

**Nigerian Mathematics in Industry Study Group  
(NIGMISG) Conference/Workshop  
Covenant University  
September 24 – 26, 2018**

**Programme of Activities**

<b>Monday, September 24, 2018</b>		
<b>Time</b>	<b>Event</b>	<b>Speaker(s) / Venue</b>
8:00 am – 10:00 am	Arrival and Registration of Participants	Venue: CUCRID Building
	Opening Ceremony / Keynote Address	
10:00AM -10:07AM	1. National Anthem/Opening Prayer	Dr. A. A. Opanuga
10:07AM-10:12AM	2. Introduction of Dignitaries and Resource Persons	Dr. M. C. Agarana
10:12AM-10:17AM	3. Opening Remarks by <b>Head</b> , Department of	Dr. Sheila A. Bishop
10:17AM-10:27AM	4. Welcome Address by <b>Chief Host</b> , Vice-Chancellor, Covenant University	Prof. AAA. Atayero
10:27AM-10:30AM	5. Introduction of Keynote Speaker	Dr. T. A. Anake
10:30AM-10:40AM	6. Keynote Address by <b>Director</b> , National Mathematical Centre, Abuja	Prof. Stephen E. Onah
10:40AM-10:47AM	7. Remarks by Sponsors / Industry Participants	Dr. Emmanuel Osalusi, Prof. Christopher Thron
10:47AM-10:52AM	8. Remarks by <b>Director</b> , CUCRID	Prof. Omoregbe Nicholas A. I.
10:52AM-10:57AM	9. Closing Remarks by <b>Dean</b> , College of Science and Technology, Covenant University	Prof. Ajanaku K. Oluseyi
10:57AM-11:02AM	10. Vote of thanks by <b>Chairman</b> , LOC	Prof. S. A. Iyase
11:02AM-11:05AM	11. Closing Prayer	Mr. Odetunmibi O.
11:05AM – 11:20AM	Group Photograph	
11:20AM - 11:50AM	Tea Break and Networking	CUCRID Building
11:50AM - 1:50 PM	MISG: Prospects, Experience and Opportunities	Prof. O. M. Bamigbola
1:50 PM – 2:50 PM	Lunch and Networking	Cafeteria 2
2:50 PM - 4:00 PM	Training Workshop on Problem Solving: Tools Agent based modeling	Prof. Christopher Thron
4:00 PM - 6:00 PM	Presentation of Papers I: <b>NIGMISG18-100 TO 120</b>	CUCRID Building
7:00 PM	Dinner	

**Tuesday, September 25, 2018**

<b>Time</b>	<b>Event</b>	<b>Speaker(s) / Venue</b>
8:30AM – 9:00AM	<b>Registrations</b>	
9:00 AM – 9:05 AM	Opening Prayer	Mr. O. A. Odetunmibi
9:05 AM - 9:10 AM	Opening Remarks by Chair, LOC	Prof. S. A. Iyase

9:10 AM - 10:10 AM	Plenary Session on Industrial Problems – Further Solution insight (CUCRID)	
10:10 AM - 10:30 AM	Tea Break and Networking	CUCRID Building
10:30 AM – 12:00 PM	Training Workshop on Problem Solving Tools: Agent based modeling	
12:00 PM - 2:00 PM	Presentation of Papers II: <b>NIGMISG18-121 TO 140</b>	CUCRID Building
2:00 PM - 2:40 PM	Lunch and Networking	Cafeteria 2
2:40 PM - 4:40 PM	Work on Industry Projects (Breakout Sessions)	Prof. O. M. Bamigbola
4:40 PM - 5:40 PM	General Feedback Sessions	Group Leaders
7:00 PM	Dinner	
<b>Wednesday, September 26, 2018</b>		
<b>Time</b>	<b>Event</b>	<b>Speaker(s) / Venue</b>
8:30 AM - 8:35 AM	Opening Prayer	Dr. A. A. Opanuga
8:35 AM - 8:45 AM	Opening Remarks by Chair, LOC	Prof. S. A. Iyase
8:45 AM - 10:10 AM	Training Workshop on Problem Solving Tools: Agent based modeling	
10:10 AM - 10:40 AM	Tea Break and Networking	
10:40 AM - 11:40 AM	Presentation of Papers III: <b>NIGMISG18-141 TO 150</b>	
11:40 AM - 1:00 PM	Presentation of Papers / Agent based modeling	
1:00 PM - 2:00 PM	Lunch and Networking	CUCRID Building
2:00 PM - 5:00 PM	Presentation of Solution Ideas/Way Forward (Plan for 2019)	
5:00 PM - 7:00 PM	Closing Ceremony / 2018 NIGMISG Farewell Banquet	
<b>Thursday, September 27, 2018</b>		
7:00 AM - 11:45 AM	Depart ure	

**Vice-Chancellor's Remarks at the Nigerian Mathematics in Industry Study Group (NIGMISG) Workshop/Conference, Held on September 24-26, 2018**

Protocol:

I am most delighted to welcome you to the 2018 Nigerian Mathematics in Industry Study Group Workshop/Conference. It is our pleasure to see this cream of distinguished guests, speakers, facilitators, and participants on our serene campus, known as Hebron, which offers a unique ambience of divine blessings and inspiration to all.

This workshop/conference is organised to explore how collaborative research can be fostered between mathematics scholars and Industry, noting that mathematical tools can be leveraged on to resolve the myriads of developmental challenges that we are faced with as a nation and continent. The application of mathematical models in fields such as engineering, natural and applied sciences, accountancy, medicine, architecture, corporate management, finance, etc. have engendered harmony and order in these fields and continues to be the bedrock of scientific and technological developments in solving many developmental challenges such as illness and health, protection and use of natural resources, energy generation, global environmental changes, urban development and traffic, globalization of the economy, etc. It becomes necessary that we view Mathematics as an all-important subject for making sustenance and development of our society in the 21st century and beyond.

As principal stakeholders and drivers of development efforts, academia and industry share a symbiotic relationship. Academia turnout graduates who are engaged by industry. Research discoveries in universities are taken up by the industry and commercialized in goods and services. Industry on the other hand expects academia to provide sustainable solutions for mastering the challenges of a competitive environment and achieving market success. The industry expects universities to design their curriculum to produce graduates whose skill-set are consistent with industry requirements.

Therefore, collaboration between universities and industries is critical for skills development, the generation, acquisition, and adoption of knowledge as well as the promotion of entrepreneurship. The benefits of university-industry relationships are far-reaching: they can facilitate the development of a coordinated and sustainable research and development programme devoid of duplications, kindle expansion in industry investment in R&D projects, and harness synergies and complementarities of scientific and technological competences.

Unfortunately, the current level of research collaboration between the academia and industry in Nigeria and Africa require significant improvement if the highlighted benefits are to be realized. Severed relationship between the duo is likened to an attempt to win a race by hopping. It is in recognition of the need to address this all important issue, that Covenant has continued to make conscious efforts aimed at fostering collaborations with the industry. We have taken steps through our Town and Gown Seminar series as well as inclusion of practicing engineers in the Board of our College of Engineering and teaching of engineering courses, to involve the industry in preparing industry ready graduates. In

the same vein, efforts are ongoing to engage the Manufacturers Association of Nigeria (MAN) in a mutually beneficial partnership with its member companies. As an institution, Covenant is open to initiatives that would engender collaborations between the university and industry.

Once again, welcome to Hebron! and have very fruitful deliberations.

Thank you.

## **MATHEMATICS AS A CATALYST FOR IMPROVING GLOBAL ECONOMY**

**Professor Stephen E. Onah**  
**Director/Chief Executive,**  
**National Mathematical Centre, Abuja, Nigeria.**

### **Preamble**

“Among the Mathematicians there is a private and strong conviction that supports them in their abstract research, namely that none of the problems of their science can remain without response”-Gheorghe Titeica.

It gives me great pleasure to be among these great minds who have something in common, that is, that Mathematics is the rallying point for improving the operations and outputs of industries and the general economic well-being of any productive sector of a national economy. It must be emphasized that the need, usefulness and importance of mathematics in improving industries, environment, security, defence, ecology, economy, etc. are not in doubt.

Aftermath of post 2008 global financial meltdown was global economic crisis that resulted into economies of many nations slid into recession. There are several schools of thought with views on how nations can recover from such meltdown shock. Most recovery plan centrifuged on bail out panacea. One school upheld that, for the global economy to bounce back, there must be a revolution in the industrial and agricultural sectors of the economy. These are sure ways for rapid and sustainable development because they provide jobs and food for teaming global population of over 7 billion people.

According to Management Consultancy Accenture, commercial expenditure in sub – Sahara Africa was expected to grow from \$600 billion in 2010 to nearly \$1 trillion by 2020. Economic analysts identified seven channels in Africa among the ten fastest growing economies in the Africa region and that Africa’s rate is also expected to double that of global economic growth rate. We need to acquire new ways of thinking, if Africa is to realize this potential and to be financially autonomous from neocolonialism.

Paper ID: NIGMISG18-100

**A MATHEMATICAL MODEL FOR RECRUITMENT AND  
DEVELOPMENTAL SUSTAINABILITY OF FISH POPULATION IN THE  
POND**

Ogbaji, Eka.Oche<sup>1\*</sup>, Ben Obakpo Johnson<sup>2</sup>, James Emmanuel Friday<sup>2</sup>, Okorie Charity Ebelechuku<sup>3</sup>, Muhammad Nuhu Abdullahi<sup>3</sup> and Adiku Lydia<sup>4</sup>

Department of Mathematics and Statistics, Federal University, Wukari, Nigeria

\*Corresponding author: **Email:** ogbajieka@yahoo.com

**ABSTRACT**

Recruitment and sustainability for fish population are renewable natural resources, if correctly managed. The basic purpose of fish recruitment and sustainability is to provide advice on the optimum exploitation level of aquatic living resources such as fish. We formulate a mathematical model for recruitment and developmental sustainability of fish population in the pond by modifying growth model of Verhulst where we incorporate catch equation of Baranov as a function of time in the model. Runge-Kutta scheme of fourth order was used to solve the modified model. Furthermore, we collected data from Federal University Wukari fish pond to validate our modified model. The result show that fish population recruited started increasing from first month to fifth month of recruitment and started decreasing equally at sixth month. We conclude that fish reach its maturity age at fifth month and our modified model can be use to predict expected fish population recruitment and sustainability from its initial recruitments.

**Key Words:** Fish population, Pond, Recruitment and Sustainability.

Paper ID: NIGMISG18-101

**AUTOTOPIC CHARACTERIZATION OF RIGHT CHEBAN LOOP**

Chinaka A. I. and Adeniran O. J.

<sup>1,2</sup> Department of Mathematics, Federal University of Agriculture Abeokuta, Nigeria

1ify4biola@yahoo.com, 08038168072

In this study, we investigate the pseudo-automorphism of right Cheban loops. It is established that every pseudo-automorphism of right Cheban loop is an automorphism on its left and right nuclei.

**Keywords:** Autotopism, pseudo-automorphism, Right Cheban loops.

**AMS subject Classification:** Primary 20N02; Secondary 20N05.

Paper ID: NIGMISG18-102

**MODELING OF LUNG CANCER WITH BAYESIAN SURVIVAL ANALYSIS**

Kazeem Adesina Dauda and Waheed Babatunde Yahya<sup>2</sup>

<sup>1</sup>Department of Statistics and Mathematical Sciences, Kwara State University, Malete, P.M.B 1530, Ilorin, Nigeria.

e-Mail: kazeem.dauda@kwasu.edu.ng<sup>1</sup>

<sup>2</sup>Department of Statistics, University of Ilorin, P.M.B 1515, Ilorin Nigeria.

e-Mail: wbyahya@unilorin.edu.ng<sup>2</sup>

**ABSTRACT**

Survival analysis is an important and powerful statistical tool commonly used in the clinical and medical research. The most commonly used methods of analyzing survival data are parametric, semi-parametric and nonparametric techniques. However, little work has been done on the analysis of survival data with Bayesian school of thought, even when there is prior information about the disease. This research work aims to extend the Bayesian approach to survival data using a published data set on lung cancer disease. The data set was first analyzed using Exponential, Weibull and Lognormal parametric approaches, and Weibull was found to be the best model based on the results of AIC. Furthermore, the results of the Weibull were compared to the Bayesian approach using half- Cauchy as the prior for scale and shape parameters. The results review that the Bayesian model provides a smaller standard error for the six covariates in the data than the parametric methods and was found to be the best approach. finally, the Bayesian approach is implemented with R throughout the package Laplacedemo (Laplace Approximation).

Key word: Bayesian Analysis; Half- Cauchy; Scale and Shape Parameters; Prior Information; Laplace Approximation

Paper ID: NIGMISG18-103

**EFFECT OF NON-IMMUNOGENIC TUMOR MICROENVIRONMENTAL FACTORS ON TUMOR GROWTH WITH RESONANCE EFFECT**

Ibrahim Muawiyya Idris & Dauda Usman

Department of Mathematics and Computer Science

Umaru Musa Yar'adua University katsina

**Abstract**

The effect of non-immunogenic tumor microenvironmental factors on tumor growth system modelled by correlated additive and multiplicative white noises with white cross-correlation in the presence of micro-environmental resonance effect is

investigated. An analytic expression for the steady state distribution for the tumor growth system is obtained via the Fokker-Planck equation. Numerical results reveal that micro-environmental resonance effect may be responsible for the double-edge effect exhibited by some tumor micro-environmental factors by either promoting tumor growth or antagonizing tumor growth at some threshold.

**Keywords:** Langevin equation, Fokker-planck equation, Tumor growth system, Tumor microenvironment.

Paper ID: NIGMISG18-104

## **EFFECTS OF EXOTHERMIC FLUID ON MIXED CONVECTION FLOW IN A CONCENTRIC ANNULAR IN A CHANNEL**

Anas Sani Maihulla

Department Of Mathematics, Sokoto State University

Sokoto, Nigeria.

anasmaihulla@gmail.com

### **Abstract**

Graphical results are presented for heat and mass transfer effect on hydromagnetic flow of a moving permeable vertical surface. An analysis is performed to study the momentum, heat and mass transfer characteristics of MHD natural convection flow over a moving permeable surface. An investigation also performed to study the effect of transpiration and exothermic fluid on mixed convection flow in vertical porous plates. The differential equations governing the flow have been solved by using Differential Transformation Method (DTM). Suction/injection is used to control the fluid flow in the channel. Numerical results are presented graphically and discussed quantitatively with respect to various parameters embedded in the problem.

**Key words:** Heat and mass transfer Hydromagnetic flow, mixed convection, differential transformation method, exothermic chemical reaction, and vertical surface.



Paper ID: NIGMISG18-105

## STUDY ON ODD BURR III-RAYLEIGH DISTRIBUTION ITS PROPERTIES AND APPLICATION

**Nura Umar<sup>1\*</sup>; Mustapha Lawal Malumfashi<sup>1</sup>**

<sup>1</sup>Department of Mathematics and Computer Science  
Umaru Musa Yar'adua University  
Katsina-Nigeria  
e-mail: umar.nura@umyu.edu.ng  
Phone No.: 08039372829

**Abstract:** In this paper, we define the Odd Burr III-Rayleigh distribution using the Odd Burr-III family of distributions. Some of its statistical properties including the moments, moment generating function, reliability analysis and order statistics were studied, the parameters of the proposed distribution was estimated using the method of maximum likelihood, the usefulness of the proposed distribution was illustrated using real dataset.

*Keywords-component; Rayleigh distribution; moments; moment generating function; reliability analysis; order statistics.*

Paper ID: NIGMISG18-106

## STATISTICAL TIME SERIES ANALYSIS FOR ESTIMATION OF WIND SPEED AND STORMS HAZARDS IN SOKOTO METROPOLIS

**S. U. Ibrahim<sup>1</sup>, M. O. Oladejo and U. L. Okafor**

*Department of Mathematics, Faculty of Sciences, Nigerian Defence Academy, Kaduna, Nigeria*

*Corresponding Author: shehusakkwato@gmail.com; +2348030536594*

### Abstract

Statistical time series analysis for estimation of wind speed and storms hazards in Sokoto metropolis have been used in this research using data series obtained from Nigeria Meteorological unit (NIMET) Sokoto. Such data series were obtained as annual average secondary data series for period of fifteen years. (2002-2016). Time plots as series plot and auto correlation plot have been observed which was supported by statistical tests. Based on the estimated ARIMA model parameters values of such climatic element, AR (1) was estimated as: 1.42745, AR (2): -0.98723, MA (1): 1.14272 and MA (2): -0.72362. where the estimated parameters were diagnosed and selected. Hence the model parameters were found to be adequate under Portmanteau test and the model was modeled as ARIMA (2, 0, 2).

**Keywords:** Auto regressive, moving average, stationary, invertibility, white noise process

*Paper ID: NIGMISG18-107*

**EXPLORING NEW STATISTICAL METHODS FOR ASSESSING THE VARIATION OF GAS FLARING AND OIL SPILLAGE IN NIGERIA COASTAL REGION.**

**<sup>1</sup>Ekerikevwe, Kennedy Irikefe, <sup>1</sup>Orighoyegha Maruvie Glenn and <sup>1</sup>Akpojaro Ogheneochuko Owens**

<sup>1</sup>Department of Statistics, Delta State Polytechnic, Otefe – Oghara, Delta State, Nigeria

E-mail: Kennedyekerikevwe@gmail.Com, Tel: +234-807-777-9333

**ABSTRACT**

In Nigeria, the severity of environmental pollution resulting from oil spills and gas flaring varies from disastrous to no detectable effect depending upon the quantity released, the nature of the incident and the socio-political sensitivities surrounding an incident. This threat of economic and environmental devastation has led to series of environmental impacts assessments in Nigerian coastal regions. This paper explores new statistical methods for assessing the variation of gas flaring and oil spillage in the Nigeria Coastal Region. The findings of the study showed that while oil spillage impacts negatively on economic development, gas flaring impact positively on it. The reason is adduced to the fact that while oil spillages militate against sustainable development occasioned by its interference with life support system sustaining the economy, government rather derives huge revenue from gas flaring. The result is a negative impact on the whole economy given that Nigeria mostly relies on oil for its economic development. The study made several recommendations to redeem this situation.

Keywords: Oil spillage, Gas flaring, Data Exploration, Statistical models, Hypothesis, Variation, Coastal Region.

Paper ID: NIGMISG18-108

**APPLICATIONS OF MATHEMATICAL TOOLS IN SOLVING QUEUEING PROBLEMS**

S.A. Bishop, P. I. Adamu, K. S. Eke, A. M. Olanrewaju, G. O. Akinlabi

**Abstract:** The mathematical study of waiting lines is mainly concerned with queue performance measures where several applications have been drawn in past studies. The aim of this research is to analyze Mathematical queueing models formed from real life problems and suggest possible solutions.

**Keywords:** Queues, Mathematical queueing models, Analysis of queues

Paper ID: NIGMISG18-109

### **A MATHEMATICAL MODELLING FOR ROAD PASSENGER TRANSPORTATION PROFIT ANALYSIS**

OGBAJI, E.O.<sup>1\*</sup>, ADUBISI, O.D.<sup>2</sup>, OKORIE C.E.<sup>2</sup>, DAVID, I.J.<sup>3</sup> AND <sup>3</sup>PETER, O.C.

<sup>1,2,3</sup>Department of Mathematics and Statistics, Federal University Wukari

\*Corresponding author: **Email:** [ogbajieka@yahoo.com](mailto:ogbajieka@yahoo.com), **Phone:** 07030314905

**Abstract:** In this paper, we proposed a mathematical model for transportation profits analysis with a view of assisting long distance road transportation companies to monitor their daily, weekly, monthly or annual profits and also to predict or forecast their profits. This paper is concerned on the formulation of mathematical model on transportation using the principle of proportionality and linear algebraic equations. Data were gotten from two different transports company that was used to formulate values for the model constants. The approach use in solving this linear model equation is least square method. In the work, two different mathematical models were formulated for the two difference transportation company. The results proved that due to differences in organization and management of the company, the model constants can be calculated only for a particular company and recalculated for other company To validate the results, statistical analysis was carried out and it was show that, there is significant correction between actual profit and model profit of the same company but there is no significant correction between actual profit and different company model profit. In view of above results, profit model equation can predict profit for a particular company.

**Key words:** Road passenger, transporting expenses, transportation profit

Paper ID: NIGMISG18-109

### **A MATHEMATICAL MODELLING FOR ROAD PASSENGER TRANSPORTATION PROFIT ANALYSIS**

OGBAJI, E.O.<sup>1\*</sup>, Adubisi, O.D.<sup>2</sup>, OKORIE C.E.<sup>2</sup>, DAVID, I.J.<sup>3</sup> AND <sup>3</sup>PETER, O.C.

<sup>1,2,3</sup>Department of Mathematics and Statistics, Federal University Wukari

\*Corresponding author: **Email:** [Ogbajieka@Yahoo.Com](mailto:Ogbajieka@Yahoo.Com), **Phone:** 07030314905

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only for a particular company and recalculated for other company To validate the results, statistical analysis was carried out and it was show that, there is significant correction between actual profit and model profit of the same company but there is no significant correction between actual profit and different company model profit. In view of above results, profit model equation can predict profit for a particular company.

Key words: Road passenger, transporting expenses, transportation profit,

Paper ID: NIGMISG18-111

## NUMERICAL ANALYSIS AND APPLICATION OF A NONLINEAR PARABOLIC MODEL TO POLUTANT DISPERSION

Dr Chinedu Nwaigwe and Mr David Emeka  
Nwaokoro Department of Mathematics, Rivers State  
University, Port Harcourt, Nigeria  
[nedunwaigwe@gmail.com](mailto:nedunwaigwe@gmail.com);  
[mscsngltd@gmail.com](mailto:mscsngltd@gmail.com)

### Abstract

In this work, we propose a nonlinear parabolic partial differential equation with a time-dependent Dirichlet boundary condition and a homogeneous Neumann boundary condition to study the evolution of a pollutant concentration in a one-dimensional domain. By adopting the concept of freezing coefficients, we formulate an implicit-explicit (IMEX) finite difference scheme for the model. The Backward Euler scheme in time and central difference scheme in space are considered. The resulting numerical scheme is implemented in *fvsolver*, a C++ code developed by the first author. The numerical results for the concentration distribution are presented at different times. The results show that the method remains stable even for large time steps; and that the pollutant concentration increases with time in the domain, but decreases with distance at each instant of time. This is clearly expected since the domain is initially at a zero pollutant concentration, and is only polluted through the left boundary. We remark that the stability and convergence analysis of the scheme is currently under construction by the first author.

Keywords: parabolic pdes, finite difference methods, numerical analysis, pollutant concentration, *fvsolver*, C++, convergence, stability, IMEX.

Paper ID: NIGMISG18-112

## **THE *FVSOLVER*: A C++ CODE FOR TEACHING, RESEARCH AND APPLICATIONS**

Dr Chinedu Nwaigwe

<sup>1,2</sup>Department of Mathematics, Rivers State University, Port  
Harcourt, Nigeria

<sup>2</sup>Mathematical and Scientific Computing Solutions (MSCS)  
Limited [nedunwaigwe@gmail.com](mailto:nedunwaigwe@gmail.com); [mscsngltd@gmail.com](mailto:mscsngltd@gmail.com)

**Abstract:** In this talk, I will present an overview of my code, the *fvsolver*, which I have been developing since my PhD study in the United Kingdom. The talk will begin by discussing some of the environmental challenges facing humanity, especially the problem of flooding. I will briefly expose some of the tools mathematicians and engineers have been developing to tackle such problems. Then, I will present the associated challenges in respect to the relevant mathematical and numerical problems. Hyperbolic partial differential equations and conservative numerical schemes will be discussed. The concept of well-balanced and consistent schemes will be explained and the challenges brought to the fore. Then, I will present the *fvsolver* and its mechanics for solving partial differential equations. Numerical experiments of flooding and flows over both flat and complicated domains will be demonstrated to showcase the capabilities of the solver. The talk will end with a highlight of the challenges and opportunities for the development of the *fvsolver* and more.

**Keywords:** hyperbolic pdes, conservative methods, numerical analysis, flooding, fluid dynamics, well-balanced schemes, consistent methods, *fvsolver*, C++, Code, MSCS Ltd.

Paper ID: NIGMISG18-113

## **AN INVESTIGATION INTO SECONDARY SCHOOL STUDENTS ANXIETY TOWARDS STATISTICS**

Oluwole A. Odetunmibi, Pelumi E. Oguntunde, Hilary I. Okagbue and Paul O.  
Ogundile

Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

**Contact detail:** [oluwole.odetunmibi@covenantuniversity.edu.ng](mailto:oluwole.odetunmibi@covenantuniversity.edu.ng), 08032156440

**Abstract:** Students' performance in any particular subject is based on how they are able to deal with and handle anxiety towards such subject. This study critically examined the statistics anxiety that exist among secondary schools students: how it relates to male and female students, private and public schools and the statistics anxiety among various levels of secondary school students. The data used for this work was collected through the use of questionnaire in which a total of four hundred questionnaires were administered to students from both private and public schools. The research analysis result revealed that, there exist anxiety towards statistics among secondary school students, female students are more affected, public schools are also more affected

compared to private schools and students of lower levels exhibit more anxiety towards the subject compared to higher levels.

Key words: Anxiety, Performance, Students and Statistics.

Paper ID: NIGMISG18-114

## **MIDPOINT METHOD FOR SOLVING UNCERTAIN DIFFERENTIAL EQUATIONS**

Dayo G. Olaniregun<sup>a</sup>, Opeyemi P. Ogundile<sup>b</sup>, S. O. Edeki<sup>b</sup>

<sup>a</sup>University of Ibadan, Ibadan, Nigeria.

<sup>b</sup>Covenant University, Ota, Ogun State, Nigeria.

**Corresponding Author: [opeyemiogundile@yahoo.com](mailto:opeyemiogundile@yahoo.com)**

### **Abstract**

Uncertain differential equations (UDE) which model random events based on people's belief degrees have been a crucial tool in mathematics nowadays. Over the years, researchers have suggested approximations to Uncertain Differential Equations based on some numerical methods. The purpose of this paper is to minimize the numerical error as little as possible, so that we can obtain approximates that will be acceptable as solutions to Uncertain Differential Equations. A new numerical method based on the Midpoint method is designed in this paper and its effectiveness in obtaining the Expected value will be illustrated with a simple short rate interest model in finance theory as well as other examples. Obtaining good approximate solutions to this type of equations will be a step forward in the direction of solving other uncertain equations whose analytic solutions may not be easily derived or does not exist.

Keywords: UDE; Midpoint method; Approximate solution; Uncertainty distribution; Uncertainty Theory

Paper ID: NIGMISG18-115

**RANDOM IMPLICIT HYBRID ITERATIVE ALGORITHMS OF JUNGCK-TYPE AND COMMON RANDOM FIXED POINT THEOREMS WITH STABILITY RESULTS**

<sup>1</sup>Hudson Akewe and <sup>2</sup>Kanayo Stella Eke

<sup>1,2</sup> Department of Mathematics, Covenant University, Canaanland, Ota, Nigeria

Email: <sup>1</sup>hudson.akewe@covenantuniversity.edu.ng and

<sup>2</sup>kanayo.eke@covenantuniversity.edu.ng

**Abstract:** Let  $(E, \|\cdot\|)$  be a separable Banach space,  $C$  be a non-empty closed convex subset of  $E$  and  $S, T : \Omega \times C \rightarrow E$  be a nonself random commuting mappings satisfying the generalized random  $\varphi$ -contractive-like operator

$$\|T(\omega, x) - T(\omega, y)\| \leq \delta \|S(\omega, x) - S(\omega, y)\| + \varphi(\|S(\omega, x) - T(\omega, x)\|), \quad \text{with} \\ T(\omega, C) \leq S(\omega, C)$$

and  $S(\omega, C)$  subspace of  $E$ ,  $0 \leq \delta < 1$ ,  $\varphi : \mathfrak{R}^+ \rightarrow \mathfrak{R}^+$  with  $\varphi(t) > 0$ ,  $\forall t \in (0, \infty)$  and  $\varphi(0) = 0$ .

In this paper, a stochastic version of implicit hybrid iterative algorithm called a modified random implicit Jungck-Ishikawa and random implicit Jungck-Mann hybrid iterative algorithms are introduced and the unique common random fixed theorems are proved in the sense of two maps  $(S, T)$  for a generalized random  $\varphi$ -contractive-like operators in a separable Banach space. Strong convergence results for random implicit Picard-Mann, random Picard iterative schemes for single map  $T$  are deduced as corollaries. Stability results are also proved and an example is provided to demonstrate the applicability of the random hybrid schemes.

**Keywords and Phrases:** Random implicit Jungck-Ishikawa iterative schemes, generalized random contractive-like operators, random weakly compatible maps, unique common random fixed point.

Paper ID: NIGMISG18-116

**ENTERPRISE RISK MANAGENT  
(Issues and Lessons from Nigeria Universities)**

Evans Isioma Egbule

Zenith Bank Plc, Redeemed Christian Church of God Branch, KM 46, Lagos/Ibadan  
Express Way, Ogun State

Email: [Isioma.Egbule@zenithbank.com](mailto:Isioma.Egbule@zenithbank.com), [evans.isioma@yahoo.com](mailto:evans.isioma@yahoo.com)

**ABSTRACT:** Today's business world, presents challenges that have significant levels of risks in our existence. Life is a risk, living is even riskier, man therefore exists to manage these risks in other to make a living. Risk management has therefore become an integral tool required for the survival of enterprises. Enterprises operate in such ways that enable it to identify, understand, control and monitor the various risks events in its operations, while still pursuing organizational objectives of value creation for its stakeholders. Every enterprise is faced with its peculiar risks which if not well managed,

may spell doom to the enterprise, the sector or even the general economy. The global financial crises of the 2007/2008 was caused primarily by the risks associated with interest-focused risks assets. These loans were made available to the risky subprime borrowers with high rate of loan defaults. Similarly, the risk management techniques adopted by many enterprises are not necessarily sufficient to identify and mitigate the impact of the external and internal factors that affect the organization risk culture. The committee of Sponsoring Organization of the Treadway Commission COSO (2004) defined enterprise risk management as the process effected by the entity's board of directors, and other personnel applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity and manage risk to within its risk appetite and provide assurance of achievement of entity's goals and objectives. Dabari and Saidin (2015), highlighted a growing interest among academics, industrialists, professionals, and international organizations on the implementation of ERM in financial institutions. Nigeria Universities are pervaded by so much risk that destroys the fabrics of our society and extinguishes potentials in our undergraduates and graduates as well. Such risks caused by distractions, peer influence, e-fraud, addiction to drug and stimulants, and attraction to the opposite sex must be identified and dealt with. This paper highlights various techniques of identifying and managing such risks and proffers solutions to mitigate its impact.

**Keywords and Phrases:** Enterprise, risk management, financial institutions, Nigeria Universities

Paper ID: NIGMISG18-117

## **ENTROPY GENERATION OF MHD COUPLE STRESS FLUID THROUGH VERTICAL MICROCHANNEL**

A.A. Opanuga\*, O.O. Agboola, H. I. Okagbue, S.A. Bishop

Department of Mathematics, Covenant University Ota, Nigeria

\*abiodun.opanuga@covenantuniversity.edu.ng

### **Abstract:**

Entropy generation analysis of steady, viscous, incompressible hydromagnetic couple stress fluid through vertical microchannel is investigated. The solution of the nonlinear ordinary differential equations governing flow is obtained by differential transform technique. The flow irreversibility and Bejan number are calculated using the obtained results. Effects of couples stresses, fluid wall interaction parameter (FWIP) and rarefaction on the velocity profile, temperature profile, entropy generation and Bejan number are discussed graphically. Couple stress parameter and rarefaction reduce fluid velocity and entropy generation.

**Keywords:** Microchannel, Entropy generation, MHD, Natural convection, Differential transform method (DTM).



Paper ID: NIGMISG18-118

**UNSTEADY HEAT AND MASS TRANSFER MAGNETOHYDRODYNAMIC (MHD) CONVECTIVE COUETTE FLOW WITH HEAT AND MASS FLUXES USING FINITE ELEMENT METHOD (FEM)**

<sup>1</sup>Omokhuale E. and <sup>2</sup>Altine M. M.

<sup>1</sup>Department of Mathematical Sciences, Federal University Gusau, P. M. B. 1001, Zamfara State, Nigeria

<sup>2</sup>Department of Mathematics, Federal University Birnin Kebbi, P. M. B. 1157, Kebbi State, Nigeria

Authors' Emails: <sup>1</sup>emmanuelomokhuale@yahoo.com and altinemuhammad@gmail.com

Authors' Phone no.: <sup>1</sup>+2348032878725,

**Abstract**

An analysis of unsteady hydromagnetic convective Couette flow of a viscous, electrically conducting and incompressible fluid taking into cognizance thermal radiation, diffusion and diffusion thermo effects with heat and mass fluxes is conducted numerically using Finite Element Method (FEM). Computations were done for a wide range parameters of engineering interest embedded in the flow problem. The effects of these flow parameters on the velocity, temperature and concentration are presented graphically while that of the skin-friction, Nusselt and Sherwood numbers are gotten and displayed in tabular forms. The obtained results are benchmarked with previously published works and was seen to be in good agreement.

**Keywords:** MHD; Heat and mass transfer; Heat and mass fluxes; FEM.

Paper ID: NIGMISG18-119

**BOUNDARY LAYER MIXED CONVECTION FLOW OF CASSON FLUID OVER A STRETCHING SHEET WITH CONVECTIVE SURFACE BOUNDARY CONDITIONS AND HALL EFFECT IN THE PRESENCE OF CHEMICAL REACTION AND INTERNAL HEAT GENERATION**

Olanrewaju, Anuoluwapo Mary<sup>1</sup>, Olanrewaju, Philip Oladapo<sup>2</sup> and Bishop Sheila<sup>3</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Sango Ota. Ogun State

<sup>2</sup>Department of Mathematics/Statistics, Federal University Wukari, Taraba State

<sup>3</sup>Department of Mathematics, Covenant University, Sango Ota. Ogun State

(anuoluwapo.olanrewaju@covenantuniversity.edu.ng<sup>1</sup>, oladapo\_anu@yahoo.ie<sup>2</sup>, sheila.bishop@covenantuniversity.edu.ng<sup>3</sup>)

**Abstract**

The paper analysis the boundary layer mixed convection flow of Casson fluid over a stretching sheet with convective surface boundary conditions and Hall Effect in the presence of chemical reaction and internal heat generation. Similarity solutions are

obtained using scaling transformations. Using the similarity variables, the governing non-linear partial differential equations are transformed into a set of coupled non-linear ordinary differential equations, which are solved numerically by the shooting iteration technique together with sixth-order Runge-Kutta scheme. To observe physical insight and interesting aspects of the problem in the presence of internal heat generation and chemical reaction, the non-dimensional velocity, transverse velocity, temperature and concentration field are numerically studied and displayed graphically for pertinent controlling fluid flow parameters. The results show the effect of the combined parameters of chemical reaction with the internal heat generation having greater influence on the Casson fluid model flow. The results of Ashraf et al. (2017) serve as a special type of ours and our results agrees with their published research article.

**Keywords:** Casson fluid model, mixed convection flow, Hall Effect, internal heat generation, chemical reaction, boundary layer flow.

Paper ID: NIGMISG18-120

### **APPLICATION OF DIFFERENTIAL TRANSFORM METHOD TO SECOND-ORDER FUZZY DIFFERENTIAL EQUATIONS**

**O. O. Agboola<sup>1</sup>, A. A. Opanuga<sup>1</sup>, O. T. Olotu<sup>2</sup>**

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Nigeria

<sup>2</sup>Department of Mathematics, University of Ilorin, Ilorin, Nigeria

#### **ABSTRACT**

In this, paper, we develop differential transform method for the solution of second-order fuzzy differential equations which are very significant in modelling real-life situations. Numerical examples are presented to demonstrate the efficiency of the method.

Paper ID: NIGMISG18-121

### **OPTIMIZING LEAN MANUFACTURING FOR SUSTAINABILITY IN SUB-SAHARAN AFRICA**

<sup>1,2</sup>Michael C. Agarana, <sup>1</sup>Timothy Anake, <sup>2</sup>Esther T. Akinlabi

<sup>1</sup>Department of Mathematics, Covenant University, Nigeria.

<sup>2</sup>Department of Mechanical Engineering Science, University of Johannesburg

**Abstract:** Recent advances in Manufacturing can be linked to lean manufacturing. This study attempts to optimize the lean production of a consumable good in a major country in sub Saharan Africa in order to enhance sustainability of the region. Operational research tools were deployed to model the production processes of a particular product and the mathematical model obtained was solved with the aid of computer software and program written with a python computer language. The results obtained showed that

for the three pillars of sustainability to be upheld in sub Saharan Africa, wastage should be curtailed and more personal should be trained to understand the advanced manufacturing techniques needed for lean production.

Keywords: Lean Manufacturing, Optimization, Sustainability, Sub-Saharan Africa.

Paper ID: NIGMISG18-122

### **MODELING AND NUMERICAL SIMULATION OF ADDITIVE MANUFACTURING PROCESS**

<sup>1,2</sup>Michael C. Agarana, <sup>1</sup>Timothy Anake, <sup>3</sup>Esther T. Akinlabi

<sup>1</sup>Department of Mathematics, Covenant University, Nigeria.

<sup>2</sup>Department of Mechanical Engineering Science, University of Johannesburg

**Abstract:** This study set out to model and simulate, numerically, the basic additive manufacturing process which comprises CAD modelling, STL conversion/file manipulation, Printing, removal of prints, and post processing. Mathematical modelling tools were adopted and the resulted model was simulated using numerical techniques with the aid of computer software. The results obtained can enhance lean additive manufacture generally if adopted in the processes.

Keywords: Modelling, Numerical Simulation, Additive Manufacturing process

Paper ID: NIGMISG18-123

### **ENHANCING PROFIT MAKING OF COVENANT UNIVERSITY SUPERMARKETS USING LINEAR PROGRAMMING MODEL**

Ezinne C. Erondy and Michael C. Agarana

Department of Mathematics, Covenant University, Nigeria

**Abstract:** Supermarkets in Covenant University are with little or no competition. However the level of profit making is below the optimal. This paper attempt to identify the factors responsible for the low level of profit making and apply linear programming algorithm to minimize the effect of these factors in order to improve profit making of these supermarkets. The resulting model was solved with the aid of LINGO. The results obtained show that staff turnover and late restocking are some of the factors that significantly contribute to the low level profit making of these supermarkets.

**Keywords:** Profit Making, Covenant Universities, Supermarkets, Linear Programming Model

Paper ID: NIGMISG18-124

## **GOAL PROGRAMMING SOLUTION TO THE MULTI-CRITERIA DECISION MAKING PROBLEM OF HEBRON DRINKS**

Ezinne C. Erundu and Michael C. Agarana

Department of Mathematics, Covenant University, Nigeria

**Abstract:** Hebron Drinks is one of the small and medium enterprises (SMEs) at Covenant University. The firm produces variety of products, at small scale level, mainly for the university community. Her products include bottled water and Yoghurt. The management of Hebron Drinks are usually faced with different decisions to make on a daily basis, in order to improve the operations of the enterprise. In this study, an attempt is made to help the management of Hebron Drinks to make good decisions by modelling their decision making processes using goal programming algorithm. A computer software is used to solve the resulted model. The results obtained show that the decision making of Hebron Drinks management would improve if the right personnel are employed to man different strategic positions of the enterprise.

**Keywords:** Hebron Drinks, Goal Programming, Multi-criteria decision making

Paper ID: NIGMISG18-125

## **THE GOMPERTZ FLEXIBLE WEIBULL (GOFW) DISTRIBUTION**

Pelumi E. Oguntunde<sup>1</sup>, Mundher A. Khaleel<sup>2</sup>, Oluwole A. Odetunmibi<sup>1</sup>, and  
Hilary I. Okagbue<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

<sup>2</sup>Department of Mathematics, University of Tikrit, Tikrit, Iraq

**Abstract:** This paper introduces the Gompertz flexible Weibull distribution as an extension of the flexible Weibull distribution. Its various statistical properties are obtained and established while the method of maximum likelihood estimation is used in estimating the unknown model parameters. The application of Gompertz flexible Weibull distribution is illustrated by making use of three real life data sets, this is done to demonstrate its potentials over some other important distributions like the Gompertz Weibull, Gompertz Burr Type XII, Gompertz Lomax, Exponentiated Flexible Weibull, Exponentiated Flexible Weibull Extension and Kumaraswamy Flexible Weibull distributions.

**Keywords:** Generalized model, Flexible Weibull distribution, Mathematical Statistics, Maximum Likelihood Estimation, Statistical Properties

Paper ID: NIGMISG18-126

## **ALTERNATIVE APPROACH IN DISTORTION GRADIENT PLASTICITY THEORY**

Adebowale Borokinni<sup>1</sup>, Odunayo Fadodun<sup>2</sup>, Ade Akinola<sup>2</sup>, Olawanle Layeni<sup>2</sup>

<sup>1</sup> *Distance Learning Institute, University of Lagos, Lagos, Nigeria*

*E-mail: aborokini@unilag.edu.ng borokinniadebowale@gmail.com*

<sup>2</sup> *Department of Mathematics, Obafemi Awolowo University, Ile-Ife, Nigeria*

*E-mail: fadodun.odunayo@gmail.com, aakinola@oauife.edu.ng,*

*olawanle.layeni@gmail.com*

**Abstract:** This study presents an alternative thermodynamically consistent distortion gradient plasticity theory for polycrystalline materials. The formulation employs the principle of virtual power, laws of thermodynamics, and codirectionality hypothesis for the constructions of macroscopic and microscopic balance laws governing the elastic and plastic responses of the materials. Expressing the plastic distortion tensor in terms of accumulated plastic strain and plastic rotation vector shows that the the two quantities are governed by independent plastic flow equations. In addition, it is obtained that the flow equation which governs the accumulated plastic strain interacts with the elastic response of the materials while the flow equation governing the plastic rotation vector is independent of the elastic response. Finally, and amongst other things, it is shown that the present model is computationally less expensive in the sense that it requires lesser numbers of equations for the prediction of plastic behavior of the materials.

**Keywords:** Gradient plasticity, Microstresses, Polycrystalline, Flow rule

Paper ID: NIGMISG18-127

## **INTERPOLATING FUNCTION AND GOMPERTZ FUNCTION APPROACH IN POPULATION GROWTH ANALYSIS**

<sup>1</sup>Ogunrinde R. B., <sup>2\*</sup>Ayinde S. O., and <sup>3</sup>Adebayo S. F.

<sup>1,2</sup>Ekiti State University, Faculty of Science, Department of Mathematics, Ado Ekiti,

<sup>3</sup> Federal Polytechnic, Department of Mathematics, Ado Ekiti

<sup>1</sup>roseline.ogunrinde@eksu.edu.ng, <sup>2\*</sup>ayinde.olukayode@eksu.edu.ng,

<sup>3</sup>adefunmdanf@v@gmail.com

**Abstract:** The average annual percent change in the population in Nigeria, resulting from a surplus or deficit of births rate over deaths rate, the balance of migrants entering and leaving the country. The rate may either be positive or negative. The growth rate is a factor to determine the burden of a country by the changing needs of her people through infrastructure. In this research, an interpolating function was proposed following Gompertz function approach and a Numerical Method was developed to solve the population and growth problem. The method is found to be effective as the

numerical solution is as the same as the actual solution of the problem. The method also is used to predict the future population growth in Nigeria. Gompertz function or curve was for long of interest being used by Actuaries and Demographics directly as an equation.

**Keywords:** Gompertz Function, Mathematical Method, Population Growth, Carrying Capacity, Actuaries and Demographics

Paper ID: NIGMISG18-128

### **A FRAMEWORK FOR DEVISING PARALLEL-PROCESSING MILNE'S DEVICE THROUGH EXPONENTIALLY FITTED AIMED AT EXECUTING VIBRATION PROBLEMS**

G. J. Oghonyon<sup>1</sup>, Matthew Remilekun Odekunle<sup>2</sup>, Adetola Olaide Adesanya<sup>2</sup>, and  
Temitope Abodunri<sup>3</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Nigeria

<sup>2</sup>Modibbo Adamawa University of Technology, Yola, Nigeria

<sup>3</sup>Department of Physics, Covenant University, Nigeria

#### **Abstract**

Background and Objective: Milne's device concentrates mainly on nonstiff ODEs and having many facets qualities on designing an applicable step size/varying the step size and find the tolerance criteria. This Milne's device is an extraction of Adam's family consisting of a k-step predictor method and k-1 corrector method that devise the predictor-corrector pair. The sole aim of this research work will be geared towards a framework for devising parallel-processing Milne's device (DPPMD) aimed at executing vibration problems. Materials and Methods: The exponential fitted method is utilized as the basis function approximation via collocation and interpolation. This idea of collocation and interpolation technique will be put together and resolve to establish the DPPMD which will further produce the primary local truncation error after finding the order of DPPMD. Results and Discussion: Examples of vibration problems will be considered and examine to display the computed maximum errors liken to other existing techniques. Conclusions: All completed final results are viable with the formulation of DPPMD and this showcase that DPPMD is more technical and with better accuracy in terms of establishing the computed MAXE (maximum error) at all levels of the tolerance criteria. Once more, DPPMD is more superior to backward differentiation formula since it is developed with known frequency via exponentially fitted method.

Paper ID: NIGMISG18-129

### **IMPULSIVE JUMP-DIFFUSION MODELS FOR PRICING SECURITIES**

Oyelami, Benjamin Oyediran  
National Mathematical Centre Abuja, Nigeria  
Tel:+2348036547613  
Contact Email: [boyelami2000@yahoo.com](mailto:boyelami2000@yahoo.com)

#### **Abstract**

In this paper, an impulsive stochastic differential equations which contain jump, diffusion and impulsive components for pricing European call and put option is considered. Various types of formulation of strike prices emphasized. The existence of strong solution to the model is established and numerical solution to model sought using Monte Carlo simulation to price options at various scenarios.

#### **Keywords**

Model, impulsive, stochastic, jump, diffusion, pricing options and Monte Carlo simulation.

Paper ID: NIGMISG18-130

### **EXPONENTIATED POWER HALF LOGISTIC DISTRIBUTION: THEORY AND APPLICATIONS**

Emmanuel W. Okereke  
Department of Statistics Michael Okpara University Umudike, Nigeria  
[okereke.emmanuel@mouau.edu.ng](mailto:okereke.emmanuel@mouau.edu.ng)

#### **ABSTRACT**

Paper ID: NIGMISG18-131

### **THE SOLUTIONS OF SOME GAMES OF STRATEGY USING MINIMAX THEOREM**

Ngene Chibuike and U. Y Abubakar  
Department of Mathematics,  
Federal University of Technology, Minna, Nigeria.

*E-mail: [ngenechika7@gmail.com](mailto:ngenechika7@gmail.com) , [ngenechibuike95@gmail.com](mailto:ngenechibuike95@gmail.com)*

**Abstract:** As life is all about competition. This paper provides a systematic quantitative approach for deciding the best strategies in competitive situation, which arises in situations of conflicting interest. We developed a frame work for analyzing decision making and quantitative technique that can be used by player to arrive at an optimal strategy.

**Keywords and phrases:** *Competition, strategy, decision making , player, optimal strategy.*

Paper ID: NIGMISG18-132

### ON THE POSITIVE SOLUTION OF A FOUR-POINT SECOND-ORDER BOUNDARY VALUE PROBLEM ON THE HALF-LINE

O. F. Imaga<sup>1</sup>, S. A. Iyase<sup>1</sup>, J. G. Oghonyon<sup>1</sup>  
 Department of Mathematics, Covenant University Ota, Nigeria  
 Email: imaga.ogbu@covenantuniversity.edu.ng

#### **Abstract**

This research paper considers the following four-point second-order boundary value problem on the half-line

$$u''(t) + b(t)w(t, u(t), u'(t), u''(t)) = 0, \quad 0 < t < +\infty,$$

subject to the boundary conditions:

$$u(+\infty) - u(\eta) = u(0), \quad u'(+\infty) = 0,$$

where  $\eta \in (0, +\infty)$  and  $w: [0, +\infty) \times \mathbb{R}^2$  is a continuous function that satisfies a Nagumo's condition. The techniques that will be used to obtain the existence of at least one solution are the Schauder's fixed point theorem, and the method of upper and lower solutions.

**Keywords and phrases:** four-point boundary value problems, Schauder's fixed point, lower and upper solutions, non-local boundary conditions, half-line.

Paper ID: NIGMISG18-133

### SOME DIFFERENTIAL CALCULUS NOTES ON WRAPPED EXPONENTIAL DISTRIBUTION

Hilary I. Okagbue, Pelumi E. Oguntunde, Patience I. Adamu, Abiodun A. Opanuga,  
 Sheila A. Bishop

Department of Mathematics, Covenant University, Ota, Nigeria

#### **Abstract**

Wrapped probability distributions are used in modeling circular data arising from physical, medical and social sciences. Wrapped exponential distribution is obtained from wrapping exponential distribution in a unit sphere. This work considers the generation of ordinary differential equations whose solutions are the probability functions of wrapped exponential distribution. This will help in understanding the nature of exponential distribution when wrapped in a circle. Different methods can be used in obtaining the solutions to the differential equations generated from the process. Some unique patterns were observed which can channel research activities towards the area. In conclusion, some expressions were obtained that link the probability functions with their respective derivatives.

**Keywords:** Wrapped exponential distribution, differential calculus, ordinary differential equations, survival function, hazard function, odds function.



Paper ID: NIGMISG18-134

## **GENDER PERSPECTIVES IN THE TREATMENT OF MENTAL ILLNESS IN NIGERIA**

Tomike I. Olawande<sup>1</sup>, Ayodele S. Jegede<sup>2</sup> and Hilary Okagbue<sup>1</sup>

<sup>1</sup>Covenant University, Nigeria

<sup>2</sup>University of Ibadan, Nigeria

Corresponding Email: tomike.olawande@covenantuniversity.edu.ng

### **ABSTRACT**

Mental illness present lots of challenges especially in Nigeria. Cultural factors influences choice of mental healthcare therapy in the treatment of people living with mental illness. Little attention has been paid to spiritual perspectives in the treatment of mental illness. This study therefore examined spiritual perspectives in the treatment of mental illness in Ogun State, Nigeria. The research design was a cross-sectional survey of communities and four neuropsychiatric hospitals in Ogun State, Nigeria. Qualitative and quantitative methods of data collection were triangulated. Multi-stage sampling technique was used to select three Local Government Areas (LGAs) in Ogun state. Nine hundred and sixty seven (967) adults aged 18 and above were randomly selected. Ten In-depth Interviews were conducted among caregivers of people living with mental illness (PLWMI) (those who are receiving treatment and those who have recovered) and nineteen Key Informant Interviews were conducted among traditional healers that reside in the study area. Out of the total, 52 percent of the respondents were female while 46 percent were male. With regard to the choice of mental healthcare therapy, for male respondents, 80.2% and 19.8% reported that the choice of mental healthcare therapy are traditional/spiritual and orthodox respectively. On the other hand, 70.7% and 29.3% of female respondents reported that the choice of mental healthcare therapy are traditional/spiritual and orthodox respectively. This study concluded and recommended that gender differences largely influenced the choice of mental healthcare therapy. The availability and choice of mental healthcare services towards improving the mental health of adults were key factors that could impact the mental health status of adults.

**Keywords:** Gender, Treatment and Mental Illness

Paper ID: NIGMISG18-135

## **MHD BOUNDARY LAYER SLIP FLOW AND HEAT TRANSFER BY HOMOTOPY PERTURBATION METHOD**

**Olisa J. D.**

**Mathematics and Statistics Department, University of Port Harcourt**

E mail: joy\_dili@yahoo.com, Phone No: 08035532752

### **ABSTRACT**

Magneto hydrodynamic(MHD) boundary layer flow and heat transfer over a flat plate with velocity and temperature slip is investigated. The governing nonlinear partial differential equations are transformed to ordinary differential equations which are also nonlinear using a similarity transformation and are solved by the homotopy perturbation method (HPM). The effects of the resulting parameters from the transformation including the slip parameters are analyzed graphically. The results are also in agreement with previous studies indicating the effectiveness of the HPM.

**KEYWORDS:** magnetohydrodynamics, heat transfer. Slip, homotopy perturbation

Paper ID: NIGMISG18-136

## **SAMPLING DISTRIBUTION OF SOME SELECTED PROBABILITY DISTRIBUTIONS. A MONTE-CARLO APPROACH**

\*Ibrahim, S. A. and Junaidu, M. S.

Department of Physical Sciences, Al-Hikmah University, Ilorin, Nigeria

\* Corresponding Author: Tel: +234(0)8052262175;

Email: adeshinas2010@alhikmah.edu.ng, adeshinas@gmail.com

### **Abstract**

The normality of sampling distribution is crucial for statistical inference; and sampling distribution is the source of all knowledge in statistical analysis. In this study, sampling distributions of means for some selected probability distributions such as normal, uniform, lognormal and exponential distributions were studied. Data used were simulated from R software. It was found that the mean of the sampling distribution of means for all sample size  $n=[10, 20, 30, 50, 80, 100]$  considered for each distribution were in a neighbourhood of the true population mean with a little bias. It was also found that the standard deviation (also called standard error) of sampling distribution of means agree quite closely with the formula based estimate, and standard error decreased as sample size  $n$  increased for all distributions considered. Finally, it was observed through histogram that sampling distribution of means approximate normal as sample size  $n$  increases for all the population distributions considered, which support the theory of Central Limit theorem. Since the sampling distribution of means is approximately normal, this justifies the use of statistical procedure based on normal

distribution theory to estimate confidence intervals of  $\mu$  even when working with non-normal data.

**Keywords:** Probability Distributions, Sampling Distribution of means, Simulation, Central Limit Theorem.

Paper ID: NIGMISG18-137

### AN ALTERNATIVE TEST TO HOTELLING'S $T^2$ IN MULTIVARIATE TEST UNDER NON-HOMOGENOUS OF DISPERSION MATRICES

**P. O. Adebayo<sup>1</sup> and G. M. Oyeyemi<sup>2</sup>**

Department of Statistics, University of Ilorin, Ilorin, Nigeria

<sup>1</sup>[bayooni3@gmail.com](mailto:bayooni3@gmail.com)

<sup>2</sup>[gmoyeyemi@gmail.com](mailto:gmoyeyemi@gmail.com)

**Abstract:** An alternative procedure to Hotelling's T square which is known as Multivariate Behrens – Fisher problem that is, when the assumption of equality variance co – variance matrices is violated is proposed and compared with Hotelling's  $T^2$  and other existing methods (Johanson, Yao and Krishnamoorthy & Yu) using power of the test and type I error rate as measures of performance when small and large sample sizes are associated with small and large variance co – variance matrix at different significant level  $\alpha$  (0.05,0.025 and 0.01). The simulations were carried out when the null and alternative hypothesis is true using multivariate normal population. The results showed when variance co – variance matrix is large, proposed procedure performed better than other procedures and when small sample size is associate with small variance co – variance matrix, Yao procedure is better, while Hotelling's T square is better when equal sample size is associated with large variance co – variance matrix, but becomes poor when equal sample size is associated with small variance co – variance matrix.

Paper ID: NIGMISG18-138

### A THIRD-ORDER $p$ -LAPLACIAN BOUNDARY VALUE PROBLEM ON AN UNBOUNDED DOMAIN

S. A. Iyase<sup>1</sup>, O. F. Imaga<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, P.M.B, 1023 Ota, Ogun State, Nigeria

E-mail: [samuel.iyase@covenantuniversity.edu.ng](mailto:samuel.iyase@covenantuniversity.edu.ng), [driyase2011@yahoo.com](mailto:driyase2011@yahoo.com)

**Abstract:** In this work, we apply Leray-Schauder continuation principle to establish the existence of at least one solution to the third order  $p$ -Laplacian boundary value problem on an unbounded domain of the form

$$(\omega(t))\varphi_p(u''(t))' = K(t, u(t), u'(t), u''(t)), t \in [0, \infty)$$

$$u'(0) = \sum_{i=1}^m \alpha_i \int_0^{\xi_i} u(t) dt, u(0) = 0, \lim_{t \rightarrow \infty} (\omega(t) \varphi_p(u''(t))) = 0$$

under the non-resonant condition  $\sum_{i=1}^m \alpha_i \xi_i^2 \neq 2$ .

**Key words:** Non-resonance;  $p$ -Laplacian; Unbounded domain, Third order boundary value problem

2010 Mathematics Subject classification; 34B10, 34B15

Paper ID: NIGMISG18-139

## MATHEMATICAL MODELLING AND PREDICTION IN INFECTIOUS DISEASE EPIDEMIOLOGY

Ibrahim Wale Muhammed,

Department of Physical Sciences, Al-Hikmah University, Adewole Housing Estate,  
PMB 1601, Ilorin, Kwara State, Nigeria

E-mail- [ibraeverest@gmail.com](mailto:ibraeverest@gmail.com)

**Abstract:** The concept of prediction is delineated as it is understood by modellers, and illustrated by some classic and recent examples. A precondition for a model to provide valid predictions is that the assumptions underlying it correspond to the reality, but such correspondence is always limited—all models are simplifications of reality. A central tenet of the modelling enterprise is what we may call the ‘robustness thesis’: a model whose assumptions approximately correspond to reality will make predictions that are approximately valid. To examine which of the predictions made by a model are trustworthy, it is essential to examine the outcomes of different models. Thus, if a highly simplified model makes a prediction, and if the same or a very similar prediction is made by a more elaborate model that includes some mechanisms or details that the first model did not, then we gain some confidence that the prediction is robust. An important benefit derived from mathematical modelling activity is that it demands transparency and accuracy regarding our assumptions, thus enabling us to test our understanding of the disease epidemiology by comparing model results and observed patterns. Models can also assist in decision-making by making projections regarding important issues such as intervention-induced changes in the spread of disease.

**Keywords:** Epidemic modelling, HPV, model prediction, pandemic influenza, reproductive number, SIR

Paper ID: NIGMISG18-140

### **ANALYTICAL FORMULATION OF ASIAN OPTION PRICING MODEL UNDER UNCERTAIN MARKET**

O. P. Ogundile<sup>1</sup>, S. O. Edeki<sup>1</sup>, D. G. Olaniregun<sup>2</sup>, I. Adinya<sup>2</sup>, P. O. Ogunniyi<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

<sup>2</sup>Department of Mathematics, University of Ibadan, Ibadan, Nigeria

Asian option is a special type of financial instrument due to its averaging nature. It becomes widely accepted by financial investors because of its high risk management property. This work considers the formulation of analytical Asian option model (AOM) driven by Liu process under the uncertain environment unlike its counterpart: Black Scholes Model (BSM) governed by Brownian motion. AOM for call and put options is derived and some mathematical properties are investigated.

**Keywords:** Uncertain pricing model; Liu process; Asian option; Black Scholes model.

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### **HE'S POLYNOMIALS FOR ONE-FACTOR MARKOVIAN MODEL FOR BOND PRICING**

S. O. Edeki<sup>1</sup>, G. O. Akinlabi<sup>1</sup>, O. P. Ogundile<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

<sup>2</sup>Department of Mathematics, University of Ibadan, Ibadan, Nigeria

In financial setting, one-factor model reflects the notion that there exists one Wiener process in the definition of the short rate process indication one source of randomness. In this work, the corresponding derivative price is obtained using He's polynomial method. This can be extended to multi-factor models formulated in terms of stochastic dynamics.

**Keywords:** Option pricing; Black Scholes model. Analytical solutions; He's polynomials

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## TIME-FRACTIONAL BLACK-SCHOLES OPTION PRICING MODEL IN THE SENSE OF RADM

S. O. Edeki<sup>1</sup>, I. Adinya<sup>2</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

<sup>2</sup>Department of Mathematics, University of Ibadan, Ibadan, Oyo State

In this work, an approximate-analytical method resulting from the modification of the popular Adomian Decomposition Method is proposed for obtaining the solution of time-fractional Black-Scholes model. The method is referred to Restarted Adomian Decomposition Method (RADM). For further extension, the space-fractional Black-Scholes Option Pricing model can be considered.

**Keywords:** Option pricing; Black Scholes model; Restated Adomian Decomposition Method; Analytical solutions; Adomian polynomials

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## NUMERICAL SOLUTION OF STIFF SYSTEMS VIA HYBRID BOUNDARY VALUE METHODS

G.O. Akinlabi<sup>1\*</sup>, R. B. Adeniyi<sup>2,1</sup>, S. A. Bishop<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Canaanland, Ota, Nigeria

<sup>2</sup>Department of Mathematics, University of Ilorin, Ilorin, Nigeria

*\*Corresponding Author's e-mail: grace.akinlabi@covenantuniversity.edu.ng*

**Abstract:** In this work, we derive new methods called the Hybrid Boundary Value Methods (HyBVMs) and use them to approximate both linear and nonlinear stiff systems including the Van der Pol equation. This new scheme is one of the variations of the Boundary Value Methods (BVMs), which were developed to overcome the limitations of the popular Linear Multistep Methods (LMMs). The HyBVMs are also based on the LMMs by utilizing data at both step and off-step points. Numerical tests were presented on both nonlinear stiff systems so as to illustrate the process by using the specific cases:  $k = 4$  and  $k = 6$ . The results were of high accuracy as the rates of convergence of the solutions were compared with other BVM: Extended Trapezoidal Rules (ETRs).

**Keywords:** Stiff systems; Hybrid BVM; Linear Multistep Method; Boundary Value Method

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## ADAPTIVE HYBRID STRATEGY FOR SOLVING TRANSPORTATION PROBLEMS

Patience I. Adamu<sup>1</sup>, Hilary I. Okagbue<sup>2</sup>, Micheal C. Agarana<sup>3</sup>, Chinwe Ekenna<sup>4</sup>

<sup>1</sup>patience.adamu@covenantuniversity.edu.ng

<sup>2</sup>hilary.okagbue@covenantuniversity.edu.ng

<sup>3</sup>Micheal.agarana@covenantuniversity.edu.ng

<sup>4</sup>cekenna@albany.edu

**Abstract**—Solving transportation problems parallels the simplex method which involves finding an initial basic feasible solution (IBFS) to start the solution process. A good IBFS reduces the number of iterations, thereby minimizing the cost for finding the optimal solution. In a bid to minimize this cost, a number of strategies (rules) have emerged for finding IBFS of input transportation problems. Each of these rules uses different parameters to select a basic variable in each stage which makes them to have different strengths. Some rules perform better than the others depending on the input transportation problem. So, selecting the best one to use may be very challenging and this challenge is increased in large transportation problems with large number of sources and destinations.

Hence we present a general approach for forming a hybrid strategy (AHS). It assembles a set of rules and uses machine learning strategies to form a hybrid of the assembled rules. AHS observes the performance (strength) of each component rule and uses the best one to select a basic variable in each stage when finding the IBFS of an input transportation problem.

We used two sets of experiments to show how AHS performs in comparison with existing rules. In the first experiment we assembled three strategies to form the hybrid strategy (AHS) which we used to solve a balanced transportation problem. In the second experiment we assembled a different set of strategies to solve the unbalanced transportation problem. Results show that AHS compete favorably with existing rules.

**Keywords:** Simplex method, Transportation problem, Motion planning, Robotics.

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## STATISTICAL ANALYSIS OF MALNUTRITION PATIENTS - AN EFFECT OF BOKO HARAM INSURGENCE IN NIGERIA

Patience I. Adamu<sup>1</sup>, Hilary I. Okagbue<sup>2</sup>, Pelumi E. Oguntunde<sup>3</sup>, Oluwole A. Odetunmibi<sup>4</sup>

<sup>1</sup>patience.adamu@covenantuniversity.edu.ng

<sup>2</sup>hilary.okagbue@covenantuniversity.edu.ng

<sup>3</sup>pelumi.oguntunde@covenantuniversity.edu.ng

<sup>4</sup>Oluwole.odetunmibi@covenantuniversity.edu.ng

**Abstract**— Malnutrition is a health problem that results majorly from eating unbalanced diets, and its severe case is caused by starvation. Study show that this

ailment is commonly found in children and accompanied usually with severe weight loss, poor wound healing, organ failure and even death. This is one of the effects of insurgency, because poverty and starvation which is the major cause of this disease is synonymous with insurgence. The Boko Haram in Nigeria started fully in the 2009. This research is geared towards analyzing the extent to which the Boko Haram insurgence has affected the health of the people, using malnutrition as a case study. The data presented is obtained from University of Maiduguri Teaching Hospital, Department of Health Information Management Coding and Indexing Unit (Research and Education). It covers the period from 2007 to September 2017. The data shows the number of male and female reported cases every month before the insurgence and during the insurgence. The analysis is performed using Statistical Package for Social Sciences (SPSS) version 20 and Excel. Results show that those living with this ailment are children between the ages of 0-10 years. Though there were reported cases before the insurgence, the reported number of cases increased significantly during the insurgence and highest number was recorded in 2015. Malnutrition was found to almost equally affect both genders.

**Keywords:** Malnutrition, Boko Haram, Nigeria, SPSS, Excel

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### **CONFORMABLE DERIVATIVE APPROACH TO TIME-FRACTIONAL ORDER LOGISTIC MODEL**

S. O. Edeki<sup>1</sup>, P. O. Ogunniyi<sup>1</sup>, G. O. Akinlabi<sup>1</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

In this work, Time-fractional Order Logistic Model (TFOLM) is considered via a decomposition method. The fractional derivative(s) in this regard are defined in the conformable setting unlike the general Caputo derivative. Comparison is made using the classical Logistic Model.

**Keywords:** Logistic Model; Adomian Decomposition Method; Analytical solutions; Conformable Derivatives



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## **BERNSTEIN-PADE APPROXIMATION OF SOLUTIONS OF LINEAR VOLTERRA INTEGRAL EQUATIONS OF SECOND KIND**

T. A. Anake<sup>1</sup> and O. A. Agbolade<sup>1,2</sup>

<sup>1</sup>Department of Mathematics, Covenant University, Ota, Ogun State, Nigeria

<sup>1,2</sup>Department of Mathematics & Statistics Federal Polytechnic Ilaro, Nigeria

### Abstract

The numerical solution of non-homogenous Volterra integral equations of second kind with separable kernel has been studied. The numerical scheme is derived by collocation method with Bernstein polynomials as basis functions of the approximating polynomial evaluated at standard collocation points. Thereafter, the Bernstein approximant is resolved into a Pade approximants of varying order. Numerical experiments have been conducted and the convergence of the computed solutions, respectively, to the exact solution are studied graphically and absolute errors obtained are given. Both methods are efficient.

**Index Terms:** Volterra Integral Equations, separable kernel, Bernstein polynomials, Standard Collocation Method, Pade Approximation

### **NIGMISG18-148**

#### **Analytical form of sputter yield and projected range with the surface binding energy of different types of perovskite solar cells**

**Oluwole E. Oyewande<sup>a,b</sup> and Akinwumi Akinpelu<sup>a</sup>**

<sup>a</sup>Department of Physics, College of Science & Technology, Covenant  
University, Ota, Nigeria

<sup>b</sup>Department of Physics, Faculty of Science, University of Ibadan, Nigeria  
oluwole.oyewande@covenantuniversity.edu.ng  
akinwumi.akinpelu@covenantuniversity.edu.ng

**Abstract.** Focus has been intensified on perovskite materials as potential substitutes for silicon in solar cell fabrication in recent years. In a new approach to these studies, Monte Carlo Simulations of ion beam surface sputtering of potential perovskites materials were performed to investigate the effect ion-solid interactions on the physical factors responsible for differences in optoelectric properties of these structurally similar materials. A correspondence was established between the physical sputtering factors, such as projected range, ion-range and the ion-sputter yield, and the efficiencies of solar cells based on these materials. However, the form of this correspondence is unclear. In this paper, we deduce the mathematical forms of the sputter yield and projected range and the evolution equations of these quantities. We found that the differences in these factors are related to differences in their surface binding energy.





