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The 19th IMT-GT International Conference on Mathematics, Statistics and their Applications

Program Book

27-28 May 2024

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Introduction to The 19th IMT-GT International Conference on Mathematics, Statistics and their Applications 2024

This international conference is initiated by IMT-GT (Indonesia-Malaysia-Thailand Growth Triangle) consortium to promote mathematics and statistics in the region. The goal of the conference is to bring together scientists, mathematicians, statisticians, and academicians from the region of Indonesia, Malaysia, and Thailand, as well as any other region of the world, to share knowledge, expertise, and the recent development of mathematics and statistics in the form of plenary presentations and some social events.

In today's digital age, data science has emerged as a critical discipline for extracting valuable insights from vast data. As data becomes increasingly abundant and complex, the role of mathematics and statistics in data science has become even more significant. With the theme "Mathematics and Statistics in Data Science Era", the conference hopes to attract researchers to share their findings, explore the importance of mathematics and statistics, and highlight their essential roles in data analysis, modelling, and prediction.

The scope of the conference includes the most recent theories, issues, and practices in the area of:

- Linear Algebra, Optimisation, and Control Theory
- Statistical Analysis and Data Science
- Modelling, Machine Learning, and Business Intelligence
- Computational Mathematics
- Numerical Analysis and Scientific Computing
- Ordinary Differential Equations and Dynamical System
- Number Theory and Combinatorics
- Algebra, Algebraic Geometry, Analysis, and Operator Algebra
- Functional Analysis, Lie Groups, Lie Algebras, and Topology
- Probability Theory and Stochastic Processes
- Mathematical Finance and Actuarial Science
- Cosmology and Mathematical Physics
- Applications of Mathematics and Statistics
- Surveys and Official Statistics

In Memory of Assoc. Prof. Putipong Bookkamana

Education

1985	Master of Science in Applied Statistics, National Institute of Development Administration (NIDA), Thailand.
1981	Bachelor of Science in Mathematics, Srinakharinwirot University, Thailand.

Work Experience

1987 – 1997:	Lecturer (Level 3 – 7) ,Department of Statistics, Faculty of Science, Chiang Mai University, Thailand.
1997 – 2010:	Assistant Professor (Level 8) ,Department of Statistics, Faculty of Science, Chiang Mai University, Thailand.
2010 – 2019:	Associate Professor (Level 8 – 9) ,Department of Statistics, Faculty of Science, Chiang Mai University, Thailand.

Royal Thai Orders and Decorations

Assoc. Prof. Putipong Bookkamana received the Royal Decoration of Knight Grand Cordon (Special Class) of the Most Noble Order of the Crown of Thailand.

The praising for Assoc. Prof. Putipong Bookkamana

Assoc. Prof. Putipong Bookkamana did the duty with integrity. He was extremely responsible for the work who considers the benefits of the country mainly. He was good-natured and bountiful and loved the subordinate. For the whole time he had instructed the academic knowledge to the pupils. He let the pupils go to the temples for merit. He educated them to faith in Buddhism. He always maintained the monk's Buddhism. He helped and cared for the pupils to have the scholarship so the pupils always love and respect him.

Message From Chairman of ICMSA Council

Distinguished guests, esteemed colleagues, and fellow researchers, On behalf of ICMSA council, I would like to express my special thanks and gratitude to Universiti Tunku Abdul Rahman who host this year ICMSA conference. I also express my gratitude and special thanks to all keynote and invited speakers, participants for all your valuable time and efforts to participate in this conference and it is my great privilege to welcome you all to the 19th International Conference on Mathematics, Statistics and their Applications (ICMSA 2024). We are very delighted to have you join us for this prestigious event. ICMSA is an annual international conference initiated by the IMT-GT (Indonesia-Malaysia-Thailand Growth Triangle) Consortium, aimed at promoting and advancing the fields of mathematics and statistics in our region. This conference is designed as a scientific meeting for all scholars who are working in the field of Mathematics and Statistics from Indonesia, Malaysia, and Thailand, as well as other regions in the world, to share knowledge, expertise, and the recent development of mathematics, statistics and their applications. ICMSA is held alternately each year in Indonesia, Malaysia and Thailand. The first ICMSA was held in 2005 at the University of Sumatera Utara, Indonesia. Universiti Tunku Abdul Rahman has previously hosted the conference twice, which were the 6th ICMSA in 2010, and the 16th ICMSA in 2020. Last year, the 18th ICMSA was organized by Universitas Syiah Kuala, Indonesia. We are very delighted that Universiti Tunku Abdul Rahman is hosting again the 19th edition conference this year. Therefore, I sincerely hope this conference will inspiring and also the one to be anticipated in the next year that will be conducted in Thailand. Distinguished guest ladies and gentlemen, The conference creates a platform for scholars to exchange research ideas and encourages cross-discipline collaborations by expanding research network. It is hoped that all participants may benefit from the conference to advance research and practices in mathematics and statistics field. Last but not the least, my deepest gratitude goes to Universiti Tunku Abdul Rahman, and I extend my sincere appreciation to the organizing committee, sponsors, publisher, reviewers, volunteers, and all parties that have supported this conference . I wish you all a very productive conference with encouraging discussions and exchange of knowledge. May God bless us all with good health to make this event a successful and enjoyable one!
Thank you.

Hizir Sofyan
Chairman of ICMSA Council

Message From Chairperson of ICMSA 2024

Welcome to the International Conference on Mathematics and Statistics in the Data Science Era! Organized by the IMT-GT (Indonesia-Malaysia-Thailand Growth Triangle) consortium, this conference serves as a vital platform to advance mathematics and statistics within our region and beyond. We are thrilled to gather a diverse group of scientists, mathematicians, statisticians, and academicians from Indonesia, Malaysia, Thailand, and around the globe. Our primary aim is to foster the exchange of knowledge, ideas, and advancements in the fields of mathematics and statistics. In today's digital age, data science has emerged as a cornerstone for deriving meaningful insights from complex and abundant data. The theme of this year's conference, "Mathematics and Statistics in Data Science Era," underscores the increasing importance of these disciplines in the realm of data analysis, modeling, and prediction. Through plenary presentations and engaging social events, we hope to create an enriching environment where you can share your research, explore innovative concepts, and build lasting collaborations. We are excited to welcome you to this vibrant intellectual gathering and look forward to the invaluable contributions each of you will make to the ongoing dialogue in mathematics and statistics. Thank you for joining us and making this conference a success.

Warm regards,
Goh Yong Kheng
Chairman of ICMSA 2024

Plenary Session I - Dual-guided Reinforcement Learning for Utility Optimization in Continuous-time

Prof. Dr. Wong Hoi Ying
Department of Statistics
The Chinese University of Hong Kong,
Central Ave, Hong Kong.

Hoi Ying Wong is a Professor in the Department of Statistics and an Outstanding Fellow of the Faculty of Science at The Chinese University of Hong Kong (CUHK). His research interests encompass stochastic control theory, big data analytics, machine learning, numerical methods, and their applications in finance and risk management. Since 2005, he has served as an Associate Editor of the International Journal of Theoretical and Applied Finance. In 2018, he received the Best Paper Award from the IMA Journal on Management Mathematics, and he has also been recognized with several teaching awards from CUHK. Additionally, he has gained consulting experience with the Hong Kong Monetary Authority, commercial banks, and FinTech firms.

Abstract

Many financial economic problems are formulated as expected utility optimizations, often described by continuous-time stochastic processes to capture the economic environment. It is well-documented that economic variables have a low signal-to-noise ratio, resulting in imprecise estimations of the economic environment. In such situations, reinforcement learning (RL), a machine learning framework for solving dynamic decision problems, becomes valuable. RL encompasses both exploitation and exploration, with exploration enabling the agent to learn potentially better strategies from unexplored territories. However, classic RL approaches are developed based on dynamic programming, while many financial economic problems can be better solved using a duality approach, especially when there are constraints on the state process. In this context, we propose a novel dual-guided RL method for expected utility optimization problems. The objective is to learn model-free exploitation-exploration control (or distributional control) that surrounds the model-based optimal target derived from duality formulation. Building on this concept, we devise an RL algorithm to learn distributional control and prove its consistency, meaning that our solution converges to the classic model-based solution when exploration is turned off. Our RL framework can be applied to a wide range of utility functions, and the learned distributional control ensures satisfaction of state process constraints. Through numerical studies, we demonstrate the superiority of our proposed RL framework in reducing the impact of model ambiguity. This is a joint work with Bowen Jia and Kyunghyun Park.

Plenary Session II - Feature Selection in Echocardiogram Dataset using Machine Learning

Prof. Dr. Huang Huang-Nan
Dean of College of Science,
Tunghai University,
Taichung city, Taiwan.

Currently serving as a full Professor and the Dean of the College of Science at Tunghai University in Taiwan, Professor Huang focuses his research on various areas, including biomedical signal and image processing, fluid mechanics, robust control theory, numerical analysis, and delay systems. He has garnered recognition for his achievements, receiving awards for his work in supervised and unsupervised learning on echocardiogram data, diabetic foot wound treatment, and developing wavelet-based watermarking and compression techniques ensuring the data confidentiality of ECG signals and biomedical data, among other notable contributions.

Abstract

This study employs machine learning (ML) to make predictions based on input features during both training and inference stages. Feature selection methodology significantly influences ML model accuracy, encompassing data extraction, which involves gathering all necessary data for ML. Additionally, the study integrates the concept of feature engineering, necessitating the labeling of raw cardiac ultrasound data with meaningful labels to facilitate more precise target value prediction by the ML model. Thus, the study aims to refine feature selection strategies from the raw dataset and address data cleansing issues.The ultrasound dataset undergoes cleaning and crucial features are identified through data standardization, normalization, and missing feature imputation within the realm of feature engineering. Data scrubbing endeavors to preserve and select critical features from the echocardiogram dataset, thereby enhancing the accuracy of ML algorithm predictions.

Standard feature engineering methods are employed to culminate in the selection of four significant feature values. Leveraging ML algorithms available on the Azure platform—specifically Random Forest and CatBoost—a Voting Ensemble method is adopted for training. Additionally, visual tools are employed to facilitate a deeper comprehension of raw data and enhance the predictive model's accuracy. This paper underscores the importance of feature engineering, particularly in the cleaning and analysis of missing values within the raw echocardiography dataset, and the identification of crucial features therein. Utilizing the Azure platform, the study predicts individuals with a history of heart disease over the past three years, juxtaposed with those without such a history. Through data scrubbing and preprocessing techniques in feature engineering, the model exhibits enhanced accuracy in predicting future occurrences of heart disease in patients.

Plenary Session III - On Graph Planarisation and Skewness

Prof. Dr. Chia Gek Ling
Department of Mathematical and Actuarial Sciences
Universiti Tunku Abdul Rahman, Sungai Long Campus
43000 Cheras, Malaysia.

Prof. Dr. Chia Gek Ling graduated with a B. Sc. (Hons) in 1977 from the University of Malaya where he continued to pursuit his M. Sc. and PhD in the area of Graph Theory. He has been serving the Department of Mathematics, University of Malaya until in 2014 upon retirement. He then joined the Universiti Tunku Abdul Rahman at the Sungai Long Campus until now.

Over the last 40 years, he has been investigating discrete problems in Mathematics with emphasis on Graph Theory and Combinatorial Designs. His main interests in Graph Theory are in chromatic polynomials, cycle in graphs, clique graphs and graph parameters.

Currently he is an Editorial Member of the AKCE Journal of Graphs and Combinatorics, and of the Electronic Journal of Graph Theory and Applications.

Abstract

A *plane* graph is a graph drawn on the plane such that no two of its edges cross each other. A *planar* graph is a graph which can be redrawn as a plane graph. Graph planarity is a fundamental concept in graph theory. The *skewness* of a graph G is the minimum number of edges in G whose deletion results in a planar graph. The notion of skewness of graphs was introduced by R.K. Guy and P.C. Kainen independently at about the same time (1972). The determination of the skewness of graphs is known to be an NP-complete problem. We shall first present some interesting properties regarding planar graphs follow by a brief survey on the skewness of graphs along with some recent progress on the skewness of graphs.

Plenary Session IV - Data Privacy - An Optimisation Approach and a Case Study in Cluster Analysis

Prof. Dr. Abdellah Salhi
School of Mathematics, Statistics, and Actuarial Science,
University of Essex,
Wivenhoe Park, Colchester CO_4 3SQ, UK.

Abdellah Salhi has studied at Centre Universitaire de Sétif, Algeria. He was one of the very first students of that institution. He continued his studies in Computing/Operational Research at Université de Constantine, Algeria. He undertook his postgraduate studies (MSc/PhD) at the University of Aston in Birmingham, UK. He returned to Algeria for a short period of time, before returning to the UK.

He is currently a Professor of Operational Research in the School of Mathematics, Statistics and Actuarial Science, formerly the Department of Mathematical Sciences, at the University of Essex, United Kingdom. He is an expert in mathematical programming, optimisation and algorithm design. He has interests in data analytics, numerical analysis and computational mathematics, and their applications in business and other contexts.

He has previously worked as a Lecturer and Research Fellow at different universities, on a number of funded projects such as Decision Making under Partial Information (University of Leeds), Implementation of the REvised Simplex Algorithm on Massively Parallel Computers (University of Edinburgh), and Data-mining Electricity Market Data (University of Southampton) to help National Power estimate favourable bid prices for trading in electricity.

Prof. Salhi has recently led (as Principal Investigator) or contributed (as Co-Investigator) on a number of funded research projects such as Optimal Design by Data Analysis with Visualisation and Interaction (jointly with University College London), Labour scheduling whitin the Port of Felixstowe, the largest container port in the UK, Data Driven Analytics to Support Decision Making at MSX international, an automotive warranty company, Green Logistics and Optimisation of the Last Mile Distribution at Ocado, a major online retailer based in the UK, to name a few. He is currently working on the Detection and Localisation of Dark Ships at High Seas with PoleStar, a US company that specialises in tracking ships that engage in illegal activity in maritime environments. His projects attracted funding in excess of £1M , over the years.

He is also a member of the Business and Local Government Data Research Centre (BLG-DRC), a

multi-million-pound ESRC-funded project hosted by the University of Essex. His role is to generate new methodologies for big data analytics especially in the context of smart town centres.

He has introduced the Plant Propagation Algorithm (PPA) for global optimisation, a process inspired by the way plants, and in particular the strawberry plant, propagate. He has a patent for an algorithm on efficient distribution of goods. He has invented the foldable beehive, Origami style.

He has successfully supervised 17 PhD students from a dozen countries and published extensively in refereed journals such as the Journal of the Operational Research Society, Annals of Operations Research, IEEE Transactions on Evolutionary Computation, Operations Research Letter, Applied Soft Computing and others. He participates regularly as a plenary and keynote speaker in a number of international conferences. He was Head of the Department of Mathematical Sciences at Essex University from 2010 to 2016.

Abstact

Data Privacy (DP) has always been an issue in data analysis. This is more so today than ever before because of the advanced tools available to take advantage of data for all sorts of reasons including unethical. It has, therefore, become one of the big challenges that Big Data has thrown about in recent years. A number of attempts at dealing with DP and confidentiality preservation have been made. They mainly rely on data encoding, homomorphic encryption in particular, and other mathematical devices that allow datasets to be worked on in place of others with the aim of getting the same or equivalent solutions. They do, however, have limitations often due to the high dimensionality of these datasets and their extremely large volumes. The curse of dimensionality and volume are of course inherent to the concept of Big Data. In my talk, I will suggest a new approach for protecting data privacy and confidentiality that relies on optimisation, complexity theory and NP-Completeness, in particular. I will describe this approach and illustrate it on a very common problem in data science, namely clustering which will be converted into a TSP. Results will be provided and discussed.

Plenary Session V - Optimal Routing of Pedestrian Flow in a Complex Topological Network with Multiple Entrances and Exits

Prof. Dr. Anton Abdulbasah Kamil
Faculty of Economics, Administrative and Social Sciences, Business Administration
Istanbul Gelisim University,
34310 Istanbul, Turkey.

Prof. Dr. Anton Abdulbasah Kamil is currently a Professor of Econometrics at Istanbul Gelisim University, Turkiye. He received his PhD in Econometrics and Operations Research from Prague University of Economics and Business, Czech Republic in 1998. His research interests cover a wide range of topics related to Optimization, Statistics, and Econometric modelling.

He is on the Editorial Board of several international journals, one of them is Bulletin of the Malaysian Mathematical Sciences Society. Since 2013, he serve as a Reviewer for Mathematical Reviews (MR) A division of the American Mathematical Society.

Abstract

A real-world topological network consists of multiple entrances along its source nodes. Routing appropriate percentages of pedestrians from these entrances to the particular available routes with relevant arrival rates will improve the network's performance. This paper presents a framework for finding the optimal arrival rates of pedestrians from all available entrances and routes to downstream nodes maximizing the network's throughput. The calculation of the arrival rates and movement directions is based on M/G/C/C analytical and simulation models and the network flow model and considers the real distances of the entrances along the source nodes. The framework was tested on the Tuanku Syed Putra Hall, Universiti Sains Malaysia, Malaysia. Extensive analyses of the performances of its available nodes, especially on the achievable optimal throughputs were documented and discussed. Quantitative results show that the hall's throughput is optimized when pedestrians' arrival rates to all the available entrances and their movement directions are controlled within certain ranges.

Program Schedule

DAY 1: 27 May 2024 (Monday)		
Time (UTC +8)	**Room**	**Agenda**
8.15 am – 9.00 am	Iris I	Registration
9.00 am – 9.15 am	A	**Welcome Speech from UTAR** **Dr. Wong Voon Hee** *Head of Department, Department of Mathematical and Actuarial Sciences, Universiti Tunku Abdul Rahman, Malaysia* **Welcome Speech from ICMSA Council** **Prof. Hizir Sofyan** *Chairman of ICMSA Council, Head of Graduate School,Universitas Syiah Kuala, Banda Aceh, Indonesia Tunku Abdul Rahman, Malaysia*
9.15 am – 10.00 am	A	Keynote Speech I **Prof. Dr. Wong Hoi Ying** (The Chinese University of Hong Kong, Hong Kong) **"Dual-guided Reinforcement Learning for Utility Optimization in Continuous-time"**
10.00 am – 10.30 am		*Break / Photo Session*
10.30 am – 11.15 pm	A	Keynote Speech II **Prof. Dr. Huang Huang-Nan** (Tunghai University, Taiwan) **"Feature Selection in Echocardiogram Dataset using Machine Learning"**
11.15 am – 12.00 pm	A	Keynote Speech III **Prof. Dr. Chia Gek Ling** (Universiti Tunku Abdul Rahman, Malaysia) **"On Graph Planarisation and Skewness"**
12.00 pm – 1.30 pm	Funtasia	*Lunch*
1.30 pm – 3.30 pm	A, B	Parallel Session 1
3.30 pm – 4.00 pm		*Break*
4.00 pm – 6.20 pm	A, B	Parallel Session 2
7.00 pm – 7.30 pm	Cempaka	Opening Ceremony • **Welcoming Video** • **Opening Speech** **Dr. Goh Yong Kheng** *Chairman of ICMSA2024*
7.30pm	Cempaka	Buffet Dinner

DAY 2: 28 May 2024 (Tuesday)		
Time (UTC +8)	**Room**	**Agenda**
9.00 am – 9.45 am	A	Keynote Speech IV (Online) **Prof. Dr. Abdel Salhi** (University of Essex, United Kingdom) **"Data Privacy: An Optimisation Approach and a Case Study in Cluster Analysis"**
9.45 am – 10.30 am	A	Keynote Speech V (Online) **Prof. Dr. Anton Abdulbasah Kamil** (Istanbul Gelisim University, Turkey) **"Optimal Routing of Pedestrian Flow in A Complex Topological Network with Multiple Entrances and Exits"**
10.30 am – 11.00 am		*Break*
11.00 am – 12.40 pm	A, B	Parallel Session 3
12.40 pm – 2.00 pm	Funtasia	*Lunch*
2.00 pm – 3.40 pm	A, B	Parallel Session 4
3.40 pm – 4.00 pm		*Break*
4.00 pm – 5.40 pm	A, B	Parallel Session 5

* Room A : Matahari I
* Room B : Matahari II

Parallel Session 1 (Matahari I)

Date: 27 May 2024 (Monday)
Time: 1.30pm - 3.30pm
Theme: Applied Mathematics
Chairperson: How Hui Liew

No.	Time (UTC+8)	Presenter	Title
1	1.30pm – 1.50pm	Norzieha Mustapha	An application of hybrid weighted similarity measure of neutrosophic set in medical diagnosis
2	1.50pm – 2.10pm	Anusara Khamngam	Comparison of support vector machine and random forest algorithms for classification of songs for relaxation purposes in individuals with stress disorders
3	2.10pm – 2.30pm	Dick Mun Chang	Diagonal variable matrix method in solving inverse problem in image processing
4	2.30pm – 2.50pm	Nur Syahirah Roslan	Utilizing optimizable machine learning to predict extraversion from eeg coherence of the face-to-face interaction task
5	2.50pm – 3.10pm	How Hui Liew	Investigating the feature extraction capabilities of nonnegative matrix factorisation algorithms for black-and-white images
6	3.10pm – 3.30pm	Sumayyah Alabdulhadi (online)	Mhd mixed convection flow and heat transfer due to an inclined stretching/shrinking sheet

An Application of Hybrid Weighted Similarity Measure of Neutrosophic Set in Medical Diagnosis

Norzieha Mustapha[1], *Suriana* Alias[1], *Roliza* Md Yasin[1] , *Noorazliyana* Shafii[2] and *Said* Broumi[3]

[1]College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Cawangan Kelantan, Malaysia
[2]School of Health Sciences, Health Campus, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia
[3]Laboratory of Information Processing, Faculty of Science Ben M'Sik, University Hassan II, Casablanca, Morocco

Abstract. The study introduces a hybrid weighted similarity measure (HWSM) for the analysis of symptoms and diseases in patients using a neutrosophic set (NS). NS proves valuable for modeling uncertainty by accommodating contradictory and ambiguous information. The development of a similarity measure for NS information is crucial in various applications, particularly in medical diagnostics, to quantify similarity between sets. While existing literature provides various similarity measures for NS, only a limited number incorporates hybrid techniques. This study proposes a hybrid similarity measure that combines existing measures and integrates them with an entropy weight measure. To elaborate, distance- based similarity measures for NS are initially considered. Subsequently, an entropy weight measure is employed to calculate the attributes' weight of the attributes. The work includes formulating the properties of the proposed HWSM and its practical application in medical diagnosis, focusing on assessing the possibility of medical diagnoses in a patient. The study examines five symptoms which are fever, headache, stomach pain, cough, and chest pain. The HWSM is applied to analyze these symptoms across five different diseases, resulting in consistent and reliable outcomes. This research contributes to the ongoing enhancement of diagnostic tools for medical practitioners, addressing challenges associated with uncertainty in patient information.

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Comparison of Support Vector Machine and Random Forest Algorithms for Classification of Songs for Relaxation Purposes in Individuals with Stress Disorders

Anusara Khamngam, Wuttichai Srisodaphol[1], and *Prem Junsawang*
Department of Statistics, Faculty of Science, Khon Kaen University, Khon Kaen 40002 Thailand

Abstract. The research compares the performance of support vector machine (SVM) and random forest algorithms in identifying songs suitable for relaxation in patients with stress problems. The dataset comprises both Thai and international songs categorized into therapy and non-therapy groups. The results demonstrate that the support vector machine achieves an accuracy of 78%, outperforming the random forest with an accuracy of 72%. Precision and F1-score metrics further emphasize the superiority of the support vector machine in classification. Notably, the support vector machine has recall rates of 50% and 100% for therapy and non-therapy classes, respectively, while the random forest has recall from class therapy of 38% and class non-therapy of 100%. The findings suggest that providing individuals with stress issues the opportunity to listen to stress-reducing music can be a viable approach to reducing the need for psychiatric therapy. The support vector machine is a better algorithm than the random forest for classifying songs for relaxation because it is more accurate, precise, and has more even recall rates.

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Diagonal Variable Matrix Method in Solving Inverse Problem in Image Processing

Dick Mun Chang[1], *Hong Seng* Sim[1]*, *Yong Kheng* Goh[1], *Sing Yee* Chua[2] , and *Wah June* Leong[3]

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Abstract. In this project, we introduce a new gradient method called the Diagonal Variable Matrix method. A key feature of our method is the integration of component-wise adaptive diagonal variables. Our proposed method is aimed to minimize H_{k+1} over the log-determinant norm subject to weak secant relation. The derived diagonal matrix H_{k+1} is the inverse of the B_{k+1}, which enables the calculation of the search direction, $d_k = H_{k+1}g_k$, where g_k denotes the gradient of the objective function. The proposed method is coupled with the utilization of backtracking Armijo line search. The proposed method is specifically designed to reduce the function call times and training duration, particularly in the context of solving large-dimensional problems. To assess the efficiency of our proposed method, we perform a comprehensive comparative analysis against established methods, using profiling graphs to analyze various performance metrics such as the number of iterations, number of function calls, and computational time. Numerical results indicate that our method outperforms various Conjugate Gradient methods and the Steepest Descent method. As a practical illustration, the proposed method is implemented in solving image deblurring problems.

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Utilizing Optimizable Machine Learning to Predict Extraversion from EEG Coherence of the Face-to-Face Interaction Task

Nur Syahirah Roslan[1]*, *Nur Lyana Shahfiqa* Albashah[1], and *Ibrahima* Faye[2]

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[2]Department of Fundamental and Applied Sciences, Universiti Teknologi PETRONAS, 32610 Bandar Seri Iskandar, Perak, Malaysia.

Abstract. Researchers have begun investigating personality assessments using brain-imaging techniques such as electroencephalography (EEG). However, previous studies usually utilized EEG power, resting state, and video stimulus in the extraversion classification study, which could be the factors contributing to insufficient accuracy. Thus, this study proposes to classify extraversion using EEG coherence during the face-to-face interaction task with an accuracy target of greater than 90%. A total of 32 healthy male individuals were selected for this study based on their scores on the Big Five Inventory (BFI) and the Eysenck Personality Inventory (EPI). Sixteen of the individuals were identified as extraverts, whereas the remaining sixteen were identified as introverts. The study employed the Kruskal-Wallis test to identify the high-ranking features. For the extraversion classification, optimizable KNN and SVM were utilized, along with leave-one-out cross-validation. The findings indicated that employing 1624 EEG coherence yielded an accuracy percentage of below 80%. Nevertheless, with the utilization of feature selection, it is feasible to attain an accuracy of over 80%. While the study did not reach a 90% accuracy rate, we believe it has the potential to offer valuable insights into improving the assessment of extraversion using EEG.

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Investigating the Feature Extraction Capabilities of Nonnegative Matrix Factorization Algorithms for Black-and-White Image

How Hui Liew[1]*, *Wei Shean* Ng[1], and *Huey Voon* Chen [1]
[1]Department of Mathematical and Actuarial Sciences, Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, 43000 Kajang, Selangor, Malaysia

Abstract. Nonnegative matrix factorisation (NMF) is different from canonical matrix factorisations in numerical linear algebra. It is a nonunique approximation to a nonnegative matrix by two lower-rank nonnegative matrices. Different distance measures lead to different optimisation problems and different NMF algorithms which are dependent on the rank and the initial conditions. This paper investigates the open-source implementations of NMF algorithms and studies the feature extraction capabilities of NMF algorithms using the scikit-learn numeric library with different ranks and initial conditions empirically. The feature extraction capabilities of NMF on the Boolean matrix related to black-and-white images are investigated. The regularisation parameter shows no significant improvements in the feature information extraction for Boolean matrices. It is found that the NMF will not preserve sparsity for the standard NMF algorithms. The findings of the study show that a more appropriate loss function than the beta-loss function is essential for accurate approximation of Boolean matrices using NMF. In addition, this research provides some insights into the performance of NMF algorithms from the scikit-learn library and highlights the importance of considering different factors such as rank and initial conditions when evaluating the results of NMF algorithms.

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MHD Mixed Convection Flow and Heat Transfer due to an Inclined Stretching/Shrinking Sheet

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Abstract. This study focuses on the numerical analysis of magnetohydrodynamic (MHD) mixed convection flow of a viscous fluid over an inclined stretching sheet. The sheet's temperature and stretching velocity are assumed to follow a power law distribution. To simplify the governing partial differential equations (PDEs), we apply similarity transformations, which transform them into ordinary differential equations (ODEs). We employ the bvp4c solver in Matlab for numerical computations. Specifically, when the buoyancy force is present and the parameter n is related to m as $n = 2m - 1$, we obtain similarity solutions. For a particular variant of the shrinking strength, non-unique solutions are found. It is evident from the temporal stability analysis that only one of them remains stable throughout time. The study investigates the effects of various parameters, such as velocity and temperature exponents, magnetic field strength, inclination angle, and buoyancy, on the flow and heat transfer properties, which are illustrated through graphical representations. Notable findings include that the local Nusselt numbers and skin friction coefficients decrease when the inclination angle of the stretching sheet increases, while they increase when the inclination angle of the shrinking sheet increases.

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Parallel Session 1 (Matahari II)

Date: 27 May 2024 (Monday)
Time: 1.30pm - 3.30pm
Theme: Statistics
Chairperson: Sook Theng Pang

No.	Time (UTC+8)	Presenter	Title
1	1.30pm – 1.50pm	Soo Lin Lee	An economic production quantity inventory model with a circular economy indicator operating in two markets
2	1.50pm – 2.10pm	Ahmad Faiz Mohd Azhar	Investigating accuracy of biomarker involving a parametric approach of proportional hazard skewed normal model
3	2.10pm – 2.30pm	Kee Seng Kuang	Universal portfolio generated by Hellinger distance
4	2.30pm – 2.50pm	Sing Yan Looi	Navigating misinformation: understanding audience perception and evaluation in different data visualizations
5	2.50pm – 3.10pm	Chiong Liong Wong	Identifying the process shift with robust control charts in the presence of contamination
6	3.10pm – 3.30pm	Sook Theng Pang	Performance of brownian-motion-generated universal portfolios during COVID-19 pandemic

An Economic Production Quantity Inventory Model with a Circular Economy Indicator Operating in Two Markets

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Abstract. A sustainable inventory system seeks to enhance production profits and minimize environmental impact. This study introduces an Economic Production Quantity (EPQ) model incorporating dual-market demand, recoverable items, external procurement, and variable item return rates, along with a circular economy indicator. Two scenarios are examined during the concurrent production and repair processes, and a model is devised to maximize the total profit per unit time (TPUT). In the first scenario, there is a sufficient or surplus quantity of moderate-quality return items available for repair. In the second scenario, there is an insufficient quantity of moderate-quality return items for repair, necessitating additional procurement from an external supplier. Items repaired from both scenarios will be marketed in the secondary market. Additionally, both scenarios involve the sale of repaired high-quality return items in the primary market. In the absence of a sufficient quantity of high-quality return items, new production items are anticipated to meet the remaining demand of the primary market. The proposed models are tested through numerical examples, and a numerical sensitivity analysis is conducted to explore how dual-market operations affect the total profit per unit time.

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Investigating Accuracy of Biomarker Involving a Parametric Approach of Proportional Hazard Skewed Normal Model

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Abstract. Time-dependent receiver operating characteristics (ROC) curve is useful to measure the accuracy performance over time. In this paper, we have shown how to determine the accuracy trend using proportional hazard model with continuous skewed normal biomarker and skewed normal time-to-event. Bayesian inference and adaptive multivariate integration over hypercubes are used respectively for parameter estimation and solving the sensitivity and specificity of the time-dependent ROC. The simulation study and application on real data suggests that it is possible to predict the accuracy measurement over time by changing the estimated association parameter between the biomarker and time-to-event data. In addition, studies on the impact of sample size on the ROC curve shows an advantage of this parametric method over conventional nonparametric and semiparametric.

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Universal Portfolio Generated by Hellinger Distance

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Abstract. There are numerous universal portfolios generated in different studies using various divergence functions to achieve one goal, which is to maximize wealth. To extent the exploration, through this study we have generated a new universal portfolio using the Hellinger distance. We conducted a thorough performance assessment of our newly developed portfolio using a diverse array of stock price data obtained from the local stock exchange. The comparison of performance of the universal portfolio with other common strategies like buy-and-hold strategy and constant rebalanced portfolio was done.

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Navigating Misinformation: Understanding Audience Perception and Evaluation in Different Data Visualizations

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Abstract. In the age of Big Data where data literacy is vital across diverse domains, the prevalence of misleading visualizations raises significant concerns. Examining the extent of such visualizations is crucial since viewers often lack the ability to choose the form of presentation. This study aims to investigate the impact of intentionally misleading data visualizations on cognitive biases by exploring factors that potentially influence perceptions and evaluations, including different methods of data visualization, audience academic background and the order of data presentation. Sixty undergraduate students with two different major programmes from a local higher educational institution are selected to participate in this study. These students were tasked with responding to predesigned questions based on two different sets of infographics addressing the same issues. The findings indicate that both data presentation and analytical background significantly influence audience perception and evaluation. Additionally, the order of data presentation reveals that audience evaluation is influenced by their initial negative impression. These results underscore the critical role of data literacy in enhancing the understanding of data visualization, particularly in the context of public issues.

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Identifying the Process Shift with Robust Control Charts in the Presence of Contamination

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Abstract. Conventional control charts have traditionally been reliable tools for monitoring processes under the assumption of normally distributed data. However, real-world data often deviate from this idealized normality, leading to reduced charting performance and potentially causing process anomalies to go unnoticed. In this study, by integrating robust statistical estimators and innovative charting techniques, robust control charts demonstrate their capability to effectively detect process shifts and abnormalities in a variety of challenging settings. Through Monte Carlo simulation studies and a real dataset application, this research provides insights into the benefits and limitations of robust control charts. Our findings indicate that the proposed robust control charts show a notable performance in detecting data anomalies, specifically for the shift in mean, outperforming conventional charts in this regard. Comparison among the three robust location estimators via simulations, namely Huber (*H*) and Biweight (*B*) estimators as well as the proposed Biweight estimator integrating the *M-Scale* (*BM*) estimator also demonstrate its superiority in handling shifting in mean process situations.

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Performance of Brownian-Motion-Generated Universal Portfolios during COVID-19 Pandemic

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Abstract. The universal portfolio is a class of portfolio investment strategies theoretically proven to achieve good returns. Brownian motion is a fundamental stochastic process heavily applied in financial derivative pricing. The goal of this study is to investigate the performance of finite order Brownian motion-generated universal portfolio for three independent stocks during the COVID-19 pandemic. The portfolio includes three stocks from Malaysia, Singapore and Thailand from January 2020 to June 2022. Buy and Hold and Constant Rebalance portfolios will be used as benchmarks. The effect of parameters of Brownian motion in forming the Brownian motion-generated universal portfolio is investigated to learn more insights into parameter selection. This research shows that the Brownian motion-generated universal portfolio performs better than the benchmarks (compared with the respective listed index within each country), especially in terms of the Sharpe ratio and Sortino ratio. Some fruitful results are obtained with dynamic Brownian motion parameter setting according to Follow the Winner and Follow the Loser which avoids the forward looking bias.

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Parallel Session 2 (Matahari I)

Date: 27 May 2024 (Monday)
Time: 4.00pm - 6.20pm
Theme: Pure Mathematics
Chairperson: Hong Keat Yap

No.	Time (UTC+8)	Presenter	Title
1	4.00pm – 4.20pm	Yei Shan Jessica Liang	Fractals corresponding to the metallic means sequences
2	4.20pm – 4.40pm	Wei Kit Lai	On the sum or difference of an idempotent and a tripotent in a quaternion algebra over the ring of integers modulo p
3	4.40pm – 5.00pm	Chii Liang Ng	Smallest cubic graphs with given girth and skewness
4	5.00pm – 5.20pm	Narawadee Phudolsitthiphat	Some properties of hyperbolic k-Narayana quaternions
5	5.20pm – 5.40pm	Darren Ong Chung Lee	Exact mobility edges for almost-periodic CMV matrices via gauge symmetries
6	5.40pm – 6.00pm	Mohd Sham Mohamad	Some Analysis on the Conjugacy Search Problem of the Diffie-Hellman Key Exchange Protocol based on the Subgroup SL(2,3)
7	6.00pm – 6.20pm	Hong Keat Yap	Weakly tripotent elements in quaternion rings over Z_p

Fractals Corresponding to the Metallic Means Sequences

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Abstract. In this work, we investigate a periodically ordered sequences that correspond 1-dimensional tilings (i.e. of the interval of [0,1]). These sequences are used to model quasicrystals. By recursively removing the tiles we can generate a fractal similar to the Cantor set. Lastly, we show the fractal using figures and show how to calculate the similarity dimension.

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On the Sum or Difference of an Idempotent and a Tripotent in a Quaternion Algebra over the Ring of Integers Modulo p

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Abstract. Let H denoted as quaternions. Quaternions form an algebra over a ring R, as an extension of complex numbers into a four-dimensional space, where $H = \{a_0 + a_1 i + a_2 j + a_3 k \mid a_0, a_1, a_2, a_3 \in R\}$. A quaternion algebra, particularly defined over fields of characteristic 0, finds numerous applications in physics. In this article, we explore some properties of the sum of an idempotent and a tripotent element in the finite ring H/Z_p, adapting the definition of SIT rings that was introduced by Ying et al in 2016. We provide some conditions for H/Z_p to be SIT rings and we give some examples of weakly tripotent rings (Breaz and Cimpean, 2018) in H/Z_p.

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Smallest Cubic Graphs with Given Girth and Skewness

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Abstract. The skewness of a graph is the minimum number of its edges whose deletion results in a planar graph. We determine the minimum orders of cubic graphs with girth no more than 6 and skewness no more than 4. In passing, we also determine the skewness of all cubic cages whose girth is no more than 8.

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Some Properties of Hyperbolic *k*-Narayana Quaternions.

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Abstract. In this paper, we introduced the hyperbolic *k*-Narayana quaternions. Several properties of these quaternions are investigated, including the Binet formulas, generating functions, and summation formulas. Moreover, some identities such as Catalan, Cassini, and d'Ocagne are obtained. Our results extend and generalize well-known theorems.

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Exact Mobility Edges for Almost-Periodic CMV Matrices via Gauge Symmetries

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Abstract. We investigate the symmetries of so-called generalized extended CMV matrices. It is well-documented that problems involving reflection symmetries of standard extended CMV matrices can be subtle. We show how to deal with this in an elegant fashion by passing to the class of generalized extended CMV matrices via explicit diagonal unitaries in the spirit of Cantero–Grünbaum–Moral–Velázquez. As an application of these ideas, we construct an explicit family of almost-periodic CMV matrices, which we call the mosaic unitary almost-Mathieu operator, and prove the occurrence of exact mobility edges. That is, we show the existence of energies that separate spectral regions with absolutely continuous and pure point spectrum and exactly calculate them.

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Some Analysis on the Conjugacy Search Problem of the Diffie-Hellman Key Exchange Protocol Based on the Subgroup $SL(2,3)$

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Abstract. In this paper, some conditions are presented to attain the same shared secret key over the nonabelian group for the well-known Diffie-Hellman method. Such examples in special linear group $SL(2,3)$ are presented as well to illustrate the implementation of Diffie-Hellman key exchange protocol.

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Weakly Tripotent Elements in Quaternion Rings over $\mathbb{Z}_p$

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Abstract. A ring R is called weakly tripotent if every element $x \in R$, it can be written as $x^3 = x$ or $x^3 = -x$. In this paper, we discuss weakly tripotent elements in quaternion rings over $\mathbb{Z}_p$, $\mathbb{H}/\mathbb{Z}_p$.

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Parallel Session 2 (Matahari II)

Date: 27 May 2024 (Monday)
Time: 4.00pm - 6.20pm
Theme: Applied Mathematics and Statistics
Chairperson: Kong Hoong Lem

No.	Time (UTC+8)	Presenter	Title
1	4.00pm – 4.20pm	Dong Ling Tong	Improving financial distress prediction using machine learning: A preliminary study
2	4.20pm – 4.40pm	Siti Nur Idara Rosli	Neutrosophic Bézier Curve Model for Uncertainty Problem Using Approximation Approach
3	4.40pm – 5.00pm	Suriana Alias	Rough Neutrosophic Multisets Geometric Aggregation Operator with Entropy Weight Combined Roughness Dice Similarity Measure and Its Application
4	5.00pm – 5.20pm	Iebin Lian	Covariate balancing for multiple exposures with interaction in observational studies
5	5.20pm – 5.40pm	Shan-Chi Wu	Probability of Informed No-Tradings: A Copula-Based PIN Model with Zero-Inflated Poison Distributions
6	5.40pm – 6.00pm	Wei Lin Teoh	A study on the performances of the run sum X-bar chart under the Gamma process
7	6.00pm – 6.20pm	Kong Hoong Lem	The STL-ARIMA approach for seasonal time series forecast: a preliminary study

Improving Financial Distress Prediction using Machine Learning: A Preliminary Study

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Abstract. Financial distress is a situation where a company faces significant difficulties in meeting its financial obligations and maintaining profitability, subsequently leading to bankruptcy, insolvency, and severe financial losses. Therefore, early warning for companies at risk of financial distress is vital for business stakeholders to take timely corrective actions and avoid adverse outcomes. Existing financial distress predictions often rely on historical datasets, incorporating various indicators collected through varied methodologies and experts' opinions. The challenge arises in discerning which indicators are pivotal for predicting corporate distress, as their influence and relevance may vary. This study proposed a machine learning framework to eliminate variations of different experts' knowledge when selecting pivotal indicators. Data containing 4006 companies and 204 indicators was extracted from CSMAR. The Chi-Square test is employed to select significant indicators. The correlation of these selected indicators is modeled using the C4.5 decision tree. Results showed that this selected feature set is closely aligned with those obtained when utilizing all features in the data. A thorough comparison of the indicators selected by the expert revealed notable distinctions. Features chosen by the Chi-Square test are related to financial ratios and also exhibit a pronounced focus on societal attention, shareholding concentration, and market dynamics.

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Neutrosophic Bézier Curve Model for Uncertainty Problem Using Approximation Approach

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Abstract. The problem of gathering data with uncertainty is difficult to address since certain values are eliminated owing to noise. Thus, the fundamental gap revealed is that fuzzy and intuitionistic fuzzy sets cannot deal with indeterminacy problems compared to neutrosophic sets. This research demonstrates how to use a neutrosophic set to approximate the Bézier curve. The neutrosophic set and its qualities are used to identify the neutrosophic control point relation in the first stage. The control point and the Bernstein basis function are then combined to form a neutrosophic Bézier. The curve is then depicted using an approximation method involving truth membership, false membership, and indeterminacy membership curves. A numerical example and an algorithm for obtaining the neutrosophic Bézier curve are provided at the end of this work. As a result, this research can help data analysts acquire data without wasting any uncertain information data. Besides, this study can make a significant contribution to the scope of computational mathematics and modelling.

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Rough Neutrosophic Multisets Geometric Aggregation Operator with Entropy Weight Combined Roughness Dice Similarity Measure and Its Application

Suriana Alias[1]*, *Daud* Mohamad[2], *Adibah* Shuib[2], *Norzieha* Mustapha[1], *Roliza Md Yasin*[1] *Nazhatul Sahima* Mohd Yusoff[1] and *Said* Broumi[3]

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Abstract. Rough neutrosophic multisets (RNM) is an uncertainty set theory generalized from the rough neutrosophic set. In the same equivalence relation, the universal set is a neutrosophic multisets with boundary regions involving lower and upper approximation. To date, to handle the multiplicity of information collected, the rough neutrosophic multisets geometric aggregation operator (RNMGAO) is introduced. The algebraic operations of RNM used in the derivation of RNMGAO are defined. The entropy measure of RNM is also discussed as a weighted assign for each criterion simultaneously with the geometric aggregation operator. The roughness Dice similarity measure of RNM is combined in methodology for ranking purposed. The application in medical diagnosis of three epidemic diseases Coronavirus, Influenza, and Pneumonia is implemented as a case study.

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Covariate Balancing for Multiple Exposures with Interaction in Observational Studies

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Abstract. The procedure to balance the distribution of covariates (Z) among exposure levels is a crucial step for establishing causality between the exposure and the outcome in observational studies. Standard approaches mostly deal only with single exposure. However, it is not uncommon that the exposure interacts with other exposures of interest on the outcome. In such cases, ignoring the interaction and applying standard balancing procedures on a single exposure may produce severe bias. For example, the Georgia Capital Charging and Sentencing Study aimed to investigate if the race of the defendant as well as the race of the victim affected the length/severity of the sentence (Y). In such a study, there are two exposures of interest on the outcome with significant interaction. Analysing each exposure separately may produce biased results. Base on the simulation results we suggest to use covariate-partition strategy for single-exposure scenario and all-covariate strategy for multiple-exposure scenario.

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Probability of Informed No-Tradings: a Copula-Based PIN Model with Zero-Inflated Poisson Distribution

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Abstract. Classical PIN models assume that, given the information scenario, the number of buy and sell order flows are independently Poisson distributed, which enforces certain probability of no-trades. However, empirical data shows that the implied probabilities of no-trades do not match the aforementioned assumptions. Therefore, we propose a new PIN model that better fits the data by using zero-inflated Poisson distributions and copula functions, which allow us to match the probability of no-trades. The expectation conditional maximization (ECM) algorithm is further proposed to tackle the parameter fittings, which is verified by simulation studies. Empirical studies show that this model outperforms the original PIN models, with significant parameters on the zero-inflations as well as copulas. In particular, we find that it is possible for an information to simultaneously increase the probability of no trade and boost up the average number of transactions, which contradicts to the intuition.

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A Study on the Performances of the Run Sum $\bar{X}$ Chart Under the Gamma Process

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Abstract. The run sum (RS) $\bar{X}$ chart is known as a simple and powerful tool for monitoring the mean of a process. Most developments of the RS $\bar{X}$ chart assume that the underlying process comes from a normal distribution. However, in practice, many processes tend to follow non-normal distribution. These non-normal processes affect the performance of control charts under the design of normal distribution. In this paper, we present a detailed analysis on the performances of the RS $\bar{X}$ chart when the underlying data come from a gamma distribution. By using Monte Carlo simulation approach, the run-length properties, namely the average run length and the standard deviation of the run length will be computed. Particularly, the 4 and 7 regions RS $\bar{X}$ charts under both distributions are considered. When the charts' parameters specifically designed for the normal distribution are used to monitor the data from gamma distribution, simulated results show that the RS $\bar{X}$ chart's performances are significantly deteriorated. Overall, the 7 regions RS $\bar{X}$ chart has lower false alarm rate and faster detection speed compared to the 4 regions RS $\bar{X}$ chart when the underlying distribution is gamma.

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The STL-ARIMA Approach for Seasonal Time Series Forecast: A Preliminary Study

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Abstract. STL which stands for Seasonal and Trend decomposition using Loess, is a technique for decomposing a time series into its underlying components: trend, seasonal, and residual. In this study, STL has been combined with the AutoRegressive Integrated Moving Average, ARIMA model to help improve the forecast performance on seasonal time series. In the proposed algorithm, data first undergoes the SLT decomposition. Later, each component series was forecasted separately using (S)ARIMA models. Finally, these forecasts for each component were added up to serve as the overall forecast. Forecast performance was compared with the SARIMA method using metrics such as MAE, RMSE and MAPE. Based on a preliminary case study using atmospheric carbon dioxide concentration data from Mauna Loa, Hawaii, the findings suggest that the proposed algorithm offers a viable alternative for improving forecast performance in seasonal data.

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Parallel Session 3 (Matahari I)

Date: 28 May 2024 (Tuesday)
Time: 11.00am - 12.40pm
Theme: Applied Mathematics
Chairperson: Wing Son Loh

No.	Time (UTC+8)	Presenter	Title
1	11.00pm – 11.20am	Jasmine Wang Thye Wei	Prediction of residential property prices using machine learning algorithms
2	11.20am – 11.40am	Indah Manfaati Nur	Multi-Class Imbalance Classification using Light Gradient Boosting Machine
3	11.40am – 12.00pm	Noviana Pratiwi	Socio-Demographic Possible Factor in Infant Mortality Rate : A machine Learning Approach
4	12.00pm – 12.20pm	Fityanul Akhyar	Fish Grades Identification System with Ensemble-Based Key Feature Learning
5	12.20pm – 12.40pm	Wing Son Loh	An Unsupervised Machine Learning Approach for Estimating Missing Daily Rainfall Data in Peninsular Malaysia

Prediction of Residential Property Prices Using Machine Learning Algorithms

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Abstract. Residential property prices prediction is essential for evaluating market value and identifying over-pricing or under-pricing. This study investigates the performance of various machine learning algorithms, including Decision Tree (DT), Random Forest (RF), and Multilayer Perceptron (MLP) in predicting residential property prices. The study performs exploratory data analysis and principal components analysis (PCA) to reduce the dimensionality of the variables and extract the most useful variables affecting terrace house prices in Kuala Lumpur, Malaysia. A publicly available dataset is used for training and testing the algorithms, with a 70:30 proportion after pre-processing procedures. Performance indicators such as Kappa statistics, *r*-squared, Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE), and Root Mean Squared Error (RMSE) are used to evaluate the algorithms. The results show that RF outperforms DT and MLP, achieving the highest accuracy score of 85.82%, and highest Kappa statistics of 0.8307. The study also finds that the predicted data by RF algorithm are reliable from the train set. After performing exploratory data analysis and PCA, RF-PCA demonstrated the best performance in residential property price prediction, with an r-squared value of 0.7497, the lowest values of MAE (0.6091), MAPE (19.23%), and RMSE (1.066) compared to DT-PCA and MLP-PCA.

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Multi-Class Imbalance Classification using Light Gradient Boosting Machine

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Abstract. Diabetes mellitus is a chronic disease or metabolic disorder characterized by hyperglycaemia. Diabetes is still a global health problem with an increasing prevalence. Early detection of diabetes is crucial to reducing more serious health risks. A machine learning classification algorithm approach can be used to classify and perform early detection of diabetes based on critical information from diabetes patients' data. The study aims to classify diabetes using the Light Gradient Boosting Machine (LGBM) method with Synthetic Minority Oversampling of Nominal and Continuous (SMOTENC). The SMOTENC oversampling method is used to deal with imbalances in the datasets, while the LGBM is used for the classification of diabetes. The results of the research show that by applying the SMOTENC technique obtained a more balanced distribution of data, so when used in the process of classification using LGBM yielded a high model performance, based on accuracy, precision, recall, f1-score and AUC.

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Socio-Demographic Possible Factor in Infant Mortality Rate : A Machine Learning Approach

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Abstract. The infant mortality rate (IMR) is a complex world public health indicator. For countries with limited resources that require easy-to-calculate and precise measurements of population health, IMR may remain an appropriate choice. Several studies on infant mortality rates use a multilevel perspective that connects background with nearby variables. On the other hand, interdisciplinary perspectives such as social demography provide a general picture of the diverse relationships between socio-demographic disparities and mortality rates. Analysis of differences in infant mortality rates is the focus of this research. Understanding the socio-demographic factors that influence it can support the development of more appropriate intervention strategies. OPLS-DA is used as an analysis method because of its ability to handle complex multivariable structures and explain the relationship between socio-demographic variables and infant mortality rates. The OPLS-DA model is used to extract significant patterns and relationships in the data so that it is possible for socio-demographic factors to have a significant impact on infant mortality rates. It is hoped that the results of the classification will provide insight and become the basis for developing policies by considering socio-demographic aspects in efforts to prevent infant mortality.

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Fish Grades Identification System with Ensemble-Based Key Feature Learning

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Abstract. Indonesia has already contacted the maritime nations due to its 5.8 million km² of coastline. Consequently, fish products are among the most important commodities. Moreover, fish grading is a crucial step in the process of exporting fisheries products. Currently, in Indonesia, the process itself is manually inspected by an expert. In addition, this paper proposes to assist the industry by suggesting a method for grading fish. This method involves combining two essential fish parts with different resolutions: the high-level feature (the body) and the low-level feature (the eye) serve as defining characteristics. These two main parts are accurately localized using a deep learning-based object detection model, specifically YOLOv7, and extracted with an efficient and adaptive learned classification model, namely EfficientnetV2S. In the final stage, the two extracted features are combined and learned with Dense Layers to generate three distinct fish grades. Based on the experimental results, the proposed work achieved an accuracy, F1 Score, and recall of 96.88%, 97%, and 97%, respectively. The proposed model outperformed the baseline model, which relies solely on deep learning-based classification, by a significant margin.

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An Unsupervised Machine Learning Approach for Estimating Missing Daily Rainfall Data in Peninsular Malaysia

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Abstract. Rainfall data plays a vital role in various fields including agriculture, hydrology, climatology, and water resource management. Stakeholders had raised concerns over the issue of missing rainfall data as it presents a huge obstacle in achieving reliable climate forecasts. Therefore, it is necessary to perform accurate estimation for the missing daily rainfall data. Each year, the peninsular Malaysia experiences a significant rainfall event during the monsoon period due to the North-East monsoon (NEM) wind. The intricate spatial rainfall dynamics requires a computational model, capable of generating accurate estimates and deciphering hidden patterns from the missing data. An unsupervised machine learning model known as the Self-Organising Feature Map (SOFM) is developed to estimate the missing daily rainfall across 10 rainfall stations during the NEM period between 2010 and 2020. The SOFM exhibited reliable performance across the percentage of missingness between 10% to 50%. Below 50% missingness, the evaluated statistical metrics, coefficient of determination (R^2) is attained above 0.5, ranging between 0.504 and 0.915; root mean square error (RMSE) between 15.9 to 22.7. The feature maps enabled the visualisation of the relationship between the rainfall intensity and studied rainfall stations. The feature maps suggested that the studied rainfall stations are inhomogeneous.

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Parallel Session 3 (Matahari II)

Date: 28 May 2024 (Tuesday)
Time: 11.00am - 12.40pm
Theme: Statistics (hybrid)
Chairperson: Hong Beng Yeoh

No.	Time (UTC+8)	Presenter	Title
1	11.00am – 11.20am	Calvin Nathanel Utomo	Comparative Analysis of Crisis Management Plan Implementation: Unveiling Academic Quality in Malaysian Higher Education through Covariance-Based SEM and PLS-SEM
2	11.20am – 11.40am	Era Setya Cahyati	Probabilistic Soft Set Theory for Decision-Making in Choosing Korean Dramas
3	11.40am – 12.00pm	Hong Beng Yeoh	Examining technological performance-related variables for effective usage of ChatGPT in academic learning of tertiary learners
4	12.00pm – 12.20pm	Thabiso Masena (online)	Investigating the lingering effects of the pandemic on wholesale industry sales in South Africa
5	12.20pm – 12.40pm	Sandile Shongwe (online)	Risk quantification using skewed distributions – An application to the South African Financial Index

Comparative Analysis of Crisis Management Plan Implementation: Unveiling Academic Quality in Malaysian Higher Education through Covariance-Based SEM and PLS-SEM

Calvin Nathanael Utomo[1*], Goh *Boon Hoe*[1*], Liew *Kian Wah*[1], *Kalaimagal* Ramakrishnan[1], Wong *Kok Cheong*[1], Yuen *Choon Wah*[2], and *Syed Khairi* Syed Abbas[3]

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Abstract. Structural Equation Modelling (SEM) has emerged as a valuable tool for analyzing latent variables that are not directly observable. This paper explores two prominent SEM methodologies: the covariance-based approach, employing maximum likelihood parameter estimation to minimize a fitting function derived from likelihood and determine the best estimate for the covariance matrix; and the variance-based approach, exemplified by Partial Least Squares SEM (PLS-SEM), which seeks to maximize the variance explained by the model through regression. These two approaches come with their own advantages and disadvantages, which will be discussed in this paper. The primary focus of this study is the application of SEM in examining the hypothetical relationship between the implementation of crisis management plans and academic quality within Malaysian higher education institutions. Data, gathered through a Likert scale, were fitted to models via covariance-based SEM and PLS-SEM. The fitness of the models obtained with multiple packages with differing algorithms in R were compared, analysed and interpreted. This paper aims to contribute by comparing methodologies and algorithms suitable for the analysis of collected data.

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Probabilistic Soft Set Theory for Decision-Making in Choosing Korean Dramas

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Abstract. Decision-making involves subjective elements influenced by individual preferences and uncertainties. A flexible framework to handle these complications is offered by probabilistic soft set theory. Probabilistic soft sets is an extension of soft set. This mathematical framework deals with ambiguity and uncertainty in the process of making decisions. In this study, probabilistic soft set will be utilized to determine the Korean drama to be watched. To apply this method, a set of drama titles with the same genre is collected. Subsequently, using this method, the data is processed and analyzed to determine the chosen drama.

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Examining technological performance-related variables for effective usage of ChatGPT in academic learning of tertiary learners

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Abstract. Recently, ChatGPT is widely leveraged as information searching and drilling natural language processing tool to facilitate academic learning. However, a comprehensive framework is indeed lacking for its effective deployment in educational institutions. Thus, this research aims to analyse technological performance related variables while using ChatGPT, namely self-efficacy, self-adaptation using Technology Adaptation Model (TAM) and self-expectancy, and their inter-relationships to support its effective usage among tertiary learners for their academic learning. Quantitative research via questionnaire survey was conducted. All question items in the questionnaire were adapted from past literature. The respondents were located using multi-staged cluster sampling technique at main campus of a comprehensive university in Malaysia. Data collected from 230 tertiary learners were analysed using Partial Least Square-Structural Equation Modeling (PLS-SEM). The research finding shows that tertiary learners' self-expectancy on the functionalities of ChatCPT and their self-efficacy to use ChatGPT significantly affect its effective usage in their academic learning. Besides, both tertiary learners' self-efficacy and self-expectancy when using ChatGPT are significantly influenced by their perceived usefulness of ChatGPT. On top of it, tertiary learners' self-expectancy in ChatGPT is also significantly influenced by their behavioural intention to use ChatGPT. Lastly, the relationship between tertiary learners' perceived usefulness and their behavioural intention to use ChatGPT is partially mediated by their perceived ease of use in ChatGPT. These research results provide an insight to related stakeholders, including tertiary learners and higher education decision makers, on their initiatives to facilitate and manage the usage of ChatGPT as a learning tool in tertiary educational institutions.

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Investigating the Lingering Effects of the Pandemic on Wholesale Industry Sales in South Africa

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Abstract. This study aims to investigate the lingering impact of the COVID-19 pandemic on the South African total monthly wholesale trade sales using time series Box-Jenkins methodology. The SARIMA$(2,1,1)(0,1,1)_{12}$ model provides the best fit to the SA's total monthly wholesale trade sales series as it has the lowest Akaike's information criterion, Bayesian information criterion, root mean square error and mean absolute percentage error values which serve as model selection and model adequacy metrics. The findings of this study show that the South African wholesale industry trade sales were negatively affected by the COVID-19 pandemic but have fully recovered.

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Risk Quantification using Skewed Distributions: An Application to the South African Financial Index

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Abstract. This study assesses the reproducibility of a recent publication on the risk quantification of the South African Financial Index (J580) using skewed distributions. That is, four skewed distributions (Burr, exponential, gamma and Weibull) are fitted to the returns (split into losses and gains) of the J580 dataset. In this paper, we redo the analysis in an effort to highlight some of the quantifiable differences in the values of the descriptives, goodness-of-fit and risk measures for all four distributions. In addition, other goodness-of-fit tests are computed for all four distributions to check consistency, and based on this extension, it is observed that the Weibull is a better model for gains due to a majority of the goodness-of-fit test inferring that and yields better risk measures. Finally, the Burr distribution is recommended for losses as it better captures the heavy tail of the loss returns.

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Parallel Session 4 (Matahari I)

Date: 28 May 2024 (Tuesday)
Time: 2.00pm - 3.40pm
Theme: Applied Mathematics
Chairperson: Ivan Heng Giap Yeo

No.	Time (UTC+8)	Presenter	Title
1	2.00pm – 2.20pm	Huai Tein Lim	Nurse scheduling problem: investigating the principles of operators in evolutionary algorithm for small size population
2	2.20pm – 2.40pm	Muhammad Hassan Muhammad	Thermodynamics and Thermal Analysis of Upper Convected Maxwell Fluid Motion past a Flat Plate with Viscous Dissipation
3	2.40pm – 3.00pm	Abubakar Usman	Examinations of Viscous Dissipation, Magnetic Field and Thermal Radiation on the Systematic Flow of Casson Fluid with Gyrotactic Microorganisms
4	3.00pm – 3.20pm	Jia Hou Chin	Mathematics Research in India: A Scientometrics and Complex Network Analysis
5	3.20pm – 3.40pm	Ivan Heng Giap Yeo	A Product Recovery Inventory Model with a Circular Economy Indicator

Nurse Scheduling Problem: Investigating the Principles of Operators in Evolutionary Algorithm for Small Size Population

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Abstract.: Developing an effective nurse shifts assignment system that considers diverse nurse requests and ward coverage is a complex and time-consuming task. Failing to address various constraints with different levels of precedence can lead to undesirable nurse schedules. The efficiency of such a system relies heavily on the attributes of an automated scheduling approach or the proficiency of a head nurse. Therefore, this paper investigates the principles of designing artificial computing operators for matrix representation of a solution to the evolutionary algorithm hybridization. Five parent selections, each with different selection intensities that prioritize elite parents and ensure diverse characteristics, are reviewed. Additionally, the integration of selection intensity with specific fragment sizes of crossovers are determined when designing a well-performing algorithm. The evaluation criteria encompass algorithm reliability, accuracy, effectiveness, and efficiency. The study reveals that the Discovery Rate Tournament parent selection with Two-factor crossover achieved a higher quality schedule with the lowest fitness value. In conclusion, a small-sized population proves suitable for addressing the complex computational problem that consist of heavy constraints. The selection intensity should strike a balance between elitism and dissimilarity intensities when combined with a smaller fragment size of mating strategy.

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Thermodynamics and Thermal Analysis of Upper Convected Maxwell Fluid Motion past a Flat Plate with Viscous Dissipation

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Abstract. The analysis of thermal and thermodynamics on the motion of upper convected Maxwell fluid past a flat plate was considered in this study. In the current analysis, the effect of viscous dissipation, thermal radiation and chemical reaction was examined using a numerical approach. The numerical approach, spectral relaxation method was utilized to solve the formulated partial differential equations (PDEs). The set of PDEs was eventually changed to ordinary differential equations (ODEs) based on the applications of a suitable similarity variables. The findings show that the prandtt number greatly affects the thermal analysis by increasing the thermal boundary layer and temperature distribution of fluids particles. The Deborah number was found enhance the velocity profile and the thermodynamics boundary layer of the fluid. The significance applications of this work can be found in polymer addictives, thermal explosion and MHD accelerator.

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Examinations of Viscous Dissipation, Magnetic Field and Thermal Radiation on the Systematic Flow of Casson Fluid with Gyrotactic Microorganisms

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Abstract. This research work is aimed at examining the significance of viscous dissipation, magnetic field alongside thermal radiation on the flow of Casson fluid. The fluid flow was considered in the presence of gyrotactic microorganisms and nanoparticles. The physics of the problem is governed with partial differential equations (PDEs). The set of PDEs are changed to ordinary differential equations (ODEs) by utilizing an appropriate similarity variables. To examine the pertinent flow parameters, a numerical approach called spectral relaxation method (SRM) was employed. This SRM approach employs the basic Gauss-Seidel method to decouple and discretize the set of differential equations. The choice of this approach is due to its consistency and accuracy. The viscous dissipation parameter (Ec) was found to enhance fluid temperature, velocity and boundary layers (thermal and momentum boundary layer). The strong opposition of magnetic parameter give rise to Lorenz force which drags the fluid flow within the boundary layer. The nanoparticle was found to bare great effect on the Gyrotactic microorganisms.

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Mathematics Research in India: A Scientometrics and Complex Network Analysis

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Abstract. Over the past three decades, there has been a noticeable growth in both the quantity and quality of scientific research in India. In recent years, India's growing prominence on the global map of research productivity has become highly visible. Numerous scientometrics studies have been reported for various fields in India such as computer science, nanoscience, nanotechnology, artificial intelligence, solar cells, and dentistry among others. However, there is a lack of scientometric research in the domain of mathematics within India, despite its crucial role in propelling advancements across various disciplines. Furthermore, research collaboration has emerged as an important factor in accelerating the progress of mathematics research in a country since the 20th century. Therefore, studying collaboration trends becomes an essential component of scientometrics. In this paper, we comprehensively analyze the state of mathematics research in India, including collaboration trends, using methods from scientometrics and complex network analysis. Scientometrics offers an overview of the nature of mathematics research being undertaken, while complex network analysis reveals the dynamics and structural variation of research collaborations at the country and institutional level across various temporal periods. The findings provide insights into the development and collaboration trends of mathematics research in India from 2001 to 2021. There has been an exponential increase in publications since 2015, with approximately 20% of mathematics research conducted in India appearing to be associated with physics research. In terms of research collaborations, there has been a notable increase in collaborations between India and several countries including the USA, China, Saudi Arabia, and Turkey. However, an analysis of institutional collaboration networks suggests that these collaborations tend to be small-scale research.

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A Product Recovery Inventory Model with a Circular Economy Indicator

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Abstract. The circular economy concept has been proposed as a way to increase sustainability, where manufacturers reduce waste by keeping materials in circulation as much as possible through product recovery, and consumers support these manufacturers by buying from them. Hence, the aim of this paper is to demonstrate the advantage of investing in circular economy activities by proposing an Economic Production Quantity inventory model for a finished product in a circular economy, where the finished product can be manufactured from raw materials and remanufactured from used items. The variable level of circularity is indicated by an index between 0 and 1. Both the production quantity and the circularity level are taken as a decision variables. The proposed model also takes carbon emission costs into account. A solution procedure to find the optimal policy is presented and is illustrated with numerical examples. Our analysis showed that investing in circular economy activities is advantageous, even when it is more profitable to manufacture than it is to remanufacture.

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Parallel Session 4 (Matahari II)

Date: 28 May 2024 (Tuesday)
Time: 2.00pm - 3.40pm
Theme: Statistics (hybrid)
Chairperson: Sin Yee Lee

No.	Time (UTC+8)	Presenter	Title
1	2.00pm – 2.20pm	Wuttichai Srisodaphol	Nonparametric outlier detection algorithm for circular regression model: A method based on circular distance
2	2.20pm – 2.40pm	Sin Yee Lee	The Influence of Financial Development on Ecological Footprint: A Panel Quantile Regression Modelling in OECD Countries
3	2.40pm – 3.00pm	Mosala Rachuene (online)	Most suitable threshold method for extremes in financial data with different volatility levels
4	3.00pm – 3.20pm	Thabiso Masena (online)	The impact of the pandemic on the retail industry sales in South Africa: A Box-Jenkins approach
5	3.20pm – 3.40pm	Sandile Shongwe (online)	Danish fire insurance data – Some comments and additional analysis

Nonparametric Outlier Detection Algorithm for Circular Regression Model: A Method Based on Circular Distance

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Abstract. In this study, we proposed an algorithm for using the circular distance to find outliers in JS circular regression. The performance of the proposed algorithm is compared with three methods: the difference between mean circular error in terms of cosine function for full and reduced data (DMCEc), the difference in betas for circular (DFBETAc), and the difference in fit for circular (DFFITc), based on simulation and real data analysis. For the simulated data, we focused on both uncontaminated data and contaminated data with 5% contamination. The study discovered that in uncontaminated data, the DMCEc, the DFBETAc, the DFFITc, and the proposed algorithm could only find outliers very rarely. However, the proposed algorithm indicated that inliers are considered to be more outliers than the previous three methods. For contaminated data with 5% contamination, accuracy, precision, and recall were used as the criteria for comparing the performance of the methods. The proposed algorithm is more efficient than DMCEc, DFBETAc, and DFFITc. For two real datasets, it was observed that the proposed algorithm successfully identified outliers in both datasets, while the DMCEc, DFBETAc, and DFFITc exhibited lower accuracy in detecting outliers. Therefore, the proposed algorithm was considered appropriate and effective for detecting outliers.

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The Influence of Financial Development on Ecological Footprint: A Panel Quantile Regression Modelling in OECD Countries

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Abstract. In the competitive landscape where Organisation for Economic Cooperation and Development (OECD) nations vie for investments and strive to maintain competitiveness, financial development, becomes a crucial factor not only in resource allocation but also in shaping the ecological footprint. The complex and varied nature of the relationship between financial development and ecological footprint in OECD nations may be oversimplified by conventional linear regression models. This study aims to model the effects of financial development on the ecological footprint of OECD countries using panel quantile regression. Analysing a sample of 36 countries within the OECD from 1995 to 2021 using a panel quantile regression framework with distributional heterogeneity, the study reveals a U-shape relationship between financial development and ecological footprint when the countries with high ecological footprint. Policymakers may promote eco-friendly financial practices, integrate green finance principles, and develop policies to manage environmental consequences of financial development. The originality of this research is evident in highlighting that the influence of financial development on ecological footprint differs among countries, contingent on their specific ecological footprint levels. This is achieved through the application of a panel quantile regression approach, providing policymakers with valuable insights.

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Most Suitable Threshold Method for Extremes in Financial Data with Different Volatility Levels

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Abstract. Estimating the threshold for extreme values is essential for anticipating and managing rare and impactful events. This paper discusses four different graphical methods of estimating thresholds using three different stock price datasets. The datasets have different levels of volatility (classified as low, medium, and high). For each of the datasets, thresholds are estimated, and a generalised Pareto distribution is then fitted to the exceedances above each threshold. Subsequently, the mean squared error is calculated for each fitted model, which is then used together with the number of exceedances for each respective threshold as criteria to analyse and make inferences on the most suitable threshold approach when using a dataset that has a specified degree of volatility. It was observed that when dealing with a dataset with low volatility, Pickand plot should be considered for threshold setting. When volatility is very moderate or high, using Hill plot to determine thresholds for extreme values is recommended. The motivation for this paper lies in the need to explore and identify the most effective threshold estimation methods when dealing with different levels of stock price volatility.

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The Impact of the Pandemic on the Retail Industry Sales in South Africa: A Box-Jenkins Approach

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Abstract. The objective of this study is to investigate the long-term impact of the COVID-19 pandemic on the South African retail industry sales using the seasonal autoregressive moving average (SARIMA) from the time series analysis tool pack called Box-Jenkins methodology. The model with the best fit to the total monthly retail sales series is the SARIMA$(0,1,1)(0,1,0)_{12}$ model as it has the lowest values of the model selection and adequacy measures such as the Akaike's information criterion, Bayesian information criterion, root mean square error and the mean absolute percentage error. This study concludes that the South African retail industry is remarkably resilient sector because while it was unstable during lockdown, the total retail sales recovered to their pre-intervention levels as soon as less strict lockdown levels were implemented.

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Danish Fire Insurance Data: A Review and Additional Analysis

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Abstract. The Danish fire insurance data is one of the most recognised and well-known datasets in the empirical insurance claims literature. This dataset is used in many textbooks and articles to illustrate the analysis of fire insurance claims, more specifically in the application of heavy-tailed loss distributions and extreme value theory. In this paper, we provide a short review of publications that used the Danish fire insurance data and conduct an additional analysis. Our additional analysis on the Danish fire insurance data involves investigating the: (i) modality issue using appropriate statistical tests and software, (ii) k-means clustering pattern using different techniques, (iii) effect of using a splicing model on the data, and (iv) differences in results that we obtained as compared to what other cited researchers reported in their earlier publications. In short, the objective of this paper is to highlight the importance of the Danish fire claims dataset by showcasing different models where it has been used to verify certain hypotheses in the empirical actuarial field. Additional analyses are also conducted to illustrate its dense usefulness in the actuarial and extremes field, where real-life datasets are scarce because they are often subjected to a lot of proprietary and privacy laws.

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Parallel Session 5 (Matahari I)

Date: 28 May 2024 (Tuesday)
Time: 4.00pm - 5.40pm
Theme: Pure and Applied Mathematics (hybrid)
Chairperson: Jia Hou Chin

No.	Time (UTC+8)	Presenter	Title
1	4.00pm – 4.20pm	Rahma Zuhra (online)	Study of the Fixed Point Theorem on Complete Cone Metric Space
2	4.20pm – 4.40pm	Somphong Jitman (online)	Complementary dual abelian codes of some specific lengths
3	4.40pm – 5.00pm	Nur Najeeha Natasha Jefri (online)	Unsteady dusty magnetohydrodynamic boundary layer flow past a sphere
4	5.00pm – 5.20pm	Asim Shoaib (online)	Comparative Studies of Region-Based Segmentation Algorithms on Natural and Remote Sensing Images
5	5.20pm – 5.40pm	Jin Wang Chang	Victim clustering with k-prototype algorithm for flood evacuation planning

Study of the Fixed-Point Theorem on A Complete Cone Metric Space

Zuhra Rahma[1], *Hafnani* Hafnani[1], and *Oktavia* Rini[1]

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Abstract. Metric space is the one of topics in mathematical analysis which is still being studied and developed. Previous research has extended the contraction mappings and completeness properties from metric spaces to other spaces such as cone metric spaces. This research will prove a fixed-point theorem on cone metric spaces, construct a function and maps to [0,1), then add several conditions to the theorem, namely partially ordered, contraction mapping, and non-decreasing and continuous functions. The outcomes include evidence indicating a unique fixed point in cone metric space. As consequence, there are three different characteristics for contraction mapping expressed in three corollaries.

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Complementary Dual Abelian Codes of Some Specific Lengths

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Abstract. Complementary dual codes have been of interest due to their wide applications in cryptography and quantum error-correction. Recently, properties of complementary dual abelian codes were established for various families of finite abelian groups. However, the enumeration formulas were given mostly based on number-theoretical characteristic functions. In this paper, complementary dual abelian codes over finite fields are revisited in the case where the underlying group is a finite abelian p-group or a product of a finite abelian p-group and a finite abelian 2-group, where p is an odd prime which is not the characteristic of the alphabet filed. The enumeration formula for such complementary dual abelian codes is given in a more precise form independent of characteristic functions. Some illustrative examples are given as well.

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Unsteady Dusty Magnetohydrodynamic Boundary Layer Flow Past a Sphere

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Abstract. The boundary layer problem for unsteady dusty Newtonian fluid flow through a sphere influenced by magnetic field has been investigated in this paper. The mathematical model for fluid and dusty phases is developed using continuity and momentum equations. By using appropriate similarity transformations, higher order partial differential equations (PDE) are reduced to first order PDE. The Keller Box method is used to solve the governed equations which consist of Finite Difference Method (FDM), Newton's method, and the formation of a block tri-diagonal matrix. The Keller Box procedure are programmed in MATLAB environment and analysed graphically. The findings are found to be in good agreement with the existing literature. The effect of

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Comparative Studies of Region-Based Segmentation Algorithms on Natural and Remote Sensing Images

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Abstract. Region-based segmentation algorithms are used as a preprocessing approach to generate over-segmented regions. Over-segmented regions refer to the creation of small regions in an image that represent no meaningful object regions. It has been observed that there are limited works on the performance comparison of the region-based segmentation algorithms on both natural and remote sensing (RS) images. Hence, the objective is to compare the performance of region-based segmentation algorithms on natural and RS images with different complexity of object regions of interest (ROIs). There are four algorithms (Felzenszwalb and Huttenlocher (FH), Quick Shift (QS), Compact Watershed (CW), and Simple Linear Iterative Clustering (SLIC)) being compared using two public datasets. The adapted rand error (ARE) and variation of information (VOI) are used for the segmentation evaluations. Generally, the results showed that the SLIC achieved better results as compared to the other algorithms for both images with different complexity of ROI. This is mainly because the over-segmented regions produced by the SLIC adhered to the image object boundaries well than the over-segmented regions generated by other algorithms. However, CW achieved better average ARE than SLIC for RS images because CW has compactness and marker parameters which influence it to achieve better results.

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Victim Clustering with K-Prototype Algorithm for Flood Evacuation Planning

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Abstract. Global warming intensifies inevitable severe floods, thus necessitating robust evacuation planning to minimize disaster impacts through swift assistance. Recognizing the interconnectedness of demand and supply aspects, effective evacuation planning considers evacuee behavior through victim clustering, which is of utmost importance. Despite previous efforts in modeling victim behavior, there remains a gap in incorporating victim clustering explicitly in flood evacuation planning. Thus, this study aims to adopt k-prototype algorithm, which is capable of handling mixed-type features, to perform victim clustering for probable flood occurrence by considering numerous influential factors including risk perception, compliance level and arrival pattern of victims. The k-prototype clustering was performed via McClain index (for performance assessment) on an illustrative mixed-type dataset (with 10 variables) comprising 498 valid respondents, for the context of Central Region of Malaysia. The findings show that the optimal number of clusters, which ranges from 2 to 4, could be formed effectively for 8 distinct scenarios. Besides, it is noticeable that the probable response to evacuate (somewhat and very likely) is about 58% under uncertainty. Concisely, this study aspires to furnish emergency planners with beneficial insights in implementing effective evacuation strategies to reduce the negative impact of flood occurrence significantly.

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Parallel Session 5 (Matahari II)

Date: 28 May 2024 (Tuesday)
Time: 4.00pm - 5.40pm
Theme: Statistics (Online)
Chairperson: Wei Lun Tan

No.	Time (UTC+8)	Presenter	Title
1	4.00pm – 4.20pm	Ainin Othman (online)	Investigating Determinants of Innovation Performance Maturity in Malaysian Private Universities: A Partial Least Squares Structural Equation Modelling Analysis
2	4.20pm – 4.40pm	Hasnain Sultan (online)	Factors Influencing Cloud Business Intelligence Adoption and Use at Organization Level
3	4.40pm – 5.00pm	Muhammad Iqbal (online)	Determination of characteristics of stunting risk families in Subulussalam, Aceh in 2022 using k-modes cluster analysis
4	5.00pm – 5.20pm	Fajar Harva (online)	Multidimensional quality of life of hypertension patients analysis using structural equation modeling-partial least square
5	5.20pm – 5.40pm	Alfy Hidayati (online)	Analysis of socio-economic factors affecting coastal community preparedness using strcutural equation modeling

Investigating Determinants of Innovation Performance Maturity in Malaysian Private Universities: A Partial Least Squares Structural Equation Modelling Analysis

Ainin Zakiah Othman[1]*, *Nur Balqishanis* Zainal Abidin[1], *Loshini* Thiruchelvam[1], and *Nur Amalina* Mat Jan[1]

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Abstract. This study investigates the potential factors within the hybrid theory of Total Quality Management (TQM) and Capability Maturity Model (CMM) (TQM-CMM) to enhance innovation capabilities among academicians in Malaysian private universities. Previous research has revealed an inconsistent association between TQM practices and innovation performance as well as a very limited study on CMM in innovation studies. The adoption of TQM-CMM principles is considered crucial for the overall development of university performance. Employing Structural Equation Modelling (SEM), the research analyses the underlying relationships among latent constructs such as leadership management commitment, people management, stakeholder focus, student focus, recognition and rewards, vision, and innovation performance as proposed in the model. Seven hypotheses are formulated to examine these latent relationships, and the Partial Least Squares Structural Equation Modelling (PLS-SEM) technique is utilized for empirical assessment. Data gathered through a survey conducted via convenience sampling technique in selected private universities in Malaysia, resulted in 115 usable questionnaires. The findings reveal that two out of the seven hypothesized relationships between TQM-CMM enablers and innovation performance are statistically significant, using 10,000 bootstrapped samples.

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Factors Influencing Cloud Business Intelligence Adoption and Use at Organization Level

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Abstract. The integration of cloud computing and business intelligence enables analytics solutions through cloud environments. Despite the fears about issues such as security, privacy, and loss of data control issue, many enterprises are increasingly adopting Cloud Business Intelligence (Cloud BI). The interest in cloud business intelligence is greatest among businesses and organisations. Yet, the extant literature reveals that little research related to the determinants impacting the adoption of Cloud BI at the level of organizations. The primary goal of this study is to identify key factors that impact the adoption and utilization of Cloud Business Intelligence (BI), with a particular focus on the organizational level. The identified factors will serve as a valuable resource for organizations, helping them implement Cloud BI adoption and usage securely and efficiently in their business operations. Wymer and Regan's criteria serve as the basis for this study. 83 factors have been identified based on previous studies on the adoption of Cloud BI. Considering the results obtained during the study, it is evident that the following 18 factors significantly impact the adoption and continual usage of Cloud BI services in organizations: Complexity, Privacy, Competitive pressure, Security, Government support, Organisation size, Availability, Relative advantage, Culture, Management support, Observability, Regulatory support, Technology readiness, Type of system, Trialability, Effective adaptable solutions, Compatibility, and Scalability. The findings can help Organizations, Cloud BI service providers, and governments to develop Cloud BI adoption strategies.

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Determination of Characteristics of Stunting Risk Families in Subulussalam, Aceh in 2022 using K-Modes Cluster Analysis

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Abstract. Stunting is a disruption in the growth and development of children caused by nutritional deficiencies and recurrent infections. Stunting can lead to a decline in intelligence levels and lower educational achievements. The aim of this research is to determine the characteristics of families at risk of stunting in the Subulussalam City. This study utilizes data from the Family Census conducted by the National Family Planning Coordination Board (BKKBN) in 2021. The data consists of 8,954 households at risk of stunting, using 10 variables for stunting risk calculation, such as households with children under two years old, under five years old, households with a fertile-aged wife, households without access to safe drinking water, and others. This study employs the k-modes cluster analysis method, which involves grouping a dataset based on specific variables into k clusters. The k-modes algorithm randomly selects k objects as cluster centers and calculates the distance of each object to the cluster modes. Households at risk of stunting in Subulussalam City mostly exhibit characteristics of having a fertile-aged wife and having too many children. Most households at risk of stunting already have access to safe drinking water and proper toilets. Clustering using k-modes resulted in an optimal k model with k=2 (SW/SB ratio) and k=5 (R-Squared). The model with k=2 revealed significant differences in the variables of households with children under two years old and ownership of proper toilets.

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Multidimensional Quality of Life of Hypertension Patients Analysis using Structural Equation Modeling-Partial Least Square

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Abstract. Hypertension is one of the non-communicable diseases that continues to experience an increasing prevalence rate. Hypertension in Indonesia has the highest prevalence compared to other non-communicable diseases. The province of Aceh ranks tenth in the highest prevalence of hypertension in Indonesia. The third highest prevalence cases in Aceh Province is in Pidie Regency. This study was conducted to analyze the factors influencing the quality of life of hypertensive patients using the Structural Equation Modeling-Partial Least Square (SEM-PLS) method. The research utilized data from a non-communicable disease survey conducted in Pidie Regency in 2023. The results of this study revealed 4 indicators representing demographic factors, 3 indicators representing activity factors, and 4 indicators representing quality of life. The factors significantly are demographics, physical activity, and medication adherence, with a Q^2 value of 0.98, meaning that 98% of the variability can be explained by demographic, physical activity, and medication adherence factors.

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Analysis of Socio-Economic Factors Affecting Coastal Community Preparedness using Structural Equation Modeling

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Abstract. Preparedness refers to the actions taken before a disaster to ensure an effective response. In disaster-related research, quantitative studies typically focus on observing direct correlations and regressions. However, directly measuring preparedness can be challenging. To comprehensively analyze variables, researchers often turn to Structural Equation Modeling (SEM), a powerful alternative. SEM is particularly useful when examining complex relationships among multiple variables. In a study focused on coastal communities in the cities of Banda Aceh, Mataram, and Ambon, the SEM method was applied using secondary data. The research considered one endogenous latent variable called "preparedness" and two exogenous latent variables related to social and economic factors, which are involving a collective of 932 participants. The results from the SEM method using GOFI criteria indicated that socio-economic factors significantly influenced coastal community readiness, with an R-squared value of 56.5%.

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