

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : The $f(Q)$ gravity and the law of energy conservation.

Speaker : Dr. Loo Tee How.

Date : 6 January 2023.

Time : 3.00pm - 4.00pm.

Venue : MM3, Level 2, Institute of Mathematical Sciences, Faculty of Science.

ABSTRACT

General relativity considers some dark components, nowadays known as the dark energy, to explain the late time inflation of the universe. However, up to this point, the evidence for the existence of the dark energy is not yet found. Various modified gravity theories were then proposed to provide an alternate explanation to the acceleration of the universe.

The law of energy conservation is one of the main physical principles. In general relativity, the conservation of energy is straightforwardly obtained as the gravitational part of Einstein field equation having null divergence. However, the conservation law is not trivially guaranteed in a general setting.

The theories of symmetric teleparallel gravity, particularly the $f(Q)$ gravity, will be studied in this presentation. Firstly, the formulation of the $f(Q)$ gravity will be discussed. The energy conservation is then investigated for this theory. A set of criteria is offered which can be scoped as a viability check for a gravity model. Finally, several models for the homogeneous and isotropic ansatz will be tested based on this energy condition criterion.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Hypergraph for predicting adverse drug reaction.

Speaker : Prof. Dr. Hiroshi Mamitsuka.
(Bioinformatics Centre, Institute for Chemical Research, Kyoto University, Japan)

Date : 24 March 2023.

Time : 3.00pm - 4.00pm.

Venue : MM3, Level 2, Institute of Mathematical Sciences, Faculty of Science.

ABSTRACT

Drug-drug interactions (DDIs), i.e. adverse drug reactions (ADRs) caused by two drugs, are a serious problem in pharmaceutical and medical sciences. Now computationally predicting DDIs is a highly paid-attention problem in not only bio- and chemo-informatics but also machine learning. Existing methods for solving this problem represent DDIs by a graph, with nodes for drugs and each edge for a DDI between the drugs connected by the edge (DDI), which is labeled by a binary vector showing the DDI types. The cutting-edge approach for learning the DDI graph is graph neural networks (GNNs), where multiple labels on edges are rather independently used, regardless that relationships among labels would be important for prediction, particularly for minor labels. We thus model DDIs by a hypergraph, where each hyperedge is a triple with two drugs and one DDI type. We then build learning methods of hypergraph neural networks, considering the above problem of GNNs. In this talk, I will describe the motivation and idea behind our hypergraph neural networks and optimization methods. I will further report the performance advantage of our hyper graph neural networks over existing methods which were obtained empirically by using benchmark datasets.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Elliptic curves with its applications to Diophantine equations and Galois theory

Speaker : Malcolm Chen Hoong Wai
MSc by Research Candidate, Institute of Mathematical Sciences.

Date : 31/3/2023 (Friday)

Time : 10.00 a.m – 11.00 a.m.

Venue : Online (Google Meet)
Google Meet joining info
Video call link: <https://meet.google.com/cfv-brwe-ynb>
Or dial: (US) +1 475-441-5158 PIN: 366 568 686#

ABSTRACT

This talk reports some of what the speaker has learnt during his two weeks stay at University of the Philippines Diliman for a CIMPA school titled “Introduction to Galois Representations and Modular Forms and their Computational Aspects”. Let K be a field of characteristic different from 2 and 3, then an *elliptic curve* defined over K can be described as an algebraic curve of the form $y^2 = x^3 + ax + b$ for some coefficients $a, b \in K$. We will discuss how points on an elliptic curve can be endowed with a group structure, which give rise to a Galois group that can be studied using representation theory, and how this *Galois representation* allows us to better understand the arithmetic properties of an elliptic curve. We will also discuss how solutions of some Diophantine equations can be parametrised in terms of rational points on an elliptic curve and how to find these points. We will conclude with how these techniques can be used to approach some open problems in Galois Theory that are related to the speaker’s MSc dissertation on computing the Galois groups of certain polynomials.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Sabbatical report: Statistical modeling of periodic rainfall pattern using a meta-analysis of regression models

Speaker : Associate Professor Dr Rossita Binti Mohamad Yunus

Date : 7/4/2023

Time : 10.00 AM -11.00 AM

Venue : MM3, Level 2, Institute of Mathematical Sciences, Faculty of Science.

ABSTRACT

Meteorological parameters such as rainfall, temperature, and wind speed collected over time are subjected to periodic patterns or trends and are an important feature in the statistical modeling of the data. The objective of the research is to model the periodic rainfall data using the meta-analysis of regression models. The main utility of a meta-analysis is to provide an estimated overall effect by combining the results from related small studies. In the model, the regression slopes of each month's rainfall are combined to get the pooled estimate.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Teaching of Mathematics Through Problem Solving.

Speaker : Zahari Othman.

Date : 19 May 2023.

Time : 10 am – 12 pm.

Venue : DKM2, Institut of Mathematical Sciences, Faculty of Science.

ABSTRACT

According to Professor David Perkin's theory of education (Harvard Graduate School of Education), the goals of Education are to teach for understanding, to help students use their knowledge to solve unexpected and non-routine problems rather than recite back facts so that students develop a culture of thinking in the classroom and real life. Deep thinking is the primary skill worth learning so students can use their knowledge flexibly to become efficient problem solvers. The seminar aims to share how educators could develop HOT skills among learners to help them develop problem-solving skills and make thinking visible to their peers and educators. Besides, educators will have some basic ideas on how to teach for understanding through the teaching of mathematics, taking on board how to develop metacognitive skills where students could reflect, evaluate, and continually improve their thinking, thinking disposition and productive habits of mind.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Matrices and Distances in Graphs.

**Speaker : Dr. Ali Azimi (Department of Mathematics and Applied
Mathematics, Xiamen University Malaysia)**

Date : 12th June 2023.

Time : 4.00 pm - 5.00 pm.

**Venue : MM3, Institute of Mathematical Sciences, Faculty of Science, Universiti
Malaya.**

ABSTRACT

In this talk, we will talk about various distances that naturally exist among vertices of a graph. First, we introduce basic concepts in graphs and different types of distances that can be defined between vertices of the graph. Next, we focus on distance matrices of graphs as matrices illustrating (ordinary) distances between pairs of vertices of the graph. We will also discuss the Steiner distance in graphs as a generalization of the ordinary distance that takes into account the presence of Steiner points.

In the second part, we shift our focus to resistance distances in graphs, as a measure for effective electrical resistance between two vertices of the graph, and present some properties of resistance distances. Finally, we discuss the Moore-Penrose inverse of a matrix, a generalization of the matrix inverse that can be applied to non-invertible matrices, and explain how the Moore-Penrose inverse is related to resistance distances in a graph.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Sharing on paper presentation in CMES23, Firat University, Turkey

Speaker : Assoc. Prof. Dr. Noor Fadiya Mohd Noor

Date : 23.06.2023

Time : 10.00 am – 11.00 am

Venue : MM3, Level 2, Institute of Mathematical Science, Faculty of Science.

ABSTRACT

I have attended the International Conference on Mathematical Engineering Sciences (CMES23) as a Speaker at Firat University, held on 20 & 21st May, 2023. The presented work is the 4th publication output of my FRGS FP009-2020 Project with one of my PhD students. This seminar is a sharing session of the communicated work and my visit to Firat University.

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Free Probability and Neural Network
Speaker: Mr. Issa Mbenard Dabo
PhD candidate from the Institute of Mathematics, University of Bordeaux,
France.
Date: 9/8/2023
Time: 3pm - 4pm
Venue: DKM4, Ground floor, Institute of Mathematical Science, Faculty of
Science.

ABSTRACT

While classical probability relies on measure theory, free probability studies randomness from an algebraic point of view. This theory based on non-commutative algebra is used in various domains such as random matrix theory, combinatorics and quantum information theory. After a brief introduction to free probability, we will see how the theory is used to study neural networks.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Heuristic methods to combat the regression challenges
Speaker: Associate Professor Dr. Mahdi Roozbeh
Faculty of Mathematics, Statistics and Computer Sciences, Semnan University.
Date: 11/8/2023
Time: 3pm - 4pm
Venue: MM3, Level 2, Institute of Mathematical Science, Faculty of Science.

ABSTRACT

Nowadays, high-dimensional data in which the number of observations is smaller than the number of parameters, appear in many practical applications such as biosciences, social networks, psychological researches, recommendation systems and so on. In the regression model analysis, the well-known ordinary least-squares estimation may not be applicable when the classical assumptions such as normality of the error terms and full ranking of the design matrix are violated. As known, a successful approach for high-dimension cases is the penalized scheme (such as LASSO) with the aim of obtaining a subset of effective explanatory variables that predict the dependent variable as the best, while setting the other parameters to zero. Here, we review and develop several penalized models to be used in high-dimension regression analysis for high-dimensional data sets.

Keywords:

High-dimensional data, Regression analysis, Penalized method, Heuristic algorithm

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: An outlook of biological age using index model for chronic kidney disease patients.
Speaker: Dr. Shaiful Anuar Abu Bakar.
Date: 30 August 2023.
Time: 9am – 10 am.
Venue: MS Teams
<https://teams.microsoft.com/l/meetup-join/19%3aGTiYh2711AHZi-pKUOwtZ0FVqL-CeXi7vQzyRIUEyp81%40thread.tacv2/1693194094866?context=%7b%22Tid%22%3a%22a63bb1a9-48c2-448b-8693-3317b00ca7fb%22%2c%22Oid%22%3a%22d860828f-72b6-4b71-9cc1-439f62826640%22%7d>

ABSTRACT

This presentation will discuss an essential measure that can be utilized to comprehend the physical changes and ageing process of a living being. The process involves the estimation of biological age (BA). Different factors can be used to profile a person's biological age. This presentation focuses on creating a BA model specifically for people with chronic kidney disease (CKD). A correlation test is used to pick significant biomarkers to continue the process. The indexing approach is then used to give each chosen biomarker the proper weighting in order to create a BA index. To obtain additional terms for the chronological age and ultimately arrive at the estimated BA, the BA index is matched to the age variance within the sample. An example of hospital data is used to demonstrate the findings, and visual observations further validate the high similarities between the training and testing data sets.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: A decentralized data dissemination scheme utilizing blockchain technology for enhanced smart transportation.
Speaker: Dr. Amizah Malip.
Date: 22.09.2023
Time: 10 am
Venue: MS Teams
<https://shorturl.at/ilrA9>

ABSTRACT

In smart transportation, data dissemination enables vehicles to share safety information with nearby vehicles, providing early warnings of potential dangers. Safety can only be achieved if the data transmitted are reliable. However, privacy concerns can arise as sharing data may infringe on a vehicle's privacy. At the same time, it is vital to hold malicious or defective vehicles accountable for any misbehavior. To address these conflicting security requirements of reliability, privacy, and accountability, we propose a secure data dissemination scheme that leverages blockchain technology. This decentralized system offers a desirable level of security by simultaneously addressing the conflicting security goals and provides a robust solution in smart transportation, enabling safer and more secure communication among vehicles.

Keywords : Blockchain, smart transportation, security, privacy

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Assessing the Effectiveness of Multiple COVID-19 Booster Vaccines: A Numerical Simulation Study.
Speaker: Dr. Muhamad Hifzhudin Noor Aziz.
Date: 22.09.2023
Time: 10.20 am
Venue: MS Teams
<https://shorturl.at/ilrA9>

ABSTRACT

Vaccination is proven to be one of the most effective interventions to control the spread of COVID-19 disease. Nevertheless, there was a question of how long we need to keep vaccinating people. In this study, we proposed an extended SEIR COVID-19 model by incorporating the effects of multiple-dose booster vaccines. The model consists of 28 nonlinear differential equations and 18 parameters. Due to its complexity, the solutions were obtained using a numerical method via MATLAB ode solver. To overcome the uncertainty in the parameter values, we performed one-at-a-time local sensitivity analysis on several important parameters in the model and observed how the perturbation affected the number of infected cases. Our results demonstrated that administering multiple booster vaccines to the population was unable to completely annihilate the disease from the population if the non-pharmaceutical control measures were loosened (large transmission rate). It was also shown that the vaccination was able to reduce the severity of the outbreak and lead to an endemic state. The results of this study were purely based on numerical simulations, and we did not intend to use the model to forecast any specific region due to insufficient real data. The results, however, are still beneficial to the health authority in making an effective contingency plan.

Keywords : *SEIR model, Vaccination, COVID-19, Sensitivity analysis*

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Power-law Hybrid Nanofluid Flows Over A Stretchy Surface
Speaker: Assoc. Prof. Dr. Noor Fadiya Mohd Noor
Date: 06.10.2023
Time: 10 am – 11 am
Venue: Microsoft Teams <https://rb.gy/t6td6>

ABSTRACT

This article reports the dynamics and heat transfer of power-law hybrid nanofluid flows over a stretchy surface along the cylindrical coordinate plane. The Tiwari-Das heterogenous model for the non-Newtonian base fluid saturated with hybrid graphene and oxide nanoparticles are considered. The partial differential equations of continuity, momentum and energy highlighting the incompressible steady hybrid nanofluid flows are reduced to coupled ordinary differential equations using similarity transformations. The resulting equations are then converted to a boundary value problem (BVP) and solved using a bvp4c algorithm in the MATLAB environment. The numerical results for the flows are generated while the velocity and temperature profiles are sketched for analysis. Finally, findings on whether the heat transfer performance of the hybrid nanofluids is better than the single/mono nanofluids are to be concluded.

All are Welcome

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Crescent moon shape detection procedures for local Islamic calendar
Speaker: Prof. Dr. Ibrahim Mohamed
Date: 17.11.2023
Time: 3.00 pm – 4.00 pm
Venue: MS Teams
<https://rb.gy/nhu9a0>

ABSTRACT

Detection of crescent moon in digital images is of interest to researchers and practitioners involved in crescent moon sighting activities. The ability to detect the crescent moon shape, if it exists, will contribute to the decision making related to the local Islamic calendar based on the *Al-Rukyah* (observation) method and support the expected visibility of the crescent moon using the *Al-Hisab* (calculation) method. However, under the syariah (Islamic law) consideration, any crescent moon detection procedure on the original image should not “create what is not” during the image processing. Hence, with this in mind, we present the methodology of various existing detection procedures in order to have a better idea on the level of changes that are acceptable to the religious authority. We then apply the procedures on images taken at Teluk Kemang Observatory Station, Negeri Sembilan, Malaysia. The result will initiate a thorough discussion on the role of image processing in the determination of important events in particular and the yearly Islamic calendar in general in Malaysia.

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title: Derivations and its related maps in rings and algebras.
Speaker: Prof. Dr. Shakir Ali.
Date: 23.11.2023
Time: 10.30 am – 11.30 am
Venue: MM3, Level 2, Institute of Mathematical Science, Faculty of Science.

ABSTRACT

Let R be an associative ring (algebra) with center $Z(R)$. For every associative ring R can be turned into a Lie ring(algebra) by introducing a new product $[x, y] = xy - yx$, known as Lie product. Therefore, we may regard R simultaneously as an associative ring (algebra) and as a Lie ring (Lie algebra). An additive mapping $d : R \rightarrow R$ is said to be a derivation on R if $D(xy) = D(x)y + xD(y)$ holds for all $x, y \in R$. A function $f : R \rightarrow R$ is called a centralizing on R if $[f(x), x] \in Z(R)$ holds for all $x \in R$. In the special case where $[f(x), x] = 0$ for all $x \in R$, f is said to be commuting on R . The study of such mappings were initiated by E.C. Posner [Proc. Amer. Math. Soc. 8(1957), 1093-1100]. In 1957, he proved that if a prime ring R has a nonzero commuting derivation on R , then R is commutative. An analogous result for centralizing automorphisms on prime rings was obtained by J.H. Mayne [Canad. J. Math. 19 (1976), 113-115]. For recent work, we refer to readers to S.Ali [Communications in Algebra 51(2023), 4044-405]. In this talk, we will discuss the recent progress made on the topic and related areas. Moreover, some examples and counter examples will be discussed for questions raised naturally. We conclude the talk with some open problems.

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : Optimal control and stability analysis of monkeypox transmission dynamics with the impact of contaminated surfaces

Speaker : Mr Abdullah Hasan Hassan

Date : 21 December 2023

Time : 2.00 p.m – 2.30 p.m

Venue : MM3, Level 2, Institute of Mathematical Science, Faculty of Science and MS Teams (Hybrid mode) <https://rb.gy/w472uy>

ABSTRACT

In this talk, I will present a comprehensive analysis of the transmission dynamics of monkeypox, considering contaminated surfaces using a deterministic mathematical model. The study begins by calculating the basic reproduction number and the stability properties of equilibrium states, specifically focusing on the disease-free equilibrium and the endemic equilibrium. Our analytical investigation reveals the occurrence of a forward bifurcation when the basic reproduction number equals unity, indicating a critical threshold for disease spread. Non-existence of backward bifurcation indicates that the basic reproduction number is the single endemic indicator on our model. To further understand the dynamics and control strategies, sensitivity analysis is conducted to identify influential parameters. Based on these findings, the model is reconstructed as an optimal control problem, allowing for the formulation of effective control strategies. Numerical simulations are then performed to assess the impact of these control measures on the spread of monkeypox. The study contributes to the field by providing insights into the optimal control and stability analysis of monkeypox transmission dynamics. The results emphasize the significance of contaminated surfaces in disease transmission and highlight the importance of implementing targeted control measures to contain and prevent outbreaks. The findings of this research can aid in the development of evidence-based strategies for mitigating the impact of monkeypox and other similar infectious diseases.

(All are Welcome)

**INSTITUTE OF MATHEMATICAL SCIENCES
UNIVERSITI MALAYA**

SIRI SEMINAR KUMPULAN PENYELIDIKAN

Title : A mathematical model of malaria considering the changes in individual awareness

Speaker : Miss Iffaticia Haura Febiriana

Date : 21 December 2023

Time : 2.30 p.m – 3.00 p.m

Venue : MM3, Level 2, Institute of Mathematical Science, Faculty of Science and MS Teams (Hybrid mode) <https://rb.gy/w472uy>

ABSTRACT

Within this investigation, we propose and analyze a mathematical model for malaria, considering the changes in individual awareness. This study uses the modified $S_{hu}S_{ha}IR - UV$ model which later reduced to a $S_{hu}S_{ha}I$ model using the Quasi-Steady State Approximation. Nondimensionalization is used on the model to simplify the equations and make all variables in the model dimensionless. From the model that has been constructed, some analytical study is investigated, including the existence and stability analysis of the equilibrium points. We conclude there is a locally asymptotically stable malaria-free equilibrium point when the basic reproduction number is less than one and unstable when it is larger than one. The model also shows the forward bifurcation, so there is a locally asymptotically stable endemic equilibrium point when the basic reproduction number is larger than one and unstable when it is less than one. An optimal control problem is characterized using the Pontryagin Maximum Principle. Several scenarios are conducted to observe the dynamics of control variables under different circumstances. Next, we calculate the cost-effectiveness using the Average Cost-Effectiveness Ratio (ACER), the Incremental Cost-Effectiveness Ratio (ICER), and the Infection Averted Ratio (IAR). We conclude that The ACER and IAR methods indicate that the most cost-effective measure can be achieved solely by conducting an awareness program, resulting in 134,000 people being spared from malaria infection. In contrast, the ICER method states that the most effective cost lies in solely using bed nets.

(All are Welcome)