PROGRAMME AND ABSTRACT BOOK

4TH INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND STATISTICS 2022

ICMSS 2022

15-16 MARCH 2022

A VIRTUAL CONFERENCE

'Towards Intensified Research in Highly Mathematical and Statistical Based Technology'

Organised by:
Department of Mathematics and Statistics
Faculty of Science
Universiti Putra Malaysia

Jointly Organised by:

Banasthali University, Jaipur, India

Supported by:

CONTENTS

FOREWORD
VICE CHANCELLOR
UNIVERSITI PUTRA MALAYSIA

Assalamu'alaikum W.B.T. and greetings

It is with great pleasure that I welcome the Keynote Speakers, Plenary Speakers and all participants of the 4th International Conference on Mathematical Sciences and Statistics 2022 (ICMSS2022). I would like to congratulate the organisers, the Department of Mathematics and Statistics, Faculty of Science, Universiti Putra Malaysia (UPM), and Banasthali University, Jaipur, India for their second collaborative effort in putting together this event and for promoting mathematical and statistical sciences as an interesting research area.

As one of Malaysia's research universities, UPM continues to work together with other leading world universities, agencies, and industries to create significant impact for wealth creation, nation building and universal human advancement through exploration and dissemination of knowledge. With its conference theme "Towards Intensified Research in Highly Mathematical and Statistical Based Technology", ICMSS2022 can help realise efforts toward theoretical and practical knowledge expansion in the area.

I hope ICMSS2022 will be a means for the participants to discuss new ways and innovative approaches in the compilation and usage of mathematical and statistical science, particularly in establishing research networking and knowledge sharing in the field of mathematics and statistics.

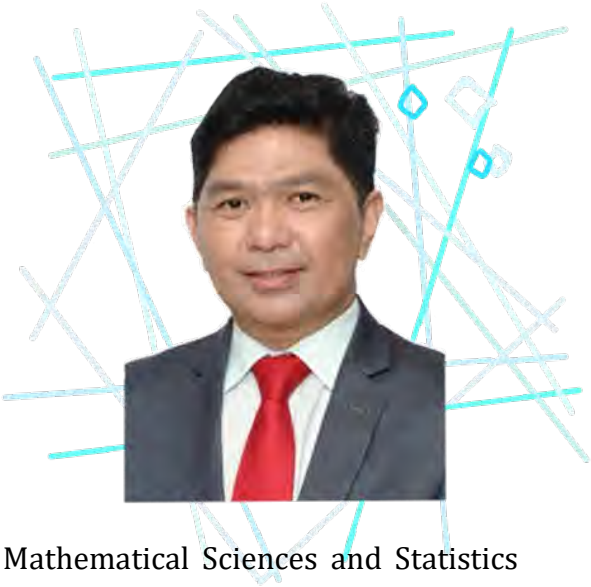
I believe this conference will create opportunities for future academic and social collaborations among all participants. I wish you all a successful conference, and a meaningful and an unforgettable experience at ICMSS2022!

Thank you and best wishes.

"WITH KNOWLEDGE WE SERVE"

YBHG. PROF. DR. MOHD ROSLAN SULAIMAN
Vice Chancellor
Universiti Putra Malaysia

FOREWORD
DEAN
FACULTY OF SCIENCE
UNIVERSITI PUTRA MALAYSIA



Assalamualaikum wbt

Welcome to the 4th International Conference on Mathematical Sciences and Statistics 2022 (ICMSS2022).

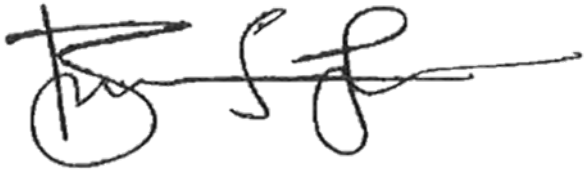
Mathematical and statistical sciences are important disciplines which carry out advanced analytical approaches to help solve related problems and make better decisions in life. ICMSS2022 is the best platform to envision and realize this.

I would like to congratulate the Department of Mathematics and Statistics, for organising the ICMSS for the fourth time. It is hoped that the hosting of this conference would serve as a venue for knowledge sharing and research collaboration among the participants, provide opportunities to discuss the challenges and applications in mathematical and statistical sciences in line with the theme "Towards Intensified Research in Highly Mathematical and Statistical Based Technology".

To the distinguished keynote and plenary speakers, I would like to express my appreciation for sharing your research findings with us. Congratulations to the committee members of ICMSS2022 for organising this conference.

Finally, I wish all participants to have a meaningful conference and keep supporting ICMSS in the future.

"WITH KNOWLEDGE WE SERVE"



PROF. ChM. DR. MOHD BASYARUDDIN ABDUL RAHMAN, FASc, FRSC, FIAAM
Dean
Faculty of Science
Universiti Putra Malaysia

FOREWORD
CHAIRMAN OF ICMSS2022

Assalamualaikum W.B.T. and Good Day

Firstly, we would like to welcome all delegates to the 4th International Conference on Mathematical Sciences and Statistics 2022 (ICMSS2022).

The newly branded Department of Mathematics and Statistics, Faculty of Science, Universiti Putra Malaysia is honoured to be given another opportunity to organize the 4th series of ICMSS. Aiming to uplift mathematical and statistical sciences to a much higher level in various fields existed everywhere.

With the theme "Towards Intensified Research in Highly Mathematical and Statistical Based Technology", ICMSS hopes to become a platform for academics, researchers, students, and industry players to share recent ideas and advances in mathematical and statistical sciences and technology. We hope that all participants will take this opportunity to actively participate in exchanging and engaging ideas among themselves.

We would like to express our gratitude to the sponsors of ICMSS2022, namely, Malaysian Mathematical Science Society (PERSAMA), Maths ProofRead, Besraya, Sunflower Shawl Empire, OEMS Intipakar Corp. Sdn. Bhd. dan Institut Statistik Malaysia (ISMy). Special thanks goes to the ICMSS2022 committee members for their tremendous effort and hardwork in making this conference a possibility.

Thank you.

"WITH KNOWLEDGE WE SERVE"

ASSOC. PROF. DR. NIK MOHD ASRI NIK LONG
Conference Chairman ICMSS2022

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CONFERENCE PROGRAMME

VIRTUAL 4TH INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND STATISTICS (ICMSS2022)
15 - 16 MARCH 2022

11th -14th March 2022 (Monday)		
Time (GMT+8)		
08:00 – 17:00	Early Registration	

15th March 2022 (Tuesday) – Day 1		
Time (GMT+8)		
08:00 – 09:10	Online Registration	MAIN ROOM
09:10 – 09:15	Briefing	MAIN ROOM
09:15 – 10:10	**Plenary 1: Dr. Mohammad Reza Beik Zadeh** Title: A Glance on Data Analytics and Its Applications	MAIN ROOM
10:15 – 10:55	**Opening Ceremony & Photography Session** by Prof. Dr. Mohd Roslan Sulaiman (Vice Chancellor UPM) •10:15 Negaraku and Putra Gemilang •10:20 Doa Recital •10:25 Welcome Speech by Chairman of ICMSS2022 •10:30 Welcome Speech & Official Video by Representatives from Banasthali University •10:35 Officiating Speech by Vice Chancellor of UPM •10:45 Video Montage of ICMSS2022 •10:50 Photography Session	MAIN ROOM
10:55 – 12:35	**Parallel Session 1**	ROOM A - D
12:35 – 14:00	Break Session	MAIN ROOM
14:00 – 16:40	**Parallel Session 2**	**ROOM A - D**

16th March 2022 (Wednesday) – Day 2		
Time (GMT+8)		
08:00 – 08:45	Online Registration	MAIN ROOM
08:45 – 08:50	Briefing	MAIN ROOM
08:50 – 09:55	**Keynote Address: Prof. Dr. Noda Nao-Aki** **Title:** Intensity of Singular Stress Field (ISSF) Variations for Cracks and Adhesive Joints Based on Three-Dimensional Theory of Elasticity	MAIN ROOM
10:05 – 11:00	**Plenary 2: Prof. Dr. Norihan Md Arifin** **Title:** Mathematical Modelling of Natural Convection in a Cavity Filled with Hybrid Nanofluid	MAIN ROOM
11:05 – 12:45	**Parallel Session 3**	ROOM A - D
12:45 – 14:10	Break Session	MAIN ROOM
14:10 – 16:30	**Parallel Session 4**	ROOM A - D
16:35 – 17:15	**Closing Remark** •16:40 Best Presenter & Poster Awards •16:50 Closing Speech by The Dean of Faculty of Science, UPM •17:05 Video for Closing Ceremony •17:10 Photography Session	MAIN ROOM

CONFERENCE SCHEDULE

DAY 1: 15 MARCH 2022 (TUESDAY)		
Time (GMT+8)	**Event**	**Room**
08:00 – 09:10	Online Registration	MAIN ROOM
09:10 – 09:15	Briefing	MAIN ROOM
09:15 – 10:10	**PLENARY 1: Dr. Mohammad Reza Beik Zadeh** from Axiata Malaysia **Title:** A Glance on Data Analytics and Its Applications **Chairperson:** Assoc. Prof. Dr. Jayanthi Arasan	MAIN ROOM
10:15 – 10:55	**OPENING CEREMONY** by Prof. Dr. Mohd Roslan Sulaiman (Vice Chancellor UPM) •10:15 Negaraku and Putra Gemilang •10:20 Doa Recital •10:25 Welcoming Remarks by Chairman of ICMSS2022 •10:30 Welcoming Remarks & Official Video by Representatives from Banasthali University •10:35 Officiating Speech by Vice Chancellor of UPM •10:45 Video Montage of ICMSS2022 •10:50 Photography Session	MAIN ROOM

10:55 –12:35 PARALLEL SESSION 1 BREAKOUT ROOM				
Time (GMT+8)	**1A** **ROOM A** **Chairperson:** **Mrs. Aniza Abd. Ghani**	**1B** **ROOM B** **Chairperson:** **Mr. Mohamed Faris Laham**	**1C** **ROOM C** **Chairperson:** **Dr. Siti Mahani**	**1D** **ROOM D** **Chairperson:** **Dr. Nadihah Wahi**

10:55 – 11:15	**INVITED 1A** **Assoc. Prof. Dr. Norazak Senu** *Numerical Study of Two-Derivative Runge–Kutta Type Methods for Solving General Third-order Ordinary Differential Equations*	**AM-007** **Siti Nurul Aifa Mohd Zainul Abidin** *Exact Analysis of Unsteady Solute Dispersion in Blood Flow – A Theoretical Study*	**INVITED 1C** **Assoc. Prof. Dr. S. Sarifah Radiah Shariff** *Optimizing Workforce Utilization in Motorcycle Component Assembly*	**FD-001** **Nurul Amira Zainal** *Unsteady Mixed Convection Flow Near the Stagnation Points of a Vertical Plate Embedded in a Hybrid Nanofluid*
11:15 – 11:35		**AM-008** **Cheah Yuat Hoong** *Modeling and Simulation on Roundabout with Waiting System*		**FD-002** **Nadihah Wahi** *Hybrid Method in Simulating Stationary Shock Problem*
11:35 – 11:55	**DE-001** **Che Haziqah Che Hussin** *Approximate Analytical Solutions of Second-Order Nonlinear Telegraph Equations*	**AM-009** **Mahmoud Moustafa** *Mathematical Modelling and Simulation of Periodontal Ligament using COMSOL Multiphysics*	**OR-006** **Yeo Heng Giap Ivan** *An Inventory Model with Recovery and Periodic Delivery that Considers Carbon Emission Cost*	**FD-003** **Wan Faezah Wan Azmi** *Slip Velocity Effect on Unsteady Free Convection Flow of Casson Fluid in a Vertical Cylinder*
11:55 – 12:15	**DE-002** **Nur Inshirah Naqiah Ismail** *Solving Neutral Delay Volterra Integro-differential Equation using Block Method*	**AM-010** **Mohamed Faris Laham** *Numerical Simulation of American Style of Asian Options under Jump Diffusion Process*	**OR-005** **Ain Aqiela Azamuddin** *New Hybrid Conjugate Gradient Method under Exact Line Search*	**FD-004** **Nur Syahirah Wahid** *Magnetic Nanofluids (MNFs) Radiative Flow over a Moving Surface with Convective Boundary Condition*
12:15 – 12:35	**DE-003** **Siti Solehah binti Bakar** *Solving SEIR model using Symmetrized Runge Kutta Methods: Implicit Midpoint Rule (IMR) and Implicit Trapezoidal Rule (ITR)*	**AM-011** **Siti Nur Iqmal** *Valuation of Power Call Options PDE under the Black-Scholes Model*	**OR-008** **Rokhsaneh Yousef Zehi** *Uncertain Negative Data in DEA: An Application of Banking in Malaysia*	**FD-005** **Rusya Iryanti Yahaya** *MHD Flow of Hybrid Nanofluid Past a Stretching Sheet: Double Stratification and Multiple Slips Effects*
12:35 – 14:00 BREAK SESSION **MAIN ROOM**				

14:00 – 16:40 PARALLEL SESSION 2 **BREAKOUT ROOM**				
Time (GMT+8)	**2A** **ROOM A** **Chairperson:** **Dr.Witriany Basri**	**2B** **ROOM B** **Chairperson:** **Assoc. Prof. Dr. Siti Hasana Sapar**	**2C** **ROOM C** **Chairperson:** **Mrs. Nazihah Mohamed Ali**	**2D** **ROOM D** **Chairperson:** **Dr. Norhaslinda Ali**
14:00 – 14:20	**AA-001** **Nurfarah Zulkifli** *p^{α} Noncoprime Graphs and Probability for Some Dihedral Groups*	**INVITED 2B** **Dr. Manoj Kumar Singh** *Stability and Bifurcation Analysis of a Harvested Leslie-Gower Predator-Prey Model in the Presence of Weak Allee Effect*	**INVITED 2C** **Prof. Dr. Shalini Chandra** *Determinants of BMI for Indian Women: Estimates from NFHS – IV*	**ST-004** **Nurliyana Juhan** *Bayesian MCMC Approach in Prognostic Modelling of Cardiovascular Disease in Malaysia: A Convergence Diagnostic*
14:20 – 14:40	**AA-003** **Mamika Ujianita Romdhini** *Neighbors Degree Sum Energy of Commuting and Non-Commuting Graph for Dihedral Groups*			**ST-007** **Norshahida Shaadan** *An Efficient Tool for Monitoring Air Quality (PM10) at Several Cities in Peninsular Malaysia Using Functional Principal Component Control Chart with Data Pre-Whitening*
14:40 – 15:00	**AA-004** **Mohammad Azim Mohd Azahari** *Translation-Invariant p-Adic Gibbs Measures for the Potts Model on the Cayley Tree of Order Four*	**AM-002** **Hor Sin Tang** *Lie Symmetries, Optimal System, and Invariant Solutions of the Generalized Cox-Ingersoll-Ross Equation*	**ST-006** **Nada Mohammed Saeed Alharbi** *Alternative Interval Estimation for the Generalized Exponential Distribution with Interval Censored and Fixed Covariate*	**ST-015** **Noratiqah Mohd Ariff** *Comparative Analysis between L-Moments and Maximum Product Spacings Method for Extreme PM_{10} Concentration*

15:00 – 15:20	**AA-005** **Asmaa Zafirah Kamaluzaman** *Self-Invertible Encryption Key on Cipher Trigraphic Polyfunction*	**AM-003** **Intan Diyana Binti Munir** *Analysis on the Solute Dispersion in Blood Flow Through an Inclined Artery with the Presence of Chemical Reaction*	**ST-009** **Razik Ridzuan Mohd Tajuddin** *A New One-Parameter Underdispersed Size-Biased Poisson Distribution for Count Data*	**ST-017** **Yashotha Satianesan** *Assessment of Various Rainfall Bias Correction Techniques in Peninsular Malaysia*
15:20 – 15:40	**AA-006** **Arif Mandangan** *On the Properties of the Almost Unimodular Matrix*	**AM-004** **Sharifah Fairuz Syed Mohamad** *Evaluation of the Degree of Public Risk of Developing Diabetes Type 2 in Relation to Takaful Policy*	**ST-011** **Oh Yit Leng** *New Extended Burr Type X Distribution: Model, Theory and Applications*	**ST-020** **Khuneswari Gopal Pillay** *Survey on Factors Influencing the Unemployment Among UTHM Graduates*
15:40 – 16:00	**AA-007** **Athirah Nawawi** *Relation Between Randic and Harmonic Energies of Commuting Graph for Dihedral Groups*	**AM-005** **Shar Nizam Sharif** *Robustness of Extended Benford's Law Distribution and Its Properties*	**ST-022** **Qian Yun Ng** *Mortality Modelling Using Stochastic Mortality Models: A Study on Malaysia's Ethnic Groups*	**ST-021** **Khuneswari Gopal Pillay** *Performance Analysis for Passenger Satisfaction of Kuala Lumpur International Airport*
16:00 – 16:20	**AA-008** **Mohd Pawiro Santono** *Bounded-Addition Fuzzy Semi-Simple Splicing Systems*	**AM-006** **Nor Farah Wahidah Nor Khalid** *Adaptive Therapy in Two-phase Model of Tumor*	**ME-002** **Nur Zahira Mohamed Zahir** *The Development of a Hypothesis Testing Learning Module Through 5E's Model for Technical and Vocational Education Students*	**ST-014** **Norhaslinda Ali** *At-Site and Regional Frequency Analysis of Extreme Rainfall Modelling in Peninsular Malaysia*
16:20 – 16:40				**ST-005** **Jyoti Dev** *Estimation with Incomplete Sampling Frames using Varying Probability Sampling*

DAY 2: 16 MARCH 2022 (WEDNESDAY)		
Time (GMT+8)	**Event**	**Room**
08:00 – 08:45	Online Registration	MAIN ROOM
08:45 – 08:50	Briefing	MAIN ROOM
08:50 – 09:55	**KEYNOTE: Prof. Dr. Noda Nao-Aki** Department of Mechanical Engineering, Kyushu Institute of Technology, Japan. **Title:** Intensity of Singular Stress Field (ISSF) Variations for Cracks and Adhesive Joints Based on Three-Dimensional Theory of Elasticity **Chairperson:** Prof. Dr. Lee Lai Soon	MAIN ROOM
10:05–11:00	**PLENARY 2**: **Prof. Dr. Norihan Md Arifin** Department of Mathematics and Statistics, Universiti Putra Malaysia, Serdang, Selangor, Malaysia. **Title:** Mathematical Modelling of Natural Convection in a Cavity filled with Hybrid Nanofluid **Chairperson:** Prof. Dr. Adem Kilicman	MAIN ROOM

11:05 – 12:45 PARALLEL SESSION 3 **BREAKOUT ROOM**				
Time (GMT+8)	**3A** **ROOM A** **Chairperson:** **Dr. Fadzilah Md Ali**	**3B** **ROOM B** **Chairperson:** **Dr. Faridah Yunos**	**3C** **ROOM C** **Chairperson:** **Dr. Haliza Rosali**	**3D** **ROOM D** **Chairperson:**
11:05 – 11:25	**FD-007** **Nur Nazirah Abdullah** *The Effect of MHD on Marangoni Boundary Layer of Hybrid Nanofluids Flow Past a Permeable Stretching Surface*	**AM-014** **Muhammad Asyraf Asbullah** *Comparative Analysis of Running Time and Memory Consumption of Rivest-Shamir-Adleman Cryptosystem and Its Four Variants*	**OR-009** **Nur Raidah Salim** *A Review on the Development of Interval Iterative Algorithms for Polynomial Root Finding*	***TBA**

11:25 – 11:45	**FD-008** **Fadzilah Md Ali** *Wang's Stretching/Shrinking Sheet Problem for Nanofluids with the Effects of Suction and Injection*	**AM-012** **Muhammad Khairi Abdul Razak** *Robustness of Image Watermarking Scheme Based on Modified Non-Separable Haar Wavelet Transform against Image Processing and Geometric Attacks*	**GE-001** **Fatemeh Ahangari** *Metric Foliated Cocycles Adapted to Isotropic Systems of Second Order Ordinary Differential Equations*	***TBA**
11:45 – 12:05	**FD-009** **Mohd Ezad Hafidz Hafidzuddin** *Analysis of Tangent Hyperbolic over a Vertical Porous Sheet of Carreau Fluid and Heat Transfer*	**AM-013** **Suzelawati Zenian** *Application of Intuitionistic Type II Fuzzy Set on fEEG Image*	**OR-004** **Ashweena Sundar** *Simulated Annealing Approach for an Outpatient Scheduling in a Hemodialysis Unit*	***TBA**
12:05 – 12:25	**FD-010** **Suhaila Saupi** *Mhd Hybrid Nanofluid over a Permeable Stretching Surface Embedded in Porous Medium with Thermal Radiation and Slip Effects*	**AM-015** **Sudha Dhandapani Subramanian** *Approximation Theory in UP-algebras Based on Intuitionistic Fuzzy Sets*	**OR-010** **Gafurjan Ibragimov** *Optimal Number of Pursuers in the Differential Game on the 1-skeleton of 4D Cube*	***TBA**
12:25 – 12.45	**GE-002** **Fatemeh Ahangari** *Exhaustive Analysis of a Distinguished Five-Dimensional Solution of Einstein Field Equations for Rotating Fluids via Variational Symmetries*	**AM-016** **Ahmad Qushairi Mohamad** *Natural Convection Flow of Casson Fluid with Carbon Nanotubes Past an Accelerated Disk*	**OR-003** **Aditi Rajput** *System Dynamics Simulation Model to reduce the Traffic Congestion of Metropolitan Cities of India by implementing Intelligent Transportation System*	***TBA**
12:45 – 14:10 BREAK SESSION **MAIN ROOM**				

14:10 – 16:30 PARALLEL SESSION 4 **BREAKOUT ROOM**				
Time (GMT+8)	**4A** **ROOM A** **Chairperson:** **Dr. Athirah Nawawi**	**4B** **ROOM B** **Chairperson:** **Assoc. Prof. Dr. Idham Arif Alias**	**4C** **ROOM C** **Chairperson:** **Dr. Hani Syahida Zulkafli**	**4D** **ROOM D** **Chairperson:** **Dr. Nur Haizum Abd Rahman**
14:10 – 14:30	**INVITED 4A** **Dr. Shared C. Pandey** *On the computable extension of fractional Volterra-type integro-differential equations involving Hilfer-Prabhakar fractional derivative*	**OT-003** **Aisyah Syahirah Sawal** *The Heston-CIR-Merton Model for Equity Warrant Valuation*	**INVITED 4C** **Dr. Gargi Tyagi** *Prevalence and Determinants of Hypertension and Diabetes in India: An Evidence from NFHS-4 Data*	**ST-027** **Nur Haizum Abd Rahman** *Spatio-temporal Analysis of COVID-19 Spread in Selangor*
14:30 – 14:50		**OT-006** **Diviekga Nair Madhavan** *Integral Constraints Pursuit Differential Game of an Infinite First Order 3-System of Differential Equations*		**ST-025** **Habsah Midi** *New Classification Algorithm for High Dimensional Data based on Robust SIMPLS*
14:50 – 15:10	**AN-001** **Abbas Umar Saje** *Simultaneous Algorithms for Solving Split Equality Fixed Point Problems for Demicontractive Mappings*	**OT-002** **Nik Asri Nik Long** *Numerical Approaches for Solving Mixed Volterra-Fredholm Fractional*	**ST-001** **Sook Theng Pang** *Short-Term Performance of the Probability-Based Universal Portfolio*	**ST-016** **Tan Zong Ming** *Control Chart for Monitoring Stock Price and Trading Volume in Malaysia Stock Market*
15:10 – 15:30	**AN-002** **Zainidin Eshkuvatov** *Nonlinear Fredholm Functional-Integral Equation of First Kind with Degenerate Kernel and Maxima*	**OT-004** **Nurul Afaaf Mohd Nasir** *Analysing Time-scales Currency Exposure using Maximal Overlap Discrete Wavelet Transform (MODWT) for Malaysian Industrial Sector*	**ST-002** **Fauhatuz Zahroh Shaik Abdullah** *Investment in Malaysia: Forecasting Fixed Deposit Using Time Series and Regression Analysis*	**ST-008** **Puteri Aiman Syahirah Rosman** *Understanding the Model Identification for Double Seasonal Integrated Moving Average (DSARIMA) Model*

15:30 – 15:50	**AN-003** **Mansi Verma** *The Existence of Minimizers for the Fuzzy Variational Problems and its Application to Optimal Control Problem*	**OT-007** **Ahlam Alharbi** *New Generalized Closed Concepts in Fuzzy Bitopological Spaces*	**ST-018** **Dg Siti Nurisya Sahirah Ag Isha** *Multiple Regression Analysis in Identifying Internal and External Factors Contributing to Academic Achievement: A Case Study in Universiti Malaysia Sabah*	**ST-023** **Wei Lun Tan** *Autonomous Language Processing and Text Mining by Data Analytics for Business Solutions*
15:50 – 16:10	**AN-004** **Sarimah Surianshah** *Technology and Student Perceptions on Online Learning Based on Socioeconomic Background*	**OT-001** **Siti Nabilah Yusof** *An IND-CPA Analysis on a Cryptosystem Based on Bivariate Polynomial Reconstruction Problem*	**ST-026** **Idari Ismail** *Two-Parameter Bathtub Hazard Model with Covariates and Right Censored Data*	**ST-024** **Zamira Hasanah Zamzuri** *Classifying the Severity Levels of Traffic Accidents using Decision Tree*
16:10 – 16:30	**AN-005** **Yasir Arfat** *An Accelerated Projection-based Parallel Hybrid Algorithm for Fixed Point and Split Null Point Problems in Hilbert Spaces*	**OT-005** **Idham Arif Alias** *Group Attack of Many Pursuers Against One Evader in an Evasion Differential Game of Integral Constraint*	**ST-028** **Hussein Ali AL-Hakeem** *Generalized Exponential Distribution with Interval-Censored Data and Time Dependent Covariate*	**DS-001** **Mohd Aftar Abu Bakar** *Wavelet Convolutional Neural Network for Forecasting Malaysian PM10 Time Series Data*
16:35 – 17:15 CLOSING CEREMONY **MAIN ROOM** •16:40 Best Presenter & Poster Awards •16:50 Closing Speech by The Dean of Faculty of Science, UPM •17:05 Video for Closing Ceremony •17:10 Photography Session				

***TBA- TO BE ANNOUNCE**

ABSTRACTS

KEYNOTE SPEAKER:

Intensity of Singular Stress Field (ISSF) Variations for Cracks and Adhesive Joints Based on Three-Dimensional Theory of Elasticity

Nao-Aki Noda

Department of Mechanical Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

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Abstract. In this talk, several variations of the intensity of singular stress field (ISSF) are discussed for three-dimensional cracks. A singular integral equation method is applied to calculate the stress intensity factor along crack front of 3D surface cracks. Stress field induced by body force doublet in a semi-infinite body is used as a fundamental solution. Then, the problem is formulated as an integral equation with a singularity of the form of r^{-3}. In solving the integral equations, the unknown functions of body force densities are approximated by the product of a polynomial and a fundamental density function, which is the exact density distribution to make an elliptical crack in an infinite body. The calculation shows that the present method gives the smooth variation of stress intensity factors along the crack front and crack opening displacement along the crack surface for various aspect ratios and Poisson's ratio. Other examples of ISSF variations are shown for prismatic adhesive bonded problems. In this case, how to obtain the accurate ISSF variation by using the finite element method is explained.

PLENARY SPEAKER 1:

A Glance on Data Analytics and Its Applications

Mohammad Reza Beik Zadeh

Axiata Malaysia

beikzadeh37@gmail.com

Abstract. The presentation under the title "A Glance on Data Analytics and Its Applications" starts with an introduction to natural and artificial intelligent system as the baseline for introducing the main concepts of data itself and data analytics. Then illustrates how analytics thinking and holistic thinking may conceptually lead to generating insight and ends up with actionable decision. The rest of the presentation highlights the eco-system of data analytics techniques and tools for applying statistics, machine learning and visual analytics on data to generate insights for decision and policy makers. The concluding part presentation explains several applications of data analytics and AI techniques in different sectors to express the role of data analytics in future.

PLENARY SPEAKER 2:

Mathematical Modelling of Natural Convection in a Cavity Filled with Hybrid Nanofluid

Norihan Md Arifin

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Abstract. Natural convection is a phenomenon in which the fluid motion is driven by buoyancy forces, caused by density differences due to temperature variations in the fluid. Developing new models of heating and cooling systems is the common method to improve quality of product in industries. As a main element of these systems, we can note working fluids that have the duty to transfer heat energy from one place to another one. The recent developments in technology require an innovative revolution in the field of heat transfer. Nanofluid is a developed fluid that has better potential for using in heating and cooling systems. Nanofluid is a kind of heat transport medium containing nanoparticles less than 100 nm which are consistently and steadily dispersed in a base fluid. Hybrid nanofluid as a next generation of nanofluid is developed which are having high thermal conductivity compared to mono nanofluid. Hybrid nanofluid refers to the formation of two or more nanoparticles in a base fluid. A numerical study is conducted to investigate the transport mechanism of natural convection in a cavity filled with hybrid fluid containing alumina Al203 and copper Cu nanoparticles are dispersed in water as a base fluid. A comprehensive mathematical model is developed, which is solved using the Galerkin weighted residual along with finite element technique. The influences of the solid volume fraction on the convective flow, as well as the effect of the inclination angle of the sloping wall on thermal performances were examined. The streamlines, isotherm plots and the variation of the average Nusselt number are presented and discussed.

Numerical Study of Two-Derivative Runge–Kutta Type Methods for Solving General Third-order Ordinary Differential Equations

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Abstract. A class of explicit Runge–Kutta type methods with the involvement of fourth derivative, denoted as two-derivative Runge–Kutta type (TDRKT) methods, are proposed and investigated for solving a class of third-order ordinary differential equations in the form u'''= f (x, ux,u'x,u''(x))**.** In this paper, two stages with algebraic order five and three stages with algebraic order six are presented. The derivation of TDRKT methods involves single third derivative and multiple evaluations of fourth derivative for every step. Stability property of the methods are analyzed. Beside that study on trigonometrically fitted methods for solving problems with oscillating solutions are presented. Accuracy and efficiency of the new methods are exhibited through numerical experiments.

Keywords: Runge–Kutta type methods; third-order ordinary differential equations; Algebraic order; stability property; rooted-tree

Prevalence and Determinants of Hypertension and Diabetes in India: An Evidence from NFHS-4 Data

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Abstract. Hypertension and diabetes are two major risk factors which cause life threatening non-communicable diseases such as brain stroke, cardiovascular diseases, etc. India is seeing a rapid increase in prevalence of hypertension and diabetes year by year. To reduce such cases, it is important to identify socio-demographic and geographic groups. This study aims to identify some socio-demographic factors associated with hypertension and diabetes and to find spatial clusters to locate high prevalent areas. Spatial regression models will be used to estimate the area-specific prevalence of hypertension and diabetes using the national family health survey 2015-16 (NFHS-4) data.

Keywords: Non-communicable diseases, Regression model, Spatial model, National Family Health Survey, India.

Optimizing Workforce Utilization in Motorcycle Component Assembly

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Abstract. The lack of resource utilization has resulted in manufacturing staying at the same level for a long time. This problem cannot be solved simply by adding machines and hiring more labor. There is an urgent need for innovation and more investment in the development of manufacturing systems. Therefore, a strategic approach is needed to plan and handle the motorcycle component assembly process. This research aimed to evaluate the current workforce utilization of motorcycle parts assembly line and put forward a feasible plan for the assembly company to achieve their best production based on limited workforce resources. The study specifically targeted assemblers located in Port Klang, Selangor. The data used for the research is the auxiliary data in a three-month time span and is recorded in the assembly company. Simulation is applied in this research to grasp the current situation and Arena simulation software tool is used. The improvement models are proposed by reallocating the workers into their designated workstations. The findings found that by setting a group of workers that operate in a cyclical manner assisted the assembler to maximize the workforce utilization rate. In order to make future research completer and more thorough, more exploration is encouraged by adding related measures (such as applied inventory practices, production and other related costs, and larger sample sizes). The results from this study can help the assembler management to make better decisions thus upgrading the motorcycle component assembly system.

Keywords: Simulation model, assembly line, workforce, motorcycle component, productivity.

Stability and Bifurcation Analysis of a Harvested Leslie-Gower Predator-Prey Model in the Presence of Weak Allee Effect

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Abstract. In this article, a modified Leslie-Gower predator-prey model in the presence of nonlinear prey harvesting is proposed and analyzed by considering that the growth rate of prey species is subjected to a weak Allee effect. First, the boundedness and positivity of the solutions of the system have been studied. The parametric conditions under which various feasible equilibrium points exist have been derived. In succession, local stability for each equilibrium point has been analyzed. Further, the parametric conditions for existence of various bifurcations (saddle-node bifurcation, Hopf bifurcations, Bogdanov-Takens bifurcation homoclinic bifurcation) have been obtained. Finally, the analytical findings have been validated by numerical simulations and possible phase sketches.

Keywords: Predator-prey model; Stability; Bifurcation; Allee effect; Harvesting

On the computable extension of fractional Volterra-type Integro-differential Equations Involving Hilfer-Prabhakar Fractional Derivative

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Abstract. In the present article, an extension for the family of Volterra-type integro-differential equations, involving a generalization of Hilfer fractional derivative with the Lorenzo-Hartley's G-function (LHGF) in the kernel, is proposed. A compact and computable solution of the considered family of integro-differential equations is established in terms of an infinite series of LHGF. Further, certain known and new special cases of the proposed family are also established. Furthermore, some examples of the integro-differential equation are also discussed. Moreover, from the application point of view, generalized fractional free-electron laser equations involving the Caputo and the Riemann-Liouville fractional derivatives are determined as the classical cases of the studied family. Finally, the graphical illustrations for the solutions of the studied generalized fractional free-electron laser equations are demonstrated.

Keywords: Fractional-order integro-differential equation. Hilfer-Prabhakar fractional derivative. Lorenzo Hartley's *G*-function. Laplace transform.

Determinants of BMI for Indian Women: Estimates from NFHS - IV

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Abstract. The health status of women in a country determines the overall health of the whole country. The basic factor responsible for health is nutrition. Thus, it is necessary to study nutrition and the factors responsible. Studies have shown that the nutritional status of Indian women is one among the poorest. In this paper, considering Body Mass Index (BMI) as an index to measure nutritional status, we study the factors affecting BMI for Indian women. Data from National Family Health Survey (NFHS-4) have been used for the analysis. The results of exploratory analysis revealed that the proportion of underweight women was high among rural women and that of overweight/obesity was high among urban women. With increase in age, education and wealth, BMI of women showed an increasing trend. Women from Schedule tribes had smaller proportion of obesity than women of other castes. Christian women had better BMI status than other religions. BMI improved with decrease in level of anemia. North-Eastern women had the best BMI status among all zones. Furthermore, regression modeling was performed to fit three different models to the data namely, Multiple Linear Regression model, Log-Linear Regression Model and Multiple Linear Regression model with LASSO Regularisation, to determine the most significant predictors of BMI. On comparing the above models using adjusted R2 to find the best model, Log-Linear model was observed to give the best fit.

Keywords: Women's Health, NFHS, BMI, Linear Regression, Log-Linear, LASSO.

CONTRIBUTED TALK

AA-001
p^{α} Noncoprime Graphs and Probability for Some Dihedral Groups

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Abstract. The study of coprime probability and graphs have its own uniqueness that produces a particular pattern according to its variabilities. Some obvious results can be seen from the previous research where the domination number will always be equal to one and the types of graphs that can be formed are either star, planar or r -partite graph depending on certain cases. For the probability, the results vary according to the groups and also certain cases that need to be considered. The noncoprime graph has been introduced and it is defined as a graph associated to the group G with vertex set $G\backslash\{e\}$ such that two distinct vertices are adjacent if their orders are relatively noncoprime. However, in probability theory, the study of noncoprime probability of a group has not been introduced yet. Hence, a thorough study has been conducted where the goal of this research is to introduce a newly defined graph and probability which are the p^{α} noncoprime graph and p^{α} noncoprime probability of a group. The main focus of this approach is that the greatest common divisor of the order of x and y, where x and y are in G, is equal to a power of prime number. In this paper, the scope of the group is mainly focused on the dihedral group, D_{mn} where m and n are prime and m is not equal to n. Some invariants, which are the diameter, the girth, the clique number, the chromatic number, the domination number, and the independence number of p^{α} noncoprime graph are found. Additionally, the generalization of the p^{α} noncoprime probability are also obtained.

Keywords: coprime probability, coprime graph, p^{α} noncoprime probability, p^{α} noncoprime graph

AA-003
Neighbors Degree Sum Energy of Commuting and Non-Commuting Graph for Dihedral Groups

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Abstract. Suppose that G is a finite group and $Z(G)$ is the center of G. In this paper, we discuss the graph where the vertices set is $G\backslash Z(G)$. The non-commuting graph of a group G, denoted by Γ_G, is constructed by joining two distinct vertices $v_p, v_q \in G\backslash Z(G)$ with an edge whenever $v_p v_q \neq v_q v_p$. The complement of Γ_G is the commuting graph of a group G, $\bar{\Gamma}_G$, with two distinct vertices $v_p, v_q \in G\backslash Z(G)$ are adjacent whenever $v_p v_q = v_q v_p$. The number of vertices adjacent to v_p is defined as d_{v_p}, which is the degree of v_p Neighbors degree sum (NDS) matrix of a graph is defined as a square matrix whose (p, q)-th entry is $d_{v_p} + d_{v_q}$ if v_p and v_q are adjacent, $-d_{v_p}^2$ if $v_p = v_q$ or otherwise, it is zero. This study presents the formulas of neighbors degree sum (NDS) energies of commuting and non-commuting graphs for dihedral groups of order $2n$, D_{2n}, for two cases−odd and even n.

Keywords: Energy of graph, Neighbors Degree Sum Matrix, Commuting graph, non-commuting graph, Dihedral group.

AA-004
Translation-Invariant *p*-Adic Gibbs Measures for the Potts Model on the Cayley Tree of Order Four

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Abstract. Different topological structure between real and *p*-adic fields provides a distinct condition for solution of equations or system of equations. For example, the equation $x^2+1=0$ does not have solution over real field but it has solution over *p*-adic field for $p \equiv 1 \pmod 4$. Meanwhile, the equation $x^3 \equiv p$ has solution in real field but not in *p*-adic field. It is convenience to investigate the translation-invariant *p*-adic Gibbs measures of Potts model on Cayley trees in terms of zeros of a certain polynomial. The translation-invariant *p*-adic Gibbs measures of Potts model on Cayley trees of order two and three was described with respect to some respective conditions on the coefficient of certain quadratic and cubic polynomials. In this paper, the set of *p*-adic Gibbs measures of *p*-adic Potts model on the Cayley tree of associate order is considered. For this case, it is possible to associate the existence of the translation-invariant *p*-adic Gibbs measures with zeros of univariate or multivariate polynomial, or solutions of system of equation over *p*-adic field.

Keywords: *p*-adic field, *p*-adic Gibbs measure, *p*-adic Potts model, translation-invariant, Cayley trees

AA-005
Self-Invertible Encryption Key on Cipher Trigraphic Polyfunction

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Abstract. Cipher Trigraphic Polyfunction developed by previous researchers is a modification of Hill Cipher technique in modern cryptography. It was built on the system using three symbols or letters and more than one transformation of the original message. The modular arithmetic of a key matrix plays an important role in the encryption and decryption processes. To get the inverse matrix in the decryption process is a crucial aspect. Some matrices do not have inverses, and, in that case, the receiver needs to choose a different key matrix to decrypt a cipher. To make sure every ciphertext block can be decrypted; an inverse key matrix is not needed for decryption, and this definitely simplifies the computational complexity and saves the computational time. The objective of this paper is to obtain some patterns of secret keys and subsequently generate a self-invertible key which will be used in the encryption and decryption process of Cipher Trigraphic Polyfunction.

Keywords: Encryption, decryption, hill cipher, self-invertible, secret key

AA-006
On the Properties of the Almost Unimodular Matrix

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Abstract. Matrix inversion is one of the most significant operations on matrix. For any integer matrix $A \in \mathbb{Z}^{n\times n}$, the inverse of this matrix may contain numerous numbers of non-integer entries. These entries could be long floating-point numbers. Storing, transmitting, or operating such inverse could be cumbersome especially when the size n is large. The only square integer matrix that is guaranteed as having integer matrix as its inverse is unimodular matrix $U \in \mathbb{Z}^{n\times n}$ with property that $\det(U) = \pm 1$. Recently, a new integer matrix that has property almost similar to the unimodular matrix emerges. It is known as almost unimodular matrix $\tilde{G} \in \mathbb{Z}^{n\times n}$. Although $\det(\tilde{G}) \neq \pm 1$, the inverse of this matrix is proved as containing only a single non-integer entry while the rest are guaranteed as integers. In this paper, some properties of the almost unimodular matrix $\tilde{G} \in \mathbb{Z}^{n\times n}$ are discussed. By investigating its properties, then more of its potential applications could be discovered.

Keywords: Square integer matrix, integer matrix inversion operations, unimodular matrix, almost unimodular matrix.

AA-007
Relation Between Randic and Harmonic Energies of Commuting Graph for Dihedral Groups

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Abstract. Suppose that G is a group and $Z(G)$ is the center of the group G. In this paper, we discuss a specific type of graph known as the commuting graph, denoted by Γ_G, whose vertex set contains all group elements excluding central elements, $G\backslash Z(G)$. This graph has to satisfy a condition in which $v_p, v_q \in G\backslash Z(G)$ where $v_p \neq v_q$ are adjacent whenever $v_p v_q = v_q v_p$. The number of vertices adjacent to v_p is denoted as d_{v_p}, which is the degree of v_p. The Randic and harmonic matrices of Γ_G are defined as square matrices in which (p, q)-th entry are $\frac{1}{\sqrt{d_{v_p} \cdot d_{v_q}}}$ and $\frac{2}{d_{v_p} + d_{v_q}}$ if v_p and v_q are adjacents, respectively; otherwise, it is zero. Randic energy is the sum of the absolute eigenvalues of the Randic matrix whereas harmonic energy is the sum of the absolute eigenvalues of the harmonic matrix. In this paper, we compare Randic and harmonic energies focusing on the commuting graph for dihedral group of order $2n$, D_{2n}.

Keywords: Commuting graph, Randic energy, Harmonic energy, Dihedral group

AA-008
Bounded-Addition Fuzzy Semi-Simple Splicing Systems

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Abstract. One of the first theoretical models for DNA computing is known as splicing system. In a splicing system, two strings of DNA molecules are cut at certain recognition sites, and the prefix of the first string is connected to the suffix of the second, resulting in new strings. For a specific form of splicing system, namely semi-simple splicing systems, the recognition sites for both strings of DNA molecules are the same. Only regular languages are known to be produced by splicing systems with finite sets of axioms and splicing rules. As a result, a variety of splicing system restrictions have been considered in order to increase their generating power. Fuzzy splicing systems have been introduced, in which truth values (i.e., fuzzy membership values) from the closed interval [0, 1] are assigned to splicing system axioms. The truth values of each generated string *z* from strings *x* and *y* are obtained by applying a fuzzy bounded-addition operation to their truth values. This study focuses on the characteristics of bounded-addition fuzzy semi-simple splicing systems. It has been demonstrated that fuzzy semi-simple splicing systems with bounded-addition operation increases the generative power of the splicing languages generated.

Keywords: Semi-simple splicing system, fuzzy splicing system, bounded-addition operation, restriction, formal language theory.

AM-002
Lie Symmetries, Optimal System and Invariant Solutions of the Generalized Cox-Ingersoll-Ross Equation

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Abstract. The Cox-Ingersoll-Ross (CIR) model is a short-rate model and is widely used in the finance field to predict the movement of interest rates in bond pricing models. This paper exploited Lie symmetry analysis to solve the generalized CIR model by determining the infinitesimal generators. Lie symmetry is one of the powerful tools to solve the partial differential equation (PDE) analytically by reducing the PDE into a lower form. Besides, an optimal system of one-dimensional subalgebras is constructed and then used to reduce the generalized CIR equation by introducing the similarity variables. Lastly, the invariant solutions are obtained by solving the reduced equation.

Keywords: Cox-Ingersoll-Ross (CIR) mode, Lie symmetry analysis, Optimal system, invariant solutions

AM-003

Analysis on the Solute Dispersion in Blood Flow Through an Inclined Artery with the Presence of Chemical Reaction

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Abstract. The present study discusses on the solute dispersion in a blood flow through an inclined artery with the presence of chemical reaction. The blood flow is considered to be laminar, incompressible and steady flow of Bingham model. The continuity and momentum equations are solved in cylindrical coordinate for the velocity solution using direct integration method. The steady convective-diffusion equation with the presence of chemical reaction is in the form of non-homogeneous Bessel differential equation and is solved analytically for the solute concentration. The obtained solutions are then utilized for the Taylor-Aris method for obtaining the solution for effective axial diffusion. The solutions of velocity, solute concentration and effective axial diffusion are plotted graphically to analyze the effect of angle of arterial inclination, gravitational force and chemical reaction rate on the blood flow and solute dispersion. Result shows an increase in velocity profile of blood flow as the angle of inclination increases until $90°$ inclination which has the highest velocity profile. As the artery inclined more, the velocity profile decreases until it reaches the lowest velocity at $270°$ inclination. Consequently, increase in velocity decreases the solute concentration inside the artery. Nevertheless, solute concentration increases as the angle of inclination increase. Additionally, the increase in chemical reaction rate decreases the effective axial diffusion which also increases the solute concentration.

Keywords: Inclined artery, Bingham model, Solute dispersion, Chemical reaction, Taylor-Aris method

AM-004
Evaluation of the Degree of Public Risk of Developing Diabetes Type 2 in Relation to Takaful Policy

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Abstract. The alarming increase in type 2 diabetes have not only impacted the public with mental and physical distress but have also increased anxiety and burden on financial aspects in relation to preventing and treating the disease. This has mostly been a result of increasing health care costs and unhealthy diet and lack of physical activity on a consistent basis; therefore, causing people to be unaware of their health status which may have already developed into the early onset of such disease. This study aims to evaluate the degree of the Malaysian public's risk in developing diabetes type 2; and further investigate the relationship of socio-demographic factors in explaining the variation in risk categories. The study employs both descriptive as well as inferential statistics such as independent t-tests and multinomial logistic regression in achieving the objectives. Findings from the sample of 860 Malaysians in the study reveal that almost half of the respondents are in the intermediate risk category of developing diabetes type 2 where significant differences are found among gender; while results from the regression portray that, factors such as marital status, household income, and education levels play significant roles in the willingness to pay for takaful policy related to diabetes. Finally, the study also provides an evaluation of the degree of risk among ten respondents to show their degree of risk in terms of probabilities.

Keywords: diabetes type 2, risk factors, socio-demographics, takaful

AM-005
Robustness of Extended Benford's Law Distribution and Its Properties

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Abstract. It was anticipated more than a century ago that the distribution of first digits in real-world observations would not be uniform, but would instead follow a trend in which measurements with lower first digits occur more frequently than measurements with higher first digits. Frank Benford coined the term "First Digit Phenomena" to describe this phenomenon, which is now known as Benford's Law distribution. Benford's Law distribution has long been recognised, but it was widely dismissed as a mathematical oddity in the natural sciences. There is a theoretical requirement to analyse such disparities as departures from Benford's Law have been observed. The use of parametric extensions to existing Benford's Law is justified, as evidenced by the inclusion of *k*-tuples as a new parameter in the study. A *k*-tuple can be interpreted as a set of order and cardinality of the first significant leading digit in datasets. Therefore, a convenience and concise method for deriving parametric analytical expansions of Benford's Law for first significant leading digits is proposed by embedding *k*-tuples. A new probabilistic explanation for the appearance of extended Benford's Law distribution has been discovered. As a result, a one-parameter analytical extension of Benford's Law for first significant leading digits is proposed. The new distribution is robust to its properties, which include a sum of first digit frequencies equal to 1, unimodality, logarithmic distribution, and positive skewness. Implicitly, its mathematical features are investigated, and a new generic class of moments generating functions is created, consisting of mean, variance, skewness, and kurtosis. Based on moments generating function, extended Benford's Law shows lesser values than existing Benford's Law. At the end of study, the new extended Benford's Law distribution is better than the previous Benford's Law distribution in theory, where measurements with lower digits occur more frequently.

Keywords: Benford's Law, mean, variance, skewness, kurtosis

AM-006
Adaptive Therapy in Two-phase Model of Tumor

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Abstract. Adaptive therapy is an alternative treatment for standard of care in cancer treatment called continuous therapy where adaptive therapy is an on and off treatment where this treatment schedule depends on the size of tumor. Adaptive therapy aims to delay the emergence of resistance in cancer treatment by allowing a significant number of sensitive cells to remain alive during treatment break in order to suppress the growth of resistant cells population. Resistant cells often come with fitness costs where for example resistant cells proliferate slower than sensitive cells. It is important to understand whether the cost of resistance will play a deterministic criterion in knowing whether the cancer will respond well to adaptive therapy. We will use a two-phase model consisting of tumor cells and water where the tumor cells phase is divided into two species: drug-sensitive cells and fully resistant cells. We use the conservation of mass and momentum equations coupled with oxygen-dependent cell growth and death terms to model the avascular tumor. For both high and low initial fraction of resistant cells, a cost in growth rate or competitive rate is required to see meaningful gains while a cost in death rate does not show that it will get significant benefit from adaptive therapy. The cell death rate by drug and drug decay rate does affect the response of sensitive cells towards the drug where low drug decay rate shows that there will be no difference in both adaptive therapy and the standard of care and low drug effect rate makes both treatments less effective in killing sensitive cells. High cell death rate by drug results in positive correlation between the cost of resistance and the time gained by adaptive therapy while this correlation cannot be seen when the rate of cell death by drug is low.

Keywords: Adaptive therapy, two-phase model, tumor growth, drug resistance, cost of resistance

AM-007
Exact Analysis of Unsteady Solute Dispersion in Blood Flow – A Theoretical Study

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Abstract. An artery narrowing referred to as atherosclerosis or stenosis causes a reduction in the diameter of the artery. When blood flow through an artery consists of stenosis, the issue of solute dispersion is more challenging to solve. A mathematical model is developed to examine the unsteady solute dispersion in an overlapping stenosed artery portraying blood as Herschel-Bulkley fluid model. The governing and the constitutive equation is solved analytically to get the velocity of fluid. The generalized dispersion model (GDM) is imposed to solve the convective-diffusion equation and to describe the entire dispersion process. The peak of mean concentration of solute increases with an increase in the slug input of solute length, power-law index, yield stress and stenosis height. The maximum mean concentration is the effective dose for therapeutic concentration. The existence of stenosis restricted the blood flow and drug dispersion. In short, this study improved the understanding of the physiological processes involved in transporting the drugs and nutrients to the targeted stenosed region in the circulatory system.

Keywords: Blood flow, Solute, Dispersion, Herschel-Bulkley fluid, Concentration.

AM-008
Modeling and Simulation on Roundabout with Waiting System

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Abstract. Roundabouts play a crucial role especially in the moderate population area and other certain places likely in residential and school areas instead of traffic lights. Since roundabouts can significantly solve the congestion problem on intersection roads however the mobility and time delay depend on the capacity of vehicles. In case at the high-capacity moment, it will affect the smoothness of traffic flow and queue length on the secondary lane. This is because according to the systematic regulations, the cars from the secondary lane need to wait for the cars on the main lane to move forward until they have sufficient space to enter the roundabout. In addition, the incoming cars from the main lane have the priority to pass through the arm junction and the cars on the secondary lane have to make sure these incoming cars are totally driven through the arm junction, then the cars from the secondary lane are just allowed to enter the roundabout. Based on the phenomena mentioned, the waiting takes place on the secondary lane. Therefore, the waiting system is applied onto the secondary lane as well as the determination of cars crossing the arm junction. The plots of Total Travel Time, Total Waiting Time and queue length with different parameters are simulated and discussed. Finally, the results presented in certain situations, produced the tailback on secondary lanes and occasionally smoothen the traffic flow due to the mentioned priority regulations.

Keywords: Waiting System, Roundabout, Traffic Flow, Hyperbolic Conservation Laws, Godunov Method.

AM-009
Mathematical Modelling and Simulation of Periodontal Ligament using COMSOL Multiphysics

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Abstract. This paper investigated the mathematical modelling and simulation of periodontal ligament using COMSOL Multiphysics. The behaviour of the periodontal ligament is studied. The periodontal ligament is considered to be sandwiched between two approached parallel rigid impervious plates. The governing equations and the specified boundary conditions are introduced to describe a rectangular domain. The approximate analytical solution of the problem is verified numerically by using COMSOL Multiphysics that is based on the finite element method. A 3D realistic geometry is constructed using scans of human teeth. A detailed analysis of the stress and displacement induced by a force is obtained.

Keywords: Tooth movement, Periodontal ligament, Stress analysis, COMSOL

AM-010
Numerical Simulation of American Style of Asian Options under Jump Diffusion Process

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Abstract. In today's financial markets, American style options are important derivative contracts. They trade in large volumes on a variety of underlying assets, including stocks, indices, foreign exchange rates, and futures. In this study we derive and analyze a penalty method for solving American style of Asian option problems. A small non-linear penalty term is added in the Black-Scholes equation. We remove the free and moving boundary imposed by the contract's early exercise feature to get a stable solution domain in this approach. By including Jump-diffusion in the models, they are able to capture the skewness and kurtosis features of return distributions often observed in several assets in the market. The performance of the schemes is investigated through a series of numerical experiments.

Keywords: Option pricing, penalty method, Asian options, American-style Asian options.

AM-011
Valuation of Power Call Options PDE under the Black-Scholes Model

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Abstract. The Black-Scholes model is associated with partial differential equations (PDE) and this study aims to develop a pricing model for European power call options under the Black-Scholes model using explicit, implicit, and Crank-Nicolson methods. These methods use the PDEs to numerically approximate the option prices. Numerical results compare the accuracy and efficiency of the methods for pricing options with nonlinear payoff.

Keywords: Power options, Black-Scholes model, partial differential equations

AM-012
Robustness of Image Watermarking Scheme Based on Modified Non-Separable Haar Wavelet Transform against Image Processing and Geometric Attacks

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Abstract. Online communication has been made simple with the introduction of the Internet, so there is a need to give protection to digital media. As technology continues to grow, more ways to use or modify data are discovered. Accordingly, the protection of digital media also needs to continue to develop. This paper presents a new non-blind image watermarking algorithm applying modified non-separable Haar wavelet transform (NSHWT), singular value decomposition (SVD), Arnold's cat map and Rabin-p cryptosystem. The discrete wavelet transform (DWT) remains a highly popular choice for transform domain image watermarking because of its useful properties. Even so, transform domain watermarking can be resource-consuming, especially when dealing with larger data. To improve on this, the proposed algorithm applies the modified NSHWT, which is a much more efficient method to apply the DWT technique on an image. The embedded watermark image is protected by scrambling the image using Arnold's cat map, and the scrambling parameters are encrypted with the Rabin-p cryptosystem. In general, the application of modified NSHWT and SVD makes the watermark highly robust, and its security is ensured with the protection by Arnold's cat map and Rabin-p cryptosystem. The algorithm shows high robustness when under different image processing and geometric attacks.

Keywords: digital image watermarking, cryptosystem, robustness, NSHWT, SVD

AM-013
Application of Intuitionistic Type II Fuzzy Set on fEEG Image

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Abstract. In this paper, the fEEG images are enhanced based on an intuitionistic type II fuzzy set. The non-membership function is defined by a Sugeno type intuitionistic fuzzy generator. Moreover, a new membership function is defined by using Hamacher t-conorm. Experimental results show that the method provides better results compared to classical methods.

Keywords: fEEG image, type II fuzzy set, intuitionistic fuzzy set, image enhancement

AM-014
Comparative Analysis of Running Time and Memory Consumption of Rivest-Shamir-Adleman Cryptosystem and Its Four Variants

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Abstract. This work presents a comparative analysis of Rivest-Shamir-Adleman (RSA) cryptosystem variants. The scope of the work is limited to five cryptosystems: RSA, Somsuk-RSA, Modified-RSA (MRSA), Easy Simple Factoring-RSA (ESF-RSA) Phony-RSA. The aim is to simulate five variants of the RSA cryptosystem using Maple programming. Then, identify which cryptosystem has the largest running time and memory consumption for key generation, encryption, and decryption. The single-precision multiplication (spm) is used to determine running time and Maple programming for actual running time. As a result, ESF and RSA are the fastest cryptosystems for key generation, ESF-RSA is the fastest cryptosystem for encryption, and Phony-RSA is the fastest for decryption. In addition, the ESF consumes the smallest memory, whereas; MRSA consumes the largest memory to compute all processes.

Keywords: RSA, cryptosystem, running time, memory consumption, single precision

AM-015
Approximation Theory in UP-algebras Based on Intuitionistic Fuzzy Sets

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Abstract. The theory of fuzzy sets has several applications in real-life situations, and many scholars have researched fuzzy set theory. After introducing the concept of fuzzy sets, several research studies were conducted on the generalizations of fuzzy sets. In this article, we introduced the concept of intuitionistic fuzzy sets and discussed their relationship with other kinds of fuzzy sets. Further, we discussed the operation properties, applied intuitionistic fuzzy sets to UP-algebras, and investigated various properties. This paper aims to study upper and lower approximations of intuitionistic fuzzy sets in UP algebra.

Keywords: UP-algebra, intuitionistic fuzzy set, intuitionistic fuzzy UP-subalgebra, intuitionistic fuzzy near UP-filter, intuitionistic fuzzy UP-filter

AM-016
Natural Convection Flow of Casson Fluid with Carbon Nanotubes Past an Accelerated Disk

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Abstract. In this study, the impact of heat transfer on free convective Casson nanofluid flow induced by an accelerated disk is analyzed. The study of non-Newtonian Casson nanofluid that is suspended by single wall carbon nanotubes (SWCNTs) and multi wall carbon nanotubes (MWCNTs) has a vital role in human blood flows. The problem is governed by governing momentum and energy equations that come along with appropriate conditions for initial and accelerated boundaries. The dimensionless form of the governing equation is then derived by applying the suitable dimensionless variables. An exact solution of temperature and velocity fields is obtained by utilizing Laplace transform technique. The impacts of pertinent parameters such as Casson parameter, Grashof number, nanoparticle volume fraction and time on both profiles are discussed and illustrated graphically. It is found that both temperature and velocity distributions satisfyingly meet all the initial and boundary conditions. The addition of CNTs particles leads to an increase in both temperature and velocity profiles, and SWCNTs possess a higher magnitude of temperature due to its outstanding thermal conductivity when compared to SWCNTs.

Keywords: Free convection, Casson fluid, Nanofluid, Carbon nanotubes, Accelerated disk

AN-001
Simultaneous Algorithms for Solving Split Equality Fixed Point Problems for Demicontractive Mappings

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Abstract. In this paper, we introduced new algorithms for solving split equality fixed point problems for the class of demicontractive mappings in Hilbert spaces and prove the convergence results of the proposed algorithms. The results presented in this paper generalized a number of well-known result announced.

Keywords: Iterative Algorithm, Nonlinear Mappings, Fixed Point Problem, Weak Convergence.

AN-002
Nonlinear Fredholm Functional-Integral Equation of First Kind with Degenerate Kernel and Maxima

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Abstract. In this note, the solvability and solution construction of a nonlinear Fredholm functional-integral equation of the first kind with degenerate kernel and maxima are considered. Using the regularization method combined with the method of the degenerate kernel, we obtained an implicit functional equation with maxima. Since the Fredholm functional-integral equation of the first kind is ill-posed (non-correct), we used boundary conditions to ensure the uniqueness of the solution. Using the method of successive approximations, we transform the implicit functional equation to the nonlinear Volterra type functional-integral equation of the second kind. The solvability and uniqueness of the solution of the latter integral equations are proved. Two examples are analyzed with an exact and approximate solution, which is in line with the theoretical findings.

Keywords: Fredholm functional-integral equation, first kind, nonlinear equation, degenerate kernel, maxima, boundary conditions, regularization, one value solvability.

AN-003
The Existence of Minimizers for the Fuzzy Variational Problems and its Application to Optimal Control Problem

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Abstract. Classical variational problems work well under the assumption that all the variables defining the particular energy functionals are crisp or would be accessible accurately. However, uncertainty and inadequate knowledge are inherent characteristics of modeling mathematical systems that led to the study of fuzzy variational problems that has received significant attention over the previous decade with its successful applications in numerous fields, such as image segmentation and optimal control theory. The current study on fuzzy variational problems explicitly focuses on the necessary optimality conditions for solving its extremums and has been studied under several differentiability conditions. However, the existence results for the minimizers are not established yet. This paper studies the existence of minimizers for fuzzy variational problems under a weaker notion of convexity, namely pre invexity, and Buckley-Feuring differentiability. We further discuss its application in a real-world cost minimization problem that is modeled as a fuzzy variational problem.

Keywords: Fuzzy variational problem; fuzzy Euler-Lagrange equations; existence of minimizer; invex sets; preinvex functions

AN-004
Technology and Student Perceptions on Online Learning Based on Socioeconomic Background

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Abstract. This study examines the effects of technology on student perceptions of online learning in Mathematics and Science based on socioeconomic status. We used a sample of 300 secondary students in both urban and rural areas of Sabah, Malaysia. A random sampling method was employed in data collection. This study used the two-stage least square approach. Analysis of the student perceptions model revealed significant differences between students from the two backgrounds. The effects become pronounced when the endogeneity problem was addressed using intergenerational socio-economic background variables. Findings from this study perhaps may provide policymakers with insight into a better application of technology that may enhance student perceptions level on online learning in Mathematics and Science, especially in the current Covid-19 crisis. Also, it may give a guideline for households to supply better technology for their children's better education outcomes.

Keywords: technology, student perceptions, two-stage least square approach, socioeconomic status, online learning

AN-005
An Accelerated Projection-based Parallel Hybrid Algorithm for Fixed Point and Split Null Point Problems in Hilbert Spaces

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Abstract. In this paper, we posit a framework for the investigation of the fixed-point problems (FPP) involving an finite family of k-demicontractive operators and the split common null point problems (SCNPP) in Hilbert spaces. We employ an accelerated variant of the parallel hybrid shrinking projection algorithm for the construction of a common solution associated with the FPP and SNPP. Theoretical results comprise strong convergence characteristics under suitable sets of constraints as well as numerical results are established for the underlying algorithm. Applications to signal processing as well as various abstract problems are also incorporated.

Keywords: Parallel Hybrid Algorithm, Inertial Extrapolation, Strong Convergence, Fixed Point Problem, Demicontractive Operator, Null Point Problem

DE-001
Approximate Analytical Solutions of Second-Order Nonlinear Telegraph Equations

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Abstract. Multistep Modified Reduced Differential Transform Method (MMRDTM) is proposed and implemented in this study to solve nonlinear telegraph equations (NLTEs). This method involves replacement of the nonlinear term in NLTEs with corresponding Adomian polynomials prior to adopting the multi-step approach. As a result, we offer alternatives for solving NLTEs in a simpler and less difficult manner. Furthermore, the solutions can be approximated more accurately over a longer period of time. In order to demonstrate the capability and accuracy of the MMRDTM, we considered several NLTEs and presented the features of the solutions in graphs and tabular forms. From the results of this study, the MMRDTM was found to provide highly accurate solutions or exact solutions for these types of equations.

Keywords: Adomian polynomials, modified approach, multistep approach, Reduced Differential Transform Method, nonlinear Telegraph equations

DE-002
Solving Neutral Delay Volterra Integro-differential Equation using Block Method

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Abstract. The aim of this research is to produce accurate numerical results in solving neutral Volterra delay integro-differential equations (NVDIDE) of constant type. A third-order explicit multistep block method is derived by applying the Taylor series. The problems are solved by approximating two points simultaneously with constant step. The delay arguments are approximated using previously calculated values while the integration part is approximated using the quadrature rule. The method is assumed to be reliable in solving NVDIDE of constant type.

Keywords: Constant delay, Multistep Block Method, Neutral Delay Volterra Integro-Differential Equation.

DE-003
Solving SEIR model using Symmetrized Runge Kutta Methods: Implicit Midpoint Rule (IMR) and Implicit Trapezoidal Rule (ITR)

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Abstract. During this pandemic, the SEIR (susceptible-exposed-infected-recovered) model has become a popular topic among researchers. Such an epidemiological model is said to be a great decision tool to forecast the behaviour of Covid19 outbreak for future actions. Following trend, this paper attempts to use symmetrized Runge Kutta methods; Implicit Midpoint Rule (IMR) and Implicit Trapezoidal Rule (ITR), to solve this model. The base method, (IMR and ITR) are tested with one-step symmetrization (1ASIMR, 1ASITR, 1PSIMR, and 1PSITR) and two-step symmetrization (2ASIMR, 2ASITR, 2PSIMR and 2PSITR) in both active and passive modes. The symmetrized Runge Kutta method is best when used with stiff equations. Thus, we used a high rate of disease transmission, β to study the efficiency of each method and predict the proportion of individuals in each category according to the SEIR model. All the parameters and values are obtained through official websites of Malaysia and calculated based on previous studies starting from 2nd December 2021 to 1st January 2022. The equilibrium points: disease free equilibrium (DFE) and disease endemic equilibrium (DEE) are presented and calculated. Next, the basic reproduction number, R_0 is computed using the next generation method. The result depicted $R_0 > 1$, which indicates the disease has spread over. Finally, 2PSIMR is found to be the best method out of all. The efficiency of the methods is discussed and compared.

Keywords: symmetrized RK methods, Covid19, SEIR model, stiff system of ODEs, prediction

DS-001
Wavelet Convolutional Neural Network for Forecasting Malaysian PM10 Time Series Data

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Abstract. Hourly particulate matter time series data from several air quality monitoring stations in Peninsular Malaysia were forecast by using the Convolutional Neural Network (CNN) algorithm. Instead of using the original time series, which are time-domain sequence data, this study used the time-frequency domain sequence data which were retrieved by wavelet transformation. Air pollutants' concentration considered for this study is the particulate matter with a diameter of 10 microns or less, PM_{10}. The transformation used in this study is the Morlet wavelet transform, which is continuous wavelet transformation (CWT). Different time steps for the time series dependencies were considered to assess the PM_{10} dependencies on its past values. The results were compared with the results from CNN algorithm using the original time series and it is shown that the Wavelet Convolutional Neural Network algorithm improves the forecast accuracy of PM_{10} time series.

Keywords: convolutional neural network, wavelet transform, air quality, time series forecasting, deep learning

FD-001
Unsteady Mixed Convection Flow Near the Stagnation Point of a Vertical Plate Embedded in a Hybrid Nanofluid

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Abstract. According to previous research, examining the stagnation point flow is essential in various industrial and technological processes, including extrusion. Thus, this numerical study aims to investigate the behaviour of the unsteady mixed convection flow and heat transfer near the stagnation region past a vertical plate in a hybrid nanofluid. The hybrid nanofluid employed in this study consists of two different nanoparticles, which are alumina (Al_2O_3) and copper (Cu), while water (H_2O) is selected as the base fluid. By choosing an appropriate similarity transformation, the partial differential equations are transformed into a system of linear equations, which are solved using the bvp4c function in MATLAB software. The influence of the nanoparticle volume fraction and the unsteadiness parameter is scrutinised. The findings revealed that the skin friction coefficient and the local Nusselt number of the Al_2O_3-Cu/H_2O decrease with the addition of the nanoparticle volume fraction. Furthermore, the presence of the unsteadiness parameter reduces the momentum boundary layer thickness. In contrast, the boundary layer thickness in the temperature profile increases as the unsteadiness parameter improves.

Keywords: Mixed convection, unsteady flow, stagnation point, hybrid nanofluid, vertical plate

FD-002
Hybrid Method in Simulating Stationary Shock Problem

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Abstract. In this project, we want to find out if we can omit the anomalous behavior in simulation of high-speed flow over a blunt body using Lattice Boltzmann method (LBM) in corroboration with Roe flux scheme from shock capturing method, while retaining the correct physical properties of the flow. The objective of this project is to correctly simulate the solution of high-speed flow in normal shock whenever each scheme will take advantage. Previously we used D1Q3 model to simulate on a 1D shock problem at shock location whereas Roe's flux scheme was used at other locations. The significant finding is the oscillation near the discontinuity was removed. For higher dimension, we used still the same one-dimensional model with respect to each respective direction.

Keywords: FV-LBM, shock instability, shock capturing method, Roe's flux scheme.

FD-003
Slip Velocity Effect on Unsteady Free Convection Flow of Casson Fluid in a Vertical Cylinder

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Abstract. Fluid flow velocity is influenced by slip velocity at the boundary, and it does exist in real-life applications such as blood flow in the arteries. The study aims to obtain analytical solutions and understand the fluid flow behavior with the slip velocity effect for the unsteady free convection flow of Casson fluid in a cylinder. Governing equations of momentum and energy are converted into dimensionless forms by using the appropriate dimensionless variables. Then, the joint methods of Laplace transform with respect to time variable and finite Hankel transform of zero-order with respect to the radial coordinate are employed to obtain dimensionless equations of velocity and temperature together with the initial and boundary conditions. The expression of analytical solutions of velocity and temperature profiles are obtained. The obtained analytical solutions satisfy all the initial and boundary conditions. The behavior of velocity and temperature profiles are plotted and discussed graphically. Based on the obtained result, it can be observed that increase in the Casson parameter, Grashof number, time and slip velocity will lead to increment in fluid velocity and temperature. Meanwhile, increment of Prandtl number leads to the decrement of fluid velocity and fluid temperature. Lastly, the present result is validated when the obtained analytical solution of velocity is compared with the published result and found in a good mutual agreement. Thus, the study is significant to explore the uniqueness of Casson fluid behavior since it is related to the nature of blood flow in small blood vessels.

Keywords: Casson fluid, slip velocity, free convection, Laplace transform, finite Hankel transform

FD-004
Magnetic Nanofluids (MNFs) Radiative Flow over a Moving Surface with Convective Boundary Condition

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Abstract. The influence of convective boundary conditions and heat radiation on magnetic nanofluids (MNFs) flowing through a permeable moving plate is investigated numerically in this study. The governing partial differential equations (PDEs) are transformed into ordinary differential equations (ODEs) using suitable similarity variables. The ODEs are solved by implementing the built-in solver in Matlab called bvp4c. The suitable specification on the value of the parameters led towards the execution of two numerical outputs. We have finalized the investigation by incorporating a stability analysis to confirm the stability qualities conveyed by the outputs. The stability analysis has supported our initial presumption that only one of the outputs, where only the first solution is stable. In this present study, the thermal performance between cobalt ferrite nanofluid and manganese-zinc ferrite nanofluid is compared, and it appears that cobalt ferrite nanofluid has a slightly better performance in heat transportation compared to manganese-zinc ferrite nanofluid. We also considered a higher amount of thermal radiation and Biot number to scrutinize the heat transfer performance of MNF, and we found out that the greater amount of these parameters is effective in improving the heat transfer rate. The skin friction coefficient is magnified when the plate is moving towards the slit, but the heat transportation performance is higher when the plate is moving out from the slit. This work is significant because it simulates the thermal performance of MNFs when greater radiation and convective heats are applied on a moving plate.

Keywords: Nanofluid, thermal radiation, moving surface, suction, convective boundary condition, stability analysis

FD-005
MHD Flow of Hybrid Nanofluid past a Stretching Sheet: Double Stratification and Multiple Slips Effects

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Abstract. The study on various hybrid nanofluids, flowing over different physical geometries and conditions, is of recent interest among researchers to understand the behavior of this new heat transfer fluid. In the present study, the numerical solutions for hybrid Ag-CuO/H$_2$O nanofluid flow over a stretching sheet with suction, magnetic field, double stratification, and multiple slips effects are computed and analyzed. Governing equations and boundary conditions, which utilized both the Buongiorno model and the Tiwari and Das model, are introduced to describe the flow problem. Then, similarity variables are applied to transform the equations into nonlinear ordinary differential equations and boundary conditions. The numerical computation for the problem is done in Matlab using the bvp4c solver, and the results are presented in the form of tables and profiles of velocity, temperature, and concentration. Besides that, the physical quantities of interest are calculated for the reference of interested parties. It is found that the rise in solutal slip and stratification parameters reduces the Sherwood number. Meanwhile, the increase in thermal slip and stratification parameters lowers the Nusselt number. In addition, the skin friction coefficient is observed to increase with the augmentation of the hydrodynamic slip parameter.

Keywords: Hybrid nanofluid, MHD, stretching sheet, slip, stratification

FD-007
The Effect of MHD on Marangoni Boundary Layer of Hybrid Nanofluids Flow Past a Permeable Stretching Surface

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Abstract. Numerous researchers studied on the properties of hybrid $Cu - Al_2O_3$/water nanofluid in order to have better thermal efficiency that could be used in industrial applications. Therefore, the present study accentuates the effect of MHD on Marangoni boundary layer of hybrid $Cu - Al_2O_3$/water nanofluids flow over a stretching surface. Furthermore, the governing boundary layer equations which are partial differential equations (PDEs) are transformed into a set of ordinary differential equations (ODEs) using similarity transformations. Then, these problems are solved numerically using the shooting method through Maple software. The velocity and temperature profiles, as well as local Nusselt number are observed with the specific parameter namely, magnetic parameter M, Cu volume fraction, and suction.

Keywords: Hybrid nanofluid, Magnetic, Marangoni, Suction, Shooting

FD-008
Wang's Stretching/Shrinking Sheet Problem for Nanofluids with the Effects of Suction and Injection

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Abstract. In this study, Wang's stretching/shrinking sheet problem for nanofluids with the effects of suction and injection is investigated. The non-linear partial differential equations are reduced to non-linear ordinary differential equations using similarity transformation. The transformed boundary layer equations are then solved numerically by using bvp4c solver in MATLAB software. Three different types of nanoparticles, which are copper, alumina and titania (Cu, Al_2O_3, TiO_2) with water as the base fluid are considered and analyzed in this study. The effects of suction and injection, solid volume fraction and stretching/shrinking parameter on the fluid flow and heat transfer are evaluated. The numerical results are obtained for the velocity and temperature profiles, as well as the skin friction coefficient and local Nusselt number are presented in the graphical form. The results show that suction improves the heat transfer of nanofluids. Dual solutions are found to exist for both suction and injection effects. For the shrinking case, dual solutions are also obtained, however unique solution found for the stretching case.

Keywords: Boundary Layer, Dual Solutions, Nanoparticles, Stretching/Shrinking, Suction/Injection

FD-009
Analysis of Tangent Hyperbolic over a Vertical Porous Sheet of Carreau fluid and Heat Transfer

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Abstract. The purpose of this study is to investigate the boundary layer of Carreau fluid and heat transfer over an exponentially stretching plate derived in a vertical porous with variable surface thermal flux. The partial differential equations that represent the momentum equation and heat equation are commuted into nonlinear ODEs by applying similarity transformations and results found numerically. The impact of several emerging dimensionless parameters labeled as the Weissenberg number (*We*), power-law index (*n*), velocity slip (*Sf*), thermal jump (*ST*) and Prandtl number (*Pr*) on the velocity profile and heat transfer on the boundary layer are shown in detail. In more detail, also the influence of physical parameters on local skin friction and Sherwood number are studied. The shooting method with the explicit technique is used to find the solution and all results are illustrated graphically and numerically. It is to notice that the Weissenberg number has different behavior in Carreau fluid compared to other fluids. The research is relevant to the processing of chemical materials.

Keywords: Carreau Fluid, heat transfer, power index, laminar flow, magnetic field

FD-010
Mhd Hybrid Nanofluid over a Permeable Stretching Surface Embedded in Porous Medium with Thermal Radiation and Slip Effects

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Abstract. The effects of thermal radiation and velocity slip on the magnetohydrodynamics (MHD) hybrid Cu-Al2O3 nanofluid over a permeable stretching surface embedded in porous medium is reported in this thesis. The similarity transformation is used to reduce partial differential equations to ordinary differential equations. The problem is solved using an exact analytical method. The porosity as the new additional parameters are considered to explore the effects of porous medium. The effect of varying parameters on the velocity and temperature profiles are illustrated in graphs, while the skin friction coefficient and the local Nusselt number are displayed in data tabulation. The existence of porosity causes the increasing of temperature profile and decreasing of velocity profile, meanwhile the skin friction coefficient and the local Nusselt number is reduced.

Keywords: Boundary layer flow, hybrid nanofluid, heat transfer, thermal radiation, porous medium.

GE-001
Metric Foliated Cocycles Adapted to Isotropic Systems of Second Order Ordinary Differential Equations

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Abstract. As it is well known, the inverse problem of Lagrangian mechanics is structurally based on the fact that whether or not a given system of second order ordinary differential equations (SODEs) can be characterized as the Euler-Lagrange equations of some Lagrangian. In particular, the essential condition for a system of homogeneous SODEs to be metrizable via a Finsler function of scalar flag curvature is that the given system of SODEs must be isotropic. In addition, projectively flat Finsler functions possess isotropic geodesic sprays and accordingly have constant or scalar flag curvature. In this paper, a comprehensive investigation of metric foliated cocycles which are geometrically compatible with a given system of isotropic SODEs is presented. For this purpose, the constant flag curvature (CFC) test, as well as the scalar flag curvature (SFC) test, presented by I. Bucataru and Z. Muzsnay are applied in order to induce a metric structure which leads to construction of a foliated cocycle equipped with a bundle-like metric on the tangent bundle. Consequently, by exhaustive analysis of the main circumstances under which the projective deformations of a flat isotropic spray are metrizable, we create a class of transverse foliated cocycles on the tangent space which are totally adapted to the given system of isotropic SODEs.

Keywords: Isotropic Sprays, Bundle-like Metric, Flag Curvature, Foliated Cocycle, Metrizability.

GE-002
Exhaustive Analysis of a Distinguished Five-Dimensional Solution of Einstein Field Equations for Rotating Fluids via Variational Symmetries

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Abstract. The Kaluza-Klein theory can be reckoned as a classical unified field theory of two of the significant forces of nature: gravitation and electromagnetism. This formulation geometrically demonstrates the effects of a gravitational and an electromagnetic field by investigating a five-dimensional space with a metric constructed via the space-time metric and the four-potential of the electromagnetic field. In order to explore the influences of dimensionality on the distinct physical parameters, inquiring into stationary Kaluza-Klein rotating fluids is of particular significance. In this paper, a comprehensive analysis of the variational symmetries for a specific Kaluza-Klein solution of Einstein field equations for rotating fluids is presented. This privileged model precisely describes the physical behavior of a cylindrically symmetric stationary fluid with constant density and pressure. In the current paper, first of all, the variational symmetries of our analyzed model are completely determined and the structure of the Lie algebra of the resulting symmetries is accurately analyzed. It is illustrated that the Lie algebra of local symmetries corresponding to the system of geodesic equations is non-solvable and not semisimple and the algebraic structure of the derived quotient Lie algebra is discussed. Mainly, by constructing the adjoint representation group, which introduces a conjugate relation in the set of all one-dimensional symmetry subalgebras, an optimal system of group invariant solutions is created. Therefore, the associated set of invariant solutions can be regarded then as the minimal list from which all the other invariant solutions of one-dimensional subalgebras are thoroughly determined simply via transformations. Literally, all the corresponding local conservation laws of the resulting variational symmetries are totally calculated. Indeed, the symmetries of the metric of our analyzed space-time lead to the constants of motion for the point particles.

Keywords: Variational Symmetries, Einstein Field Equations, Kaluza-Klein Theory, Adjoint Representation, Conservation Laws.

ME-002
The Development of a Hypothesis Testing Learning Module Through 5E's Model for Technical and Vocational Education Students

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Abstract. The teaching and learning of statistics can be seen as something very different from other subjects. Apart from cultivating counting skills that involve high thinking and creativity, statistics also requires an understanding in terms of a concept that is accurate and more comprehensive. However, various misconceptions of students in studying inferential statistics were the most troubling things in the study especially for the Hypothesis Testing topic. Thus, this study aims to develop teaching and learning modules of hypothesis testing topics based on the 5E's model as a learning module for students from Technical and Vocational Education background. The 5E model is used to develop teaching and learning activities through five phases, namely engagement, exploration, explanation, elaboration, and evaluation. This teaching and learning module used an ADDIE model as a development design by implementing the 5E's model teaching design for the content of the module. Next, this study also evaluates the feedback on the level of effectiveness of the teaching and learning modules that have been constructed. This study was conducted using a quantitative method through questionnaires. A total of 2 experts and 8 students have been selected as respondents in order to provide their feedback on the evaluation of teaching and learning modules that have been developed. The analysis of the questionnaires have been translated in the form of percentage. The results of the study state that the development of this teaching and learning module were pleasing and have achieved its development goals. In addition, the teaching and learning modules that have been developed shows that the teaching design used is in line with students' expectations. In conclusion, the topic of hypothesis testing is said to be difficult to understand by students if the instructional design is used properly and student-centered so that students can move actively in the classroom.

Keywords: 5E Model, Teaching and Learning Module, ADDIE Model

OR-003
System Dynamics Simulation Model to reduce the Traffic Congestion of Metropolitan Cities of India by implementing Intelligent Transportation System

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Abstract. Poor traffic conditions and severe road traffic congestion is an everlasting problem in metropolitan cities of India. With the rapid increase in vehicles, metropolitan cities of India, are indispensably facing traffic congestion, which results in economic and environmental losses. This paper presents a system dynamics simulation model to reduce the traffic congestion by implementing an Intelligent Transportation System (ITS) in metropolitan cities of India. ITS refers to the interconnection of an adaptive and intelligent integration of vehicles, drivers, and the transportation system. The system dynamics simulation model aims to predict the impact of innovative and intelligent transportation strategies and their implementation in metropolitan cities of India. The developed system dynamics simulation model helps in improving the transportation system of metropolitan cities of India and also identifies crucial factors to relieve traffic congestion. It is found that implementation of ITS not only helps in reducing traffic congestion but also enhances safety and mobility. The innovative scientific contributions of this research study include system dynamics simulation model development and scenarios generation for reducing traffic congestion by improving reliability, safety and mobility.

Keywords: Intelligent Transportation System, System Dynamics, Metropolitan Cities, Traffic Congestion, Scenario Simulation.

OR-004
Simulated Annealing Approach for an Outpatient Scheduling in a Hemodialysis Unit

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Abstract. National Renal Registry (NRR) Malaysia has reported that the demand for dialysis treatment among chronic kidney disease (CKD) and end-stage kidney disease (ESKD) patients rises every year. However, available hemodialysis units have limited facilities to meet the current increasing demand. This leads to congestion, long waiting times and an increase in the duration of stay (DOS) among hemodialysis patients during their treatment sessions. Nurse assignments need to consider as well, as the dialysis facilities must provide their best treatment plan. Therefore, in our research, we focus on outpatient scheduling and nurse assignment problems in the hemodialysis unit. The objective is to minimize patients' total DOS, including the waiting time before and after the dialysis treatment. As the optimization model consumes a high computational time to solve for a large-scale instance by using the exact method, a simple heuristic is developed to deal with the problem. Later, the quality of the solution is improved by using Simulated Annealing algorithm and backtracking heuristics is applied for nurse assignment problems as at least two nurses are needed for each dialysis patient. The results show that the solutions obtained for outpatient scheduling by the Simulated Annealing are of good quality and has significantly reduced the computational time compare with the simple heuristic even when considering more patients on the waiting list. As for total DOS, we have managed to obtain the optimum value compared to the average DOS values for both 3-hour and 4-hour sessions.

Keywords: Outpatient Scheduling, Nurse Assignment, Simple Heuristic, Simulated Annealing, Optimization

OR-005
New Hybrid Conjugate Gradient Method under Exact Line Search

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Abstract. Conjugate gradient (CG) method is one of the popular method in solving unconstrained optimization problem. This method is notable for being an intermediate between the steepest descent method and the Newton's method. In this study, a new hybrid CG method is proposed with the main focus on improving Aini-Rivaie-Mustafa (ARM) CG method that were introduced in 2016. The ARM CG method sometimes generates negative CG coefficient that affects the performance of the method. Therefore, the new hybrid CG method is proposed with the intention of eliminating the negative CG coefficient value generated by the ARM CG method. The new hybrid CG method is globally convergent under the exact minimization rules and based on the numerical observation, it shows that it could solve higher number of test problems compared to ARM CG method.

Keywords: Unconstrained optimization, hybrid conjugate gradient, exact line search

OR-006
An Inventory Model with Recovery and Periodic Delivery that Considers Carbon Emission Cost

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Abstract. This paper proposes an integrated inventory model that considers three types of inventories: used items, service items, and raw materials. Used items are collected from the market and are restored to a serviceable condition to satisfy demand. If the quantity of the restored items is lacking, then the remaining demand is satisfied by converting raw materials into service items through a production run. Demand is satisfied by shipping periodically in batches of equal size. The warehousing of items incurs a carbon emission cost in addition to the traditional holding costs. Additionally, the transportation of items to the client incurs a carbon emission cost as well. The objective of the model is to provide insights to help determine both the frequency and the size of the batch shipments to minimize the joint total inventory cost and carbon emission cost. This paper also proposes a numerical solution procedure and provides a numerical example to illustrate the model. A numerical sensitivity analysis is performed to derive insights that are potentially beneficial to policy-makers.

Keywords: inventory model, recovery, carbon emission

OR-008
Uncertain Negative Data in DEA: An Application of Banking in Malaysia

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Abstract. DEA models and their applicability is heavily depended on the type of data that has been used for efficiency assessment. Conventional DEA models assume the all the involved data in the efficiency evaluation are non-negative which in many cases seems unrealistic specially when the profit or the rate of growth are involved in the evaluation of organizations. Moreover, the perturbation in data is unavoidable in real-world applications and negative data also might be affected by error. In this paper, we propose a robust DEA model to handle uncertain negative data that guarantees the robustness of solution against the uncertainty in data. The proposed robust DEA model is constructed under a box-ellipsoidal uncertainty set and an application of banking in Malaysia is presented to validate the applicability of proposed model and evaluate the effect of uncertainty in efficiency assessment and ranking of 30 banks in Malaysia.

Keywords: Data envelopment analysis (DEA), Mathematical programming, Robust optimization, Uncertainty, Negative data

OR-009
A Review on the Development of Interval Iterative Algorithms for Polynomial Root Finding

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Abstract. Many mathematical problems concerning nonlinear equations can be well interpolated as polynomials in most cases. Interval iterative algorithms are among the most efficient ways for polynomial roots finding. Recent interest in the research and development of this method stems from its capacity to overcome the theoretical limitations associated with point iterative methods in terms of order of convergence and computational efficiency. This review article encompasses theoretical findings as well as algorithmic considerations, with the aim of presenting an overview of effective root-finding methods and the corresponding methodologies. Particular emphasis is dedicated to iterative algorithms via interval arithmetic capable of approximating the zeros using fast and accurate algorithms while minimizing and enclosing the inevitable rounding errors. Several classical results, which substantially influenced the development of the subject, are also discussed in depth.

Keywords: polynomial; interval arithmetic; interval iterative algorithm; order of convergence, root-finding method

OR-010
Optimal Number of Pursuers in the Differential Game on the 1-skeleton of 4D Cube

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Abstract. A differential game of several pursuers and one evader is studied. All the players move only along the edges of a 4-dimensional cube. The maximal speed of evader is 1 and that of each pursuer is less than 1 and greater or equal to 1/3. If the state of a pursuer coincides with the state of the evader, then pursuit is completed. The optimal number of pursuers to complete the game is found. Also, strategies for pursuers and evader are constructed.

Keywords: Differential game, many pursuers, edge graph, strategy, pursuer, evader.

OT-001
An IND-CPA Analysis on a Cryptosystem Based on Bivariate Polynomial Reconstruction Problem

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Abstract. Polynomial Reconstruction Problem (PRP) was introduced in 1999 as a new hard problem in post-quantum cryptography. Augot and Finiasz were the first to design a cryptographic system based on univariate PRP which was published at Eurocrypt 2003 and has been broken in 2004. In 2013, a bivariate PRP was proposed. The design is a modified version of Augot and Finiasz. Our strategized method via modified Berlekamp-Welch Algorithm and Coron strategies, has allowed us to obtain certain secret parameters of the bivariate PRP. This finding has resulted in us to conclude that the bivariate PRP is not secure against indistinguishable chosen plaintext attack (IND-CPA).

Keywords: Polynomial Reconstruction Problem, post-quantum cryptography, univariate polynomial, bivariate polynomial, chosen plaintext attack

OT-002
Numerical Approaches for Solving Mixed Volterra-Fredholm Fractional Integro-Differential Equations

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Abstract. In this paper, an approximate solution for solving nonlinear mixed Volterra-Fredholm fractional integro-differential equations is presented. The fractional derivative is defined in terms of Caputo type. Two methods are suggested: Adomin Decomposition Method (ADM) and Residual Power Series Method (RPSM). In these methods, Adomian polynomials and residual function are derived. The fractional Volterra-Fredholm integro-differential equation is reduced to a recurrence formula, in which it can be solved rather straightforwardly. Numerical examples demonstrate the efficiency and accuracy of ADM over RPSM.

Keywords: Fractional integro-diffferential equation, Caputo derivatives, Adomian polynomial residual function.

OT-003
The Heston-CIR-Merton Model for Equity Warrant Valuation

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Abstract. Warrant is a derivative that gives the right, but not the obligation, to buy or sell a security at a certain price before expiration. Warrant valuation method was inspired from option valuation because of the similarities of these two derivatives. Nonetheless, call option pricing models such as Black-Scholes were proven to contain many flaws, such as the assumption of constant interest rate and stochastic volatility. The aim of this study is to develop a pricing formula for equity warrants which includes stochastic volatility, stochastic interest rates and jumps. This dynamic is called the Heston-CIR-Merton model. The development of the model involves the derivation of stochastics differential equations which involves Cauchy problems and heat equations are then solved using partial differential equations. The derivation of analytical solutions is also provided.

Keywords: equity warrant, Heston-CIR-Merton model, stochastic volatility, stochastics interest rate, jumps.

OT-004
Analysing Time-scales Currency Exposure using Maximal Overlap Discrete Wavelet Transform (MODWT) for Malaysian Industrial Sector

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Abstract. Based on the dynamic nature of foreign exchange rate risk toward Malaysian firms across different time horizons, this paper is motivated to investigate the multiscale effect of currency exposure using wavelet analysis for 71 industrial products and services firms listed on the main market of Bursa Malaysia. The study employed Daubechies Least Asymmetric as a special wavelet filter in Maximal Overlap Discrete Wavelet Transform (MODWT) method to decompose a given time series into different time-intervals from January 2000 till December 2020. Specifically, the study found that there was non-monotonic exchange risk concentration from low to high time scale. As a result, as the time horizon widened, the firm profitability became more sensitive to the foreign currency fluctuations. Besides, the majority of the sample firms were negatively exposed to the U.S dollar, euro, and Japanese yen indicating that Malaysia industrial firms benefited from depreciation of these currencies. Given the significant time scale effect of currency exposure, firm managers and investors should incorporate the length of foreign transactions for greater accuracy and timely decision making in hedging strategies.

Keywords: Currency exposure, wavelet analysis, maximal overlap discrete wavelet transform (MODWT), industrial products and services.

OT-005
Group Attack of Many Pursuers Against One Evader in an Evasion Differential Game of Integral Constraint

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Abstract. An evasion game for one evader to avoid being captured by many pursuers is studied. A group attack against the evader is defined. The study of two pursuers attacking is first investigated and then generalized to the case of many pursuers. Control functions of all players are subjected to integral constraints.

Keywords: Group attack, evasion, one evader, many pursuers, integral constraint.

OT-006
Integral Constraints Pursuit Differential Game of an Infinite First Order 3-System of Differential Equations

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Abstract. We investigate a pursuit differential game of two pursuers against an evader in Hilbert space l_2. The equation of the game is described by an infinite first order 3-system of differential equations with integral constraints subjected to the control functions of all the players. The game terminates when both pursuers forward the initial state of the system into another state given by N where N could also be a zeroth state. In this study, a solution for the control problem is found. Consequently, admissible strategy for the pursuers is developed and sufficient conditions to complete the pursuit on a finite time interval are established.

Keywords: Pursuit, control, strategy, infinite system of differential equations, integral constraints

OT-007
New Generalized Closed Concepts in Fuzzy Bitopological Spaces.

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Abstract. This paper is focused on Fuzzy Bitopology. Zadeh (1965) introduced and laid out landmark papers concerning introduction to fuzzy topology. Subsequently several authors generalized various basic concepts from general topology to fuzzy sets and developed the theory of fuzzy topological space. The idea of this work is to contribute and improve several mathematical topics in fuzzy bitopological spaces. This study is considered new science and has many applications, such as applying the concept of closure, opening and separation in fuzzy bitopological spaces to expanding and narrowing the cancer cell and controlling its content. Also, in artificial intelligence and in making a mathematical model or database. The importance of this work is evident through that it will be a fertile reference not only for the fuzzy bitopology field, but for all branches of mathematics. The problem statement of this study lies in the definition of generalized closed set to fuzzy bitopological spaces by let the first factor of it is fixed on fuzzy open set from the first fuzzy space τ_i, then by making the second factor diversified to includes the types: β closed, semi closed, preclosed, and α-closed from the second fuzzy space τ_j. So, we introduce and develop basic notions of generalized closed sets in fuzzy bitopological spaces. In addition, some basic theorems are studied, and we found the relations between them in fuzzy bitopological spaces. We also pointed out many interesting examples and counter examples which explain that the inverse relation is not correct. In addition, we defined some basic definitions like closure, interior, neighborhood, quasi-neighborhood on these sets.

Keywords: Fuzzy bitopological spaces, fuzzy generalized closed sets, fuzzy generalized neighborhoods, fuzzy closure operator, fuzzy interior operator.

ST-001
Short-Term Performance of the Probability-Based Universal Portfolio

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Abstract. Universal portfolio is an investment strategy that produces an efficient performance in the stock market. Two universal portfolios generated by probability distribution, namely multinomial distribution universal portfolio and multivariate normal distribution universal portfolio are selected in this study. The above two universal portfolios are run on selected stock-price data sets from the local stock exchange. Empirical results have shown that the above two universal portfolios outperform the individual wealth for short term duration.

Keywords: Universal portfolio, multinomial distribution, multivariate normal distribution, investment strategy, short term duration.

ST-002
Investment in Malaysia: Forecasting Fixed Deposit Using Time Series and Regression Analysis

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Abstract. This paper studies Malaysian banking fixed deposit (FD) rates from 1997 to 2018 using time series and regression analysis. The FD rates is based on rates set by Bank Negara Malaysia. Multiple Linear Regression (MLR) is used to study the linear relationship between FD Rates and certain economic and financial indicators. The findings suggest FD Rates is heavily affected by Base Lending Rate (BLR), Consumer Price Index (CPI) and Real Effective Exchange Rate (REER). However, autocorrelation occurs and ARDL method is employed by adding variable lags. The new model adds in the lag of FD Rates, BLR and REER to fulfill the independent assumptions. Subsequently, the time series behavior of the three variables is investigated using ARIMA model approach. Forecasts of three explanatory variables for the next three years is made in order to predict the next three years FD Rates using the regression equation. The computed rates are then converted to 12-month period FD Rates. Results indicates that fixed deposit give a low but consistent return.

Keywords: Time series, ARIMA, forecast

ST-004
Bayesian MCMC Approach in Prognostic Modelling of Cardiovascular Disease in Malaysia: A Convergence Diagnostic

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Abstract. Most studies that considered the Bayesian Markov Chain Monte Carlo (MCMC) approach in prognostic modelling of cardiovascular disease were only focused on the application of the Bayesian approach in variable selection, model, and prior distribution choice. Yet rarely of these studies have explored the convergence of Markov chains in the model. In this study, convergence diagnostics were performed using graphical methods to assess the convergence of Markov chains. A total of 7180 ST-Elevation Myocardial Infarction (STEMI) male patients from the National Cardiovascular Disease Database-Acute Coronary Syndrome (NCVD-ACS) registry year 2006-2013 were analysed. Six significant variables were identified in the multivariate Bayesian model of male patients namely diabetes mellitus, family history of cardiovascular disease, chronic lung disease, renal disease, Killip class and age group. Based on these significant variables, the trace plots showed no specific trends, and the mixing of MCMC tends to be good for the model. As for the density plots, the estimated posterior distribution of the variables for male patients seems to follow a normal distribution and for the autocorrelation plots, there were only mild autocorrelations. Concerning generic use of the MCMC approach, the application of a variety of plots as diagnostic tools in this study indicated that the Markov chains have reached convergence.

Keywords: Bayesian, cardiovascular, convergence diagnostic, graphical, MCMC

ST-005
Estimation with Incomplete Sampling Frames using Varying Probability Sampling

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Abstract. Sampling frames are mostly incomplete in large scale surveys. This paper suggests a weighted pps estimator of population mean when the sampling frame is incomplete. Bias, mean square error of the estimators are obtained and further its efficiency is also discussed. The result obtained have been illustrated with the help of hypothetical data (in case we do not get suitable data we normally construct hypothetical data)

Keywords: Incomplete sampling frames, bias, mean square error, efficiency, probability proportional to size (pps) sampling.

ST-006
Alternative Interval Estimation for the Generalized Exponential Distribution with Interval Censored and Fixed Covariate

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Abstract. This paper investigates several alternative methods of constructing confidence interval estimates based on the bootstrap and jackknife techniques for the generalized exponential distribution with interval-censored and fixed covariates. Simulation studies were conducted to compare the bootstrap techniques, which includes bootstrap-t, bootstrap-percentile, and BCa confidence interval estimation methods, with the jackknife confidence interval estimation methods using coverage probability. The results indicate that the bootstrap technique works better than the jackknife techniques when dealing with interval-censored data with fixed covariates.

Keywords: Bootstrap, Jackknife, Interval-censoring, Fixed covariate, Coverage probability study

ST-007
An Efficient Tool for Monitoring Air Quality (PM10) at Several Cities in Peninsular Malaysia Using Functional Principal Component Control Chart with Data Pre-Whitening

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Abstract. The use of a control chart to monitor air quality performance is important to assist in the management of the air pollution problem. This study aims to propose a control chart that enables the monitoring of daily air quality (PM10) over time. The control chart is developed based on daily curves data using Functional Principal Component Analysis. Using a control chart, any deterioration of air quality (PM10) can be assessed based on the pattern of detected anomalies. Continuous monitoring can be conducted using daily air quality indices, which are developed using the Hotelling T^2 statistics. To reduce the autocorrelation effect that may cause false alarm, data- pre-whitening is employed in this study. The application of the control chart was conducted using historical data, involving a seven-year period of data starting from 2004-2010 at several urban air quality monitoring stations located in Peninsular Malaysia. The results of the analysis have shown that this functional data-based control chart outperforms the classical average-based control chart in terms of the number of indecisive out-of-control points. The implementation of data pre-whitening approach also reduces false alarms. In the context of an application, the results also show that the cities located in the west part of Peninsular Malaysia are more likely to experience more abnormal air quality (PM10). The control chart is proven to be practically useful as a monitoring tool to easily visualize the normal and abnormal trend of daily air quality (PM10) in this study.

Keywords: Air Quality, Control Chart, Functional Data Analysis, Data pre-whitening, Statistical process control

ST-008
Understanding the Model Identification for Double Seasonal Integrated Moving Average (DSARIMA) Model

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Abstract. Double Seasonal Autoregressive Integrated Moving Average (DSARIMA) model is an extension of the single SARIMA that is incorporated in modelling data with two seasonality. Model identification, parameter estimation and diagnostic checking are the steps in the modelling. However, the model identification is the most crucial stage as it provides the information used in the next step. Thus, this study extended the derivation of the model identification for DSARIMA in all three models which are additive, multiplicative and subset. The daily and weekly seasonality which can be indicated by 24 and 168 were used in this study with the derivation involving correlation and covariance from the general form of both seasonal and non-seasonal parts. The derivation results were shown for ARIMA (0,0,1) $(0,0,1)^{24}(0,0,1)^{168}$, ARIMA (0,0,[1,24,25,168,169,192,193]) and ARIMA (0,0,[1,24,168]) for multiplicative, subset and additive models, respectively. From the result, this study gives a valuable insight into the model identification step in DSARIMA models.

Keywords: DSARIMA, identification, additive, multiplicative, subset

ST-009
A New One-Parameter Underdispersed Size-Biased Poisson Distribution for Count Data

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Abstract. This paper proposes a new one-parameter discrete distribution for positive count data, named as underdispersed size-biased Poisson distribution as an alternative to modeling underdispersed positive count data. Several properties and measures such as moment about origins, variance, skewness, kurtosis, index of dispersion, coefficient of variation and recurrence relationship are presented. Estimator based on two estimation techniques, i.e., maximum likelihood and moment method are developed as well. It was found that both estimation techniques yield an identical estimator which is unique, positively biased, consistent and asymptotically normal. A dataset is fitted to the proposed distribution to verify the ability of the proposed distribution in explaining real dataset with comparison to a known size-biased distribution.

Keywords: two-component mixture distribution, underdispersion, weighted distribution

ST-011
New Extended Burr Type X Distribution: Model, Theory and Applications

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Abstract. Burr type X distribution is one of the popular distributions used in survival analysis. Many attempts have been made to increase its flexibility through the formation of new distributions by using Burr type X as the baseline distribution. This study introduces a new extended Burr type X distribution: exponentiated Beta Burr type X distribution (EBBX). We derive its statistical properties including quantile function, moments, moment generating function, and order statistics. We estimate the model parameters by using the maximum likelihood approach. We then proceed to conduct a simulation study with varying sample sizes and parameters values for accessing the performance of the proposed model. We illustrate the flexibility of the proposed distribution and its sub-models through a real data set of aircraft windshields. The results show that EBBX distribution can be used to model unimodal, bathtub, increasing, and decreasing hazard functions.

Keywords: Burr type X, exponentiated, beta generalized, bathtub hazard function,

ST-014
At-Site and Regional Frequency Analysis of Extreme Rainfall Modelling in Peninsular Malaysia

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Abstract. The objective of this study is to determine the appropriate probability distribution to describe the monthly maximum daily rainfall data from year 2005 to 2019 for 30 rain gauge stations in Peninsular Malaysia based on at-site and regional hydrological frequency analysis. Five three-parameter probability distributions were considered in this study i.e generalized extreme value (GEV), generalized Pareto (GPA), generalized logistic (GLO), generalized normal (GNO) and Pearson Type III (PE3). L-moment method of estimation is used to estimate the parameter of a model. The Monte Carlo simulation based on Z_{DIST} was used to assess the goodness of the fitted model. Results obtained by traditional at-site frequency analysis are compared with those obtained by regional frequency analysis. The results showed that the best probability distribution for monthly maxima daily rainfall data at each station and the ones of corresponding homogeneous regions obtained by regional frequency analysis were not necessarily consistent. Although the optimal probability distribution may vary according to the stations, in most cases, data for most of the stations are found to follow the generalized logistic distribution while for the regional study, most of the region conform to the generalized extreme value distribution.

Keywords: Regional frequency analysis, at-site frequency analysis, probability distribution, L-moment, extreme rainfall.

ST-015
Comparative Analysis between L-Moments and Maximum Product Spacings Method for Extreme PM_{10} Concentration

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Abstract. Malaysia occasionally suffers from severe air pollution especially in the urban and industrial area. The air quality stations across the country monitor various variables of air pollutants including particulate matter such as PM_{10}. Due to harmful effects of pollution on human health and the environment, especially for extreme cases, air quality is a matter of worldwide concern amongst scientists, policy makers and public alike. In extreme value analysis, the generalized extreme value (GEV) distribution is widely adopted, and its parameters were estimated by various methods. Studies on these estimation methods are of great interest since reliable estimates are needed for modelling and forecasting extreme events. In this study, two methods based on order statistics are compared which are the L-moments (LM) and maximum product spacings (MPS) method. The L-moments method is a common method in extreme value analysis while MPS is considered as an alternative for maximum likelihood estimation (MLE) method. Both methods are applied on daily maximums of PM_{10} concentration at sixty air quality monitoring stations in Malaysia. Both methods provide relatively close estimates and MPS is shown to be a reasonable alternative for parameter estimation of GEV distribution of extreme PM_{10} concentration in Malaysia.

Keywords: generalized extreme value (GEV) distribution, L-moments (LM), maximum product spacings (MPS), daily maximum, PM_{10}

ST-016
Control Chart for Monitoring Stock Price and Trading Volume in Malaysia Stock Market

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Abstract. Traditional statistical control charts are rarely used as a tool to monitor the stock trading and portfolio analysis due to its capability of providing a buying, selling or holding signal to the investor. Besides that, the normality assumption for a control chart is always violated due to the share prices and trading volumes being highly correlated. To overcome this problem, the auto regressive integrated moving average (ARIMA) model can be integrated into the control chart scheme. In this paper, a moving limit ARIMA control scheme is developed to monitor both stock price and trading volume at the same time. A real-life stock exchange data has been used to demonstrate the effectiveness of the proposed control scheme as compared with the performances of the volume-weighted moving average (VWMA) and relative strength index (RSI) charts. The proposed control scheme shows better performance compared to VWMA and RSI charts.

Keywords: ARIMA model, control chart, stock price, trading volume, volume-weighted moving average.

ST-017
Assessment of Various Rainfall Bias Correction Techniques in Peninsular Malaysia

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Abstract. Climate impact assessment models can have outputs that are sensitive to biases on the local scale. Hence, bias correction methods are used to amend the distribution of the climate impact assessment model so that it matches local observations. A great deal of errors can be removed from the model after applying the bias correction method. This study focuses on which is the best bias correction method after applying various bias correction methods on the observed rainfall data over Peninsular Malaysia. The bias correction methods used in this study includes the quantile mapping method, the delta method and the quantile delta mapping method. The rainfall data of 15 rainfall stations were obtained from the Malaysian Meteorological Department, whereas the General Circulation Model data used follows the CNRM-CM5 model. The bias correction methods used are the quantile mapping method, delta method and the quantile delta mapping method. The quantile mapping method is known for seasonal forecasting which has grown extensively, partly due to its broad use in correcting climatological biases in studies projecting future climate change. The delta method approach uses observations as a basis and, thus, is a stable and robust method that produces future time series with dynamics similar to current conditions, but it does not account for potential future changes in climate dynamics. The quantile delta mapping method is a break from other typical quantile mapping methods whereby it is not constrained by the stationarity assumption. The results show that the quantile mapping method is the best bias correction method among the three methods used in this study.

Keywords: Bias Correction; Quantile Mapping; Delta Method; Quantile Delta Mapping; General Circulation Model

ST-018
Multiple Regression Analysis in Identifying Internal and External Factors Contributing to Academic Achievement: A Case Study in Universiti Malaysia Sabah

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Abstract. Academic achievement is the ability to remember information or facts, to study, and to communicate knowledge in written form or verbally. It is one of the most essential measures of understanding and learning in all educational systems. Identifying factors that influence students' success is important in order to improve their performance in education. Hence, this study aimed to determine the significant internal and external factors contributing to students' performance. Self-esteem, emotional intelligence, IQ, and personality traits were employed as internal factors in this study, whereas parents' education level and parents' monthly income were used as external factors. Students' academic performance was measured using cumulative grade point average (CGPA). This study included 327 final-year undergraduate students from the Faculty of Science and Natural Resources and selected through a stratified sampling method. The data was analysed using stepwise multiple linear regression. Three regression models have been developed: internal factors model, external factors model, and the combination of internal and external factors model. The internal factors model revealed that self-esteem and IQ were significant contributing factors which accounted for 2.7% (Adj. $R^2 = 0.027$) of the variance in academic achievement while the external factors model exposed that only mothers' education level was a significant factor which explained 1.9% (Adj. $R^2 = 0.019$) of variance in students' performance. The combination model of internal and external factors discovered that mothers' education level and self-esteem were significant factors that accounted for 3.8% (Adj. $R^2 = 0.038$) of variance in students' achievement. The findings suggested that self-esteem, IQ, and mothers' education level were significant factors in students' achievement. Therefore, it is highly recommended for the government collaborating with parents, educators, and university administration to develop strategies or programs focusing on these three factors in order to improve students' academic performance.

Keywords: Academic achievement, self-esteem, emotional intelligence, IQ, personality traits, parents' education level, parents' monthly income, multiple regression

ST-020
Survey on Factors Influencing the Unemployment Among UTHM Graduates

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Abstract. Nowadays, unemployment is a severe problem among fresh graduates. Thus, a survey on factors that influence unemployment among UTHM graduates was conducted. A questionnaire was distributed via email according to a frame list based on the UTHM graduates in 2019 and 2020. A total of 435 responses were collected in this study. Factor analysis was conducted, and five factors of unemployment were presented throughout the 16 variables. Word cloud analysis revealed that employers are most concerned with working experience and technical skills are the most significant factor for graduates in the job search. Pearson's Chi-square test was used to determine the relationship between gender and race to the factors of unemployment. Then, the three lowest values of *p*-values were presented in the contingency table for further discussion. The three lowest *p*-values for the gender of 0.01968, 0.2696 and 0.001369 were presented in the contingency table. The significant variables were gender discrimination, having excellent communication skills and being an introvert who can manage the job. Also, the three lowest *p*-values for races of 3.102×10^{-5}, 5.189×10^{-6} and 2.576×10^{-7} were presented in the contingency table. The significant variables for races included the race of the respondents, overqualified skills and the excess of graduates will influence to get a job. Hence, students and lecturers should be giving close and thoughtful attention to solving the problem of unemployment among graduates.

Keywords: Unemployment, Factors, Factor Analysis, Word Cloud, Cross-tabulation Analysis.

ST-021
Performance Analysis for Passenger Satisfaction of Kuala Lumpur International Airport

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Abstract. Kuala Lumpur International Airport (KLIA) serves as the country's primary international gateway, providing the first impression to airport users and visitors. It also provides incomparable benefits to Malaysia's economy, such as tourism. Therefore, the airport requires to focus on the passenger's experience and satisfaction to deliver better service and meet their expectations. The objectives were to determine the association between the service quality of airport and KLIA passenger's recommendation by Chi-square test, the passenger's recommendation based on the airport services quality by logistic regression, and the KLIA passenger's satisfaction and experience through the passenger's online review to be investigated by text mining technique, word cloud and sentiment analysis. The results showed an association between the eight distinct types of service quality of airports and passenger recommendation in KLIA. Six models were significant to the KLIA passenger recommendation to another passenger whether it is a satisfying airport. The term "staff" was the most frequently occurring word among the passenger reviews. Based on the sentiment analysis, the passenger reviews were more likely to be the neutral sentiment. Hence, it is recommended to place a smiley box in each toilet and ask people to rate the cleanliness of that specific toilet rather than the entire restroom as it increases practical usability by reducing the number of contradictory votes each time interval.

Keywords: Kuala Lumpur International Airport, Service Quality, Chi-square Test, Logistic Regression, Sentiment Analysis.

ST-022
Mortality Modelling Using Stochastic Mortality Models: A Study on Malaysia's Ethnic Groups

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Abstract. The life expectancy of the population globally has been continuously increasing over the years due to healthcare and socioeconomic improvements. The rapid increase in life expectancy over the last few decades leads to an ageing population as the population lives longer. With the rise of elderly population in the society, insurance companies and pension funds need to deal with longevity risk, which is the risk of incurring greater pay-out ratios than projected as life expectancies exceed pricing assumptions. Hence, accurate mortality modelling and projection are of key interest to insurance companies, pension providers and government to overcome this issue. This study will focus on modelling mortality rates in Malaysia based on 3 major ethnic groups, namely Malay, Chinese and Indian for different ages using data from Abridged Life Tables for a 20-year period (2001-2020) provided by the Department of Statistics Malaysia. Mortality rates for each gender and ethnic group will be modelled using stochastic mortality models, i.e. Lee-Carter model, Hyndman-Ullah model and Augmented Common Factor model. Based on the evaluation of goodness-of-fit using Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE), we conclude that the Hyndman-Ullah model has the best fit for past mortality rates with the lowest values of RMSE and MAPE. Future research can be conducted by using Hyndman-Ullah model to forecast mortality rates in Malaysia based on age, gender and ethnic groups, which can be then applied in updating pension and annuities calculations on the existing and new contracts to minimize financial losses arising from longevity risk.

Keywords: stochastics mortality model, mortality modelling, Hyndman-Ullah model, Malaysia

ST-023
Autonomous Language Processing and Text Mining by Data Analytics for Business Solutions

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Abstract. Speech analytics solution is a technology that enables a company to discover customer's patterns and insights by analyzing relevant data, such as recorded audio files or phone conversations. The accuracy of speech recognition or speech-to-text transcription has been a challenge all along. This paper aims to present a text classification model for the call transcriptions based on the context, and to improve the accuracy of Google Speech API in Malay language. In this study, the accuracy of speech-to-text transcription is measured by word recognition rate and an accuracy scale. Time-cut-point and audio speed are the factors investigated to determine whether these factors affect the accuracy of text transcription. The results obtained from different time-cut-point and audio speed settings have been studied to identify the best combination. Furthermore, the pre-processed text data is utilized to train the text classification model using Support Vector Machine and Naive Bayes algorithms. In this paper, two approaches have been studied to improve Google Speech API. The first approach is to apply speech adaptation, which is the function made by Google. However, it showed that the accuracy dropped when 250 words were added into the speech adaptation, or when the audio speed was lowered. This is because the word error rate for both methods have increased. In the second approach, removing speech adaptation and lowering audio speed simultaneously caused a decrease in word error rate, hence the accuracy increased. In a nutshell, Support Vector Machine has a better accuracy score of text classification as compared with Naive Bayes algorithms. As a result, short time-cut-point with normal speed of audio file showed a positive impact to improve Google speech-to-text API, along with Support Vector Machine being more suitable for classification model.

Keywords: Speech analytics solution, Word recognition rate, Support vector machine, Naïve Bayes algorithms.

ST-024
Classifying the Severity Levels of Traffic Accidents using Decision Tree

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Abstract. Road accidents are one of the main causes of deaths in Malaysia as well as heart disease and cerebrovascular disease. This study aims to identify the main factors that drive to the occurrence of road accidents in Malaysia. Thus, the preventive measures can be designed toreduce the incidence of road accidents. The relationship between the severity of road accidents and influencing factors such as vehicle movement, traffic system, marking and road geometry were also studied. The Classification and Regression Tree (CART) and Chi-square Automatic Interaction Detector (CHAID) techniques were used to identify the effects of factors in this study. The results from the decision tree show that the main factors that determine the severity of the accident are the type of vehicle, the type of violation, lighting, and severity of driver's injuries. The information in this study is important with the hope that road users can be vigilant and avoid being exposed to the causes that allow them to be involved in accidents.

Keywords: traffic accidents, classifications, decision trees, severity levels, CART

ST-025
New Classification Algorithm for High Dimensional Data based on Robust SIMPLS

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Abstract. The ordinary least squares (OLS) method is often used to estimate the parameters of a linear regression model because of tradition and ease of computation. However, for high dimensional data where $p > n$, the OLS fails to produce an estimate because the $X'X$ becomes singular. The statistically inspired modification of the partial least squares (SIMPLS) is put forward to rectify this problem. The idea of SIMPLS is to extract uncorrelated components in such a way that the components of response and predictor variables will have maximum covariance. Nonetheless, it is now evident that the SIMPLS estimates are imprecise with inflated standard errors of the estimates when outliers are present in a data set. In this paper, a robust SIMPLS is proposed by integrating a new weight function in order to reduce the effect of vertical outliers and high leverage points (HLPs). A new diagnostic plot is also established based on the proposed robust SIMPLS. The proposed diagnostic plot is very successful in classifying observations into regular observations, vertical outliers, good and bad HLPs (outlying observations in X-space).

Keywords: high dimensional data; high leverage points; multicollinearity; robust method; robust SIMPLS

ST-026
Two-Parameter Bathtub Hazard Model with Covariates and Right Censored Data

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Abstract. Many lifetime distributions present monotonic or non-monotonic failure rate functions that are bathtub-shaped or upside-down bathtub-shaped failure rates. This research extended a two-parameter bathtub increasing (TBI) model that exhibits either bathtub-shaped or increasing failure rate depending on its parameter. In this research, the model was extended by adding covariates with right censored data. The parameter estimates were computed based on maximum likelihood estimation (MLE). A simulation study was then executed to assess the performance of parameter estimates based on their bias, standard error and root mean square error at various censoring proportions and sample sizes. The results suggested that the larger the sample size, the lower the standard error and root mean square error (RMSE). The RMSE values increased when the censoring proportion increased, demonstrating that the estimations performed well with smaller censoring proportions.

Keywords: Two-parameter bathtub model, covariates, right censored

ST-027
Spatio-temporal Analysis of COVID-19 Spread in Selangor

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Abstract. The coronavirus disease 2019 is a novel pandemic that has spread over the world, affecting every country including Malaysia. Therefore, forecasting the number of positive COVID-19 cases is crucial especially in Selangor where the cases are considered high. The COVID-19 data can be modelled and forecast by using time series methods on both univariate and multivariate modelling. The spatio-temporal model is one of the multivariate models because it is not only linked to the events from the past time, but also has relevance to the other location. This study aims to model and compare the forecast of COVID-19 confirmed cases by using the integrated generalized space-time autoregressive (GSTARI) model with different weights which are uniform and inverse distance weight and autoregressive integrated moving average (ARIMA) model in three districts which are Petaling, Hulu Langat, and Klang. The parameter estimate was done by using the ordinary least squares (OLS) method and the performances were compared using root mean square error (RMSE). The study showed the GSTARI (1,1) model with uniform and inverse distance weight outperformed ARIMA model in Petaling and Klang districts but not in Hulu Langat. However, as overall the GSTARI model still gave the best result in forecasting since GSTARI model only required less computational run time compared to the ARIMA model.

Keywords: Spatio-temporal, GSTAR, ARIMA, COVID-19, forecasting

ST-028
Generalized Exponential Distribution with Interval-Censored Data and Time Dependent Covariate

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Abstract. This study will improve the performance of the Generalized Exponential Distribution (GED) by incorporating time-dependent covariates (TD) in the presence of interval-censored data. Interval-censored data usually arises in clinical and epidemiological studies where lifetime is only known to fall within an interval. Moreover, this study concentrates on the parameter's estimation for this distribution. This study will compare the maximum likelihood estimation (MLE) for two distinct models, namely time-dependent covariates model and time independent covariates model in terms of their bias, standard error (SE) and root mean square error (RMSE) at various attendance probability (AP) and sample sizes. The results indicate that bias, SE and RMSE values of the parameter estimates increase with the increase in attendance probability and decrease with the increase in sample size.

Keywords: Generalized exponential distribution (GED), Interval censoring, Time-dependent covariates, Time-independent covariates, MLE.

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