem for the new class of mappings in infinite-dimensional Hilbert spaces are proved together with its application. The results presented in the paper extend and improve the results of Osilike and Isiogugu [10], Quan and Chang [12], Quan et al [13] and host of other corresponding related results in literature.
Keywords: multiple-set split feasibility, asymptotically pseudononspreading mappings; fixed point set, demiclosed- ness principle, weak convergence, strong convergence

0.0.102 STATISTICAL ANALYSIS OF ROAD ACCIDENT IN NIGERIA FOR THE YEAR 2022

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ABSTRACT This study focused on statistical analysis of road accident in Nigeria for the year 2022. The increasing cases of road traffic accident in Nigeria, has called for evidence based holistic attention and approach towards reducing its occurrence considering the magnitude of the problem it presents to every Nigerian road users. This study used secondary source of data collection with data obtained from Federal Road Safety Corps (FRSC). The Multiple Bar Chart, Chi-Square test and Friedman test were used to analyze the data. The findings of this study revealed from graphical presentation that Quarter 1 had the highest number of casualties and people involved while Quarter 4 had highest number of cases. North Central has the highest number of cases, North West has the highest number of casualties and South West has the highest number of people involved. The result of Chi-Square test showed that the issues of road accidents in Nigeria depends on quarterly period of the year and zonal division of the country since their p-values were less than 0.05 level of significance. The Friedman test also revealed that the issues of road accidents in Nigeria are not the same across quarterly period of the year and zonal division of the country since their p-values were less than 0.05 level of significance. Further test was conducted and it was found that Quarter 1 and South West are the period and the zonal division of the country that has the highest issues of accidents in Nigeria.
Keywords: Road accident, Casualties, Road Safety, Geo-Political Zones

0.0.103 STATISTICAL ANALYSIS OF REPORTED CASES OF RENAL FAILURE IN ANAMBRA STATE

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Abstract Renal disease rank high as one of the causes of global death. This study investigated reported cases of renal disease in Anambra State from 2010 – 2021. Three research questions and one hypothesis guided the study. The study adopted ex-post facto research design and Method of least square, Chi square and Pearson correlation analysis were used in the analysis. The results revealed that renal failure

is independent of sex and Body Mass Index (BMI), but depends on age with growth rate of 2.7%. It was recommended among others that people should be mindful of what they consume.
KEYWORDS: Renal failure, Chronic Kidney disease, Trend, Growth rate

0.0.104 An empirical comparison of multivariate classifiers under different underlying distributions

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ABSTRACT: Classification is a statistical method where the model tries to predict the correct group of a given input data based on predetermined characteristics.This work evaluates and compares the performance of different parametric and nonparametric classifiers for the classification of multivariate normal, multivariate t-distribution and multivariate exponential datasets simulated in R-studio. The datasets were generated using different sample sizes, number of variables, distances between the group mean vectors and degrees of freedom. The classifiers considered are linear discriminant (LD), Logistic regression, naïve Bayes, support vector machines (SVM), k-nearest neighbours and decision trees and the performance measure used was the misclassification rate (error rate). The results showed that the LD gave the best classification under the multivariate normal distribution, when the distance between the mean vectors is small irrespective of the number of variables and sample sizes. When the distance between the mean vectors is large irrespective of the number of variables and sample size, the LD, Logistic regression, SVM and k-NN showed good classification performances. When classifying under different multivariate distributions, the result showed a significant variation from those of multivariate normality.
Keywords: multivariate classifier, misclassification rate, k-nearest neighbor, linear discriminant classification, naïve Bayes.

0.0.105 MODELLING AND FORECASTING NIGERIA'S GROSS DOMESTIC PRODUCT (GDP) WITH HYBRID ARIMA-RBF MODEL

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Abstract: A nation's GDP is an important index reflecting development in economy and incomes. This paper studied the hybrid of Autoregressive Integrated Moving

Average (ARIMA) and Radial Basis Function (RBF) that best fitted Nigeria's yearly Gross Domestic Product (GDP) for the period 1960-2022. The series was tested for stationarity using Augmented Dick Fuller test (ADF) and was seen to be stationary at the second differencing. ARIMA (3, 2, 1) was identified as an appropriate ARIMA model. Thereafter, RBF was used to model the nonlinearity in the residuals of the selected ARIMA. The best RBF model was the one consisting of one input with one neuron, tone hidden layer with ten neurons and one output layer with one neuron N (1,10,1) . The results of the out-of-sample forecasted period showed that hybrid ARIMA-RBF outperformed the standalone ARIMA model.
Keywords: Modelling, Forecasting, GDP, Hybrid ARIMA-RBF

0.0.106 Evaluation of Generalized Scaled-Deviation of Third-order Augmented Orthogonal Composite Designs

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ABSTRACT: The generalized scaled-deviation (GSD) criterion plays a pivotal role in enhancing parameter estimation precision within response surface designs. This study investigates GSD and its variants, including GSD_l , GSD_q , GSD_b , and GSD_c , which respectively pertain to full, linear, quadratic, bilinear, and cubic coefficients estimation of augmented orthogonal uniform composite designs (AOUCDs) and augmented orthogonal uniform composite minimax loss designs (AOUCM). The results showed that AOUCM designs performed better in terms of the full model, linear, quadratic, bilinear and cubic coefficients with the least GSD, GSD_l , GSD_q , GSD_b , and GSD_c values, emphasizing their effectiveness in enhancing parameter estimation precision.
Keywords: Generalized scaled-deviation; Response surface designs; Third-order models; Optimality criterion

0.0.107 PROPORTIONAL ODDS MODELLING OF HIV INFECTION AMONG PREGNANT WOMEN

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Abstract: The HIV virus is a cankerworm that is bedeviling human-kind, with sequel advancement to Acquired Immuno-deficiency Syndrome (AIDS), if not prop-

erly managed can have effect on the socio-demographic factors. The study aimed at determining the impact of socio-demographic factors that affects HIV status of pregnant women in Imo state using a Proportional Odds Model. It was discovered that single women within the Age (15-19) years and resident in the rural area were the factors that contributed to the reason why these pregnant women are prone to contacting HIV/AIDS infection in Imo State.

Keywords: HIV, AIDS, Proportional odds modelling, Socio-demographic factors, Pregnant women

0.0.108 Modeling and Forecasting of Naira/USD Dollar Exchange Rates: Insights from Machine Learning Algorithms

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Abstract: One of the major topical issues in Nigeria now is the very disturbing increase in Naira/US dollar exchange rates. The negative economic effects of this have been felt in all aspects of Nigeria's economy and its rates have been observed to be one of the major factors responsible for the increase in inflation rate in Nigeria. To derive meaningful insights into the future trend of Naira/ US dollar exchange rates, this study applied five Machine Learning algorithms (Random Forest, AdaBoost, Decision tree, gradient boosting, and bagging regression) to model and forecast the Naira/ US dollar Exchange rate. Data on daily Naira to US dollar exchange rates between 10/12/2001 and 17/04/2024 were obtained from the Central Bank of Nigeria (CBN). Relevant data preprocessing was carried out and the performance of these Machine Learning algorithms was evaluated using Root Mean Square Error (RMSE), R^2 , adjusted R^2 , and Mean Absolute Error (MAE). Seventy percent (70%) of the data was used in training and 30% were used in validation. Descriptive statistics show a maximum exchange rate of N 883.06 per dollar with minimum and mean exchange rates of N 256.41 per USD dollar and N 1662.35 per US dollar respectively within the period. The series was also found to be skewed to the right. Results of the performance evaluation of these ML algorithms reveal that Random Forest gave the least RMSE (33.5606), the least MAE (3.6489), the highest R^2 (0.9730) as well as the highest value of the adjusted R^2 (0.9729) compared with other Machine Learning algorithms considered. The result of the 15-day prediction reveals that the Naira/US dollar rate cannot go below N1100 per $1 in the coming 15 days. This study concludes that the Random Forest (RF) regression performed better than other ML algorithms. Therefore, to save the

Naira from complete collapse, the government through the Central Bank of Nigeria (CBN) must come out with workable monetary policies that will help strengthen the value of the Naira. There is also a need for us to reduce imports by moving from a consumption economy to a production economy.
Keywords: Dollar, Naira, Machine Learning, Random Forest, AdaBoost

0.0.109 Evaluating the Groundwater Reservoir Quality in F.C.T Abuja and its Health Implication Using Statistical Approaches

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ABSTRACT: This paper highlights the standard of groundwater sources its effects on health in FCT, Abuja. Hand dug well and borehole water samples were collected from three locations Abaji, Kwali, and Gwagwalada F.C.T. Abuja. The samples collected from those locations were analysed using SPSS. The test results obtained and recorded with reference to physical, chemical and biological procedures was done in accordance with WHO & NGSDWQ standard. The physical tests done includes colour, turbidity and Total Dissolved Solid TDS. All parameters with respect to physical tests were recorded for all the samples. The chemical results show that the PH value ranges from 6.68-7.37 which indicates alkalinity. The water hardness of hand dug wells ranges from 14-370 with an average value of 187 which indicates moderately hard water. Test results also show value above World Health organization (WHO) admissive limit and Nigeria Standard for Drinking Water (NGSDWQ). The chemical parameters obtained from the tests results shows that Ec, BOD, COD, HCO 3 , CO3, SO 4 , CL, NO 3 , Ca and heavy metals including Pb, Cd, Cu, Fe, Mn, Zn and Ca in all the other waters samples collected and analysed were within the allowable limits. The analysis of variance (ANOVA) shows that there was a significant difference in Total Bacteria Count (TBC) in those locations with respect to borehole samples collected at P>0.05. Analysis of variance also shows that there was a significant difference in Fe, Mn, Cu and Cd between the well in those locations. The analysis done has revealed that regular routine monitoring by concerned authorities should be adhered to ensure compliance and safety among many other recommendations for further research.

0.0.110 MANOVA ANALYSIS IN EDUCATION AND RESEARCH: USES, EXAMPLES AND LIMITATIONS

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ABSTRACT: Analysis of data is an integral part of research as it shows the beauty of collated data. Researchers in their bid to transform data employ various statistical tools. Such statistical tool employed by researchers is the MANOVA (Multivariate analysis of variance). MANOVA is a statistical method used to assess the impact of many levels of independent variables, either individually or in combination, on the dependent variables. Multivariate analysis of variance (MANOVA) is a statistical technique that builds upon univariate analysis of variance (ANOVA). It is simply an ANOVA involving multiple dependent variables. MANOVA is a comprehensive statistical tool employed in research and education to examine group differences when there are multiple dependent variables. It enables researchers to comprehend complex correlations and patterns within data. MANOVA is a statistical technique that can be used in experimental research to assess the impact of one or more independent variables (factors) on several dependent variables. For example, in a pharmaceutical study, scientists may employ MANOVA to investigate the simultaneous impact of different medicine dosages on many health outcomes. Additionally, it allows researchers to make comparisons between many groups across various outcome measures. In addition, MANOVA in research facilitates the inclusion of covariates in the analysis, allowing for better control of potentially confounding variables. This results in a reduction of error variance and an improvement in statistical power. Despite its widespread applications and significance, the use of MANOVA is subject to certain limitations. These limitations encompass its sensitivity to outliers, the difficulty in interpreting results, and the requirement for larger sample sizes. In conclusion, researchers are encouraged to utilize MANOVA when analyzing data that involves multiple dependent and independent variables. This approach will enable them to gain a more profound understanding of the factors that influence outcomes and make well-informed decisions to improve practices and policies in their respective fields.

Keywords: MANOVA, Analysis, Education, Research, Statistics

0.0.111 Adaptation of an Extended Cox model to Malaria data from the General Hospital Keffi

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Abstract: The extended Cox model, also known as the proportional hazard model, is a widely used approach for modeling time-to-event data, particularly in the field of medical and epidemiological research. In this paper the malaria data set obtained from the General Hospital Keffi, combined with simulated time and clusters was used, survival times were generated from the Weibull distribution for between 3 to 7 days when one is expected to complete malaria treatment and three levels of clusters, which included; 20, 10, 5 observations per cluster were generated using 25, 50, 100 clusters, corresponding to the sample size of the malaria data of 500 in each situation. Cluster effect follows a normal distribution of mean zero and variance 0.5. Results of simulation shows that model validation, performance and robustness were achieved with model 2, with evidence of constant hazard and least values of AIC and BIC. Here the cluster sizes of 50 with 10 observation within each cluster correctly specify the group set that captures the unobserved heterogeneity within the data. Male patients are 15% more at risk of death than their female compares. Patients with the covariate set; age group 1; (0-5years), blood group A, B and AB, most especially those of group "A", coupled with an increasing temperature were seen to be most vulnerable and at great risk of death from the disease. The malaria data is best represented by ten (10) patients within blocks of 50 clusters in a sample of 500 patients for the medical facility.
Keywords: Cox Proportional Hazard model, Partial Simulation, Clusters, Extended Cox model, Malaria

0.0.112 Modelling Road Traffic Accident Along Opi-Nsukka Road: A Poisson Regression Approach

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ABSTRACT Road traffic accidents have become serious threats along Opi-Nsukka road in recent years. The outcry emanates from the increasing prevalence of negative effects of accidents on human lives, properties, environments and the economy. Poisson regression model was used to study the relationship between road accidents and the factors facilitating them along Opi-Nsukka road. Count data on yearly road traffic accidents along Opi-Nsukka road covering the period 2016 to 2020 were used. The results indicated that all predictors were significant with p-value less than 0.05. This implies that all factors causing road accidents predicted major increase

of accidents along Opi-Nsukka road.
Keywords: Poisson regression, Road accidents, Likelihood Ratio Test, Multicollinearity, Predictors, Goodness-of-fit

0.0.113 APPLICATION OF ARIMA METHOD ON UNEMPLOYMENT RATE IN NIGERIA

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ABSTRACT: In Nigeria, Unemployment rate is one of the problems bedeviling the economy. The inability of Job seekers to secure gainful employment tends to create disaffection among these people and cause some of them especially the youth, to resort to social vices. In the motivation to experience low unemployment rate which is an economic indicator in Nigeria, deriving appropriate ARIMA model to give insight into future occurrence of this indicator for intervention calls for the application of ARIMA model. This study seeks to fit ARIMA model to unemployment rate and forecast future values for unemployment rate. Data on employment rate is sourced from the National Bureau of Statistics (NBS) from 1991 to 2020. Results revealed that to obtain the appropriate ARIMA model that fits the data, ten closely suitable ARIMA models were identified. Using the least values of AIC, AICc and BIC as selection criteria, ARIMA (0, 1, 1) was found to be the best fitted model for each of the two series. Subsequent diagnostic checks confirm the adequacy of the fitted models, with residual analyses indicating no significant autocorrelation or heteroscedasticity. The forecasted values for the unemployment rate series maintain a constant point forecast. This implies that unemployment in Nigeria does not reveal a noticeable increase nor decrease but will be constant in Nigeria. Due to the unchanging forecasted value which appears not to be decreasing, there is need for interventions that will lead to the visible reduction of present unemployment rate in Nigeria.
Keywords: Unemployment Rate, Nigeria, ARIMA model

0.0.114 Effect of Poverty on Malnutrition in Rural Development Using Iogic Regression Model (A Case Study of Jigawa State)

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Abstract: Hunger among under special populace is broad generally in low and center pay networks in Jigawa State. Malnourished youngsters are frequently experiencing longer and serious sicknesses and have a higher danger of dying and have postponed engine advancement, lower psychological capacity, and helpless school execution. As per NDHIS 2018) 15%, 18% and 22% under five youngsters were squandered, hindered, and underweight separately in Jigawa State. Astounding upgrades have been seen on numerous areas in Jigawa State like enhancements in horticulture, instruction, wellbeing, financial and mechanical areas. The main aim of this work is to identify and examine the correlation relationship of nutritional status of under-five children in Jigawa state using ordinal logistic regression model in relation to Women Childbearing Age (15-49) years. This investigation utilize the Jigawa State Nourishment information in NDHIS 2018. Also, SPSS is use as measurable bundle for examination of information separated. Results shows that among 26v640 considered kids 22%, 72% and 6% were living in metropolitan, rustic, and Semi-country networks separately. The mean Z-scores tallness for-age, weight-for-age and weight-for stature were - 1.01, - 1.18 and - 0.87 separately and the predominance of hindering, underweight and squandering was 20.1%, 22.8% and 12.3% individually. The Coordination's investigation, utilizing chi square and single direction ANOVA test uncovered that period of youngsters, birthweight, space of home, abundance list, instruction of mother and family head, Mother's BMI, admittance to latrines and drinking water showed critical relationship with every one of the three markers of unhealthiness. In multivariate examination utilizing various straight relapses model showed that age and birth weight of kids was a huge indicator of hindering, underweight and squandering keeping other powerful factors at consistent.
Keywords: Malnutrition, stunting, underweight, wasting and under-five children

0.0.115 Prompt Engineering application in Data Analysis: A Comprehensive Overview Of asMultidisciplinary Framework and Information Design for Actionable Results

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Abstract: In the rapidly evolving landscape of data analysis, the formulation of clear and concise prompts stands as a cornerstone for unlocking the potential of vast datasets and deriving actionable insights. This paper presents a comprehensive exploration of the pivotal role of prompt engineering in data analysis, drawing upon insights from cognitive psychology, behavioral economics, information design, and ethical theory. By synthesizing a wide array of existing literature, case studies, and examples, we delve into the intricate nuances of prompt crafting and its profound implications for analysis workflows and outcomes. At its core, prompt engineering represents more than just a guiding mechanism for analysts—it embodies a fundamental cognitive process that shapes the trajectory of data exploration and interpretation. Grounded in the principles of cognitive load theory elucidated by Sweller (1988), effective prompt design mitigates the cognitive burden on analysts, facilitating a streamlined and systematic approach to data analysis. Moreover, insights from behavioral economics, particularly the seminal work of Tversky and Kahneman (1974) on heuristics and biases, underscore the profound impact of prompt framing on analysts' decision-making processes and the conclusions drawn from analysis. Beyond its cognitive dimensions, prompt engineering transcends disciplinary boundaries to embrace principles of information design and ethical practice. Through meticulous attention to language, structure, and context, well-crafted prompts serve as a conduit for transforming raw data into meaningful narratives, empowering analysts to derive actionable insights with confidence and precision. Furthermore, ethical considerations loom large in the realm of prompt construction, as highlighted by Barocas and Selbst (2016). Transparent and accountable prompt design is essential for safeguarding against biases and ensuring fairness, equity, and accountability in data-driven decision-making processes. By synthesizing these diverse perspectives, this paper aims to offer data analysts and practitioners a comprehensive toolkit for navigating the complexities of prompt engineering. Through a multidisciplinary lens, we illuminate the theoretical underpinnings of prompt crafting, explore practical strategies for formulating prompts that lead to actionable insights, and navigate the ethical terrain inherent in prompt construction. Ultimately, our goal is to empower analysts to harness the full potential

of prompt engineering in enhancing the efficiency, accuracy, and ethical integrity of data analysis processes, thus driving informed decision-making and advancing organizational goals in an increasingly data-centric world.
Keywords: Data analysis, Prompt crafting, Cognitive psychology, Behavioral economics, Information design, Actionable insights, Ethical considerations

0.0.116 A MATHEMATICAL MODEL OF WOUND HEALING (ULCERATION) USING FRACTIONAL CALCULUS

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ABSTRACT: Ulcer disease is a major burden for health care systems worldwide. In this work, we developed fractional reaction diffusion mathematical model that focused on the important factors (such as oxygen, capillary tip density, blood vessel density, fibroblast, Chemo attractants, and blood sugar level) that help in successful ulcer wound healing. The mathematical model explained how these factors diffuse into the wound space and react with one another for a successful healing of the ulcer wound. The mathematical model represented with partial differential equation which was developed and then converted into fractional order derivatives. Analytical solution was obtained using Laplace Adomian Decomposition Method. The stability analysis was carried out and the graph of the solution to the model was presented to see which of these factors plays the most effective role in the healing process of ulcer wound. The work deduced that oxygen played the most active role in the healing of the ulcer wound.
KEYWORD: Ulcer, disease, wound, Mathematical model, oxygen, capillary tips density, fibroblast, stability, fractional, decomposition, pde

0.0.117 Multivariate Analysis of Some Hazardous Sexually Transmitted Ailments in Owerri, Imo State Nigeria

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ABSTRACT: Despite efforts to develop ideas in undertaking research on sexually transmitted diseases (STDs), the international research community's progress

remains slow compared to the needs of adolescents living with STDs. This study aimed to determine the reported cases of STDs in the Federal Medical Center, focusing on three specific types: urinary tract infections, Staphylococcus infections, and retroviral diseases. The data was collected from the Federal Medical Center in Owerri. The results of this research study were analyzed using One-way MANOVA, which revealed no significant difference in the prevalence of STDs between sex groups. Additionally, there was no significant difference in the incidence of STDs among sex groups who had previously been diagnosed with these diseases. The findings of this study suggest an epidemic of STDs among adolescents, regardless of their sex, living in Imo State. Therefore, there is an urgent need for standard and comprehensive procedures for adolescents transitioning from pediatric to adult care. Furthermore, intensive education on STDs is necessary, particularly in basic and post-basic schools in Imo State.
Keywords: MANOVA, STDs, FMC, OWERRI, Nigeria