



# INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND TECHNOLOGY 2020

8 - 10 DECEMBER 2020 | VIRTUAL CONFERENCE

**Sustainable Development of Mathematics &  
Mathematics in Sustainability Revolution**

**MATHTECH**  
**2020**



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## FOREWORD

**Professor Dr. Hailiza Kamarulhaili**

Dean, School of Mathematical Sciences  
Universiti Sains Malaysia

I am pleased to welcome our plenary speakers, invited speakers, presenters and all participants from countries across the world to the virtual conference of MathTech 2020. MathTech 2020 serves as an international convention that brings together all researchers, academia and industries to share and exchange ideas through a plethora of sessions and discussions. This gathering is also a platform to bridge the gap between the academia at the tertiary level and those at the pre-university level and secondary school. Most importantly, MathTech 2020 is here to support and promote the importance of Mathematics in achieving the Sustainable Development Goals (SDGs) for a better world and a better future.

MathTech 2020 is meant to be a pool that unites all current issues related to Pure Mathematics, Applied Mathematics, Mathematics Education, Financial Mathematics, Statistics, Operations Research, Mathematics & Technology, and other related disciplines in Mathematics. It is hoped that the knowledge shared among the researchers and participants would benefit the entire community, locally and globally. MathTech 2020 aims to bring together ideas that connect people and the communities to understand more about sustainable Mathematical sciences and relevant issues that would culminate in global sustainable development.

The concept of SDGs is not merely about ecological and economic issues. However, it blends the knowledge of Sciences and Mathematics together in developing ways and means to achieve the required goals. The use of mathematics to promote quality education and lifelong learning has been a focus in recent years and MathTech 2020, serves as an agent of change to help people to realize the importance of Mathematics in many aspects of life and development. Now, the challenge is not just to define the mathematical concepts in its own way, but also to develop mathematics toward greater sustainability in achieving better learning results for all.

I would also like to take this opportunity to express my sincere appreciation to all those who have contributed towards the organization of this conference, especially to the MathTech 2020 team, my deepest gratitude goes to you. I thank you all for the continuous support and tremendous effort towards making this event a success.

Thank you.

*Everything makes sense with Math@USM*

**Professor Dr. Hailiza Kamarulhail**



## FOREWORD

**Dr. Ahmad Lutfi Amri Ramli**

Chair

MathTech 2020

Welcome to MathTech 2020!

Late last year, we chose sustainability as the central theme of our MathTech conference. Little did we know that earth would face a crisis from the Covid-19 pandemic, and that sustainability would become more relevant than ever.

Mathematics has always been relevant in every era of human history. This particular year, various parties are struggling in terms of health, economics, social and politics. Thus, it is essential to use the knowledge of Mathematics to keep others sustaining during this challenging period. With Mathematics, we can assess the situation at hand, provide valuable insight into possible ways forward, and garner hope for the future.

MathTech 2020 presents various research in Mathematics combined with the usage of technology. Some papers focus on the current pandemic and local endemic, which offers good insight into on-going issues from a Mathematical perspective. Others discuss various topics in Mathematics which are also crucial in moving the body of knowledge forward.

On behalf of the MathTech 2020 committee, I hope that the conference will be a rewarding experience even though we are only connected virtually this time around. A huge appreciation towards our co-hosts from Institut Teknologi Bandung and Thuyloi University for their active participation in this conference.

I sincerely wish to express my gratitude to my fellow teammates in the MathTech 2020 organising committee for being able to adapt to the new norm of organising a conference. And finally thank you to all speakers, workshop instructors, presenters and participants for being a part of MathTech 2020. This would not have been possible without your contribution and support.

With that, please have a great conference and be safe wherever you are!

A handwritten signature in black ink, appearing to be 'A. Ramli', written in a cursive style.

**Dr. Ahmad Lutfi Amri Ramli**





## CONFERENCE PROGRAMME

### INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND TECHNOLOGY 2020 (MATHTECH 2020)

8 – 10 DECEMBER 2020

#### Day 1 | 8 Dec 2020 (Malaysia Time or GMT+8)

08:45 – 09:00	Welcome Speech	Room A
09:00 – 10:00	<b>Plenary Session 1</b>	Room A
10:00 – 10:40	<b>Invited Session 1</b>	Room A
10:40 – 11:00	Break	
11:00 – 13:00	<b>Workshop 1</b>	Room E
	<b>Parallel Session 1</b>	1A - Room A
		1B - Room B
		1C - Room C
		1D - Room D
13:00 – 14:00	Lunch Break	
14:00 – 14:40	<b>Invited Session 2</b>	Room A
14:40 – 15:00	Break	
15:00 – 17:00	<b>Workshop 2</b>	Room E
	<b>Parallel Session 2</b>	2A - Room A
		2B - Room B
		2C - Room C
		2D - Room D

**Workshop 1:** *The Basic on being Gig Edutuber*

**Workshop 2:** *Unboxing Topological Data Analysis*



## CONFERENCE PROGRAMME

### INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES AND TECHNOLOGY 2020 (MATHTECH 2020)

8 – 10 DECEMBER 2020

Day 2   9 Dec 2020 (Malaysia Time or GMT+8)		
08:40 – 09:40	<b>Statworks Sharing Session</b>	<i>Room A</i>
09:40 – 10:40	<b>Plenary Session 2</b>	<i>Room A</i>
10:40 – 11:00	Break	
11:00 – 13:00	<b>Workshop 3</b>	<i>Room E</i>
	<b>Parallel Session 3</b>	<i>3A - Room A</i>
		<i>3B - Room B</i>
		<i>3D - Room D</i>
13:00 – 14:00	Lunch Break	
14:00 – 14:40	<b>Invited Session 3</b>	<i>Room A</i>
14:40 – 15:00	Break	
15:00 – 17:00	<b>Workshop 4</b>	<i>Room D</i>
	<b>Workshop 5</b>	<i>Room E</i>
	<b>Parallel Session 4</b>	<i>4A - Room A</i>
		<i>4B - Room B</i>

**Workshop 3:** *Meaningful Mathematics Teaching and Learning Pedagogy, A Sustainable Method to Empower High Order Thinking Skills (HOTS) and Metacognition of Students*

**Workshop 4:** *Tools and Tricks of The Trade For Teaching*

**Workshop 5:** *COMOKIT- A Modeling Kit to Understand, Analyze and Compare the impacts of mitigation policies against the COVID-19 pandemic at the Scale of City*



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**INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES**  
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Day 3   10 Dec 2020 (Malaysia Time or GMT+8)		
09:00 – 09:40	<b>Invited Session 4</b>	<i>Room A</i>
09:40 – 10:40	<b>Plenary Session 3</b>	<i>Room A</i>
10:40 – 11:00	Break	
11:00 – 13:00	<b>Workshop 6</b>	<i>Room E</i>
	<b>Parallel Session 5</b>	<i>5A - Room A</i>
		<i>5B - Room B</i>
		<i>5D - Room D</i>
13:00 – 14:00	Lunch Break	
14:00 – 16:00	<b>Workshop 7</b>	<i>Room E</i>
	<b>Parallel Session 6</b>	<i>6A - Room A</i>
		<i>6B - Room B</i>
		<i>6D - Room D</i>
16:00 – 16:10	Closing	<i>Room A</i>

**Workshop 6:** *How to Gamify Your Math Classroom*

**Workshop 7:** *Creating Your First Interactive Tableau Dashboard for Data Visualisation*



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***DAY 1 | 8 DEC 2020 (Malaysia Time or GMT+8)***

Time	Room A	Room B	Room C	Room D	Room E
08:45 – 09:00	Welcome Speech				
09:00 – 10:00	<b>Plenary 1</b> Prof. Dr. Edy Tri Baskoro				
10:00 – 10:40	<b>Invited 1</b> Assoc. Prof. Dr. Nguyen Ngoc Doanh				
10:40 – 11:00	Break				
11:00 – 13:00	<b>Parallel 1A</b>	<b>Parallel 1B</b>	<b>Parallel 1C</b>	<b>Parallel 1D</b>	<b>Workshop 1</b>
13:00 – 14:00	Lunch Break				
14:00 – 14:40	<b>Invited 2</b> Professor Dr. Ibrahim Mohamed				
14:40 – 15:00	Break				
15:00 – 17:00	<b>Parallel 2A</b>	<b>Parallel 2B</b>	<b>Parallel 2C</b>	<b>Parallel 2D</b>	<b>Workshop 2</b>

***Workshop 1: The Basic on being Gig Edutuber***


***Workshop 2: Unboxing Topological Data Analysis***





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**DAY 2 | 9 DEC 2020 (Malaysia Time or GMT+8)**

Time	Room A	Room B		Room D	Room E
08:40 – 09:40	<b>Statworks</b> Ms. Puteri Anis Aneza Binti Zakaria				
09:40 – 10:40	<b>Plenary 2</b> Assoc. Prof. Dr. Leong Kwan Eu				
10:40 – 11:00	Break				
11:00 – 13:00	<b>Parallel 3A</b>	<b>Parallel 3B</b>		<b>Parallel 3D</b>	<b>Workshop 3</b>
13:00 – 14:00	Lunch Break				
14:00 – 14:40	<b>Invited 3</b> Assoc. Prof. Dr. Teh Su Yean				
14:40 – 15:00	Break				
15:00 – 17:00	<b>Parallel 4A</b>	<b>Parallel 4B</b>		<b>Workshop 4</b>	<b>Workshop 5</b>

**Workshop 3:** *Meaningful Mathematics Teaching and Learning Pedagogy, A Sustainable Method to Empower High Order Thinking Skills (HOTS) and Metacognition of Students*


**Workshop 4:** *Tools and Tricks of The Trade For Teaching*

**Workshop 5:** *COMOKIT- A Modeling Kit to Understand, Analyze and Compare the impacts of mitigation policies against the COVID-19 pandemic at the Scale of City*



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***DAY 3 | 10 DEC 2020 (Malaysia Time or GMT+8)***

Time	Room A	Room B		Room D	Room E
09:00 – 09:40	<b>Invited 4</b> Dr. Khayriyyah Mohd Hanafiah				
09:40 – 10:40	<b>Plenary 3</b> Prof. Dr. Zinaida Fadeeva				
10:40 – 11:00	Break				
11:00 – 13:00	<b>Parallel 5A</b>	<b>Parallel 5B</b>		<b>Parallel 5D</b>	<b>Workshop 6</b>
13:00 – 14:00	Lunch Break				
14:00 – 16:00	<b>Parallel 6A</b>	<b>Parallel 6B</b>		<b>Parallel 6D</b>	<b>Workshop 7</b>
16:00 – 16:10	Closing				

***Workshop 6: How to Gamify Your Math Classroom***

***Workshop 7: Creating Your First Interactive Tableau Dashboard for Data Visualisation***



**Parallel Sessions & Workshops**  
**INTERNATIONAL CONFERENCE ON MATHEMATICAL SCIENCES**  
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**DAY 1 | 8 DEC 2020 (Malaysia Time or GMT+8)**

**Parallel 1**

Time	Room A	Room B	Room C	Room D	Room E
11:00 – 11:20	AM02	PM12	MS01	MT01	<b>Workshop 1</b> <i>The Basic on being Gig Edutuber</i>
11:20 – 11:40	AM03	PM15	MS02	OR04	
11:40 – 12:00	AM06	PM11	FM02	OR01	
12:00 – 12:20	AM08	PM02	FM03	OR02	
12:20 – 12:40	AM20	PM09	FM04	OR03	
12:40 – 13:00	AM28	PM03	MS03	MT02	

**Parallel 2**


Time	Room A	Room B	Room C	Room D	Room E
15:00 – 15:20	AM38	ST13	AM19	ME01	<b>Workshop 2</b> <i>Unboxing Topological Data Analysis</i>
15:20 – 15:40	AM29	ST08	AM22	ME02	
15:40 – 16:00	AM09	ST14	AM07	ME03	
16:00 – 16:20	AM10	ST20	AM13	ME04	
16:20 – 16:40	AM11	ST23	AM17	ME05	
16:40 – 17:00	AM14		AM24	ME06	




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**Parallel 3**

Time	Room A	Room B		Room D	Room E
11:00 – 11:20	AM01	ST22		FM01	<b>Workshop 3</b> <i>Meaningful Mathematics Teaching and Learning Pedagogy, A Sustainable Method to Empower High Order Thinking Skills (HOTS) and Metacognition of Students</i>
11:20 – 11:40		ST01		FM07	
11:40 – 12:00	AM12	ST24		FM05	
12:00 – 12:20	AM27	ST25		FM09	
12:20 – 12:40	AM39	ST28		FM06	
12:40 – 13:00	AM42	ST06		FM08	

**Parallel 4**


Time	Room A	Room B		Room D	Room E
15:00 – 15:20	AM04	ST09		<b>Workshop 4</b> <i>Tools and Tricks of The Trade For Teaching</i>	<b>Workshop 5</b> <i>COMOKIT- A Modeling Kit to Understand, Analyze and Compare the impacts of mitigation policies against the COVID-19 pandemic at the Scale of City</i>
15:20 – 15:40	AM16	ST19			
15:40 – 16:00	AM23	ST16			
16:00 – 16:20	AM25	ST10			
16:20 – 16:40	AM26	ST26			
16:40 – 17:00	AM33	ST15			




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**Parallel 5**

Time	Room A	Room B		Room D	Room E
11:00 – 11:20	AM18	ST11			<b>Workshop 6</b> <i>How to Gamify Your Math Classroom</i>
11:20 – 11:40	AM34	ST07		PM10	
11:40 – 12:00	AM37	ST18		PM06	
12:00 – 12:20	AM41	ST21		PM08	
12:20 – 12:40	AM05	ST27		PM04	
12:40 – 13:00	AM40	ST17			

**Parallel 6**

Time	Room A	Room B		Room D	Room E
14:00 – 14:20	AM15	ST02		PM07	<b>Workshop 7</b> <i>Creating Your First Interactive Tableau Dashboard for Data Visualisation</i>
14:20 – 14:40	AM31	ST03		PM05	
14:40 – 14:00	AM35	ST04		PM13	
15:00 – 15:20	AM30	ST05		PM01	
15:20 – 15:40	AM36	ST12		PM14	
15:40 – 16:00	AM21	AM32			

## DAY 1 • 8 DEC 2020 (Malaysia Time or GMT+8)

Time	<b>Room A</b> <b>Chairperson:</b> <i>Prof. Dr. Hailiza Kamarulhaili</i>
09:00 – 10:00	PLENARY SESSION 1 <b>Prof. Dr. Edy Tri Baskoro</b> <i>Recent Progress on the Partition Dimension of Graphs</i>
Time	<b>Room A</b> <b>Chairperson:</b> <i>Assoc. Prof. Dr. Noor Atinah Ahmad</i>
10:00 – 10:40	INVITED SESSION 1 <b>Assoc. Prof. Dr. Nguyen Ngoc Doanh</b> <i>A Hybrid Modeling Approach for Sustainability Science</i>
Time	<b>Room A</b> <b>Chairperson:</b> <i>Assoc. Prof. Dr. Mohd Tahir Ismail</i>
14:00 – 14:40	INVITED SESSION 2 <b>Prof. Dr. Ibrahim Mohamed</b> <i>Statistics in Crescent Moon Sighting</i>



Time	Session 1A Room A <b>Chairperson:</b> <i>Dr. Mohd Hafiz bin Mohd</i>	Session 1B Room B <b>Chairperson:</b> <i>Dr. Ng Zhen Chuan</i>	Session 1C Room C <b>Chairperson:</b> <i>Dr. Norazrizal Aswad Abdul Rahman</i>	Session 1D Room D <b>Chairperson:</b> <i>Dr. Majid Khan Bin Majahar Ali</i>	Room E
11:00 – 11:20	AM02-Paper ID: 0029 <b>Abhineshwary Bhalraj</b> <i>Analytical and Numerical Solutions of Leptospirosis Model</i>	PM12-Paper ID: 0126 <b>Zulfaneti</b> <i>On Trees on <math>n</math> Vertices with Metric-Location-Domination Number <math>\frac{1}{2}n</math></i>	MS01-Paper ID: 0125 <b>N. S. Nordin</b> <i>Analytical Network Process Based Representation Operations on Triangular Fuzzy Numbers for Supplier Selection Decision</i>	MT01-Paper ID: 0059 <b>Mu'azah Md. Aziz</b> <i>BasiCal Mobile Application Development Using Multimedia Element's Adoption on Basic Calculus Teaching and Learning</i>	<p>WORKSHOP 1 <i>The Basic on Being Gig Edutuber</i></p> <p><b>Dr. Nik Hadiyan Nik Azman and Dr. Ema Izati Zull Kepili</b></p>
11:20 – 11:40	AM03-Paper ID: 0033 <b>Tayyaba Akram</b> <i>Numerical Solution of the Time Fractional Black-Scholes Equation Using B-spline Technique</i>	PM15-Paper ID: 0157 <b>Muhammad Ridwan</b> <i>On Graphs of Order <math>n</math> with Dominating Partition Dimension <math>n - 3</math></i>	MS02-Paper ID: 0149 <b>Helena Margaretha</b> <i>A Dynamical Model of Dengue Primary and Secondary Infections with an Application to Microinsurance</i>	OR04-Paper ID: 0186 <b>Nurul Atiqah Mazlan</b> <i>Effective Route Analysis for Petrol Tanker and Optimization Using Dijkstra Algorithm and Arena Simulation at Petrol Station XYZ</i>	
11:40 – 12:00	AM06-Paper ID: 0038 <b>Asma Izzati Asnor</b> <i>Numerical Solution of Fourth-Order Stiff Ordinary Differential Equations by Implicit High Order Block Backward Differentiation Formula</i>	PM11-Paper ID: 0124 <b>Rikayanti</b> <i>Algorithm for Computing the Total Vertex Irregularity Strength of Some Cubic Graphs</i>	FM02-Paper ID: 0037 <b>Wulan Nurul Kamilah</b> <i>Literature Study on Sharia Mathematical Finance</i>	OR01-Paper ID: 0025 <b>Sharifah Aishah Syed Ali</b> <i>Valid Inequalities for the Capacitated Lot-sizing Problem in a Hybrid Manufacturing and Remanufacturing System (HMRS)</i>	

12:00 – 12:20	AM08-Paper ID: 0042 <b>Nur Tasnem Jaaffar</b> <i>Solving Numerically the Singularly Perturbation Problems of Delay Differential Equations</i>	PM02-Paper ID: 0030 <b>Mohd Ali Khameini Ahmad</b> <i>Note on Quartic Equations over <math>p</math>-Adic Field <math>\mathbb{Q}_p</math></i>	FM03-Paper ID: 0047 <b>Moch Fandi Ansori</b> <i>Dynamics of Bank's Balance Sheet: A System of Deterministic and Stochastic Differential Equations Approach</i>	OR02-Paper ID: 0108 <b>Chow Chia Khang</b> <i>Optimisation of Traffic Signal Plan for Isolated Intersection using Genetic Algorithm</i>
12:20 – 12:40	AM20-Paper ID: 0106 <b>Amirah Azmi</b> <i>Numerical Solution of Linear One Dimensional Fisher's Reaction Diffusion Equations by Finite Difference Methods</i>	PM09-Paper ID: 0114 <b>Andy Chuin Liang Kang</b> <i>Complete Identification of Generators and Check Elements of Zero Divisor Codes over Cyclic Group Rings</i>	FM04-Paper ID: 0057 <b>Prasetyo Utomo</b> <i>The Application of Simulated Annealing Method in Optimizing Profit-Loss Sharing Ratio with Vasicek Model</i>	OR03-Paper ID: 0109 <b>Suat Ching Lau</b> <i>Solving the Elevator Dispatching Problem Using Genetic Algorithm</i>
12:40 – 13:00	AM28-Paper ID: 0137 <b>Arrianne Crystal Velasco</b> <i>Numerical Resolution of the Electrical Impedance Tomography Inverse Problem with Fixed Inclusions</i>	PM03-Paper ID: 0039 <b>Intan Muchtadi-Alamsyah</b> <i>The Relation between <math>\tau_n</math>-Tilting Modules and <math>n</math>-term Silting Complexes</i>	MS03-Paper ID: 0163 <b>Chan Lay Guat</b> <i>Multi-state Transition Model in Continuing Care Retirement Communities (CCRC): A Case Study</i>	MT02-Paper ID: 0150 <b>Helena Margaretha</b> <i>Solving Sparse Reward Games Using Deep Q-Learning with Demonstration and Partial Training</i>

Time	Session 2A Room A <b>Chairperson:</b> <i>Dr. Syakila Ahmad</i>	Session 2B Room B <b>Chairperson:</b> <i>Dr. Nuzlinda Abdul Rahman</i>	Session 2C Room C <b>Chairperson:</b> <i>Dr. Mohd Shareduwan bin Mohd Kasihmuddin</i>	Session 2D Room D <b>Chairperson:</b> <i>Dr. Hajar Sulaiman</i>	Room E
15:00 – 15:20	AM38-Paper ID: 0184 <b>Faridah Yonus</b> <i>Power of Frobenius Endomorphism</i>	ST13-Paper ID: 0130 <b>Joseph Ludwin DC. Marigmen</b> <i>Analysis of Dengue Incidence in Baguio, Philippines</i>	AM19-Paper ID: 0099 <b>H. Y. Alfifi</b> <i>The Stability and Hopf Bifurcation Analysis for the Delay Diffusive Neural Networks Model</i>	ME01-Paper ID: 0032 <b>Ainul Maulid bin Ahmad</b> <i>The Effectiveness of Multimedia Elements Integrated Into Calculus Learning Using BasiCal Mobile Application</i>	WORKSHOP 2 <i>Unboxing Topological Data Analysis</i>  <b>Assoc. Prof. Dr. R. U. Gobithaasan</b>
15:20 – 15:40	AM29-Paper ID: 0138 <b>Ali H. M. Murid</b> <i>Methods and Comparisons for Computing the Zeros of the Ahlfors Map for Doubly Connected Regions</i>	ST08-Paper ID: 0096 <b>Nurul Syafiah Abd Naeem</b> <i>Spatio-Temporal Regression Analysis of Dengue Cases with Climate Variables in Pulau Pinang</i>	AM22-Paper ID: 0112 <b>Mohd. Asyraf Mansor</b> <i>Optimal Performance Evaluation Metrics for Satisfiability Logic Representation in Discrete Hopfield Neural Network</i>	ME02-Paper ID: 0065 <b>Nurul Aini Arnis Sutan Sati</b> <i>Learning and Facilitating the Form 6 Topic of Limits and Continuity with the Graphing Calculator</i>	
15:40 – 16:00	AM09-Paper ID: 0044 <b>Petarpa Boonserm</b> <i>Quasinormal Modes of Perfect Spheres</i>	ST14-Paper ID: 0131 <b>Joseph Ludwin DC. Marigmen</b> <i>Analysis on the Onset of Dengue Outbreaks in Baguio City</i>	AM07-Paper ID: 0040 <b>Werry Febrianti</b> <i>Solving Systems of Ordinary Differential Equations Using Differential Evolution Algorithm with the Best Vector of Mutation Scheme</i>	ME03-Paper ID: 0083 <b>Norfaizah Paisan</b> <i>Students' Performance and Perception in Solving Sentence-form Mathematical Problems Through Multimedia Usage in Google Classroom</i>	

16:00 – 16:20	AM10-Paper ID: 0052 <b>Kunlapat Sansook</b> <i>Greybody Factors for Various Black Holes in Perfect Fluid Spheres</i>	ST20-Paper ID: 0160 <b>Rizavel C. Addawe</b> <i>Exploratory Data Analysis of COVID-19 Cases in Baguio City, Philippines</i>	AM13-Paper ID: 0056 <b>Lawrence Aaron P. Caro</b> <i>Application of Genetic Algorithm with Multi-Parent Crossover On An Inverse Problem in Delay Differential Equations</i>	ME04-Paper ID: 0122 <b>Nancy Velasco</b> <i>Linear Algebra and Robotics in the Teaching Process</i>
16:20 – 16:40	AM11-Paper ID: 0054 <b>Nor Ain Azeany Mohd Nasir</b> <i>The Effects of Slip and Radiation on Stagnation Point Flow and Heat Transfer Past An Exponentially Stretching/Shrinking Riga Plate</i>	ST23-Paper ID: 0177 <b>Jhunas Paul T. Viernes</b> <i>Contract Tracking and Expanded Testing of COVID-19 Cases in Baguio City, Philippines</i>	AM17-Paper ID: 0095 <b>Xu Ming Ming</b> <i>Refinement of SOR Method For the Rational Finite Difference Solution of First-Order Fredholm Integro-Differential Equations</i>	ME05-Paper ID: 0143 <b>Christiyanti Aprinastuti</b> <i>Implementation of Computational Thinking and Ignatian Pedagogy in Geometry Subject for Elementary School Pre-Service Teachers at Sanata Dharma University</i>
16:40 – 17:00	AM14-Paper ID: 0074 <b>Lok Yian Yian</b> <i>Bödewadt Flow and Heat Transfer in Nanofluid Over A Stagnant Disk with Suction</i>		AM24-Paper ID: 0121 <b>Saranya Gunasingam</b> <i>Order Seven Block Integrator Method For the Solution of First Order Ordinary Differential Equation</i>	ME06-Paper ID: 0174 <b>Jeyaletchumi Muthiah</b> <i>Inculcating Creativity with Graphing Calculator</i>

## DAY 2 • 9 DEC 2020 (Malaysia Time or GMT+8)

Time	Room A
08:40 – 09:40	Statworks Sharing Session <b>Ms. Puteri Anis Aneeza Binti Zakaria</b> <i>Technology Update: TI-Nspire CX Ecosystem</i>

Time	Room A <i>Chairperson: Prof. Dr. Munirah Ghazali</i>
09:40 – 10:40	PLENARY SESSION 2 <b>Assoc. Prof. Dr. Leong Kwan Eu</b> <i>Developing Mathematical Reasoning and Problem Solving Abilities Using Technology</i>

Time	Room A <i>Chairperson: Assoc. Prof. Dr. Farah Aini Binti Abdullah</i>
14:00 – 14:40	INVITED SESSION 3 <b>Assoc. Prof. Dr. Teh Su Yean</b> <i>Mathematical Modelling for Environmental Sustainability</i>

Time	Session 3A Room A <b>Chairperson:</b> <i>Dr. Yazariah Mohd Yatim</i>	Session 3B Room B <b>Chairperson:</b> <i>Dr. Zainudin Bin Arsad</i>		Session 3D Room D <b>Chairperson:</b> <i>Dr. Shamsul Rijal Muhammad Sabri</i>	Room E
11:00 – 11:20	AM01-Paper ID: 0027 <b>Hafed. H. Salleh</b> <i>Fuzzy Linear HIV Infection Model Solution and Analysis by Homotopy Perturbation Method</i>	ST22-Paper ID: 0164 <b>Jamiah Ameer Ali</b> <i>Investigating the Influence of Economic Variables and Socio- Economic Indicators on Carbon Emission in Asian and Asia-Pacific Countries</i>		FM01-Paper ID: 0024 <b>MD. Jamal Hossain</b> <i>Study of Bitcoin Volatility Dynamics: MSGARCH Model Approach</i>	<p>WORKSHOP 3 <i>Meaningful Mathematics Teaching and Learning Pedagogy, A Sustainable Method to Empower High Order Thinking Skills (HOTS) and Metacognition of Students</i></p> <p><b>Assoc. Prof. Dr. Ang Miin Huey</b></p>
11:20 – 11:40		ST01-Paper ID: 0026 <b>Sarah Mohd Khaidi</b> <i>New Tourism Product Forecasting – A Study of Different Potential Markets</i>		FM07-Paper ID: 0088 <b>Wajeih Mustafa Sarsour</b> <i>Investment Valuation and the Performance of Companies with Modified Interval Rate of Return: A Simulation Markov Chain</i>	
11:40 – 12:00	AM12-Paper ID: 0055 <b>Aisha Aliya Yakubu</b> <i>Global Stability Analysis of Pertussis Transmission Dynamics with Maternally Derived Immunity Compartment</i>	ST24-Paper ID: 0182 <b>Zainudin Arsad</b> <i>Day-of-the-Week and Turn-of-the-Month Effects on Stock Market in Malaysia</i>		FM05-Paper ID: 0068 <b>Novriana Sumarti</b> <i>Implementation of Real Options with Learning Process on Bitcoin Mining Project</i>	



12:00 – 12:20	AM27-Paper ID: 0136 <b>Elvira de Lara-Tuprio</b> <i>Mathematical Analysis of a COVID-19 Compartmental Model with Interventions</i>	ST25-Paper ID: 0183 <b>Zainudin Arsad</b> <i>The Impact of Stock Market Integration on Economic Growth in Asia and Europe Regions</i>		FM09-Paper ID: 0158 <b>Hishamuddin Abdul Wahab</b> <i>The Wavelet-Based Exchanged Rate Exposure and Hedging Practices: An Application on Food and Beverage Firms in Malaysia</i>
12:20 – 12:40	AM39-Paper ID: 0189 <b>Noorehan Yaacob</b> <i>Mathematical Modeling of Quasi-Static Signal and Ligand during Invadopodia Formation with Velocity Jump</i>	ST28-Paper ID: 0188 <b>Zainudin Arsad</b> <i>Estimating Dynamic Relationship Between Stock Price and Macroeconomic Variables Using Kalman Filter Approach</i>		FM06-Paper ID: 0076 <b>Beidi Peng</b> <i>Optimal portfolio choices under the SVCEV Model with exponential utility</i>
12:40 – 13:00	AM42-Paper ID: 0104 <b>Aisha Aliya Yakubu</b> <i>Analysis and Numerical Solution of Fractional Order Control of COVID-19 Using Laplace Adomian Decomposition Method</i>	ST06-Paper ID: 0064 <b>Mohammad Raquibul Hossain</b> <i>Empirical Mode Decomposition Based Double Exponential Smoothing Method for Daily Stock Price Forecasting</i>		FM08-Paper ID: 0103 <b>Kuang Kee Seng</b> <i>Universal Portfolios Generated by the Reverse <math>f</math> and Bregman Divergences</i>

Time	Session 4A Room A <b>Chairperson:</b> Assoc. Prof. Dr. Lee See Keong	Session 4B Room B <b>Chairperson:</b> Dr. Rosmanjawati Abdul Rahman		Room D	Room E
15:00 – 15:20	AM04-Paper ID: 0035 <b>Shehab Abdulhabib Alzaeemi</b> <i>The Impact of MCO (Movement Control Order) Towards Air Quality in Selected Cities in Malaysia</i>	ST09-Paper ID: 0102 <b>Adamu Abubakar Umar</b> <i>Transmuted New Weighted Weibull Distribution: Some Statistical Properties and Application to Survival Time Data</i>			
15:20 – 15:40	AM16-Paper ID: 0091 <b>Xin Yi Kh'ng</b> <i>Modeling Sea Level Rise Impact on Coot Bay Hammock, Florida Everglades</i>	ST19-Paper ID: 0153 <b>Khuneswari Gopla Pillay</b> <i>Comparison Between Best Subset and Lasso Regression on Consumer Price Index Malaysia</i>		WORKSHOP 4 <i>Tools and Tricks of The Trade For Teaching</i> <b>Prof. Dr. Abd Karim Alias</b>	WORKSHOP 5 <i>COMOKIT – A Modeling Kit to Understand, Analyze and Compare the impacts of mitigation policies against the COVID-19 pandemic at the Scale of City</i>  <b>Assoc. Prof. Dr. Benoit Gaudau</b>
15:40 – 16:00	AM23-Paper ID: 0115 <b>Lucky Cahya Wanditra</b> <i>Forecasting Total Suspended Solid Using Wavelet ARIMA Model</i>	ST16-Paper ID: 0144 <b>Nur Athirah Mohamad Salleh</b> <i>Application of Second Order Markov Chain on Daily Average Wind Speed in Malaysia</i>			

## Tables of Presentations

16:00 – 16:20	AM25-Paper ID: 0123 <b>Raynaldi Lalang</b> <i>Optimal Sinusoidal Submerged Breakwater for Coastal Protection</i>	ST10-Paper ID: 0105 <b>Adamu Abubakar Umar</b> <i>Performance of Variable Sampling Interval EWMA Chart with Auxiliary Information for the Process Mean Based on Expected Average Time to Signal</i>	
16:20 – 16:40	AM26-Paper ID: 0127 <b>Izmi Sukma Rianti</b> <i>A Simple Mathematical Model Simulating Individual Weight Based on Daily Diet Menu</i>	ST26-Paper ID: 0199 <b>Mukhtar Eri Suhaeri</b> <i>Evaluation of Clustering Approach with Euclidean and Manhattan Distance for Outlier Detection</i>	
16:40 – 17:00	AM33-Paper ID: 0148 <b>Murtala Bello Aliyu</b> <i>Effects of Competitor Species Growth Rate on Species Biodiversity</i>	ST15-Paper ID: 0135 <b>Saidat Fehintola Olaniran</b> <i>Purchasing Power Parity: The West African Experience</i>	

**DAY 3 • 10 DEC 2020 (Malaysia Time or GMT+8)**

Time	<b>Room A</b> <i>Chairperson: Assoc. Prof. Dr. Saratha Sathasivam</i>
09:00 – 09:40	INVITED SESSION 4 <b>Dr. Khayriyyah Mohd Hanafiah</b> <i>Using Mathematics to inform Public Health Precautions for Controlling Covid-19</i>

Time	<b>Room A</b> <i>Chairperson: Prof. Dr. Ahmad Izani Md Ismail</i>
09:40 – 10:40	PLENARY SESSION 3 <b>Prof. Dr. Zinaida Fadeeva</b> <i>Sustainable Development and Mathematics</i>

Time	Session 5A Room A <b>Chairperson:</b> <i>Dr. Nur Nadiah binti Abd Hamid</i>	Session 5B Room B <b>Chairperson:</b> <i>Dr. Fam Pei Shan</i>		Session 5D Room D <b>Chairperson:</b> <i>Dr. Johnny Lim Khai Yang</i>	Room E
11:00 – 11:20	AM18-Paper ID: 0097 <b>Mohd Norfadli Suardi</b> <i>Redlich-Kister Finite Difference Solution for Two-Point Boundary Value Problem by Using MKSOR Iteration</i>	ST11-Paper ID: 0113 <b>Jayanthi Arasan</b> <i>Jackknife and Bootstrap Estimates for Modified Residuals of the Log- Logistic Model</i>			
11:20 – 11:40	AM34-Paper ID: 0154 <b>Nur Farah Azira Zainal</b> <i>Solving Nonlinear Burgers' Equation with Semi-Approximate Approach Using Modified Gauss-Seidel Iteration</i>	ST07-Paper ID: 0084 <b>Siti Zulaikha Mohd Jamaludin</b> <i>Modelling Binary Logistic Regression for Low Birth Weight in Segamat, Johor Malaysia</i>		PM10-Paper ID: 0117 <b>Amer Mohammed</b> <i>Geometric of Numerical and Quadratic Numerical Range for Block Operator Matrices</i>	WORKSHOP 6 <i>How to Gamify Your Math Classroom</i>  <b>Dr. Ahmad Lutfi Amri Ramli and Dr. Yazariah Mohd Yatim</b>
11:40 – 12:00	AM37-Paper ID: 0173 <b>Muhammad Asim Khan</b> <i>Compact High-Order Implicit Iterative Scheme for the Two-Dimensional Time-Fractional Diffusion Equation</i>	ST18-Paper ID: 0152 <b>Fauhatuz Zahroh bt Shaik Abdullah</b> <i>Application of Logit- Loglinear Model for TB Disease</i>		PM06-Paper ID: 0082 <b>Ftameh Khaled</b> <i>Quadratic Stochastic Operators Generated by Mixture Distributions</i>	

12:00 – 12:20	AM41-Paper ID: 0191 <b>Chuei Yee Chen</b> <i>Scaled Parallel Iterative Method for Finding Real Roots of Nonlinear Equations</i>	ST21-Paper ID: 0161 <b>Syafrina Abdul Halim</b> <i>Statistical Modelling of Annual Retail Sales of Good and Services in The United States Using Generalized Pareto Distribution Model</i>		PM08-Paper ID: 0101 <b>Ali Turab</b> <i>Some Particular Aspects of Certain Type of Probabilistic Predator-Prey Model with Experimenter-Subject-Controlled Events and the Fixed Point Method</i>
12:20 – 12:40	AM05-Paper ID: 0036 <b>Altaf Abdulkarem Al-Shawba</b> <i>New Generalized (<math>G'</math> / <math>G</math>)-Expansion Method for Solving <math>(3 + 1)</math>-Dimensional Conformable Time Fractional KdV-ZK Equation</i>	ST27-Paper ID: 0140 <b>Oyebayo Ridwan Olaniran</b> <i>Shrinkage Based Variable Selection Techniques for the Sparse Gaussian Regression Model: A Monte-Carlo Simulation Comparative Study</i>		PM04-Paper ID: 0045 <b>Muhammad Afifurrahman</b> <i>On The Number of Different Entries in Involutionary MDS Matrices over Finite Fields of Characteristic Two</i>
12:40 – 13:00	AM40-Paper ID: 0190 <b>Nor Syahida Mohamad</b> <i>Quadrature-Piecewise Collocation Solutions to the Fredholm Integral Equation of II kind Using ESOR Iteration</i>	ST17-Paper ID: 0146 <b>Sayed Kushairi Bin Sayed Nordin</b> <i>Testing the Validity of the Energy-Environmental Kuznets Curve (EEKC) Hypothesis in Oil-Importing versus Oil-Exporting Countries: A Heterogeneous Panel Data Modeling Analysis</i>		



Time	Session 6A Room A <b>Chairperson:</b> <i>Dr. Kong Voon Pang</i>	Session 6B Room B <b>Chairperson:</b> <i>Dr. Noor Saifurina Nana Khurizan</i>		Session 6D Room D <b>Chairperson:</b> <i>Dr. Shamani Supramaniam</i>	Room E
14:00 – 14:20	AM15-Paper ID: 0090 <b>Chai Jian Tay</b> <i>Pharmacoeconomic Model of Dengue Vaccine for Malaysia: Assessing a Highly Cost-effective and Affordable Vaccine Price Threshold</i>	ST02-Paper ID: 0031 <b>Pei Ling Kiew</b> <i>Testing the Validity of Fisher Hypothesis: The Case of ASEAN-5</i>		PM07-Paper ID: 0094 <b>Yao Liang Chung</b> <i>Radius Problems for Some Subclasses of Analytic Functions</i>	WORKSHOP 7 <i>Creating Your First Interactive Tableau Dashboard for Data Visualisation</i>  <b>Dr. Teh Sin Yin</b>
14:20 – 14:40	AM31-Paper ID: 0142 <b>Juancho A. Collera</b> <i>Dynamics of an IS-LM Macroeconomic Model with Delay-Dependent Coefficients</i>	ST03-Paper ID: 0043 <b>Shantini Sekaran</b> <i>Examining the Nonlinearity Effects of Oil Price Changes of Commodity Prices</i>		PM05-Paper ID: 0070 <b>Musa Josiah Marut</b> <i>Symmetric Toeplitz Determinants for Starlike and Convex Functions Defined by Subordination</i>	
14:40 – 15:00	AM35-Paper ID: 0159 <b>Kie Van Ivanky Saputra</b> <i>Stocks Clustering with Fourier Transformation Towards Indonesian Stocks for Pairs Trading and Investment Diversification</i>	ST04-Paper ID: 0046 <b>Mohsen Ayyash</b> <i>What Explains the Gender Pay Gap in the West Bank?</i>		PM13-Paper ID: 0155 <b>Khairun Nisak Muhammad</b> <i>On Some Behaviour of Convergents for <math>\vartheta</math>- Expansion and Regular Continued Fraction (RCF) Expansion</i>	

15:00 – 15:20	AM30-Paper ID: 0141 <b>Sanjith Udayakumar</b> <i>Kinetic Modelling of Alkaline Leaching of Thorium Hydroxide (Th(OH)<sub>4</sub>) from Monazite</i>	ST05-Paper ID: 0053 <b>Zi Yun Chow</b> <i>Revisited Export-Led Growth Relationship: Does Trade Openness Matter?</i>		PM01-Paper ID: 0028 <b>Nur Asifa Mohd Ali</b> <i>An Application of Fourier Transform Through Matlab in Classifying Tempos</i>
15:20 – 15:40	AM36-Paper ID: 0171 <b>Raihanah Adawiyah Shaharuddin</b> <i>Traffic Simulation Using Agent Based Modelling</i>	ST12-Paper ID: 0129 <b>Siti Fatimah Ismail</b> <i>Investigating the Effects of Monetary Versus Fiscal Policies on GDP Growth in Malaysia: Smooth Transition Autoregressive (STAR) Approach</i>		PM14-Paper ID: 0156 <b>John Rafael M. Antalan</b> <i>Computation of some Distance-based Topological Indices for Multiplicative Circulant Networks of Order 3<sup>h</sup></i>
15:40 – 16:00	AM21-Paper ID: 0110 <b>Kong Voon Pang</b> <i>Constrained Curve Interpolation in 3D</i>	AM32-Paper ID: 0147 <b>Wan Munirah Wan Mohamad</b> <i>Intelligent Fuzzy Logic Controller for Painting System of Vessel</i>		

## PLENARY SPEAKER 1



**Professor Dr. Edy Tri Baskoro**

*Professor EDY TRI BASKORO, Ph.D*

*Combinatorial Math. Research Group, Faculty of Mathematics & Natural Sciences, Institut Teknologi Bandung, Jalan Ganesa 10 Bandung 40132 Indonesia*

Edy Tri Baskoro was born in Jombang, Indonesia 22 May 1964, received his B.Sc degree in mathematics from Institut Teknologi Bandung (ITB) Indonesia in 1987, and his PhD degree from the University of Newcastle, Australia in 1996. Since then he has held a senior academic position at ITB. He served as the Dean of Faculty of Mathematics and Natural Sciences Institut Teknologi Bandung for the period of 2015-2020. He was the Secretary-General of the Indonesian Network for Higher Education Institutions on Mathematics and Natural Sciences (2018-2020). Since July 2006, he has been honoured a professor in mathematics of ITB. He was also an adjunct professor at the University of Newcastle Australia (2010-2015) and the Abdus Salam School of Mathematical Sciences, GC University, Lahore Pakistan (2006-2015).

His main research interests are graph theory and combinatorics. He is a pioneer in the development of graph theory and combinatorics in Indonesia. For his contributions to these fields he has been awarded First Prize National Best Lecturer (2008), Habibie Award in Basic Science Research (2009), Australian Alumni Award for Excellence in Education (2009), and the Extraordinary Intellectual Quality Award (2010). Satyalancana Karya Satya from the President of Indonesia (2013) and Ganesa Cendekia Widya Adiutama from ITB (2014). He served as the President of Indonesian Mathematical Society (IndoMS) for the period of 2006-2008, and as the President of Combinatorial Mathematics Society (InaCombS) for the period of 2006-2013. He also plays a significant role in the development of mathematics in South East Asia region. He was the President of South East Asian Mathematical Society (2014-2015). He has been engaged with CIMPA as a member of Scientific Committee since 2009 until now. He has also contributed to the development of national standards for education from primary school to higher education in Indonesia as the member of the Board of National Standards for Education 2005-2014 as the Chair for 2013-2015. As of November 2020, he has published over 156 research papers in international reputable journals, with scopus h-index 18 and 1149 citations. He has produced over 28 PhD graduates.

### RECENT PROGRESS ON THE PARTITION DIMENSION OF GRAPHS

The study of the partition dimension of connected graphs was introduced by G. Chartrand, E. Salehi and P. Zhang (1998) with the aim of finding a new way in attacking the problem of determining the metric dimension of graphs. The notion of graph metric dimension itself was initially studied by Slater (1975) and Harary & Melter (1976).

Let  $G(V, E)$  be a connected graph. Let  $\Pi = \{L_1, L_2, \dots, L_t\}$  be an ordered partition of  $V(G)$ . The representation of any vertex  $v$  with respect to  $\Pi$ , denoted by  $r(v, \Pi)$ , is defined as the  $t$ -vector with the elements are all distances between  $v$  to the partition classes in  $\Pi$ , namely  $r(v, \Pi) = (d(v, L_1), d(v, L_2), \dots, d(v, L_t))$ . The partition  $\Pi$  is called a resolving partition if the representations of all vertices in  $G$  are different. We define the partition dimension of graph  $G$  by the minimum integer  $k$  such that  $G$  possess a resolving  $k$ -partition.

The study of graph partition dimension has received much attention in the last two decades. In general, finding the partition dimension of a graph in general is one of interesting and difficult problems in graph theory. There are only a few classes of graphs whose partition dimensions can be determined. For instance, for trees, we have known the partition dimensions of paths, stars, caterpillar, lobsters and other specific trees. However, the remaining 'huge' classes of trees are still unknown for their partition dimensions. The charactering study all graphs with a certain partition dimension has been also conducted. In this paper, we will discuss the current progress of the partition dimension of graphs.

## PLENARY SPEAKER 2



**Associate Professor Dr. Leong Kwan Eu**

*Department of Mathematics and Science Education  
Faculty of Education, University of Malaya, Malaysia*

Leong Kwan Eu is currently an Associate Professor working at the Department of Mathematics and Science Education in the Faculty of Education, University of Malaya. He holds a Ph.D. in Mathematics Education from Columbia University Teachers College, New York. His working experience include 15 years of teaching secondary mathematics, pre-university mathematics and mathematics education courses. He has written several reference books in secondary mathematics and numerous articles in research journals. In addition, he actively researches and publishes in the area of mathematical modelling, technology in mathematics education, secondary mathematics and statistical analysis.

### **DEVELOPING MATHEMATICAL REASONING AND PROBLEM SOLVING ABILITIES USING TECHNOLOGY**

Mathematical problem solving is one of the mathematical thinking processes in the Malaysian secondary mathematics curriculum (KSSM). This presentation will provide mathematical investigation and problem solving tasks that can be used in mathematics classroom. By performing investigation tasks, learners would be provided with opportunity to develop their mathematical reasoning. In addition, the usage of technology would assist in developing problem solving abilities.

## PLENARY SPEAKER 3



**Professor Dr. Zinaida Fadeeva**

*Nalanda University, India*

*Centre for Global Sustainability Studies, Universiti Sains Malaysia, Malaysia*

Prof. Dr. Zinaida Fadeeva is currently a Visiting Professor at Centre for Global Sustainability Studies in University Science Malaysia as well as a Visiting Professor in the Nalanda University (India). She obtained her PhD in Environmental Management and Policy from The International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden. A senior specialist in policy and practice of sustainable consumption & production (SCP) with 25 years international professional experience, 17 years thereof with UN agencies on practical solutions covering waste management, resource efficiency & circularity, climate change, biodiversity, health, business and policy. She has taught sustainability at a number of Universities in China, Japan, India and Sweden. She has been associated with TERI School for Advanced Studies (SAS) as Visiting Professor. She is also an advisor to the EMPRETEC Programme of UNCTAD for India. She has been a Senior Consultant, UNIDO for the preparation of the background document on marine plastic pollution in the context of circular economy for the G20 countries; Senior Advisor, Office of the UN Resident Coordinator (New Delhi) for advising on capacity development and coordination in the area of circular economy and work on development of the proxy SDG 12 indicators. She has been a Visiting Scholar, United Nations University Institute for the Advanced Studies for Sustainability (UNU-IAS), Tokyo, Japan where she was engaged in policies and strategies with a particular focus on sustainable consumption and production and SDGs. She has been leading research activities of the ESD team of UNU-IAS since 2003. She has been a Senior Development Advisor, UNEP and UNDP – contributor to drafting team for the Environmental Code for Cambodia, particularly on sustainable consumption and production, access to information and environmental education.

### SUSTAINABLE DEVELOPMENT AND MATHEMATICS

In conversation with the audience, the speaker explores two questions – what role mathematics plays in addressing challenges of sustainable development and what does sustainable development means for mathematics. We will talk about understanding of natural and social phenomena as well as changes that are called upon in areas such as production and consumption systems, development of social systems and support of ecosystems. We will also talk about applications of mathematical knowledge in science, technology and education as part of the multidisciplinary strategies.

## INVITED SPEAKER 1

**Associate Professor Dr. Nguyen Ngoc Doanh**

*Department of Computer Science and Engineering, Thuyloi University (TLU), Vietnam*

*Director of UMMISCO in South-East Asia, Leader of WARM team, IRD/France and TLU/Vietnam*

Nguyen Ngoc Doanh is currently a deputy head of the Department of Science and Technology, Thuy Loi University. Before joining Thuy Loi University, he is a lecturer at Hanoi National University of Education right after he obtained his Bs and then a lecturer at Hanoi University of Science and Technology for 12 years. He received his Ph.D. in Computer Science from the University of Pierre and Marie Curie Paris 6, France in 2010. After that, he was a postdoctoral fellow for UMMISCO

UMI 209, IRD, and INRA in France for one year, and later became a member of UMMISCO. He was responsible for the South-East Asia center in UMMISCO and also a team leader of the WARM research group, a new associated team in UMMISCO that founded by the young Vietnamese researchers. The group was aimed to apply advanced information technology to solve some practical sustainable problems in Vietnam. The latest contribution of the WARM/UMMISCO research group is to join the coronavirus disease (Covid-19) expert group in Rapid Response Team supporting National Committee Against COVID-19 pandemic.

### A HYBRID MODELING APPROACH FOR SUSTAINABILITY SCIENCE

Sustainability science approach to the management of complex socio-environmental issues should address in priority the design of innovative tools and methodologies to support interdisciplinary research and participation of stakeholders. The complexity of the dynamics involved also calls for studying the impact that a plan can have on the sustainability of a system before it is actually implemented, which recent advances in computer simulations, virtual reality or tangible interfaces make possible- a hybrid modelling approach. In this talk, we will show how to use the hybrid modelling approach dealing with water, air and disease complex systems.

## INVITED SPEAKER 2

**Professor Dr. Ibrahim Mohamed**

*Institute of Mathematical Sciences, Faculty of Science, University of Malaya, Malaysia*

Professor Dr. Ibrahim bin Mohamed is currently the Head of Department of Institute of Mathematical Sciences, University of Malaya (UM). He earned his Ph.D. in Statistical Modelling from Universiti Teknologi Mara (UiTM) and joined University of Malaya afterwards. Currently, he is the President of the Institute since February 2020. His main research area concerns with the occurrence of outliers in different types of data including circular, time series and survival data. Various outlier detecting procedures have been proposed with the earliest one is called the A-statistics for univariate circular sample in 2009. One of his main finding is the

introduction of circular boxplot, useful in depicting circular data. Currently, he is involved in developing new criteria for sighting crescent moon of activities in Malaysia.

### STATISTICS IN CRESCENT MOON SIGHTING

The monthly crescent moon sighting activities has always been important in Malaysia as the visibility of a crescent moon will affect the start of the fasting month, the celebration Eidul Fitri/Adha and Islamic new year. For the past few years, the involvement of scientists in the activities in Malaysia enable relevant data on moon sighting to be collected. In this study, we use a data set which consists of 94 positive data (with sighted crescents) and 113 negative data with no sighted crescents. The variables considered are a mix of linear and circular variables. While standard tools can be used for linear-linear variables, specialized statistical measures and inferences need to be used in the analysis for analysis involving linear-circular and circular-circular variables. Three main variables which are considered important in the determination of visibility of crescent moon are Elongation, altitude of moon and ARCV. Here, we perform descriptive and inferential statistical analysis on the data in understanding the relationship between the variables considered. The understanding of these relationships especially between linear-circular and circular-circular variables should enable us to come up with a more scientific way of sighting the crescent moon in the future.



## INVITED SPEAKER 3



**Associate Professor Dr. Teh Su Yean**

*School of Mathematical Sciences, Universiti Sains Malaysia, Malaysia*

Su Yean Teh received her Bachelor of Mathematics, Master of Science and Doctor of Philosophy in Mathematical Modelling in 2004, 2005 and 2008 respectively, all from Universiti Sains Malaysia. In 2006, she was awarded the UNESCO/Keizo Obuchi Research Fellowship to undertake research on “Management Modelling of Everglades Wetlands Hydrology and Ecosystems” at University of Miami, Florida, USA. Her research interests revolve around mathematical modelling with particular focus on computational simulation of real-life problems to provide insights and to suggest possible solutions. She works on various topics in ecosystem and environmental modelling, many of which were initiated and driven by the needs of the country or industry. She was invited on various occasions to visit University of Miami and Nanjing Forestry University under U. S. Geological Survey grants. She was also sponsored by ICTP to attend four workshops at Abdus Salam International Centre for Theoretical Physics (ICTP) at Trieste, Italy and by Brown International Advanced Research Institutes (BIARI) at Brown University to participate in Climate Change and Its Impacts: Connecting Local Variability and Knowledge in a Global System. She was awarded the prestigious L’Oréal-UNESCO for Women in Science Malaysia Fellowship 2017 for her research on unifying STEM towards sustainable management of our coastal resources. She is currently an Associate Editor of Springer’s Hydrogeology Journal. She has published numerous articles, most notably in Journal of Asian Earth Sciences, Ecosystems, Ecological Modelling, Landscape Ecology, Agricultural and Forest Meteorology, Hydrogeology Journal, Environmental Science and Pollution Research, Theoretical and Applied Mechanics Letters and Journal of Marine Science and Engineering.

### MATHEMATICAL MODELLING FOR ENVIRONMENTAL SUSTAINABILITY

Mathematical modelling is an essential tool for gaining valuable insights into problems associated with environmental sustainability and for finding the possible solutions. In environmental sustainability studies, a combination of mechanistic and empirical approaches is often used to project the behaviour of the modelled system based upon known dynamics (mechanistic) and extensive data records (empirical). In our research studies, mechanistic models in combination with empirical models are often developed to address various needs of the university, country or industry. This talk will provide an overview of the past and recent modelling studies that we have conducted to address the impact of natural and anthropogenic activities on the environment and to propose mitigation or adaptation measures. We will demonstrate the application of quantitative methodology in support of sustainable management of the environment, focusing on water and coastal resources. The role of mathematical modelling in addressing the current Covid-19 pandemic in Malaysia will also be discussed. The themes of the talk revolve around the United Nations Sustainable Development Goals, SDG3 (good health and wellbeing), SDG6 (clean water and sanitation), and SDG14 (life below water).



## INVITED SPEAKER 4



**Dr. Khayriyyah Mohd Hanafiah**

*School of Biological Sciences, Universiti Sains Malaysia, Malaysia*

A senior lecturer at USM's School of Biological Sciences since 2015, Dr. Khayriyyah Mohd Hanafiah conducts research in infectious disease. Her work spans discovery of diagnostic biomarkers and antimicrobials for pathogens such as M.tuberculosis, and epidemiological modeling of global viral hepatitis prevalence and recently, trends of Covid-19 in Malaysia. She was awarded the prestigious Australian Endeavour Research Fellowship in 2017, became the first female Asian Champion of "FameLab International", the world's biggest and longest running science communication competition in 2018, and received the Ministry of Youth and Sports Malaysia "Youth Award" in 2019. She is a Young Scientist Network-

Academy of Sciences Malaysia (YSN-ASM) Affiliate, co-founder of Malaysian Science Communication Network (MSCN) and Sustainable Palm Oil Movement (SPOM), and she heads the committee for development of the training-of-trainers Malaysian Science Communication Module for increasing capacity in science communication. She regularly writes for The Star, in her column "Science, She Wrote".

### USING MATHEMATICS TO INFORM PUBLIC HEALTH PRECAUTIONS FOR CONTROLLING COVID-19

Various public health interventions were implemented to contain the rapid spread of coronavirus 2019 (Covid-19) across the world, including disruptive and less sustainable measures such as the strict movement control order (MCO). In the face of uncertainty, mathematical modelling can be used to project possible scenarios of disease transmission, which may facilitate planning and adoption of important public health measures. This presentation discusses the use of an augmented SEIR model to project Malaysia's epidemic trends post-MCO, specifically identifying the risk of a resurgence arising from 1) changes in effectiveness of existing behavior and isolation interventions, and 2) super spreader events from mass gatherings and/or international travel. Additionally, we used the model to assess the impact of re-introducing strong behavioural interventions (such as MCO) on trajectories of any subsequent epidemic waves.

## STATWORKS SHARING SESSION

**Ms. Puteri Anis Aneeza Binti Zakaria**

Statworks (M) Sdn. Bhd.

### **Technology Update: TI-Nspire CX Ecosystem**

This presentation will introduce the latest version of Texas Instruments graphing calculator with the integration of Science, Technology, Engineering and Mathematics. The all-new TI-Nspire CX II family of graphing calculators, bringing a 2 ½ times faster processor, an updated, new look and added math and coding features that will help bring STEM (science, technology, engineering and math) subjects to life for students. Building on the popular TI-Nspire CX line of graphing calculators, the new TI-Nspire CX II and TI-Nspire CX II CAS give students more opportunities to visualize important, abstract concepts, not just in math class, but in science and computer programming courses.

Participants will have a delightful time of learning TI-Nspire technology and experiencing new ways and possibilities of learning and teaching with both the handheld and the software of TI-Nspire CX II.

# Workshop 1

## The Basic on being Gig Edutuber

Dr. Nik Hadiyan Nik Azman and Dr. Ema Izati Zull Kepili  
*School of Management, Universiti Sains Malaysia, Malaysia*

### Synopsis

You have dreamed yourself delivering your knowledge in a gig way – like those in international pitch in session and in the YouTube...but you are not sure how to start doing it? Well, we envision you the educators to become part of today's gig world by becoming Gig Educator! Let us share how you can do it on the YouTube. Unleash your inner talent – blending the 'artist' side of you in educational content. Unwrap the dry content of yours and turn it into easy-to-understand materials. Learn how to build engaging script for 4-6 minutes video. Know how to act confidently in front of the camera and speak fluently like a professional. Don't be a Youtuber, be an Edutuber, better, be a Gig Edutuber & Educators.

This 2-hour workshop will cover the following topics:

#### Pre-Production Stage

- a. Building a "Cliff Hanger" Script
- b. Be an Interesting Broadcaster
- c. Ways to Engage Viewers

### Objectives

By the end of this workshop, participants would be able to

- Write an engaging script
- Act in engaging way in front of the camera.

## Workshop 2

### Unboxing Topological Data Analysis

Assoc. Prof. Dr. R. U. Gobithaasan

*School of Ocean Engineering Technology & Informatics, University Malaysia  
Terengganu, Malaysia*

#### Synopsis

These days data sets are abundant, widely available in various forms and complexities. Data has shapes! If you can identify its shape, then a conclusive decision and prediction is feasible. Topological Data Analysis (TDA) is an advanced data analysis tool developed with strong mathematical foundations in search of data's patterns. In this workshop you will be exposed to the underlying principles of TDA. By the end of this workshop, TDA will be a transparent box preparing you for a journey towards data analysis with TDA software freely available in the Internet.

This 2-hour workshop will cover the following topics:

- a. Bare basics: Set Theory, Group Theory & Various Spaces
- b. Simplicial Complexes
- c. Homology of Simplicial Complexes
- d. Persistence Modules
- e. Demo: TDA Software

#### Objectives

- To elucidate the mathematical principles of Topological Data Analysis.
- To showcase the ability of Topological Data Analysis using Scikit-TDA and GUDHI software.

## Workshop 3

### **Meaningful Mathematics Teaching and Learning Pedagogy, A Sustainable Method to Empower High Order Thinking Skills (HOTS) and Metacognition of Students**

Assoc. Prof. Dr. Ang Miin Huey

*School of Mathematical Sciences, Universiti Sains Malaysia, Malaysia*

#### **Synopsis**

Mathematics is not about computing using formula. Computing is one of the (basic) tools in mathematics study and formula is just one type of end product of mathematical studies. So, what is mathematics? Mathematics is a language that is used to describe ideas of how a problem can be solved in an analytical quantitative way. Mathematics consists of its own vocabulary and sentences called statements. Meaningful Mathematics teaching and learning gets under way once a child starts to read, think and write mathematically with understanding. The cumulative of these understood concepts induced the child's interest in mathematics. In addition, deep interest nurtures the resilience of the child in developing High Order Thinking Skills (HOTS) in Mathematics. Well coordination of different combinations of HOTS help the child reach his or her metacognitive peak which will increase the efficacy in doing independent lifelong self-learning processes in Mathematics.

This 2-hour workshop will cover the following topics:

Teaching and Learning Mathematics through

- a. Mathematical definitions.
- b. Logical Reasoning thinking using simple mathematical statements.
- c. HOTS thinking using implication and compound statements.
- d. Expressing ideas and arguments mathematically.

#### **Objectives**

At the end of the course, participants will able to

- Practice their learning or teaching of mathematics meaningfully through Mathematical Spirit that encompasses understanding, thinking and communicating mathematically.
- Read and interpret mathematical statements correctly.
- Write and communicate their quantitative problem-solving ideas or arguments clearly to others using proper mathematical statements.

## Workshop 4

### Tools and Tricks of The Trade For Teaching

Prof. Dr. Abd Karim Alias

*School of Industrial Technology, Universiti Sains Malaysia, Malaysia  
Centre for Development of Academic Excellence (CDAE), Universiti Sains Malaysia,  
Malaysia*

#### Synopsis

Engaging and motivating students in the face-to-face classroom are always very challenging task faced even by seasoned educators. To make matter even more challenging is the fact that the average concentration span of adult learners is very short (around 9 seconds). Conducting online class take the challenge of engaging students to another level. Therefore, it is incumbent upon the educators to find ways to gain the learner's attention using creative strategies such as interactive learning activities.

It is important to develop an understanding of what underpins the engagement of students in online learning environments. Many strategies and tools can be explored in providing learning experiences that will support student engagement and satisfaction.

In this session, the speaker will share some of the tools and 'tricks of the trade' that can be used and integrated in the course design. At the end of the session, the participants should be able to apply some of the practical tools and tricks in their class.

## Workshop 5

### **COMOKIT- A Modeling Kit to Understand, Analyze and Compare the impacts of mitigation policies against the COVID-19 pandemic at the Scale of City**

Assoc. Prof. Dr. Benoit Gaudou  
*UMMISCO/IRD and University Toulouse 1 Capital, France*

#### **Synopsis**

Since its emergence in China, the COVID-19 pandemic has spread rapidly around the world. Faced with this unknown disease, public health authorities were forced to experiment, in a short period of time, with various combinations of interventions at different scales. However, as the pandemic progresses, there is an urgent need for tools and methodologies to quickly analyse the effectiveness of responses against COVID-19 in different communities and contexts. In this perspective, computer modelling appears to be an invaluable lever as it allows for the *in silico* exploration of a range of intervention strategies prior to the potential field implementation phase. More specifically, we argue that, in order to take into account important dimensions of policy actions, such as the heterogeneity of the individual response or the spatial aspect of containment strategies, the branch of computer modelling known as agent-based modelling is of immense interest. I will present in this workshop an agent-based modelling framework called COVID-19 Modelling Kit (COMOKIT), designed to be generic, scalable and thus portable in a variety of social and geographical contexts. COMOKIT combines models of person-to-person and environmental transmission, a model of individual epidemiological status evolution, an agenda based one-hour time step model of human mobility, and an intervention model. It is designed to be modular and flexible enough to allow modellers and users to represent different strategies and study their impacts in multiple social, epidemiological or economic scenarios. Several large-scale experiments will be presenting, illustrating the potentialities of COMOKIT in terms of analysis and comparison of the impacts of public health policies in a realistic case study.

#### **Objectives**

- To provide an introduction to agent-based modelling of spatial phenomena and in particular of disease (COVID19) spread.
- To present the COMOKIT model.
- To present how to apply the model on new case studies.

## Workshop 6

### How to Gamify Your Math Classroom?

Dr. Yazariah Mohd Yatim and Dr. Ahmad Lutfi Amri Ramli  
*School of Mathematical Sciences, Universiti Sains Malaysia, Malaysia*

#### Synopsis

In this workshop, teachers will be exposed to the idea of gamification in mathematics. Gamification is used to enhance learning process using game elements, especially in the intimidating and dry subjects such as mathematics. Using this approach, we hope that it will motivate students in learning and assist them in understanding the basic concepts. We will share some low-budget activities that can be implemented in the classroom. These activities have been successfully applied in the elementary and secondary schools during our math camp program.

#### Objectives

- To introduce gamification in mathematics classroom.
- To demonstrate how gamification can be used to enhance learning process.



## Workshop 7

### Creating Your First Interactive Tableau Dashboard for Data Visualisation

Dr. Teh Sin Yin

*School of Management, Universiti Sains Malaysia, Malaysia*

TEH Sin Yin (Ph.D., CMILT, MLogM) is a certified Tableau Desktop Specialist. She is a Senior Lecturer and the Program Chairperson of Operations & Business Analytics and Marketing at the School of Management, Universiti Sains Malaysia. Dr. Teh is also a certified HRDF and TRIZ trainer. She has conducted various seminars and workshops for practitioners and researchers from MNCs, SMEs, universities, and government agencies. Her research interests are statistical process/quality control, business analytics, operations management, data mining, robust statistics and TRIZ theory of inventive problem solving.

#### Synopsis

Data visualisation is the presentation of data in a graphical format. Data visualisation tools provide an accessible way to see and understand trend and pattern in data with visual elements such as charts, graphs, and maps. Tableau Desktop enables us to draw actionable insights from massive amounts of data in the shortest time making it a powerful tool to support data-driven decisions. It is for anyone who works with data, regardless of technical or analytical background. This hands-on workshop is designed to help you create your first interactive Tableau dashboard while you explore some of the key elements involved in the process. Participants who completed the training will get a joint e-cert from MDEC and Tableau/Quandatics which can be linked to your Social Media such as LinkedIn.

#### Objectives

This hands-on workshop is designed to help you create your first interactive Tableau dashboard while you explore some of the key elements involved in the process.

## AM01-Paper ID: 0027

# Fuzzy Linear HIV Infection Model Solution and Analysis by Homotopy Perturbation Method

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**Abstract.** In this work the Homotopy perturbation method (HPM) has been implemented in order to provide approximate analytical solutions to linear initial value problems for HIV infection model. The HPM approach allows unknown parameters to be defined by a few iteration steps for the obtained series solution. The model describes the number of unknown immune cells and the viral load in HIV-infected patients due to the uncertainty of the immune system. CD4+T-cells and cytotoxic T-lymphocytes (CTLs) are known for the immune cells concerned. The variations in immune and viral rates are analyzed and measured in three groups of patients with low, moderate and high immune systems. A modification of the HPM method is done based on the use of the properties of the fuzzy sets theory. Some plots and analysis are generated to show how reliable and simple the proposed method. The results are presented, and few terms are adequate to achieve an accurate approximation solution.

## AM02-Paper ID: 0029

# Analytical and Numerical Solutions of Leptospirosis Model

Abhineshwary Bhalraj<sup>1,a)</sup>, Amirah Azmi<sup>1,b)</sup> and Mohd Hafiz Mohd<sup>1,c)</sup>

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**Abstract.** Leptospirosis is a zoonosis occurring worldwide, carried by rodents which causes death in humans. Outbreaks of Leptospirosis can occur following excessive rainfall or flooding. For a better understanding of the transmission of the disease, Susceptible-Infected-Recovered (SIR) model is employed in this paper. The factors that affect the transmission dynamics are analyzed. Disease free and endemic equilibrium points are determined from the proposed model and the local stability analysis for both of the equilibrium points is conducted. In addition, bifurcation analysis and numerical solutions of the model are conducted. A good accord is observed between theoretical findings and the numerical simulations. Based on the research outcome, it is common that basic reproduction number is found to be the outbreak of the Leptospirosis infection but in our study here, the parameter of natural death rate of rat population helps us to introduce the way to control the outbreak of Leptospirosis disease.

## AM03-Paper ID: 0033

### Numerical Solution of the Time Fractional Black-Scholes Equation Using B-spline Technique

Tayyaba Akram<sup>1,a)</sup>, Muhammad Abbas<sup>2,b)</sup>, Ahmad Izani Ismail<sup>1,c)</sup>,  
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**Abstract.** Financial theory can incorporate fractional differential equation, which provides new concepts and methods for theoretical analysis and practical implementations. In this research, a numerical method to solve time fractional Black-Scholes European option pricing model is developed and applied using extended cubic B-spline and Caputo fractional derivative. The numerical and graphical results shows that the option prices from the proposed technique agree well with the analytical solution.

## AM04-Paper ID: 0035

### The Impact of MCO (Movement Control Order) Towards Air Quality in Selected Cities in Malaysia

Saratha Sathasivam<sup>1,a)</sup>, Shehab Abdulhabib Alzaeemi<sup>1,b)</sup>, Law Yong  
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**Abstract.** In December 2019, the outbreak of Covid-19 does cause a lot of serious issues, fatality, economic crisis, the rise of the unemployment rate, air pollution, and so on. This paper focuses on the impact of Covid-19 that relates to the long-lasting issue of air quality. The scope of this study is focused on the changing of air quality that occurred within the Movement Control Order (MCO) which was launched by the Malaysian government against Covid-19 spreading in Malaysia. Multiple reports suggest during the MCO period, the overall air quality in Malaysia was improved. However, when we just look into the history of air quality index (AQI) value without doing any further analysis, we can see there is no significant difference between the AQI value since the MCO was executed. Therefore, we need to understand how AQI value is obtained and compare available data before MCO is launched to the first three phases of MCO. This paper estimates the impact of MCO towards reduction of moving vehicles which can give impact to air quality in terms of 24-hours PM<sub>2.5</sub> concentrations. Air quality index data have been analyzed by developed code using MATLAB. From the investigating and analyzing the data conducted, we found out the impact of MCO on the air quality in Malaysia is positive.

## AM05-Paper ID: 0036

### New Generalized ( $G'/G$ )-Expansion Method for Solving (3+1)-Dimensional Conformable Time Fractional KdV-ZK Equation

Altaf Abdulkarem Al-Shawba<sup>1,a)</sup>, Farah Aini Abdullah<sup>1,b)</sup>, Amirah Azmi<sup>1,c)</sup> and Md. Ali Akbar<sup>2,d)</sup>

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**Abstract.** In this study, the new generalized ( $G'/G$ )-expansion method is employed to extract abundant new travelling wave solutions in terms of trigonometric functions, hyperbolic functions and rational forms. This method provides some wide-ranging solutions from which some existing solutions for specific values of integral constants will be re-established and some new solutions will be found. The method is applied to the (3+1)-dimensional Kdv-Zakharov-Kuznetsov (KdV-ZK) equation with time fractional derivative. The fractional derivative is described in the sense of conformable fractional derivative (CFD). The CFD is new simple well-behaved definition that can convert the fractional derivative into ordinary derivative. The obtained solutions show that the introduced method with the CFD is reliable and efficient technique for the (3+1)-dimensional time fractional KdV-ZK equation.

## AM06-Paper ID: 0038

### Numerical Solution of Fourth-Order Stiff Ordinary Differential Equations by Implicit High Order Block Backward Differentiation Formula

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**Abstract.** In this study, an implicit high order block backward differentiation formula (HOV-BBDF(4)) method is proposed for the integration of fourth-order stiff Ordinary Differential Equations (ODEs). HOV-BBDF(4) method is implemented in a variable step and variable order approach. Our aim is to resolve the considered problems that would improve the degree of precision and optimize the computational effort. To demonstrate the accuracy and efficiency of the HOV-BBDF(4) method, a few selected problems are solved. Then, the numerical data of HOV-BBDF(4) are compared with MATLAB's ODE solvers. The analysis of the numerical data show that HOV-BBDF(4) method required less computational effort while improving the degree of precision. Thus, this validates that HOV-BBDF(4) can be suggested as another alternative method for fourth-order stiff ODEs.

## AM07-Paper ID: 0040

# Solving Systems of Ordinary Differential Equations Using Differential Evolution Algorithm with the Best Base Vector of Mutation Scheme

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**Abstract.** A general algorithm is presented to approximately solve a great variety of systems of ordinary differential equations (ODEs) independent of their form, order, and given conditions. The systems of ODEs are formulated as optimization problem because it isn't an easy way to get the exact solution for systems of ODEs. Therefore, approximate solution is needed for solving systems of ODEs. One of the approaches, that is used in this paper is using Fourier series expansion to approximate solutions of system of ODEs. The Differential Evolution (DE) method is used as an optimization method to estimate the most accurate coefficients of Fourier series expansion. In this case, DE will be used to minimize the residual functions of the system of ODEs with Fourier series approximations. The original DE is made by putting the best base vector into the mutation part of the DE algorithm. The results show good performance of DE in solving system of ODEs.

## AM08-Paper ID: 0042

# Solving Numerically the Singularly Perturbation Problems of Delay Differential Equations

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**Abstract.** Multistep method is developed to solve problems concerning second order delay differential equations that involved singular perturbation problems. The process consists of using block technique where three points approximate solutions are computed at the same time. Each of the three points is directly integrated once and twice and approximated by using Lagrange interpolation. Predictor and corrector technique are applied to obtain the accuracy of the method with the corrector having one order higher than the predictor. The boundary conditions are transformed to the initial conditions via the shooting technique. The reliability of the method is tested for order, consistency, convergence and zero stability. Additionally, the functionality of the method proposed is shown by solving certain numerical problems.

## AM09-Paper ID: 0044

### Quasinormal Modes of Perfect Spheres

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**Abstract.** Quasinormal modes are the decay modes of the oscillations of black holes and general relativistic stars. They are characterized by complex frequencies. Their real parts correspond to the ordinary oscillation frequencies, while their imaginary parts correspond to the damped oscillation. In the standard scattering problems, the quasinormal modes correspond to the zero incident waves. The equation of black hole (or star) perturbations looks like the one-dimensional Schrödinger equation. The quasinormal modes are the solutions to the Schrödinger like equation, with the appropriate boundary conditions. The exact quasinormal modes can be found in rare cases. In this paper, the quasinormal modes of perfect fluid spheres are calculated. The method is based on the Wentzel–Kramers–Brillouin (WKB) approximation. The results show that the quasinormal modes for  $\ell = 0$  of the perfect fluid spheres, with their radii greater than  $3M$ , have the same function as those for  $\ell \neq 0$ , where  $\ell$  is the quantum angular momentum and  $M$  is the mass of a perfect fluid sphere. Otherwise, the quasinormal modes for  $\ell = 0$  have a different function from those for  $\ell \neq 0$ .

## AM10-Paper ID: 0052

### Greybody Factors for Various Black Holes in Perfect Fluid Spheres

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**Abstract.** Hawking radiation is emitted from black holes. At the black hole event horizon, the Hawking radiation is the exact blackbody radiation. However, while propagating, the Hawking radiation is modified by the curvature of spacetime. Therefore, it is not considered as blackbody radiation when travelling out of the event horizon. Greybody factors are the transmission probabilities with which the Hawking radiation can be transmitted by gravitational potential to spatial infinity. This potential is the curvature of spacetime generated by a black hole. In this paper, the greybody factors for various black holes in perfect fluid spheres are calculated. The formula of the lower bound on the transmission probability is used to obtain the greybody factors. The bounds can give us a qualitative understanding of the quantum nature of black holes. Finally, we calculate the Hawking temperature and entropy of blackholes.

**AM11-Paper ID: 0054****The Effects of Slip and Radiation on Stagnation Point Flow and Heat Transfer Past an Exponentially Stretching/Shrinking Riga Plate**

Wan Syafiqah Wan Hussin<sup>1,a)</sup>, Nor Ain Azeany Mohd Nasir<sup>2,b)</sup> and Anuar Ishak<sup>3,c)</sup>

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**Abstract.** A steady stagnation point flow and heat transfer over a permeable exponentially stretching/shrinking Riga plate is introduced. The investigation towards the effects of radiation, slip velocity, and thermal on the flow are included. The governing equations are transformed using similarity variables into nonlinear ordinary differential equations. A boundary value problem solver, bvp4c, is chosen to solve the transformed equations numerically. Dual solutions are obtained, and the stability investigation is carried out to determine the stability of the solutions. It is found that the slip velocity and the thermal jump reduce the velocity and temperature inside the boundary layer. Suction minimizes the impact of slip towards the flow. As expected, the radiation increases the heat transfer rate of the flow.

**AM12-Paper ID: 0055****Global Stability Analysis of Pertussis Transmission Dynamics with Maternally Derived Immunity Compartment**

Aisha Aliya Yakubu<sup>1,a)</sup>, Farah Aini Abdullah<sup>1,b)</sup>, Ahmad Izani Md Ismail<sup>1,c)</sup> and Yazariah Mohd Yatim<sup>1,d)</sup>

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**Abstract.** In this paper, the global stability analysis of the pertussis model with maternally derived immunity is studied. The model is qualitatively analysed to investigate the asymptotic behavior of the model with respect to the equilibria. Using the Lyapunov function method, the pertussis-free equilibrium is determined to be globally asymptotically stable when the associated basic reproduction number is less than unity. Furthermore, the study is also extended to prove the existence of a globally asymptotically stable pertussis endemic equilibrium using a suitable nonlinear Lyapunov function.

## AM13-Paper ID: 0056

# Application of Genetic Algorithm with Multi-Parent Crossover on an Inverse Problem in Delay Differential Equations

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**Abstract.** We propose an approach in solving a parameter estimation problem in delay differential equations (DDE). By taking the interpolation of the data set, the problem is posed as a minimization problem using  $L^2$ -norm. We use a heuristic algorithm called Genetic Algorithm with multi-parent crossover (GA-MPC) to numerically solve the optimization problem. We consider four DDE models of biological systems with discrete and continuous delay to test our method.

## AM14-Paper ID: 0074

# Bödewadt Flow and Heat Transfer in Nanofluid over a Stagnant Disk with Suction

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**Abstract.** A study of the steady Bödewadt flow and heat transfer in nanofluid with constant suction is studied. The nanofluid that considered has the water as base fluid with the nanoparticle as copper, Cu. A similarity transformation that adopted by Von Karman transformation is used to reduce the number of independent variables that involved in the partial differential equations. Numerical solutions are obtained for some values of suction parameters. Both momentum and thermal boundary layer thicknesses reduce as the value of suction increases. It is also found that adequate suction is needed so that the similarity solution is realistic for the thermal energy problem.



## AM15-Paper ID: 0090

# Pharmacoeconomic Model of Dengue Vaccine for Malaysia: Assessing a Highly Cost-Effective and Affordable Vaccine Price Threshold

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**Abstract.** Malaysia continues to record high number of dengue cases despite numerous efforts to reduce dengue transmission. The availability of a safe and efficacious vaccine is regarded as the key to effective dengue control. Eradication of dengue would require vaccination of a significant proportion of the population. Hence, apart from being safe and effective, the vaccine has to be affordable for it to reach a wider population. This paper aims to estimate the cost-effective price of vaccine by means of a pharmacoeconomic model developed by linking a dengue transmission model with a vaccine pricing mechanism. The dengue transmission model is formulated based on SIR model with the addition of a vaccinated human compartment. The vaccine pricing mechanism is based on incremental cost-effectiveness ratio (ICER), which involves both the disability adjusted life years (DALY) and economic burden of dengue in Malaysia. Simulation results indicate that the greatest possible reduction in dengue cases, DALY and economic burden are 78.99%, 55.4% and 53.58%, respectively by vaccinating 100% of 9–45 years old human before the disease onset and with vaccine efficacy of 80%. Based on the cost-effectiveness analysis results, we recommend a highly cost-effective and affordable vaccine price threshold of USD5 per dose for Malaysia.

## AM16-Paper ID: 0091

# Modeling Sea Level Rise Impact on Coot Bay Hammock, Florida Everglades

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**Abstract.** The low-lying Florida Everglades ecosystem maintains a delicate balance of freshwater and seawater interactions and is particularly vulnerable to the impacts of climate change and accelerated sea level rise (SLR). The associated increase in surface seawater inundation and subsurface saltwater intrusion will reduce the availability of fresh groundwater. This would pose a risk to the Floridan surficial aquifer, which provides potable water supply for millions in the state of Florida. The increased levels of salinity and decreased freshwater inputs will also alter coastal ecosystems by facilitating the establishment and encroachment of plants with higher salinity and flooding tolerance. In the Florida Everglades, coastal hardwood hammocks are particularly vulnerable to saltwater intrusion induced by SLR. This paper aims to project a possible change in the Coot Bay Hammock of Florida Everglades subject to gradually rising sea level. For this purpose, the simulation model MANTRA, developed by coupling the vegetation model MANHAM and the groundwater flow and solute transport model SUTRA, is enhanced and applied. MANTRA is able to simulate the existing vegetation zonation pattern at a transect of Coot Bay Hammock. Model simulation reveals that SLR would induce the displacement of the salinity-intolerant hardwood hammocks by the salinity-tolerant mangroves. This highlights the need to conserve and sustain the South Florida's coastal ecosystem in the face of climate change and SLR.

## AM17-Paper ID: 0095

# Refinement of SOR Method for the Rational Finite Difference Solution of First-Order Fredholm Integro-Differential Equations

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**Abstract.** As it is known, the linear rational finite difference (LRFD) method has the advantage of its excellent stability, and the Successive Over-Relaxation (SOR) method has the advantage of fast convergence rate due to the flexible choice of parameter. In this paper, in order to make full use of the advantages of LRFD and SOR methods, the composite trapezoidal (CT) quadrature scheme is combined with the 3-point linear rational finite difference (3LRFD) method (CT-3LRFD) to discretize the first-order linear Fredholm integro-differential equation and produce the approximation equation. Furthermore, the SOR method is extended to be the refinement of Successive Over-Relaxation (RSOR) method which then used to solve the numerical solution of the generated linear systems. At the same time, for the sake of comparison, the classical Gauss-Seidel (GS) and Successive Over-Relaxation (SOR) methods are also introduced as the control method. In the end, through several numerical examples, the three parameters of the number of iterations, the execution time and the maximum absolute error are displayed, which fully illustrate that the RSOR method is competitive with existing GS and SOR methods in solving large dense linear system generated by the CT-3LRFD formula.

## AM18-Paper ID: 0097

# Redlich-Kister Finite Difference Solution for Two-Point Boundary Value Problem by Using MKSOR Iteration

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**Abstract.** In this study, two-point boundary value problems (BVPs) have been considered and discretized by using the second-order Redlich-Kister Finite Difference (RKFD) discretization scheme in order to get a large-scale and sparse linear system. In the process of obtaining the linear system, firstly we propose the second-order RKFD discretization scheme and then discretize all derivative terms of the proposed problems for the derivation of the corresponding second-order RKFD approximation equation. Due to the generation of a large-scale linear system, the iterative methods namely Gauss-Seidel, Kaud Successive Over Relaxation and Modified Kaud Successive Over Relaxation (MKSOR) iterative method had been chosen in this study to get the Redlich-Kister solution. For the sake of comparison, these iterative methods have been tested for solving three examples in which all numerical results obtained have been recorded based on three measurement parameters such as number of iterations (Iter), execution time (Time) and maximum error. The combination of MKSOR iteration method with RKFD discretization scheme was found to be superior compared to other iterations.

## AM19-Paper ID: 0099

# The Stability and Hopf Bifurcation Analysis for the Delay Diffusive Neural Networks Model

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**Abstract.** In this paper the semi-analytical solution is investigated for the delayed diffusive neural network model. Delay partial differential equations are approximated to the delay ordinary differential equation systems, by using Galerkin technique method. The main aim of this work is to determine the effect of diffusion and delay parameters and exploring the full map of stability analysis of the system. Stability analysis and bifurcation maps are discussed, as well, and in order to further explain certain concepts. The effect of diffusion parameter and delay values is comprehensively studied and as a result both variables can destabilize or stabilize the system. Illustrated examples of the unstable and stable limit cycles, and the Hopf bifurcation points are shown to prove the formerly revealed outcomes in the Hopf bifurcation map. In addition, comparisons between the numerical results and semi-analytical outcome provide comparison for all figures shown in the work.

## AM20-Paper ID: 0106

# Numerical Solution of Linear One Dimensional Fisher's Reaction Diffusion Equations by Finite Difference Methods

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**Abstract.** An algorithm for approximating solutions of one dimensional (1-D) Fisher's reaction diffusion equations (FRDE) with Dirichlet boundary conditions by using explicit and implicit finite difference methods (FDMs) is utilized. FRDE is an equation that describes a balance between linear diffusion and nonlinear reaction terms. Matrix operation is used throughout the process of obtaining the approximate solution. The domain of FRDE is discretized by using explicit Forward Time Central Space (FTCS) and implicit Crank-Nicolson schemes. Numerical comparisons with analytical solution are also presented to determine the accuracy of the proposed schemes on FRDE. All numerical computations are performed using MATLAB programming. Von Neumann is used to analyse the stability of the proposed scheme. From our results, we have found that the solution of the Crank-Nicolson approach to linear FRDE is more desirable because it is unconditionally stable and can solve problems without limiting the time-step.

## AM21-Paper ID: 0110

### Constrained Curve Interpolation in 3D

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**Abstract.** The interpolation of parametric space curves with planes as constraints is considered. For an ordered set of spatial data points and a set of constraint planes, given that the polyline connecting the data points does not intersect the constraint planes, a smooth interpolant which avoids the constraints with  $G^1$  continuity is desired. The constraints considered are infinite and finite planes while the interpolation method used is rational cubic Bézier. The shape of the curve is manipulated by modifying the weights of rational cubic Bézier on the data points. Two weight modification methods are considered and compared to find the best method that produces a smooth interpolant.

## AM22-Paper ID: 0112

### Optimal Performance Evaluation Metrics For Satisfiability Logic Representation in Discrete Hopfield Neural Network

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**Abstract.** The performance measures and the quality assessment of the solutions for Satisfiability logic in Discrete Hopfield Neural Network (DHNN) are significantly dependent on the selection of the optimal performance evaluation metrics. The current performance measures were mostly leveraging the computational time, absolute error, mean squared error, and goodness of fit measures. To assess the learning capability of a neural network model, the optimal performance metrics are adopted in measuring the quality of the solutions and interpretations obtained by the network especially when dealing with the different number of clauses of Satisfiability logic. The core impetus of this study is to investigate the effects of various performance evaluations metrics towards the model's performance based on the learning error, similarity analysis, and energy analysis. Overall, the simulation results similarity analysis for  $k$ Satisfiability logic in Discrete Hopfield Neural Network, when  $k = 3$  with different complexities. This finding will reveal the ideal performance metrics that comply with Satisfiability logic and neural network model evaluation.

## AM23-Paper ID: 0115

### Forecasting Total Suspended Solid Using Wavelet ARIMA Model

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**Abstract.** By using wavelet and Python coding, we predict the amount of total suspended solid (TSS) in Cikapundung River in time series manner. We have TSS dataset in Cikapundung River from 2017 to 2018. The dataset will be used for make a model from Total Suspended Solid that depend on time. Wavelet transformation is used for scaling and determining the frequency from the TSS dataset. The result of the transformation can be use as input for ARIMA model. Model from wavelet ARIMA is good enough for forecasting TSS in Cikapundung River.

## AM24-Paper ID: 0121

### Order Seven Block Integrator Method for the Solution of First Order Ordinary Differential Equation

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**Abstract.** This research presents the derivation and implementation of an order seven block integrator for solving first order ordinary differential equations using interpolation and collocation techniques. The approximate solution is a combination of power series and exponential function to create a continuously implicit linear multistep method. This study further investigates the properties of the block integrator by adapting the expansion technique using Taylor series and determines that the properties are zero-stable, consistent, convergent as a result of Dahlquist theorem and region of absolute stability. Following this, the block integrator is then tested on two applications, namely the stiff equation and mixture model. From the results, it is evident that the order seven block integrator method gives better approximation than the order four, five and six block integrator based on comparison with the exact solution.

## AM25-Paper ID: 0123

# Optimal Sinusoidal Submerged Breakwater for Coastal Protection

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**Abstract.** In this paper, we investigate the wave damping mechanism by sinusoidal submerged breakwater using a half-linear Shallow Water Equations (SWE). We solve the equations analytically using the multi-scale expansion method to obtain the wave elevation profile over a breakwater with specific height and length. Then, to get information about how much damping caused by the breakwater, we derived the analytical solution to obtain the wave reflection and transmission coefficient. Furthermore, we also solve the SWE numerically using the staggered finite volume method. Moreover, the effectiveness of a sinusoidal breakwater as coastal protector is observed from the value of the transmission coefficient  $K_t$ , that is the ratio between the transmission and the incoming wave amplitude. Hence, a smaller value of  $K_t$  implies larger reduction on the wave amplitude. For validation, we compare the numerical  $K_t$  result with the analytical  $K_t$ . Furthermore, the result of this paper will be useful to construct the effective breakwater for coastal protection.

## AM26-Paper ID: 0127

# A Simple Mathematical Model Simulating Individual Weight Based on Daily Diet Menu

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**Abstract.** The weight loss occurs if we eat fewer calories than we burn. The rate of burn calories depends on both metabolism and body composition. This paper discusses the dynamics of weight loss by regulating caloric intake. Therefore, it is necessary to prepare a daily diet menu based on caloric intake. Calories required by each range from 2000-2500 kcal. We propose a simple mathematical model used to simulate the individual weight change to understand the influence of menu recommendation for individuals to lose or gain weight. We develop one dimensional differential equation of weight change and linear programming for the menu schedule. The weight change model is constructed using the concept of energy balance equation between energy intake and energy expenditure. Linear programming is applied to select the diet menu for breakfast, morning tea, lunch, evening tea and dinner with noticed aspects include the total calories and nutritional components (carbohydrates, protein, fat, and fiber).

## AM27-Paper ID: 0136

# Mathematical Analysis of a COVID-19 Compartmental Model with Interventions

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**Abstract.** Mathematical models of the COVID-19 pandemic have been utilized in a variety of settings as a core component of national public health responses. Often based on systems of ordinary differential equations, compartmental models are commonly used to understand and forecast outbreak trajectories. In view of the primarily applied nature of COVID-19 models, theoretical analysis can provide a global and long-term perspective of key model properties, and useful insights about the infection dynamics they represent. This work formulates and undertakes such an investigation for a compartmental model of COVID-19, which includes the effect of interventions. More specifically, this paper analyzes the characteristics of the solutions of a compartmental model by establishing the existence and stability of the equilibrium points based on the value of the basic reproductive number  $R_0$ . Our results provide insights on the possible policies that can be implemented to address the health crisis.

## AM28-Paper ID: 0137

# Numerical Resolution of the Electrical Impedance Tomography Inverse Problem with Fixed Inclusions

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**Abstract.** Electrical Impedance Tomography or EIT is an imaging technique that reconstructs the conductivity distribution in the interior of an object using electric currents. In this paper, we study the continuum model for EIT in a domain where the geometric inclusions are fixed and only the conductivity values inside these inclusions are unknown. We show analytically and numerically how the Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm, a quasi-Newton method, can be effective in solving this inverse conductivity problem for EIT.

## AM29-Paper ID: 0138

# Methods and Comparisons for Computing the Zeros of the Ahlfors Map for Doubly Connected Regions

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**Abstract.** The Ahlfors map is a conformal mapping function that maps a multiply connected region onto a unit disk. It is a generalization of the Riemann map for a simply connected region. It is known that the Ahlfors map can be written in terms of the Szegő kernel. The Szegő kernel plays an important role in conformal mapping and satisfies a boundary Kerzman-Stein integral equation. The zeros of the Ahlfors map are basically the zeros of the Szegő kernel. The exact zeros of the Ahlfors map are unknown except for the annulus. For general doubly connected regions, the zeros must be computed numerically. This paper presents some numerical methods of computing the zeros of the Ahlfors map for doubly connected regions with smooth boundaries. A numerical example and comparisons are also presented.

## AM30-Paper ID: 0141

# Kinetic Modelling of Alkaline Leaching of Thorium Hydroxide (Th(OH)<sub>4</sub>) from Monazite

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**Abstract.** The thorium concentration in monazite can be as high as 6-15 wt. % and it has the potential to be used in the nuclear power system as a fuel. Thorium is predominantly present in the form of thorium orthophosphate (Th<sub>3</sub>(PO<sub>4</sub>)<sub>4</sub>) along with the other rare-earth phosphates [Ce, La, Nd, Pr, Sm (PO<sub>4</sub>)] in the monazite mineral. The alkaline decomposition method was applied for leaching out thorium (Th) from monazite. In this study, the effect of monazite particle size (75, 150, and 250 μ) and leaching temperature (373, 393, 423, and 453 K) on the kinetics of thorium leaching were investigated using MATLAB software based on the rates of mass transfer, heat transfer, and chemical reactions. The model developed based on shrinking core model (SCM) for isothermal condition to evaluate the rate of thorium leaching from monazite. Based on the simulation results, the particle size has a more significant effect on the thorium leached than leaching temperature. About 90% of Th fraction was leached after 35 min at the maximum leaching temperature of 453 K for 75 μm particle size, while it takes longer time for 125 and 350 min for a 150 and 250 μm particle size, respectively. In general, the model followed a similar trend for all the leaching temperatures with a considerable increase in leaching time for larger particle size.



## AM31-Paper ID: 0142

# Dynamics of an IS-LM Macroeconomic Model with Delay-Dependent Coefficients

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**Abstract.** In this paper, we propose and analyze an IS-LM macroeconomic model with delay-dependent coefficients. The model assumes that the tax revenues have two complementary components, one based on the current income and the other on a past income where the fixed discrete time delay arises. Moreover, we assume that the tax share on each component depends on the time delay, and thus the resulting model is a system of delay differential equations with delay-dependent coefficients. Previously, De Cesare and Sportelli (2005) studied a similar model but the tax shares that they used were fixed constants. They showed that the equilibrium point may undergo a sequence of alternated stability switches. This can be observed for example in the case with low tax rate and low share of delayed tax revenue where loci of Hopf bifurcation points form closed curves with some of these curves overlap, and the equilibrium is unstable inside these loci. Our proposed model introduces a new parameter  $\mu$  in the tax share terms, and the case where  $\mu = 0$  captures the previously studied model with constant tax shares. We showed that increasing this new parameter results to decoupling and shrinking of the 'islands of instability', and eventually results to the absolute stability of the equilibrium.

## AM32-Paper ID: 0147

# Intelligent Fuzzy Logic Controller for Painting System of Vessel

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**Abstract.** The most effective way to keep the operating costs to a minimum is controlling corrosion and fouling by painting the vessel and doing a regular maintenance. The quality of the painting is significantly influenced by various inspection and evaluation. The quality of painting depends on Coating, Thickness and Gloss. This paper addresses fuzzy logic control (FLC) approach to measure quality-painting jobs for vessels. Fuzzy Logic Toolbox of MATLAB aids the development of FLC.

## AM33-Paper ID: 0148

# Effects of Competitor Species Growth Rate on Species Biodiversity

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**Abstract.** Due to various factors, biodiversity is under severe threat, and these forces include multiple complex interactions within the ecosystem. Nature consists of different kind of interacting species, thus how the presence of a competing species with varying growth rates ability impacts the other interacting species has remained unexplored in the ecological literature. To investigate the effects of the varying growth rate of competitor species and its interactions with other biotic factors, we revisit a simple multi-species ecological model and analyse the model with the techniques of modelling and dynamical systems. We present some findings concerning how the changing level of the growth rate of competitor species affect multi-species community dynamics. We observe the emergence of transcritical, Hopf and limit point bifurcations in this model. Each of these bifurcation points affects species composition (presence-absence) in the ecological system. For example, transcritical bifurcation triggers the extinction of species and acts as an invasion boundary in the ecological system. Limit point is where the two equilibrium meets and annihilate each other in the system, and often catastrophic ecological observation occurs beyond this point. Hopf bifurcation induces oscillatory behaviour in the ecological system as species population densities fluctuate from some minimum to maximum population densities as time progress. These types of oscillatory dynamics can pose a significant danger to species diversity in this ecological system as it leads to the extinction of species in some cases.

## AM34-Paper ID: 0154

# Solving Nonlinear Burgers' Equation with Semi-Approximate Approach Using Modified Gauss-Seidel Iteration

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**Abstract.** The main purpose of this article is to investigate the formulation and implementation of Modified Gauss-Seidel (MGS) iteration using semi-approximate approach to solve the one-dimensional (1D) nonlinear Burgers' equation. To do that, this problem needs to be discretized by using the second-order implicit finite difference scheme and the semiapproximate approach in order to get the second-order semi-approximate implicit approximation equation which leads to a sparse and huge scale linear system. Then, this linear system has been solved via the proposed MGS iteration. Four examples are presented to analyze the performance of MGS iteration. Then numerical experiments have been carried out on four examples of problems to verify the performance of MGS iteration.

## AM35-Paper ID: 0159

# Stocks Clustering with Fourier Transformation Towards Indonesian Stocks for Pairs Trading and Investment Diversification

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**Abstract.** Pairs trading is a relative new investment strategy that uses two stocks with similar characteristics. In this study, we shall implement Fourier transformation on stocks registered on Indonesia's Stock Exchange. Those transformed prices will be clustered using K-Means clustering. The created clusters may aid investors in choosing pairs for pairs trading strategy. We observed that the Fourier transformation is capable of clustering stocks based on their price movement. However, the method is not suitable for diversifying investments and choosing the best trading pairs. The incompatibility is caused by non-mean-reverting characteristics.

## AM36-Paper ID: 0171

# Traffic Simulation Using Agent Based Modelling

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**Abstract.** This paper studies two different models of agent-based modelling in simulating an urbanized city transportation network under various conditions and situations. Urbanized city traffic requires consideration of wide mobility modes to better represents the impact of certain real-life situations. Agent-based modelling with powerful modelling and simulation platforms offers an amazing framework to fulfil the needs of modelers to study from nanoscopic to macroscopic phenomena. Over the years, many platforms have been developed to cope with the need of simulating more complicated agent-based model which involves high-level programming skills and models that need to be constructed from scratch. With GAMA (GIS & Agent-based Modelling Architecture), an open-source (GPL) tool that allow modelling of real-life situation with a simpler framework, simulating the urban traffic involving the area around Universiti Sains Malaysia (USM).

## AM37-Paper ID: 0173

# Compact High-Order Implicit Iterative Scheme for the Two-Dimensional Time-Fractional Diffusion Equation

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**Abstract.** In this paper, a compact high-order implicit scheme is presented for the solution of the two-dimensional time-fractional diffusion equation. The Caputo fractional derivative and compact implicit scheme are used for the time and space derivatives respectively. The convergence of the proposed scheme will be shown to be  $O(\tau^{2-\beta} - h^4)$ , where  $\tau$ ,  $\beta$  and  $h$  are representing time step, fractional-order and space step respectively. Finally, some numerical examples are provided, which shows the accuracy of the proposed scheme.

## AM38-Paper ID: 0184

# Power of Frobenius Endomorphism

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**Abstract.** Let  $E$  be a Koblitz curve defined over  $F_{2^m}$  and the mapping  $\tau$  is a Frobenius endomorphism from the set  $F_{2^m}$  to itself. This is a special curve whose  $\tau$  has been used to improve the calculation performance of its scalar multiplication,  $nP$  where  $P$  is a point through the curve  $E$ . Previous research has found that the power of Frobenius endomorphism ( $\tau^m$ ) plays an important role in developing algorithms for division an integer  $n$  in the ring of  $Z[\tau]$ . In this paper, we provide new algorithm where  $\tau^m$  is generated based on sequences of arithmetic and  $v$ -simplex.

**AM39-Paper ID: 0189****Mathematical Modeling of Quasi-Static Signal and Ligand During Invadopodia Formation with Velocity Jump**

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**Abstract.** Cancer cell invasion in the metastasis process contributes to the high death cases among cancer patients. The spread of a tumor from one location to the other part of the body is as a result of the existence of finger-like protrusions or invadopodia on the plasma membrane. On the biological view, the formation of invadopodia involves several processes that include the activity of matrix metalloproteinase (MMP) in degrading the extracellular matrix (ECM), the creation of ligand, stimulation of signal from the binding of a ligand with epidermal growth factor receptor (EGFR), up-regulation of MMP, and actin polymerization. The purpose of this study is to investigate the appearance of invadopodia on the plasma membrane through the mathematical modelling of quasi-static signal and ligand. The method of level set is emphasized to detect the movement of the moving interface (plasma membrane) by setting the interface as the zero level set function. Also, the regular and neighboring points are solved using secondorder centered difference and ghost fluid with linear extrapolation method, respectively. The velocity is solved using the difference of gradient between the intracellular signal and extracellular ligand that consequently moves the interface. Results showed that the protrusions or invadopodia are formed on the plasma membrane with the aid of the above-mentioned methods.

**AM40-Paper ID: 0190****Quadrature-Piecewise Collocation Solutions to the Fredholm Integral Equation of II Kind Using ESOR iteration**

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**Abstract.** The Fredholm integral equations (FIEs) II kind describe as the most versatile areas of study in history in which being utilized in various fields such as biology, chemistry, engineering, mathematics and physics. Thus, several numerical methods have been imposed to discretize the mentioned equations in order to get their corresponding approximation equations. In this article, the first-order piecewise polynomial collocation scheme and first-order Quadrature method have been put in order to derive the first-order quadrature-piecewise collocation approximation equation via the discretization process. The approximation equation eventually developed a dense linear system. To get the quadrature-piecewise collocation solution of this linear system, we also ascertain the performance of Extrapolated Successive Over-Relaxation (ESOR) iterative method applied to this dense linear system. Therefore, the formulation and application of iterative methods as described are also presented. Based on the numerical computational derived from the first-order quadrature-piecewise collocation approximation equation, it shows that ESOR iteration has significantly least computational efforts in terms of number of iterations and CPU time when compared with Gauss-Seidel (GS) and Successive Over-Relaxation (SOR) iterative schemes.

## AM41-Paper ID: 0191

### Scaled Parallel Iterative Method for Finding Real Roots of Nonlinear Equations

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**Abstract.** Given a nonconvex minimization problem where the objective function is nonlinear and twice differentiable. To gain more information about the objective function, it is essential to obtain all its stationary points and study the behaviour of these points. Since many nonlinear functions are expressible as polynomial via interpolation, there is a need to devise fast and accurate algorithms to find the root(s) of the interpolating polynomial. Through interval computation, the Weierstrass-like parallel iterative methods are known for their efficiency in finding polynomial zeros. However, these schemes are highly dependent on the midpoints of each interval in generating successive intervals. In this study, we propose an adaptive scaling function on some Weierstrass-like parallel iterative methods such that the procedures are less dependent on the generated midpoints, hence allowing more efficient search for the zeros while reducing the width of the intervals. The proposed procedures with the shifted centers of the enclosing intervals are tested on 120 problems and we compare their efficiency with the existing Weierstrass-like methods in terms of the number of iterations and the largest final interval width. The results indicate that the proposed procedures outperform the original procedures, giving more reduction on the final interval width with lesser number of iterations.

## AM42-Paper ID: 0104

### Analysis and Numerical Solution of Fractional Order Control of COVID-19 Using Laplace Adomian Decomposition Method

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**Abstract.** Rapid transmission of the novel coronavirus and its resulting condition has caught most countries of the world off-guard. This work develops a fractional order model with seven compartments to describe the transmission and effects of control strategies of coronavirus. The Caputo fractional derivative operator of order  $\alpha \in (0,1)$  is applied to obtain the scheme of fractional differential equations (FDEs) of the model. The stability analysis is carried out and non-negative unique solution within the domain is verified. Laplace–Adomian Decomposition Method is applied to work out an approximate solution of the FDEs. The solution of the FDEs in the form of infinite series is obtained. The obtained results are compared with the differential transform method case, which converges rapidly to its exact value. Numerical simulations are presented to show the reliability and simplicity of the method.

## FM01-Paper ID: 0024

### Study of Bitcoin Volatility Dynamics: MSGARCH Model Approach

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**Abstract.** This paper investigated the existence of structural break and impact of Gold and Platinum value on Bitcoin value. We also examined changes in the regime using three MSGARCH models, namely single-regime, two-regime, and three-regime, and compared their performances. We found the presence of break and significant impact of the Platinum value. Previous studies found that Gold has an impact on Bitcoin value, but empirically we could not find any. The two-regime MSGARCH model performs well among three models, and there is evidence of low volatility and high volatility regime. The out-of-sample forecast performance is almost same in the three models. In the long run, the presence of low volatility regime is more prominent than the high volatility regime.

## FM02-Paper ID: 0037

### Literature Study on Sharia Mathematical Finance

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**Abstract.** This study purpose to discuss sharia mathematical finance literature. Based on IFCI report, Islamic banking and finance are growing in popularity and will continue growing in the future. Hence, it is important to continue to develop our knowledge in this regard. There several Islamic financial instruments that we discuss from previous studies in this paper, those are profit-loss sharing, shariah insurance, sukuk, and Islamic option. We focus on studying them mathematically or what can be mathematically made to inspire our research in the future.

**FM03-Paper ID: 0047****Dynamics of Bank's Balance Sheet: A System of Deterministic and Stochastic Differential Equations Approach**

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**Abstract.** We study a system of deterministic and stochastic differential equations of a bank's balance sheet variables: deposits, loans, equity and liquid assets. The deposits and loans model are assumed to follow the logistic growth model with harvesting. The growth rate of equity is proportional with the bank's profit or loss, and it can be reduced by the non-performing loans factor. The liquid assets act as the balancing variables of the balance sheet. The stochastic model is presented with randomness that appeared in the deposits withdrawal and the non-performing loans parameters. The parameters in the deterministic model are estimated using spiral optimization algorithm employing the Indonesian banking data. The estimation results are quite well as shown by the errors between the data and the estimated model are really small. Using Euler-Maruyama method, the simulation of the stochastic model is also given.

**FM04-Paper ID: 0057****The Application of Simulated Annealing Method in Optimizing Profit-Loss Sharing Ratio with Vasicek Model**

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**Abstract.** Profit-Loss Sharing (PLS) model is one of sharia economic model based on revenue-sharing system in the Musyarakah contract, where both of involved parties, the investor and market trader, contribute the capital of business. The purpose of this research is to determine the optimal ratio (nisbah) of PLS so that both investor and the trader can get optimal profits. Firstly based on a quite few data of sales profits of traders in a traditional market in Indonesia, we need to generate more data using the Bootstrap method for the simulation of models of usurer and PLS from Sumarti (2015). These models also require a prediction of Bank Indonesia (BI) interest rates using Vasicek method. Having had the various simulations on MATLAB, the result of the PLS model shows that the investor's profit in PLS model is smaller than the profit of the usurer's profit, and the profit of the trader in PLS model is greater than the trader's profit in the usurer model. The optimum ratio of PLS based on the simulations using the existing data are from 0.0003 to 0.0191.



## FM05-Paper ID: 0068

### Implementation of Real Options with Learning Process on Bitcoin Mining Project

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**Abstract.** This paper develop an approach to evaluate Bitcoin Mining Project using Real Option Method. In evaluating a project not yet being run, there is opportunity made available to the manager of company to expand or abandon the project if some particular conditions would occur in the time period being projected. The methods are based on Binomial Tree with varying time of Learning Option. Having evaluated the project for five years, it concludes that the project with Real Option methods can increase the value of the project.

## FM06-Paper ID: 0076

### Optimal Portfolio Choices under the SVCEV Model with Exponential Utility

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**Abstract.** In this paper, we consider optimal portfolio choices under a hybrid model of stochastic volatility and constant elasticity of variance (CEV). The Hamilton-Jacobi-Bellman (HJB) equation is derived for the exponential (CARA) utility. Applying an asymptotic method, we obtain an explicit solution for the leading optimal strategy and the first correction term perturbed by an OU process. The leading term coincides with the classical Merton's strategy. Furthermore, we also get a practical asymptotic optimal strategy by considering the fact that the Ornstein-Uhlenbeck (OU) process is not observable. Finally, we conduct a sensitivity analysis on the leading optimal strategy and the first correction term against the excess return.

## FM07-Paper ID: 0088

# Investment Valuation and the Performance of Companies with Modified Internal Rate of Return: A Simulation Markov Chain

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**Abstract.** An investment is considered worthwhile if it generates value for its owners. Thus, it important for an investor to have a deeper look at their equity performance in the stock market to improve their investment decisions. Therefore, this study attempts to determine the required number of companies to evaluate the performance of a particular sector in the long-run using Markov chain simulations. Accordingly, two different performance metrics are applied to determine the sample size needed to perform the analysis. This study also aimed to assess the long-run performance of the Malaysian Industrial Product and Services sector (MIPS) based on the modified internal rate of return (MIRR) utilizing stock market data of 147 publicly listed companies in the MIPS sector over the period 2007 – 2018. The study applies a two-state Markov chain model, which are either Good or Bad states to estimate the transition probability matrix of the MIRR. The findings from this study indicate that one should have at least 37 companies to assess the performance of a particular sector in the long-run. Furthermore, the findings reveal that the MIPS sector has a good performance in the long-run over the study period with a probability of 50.6%. Finally, the findings from this study are useful for potential investors and the company's board to improve their future investment decisions.

## FM08-Paper ID: 0103

# Universal Portfolios Generated by the Reverse $f$ and Bregman Divergences

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**Abstract.** The Helmbold method of generating universal portfolios can be extended to a class of reverse  $f$  and Bregman divergences. The reverse Kullback-Leibler, chi-square and alpha-divergence universal portfolios and the corresponding Bregmandivergence universal portfolios are derived. The explicit form of the portfolio depends on the associated convex function generating the divergence. Some reverse-divergence universal portfolios have no explicit form implying that they cannot be used.

**FM09-Paper ID: 0158**  
**The Wavelet-Based Exchange Rate Exposure and  
Hedging Practices: An Application on Food and  
Beverage Firms in Malaysia**

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**Abstract.** The study intends to calculate multi-horizon exchange rate exposure of Malaysian food and beverage firms from July 2005 till August 2018 based on Wavelet technique and to find the effect of hedging strategies on the extent of exchange rate exposure for each time domain. To transform single domain time series to multiple domain time series, the study is going to use a special class of Maximal overlap discrete wavelet transformation (MODWT) approach which is called Daubechies least asymmetric wavelet filter. The outcome of the study highlights the novelty of wavelet technique in revealing time-frequency domain of currency exposure. It is found that there's multiscale tendency on the level of exchange rate exposure of food and beverage corporations across time scales. Specifically, higher level of exchange rate exposure is largely concentrated within widened interval. Further, the hedged firms exhibit lesser level of exchange risk compared to unhedged firms, signifying the important role of financial hedging in reducing foreign exchange risk. The output is highly useful for firm manager for timely optimal decision making in exchange risk management strategies.

**ME01-Paper ID: 0032****The Effectiveness of Multimedia Elements Integrated into Calculus Learning Using BasiCal Mobile Application**

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**Abstract.** Calculus is one branch of mathematics which is not something that students can easily learn. The BasiCal mobile application is a mobile application that provided two topics in Calculus which is Function; and Limits and Continuity. The BasiCal mobile application was designed and developed by authors to transform the learning method from conventional to digital by using multimedia elements such as audio, text, interactivity, and graphics. The purpose of multimedia elements used is to make Calculus learning more interesting and motivate students to learn. This study was designed to investigate the effectiveness of the BasiCal mobile application which was conducted on 40-degree students at a private university in Malaysia. The sample is divided into two groups which are the experimental group and the control group. The students of the experimental group were exposed to learn through the BasiCal mobile application, while the students of the control group were exposed to learn through the conventional teaching method. This study is using pre-test and post-test as the instruments to examine the students on selected topics in Calculus before and after teaching sessions. The result shows that the achievement of the BMA group of students who use multimedia elements in the BasiCal Mobile Application is more effective than the achievement of the CTM group of students who use conventional methods in calculus learning. It was found that learning Calculus with multimedia elements integrated using mobile applications is beneficial to students as a learning tool in this age of technology.

**ME02-Paper ID: 0065****Learning and Facilitating the Form 6 Topic of Limits and Continuity with the Graphing Calculator**

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**Abstract.** This study was conducted to discover the effectiveness of using the graphing calculator in learning Limits and Continuity for Form Six students. In this study, 40 Form 6 science stream students from two schools in Seberang Perai Tengah, Penang were selected to form a sample for the study. A pre-test and post-test were carried out before and after the learning and facilitating process (PdPc) with the aid of the graphing calculator for the topic of Limits and Continuity. At the end of the PdPc session, the students were given a questionnaire to discover their perceptions, namely their attitudes and interests in using graphing calculators to learn Calculus. Based on the results of the score analysis from the pre-test and post-test, it showed that the students' achievements in the post-test were better than their achievements in the pre-test. Results from the paired *t*-test showed that there was a significant difference between the mean of the pre-test scores,  $\mu_1$ , and the mean of the post-test scores,  $\mu_2$ . Through the findings of the questionnaire, it was clear that most students had a positive perception towards learning calculus with the use of graphing calculator.

## ME03-Paper ID: 0083

# Students' Performance and Perception in Solving Sentence-form Mathematical Problems Through Multimedia Usage in Google Classroom

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**Abstract.** This research aims to test the effectiveness of multimedia usage in Google Classroom as well as to attract students' interest in solving mathematical problems in sentence form on Progression. The samples of this study consisted of 42 Form 4 students taking Additional Mathematics at Sekolah Menengah Kebangsaan Datuk Abdullah, Kota, Negeri Sembilan. This was a quantitative study using the pre-experimental design whereby only one group of samples was studied. The *t*-paired sample test was used to observe the existence of significant differences between the mean scores of the pre-test and post-test which was analyzed using version 24 of the Statistical Package for Social Science (SPSS). The second instrument for this research was a questionnaire form where the responses were analyzed using SPSS as well. The analysis on the pre-test and post-test scores showed that there was an increase in students' achievements in the topic of Progressions after the treatment. Furthermore, based on the analysis of the questionnaire, it was found that students' attitudes and interests towards learning the topic of Progression had improved with the use of multimedia technology through Google classroom.

## ME04-Paper ID: 0122

# Linear Algebra and Robotics in the Teaching Process

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**Abstract.** This article presents a novel technique to attract the attention of students when they must learn linear algebra concepts such as matrix multiplication, adjoint, inverse matrix and linear transformation (rotation in R<sup>2</sup>) in the lower levels at university. We add a didactic component that consists in a flat surface, a cardboard robotic arm that is operated by manipulating syringes and some cubes with letters of the alphabet. First the student will decode a delivered message. Then, the student will move the robotic links and gripper to bring the letters of the message to the marked area. In the end, we compared the time spent by the students doing this circuit. The added didactic component allows the students to get out of the routine, carry out healthy competition with their classmates and increase their interest in the subject. This project was presented at the Second Exact Sciences Fair of the Universidad de las Fuerzas Armadas Espe Sede Latacunga, winning first place.

**ME05-Paper ID: 0143****Implementation of Computational Thinking and Ignatian Pedagogy in Geometry Subject for Elementary School Pre-Service Teachers at Sanata Dharma University**Christiyanti Aprinastuti<sup>1,a)</sup><sup>1</sup>*Sanata Dharma University, Yogyakarta, Indonesia*<sup>a)</sup>christiyantia@gmail.com

**Abstract.** This study aims to describe the implementation of Computational Thinking in the flipped classroom in the Geometry course based on Ignatian Pedagogy for prospective elementary school teachers at Sanata Dharma University. The research method used is descriptive. The research subjects were prospective students of SD Sanata Dharma University class 2017. The data collection techniques used were observation, interviews, and documentation. The data were analyzed by using qualitative and quantitative analysis. The conclusion of this research is that the implementation of flipped classroom is carried out by learning steps, namely (1) context, (2) experience, (3) action, (4) evaluation, (5) reflection. In this step there are also 4 aspects of Computational Thinking that are developed, namely (1) decomposition, (2) pattern recognition, (3) abstraction, (4) algorithm. The results of the learning reflection show the response that students like the learning design.

**ME06-Paper ID: 0174****Inculcating Creativity with Graphing Calculator**Jeyaletchumi Muthiah<sup>1,a)</sup>, Munirah Ghazali<sup>1,b)</sup> and Chew Cheng Meng<sup>1,c)</sup><sup>1</sup>*School of Educational Studies, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia*<sup>a)</sup>jeyaletchumimuthiah@gmail.com, <sup>b)</sup>munirah@usm.my, <sup>c)</sup>cmchew@usm.my

**Abstract.** Students in general and middle school students in particular, appear to be well versed on the latest gadgets and games. However, when it comes to using educational tools to learn mathematics, science and technology concepts they seem to face many difficulties in connecting the technology to the learning of concepts. Therefore, there is an urgent need for educators to make the most out of these pedagogical technologies that is readily available for classroom use. Technology is also an avenue that can help teachers to engage their students in activities that will benefit their learning. Most importantly, technology creates ways for students to analyse and understand the world around them. Thus, students were given a task that requires them to produce a creative design with mathematical equations incorporating the mathematical learning tool graphing calculator. The amazing experiences with the use of TI 84 Plus CE graphing calculator will create an awareness that Graphs of Functions is around us all the time.

## MT01-Paper ID: 0059

# BasiCal Mobile Application Development Using Multimedia Element's Adoption on Basic Calculus Teaching and Learning

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**Abstract.** The challenge on teaching and learning Calculus could be viewed into the number of issues such as teacher's lack of creativity, traditional method adoption, and complicated illustration. The need to adopt the innovative and strategic method to help teaching and learning (T&L) on Calculus in university should be taken into consideration in serious concern. This article attempts to elaborate the mobile application development of Calculus learning called BasiCal using multimedia element's adoption. Through presenting the method on understanding Calculus in this study, descriptive analysis was conducted in ensuring the entire process on the planned stage. The findings revealed that developing mobile application of illustrative Calculus T&L would give insightful value to the entire process in raising the joyful environment to foster the understanding level on absorbing the Calculus learning. This study is expected to contribute the interest stage in learning Calculus in university with making interactive multimedia media. The mobile application development of interactive multimedia learning media will be useful to foster student learning interest and make it easier to understand Calculus learning materials.

## MT02-Paper ID: 0150

# Solving Sparse Reward Games Using Deep Q- Learning with Demonstration and Partial Training

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**Abstract.** Games that has a sparse reward space are considered a challenge in the field of deep reinforcement learning. Such games are impossible to tackle with a random exploration commonly used in early stages of learning process. We present a modified Deep Q-learning architecture, as well as some small modifications to perform better in this sparse reward games. We also introduced partial training, a policy improvement technique for neural network that kickstarts an agent to get rewards faster in games with sparse rewards. We apply our methods to 2 games with varying difficulty. The results indicate that our agent learns faster and performs significantly better compared to classical Deep Q-Learning. We further shows that combined with partial training, Deep Q-learning is viable to even solve games with really sparse reward.

# MS01-Paper ID: 0125

## Analytical Network Process Based Representation Operations on Triangular Fuzzy Numbers for Supplier Selection Decision

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**Abstract.** For decades, the supplier selection decision problem remains as one of the major concerns for many organizations worldwide. Currently, the existing methods are too complex and time-consuming for the organizations to determine the best suppliers for them. Thus, this paper aims to utilize the analytical network process (ANP) based on presentation operations to address this issue. The method was equipped with the so-called graded mean integration of multiple operations and canonical representation on triangular fuzzy numbers (TFNs) via pairwise comparison evaluations. It employed six comprehensive procedures to analyze the problem related to supplier selection. Then, the total scores were attained directly to derive the global weights of each alternative before performing the rating process. To show the feasibility of the proposed method, a numerical example was adopted via a case study. From the calculation results, it shows that both presentation operations equipped in ANP were very beneficial in terms of process simplicity and time consumption, without losing any information. These benefits can be easily understood especially when the evaluation involves a huge number of criteria and sub-criteria via a pairwise comparisons process. Thus, not only did this method make supplier selection decision-making process to be less complex, it was also able to reduce the time consumption.



**MS02-Paper ID: 0149****A Dynamical Model of Dengue Primary and Secondary Infections with an Application to Microinsurance**

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**Abstract.** Dengue is a contagious viral disease that has a potential risk to insurance industries due to the increasing number of incidence cases worldwide. Global warming has brought dengue vectors to new places. Dengue disease can strike a person more than once, and the secondary infection is potentially more severe (and costs more) than the primary one. Knowing the numbers of both primary and secondary incidence cases will help insurance industries do a precise calculation on the potential loss. Unfortunately, in most countries, only the total number of cases (undifferentiated) is recorded nationwide. Dengue secondary infection is caused by DENV serotypes that are different from those that caused the first infection. Thus a reinfection model such as an ordinary SIRS model is not realistic since it assumes that both primary and secondary cases have the same infection rate. Therefore, this paper extended the existing dengue infection model to incorporate a more realistic example of secondary dengue infection and split the historical data on the total number of incidence cases into predicted numbers of primary and secondary infections. We utilized the Markov Chain Monte Carlo method to predict the model's best parameters and initial conditions. Taking Indonesia as a specific case of a country with a long and significant history of dengue infection, our simulation predicts an alternating seasonal event of both primary and secondary infections. We formulated an insurance model that includes the loss ratio, the medical inflation rate, and the insurance awareness factor. The computed numbers of primary and secondary infections were applied to this insurance model to calculate the net premium, which serves as a baseline number to the average per-person-cost of dengue diseases among the Indonesian population. The methodology presented here can be applied to other countries/regions to predict incidence cases based on different levels of severity.

**MS03-Paper ID: 0163****Multi-State Transition Model in Continuing Care Retirement Communities (CCRC): A Case Study**

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**Abstract.** The Continuing Care Retirement Communities (CCRC) concept is growing rapidly in the world with increasing number of older people in the population. The development of CCRC in Malaysia is still in its infancy, therefore, understanding the CCRC concept and its model could be helpful to provide an alternative residential living arrangement for the elderly in Malaysia. Transition probabilities are crucial in determining the monthly fee charged in the CCRC. In this paper, we conduct a case study and proposed a Markov chains method to determine the transition probabilities of the multi-state transition model for the CCRC based on U.S. data. Then we examine the pattern of the transition probabilities for this CCRC model and its relevancy for Malaysia.

**OR01-Paper ID: 0025****Valid Inequalities for the Capacitated Lot-sizing Problem in a Hybrid Manufacturing and Remanufacturing System (HMRS)**

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**Abstract.** This paper examines an existing model of capacitated lot-sizing problem in a hybrid manufacturing and remanufacturing system (HMRS), which falls under NP-hard problem. Three classical families of valid inequalities are proposed to solve this problem. The effectiveness and efficiency of the original and proposed formulations are tested using the same numerical example available in the literature along with new simulated data sets. The computational results show that the proposed approach provides better performance than the existing solution in terms of lower bounds obtained. Lastly, the concluding remarks and some future research directions are discussed.

**OR02-Paper ID: 0108****Optimisation of Traffic Signal Plan for Isolated Intersection Using Genetic Algorithm**

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**Abstract.** Traffic signals at a junction play an essential role in granting the right to proceed to different collections of nonconflicting vehicular movements according to different periods. Well-timed traffic signals are critical in providing smooth traffic flow. In this study, the ability of the Genetic Algorithm (GA) in the optimization of the traffic signal plan is investigated. The GA is implemented using Python Programming Language. Also, SUMO, a traffic simulation package is used to simulate the traffic scenario of the solution to calculate the mean time loss. The investigation on the efficiency of GA suggests that the selection fraction of 0.8 and the mutation rate of 0.75 are more efficient. Using these figures, GA is employed in finding the traffic signal plan for low, moderate and high levels of traffic demand. The results are compared with the algorithm based on Webster's formula. GA outperforms the traditional method based on Webster's formula. Also, GA performs the best at high level of traffic demand with 38.46% lower in mean time loss, followed by 37.41% lower and 3.48% lower at low and moderate traffic levels respectively.

## OR03-Paper ID: 0109

# Solving the Elevator Dispatching Problem Using Genetic Algorithm

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**Abstract.** The elevator dispatching problem is an essential real-life problem as more high-rise buildings such as office buildings and apartments are built in this modern era. All elevators are controlled by the Elevator Group Control System (EGCS) which can increase the level of service performance by minimizing passenger waiting time. The goal is to generate an optimized allocation of elevators to hall calls, which are passenger requests for an elevator. This study uses Genetic Algorithm (GA) implemented in MATLAB to solve the conventional single deck elevator dispatching problem. The objective function considered minimizes passenger waiting time. Two different procedures for Genetic Algorithm (Reference Genetic Algorithm and Common Genetic Algorithm) are compared in terms of passenger waiting time and computational time. The overall results show that Common Genetic Algorithm outperforms the Reference Genetic Algorithm in passenger waiting time and computational time.

## OR04-Paper ID: 0186

# Effective Route Analysis for Petrol Tanker and Optimization Using Dijkstra Algorithm and Arena Simulation at Petrol Station XYZ

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**Abstract.** A petrol station is a place or facility that sells lubricants oils for motor vehicles. The most common lubricants fuels sold are gasoline and diesel fuel. Fuel is one of the most widely used sources of energy. One main issue related to any oil industry is regarding to restock the fuel in petrol station because it is always depending on fuel from depot. In order to achieve the demands, petrol station XYZ need to reconsider the alternative road to compares the effectiveness in term of management and carbon emission reduction cost of petrol tank lorry from depot to Petrol Station XYZ. Next, another issue is improving the performance of the management in term of waiting time and service time for customers to refuel their cars. Customers' arriving, waiting, serving, and leaving time were recorded in two consecutive weeks for two different hours which is from 8.00 am to 10.00 am (normal hours) and from 2.00 pm to 4.00 pm (peak hours). The arrival, waiting, and serving time were recorded for two different type of payment method which are by cash or using card. Hence, in this study we implement Dijkstra Algorithm and Queuing Theory to solve the issue that raised. Simulation has been conducted using QGIS Software and results show that there is others alternative route that can be used to transfer the fuel from depot to petrol station. ARENA Simulation result help to understand the performance of petrol station XYZ. Result shows that average waiting time during peak hour is higher than normal hour due to probability of customers pay by cash is higher than using card and there is only one cash payment counter. This study can be use by the petrol station or related industry in order to minimize total cost and maximize profit.

## PM01-Paper ID: 0028

# An Application of Fourier Transform Through Matlab in Classifying Tempos

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**Abstract.** Mathematics is essential in life and its use can be seen in everything that involves numbers including in Digital Signal Processing (DSP). DSP is the process of analysing and modifying a signal so that its performance can be upgraded. This research is categorised under DSP because it involves the processing of audio music signals to obtain their respective tempos with the application of Fourier transform. Fourier transform is a mathematical algorithm that can break down a function into components of frequencies. The Fourier transform has the ability to convert time-domain signals of a music audio into frequency-domain signals and thus helps in producing the frequency spectrum needed to analyse the tempo of the music. In this research, Fourier transform was applied along with other signal processing functions such as filterbank, smoothing, windowing, differentiation and rectification to find the tempos of instrumental music excerpts from audio files in the .wav format. This research was developed to implement DSP with the aid of a Matlab program to obtain the tempos of music from a random selection of audio files involving several genres. In relation to this, it aimed to classify the audio files into slow and fast tempos to observe which audio music can promote relaxation (slow tempo) and whether it depends on the genre of music being listened to. This research was able to successfully process 40 audio files involving 5 music genres in the .wav format to obtain their respective tempos based on two parameters settings (60-150 BPM and 60-240 BPM) and classify them into two categories: the slow tempo (60 – 100 BPM) and fast tempo (> 100 BPM). By observation, it was found that all 5 genres contain at least one audio file with slow tempo which means that the relaxation state does not depend on the genre of music being listened to.

## PM02-Paper ID: 0030

# Note on Quartic Equations over $p$ -Adic Field $\mathbb{Q}_p$

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**Abstract.** In this paper, we refined the solvability conditions of the quartic equations of the forms  $x^4 + ax^2 + b = 0$  over the  $p$ -adic numbers fields  $\mathbb{Q}_p$ .

## PM03-Paper ID: 0039

# The Relation Between $\tau_n$ -Tilting Modules and $n$ -term Silting Complexes

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**Abstract.** In 2014, Adachi, Iyama and Reiten established a bijection between support  $\tau$ -tilting modules and two-term silting complexes in bounded homotopy category of finitely generated projective  $\Lambda$ -modules, where  $\Lambda$  is a finite dimensional  $k$ -algebra. In this paper, we define support  $\tau_n$ -tilting modules and generalise their results by establishing a bijection between support  $\tau_n$ -tilting modules and  $n$ -term silting complexes.

## PM04-Paper ID: 0045

# On the Number of Different Entries in Involutory MDS Matrices over Finite Fields of Characteristic Two

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**Abstract.** Two of many criteria of a good MDS matrix are being involutory and having few different elements. This paper investigates the number of different entries in an involutory MDS matrices of order 1, 2, 3, and 4 over finite fields of characteristic two. There are at least three and four different elements in an involutory MDS matrices with, respectively, order three and four, over finite fields of characteristic two.

## PM05-Paper ID: 0070

# Symmetric Toeplitz Determinants for Starlike and Convex Functions Defined by Subordination

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**Abstract.** The coefficient bounds for starlike and convex subclasses of functions, defined by subordination are discussed. This work utilises the determinants of symmetric Toeplitz matrices. Estimates obtained from this approach coincide with known results of classical cases.

## PM06-Paper ID: 0082

# Quadratic Stochastic Operators Generated by Mixture Distributions

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**Abstract.** In this paper we consider quadratic stochastic operators with countable state space  $X$  generated by mixture of Geometric and Poisson distributions. We study approximation of such operators by operators with finite state space generated by measurable  $m$ -partition and investigate problem of regularity of such operators.

## PM07-Paper ID: 0094

### Radius Problems for Some Subclasses of Analytic Functions

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**Abstract.** In this paper, three classes of analytic functions satisfying  $\operatorname{Re} f/g > 0$  and  $\operatorname{Re} (1-z+z^2)g/z > 0$ ;  $|f/g-1| < 1$  and  $\operatorname{Re} (1-z+z^2)g/z > 0$ ; for some analytic functions  $g$ ;  $\operatorname{Re} (1-z+z^2)g/z > 0$  are defined. The radius constants of these functions belonging to various subclasses of starlike functions are obtained.

## PM08-Paper ID: 0101

### Some Particular Aspects of Certain Type of Probabilistic Predator-Prey Model with Experimenter-Subject- Controlled Events and the Fixed Point Method

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**Abstract.** This article focuses on a specific type of the predator-prey model under some experimenter-subject-controlled events. Our goal is to study predator animals' behavior in these circumstances and establish a suitable mathematical model that encompasses all facets of these relationships. The Banach fixed point theorem is used to obtain the existence and uniqueness results of the suggested probabilistic model.

## PM09-Paper ID: 0114

# Complete Identification of Generators and Check Elements of Zero Divisor Codes over Cyclic Group Rings

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**Abstract.** Let  $C_m$  be a cyclic group of order  $m$  with generator  $g$ . Let  $u$  be a zero divisor in a cyclic group ring  $F_q C_m$  having  $W$  as a submodule. Then  $C = Wu$  is called a zero divisor code over  $F_q C_m$  with generator  $u$ . To implement zero divisor codes in real world, each  $C$  needs a generator  $u$  as well as explicitly identifying its respective check element which is a principle zero divisor partner of  $u$ . In this paper, an algebraic study on zero divisors of  $F_q C_m$  is done by viewing each  $u = \sum_{i=0}^{m-1} \alpha_i g^i \in F_q C_m$  as a polynomial  $u(g) = \sum_{i=0}^{m-1} \alpha_i g^i \in F_q[g]$ . It is found that  $\gcd(u(g), g^m - 1)$  plays a vital role in extracting important properties of zero divisors in  $F_q C_m$ . Using the obtained results, the set of all zero divisors in  $F_q C_m$  or all generators of zero divisor codes over  $F_q C_m$  is completely identified with its cardinality stated explicitly. This paper ends with an explicit identification of a check element for each zero divisor code over  $F_q C_m$ .

## PM10-Paper ID: 0117

# Geometric of Numerical and Quadratic Numerical Range for Block Operator Matrices

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**Abstract.** In this paper, some established properties and results on numerical range and quadratic numerical range of block operator matrices are studied and compared. These results and properties are then applied to compute both ranges for block operator matrices of self-adjoint as well as non-self-adjoint types in the complex Hilbert space.



## PM11-Paper ID: 0124

# Algorithm for Computing the Total Vertex Irregularity Strength of Some Cubic Graphs

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**Abstract.** Determining the value of the total vertex irregularity strength of any regular graph is a challenging problem. The upper bound for this value has been given by Nurdin et al. (2010). A cubic graph is a graph of regular degree three. In this paper, we propose an algorithm to compute the total vertex irregularity strength of cubic graphs. By this algorithm we have a unified method to derive the total vertex irregularity strength of some cubic graphs, namely three cubic platonic graphs and  $k$ -prism graphs.

## PM12-Paper ID: 0126

# On Trees on $n$ Vertices with Metric-Location-Domination Number $\frac{1}{2}n$

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**Abstract.** Let  $G$  be a connected graph with the vertex set  $V(G)$  and the edge set  $E(G)$ . A subset  $S \subseteq V(G)$  is called a dominating set of  $G$  if every vertex of  $G$  that is not in  $S$  is adjacent to some vertex of  $S$ . For ordered subset  $W = \{w_1, w_2, \dots, w_k\}$  of  $V(G)$  and  $v \in V(G)$ , the representation of  $v$  with respect to  $W$  is the  $k$ -vektor  $(r|W) = (d(v, w_1), d(v, w_2), \dots, d(v, w_k))$ , where  $d(x, y)$  is the distance between vertices  $x$  and  $y$ . The set  $W$  is called a resolving set of  $G$  if all vertices of  $G$  have distinct representations with respect to  $W$ . An ordered  $W \subseteq V(G)$  is called a Metric-Locating-Dominating-set (MLD-set) of  $G$  if  $W$  is a dominating set as well as a resolving set of  $G$ . The cardinality of a minimum MLD-set is called the metric-location-domination number of  $G$ , denoted by  $\gamma_M(G)$ . In this paper, we consider the finding of trees on  $n$  vertices with the metric location domination number  $\frac{1}{2}n$ . We prove that for any tree  $T$ , the graph  $T \odot K$  has the metric location domination  $\frac{1}{2}|V(T \odot K)|$ . In particular, we provide sufficient condition for some trees namely caterpillars, to have the MLD-number  $\frac{1}{2}n$ .

## PM13-Paper ID: 0155

# On Some Behaviour of Convergents for $\theta$ -Expansion and Regular Continued Fraction (RCF) Expansion

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**Abstract.** Motivated by problems in random continued fraction expansions, this research describes the design and implementation on  $\theta$ -expansions of a real number,  $x$  in  $(0, \theta)$  where  $0 < \theta < 1$ . Initially, for such a number  $\theta$ , the convergent of  $\theta$ -expansions is computed with comparison to the regular continued fraction (RCF)-convergent based on the samples of the approximated value,  $x$ .  $\theta$ -expansions algorithm and continued fraction algorithm are applied in a Maple software to compute the  $\theta$ -convergent and RCF-convergent. In this respect, the purpose of this research is to examine the growth rate of convergent for both expansions and provide the theoretical behaviours of  $\theta$ -convergent in  $\theta$ -expansions. Numerical results based on these samples show 3 conditions of convergence growth rate, which are  $C_2$  and  $C_4$  give the best decimal approximations in  $\theta$ -expansions, whereas,  $C_n$  be the best approximations in RCF expansions. Therefore, this research reveals that various value of  $\theta$  affect the performance on their growth rate of convergent for these two expansions. As  $\theta$  approaching to 1, it reduces their convergence errors. The analysis of the experimental results reveals the RCF-convergent give a better performance compared to  $\theta$ -convergent as its yield to less convergence errors. In addition, the value of convergent do converge to the approximated value,  $x$  and that is how the name of convergent comes.

## PM14-Paper ID: 0156

# Computation of Some Distance-Based Topological Indices for Multiplicative Circulant Networks of Order $3^h$

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**Abstract.** Various distance and distance-degree-based topological indices were already computed in various families of graphs. In this paper, we consider multiplicative circulant networks of order  $3^h$  where  $h$  is a positive integer and compute the exact values of the following distance based and distance-degree based topological indices: Wiener index, hyper-Wiener index, Schultz molecular topological index, Harary index, additively weighted Harary index, and multiplicatively weighted Harary index on these networks.

# PM15-Paper ID: 0157

## On Graphs of Order $n$ with Dominating Partition Dimension $n - 3$

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**Abstract.** Let  $G = (V, E)$  be a connected graph. Let  $\Pi = \{S_1, \dots, S_q\}$  be a partition of  $V(G)$ . The partition representation  $r(u | \Pi)$  of a vertex  $u \in V(G)$  with respect to  $\Pi$  is the vector  $(d(u, S_1), d(u, S_2), \dots, d(u, S_q))$ , where  $d(u, S_j)$  represents the distance between vertex  $u$  and set  $S_j$ . The partition  $\Pi$  is called a resolving partition of  $G$  if any two vertices  $v, w \in V(G)$  have distinct representations with respect to  $\Pi$ . The partition dimension of  $G$ , denote  $\beta_p(G)$ , is the least cardinality of a resolving partition of  $G$ . The partition  $\Pi$  is called dominating if for every vertex  $v$  of  $G$ , there is an  $S_j$  such that  $d(v, S_j) = 1$ . The partition  $\Pi$  is called a resolving dominating partition of  $G$ , if it is both resolving and dominating. The minimum cardinality of a resolving dominating partition of  $G$  is called the dominating partition dimension of  $G$  and it is denoted by  $\eta_p(G)$ . For given positive integers  $n, k$  with  $k \leq n$ , characterizing all graphs of order  $n$  with dominating partition dimension  $k$  is a difficult problem. There are still few results concerning this problem, in particular for  $k$  equal to  $2, 3, n - 2, n - 1$ , or  $n$ . In this paper, we shall focus on studying the graphs  $G$  of order  $n$  with dominating partition dimension  $n - 3$ . We will give some graphs of order  $n$  and diameter 2 with dominating partition dimension  $n - 3$ .

## ST01-Paper ID: 0026

# New Tourism Product Forecasting - A Study of Different Potential Markets

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**Abstract.** Mushrooming of new tourism products in Malaysia and their shutdown in the short term are the sign of ineffective forecast. Besides, no new development in tourism products causes the decline of the number of visitors to the attractions. This study proposes an application of a grey Bass diffusion model to forecast the new tourism product using different market potential value. A potential market can provide valuable information for a good forecast. From the managements' perspective, proper planning and development is done to maintain the places based on the forecast. Grey Bass diffusion model, a popular model in handling forecast of a new product with limited data, is expected to forecast two ecotourism resorts, Tanah Aina Fahad and Tanah Aina Farrah Soraya using different market potential value. Yearly data from 2014 until 2018 from both tourism products are collected. The values of potential markets are calculated from the percentage number of visitors to Raub district since the new tourism products are located in Raub, Pahang. This study indicates that different market potential give significant impact on the accurate forecast. The closer the value of potential market calculated from percentage to the actual value, the higher the accuracy of the forecast.

## ST02-Paper ID: 0031

# Testing the Validity of Fisher Hypothesis: The Case of ASEAN-5

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**Abstract.** Fisher (1930) defined the Fisher hypothesis as a positive association between the movements of nominal interest rate and inflation whereas the nominal interest rate will be equal to the total of the expected inflation and real interest rate in the same term while real rates remain constant. The validity of the Fisher theory signifies the neutrality of money and the ineffectiveness of monetary policy. In this paper, we intended (1) to investigate the validity of the Fisher hypothesis in ASEAN-5 countries, (2) to evaluate the effectiveness of monetary policy in the countries, and (3) to reveal other control factors in affecting the correlation between the interest rate and inflation. The study was based on a panel group of five countries namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand from 1993 through 2019. Due to data deficiency, the model estimation based on MG, AMG, and CCEMG (full-term) started from the year 1998 onwards. The results revealed the absence of the Fisher effect in the panel group but the significance of the cross-sectional dependence effect among the countries was detected. Overall, the Fisher effect was tended to hold in developing countries like Indonesia, the Philippines, and Thailand, thus indicated the effectiveness of monetary policy in these countries. However, the Fisher effect was easily rejected for countries with more efficient capital markets like Singapore and Malaysia. Also, inflation was the main determinant of interest rate response such that inflation correlated positively with interest rate. Factors such as exchange rate and money supply should be included for the validation of the Fisher effect since these factors were significantly influencing on interest rate response.

## ST03-Paper ID: 0043

# Examining the Nonlinearity Effects of Oil Price Changes of Commodity Prices

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**Abstract.** The effect of oil price changes on macroeconomy is evident through many studies. The results, however, could be heterogenous using different time frames, countries and estimation approaches. Previous studies have mainly used linear modeling to explain the effect of oil price. In this study, we seek to further examine the effect of oil price changes on the global commodity prices by applying a Markov switching (MS) regression with particular emphasis on three main sector that are energy, non-energy and precious metal sector. We attempt to study the asymmetric effect of oil price change on commodity prices by modifying the non-linear MS regression to include the asymmetric component of oil price change. Our results reveal the asymmetric effect of oil price change to be significant in energy and non-energy sectors and both increase and decrease lead to higher commodity inflation. Our results also found the effect of oil price change to be heterogenous across sectoral commodity where the effect is found strongest in energy sector and weakest in the precious metal sector. Our findings suggest that the world effective exchange rate variable as the main determinant to commodity price inflation across sectors.

## ST04-Paper ID: 0046

# What Explains the Gender Pay Gap in the West Bank?

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**Abstract.** Palestine exhibits increasing trends in the gender pay gap over a couple of years. Therefore, this study aims to investigate the factor that explains the gender wage gap in the West Bank, Palestine. The current study applies the Oaxaca-Blinder decomposition method utilizing data from the Palestinian Labor Force Survey (LFS) in 2018 collected from the Palestinian Central Bureau of Statistics (PCBS). The findings indicate that the gender pay gap is mostly explained by differences in the average place of work employment, industry, and years of schooling between males and females. However, the sector of employment, occupation, work experience, seniority, number of working hours per week, marital status, and working conditions explain little part. However, more than one-half of the gender pay gap in 2018 remained unexplained by the included observed workers' characteristics. Probable elucidations for this part include not only the labor market sex-related discrimination but also some measurable earning-related attributes that are not available in the scope of LFS and unobserved characteristics. Finally, some important policy interventions are provided based on the obtained results.

## ST05-Paper ID: 0053

# Revisited Export-Led Growth Relationship: Does Trade Openness Matter?

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**Abstract.** The export-led growth relationship has long been studied and the evidence is well documented theoretically and empirically. This paper extends the study to examine the two-way relationship (export-led growth and growth-led export) and to study the relationship in a nonlinear form. The second objective of this study is to examine if trade openness matters in the relationship by comparing high versus low trade openness countries. For these purposes, the static panel threshold regression of Hansen (1999) is applied using the sample data ranging from year 1973 to 2018. The results have detected threshold effect in the two-way relationship for high trade openness group, while no threshold effect is detected for the low trade openness group. Hence, the export-growth nexus is nonlinear for high trade openness group, while it is linear for low trade openness group. The results also revealed that both export-led growth and growth-led export hypotheses hold for both groups of countries. However, the effect of export and growth on each other might vary across regimes for the nonlinear model in high trade openness group. Furthermore, trade openness matter towards the relationship between export and economic growth where the impact of exports toward growth in high trade openness countries is always greater than in the countries with low trade openness. These are because trade activities are important in high trade openness countries. Besides, other factors such as import, population growth and capital formation might have effect on growth and export either directly or indirectly.

## ST06-Paper ID: 0064

# Empirical Mode Decomposition Based Double Exponential Smoothing Method for Daily Stock Price Forecasting

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**Abstract.** In this and upcoming age of analytics and decision science, forecasting time series from diversified sources is essentially an important but challenging research area. Although, there are many methods encompassing benchmark approaches to serve the purpose, further robust methodical advances are in escalated demand due to limitations of existing ones. In quest of finding better forecasting approaches, this paper focused on implementation of empirical mode decomposition (EMD) with double exponential smoothing (DES) method (EMD-DES) and performance evaluation of this hybrid time series data fitting and forecasting approach. Both EMD and DES being very effective tools on their area of locally adaptive decomposition and fitting smoothly as well as forecasting respectively, their synergy could be a better forecasting approach as per our intuition. To evaluate EMD-DES method, 06 (six) daily stock price data sets from Nifty 50 index of Indian National Stock Exchange (NSE) were employed and accuracy of this method was compared with other 05(five) benchmark and hybrid methods through 03(three) error measures in 04(four) forecast horizons. These empirical results showed the superiority of EMD-DES method over others. Thus, the method appeals for further attention as a potentially rigorous method.

## ST07-Paper ID: 0084

### Modelling Binary Logistic Regression for Low Birth Weight in Segamat, Johor Malaysia

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**Abstract.** Low birth weight infants are new-born infants weighing less than 2.5kg and this issue is a public health concern worldwide. Low birth weight infants face greater risk of health problems in their childhood and adulthood. This study aims to identify the significant risk factors associated with low birth weight infants in Segamat, Johor state in Malaysia. This study involved 301 mothers that had given birth in year 2017 and 2018 and twenty-one predictor variables were used at the beginning of the analysis. Logistic regression analysis showed that passive smoker, number of live birth before, gestational age, infant's gender, multiple birth, foetal distress and neonatal jaundice were among the significant factors that influence delivery of low birth weight infants. The factor with the highest odds ratio that led to delivery of low birth weight infants in this study was pregnant mother with multiple birth. Although multiple birth is a natural pregnancy and hard to be prevented, pregnant mother should also always keep track of their health status throughout their pregnancy to ensure that their foetus grow healthily in their womb before birth.

## ST08-Paper ID: 0096

### Spatio-Temporal Regression Analysis of Dengue Cases with Climate Variables in Pulau Pinang

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**Abstract.** Spatio-temporal regression analysis in disease mapping gives a great worth in describing the relationship of certain covariates towards disease under study across geographical space and time. In spatio-temporal regression analysis, the model incorporates fixed covariates effects, spatially correlated random effects as well as temporal effects. This paper analyses the relationship between climate variables and dengue incidence in five districts in Pulau Pinang from 2015 to 2017. The climate variables consist of the mean weekly temperature, the total weekly rainfall distribution and the mean weekly humidity percentage. The model is fitted within a hierarchical Bayesian framework with integrated nested Laplace approximation methodology. For this analysis, the findings reveal that variable rainfall was not giving significant effect for dengue disease risk model in 2015 to 2017, while variable average weekly temperature was significant in 2015 and 2016 models and variable humidity only significant for dengue risk model in 2017.

# ST09-Paper ID: 0102

## Transmuted New Weighted Weibull Distribution: Some Statistical Properties and Application to Survival Time Data

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**Abstract.** This article introduces a four-parameter probability distribution function derived by introducing an additional parameter to the New Weighted Weibull distribution proposed by [1]. Using the quadratic rank transmutation map (QRTM) introduced by [2], the three-parameter New Weighted Weibull distribution was generalized to its four-parameter variant titled “Transmuted New Weighted Weibull distribution (TNWWD)”. The probability density function (pdf), cumulative distribution function (cdf), hazard rate, and survival function of the TNWWD model were computed and validated. Consequently, some of the mathematical properties of the proposed model were extensively studied and articulated. The parameter(s) of the TNWWD model were estimated using the method of maximum likelihood estimate. The proposed TNWWD model generally outperforms the competing Weibull and New Weighted Weibull distributions in terms of the Akaike information criterion (AIC), consistent Akaike information criterion (CAIC), Bayesian information criterion (BIC), Hannan quin information criterion (HQIC), and related performance measures. By this, the proposed four-parameter probability distribution function is expected to perform better with a real dataset and at all times. A real dataset on survival time was used to demonstrate the practical application of the proposed TNWWD model.



## ST10-Paper ID: 0105

### Performance of Variable Sampling Interval EWMA Chart with Auxiliary Information for the Process Mean Based on Expected Average Time to Signal

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**Abstract.** A control chart is one of the crucial tools in Statistical Process Control (SPC) which is usually used in process monitoring to reduce variation. It is well-known that the exponentially weighted moving average (EWMA) type chart is very sensitive in detecting small and moderate shifts. The adoption of the variable sampling interval feature in the EWMA chart with auxiliary information (called the VSI EWMA-AI chart) significantly enhances the efficiency of the EWMA-AI chart in detecting small and moderate shifts, in terms of the average time to signal (ATS) criterion when the exact shift size which must be detected quickly can be specified. However, in many industrial processes, the aforementioned shift size cannot be specified, especially when practitioners have no prior knowledge about the process. This paper adopts the expected ATS (EATS) criterion based on the Markov chain approach to evaluate the VSI EWMA-AI chart's performance when the exact shift size cannot be specified. The VSI EWMA-AI chart is compared with the EWMA-AI chart in terms of the ATS and EATS criteria. The findings show that the VSI EWMA-AI chart prevails over the EWMA-AI chart as the former provides quicker detection of process shifts.

## ST11-Paper ID: 0113

### Jackknife and Bootstrap Estimates for Modified Residuals of the Log-Logistic Model

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**Abstract.** The study of model adequacy using the modified Cox-Snell residuals for lifetime models are very common and available in most statistical packages. These existing modifications are based on the statistical assumption of how these residuals should behave and may sometimes fail due to the censoring pattern in the data. In these instances, measures other than the arithmetic mean or median and alternative computer intensive techniques that rely more on the information obtained directly from the data might be more useful and appropriate. This research explores the modified residuals based on the empirical jackknife and bootstrap bias-corrected harmonic and geometric means for the log-logistic model. The performances of the different modified residuals are compared via a simulation study at various sample sizes and censoring proportions. The results indicate that the residuals based on the harmonic mean and the jackknife harmonic mean perform much better than other estimates, especially when censoring proportions in the data are high.

## ST12-Paper ID: 0129

# Investigating the Effects of Monetary versus Fiscal Policies on GDP Growth in Malaysia: Smooth Transition Autoregressive (STAR) Approach

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**Abstract.** The existence of nonlinear effect of monetary and fiscal policies on economic performance have intensively discussed and debated among policy makers. In particular, the main objective of this paper is to investigate the performance of monetary versus fiscal policies on GDP growth. The study is based on time series data for the period of 1981Q1-2018Q1. The results reveal that GDP lag two term is a transition parameter of AR(1) and has significance effect on economic growth. Comparing policies, monetary policy where real effective exchange rate is able to stimulate higher growth but the fiscal policy through government spending, government debt and current imbalances fail to lead to higher GDP growth. Overall, we can conclude that monetary policy through exchange rate is more effective to promote growth compared to fiscal policy.

## ST13-Paper ID: 0130

# Analysis of Dengue Incidence in Baguio, Philippines

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**Abstract.** This study considers the analysis of dengue in Baguio City through correlation, regression, and univariate time-series analysis. The former gives a relationship between specific weather conditions and dengue incidence while the latter provides a forecasting model which will be used in forecasting the incidence for 2019. Additionally, a short analysis is provided using Poisson distribution and process.

## ST14-Paper ID: 0131

# Analysis on the Onset of Dengue Outbreaks in Baguio City

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**Abstract.** The research aims to study the onset of dengue outbreaks in Baguio City given weekly cumulative data for each year from 2010 to 2018. Each year, weekly cumulative data follows either a four - parameter logistic growth or a four - parameter log-logistic growth function such that the highest recorded incidence spans from week 29 to week 41. Peak values of reproduction number  $R_0$  and annual doubling time are taken to account.

## ST15-Paper ID: 0135

# Purchasing Power Parity: The West African Experience

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**Abstract.** The fifteen heads of States of the Economic Community of the West African States (ECOWAS) are currently considering a unified currency called “Eco”. This decision suggests the need to study the purchasing power parity (PPP) of the existing currency for the various countries. Thus, in this paper, we investigate the existence of the relative PPP theory over a 50 years period that spanned through 1970 to 2019 for the sixteen West African Countries against the U.S. Dollars using a panel data analysis approach. The two approaches for testing the PPP hypothesis namely; the panel unit root test and the panel cointegration test were employed to check the existence of unit root and or cointegration between the nominal exchange rate of West African countries and price ratio. The results of Im-Pesaran-Shin panel unit root test show that the nominal exchange rate and price ratio panels have a unit root, which implies that the two variables are non-stationary in their level difference and thus they are  $I(1)$ . On the other hand, the results from the Kao and Westerlund panel cointegration tests supported the existence of a long-run relationship between nominal exchange rate and price ratio. The convergence of the two results shows that there exists a long-run relationship between the two variables as well as a long-run PPP for all the sixteen West African countries. The results of this paper further imply that there is a long-run relationship between relative change in the exchange rate and price ratio for the West African countries over the period reviewed. Therefore, the recent decision to have a unified currency among the ECOWAS countries will yield a meaningful return in the long-run.

## ST16-Paper ID: 0144

### Application of Second Order Markov Chain on Daily Average Wind Speed in Malaysia

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**Abstract.** The daily average wind speed at sixteen meteorological stations in Malaysia are modeled using first and second order Markov chains. The data are classified into six scales of Beaufort number. Markov chains are used to determine the probability of the changes on the wind speed from one scale to another. The results of the limiting probabilities show that most of the stations experience the highest probabilities at the states of light air and light breeze for two and three consecutive days. The path diagram indicates that the stations are accessible, communicate and irreducible. It is observed that Mersing, Kota Bharu and Kuala Terengganu stations are potential locations for small turbines as the stations would likely to experience a strong wind compared to the others.

## ST17-Paper ID: 0146

### Testing the Validity of the Energy-Environmental Kuznets Curve (EEKC) Hypothesis in Oil-Importing versus Oil-Exporting Countries: A Heterogeneous Panel Data Modeling Analysis

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**Abstract.** This study applied heterogeneous estimators (MG, CCEMG and AMG) to verify the Energy-Environmental Kuznets Curve (EEKC) hypothesis in oil-importing and exporting countries using panel data from 2000 to 2014. We used GDP and square of GDP to see their impact on energy intensity. The results indicate CCEMG is the preferable estimator with the smallest root mean square error (RMSE) for both groups of countries. The estimated coefficients for GDP and its square reveal evidence EEC hypothesis hold in both groups of countries. The impact of explanatory variables is larger in oil-exporting countries than in oil-importing countries. The results also indicate that the cross-sectional dependency influence energy intensity. The outcome of this study could provide an insight into how the economy should be planned appropriately to minimize the trade-off effect on the environment.

## ST18-Paper ID: 0152

### Application of Logit-Loglinear Model for TB Disease

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**Abstract.** This study is related with tuberculosis disease (TB) modeling at a location in a country in Southeast Asia. The secondary data consist of patient's information from the aspect of demographic, symptoms, factors, illness history and the result of chest X-ray analyzed. This study aims to indicate the primary factor that cause the individual to get positive culture which result in TB illness and to indicate the relationship between the symptoms with the factors that cause TB. Loglinear logit is applied in this categorized analysis. The study is run by analyzing the log linear model selection to analyze categorized data. This analysis is done by three models which are demographic with TB symptoms, demographic with the factors that cause TB, and symptom with the factors that cause TB. From this log linear logit analysis, it was found that the cause of positive culture which result in TB is hoarseness of voice. Majority of the patients who resulted in culture positive is a particular race (Race B). In term of gender, female is the majority group who got positive culture. Smoking is the main factor which initiated the TB. Other factors such as alcohol, drug misuse, and HIV on the other hand do not cause a TB. Meanwhile, there is existence of interaction between the hoarseness of voice and smoking leads to TB.

## ST19-Paper ID: 0153

### Comparison Between Best Subset and Lasso Regression on Consumer Price Index Malaysia

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**Abstract.** This research is aimed to determine the factors contributing to the prediction of the total Consumer Price Index (CPI) in Malaysia through model selection using two methods which are the best subset and LASSO regression. The outliers are identified using the leverage values and studentized deleted residuals while the multicollinearity variables will undergo progressive elimination identified through Variance Inflation Factor (VIF) values. Both methods were compared using the Mean Square Error of Prediction (MSE(P)) to find the best approach to display the CPI data. The model with the smallest MSE(P) will be chosen as the best model. The result showed that the MSE(P) of the best model using both the best subset regression and LASSO regression is almost the same. Therefore, the model selection using LASSO regression will be chosen as the best approach due to the simple process in identifying the best model. The best LASSO model consists of nine major categories such as food and non-alcoholic beverages ( $X_1$ ), alcoholic beverages and tobacco ( $X_2$ ), clothing and footwear ( $X_3$ ), transport ( $X_7$ ), communication ( $X_8$ ), recreation service and culture ( $X_9$ ), education ( $X_{10}$ ), restaurants and hotels ( $X_{11}$ ), miscellaneous goods and services ( $X_{12}$ ).

## ST20-Paper ID: 0160

# Exploratory Data Analysis of COVID-19 Cases in Baguio City, Philippines

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**Abstract.** This paper is a statistical data analysis of the status of COVID-19 cases in Baguio City, Philippines. To date, there is a total number of 439 confirmed cases – 99 active, 329 recovered, and 11 deaths from 2nd March 2020 up to 10th September 2020. For continuous monitoring and in helping fight against COVID-19 in the city, this paper aims to describe the rate of infection using the 7-day moving average, two-week growth rate, daily attack rate, case doubling time, and case fatality rate. This study also characterizes the distribution of infections based on gender, age, common symptoms, occupation, severity, and travel history of cases. Results show an increasing trend for the number of cases. Most of the positive cases recorded are females, aged 20-29 years old, who are asymptomatic and not working from home. Other findings include cough as the most reported symptom of symptomatic cases. Local transmission of the virus within the city is evident.

## ST21-Paper ID: 0161

# Statistical Modelling of Annual Retail Sales of Good and Services in The United States Using Generalized Pareto Distribution Model

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**Abstract.** The total retail sales of goods and services in the US is modelled using generalized pareto distribution (GPD) model from Extreme Value Theory. The trend test which is Mann-Kendall (MK) suggests that retail sales data exhibit a non-stationarity. Thus, the non-stationary GPD with a linear dependence in time is proposed. The maximum likelihood estimation (MLE) method is used to estimate the parameters of GPD model. The return level of US annual retail sales for the next 20, 50 and 100 years are being calculated. Results showed that both stationary and non-stationary GPD produce the commendable results in fitting the data. The assessment on Q-Q plot suggest that GPD distribution provides a good fit to the annual retail sales data using MLE method. However, non-stationary GPD with time as a linear covariate does improve the model. This is supported by the goodness-of-fit test where the AIC, BIC and LRT conclude the non-stationary performed quite well compared to the stationary model. Consequently, the non-stationary GPD model is the most appropriate, comprising linear effect in the location of extremal behavior, but homogeneity in all other aspects. The return levels provided in this study could provide some useful information to the country where the government should focus more on the retail industry as the retail industry has high potential to be primary sector of the economy in the country. In addition, the government should be more creative in strategizing the marketing plan into a global market and building up the alternative way to increase the profits while coping the challenges during the pandemic period

## ST22-Paper ID: 0164

# Investigating the Influence of Economic Variables and Socio-Economic Indicators on Carbon Emission in Asian and Asia-Pacific Countries

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**Abstract.** Climate change is one of the most pressing challenges with range of ecological, physical and health impact to civilization. The main cause of climate change is massive amount of CO<sub>2</sub> emissions released due to anthropogenic. This study investigates the long-run relationship and short-run dynamic between carbon emissions with the selected economic variables and socioeconomic indicators. Utilizing data from twenty selected countries in Asia, the variables employed in this study consist of economic growth, energy consumption, government integrity and education level during the period 1995 to 2017. To achieve the objectives, the study has employed heterogeneous panel data techniques. The results of panel cointegration analysis indicates that there exists long-run relationship between total CO<sub>2</sub> emissions into atmosphere and economic growth, energy consumption, government integrity and education level. In general, LGDP is found to be negatively affecting the LCO<sub>2</sub> while LEC, LGOV and EDU are found to be positively related to LCO<sub>2</sub>. On the contrary, the income level of Asian countries does not have any impact in the long-term in analyzing the impact of economic and socioeconomic variables on CO<sub>2</sub> emissions. Government bodies will need to promote the development and utilization of energy-efficient technologies. The more efficient the government regulate environmental policies, the better the countries able to mitigate the environmental pollution. A change of perception in education role is needed to create awareness for better and cleaner atmosphere.

## ST23-Paper ID: 0177

# Contact Tracing and Expanded Testing of COVID-19 Cases in Baguio City, Philippines

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**Abstract.** Aggressive contact tracing together with continuous expanded testing are two of the most effective and offensive measures taken by the City Government of Baguio, Philippines in addressing the COVID-19 pandemic. In this paper, the relevance of these measures with the continuing fight against the virus is explored through statistical data analysis. The analysis looks at the status of infection based on the statistics of overall close contacts traced and positivity rates. Included also is a graphical analysis of the different categories of testing according to severity, barangays with cases, symptoms experienced, and occupations of the cases with onset dates recorded in a two week period from September 1 to 14, 2020.

## ST24-Paper ID: 0182

# Day-of-the-Week and Turn-of-the-Month Effects on Stock Market in Malaysia

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**Abstract.** The existence of seasonality in stock returns have challenged the notion under the Efficient Market Hypothesis. This paper examines the existence of day-of-the-week and turn-of-the-month effects in the stock returns of the Kuala Lumpur Composite Index (KLCI) in Malaysia for the period from 2000 to 2019. Using the ARIMA-EGARCH model, persistency of both effects are investigated using four shorter sub-samples. The findings from the whole sample show that while the day-of-the week effect is only present on the volatility but not on the mean returns, Monday is found to have the lowest returns and the highest volatility. The day-of-the-week effect on the volatility is found to persistently present while the absence of the effect on the mean returns is observed in three of the subsamples. Although the turn-of-the-month effect is found to present in the whole sample and quite persistently in the sub-samples, the effect is absent in the recent years. Evidence from sub-samples shows that while investors may obtain higher mean returns during the month-end period, the month-end period also present higher volatility than that during the mid-month period. Further analysis revealed that Monday is not necessarily a bad day at the stock markets with returns on Monday that fall during the month-end period are generally found to be higher than those on other days of the week. The absence of certain effects during shorter sub-samples imply that investors need to revise their trading strategy and that any strategy is only beneficial for short-term period.

## ST25-Paper ID: 0183

# The Impact of Stock Market Integration on Economic Growth in Asia and Europe Regions

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**Abstract.** The global increased of market integration for the past few decades has been staggering. Although numerous research have shown market integration as one of the main drivers of economic growth, existing literature has yet to find a conclusive result. Hence, this study examines the impact of stock market integration on economic growth in 32 countries of Asia and Europe regions. The study utilizes the Kalman Filter method to generate the stock market integration index and heterogenous panel models to investigate its relationship towards economic growth. Overall, the result shows that stock market integration has positive impact on economic growth in Asia and Europe high-income countries. However, the impact is not significant in Asia Middle-Income Countries, which suggest the insufficient absorptive capacities in these countries to benefit from the market integration. Such findings call for more appropriate market liberalization policies that fits the economic environment and geographical location of these countries.



## ST26-Paper ID: 0199

# Evaluation of Clustering Approach with Euclidean and Manhattan Distance For Outlier Detection

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**Abstract.** This paper presents the results of the experimental drying process for seaweed data. We compared the two main approaches to clustering analysis between K-Means and (Partitioning Around Medoid) PAM. In agriculture, Clustering application is the method of finding the new insights in different kind of problems. For enhancement of agriculture, machine learning always seems to be helpful in conversion of raw data into useful information. But in case of outlier presence, machine learning algorithms and techniques could not work well. In this paper, the dataset consisted of 1924 observations are taken for the analysis purpose. The dataset included one dependent variable with 29 different predictors. The variable includes the hourly solar radiation, temperature, humidity, and moisture content. The outliers were found in the dataset. The comparison between K-Means and PAM using Euclidean and Manhattan Distance for internal validity results was evaluated on the performance and evaluation of algorithms in case of outliers. The purpose was to evaluate, empirically characteristics of a representative set of internal clustering validation indices with the experimental drying process of seaweed data. The results are beneficial to minimize the outliers data and forecasting.

## ST27-Paper ID: 0140

# Shrinkage Based Variable Selection Techniques for the Sparse Gaussian Regression Model: A Monte-Carlo Simulation Comparative Study

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**Abstract.** In this paper, the sparse variable selection problem is considered for the Gaussian linear models. Varying forms of nonconvex penalties have been investigated for solving sparse variable selection problem with a specific interest in finding a solution under different forms of convex algorithmic structure. Specifically, this study investigates the solution paths of three different algorithms that utilized the coordinate-wise descent optimization technique. The three algorithms considered are the Least Absolute Selection Operator (LASSO), Minimax Concave Penalty (MCP or MC+) and the SparseNet. The predictive performances of the algorithms were studied for comparison using a Monte-Carlo simulation of several linear regression modelling scenarios.

# ST28-Paper ID: 0188

## Estimating Dynamic Relationship Between Stock Price and Macroeconomic Variables Using Kalman Filter Approach

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**Abstract.** Understanding the impact of macroeconomic variables on stock prices are important to investors for their investment decision making. This study investigates the relationship between stock prices in Malaysia and four selected macroeconomic variables: consumer price index (CPI), money supply (MS2), interest rate (INT) and real exchange rate (REXR) for the period from January 2001 to December 2019. To better reflect real-life ever changing economic conditions, the Kalman filter (KF) estimation technique is employed to estimate the time-varying impact of the macroeconomic variables on stock prices. The KF estimation produced obvious time-varying impact coefficients over the entire sample period. Not only majority of the KF coefficients are larger in magnitude than those estimated by the static OLS model, the KF estimation also produced a mixture of positive and negative impact coefficients. Generally, CPI and INT have much larger negative short-term impact on stock prices than the OLS has estimated with some positive impact at the beginning of the sample period. While the KF negative impact coefficients of REXR are generally of the same magnitude of those from the OLS model for the period from 2005 onwards, the KF estimation revealed large positive impact of REXR on stock prices for the period of 2002 to 2004. Finally, the KF estimation generally produced smaller positive impact of MS2 on stock prices while revealing much faster recovery rate following a short-term deviation. The finding that the impact of macroeconomic variables on stock prices are varying over time with a mixture of positive and negative estimates strongly suggest that investors need to continuously revise their investment strategy in order to maximize profit avoiding huge losses.

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