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Kata Aluan

Ketua Jabatan Sains Matematik

Assalamualaikum dan salam sejahtera.

Alhamdulillah dan syukur kepada Allah yang telah memberikan kurniaanNya sehingga dapat saya menyampaikan kata-kata aluan di dalam buku cenderamata Projek Sarjana Muda (PSM) Jabatan Matematik, Fakulti Sains bagi Sesi 2016/2017.

PSM merupakan salah satu aktiviti terpenting dalam jadual pengajian ijazah sarjana muda sains matematik/matematik industri di Jabatan Sains Matematik, Fakulti Sains. Secara khusus PSM bertujuan melatih pelajar tentang kaedah menjalankan penyelidikan dan pengurusan maklumat berkaitan bidang sains matematik dan aplikasinya. Latihan ini dilaksanakan dengan menggilap pelbagai kemahiran generik seperti berkomunikasi dan berhujah, penulisan akademik, pendidikan sepanjang hayat, dan lain-lain. Selain didedahkan dengan pengalaman berharga ini, pelajar juga memperoleh pengalaman tidak ternilai menjalankan penyelidikan di bawah seliaan pensyarah-pensyarah Jabatan Sains Matematik, Fakulti Sains yang hebat. Hubungan dua hala pelajar dan penyelia yang berkesan ini merupakan salah satu faktor berpengaruh bagi penghasilan sebuah PSM bermutu dan dirajuki. Saya sangat berharap aktiviti PSM ini dapat melengkapkan pelajar-pelajar untuk berani dan yakin menghadapi sama ada alam pekerjaan mahupun pengajian lanjutan di masa depan.

Akhir kata saya mengucapkan tahniah kepada semua pelajar yang membentangkan projeknya pada Simposium kali ini. Setinggi-tinggi terima kasih dan sekalung penghargaan juga saya ucapkan kepada pengerusi serta ahli-ahli Jawantankuasa PSM, Jabatan Sains Matematik, Fakulti Sains yang telah berusaha dengan gigih menjalankan tugas dan tanggungjawab meningkatkan kualiti dan pengurusan PSM di Jabatan.

Sekian, terima kasih.

PM Dr Rohanin Ahmad
Ketua Jabatan Sains Matematik
Fakulti Sains.



Assalamualaikumdanselamatsejahtera.

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Simposium yang telah dilaksanakan sejak Sesi 1990/91 ini merupakan kemuncak aktiviti Projek Sarjana Muda, Jabatan Sains Matematik. Pelajar yang terlibat perlu menghasilkan proposal dan laporan projek untuk melengkapkan proses mempraktikkan pengetahuan matematik yang diperolehi dari pembelajaran sebelum dan semasa dalam usaha menyelesaikan masalah secara kajian dan melahirkan ahli matematik yang cekap. Di dalam symposium ini diharapkan para pelajar dapat membentangkan kajian yang telah dilakukan sepanjang dua semester itu serta hasil kajian yang mereka peroleh dengan jelas dan lancar sebagai pengalaman awal sebelum mereka memasuki pasaran kerja kelak.

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Saya turut mengalu-alukan maklumbalas daripada semua pihak bagi meningkatkan kualiti pelaksanaan Projek Sarjana Muda secara amnya serta Simposium ini khususnya.

Sekian, terimakasih

Dr Zaiton Mat Isa
Pengerusi
Projek Sarjana Muda
Jabatan Sains Matematik
Fakulti Sains
Sesi 2016/2017

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29 Mei 2017

Masa	Makmal Komputer I	Makmal Komputer III	Bilik Mesyuarat Utama
8.30 – 8.50 pagi	Pelajar : Nadirah Binti Rashid Penyelia : PM. Dr. Mukhidin Muminov PD : Dr. Niki Anis Ab Karim (P) PD : Dr. Nor Muhainiah Mohd Ali	Pelajar : Nabihah Binti Abdul Jalil Penyelia : Dr. Arifah Bahar PD : Dr. Haliza Abd Rahman (P) PD: Prof. Dr. Zuhaimy Ismail	Pelajar : 'Ainaa' Athira Binti Abd Ajis Penyelia : Dr. Yeak Su Hoe PD : En. Hamisan Rahmat (P) PD : En. Che Rahim Che Teh
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29 Mei 2017

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** P – Pengerusi

PD – Penilai

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30 Mei 2017

Masa	Makmal Komputer I	Makmal Komputer III	Bilik Mesyuarat Utama
10.30 – 10.50	Pelajar : Fatin Hafizah Binti Alias Penyelia : Dr. Fuaada Mohd Siam PD : Dr. Faridah Mustapha (P) PD : PM. Dr. Normah Maan	Pelajar: Muhammad Amirul Afiq Bin Sam Penyelia : En Ismail Kamis PD : Dr. Zaitul Marlizawati Zainuddin (P) PD : PM. Dr. Rohanin Ahmad	Pelajar : Mohammad Azim Bin Mohd Azahari Penyelia : Dr. Zuhaila Ismail PD : PM. Dr. Norma Alias (P) PD : En. Che Lokman Jaafar
10.55 – 11.15 pagi	Pelajar : Abdullah Hafiz Bin Mohd Taufik Penyelia : En. Wan Rohaizad Wan Ibrahim PD : Dr. Faridah Mustapha (P) PD : PM. Dr. Normah Maan	Pelajar : Nor Afiqah Binti Ali Penyelia : Dr. Nur Arina Bazilah Aziz PD : Dr. Farhana Johar (P) PD : PM. Dr. Rohanin Ahmad	Pelajar : Nur'aliaa Atiqah Binti Zainal Abidin Penyelia : Dr. Mohd Ariff Admon PD : Pn. Wan Rukaida Wan Abdullah (P) PD : PM. Dr. Norma Alias
11.20 – 11.40 pagi	Pelajar : Amirah Farzanah Binti Sulaiman Penyelia : Dr. Norhaiza Ahmad PD : Dr. Arifah Bahar (P) PD: PM. Dr. Normah Maan	Pelajar : Nurakmaliana Binti Salimee Penyelia : Dr. Niki Anis Ab Karim PD : En. Ismail Kamis (P) PD : En. Wan Rohaizad Wan Ibrahim	Pelajar : Umie Asyikin Binti Rozali Penyelia : PM. Dr. Khairil Anuar Arshad PD : En. Che Lokman Jaafar (P) PD : Dr. Faridah Mustapha
11.45 – 12.05 tgh	Pelajar : Nur Fazwani Binti Zulkurnain Penyelia : Dr. Zarina Mohd Khalid PD : Dr. Arifah Bahar (P) PD : PM. Dr. Maslan Osman	Pelajar : Norhidayah Binti Razali Penyelia : Dr. Shazirawati Mohd Puzi PD : En. Wan Rohaizad Wan Ibrahim (P) PD : En. Ismail Kamis	Pelajar : Muhammad Sabaruddin Bin Ahmad Jamali Penyelia : Dr. Zuhaila Ismail PD : Pn. Wan Rukaida Wan Abdullah (P) PD : Dr. Yeak Su Hoe
12.10 – 12.30 tgh	Pelajar : Syaza Naurah Binti Sm Soflee Penyelia : Pn. Halijah Osman PD : Dr. Anati Ali (P) PD : PM. Dr. Maslan Osman	Pelajar : Agus Salim Bin Karudin Penyelia : Prof. Dr. Zainal Abdul Aziz PD : En. Wan Rohaizad Wan Ibrahim (P) PD : En. Ismail Kamis	Pelajar : Nurul Syafika Binti Zupawi Penyelia : En. Hamisan Rahmat PD : Pn. Wan Rukaida Wan Abdullah (P) PD : Dr. Yeak Su Hoe
REHAT			

**JADUAL SIMPOSIUM PROJEK SARJANA MUDA JABATAN MATEMATIK SESI 2016/2017
30 Mei 2017**

Masa	Makmal Komputer I	Makmal Komputer III	Bilik Mesyuarat Utama
2.15 – 2.25 ptg		Pelajar : Aina Afiqah Binti Ahmad Romzi Penyelia : Dr. Amidora Idris PD : Dr. Niki Anis Ab Karim (P) PD : PM. Dr. Ali Hassan Mohamed Murid	Pelajar : Nor Haszrina Binti Rashid Penyelia : Prof. Dr. Mohd Nor Mohamad PD : PM. Hazimah Abdul Hamid (P) PD : Prof. Dr. Zainal Abdul Aziz
2.30 – 2.50 ptg		Pelajar : Jessy Penyelia : Dr. Rashidah Ahmad PD : Dr. Syarifah Zyurina Nordin (P) PD: PM. Dr. Ali Hassan Mohamed Murid	Pelajar : Fatin Nabila Binti Baharin Penyelia : PM. Dr. Sharidan Shafie PD : PM. Hazimah Abdul Hamid (P) PD : Prof. Dr. Zainal Abdul Aziz
2.55 – 3.15 ptg		Pelajar : Ayuna Binti Sulekan Penyelia : Dr. Rashidah Ahmad PD : Dr. Syarifah Zyurina Nordin (P) PD : PM. Dr. Ali Hassan Mohamed Murid	

** P – Pengerusi

PD – Penilai

Travelling Salesman Approach for Solving Transportation Visiting Route by Using Tabu Search

Abdullah Hafiz Mohd Taufik & Dr Wan Rohaizad Wan Ibrahim

Transportation companies are usually suffering from a decrease in revenues as a result of decreasing customer base and in increasing delivery network. This is because of their obligation to deliver the item at the same price irrespective of location, usually mandated by the consumer rights. Therefore transportation companies need to look at making each aspect of their business more efficient and effective. This study focuses on the methods used to deliver item from Kota Bharu depots to delivery points (another cities). In this study, we present the basic concepts of Tabu Search method for optimizing problem of Travelling Salesman Problem (TSP). The main purpose of this work is to understand the symmetric TSP, solve this problem by using Tabu Search method to find shortest distance with small space and computational needs and then using computer program (Microsoft C++) to solve large scale symmetric TSP. Finally we find the shortest distance to visit 46 cities of Malaysia. A literature review presented here identified arc routing as the most relevant branch of operations for this study. Specifically it was found that modelling the problem as Travelling Salesman Problem that was solved using a path scanning heuristic would make the best use of skill set. The time available and would approximate a good solution for the transportation company. This report describes the chosen solution method and the final solution generated. Finally a brief chapter on possible future work is given.

**MODEL FOR SOLVING CAPACITATED VEHICLE ROUTING PROBLEM WITH
TIME-WINDOW OF UNIVERSITI TEKNOLOGI MALAYSIA BUS SYSTEM**

Agus Salim Bin Karudin & Prof. Dr. Zainal Abdul Aziz

Nowadays, transportation is playing an important part in our daily lives. Mathematically, one of the most known related are vehicle routing and scheduling. The purpose of vehicle routing is to make an efficient schedule for buses where each bus picks up passengers from certain bus stops and delivers them to their destination while satisfying various constraints such as the capacity of the bus, distance of college to the faculty. The Capacitated Vehicle Routing Problem with Time Window (CVRPTW) is the method that is used for this problem.

Time window routing is the extension of Capacitated Vehicle Routing Problem (CVRP) in which each customer i is associated with time interval $[a_i, b_i]$ called time window. The service of each customer must start within the associated time window, and the vehicle must stop at the customer location S_i time instants. In case of early arrival at the location of customer i , the vehicle generally is allowed to wait until time instant a_i where the service may start. This problem consists of different sub-problems involving data preparation and bus route generation. In fulfilling these objectives, Mixed Integer Linear Programming (MILP) model is employed and the optimal route is obtained by implementing the MILP model in an optimization solver LINGO.

By having a proper bus route, it is contemplated that UTM is able to reduce its operational cost on the bus service. In addition, the students will be getting a more efficient bus service.

Topological Properties of Banach Space

Aina Afiqah binti Ahmad Romzi & Dr Amidora binti Idris

Theory of Banach space is a study of absolute value function on the real number which are introduced by Stephan Banach in 1922. Banach space said to be the powerful tools in solving analysis problems that are being used until today. Mathematical background of topology and functional analysis are provided in this study which helps in understand this space. The main interests of the study are to explore the concept of Banach space and investigate its topological properties. Some example of classical Banach space respect to their properties are discussed in this study. The fundamental theorems of Banach spaces, such as Hahn-Banach theorem and Banach-Schauder theorem are elaborated as well as the applications of each theorem. Some topological properties are found in the fundamental theorems which causing the theorems can be applied in certain conditions.

Bias Correction in General Circulation Model (GCM)

Aina Nadia Mohammad & Assoc.Prof Dr. FadhilahYusof

General Circulation Model (GCM) is a type of climate model that used mathematics as a tool to forecast weather, to understand climate and to forecast climate change. Data generated using GCM has been used in many studies especially on the impact of climate change on future extreme events. Therefore, the data must possess high accuracy and reliability. However, previous studies have found that the data simulated from GCM have numerous errors and require some adjustments before they can be used. Hence, we performed bias correction on the simulated data to provide better accuracy and reduce errors. Most of present bias correction methods adjust statistical properties between observed and simulated data in specific periods. This research is conducted to study the performance of distribution mapping or quantile mapping by considering gamma distribution. Gamma distribution will perform distribution fitting for both data and used its parameter to construct transfer function. The database of observed precipitation for Brook's station is obtained from Water Resources Management and Hydrology Division, Department of Irrigation and Drainage (DID) from 1982 until 2015 for a duration of 34 years. Meanwhile, the simulated future data which is obtained from National Hydraulic Research Institute Malaysia (NAHRIM) is CCSM3A1B scenario. There are two sets of simulated data: 1970 - 1999 set and 2009 - 2060. The result shows the good correlation in both calibration and validation part where the root mean square error (RMSE) decreased after performing bias correction. In calibration, the RMSE had decrease from 50% to 31% meanwhile the validation had decrease from 82% to 37%. Confidence Interval for means and variance are constructed to verify the result. Thus, this study has concluded that GCM bias correction has improved the quality of the simulated data and reduced the modelling error, hence a reliable model can be established.

Finite Volume Method for Solving Two-Dimensional Diffusion Equation

‘Ainaa’ Athirabinti Abd Ajis& Dr Yeak Su Hoe

Diffusion equation is a linear second order partial differential equation (PDE) which describes density fluctuations in a material undergoing diffusion. There is no general or specific numerical technique to obtain the analytic solution of this second order linear PDEs. Therefore, the purpose of this research is to study the application of numerical method in solving the two-dimensional diffusion equation or Poisson equation in Cartesian coordinates by applying finite volume method (FVM). Cell centered finite volume method also known as control volume finite difference (CVFD) method is discussed and elaborated. FVM approximates the average integral value on a reference volume and the partial differential equation is converted to a system of linear equations. The system is solved by a direct method and a MATLAB language is implemented to calculate the FVM with a handful of sample problems. The calculated results show that FVM able to produce an accurate solution. In future, the FVM can be applied in more complex equation or more complex boundary conditions.

Testing for Nonlinearity in Time Series with Application to Exchange Rates

Amirah Farzanah Sulaiman & Dr. Norhaiza Ahmad

Linear and nonlinear time series models are typically used to forecast exchange rate time series data. However, the assumptions when applying these models are bound to the linearity or nonlinearity of the time series data. For instance, linear time series models may leave certain aspects of data unexplained due to the nonlinearity of the data. Thus, it is important to determine the type of time series data before it can be applied to either linear or nonlinear forecasting models. The purpose of this study is to investigate whether daily mid-price spot in six major foreign exchange rates against Malaysian Ringgit (MYR): Swiss Franc (CHF), Great British Pound (GBP), Hong Kong Dollar (HKD), Japanese Yen (JPY), Singapore Dollar (SGD), and US Dollar (USD) show significant evidence of nonlinearity or otherwise. The daily mid-price spot exchange rates are first transformed to log-returns and tested for stationary using Augmented Dickey Fuller (ADF) and Kwiatkowski-Philips-Schmidt-Shin (KPSS) tests. Then, two different tests of nonlinearity called Portmanteau and RESET are applied and the results are compared. It is found that all six foreign exchange rates show strong evidence of stationary and only CHF and GBP exhibit significant evidence of nonlinearity at $p\text{-value} < 0.05$ for lag 1 in Portmanteau and RESET tests. Further examination reveals that Portmanteau test show significant nonlinearity for higher lags at all six foreign exchange rates.

The Multiplicative Degree of Cyclic Subgroups of Nonabelian Metabelian

Groups of Order 24

Alcey binti Josit & Dr. Nor Muhainiah Mohd Ali

The concept of commutativity degree of a finite group G plays an important role in determining the abelianess of the group. This concept has been extended to the notion of the multiplicative degree of a group which is defined as the probability that the product of a pair of elements chosen randomly from a group is in the given subgroup of H . By using the assistance from Groups, Algorithms and Programming (GAP) software, the multiplicative degree for cyclic subgroups of nonabelian metabelian group of order 24 are determined in this undergraduate report. As a result, the multiplicative degree of cyclic subgroups of order 24 is equal to the order of cyclic subgroup divide the order of a group.

Face Recognition Using Principal Component Analysis

Anis Amirahanani binti Mohd Kamal & Assoc.Prof Dr. Robiah Adnan

Research area about pattern recognition during these days has drawn much attention among researchers. The usage of pattern recognition covers up in this paper to be discuss is face recognition by using a well-known method Principal Component Analysis (PCA). PCA is a method that used for data reduction and feature extraction for appearance based approach. In this study, a set data of PGM images that consists of 10 individual image with size of 92 by 112 pixels is treats for the face recognition analysis. The images provided are already in grey scale image and it make this analysis become easier for computational purpose. Eigen Faces approach is implement in this study since it enclosed a linear combination of weighted eigenvectors. All the eigenvector is attaining from covariance matrix of training images meanwhile the weight is selected from a suitable set of Eigen Faces. The recognition process then take place by done a projecting of images onto subspace by using Eigen Faces approach. There are two types of distance that are using to measure and give result for Eigen Faces approach which are Euclidean distance and Mahalanobis distance. The experimental result at the end prove that Mahalanobis distance outperform than Euclidean distance since it produces a lower value of distance. MATLAB 2013a and Microsoft Excel are fully implement the algorithm in analyse this face recognition problem.

**FORECASTING THE TREND AND SEASONALITY FOR NUMBER OF TOURIST
ARRIVALS IN MALAYSIA USING DECOMPOSITION METHOD AND HOLTS
WINTER METHOD**

Atiqah binti Hairel Anuar & Assoc.Prof Dr Maizah Hura Ahmad

Forecasting can be defined as a prediction of some future based on historical data obtained. This data is called time series data. Time series means a study of chronological sequence of observation on a particular variable. The time series data for this study is about the tourist arrivals in Malaysia from 2000 until 2015. Each year will be divided into four quarters which consist of 3 months. After collecting the data, the components of time series need to be identified. This study used Microsoft Excel to identify the components by plotting the graph of the data collected. From the graph, the data consists of trend and seasonality components. Hence, this study is mainly focused on the forecasting the trend and seasonality of the data research. The forecasting of the data research using the decomposition method and Holts Winter method. Both methods are chosen based on the trend and seasonality of the data research. The comparison between both methods also be taken to find the best methods for forecasting the data research by comparing their MAPE values. At the end of this study, it is identified that the decomposition method is better than Holts Winter method since it has the smallest values of MAPE compared to values in Holts Winter method which is 8.848.

**Financial Statement Management in Banking Using Goal Programming Model
and Analytic Hierarchy Process.**

Ayuna Binti Sulekan & Dr. Rashidah Ahmad

This study examines the management of the financial statement having six conflicting goals to achieve efficiently. The six goals are asset accumulation, reduction of liability, equity, profitability, earning and optimum management items in financial statement. These goals are examined with the collection of areal bank data from the annual reports and the bank's scope. The data are taken for five years duration starting from year 2012 until year 2016. The problem is modelled as lexicographic and weighted goal programming. The optimal solution is found using a well-known software known as LINGO version 11. Meanwhile, an Analytic Hierarchy Process (AHP) is used to find the weight of every six goals. The six goals are prioritized based on the viewpoints from senior financial bank officer. These weights will be used as the coefficient of the priority of the objective function. The results of the model show that all the six goals are fully achieved when using software LINGO version 11. This model can act as a guidance for the decision maker of any financial institutions when making decision that relate to finance. Besides, an idea and strategies can also be developed from this model especially when handling various types of real problems which related to the economic.

Vehicle Routing Problem with Time Window Model and Solutions for Muafakat Johor Bus Service

Azrul Naim Azhar & Dr. Zaitul Marlizawati Zainuddin

The Vehicle Routing Problem with Time Windows (VRPTW) is a well known problem especially in operational research where it can be described as the problem of designing least cost routes from one depot to a set of geographically scattered points. The routes must be designed in such a way that each point is visited only once by exactly one vehicle within a given time interval. All routes start and end at the depot, and the total demands of all points on one particular route must not exceed the capacity of the vehicle. The VRPTW has drawn enormous interests from many researchers because of its vital role in planning of distribution systems and logistics in many sector such as school bus, mail delivery and task sequencing. In this study, Muafakat Johor Bus Service for Majlis Perbandaran Johor Bahru Tengah (MPJBT) is considered. This bus service is provided by the Johor State Government for free to all citizens. The aim of this service is to reduce the cost of living and also to facilitate and improve the quality of public transport services to citizens in the routes that have been identified. Therefore, any reduction in the operation cost of this bus service will be of help to the government. On the other hand, in order to improve the quality of public transport services, the bus is expected to arrive at the respective stops at the time specified by the schedule. It is seen that one way of achieving these goals is through the route design of the bus service. Thus, in this study, VRPTW is used to model the route of Muafakat Johor Bus Service under consideration. The model was solved by using LINGO which is an efficient software for solving optimization models. The optimal route is obtained with the optimal number of buses is two. By considering the time window constraint, the current practice of one bus covering all the stops is found to be infeasible.

Mathematical Model for Timetabling Problem in Maximizing the Preference Level

Bahriah Malik & Dr Syarifah Zyurina Nordin

Timetabling problem can be classified as an assignment problem which is very crucial in making sure all the events occur at the perfect place and time demand. Among those, the difficulty in timetabling is satisfying all the restrictions and requirements. The timetabling problem is to optimize an objective function subject to a set of constraints that relate to various operational requirements and a range of resource constraints such as workload, timeslot and courses. University course timetabling problem (UCTP) is the central focus in this study. Our objective is to investigate an optimal solution by maximizing the total preferences level on lecturer to course to time slot assignments. Limited number of lecture halls and large number of courses acts as the restrictions as well as the requirements of the problem which results as the constraints to the model. Mixed integer linear programming (MILP) model is used to solve the problem. The computational experiments are conducted using LINGO 16.0. The results obtained will lead to a satisfaction for the lecturer and generate a conflict-free timetable for all parties involved.

Two Dimensional Knight's Tour by using Warnsdorff's Algorithm

Fasha Farhanni Binti Abdul Khalid & Dr. Fong Wan Heng

Knight's Tour is a classic problem used to illustrate a graph algorithm. The Knight's Tour in puzzle games is played on a chessboard with a single chess piece which is the knight. The problem of two dimensional Knight's Tour is to find a sequence of moves that allow the knight piece to visit every square on an $m \times n$ size of chessboard exactly once where m and n are not necessarily the same. Previously, some mathematicians have discussed Knight's Tour problem on the standard 8×8 size of chessboard, but after that mathematicians are more interested in non-standard chessboards. In this research, the properties of two dimensional Knight's Tour and its relation with graph theory are investigated. Next, Warnsdorff's algorithm is used to solve two dimensional Knight's Tour. Then, the graphical user interface of two dimensional Knight's Tour is generated by using the MATLAB programming software. The results for open Knight's Tour by using Warnsdorff's algorithm are found for $3 < m < 70$, where m is the size of chessboard. The result of this research is an interface of two dimensional Knight's Tour to intrigue the interest in mathematics, particularly in puzzle games.

Mathematical Modelling of Cdc2-cyclinB/Wee1 System Using Ordinary Differential Equations (ODEs)

Fatin Hafizah Binti Alias & Dr. Fuaada Binti Mohd Siam

The purpose of this study is to analyse the stability of the model of Cdc2-cyclinB/Wee1 proposed by F.M Siam, when the protein turnover is taken into the system. The dynamics of the protein is written into the system of Ordinary Differential Equations (ODEs). In order to investigate the stability of the equilibrium points, some mathematical method are employed. There includes the commutative algebra method, Sturm's Theorem and Cauchy Criterion. It is obtained that the bistability disappeared when the protein kinase turnover is taken into the system.

Solution of Unsteady Free Convection Flow of Carbon Nanotubes over an Oscillating Vertical Plate using Laplace Transform Technique

Fatin Nabila binti Baharin & Assoc. Prof. Dr. Sharidan Shafie

In this thesis, the solution of the partial differential equations by using Laplace transform method is presented. Partial differential equations which governed the problem of unsteady free convection flow of carbon nanotubes (CNTs) over an oscillating vertical plate is chosen. In this study, the single-wall CNTs is used with water as base fluids. The processes of solutions are discussed in details. First, the partial differential equations and boundary conditions are transformed into non-dimensional equations using suitable dimensionless variables. Then, the obtained non-dimensional governing equations are solved analytically using Laplace transform technique which reduced the non-dimensional equations into a set of linear ordinary differential equations. After solving the ordinary differential equations using an appropriate method, the inverse Laplace transform is applied to obtain the solution. Finally, the expression of velocity and temperature profiles for the problem of unsteady free convection flow of carbon nanotubes (CNTs) over an oscillating vertical plate are presented.

**Polynomial Approximation of the Solution of Second Order Linear Differential Equation
Using the Chebyshev Polynomials**

Hafsah Binti Abdullah & Assoc.Prof Dr. Nor'aini Aris

In the thesis, the solutions of second order linear differential equations are determined by approximating the source function of the equation using polynomials in the Chebyshev basis. The particular integral is assumed to be polynomial in the Chebyshev basis. Substitution of the particular integral into the differential equation requires the computation of the derivatives in the orthogonal basis. Therefore the derivative of each Chebyshev basis polynomial has to be represented as linear combinations of the Chebyshev basis polynomials. The method reduces the problem into solving algebraic equations to determine the coefficients of the particular integral. Matlab software is used to find the approximation of the source function and to solve the algebraic equations. The source functions considered are of the form-polynomials, exponential and trigonometric functions respectively. Comparison between the numerical solutions and the exact solutions are made to illustrate the effectiveness of the numerical method.

Mixed Integer Linear Programming Model of The Single – Runway Aircraft Landing Problem

Jessy & Dr Rashidah Ahmad

This study presents aircraft landing problem (ALP) to obtain the optimal landing time for a set of aircraft to reduce delay. The real data of the target time and actual landing time of a set of aircraft in one day flight schedule is from Kuala Lumpur International Airport (KLIA). Mixed Integer Linear Programming (MILP) is used to model the problem, aims to minimize the penalty cost incurred from the total deviation time. In this study, a computational software LINGO 16.0 is used to find the optimal solution by using Branch-and-Bound (B&B) method. The focus of this study is to take into consideration time window of a set of aircraft, target landing time, minimum separation time between an aircraft and the successive aircraft, and arbitrary size of aircraft (Heavy and Large). First, there is comparison between the total penalty cost from the real data and the solution from LINGO 16.0. Then, feasible solution is improved by tightening time window from adding two extra constraints. A comparison is made between Heavy and Large aircraft in sequencing aircraft landing. For future works, ALP problems can be modelled as scheduling problem, such as job shop scheduling problem. It is suggested that Heuristic method can also be used to solve this problem.

Three Dimensional Numerical Simulation of non-Newtonian Blood Flow through different Boundary Condition.

Mohammad Azim Mohd Azahari & Dr. Zuhaila Ismail.

In this study, the effect of different inlet of boundary conditions on non-Newtonian blood flow characteristics is examined. Blood is exhibit as a generalized power law model to characterize the non-Newtonian behaviour of blood. The blood flow in the bifurcated artery is considered to be unsteady, incompressible and laminar where the arterial bifurcation is modelled using three-dimensional system. A rigid wall with no-slip condition assumption along the arterial wall is employed in this present study. The presence of a single stenosis in the mother artery which disrupt the vessel flow together with the implication of various inlet of boundary conditions have been analyzed and discussed in details. Results have been presented graphically for axial velocity profiles, pressure and streamlines pattern at mother and daughter artery. For that purpose, a commercial software package COMSOL Multiphysics 5.2 based on finite element method (FEM) is used to examine the results. Hence, this numerical study could assist the clinicians in the prediction of any hemodynamic changes of blood flow in three-dimensional arterial bifurcation.

The Study of Mathematical Modeling on Diffusion and Advection Equations (Water Pollution Problem)

Mohd Zuhair Bin Zaharudin & Dr. Zaiton Binti Mat Isa

The river quality problem has been widely studied. Many work on the behaviour of concentration of pollutant in river were simulated by mathematical models. The behaviour of river pollution is normally modelled by diffusion and diffusion-advection equation with various boundary condition depend on the situation. In this study, diffusion-advection equation is used to describe the behaviour of river pollution. The advection-diffusion equation is solved by using Laplace transforms to get the analytical solution. Then, the solution will be interpreted by MATLAB programming to obtain the behaviour of the graph.

Solving Linear Bi-Level Programming Problem by Using Karush Kuhn-Tucker and Penalty Function

Muhammad Amirul Afiq bin Sam & En. Ismail bin Kamis

Bi-level programming problem (BLPP) plays an important role in solving many real problems, consists of upper level and lower level that involves a hierarchical relationship between both levels to satisfy the objection functions at the same time. BLPP is used in many different fields such as transportation, economic planning and revenue management. The main objective of this study is to implement an extended Karush Kuhn Tucker (KKT) conditions and Penalty function to solve a linear BLPP. The two levels of linear BLPP are reformulated into a single level by implementing an extended KKT conditions to a lower level of the problem. Hence, Penalty function is used to penalize the complementarity constraints to find an optimal solution. In this project, the linear BLPP case which is the pricing of airlines industry problem is studied. The methods used are able to determine the price of the ticket that satisfies the objective of maximizing revenues of the company and minimizing disutility of the users.

FUZZY LINEAR DIFFERENTIAL EQUATION IN HIV INFECTION

Muhammad Badrul Bin Ramle & Assoc. Prof. Dr Normah Bte Maan

This study discusses a fuzzy mathematical model of human immunodeficiency virus (HIV) infection consist a linear fuzzy differential system. The system describes the uncertain immune cell level and the viral load for different immune system's strength of HIV-infected patients. The immune system consists of the CD4+ T and cytotoxic T-lymphocyte (CD8+ T) cell. The dynamic behaviour of the immune system and the viral load of the different group of patients which weak, moderate and strong immune strength are analyse and compared. The numerical solution of the system is obtained by Runge-Kutta fourth order method. Simulation result show that the fuzzy differential system can describe the uncertainty immune cell level and HIV viral loads which due to the existing patients with different strength of the immune system.

Three Dimensional Numerical Simulation of Non-Newtonian Blood Flow through Different Type of Stenosis and Location at Bifurcated Artery

Muhammad Sabaruddin Ahmad Jamali & Dr. Zuhaila Ismail

The formation of plaques in the bifurcated arterial wall lead to stenosis that plays an important role in the development of arterial disease due to the narrowing of blood vessel. Previous research had proven that the formation of stenosis could disturb the normal hemodynamics in blood rheology. Hence, this paper intends to investigate the different type of stenosis and location at bifurcated artery to the blood flow characteristics. The blood is modelled to be non-Newtonian generalized power law where the shear thinning characteristics of streaming blood is taken into account. In addition, the flow is describe to be three-dimensional, incompressible, unsteady and laminar. The numerical simulations are performed using COMSOL Multiphysics 5.2 which based on finite element method (FEM). The simulated results of the present model over the existing model have been validated. Analysis of the results shows that the severity of stenosis produces a considerable effect on the velocity profile, pressure and also the streamlines patterns.

Evaluation on Trend in Fertility Level and Factors Affecting Fertility Rate of Malaysia

Muhammad Shafiq bin Razali & Dr Muhammad Fauzee Hamdan

Demography is one of the branches of a statistical study of a population which include fertility as one of the studies. Fertility is commonly known as a capability of a woman to produce offspring through normal sexual activity. As an indicator of a fertility level of a population of a country, a variance of the fertility schedule is calculated and evaluated as low, average or high. From the variance of the fertility schedule obtained, trend analysis is carried out using Mann-Kendall Trend test. The test will conclude whether a rise or fall of the trend in time series exists in the study. Through simple linear regression, several independent variables selected which are infant mortality rate, gross enrollment ratio, and women labor force participation are analyzed to see the existence of linearity in the relationship between the variables and total fertility rate (TFR) as the dependent variable in this finding. Excel is used to help in the computation for the linear regression test. The result from this thesis shows an upward trend of mean of fertility schedule and a downward trend of fertility level of Malaysia for the latest period of data. All independent variables of infant mortality rate, gross enrollment ratio, and women labor force participation through linear regression test do imply there exist linearity to the total fertility rate (TFR).

**Stochastic Frontier Approach in Measuring Information and Communication Services
Industry Efficiency for 45 Case Study**

Nabihah Binti Abdul Jalil & Dr. Arifah Bahar

Information and communication services industry (ICSI) is very important and give best prospect in Malaysia. ICSI can create economic opportunities and foster social and political inclusion, ultimately contributing to shared prosperity. Production efficiency is an operational state whereby a company cannot increase output of a specific good or services without additional costs. Hence, it is important to measure production efficiency to enables this industry make the best possible use of the company's resources. Due to important ICSI to Malaysia, the main objective of this study are to measure the level of efficiency production in ICSI and to analyze the efficiency scores by using several specifications. This study employs a stochastic frontier approach (SFA) methodology incorporating Cobb-Douglass and data for 2014, to estimate managerial efficiency in the in ICSI. This case study adopt a maximum likelihood approach to estimation in which the variance of both one-sided and two-sided error terms is modelled jointly with the frontiers. The analysis is carried out with a cross-section data of forty-five company in this study which is found in the annual report to find the efficiency using SFA. The labour, income tax expenses and other expenses (e.g administrative expenses, distribution expenses) are considered as inputs; revenue of each companies regarded as output. R Studio Software was used in this report to solve the SFA. According to this case study, the average efficiency measures for the ICSI estimated by the SFA are very high which is 99.47% and it is good for this case study.

On Construction Some Conformal Mappings of Elliptic Regions onto Some Class of Simply Connected Regions with Smooth Boundaries

Nadirah bt Rashid & Assoc. Prof Dr Mukhiddin Muminov

Let Ω be a simply connected region bounded by elliptic curve Γ , where Γ parameterized by equation $\eta(t) = a \cos t + i \sin t, a, b > 0$. In this paper, by using the boundary value of a Cauchy integral of function $\varphi(s)$ on elliptic curve Γ , we give a method of construction of conformal mappings from Ω to a bounded simply connected region Ω' , where $\varphi(s)$ is differentiable function on Γ and the boundary curve Γ' of Ω' is defined by piecewise smooth parametric function. We give numerical approach for some examples.

Multivariate Poisson Regression Application in Drug Consumption

Noorazura Shahira Yusniman & Assoc. Prof. Dr. Ismail Mohamad

Poisson regression model is one type of generalized linear models used to model count data. The aim of Poisson regression is to determine the relationship between some explanatory variables and the response variable. In this study, the model is applied to the consumption of psychotropic drug, a medication prescribed by therapist or health care provider that will affect the central nervous system to treat mental disorder. The data used are from an extract of a survey of West London to explore the factors influencing the patterns of consumption of psychotropic drugs. Interest lies in whether the factors; sex, age and score on the General Health Questionnaire (GHQ) influenced the probability of consumption and whether there is any relationship between these factors. The data are being converted into a cross-sectional or contingency table. SPSS is used to analyse the data. The result shows that sex, age and the score of GHQ affect the drug consumption which is determined using test of model effect.

QUEUING THEORY APPLIED IN BANK MANAGEMENT

Nor Afiqah Binti Ali & Dr Nur Arina Bazilah Binti Aziz

Queuing theory is the mathematical study of waiting lines, or queues. In queuing theory, a model is constructed so that queue lengths and waiting time can be predicted. Bank is one of the important public service centre in Malaysia that uses the queuing system in their services. Thus, the study of queuing system in the bank is important and relevant nowadays. Therefore, the main purpose of this study is to investigate the performance of queuing system in the bank. The queuing model that was applied is $M/M/s/GD/\infty/\infty$ and the software of EasyFit was used to show the interarrival time and service rate which follows the Exponential distribution. The simulation used in this model was done by SIMUL8 software.

HYPERBOLIC SYSTEM OF FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS

Nor Haszrina Binti Rashid & Prof. Dr Mohd Nor Bin Mohamad

Partial differential equations also known as PDE is the model that will be used to describe variety of phenomena such as heat, sound, electrostatics, electrodynamics, fluid dynamics and quantum mechanics. For ordinary differential equation (ODE), the model is one-dimensional dynamical systems, here PDE is multidimensional system which involves the rate of change with respect to continuous variables. In this thesis, we are concerned about the first order partial differential equations for hyperbolic system. As we know, hyperbolic is the linear second order partial differential equations. So, we will transform the second order to become first order equations using several methods. Since hyperbolic systems have connection with conservation laws due to model of hyperbolic is wave equation which is one of the example model for first order PDE, we will look into conservation laws a little. Next, from the $n \times n$ matrix form and using Riemann Invariant concept, we will solve the solution for the system.

Modeling of El Nino Southern Oscillation Index and Rainfall (Malaysia)

Nor Radwa bt Ismail & Dr Shariffah Suhaila bt Syed Jamaludin

Southern Oscillation Index (SOI) is known as a measure of air pressure differences across the Pacific Ocean, from Tahiti in the south-east to Darwin in the west. This measurement is the most important climatic indices of the world because it can analyze and predict the changes in both El Nino Southern Oscillation phenomenon. Many statistical models have been developed using SOI indices in forecasting. The objective of this research is to find the best method among Box-Jenkins Autoregressive Integrated Moving Average (ARIMA), Single Exponential Smoothing and Double Exponential Smoothing in forecasting the monthly SOI. The data were obtained from January 1990 to December 2015 with a total of 25 years. Akaike Information Criterion (AIC) and the Sum of Square Error (SSE) were used to select the best model for ARIMA model. The result shows the Box-Jenkins ARIMA is the suitable method to forecast compared with others through the value of smallest SSE .

Comparison of Systems for the Efficiency of Queues at Malaysia Fast-Food Restaurant

Norhamizah binti Saleh & Assoc.Prof Dr. Rohanin binti Ahmad

Queuing theory is about analysing every element of waiting in line to be served including the arrival process, service process, number of servers, number of system places and number of customers in the system. In a fast-food restaurant, waiting for service is a common experience for customers. Customers' queuing time should be considered carefully to increase customer satisfaction and attract more customers to come. This study deals with $M/M/2$ queue in fast-food restaurant. The data collected underwent Chi-square test for Poisson and exponential distribution in the queuing model. We also measured the performance of existing and proposed systems to compare which system is the best to be applied in the fast-food restaurant. Measurements of the systems operation of the fast-food restaurant are analysed based on $L_s, L_q, W_s,$ and W_q of each model. In this study, we proved that multi-server, single-line model is better than multi-server, multi-line model and we discuss the relation between these two models. The results are effective and practical to be applied in fast-food restaurant.

Analysis of Deterministic Sensor Deployment in Wireless Sensor Network

Norhidayah binti Razali & Dr. Shazirawati binti MohdPuzi

Wireless network with large number of sensor is called wireless sensor network (WSN). The sensor is use to sense, collect and process information in sensing area, then transmits the processed information to the base station. Therefore, it is important to analyze the deterministic sensor deployment in WSN to get the accurate information. The objective of this study is to minimize the use of sensor while maximizing the area covered by the sensors in certain deployment arrangement. In this study, the sensors are deployed in the form of square grid, triangular grid, pentagon grid and octagon grid. The analysis for each arrangement will be made, and the arrangement that gives maximum efficient coverage area while using less number of sensors will be the effective grid arrangement for sensor deployment.

One Dimensional Stefan Problem by Means of Integrated Penalty Method

Nur Aliaa Atiqah binti Zainal Abidin & Dr Mohd Ariff bin Admon

Phase change problem which is also known as Stefan problem occurs naturally in many physical processes such as freezing of foods, production of ice, chemical reaction, solidification of steel and ice formation on pipe surface. Mathematically, the melting or solidification process is a special case of moving boundary problem. This study considered mathematical modeling for one dimensional Stefan problem of melting process of ice. Stefan problem is solved using the integrated penalty method (IPM), developed by Kawarada and Natori (1976). IPM transforms the original problem into an approximate problem by introducing the additional penalty term in the diffusion equation. Free boundary or Stefan condition is approximated to the integration of penalty term. This problem is numerically solved by using finite difference method. The results show that the free boundary positions increase and the temperature distributions decrease as the time increases.

The Application Of Neural Network In Determining The Production Of Corn

Nur Atiqah binti Jamaludin & Assoc.Prof Dr Khairil Anuar bin Arshad

Corn is basically widely used by humans and animals. Corn can be grown throughout the year in most of the Asian countries for various purposes like fodder for animals, food grain, sweet corn and else. However, the fertilisers used for this plantation are too expensive. Thus, the purpose of this research is to find the best model to predict the production of corn based on experimental data collected from the Department of Chemistry to replace the fertiliser used nowadays with animal urine, small amount of fertiliser(NPK) and compose. The method used to predict the production of corn is Artificial Neural Network(ANN). Artificial neural network is one of the methods that is used for predicting. Thousands of data and variety of experiments had been done using this method in predicting such as in medication, airlines and banking system. The result for this experiment is the weight of the fruit based on different amounts of fertiliser used. The performance of the neural network is evaluated by using mean square error (MSE). STATISTICA 10 software is used throughout this research.

Modelling Call of Integration for Wireless Sensors Networks In Temperature

Nur Afiqah Hamizah bt Norizan & Dr. Shazirawati bt Mohd Puzi

In this study, a wireless sensor network (WSN) which consist of many sensor nodes is deployed in an area of interest to monitor the temperature of the surrounding. Upon sensing the abnormality in the environment, sensors need to communicate to each other to verify the situation and avoiding the false alarm situation. Intuitively, sensors who detect high temperature are most likely to initiate the communication with the neighboring sensors. The process is referred as call of integration. In this work, we model the call of integration using probabilistic approach. In other words, our model implies that sensors with higher sensing value should have higher probability to call for integration. We will model the call of integration, p based on two functions, which are exponential function and logistic growth function. The analysis and comparison between models will be made, and the model that best fit our working scenario will be determined.

Cox Regression on Veteran's Administrative Lung Cancer Trial Data

Nur Amirah Binti Abdul Hamid & Noraslinda Mohamed Ismail

Survival analysis is a statistical method to analyze the time until the event of interest occurs. In survival analysis, an event is referred as failure because most of the event might be death, disease incidence and many other negative events. This study considers the censoring which involves the incomplete time of survival of the patients. The most popular regression for the survival analysis data is the Cox proportional hazard model which is also known as a semiparametric model. This model makes fewer assumptions compared to parametric model but more assumptions than the nonparametric model. However, there is no assumption on the baseline hazard function which is contradicting to the parametric model. The purpose of this study is to analyses the effect of the covariates on the survival time of Veterans' Administrative Lung Cancer via two statistical software, SPSS and OpenBugs. At the end of the study, the result showed a quite similar in coefficient of covariates but different in the model. However, both software revealed that treatment is insignificant which lead to the no effect to the survival time of patients.

Laplace Decomposition Method for Solving Home Cooling System

Nur Athirah binti Mohd Isam & Che Lokman bin Jaafar

Home cooling system of a typical home with attic, basement and main floor can be modeled from a general system of ordinary differential equations. The method of Laplace Decomposition is a numerical method implemented to obtain an approximate solution of linear or nonlinear ordinary differential equation systems (ODEs) of order n^{th} by using combination of Laplace Transform and Adomian Decomposition. In this study, we used Laplace Decomposition method to obtain an approximate solution for home cooling system which is related to applied mathematics, physics, engineering and many branches of science. Besides that, we also discussed several Laplace Decomposition method and Runge Kutta method to solve the problem. Next, a program code is implemented by using Matlab to obtain the approximate solution. Finally, the efficiency of the methods will be discussed by analyzing the numerical answer and graphical plot with the exact solution.

Solving Two Dimensional Diffusion Problem Using Finite Volume Method

Nur Fadzilah Binti Jamaluddin & Assoc.Prof Dr Munira Ismail

In this work, the numerical and analytical solution of two-dimensional diffusion problems, which describes the steady state heat conduction, is proposed employing the finite volume method and also the separation of variables method respectively. The analytical solution for two-dimensional equations of the problems was solved and explained in two examples. Hence, as an alternative approach, the numerical solution for the same problems was also obtained showing all calculations. The work also provides a step by step algorithm process. Thus, it concludes that the numerical result is comparable with the analytical solutions.

Modelling Secondary School Students' Performance Using Logistic Regression

Nur Fazwani Zulkurnain & Dr Zarina Mohd Khalid

Education is one of the main foundations in children development contributing to national human resource development. Academic performance at school plays an important role in producing excellent students, leading to the best quality graduates at university. These pool of talents will hence become great leaders and manpower for the country, and thus be responsible for the country's economic and social development. In this study, a logistic regression model was applied in identifying factors influencing the academic performance of students at a particular secondary school using a Statistical Package for the Social Sciences (SPSS) software. We modelled the academic performance as binary response variable, which may be influenced by a number of predictor variables including gender, monthly household income, revision time, extra classes attended, time spent on playing games and watching television, and being active in co-curriculum activities. Based on the collected data from Sekolah Menengah Kebangsaan Skudai, we found that gender and attending extra classes are significant factors that have substantial impact on the chance to perform well in academic.

**ANALYTICAL SOLUTION OF STREAMLINE AND TRAVERSE TIME OF A GAS
FLOW IN STORED GRAIN**

Nur Fitrah binti Baharudin & Dr. Zaiton binti Mat Isa

In grain industry, fumigation is common method used for killing insects in stored grain. For a successful fumigation, the fumigant must be able to reach all area. In order to help understand the gas behaviour, one of the options is through mathematical modelling. This thesis aims to study the streamline and traverse time of the gas by considering an incompressible phosphine gas flow through cylindrical silos with annular inlet at the base of grain storage. Two case studies are investigated which differ at their inlet boundary condition. The thesis begins by developing mathematical model based on Darcy's flow in porous medium, where the gas satisfies Laplace's equation. Then, the available Laplace equation solution involving velocity equation is used and solved to gain the streamline equation by using integration. On the other hand, ODE45 is used to obtain the traverse time. Both streamline and traverse time is plotted based on its height and radius by using Matlab software. In general, the gas is able to reach all areas but in different time.

The Energy of Four Graphs of Four Nonabelian Metacyclic 2-Groups

Nur Idayu Alimon & Prof. Dr. Nor Haniza Sarmin

The energy of a graph is the sum of all absolute values of the eigenvalues of the adjacency matrix of the graph. An adjacency matrix is a square matrix consisting of 0 's and 1 's entries which depend on the adjacency of the vertices of the graph. The commuting graph is a graph whose vertices are non-central elements and the edges are pairs of vertices that commute while the non-commuting graph is a complement of the commuting graph. In addition, the conjugate graph is a graph in which the vertices are non-central elements and two vertices are connected if they are conjugate to each other. The conjugacy class graph is a graph whose vertices are non-central conjugacy classes and two vertices are connected if the order of the conjugacy classes have a common prime divisor. Meanwhile, a metacyclic group is a group that has a cyclic normal subgroup H such that the factor group G/H is also cyclic. In this research, the energies of commuting graphs, non-commuting graphs, conjugate graphs and conjugacy class graphs for four nonabelian metacyclic 2-groups of order at most 32 are determined. In order to compute the energies, previous results of the graphs are used while some others have to be determined first using their definition. Then, their adjacency matrices are found also using the definition. Next, the characteristic polynomials and the eigenvalues of the matrices are computed with the help of Maple2016 Software. Finally, the energies of each of the four graphs for all four groups are found. The results show that the energy of these graphs of the groups must be an even integer.

Water Level Prediction By Using Artificial Neural Network Model (ANN)

Nur Najla binti Muhamad Taufek & Dr Ani bin Shabri

Water is the most essential element to life on Earth and not lost in undergoing various processes of hydrological cycle namely, water level, rain flow, streamflow etc. In hydrological forecast, mainly forecast of water level of lake is done which is useful for various purpose. In this study, future water level forecast helps in knowing the level of water of Lake Ontario to avoid any possible disturbance of ecology or lake balancing system. Autoregressive Integrated Moving Average (ARIMA) model, Multiple Regression and Artificial Neural Network (ANN) model were used to predict water level of Lake Ontario, North America in this research. Annual data of water level Lake Ontario from year 1950 until 2010 with a total of 61 data, were being used as observation data in this study. The data had been analyzed by using R, Microsoft Excel and Matlab 2013a. The predicted values from both models were compared with the actual data and compare between ANN, Multiple Regression and ARIMA model in order to determine the best model for forecasting water level. The result shows that the ANNs model was proven better compared to Multiple Regression model and ARIMA model in forecasting water levels at Lake Ontario, North America.

Numerical Methods To Solve Elliptic Equations

Nur Nasuha Binti Mohd Nasrol & En. Che Rahim Bin Che Teh

In this study, we discuss about Elliptic equations where we consider only two-dimensional Laplace and Poisson equations with boundary value problems. Both equations will be solved by using Finite Difference Method. The goal in this study is to find the approximation solutions by using Iterative Methods such as Jacobi, Gauss-Seidel, and Successive Over-relaxation Methods and Alternating Direction Implicit Method. Since the problems will produce the large number of mesh points therefore we also developed algorithms and MATLAB programming for each of the methods to make the calculation easier.

Solving Beam on Elastic Foundation using Finite Difference Method

Nuraini Binti Hashim & Hamisan Bin Rahmat

This research was carried out to solve beam on elastic foundation which involve fourth-order ordinary differential equation. The beam can be divide into four cases which is pinned end, fixed end, free end, and guided end while the boundary conditions of these four cases: $w(0) = 0, w(l) = 0, w(0)'' = 0, w(l)'' = 0$; $w(0) = 0, w(l) = 0, w(0)' = 0, w(l)' = 0$; $w(0)'' = 0, w(l)'' = 0, w(0)''' = 0, w(l)''' = 0$ and $w(0)' = 0, w(l)' = 0, w(0)''' = 0, w(l)''' = 0$ respectively. Each of the cases is being solved by using finite difference method. The step of solving this problem is shown in this study and the results obtain using Matlab are demonstrated.

**Polynomial Interpolation of Two Instances of Flat Electroencephalography (EEG) Cluster
Data**

Nurakmaliana binti Salimee & Dr. Niki Anis bin Ab Karim

The human brain acts as a command center for the human nervous system. This nervous system is working with the information from all parts of the body. An Electroencephalography (EEG) and Magnetoencephalography (MEG) are used to measure the abnormal electrical activity of a brain. This led to the introduction of Fuzzy Topographic Topological Mapping (FTTM) where its act as a first component of viewing EEG signals. EEG signals can transform into an image and can be constructed as a digital space. The main interest of this research is to interpolate the motion of a single Flat EEG centroid point and to extend the interpolation for multiple centroid points over time. This is done by a method of polynomial interpolation where interpolation occurs between available discrete points. The mathematical expression of polynomial was derived, resulting in the general form of a polynomial. Gauss Elimination Method (GEM) was applied to form the linear system and reduced into a matrix form. In order to observe the motion of the polynomial, the suitable software included C++ programming and MATLAB were specified based on the centroid points used. Initially, interpolation occurs in single centroid point resulting single polynomial interpolation. Then, by interpolating between two sets of Flat EEG where each, two centroids points have, resulting four interpolations occurs where for every interpolation having x -variable and y -variable. Having shown the result of the number of interpolation that occurs on the Flat EEG, the true path of centroid is then decided in order to enhance the research.

Application of Cox-Ingersoll-Ross (CIR) model on Interbank Rate

Nurfarahin Borhanudin & Dr. Haliza Abd Rahman

In this study case, stochastic modeling is applied on interbank rate data of Conventional Interbank Rates and Islamic Interbank Rates taken from Bank Negara Malaysia (BNM). Short rate model is needed to describe the movement of interbank rate. Interbank rate not necessarily remain positive but also can drop to zero and negative. Thus, Cox–Ingersoll–Ross (CIR) model is used in this study since CIR model is an extension of Vasicek model which avoid the possibility of negative interbank rate. The parameter estimation used are Maximum Likelihood Estimation (MLE) with three alternative approaches in estimating transition density of CIR model which are non parametric simulated, noncentral chi-squared probability density function and besseli. Ordinary Least Square (OLS) has been implemented for initial parameter estimates. The main objective of this study is to investigate the best parameter estimation method of the CIR model. As a result of the performance of the methods, it is found that nonparametric simulated maximum likelihood estimator generate the best parameter estimates than the maximum likelihood estimator with the implementation of noncentral chi-squared probability density function and besseli due to the smallest Root Mean Square Error (RMSE) value.

Bessel Functions

Nurfatin Liyana Abd Rahman & Prof. Dr. Norsarahaida Saidina Amin

Bessel functions named after the German astronomer Friedrich Wilhelm Bessel are a series of solutions to second order differential equations with variable coefficients. They belong to a class of special functions encountered in the solutions of certain physical problems such as planetary motions, some chemical engineering processes and frequency modulated transmission, to name a few. However, it is observed that most text books and references discussing topics on Bessel functions do not contain sufficient details that are simple enough for undergraduate students to grasp. The generation of series solutions from ordinary and singular points are especially difficult and the solutions obtained are not easily visualized. This report attempts to address the problems through a step-by- step procedure on the derivation of Bessel equations and their solutions leading to Bessel functions of various orders and types. The formulation of Bessel equations are based on the oscillating suspended chain and the deflection of a vertical rod, while the analytical solutions are plotted and verified using Mathematica. Keywords: Bessel function, Bessel equation, series solution, special functions, differential equations

Optimizing University Course Timetabling using Graph Coloring Method

Nurhafizahtulhusna binti Hidzir & Dr Syarifah Zyurina binti Nordin

Timetabling problem is an issue that involved fixed time slot with the wide variety of tasks that required the constrained resources that's often occur in university. The problem consists of various conflicts such that lecturer demands, availability of lecture room and course sections. The purpose of this study is to optimize the number of time frame used with no conflict occurred. We used graph coloring method that involved vertex and edge coloring approach. Edge coloring will define the conflict between courses and lecturers. While, vertex coloring will identify the conflict of different student group taking a same course section. As a result, we are able to generate a feasible university weekly timetable in a typical semester.

The First Order Polarization Tensor and the Depolarization Factors for Spheroid

Nurhazirah Mohamad Yunos & Dr Taufiq Khairi Ahmad Khairuddin

Polarization Tensor (PT) is an old terminology in sciences and engineering where, it has recently appeared in many applications of electric and electromagnetics such as electrical imaging for medical purposes or industrial problems, material science and metal detection. In these applications, the PT can be used for example to describe conducting objects presented in electric or electromagnetic fields. In this study, the main purpose is to investigate specifically the first order PT when the conducting object is a spheroid. Firstly, the formula of the first order PT for ellipsoid is simplified based on the depolarization factors, another classical terminology in mathematics and physics. In order to use the depolarization factors, we first show that the explicit formula of the first PT for ellipsoid can be expressed in terms of the depolarization factors. After that, the new explicit formula of the first order PT derived specifically for spheroid based on the depolarization factors are verified numerically by using MatLab. Next, two properties of the first order PT for spheroid will be highlighted in this thesis. In this study, when the conductivity of the spheroid is greater than 1, we prove that the first order PT for the spheroid is a positive definite matrix whereas, when the conductivity is between 0 and 1, the first order PT is a negative definite matrix. Then, we also show that the determinant of the first order PT for spheroid is the same with the determinant of the first order PT after the spheroid is rotated for various angles. This implies that the determinant of the first order PT for spheroid is not affected by the orientation of the spheroid. In addition, some numerical examples are also provided in this thesis to support our proposed theorems.

Inter-Route Improvement Heuristic Method for Capacitated Vehicle Routing Problem

Nurhidayah Binti Abdul Mutalib & Dr. Farhana Johar

The purpose of this study is to generate an improvement solution for Capacitated Vehicle Routing Problem (CVRP) by using Inter-Route Improvement Heuristic Method. As we know, the Vehicle Routing Problem (VRP) has many components or types and the CVRP is one of its components which are involves many customers and one single depot only. CVRP must restrict to a single capacity constraint in order to distribute the goods to the customers. The main objective of this research is to make an improvement of an initial solution by relocating a customer randomly. Three types of data are used; i.e. clustered, random and random-clustered to see the performance of proposed method by using C++ Programming Language. Based on the results obtained in this study, the total distances decreases when the maximum capacity of the vehicle increases. Further research should be expand by make more improvement for CVRP by using metaheuristic methods such as Variable Neighborhood Search (VNS) algorithm.

Application of Multivariate Poisson Regression in Byssinosis Disease

Nursyahirah Binti Mohd Shahid & Assoc. Prof. Dr. Ismail B. Mohamad

Poisson regression is commonly used to analyze count data where it relate the response variable with explanatory variables. It belongs to the generalized linear model (GLM) where the probability distribution of the response variable which is Poisson distribution in this case, belongs to the exponential family distribution. The standard GLM practice uses maximum likelihood approach to estimate the model parameters and used the deviance to determine goodness of fit of the model. In this study, Poisson regression is applied to data that show number of workers suffering and from byssinosis. There are five explanatory variables which include dustiness of workplace with rate (1-high, 2-medium, 3-low), smoking status (1-smoker, 2-non-smoker), sex (1-male, 2-female), ethnic of group worker (1-white, 2-other) and length of employment in years (1-less than 10 years, 2- 10-20 years, 3- over 20 years). SPSS is used to analyze this data. This research shows that the high rate of the dustiness workplace is the biggest factor that cause the presence of byssinosis among workers which is determined by test of model effect.

**APPLICATION OF SIMPLEST EQUATIONS OF BERNOULLI AND RICCATI KIND
FOR OBTAINING EXACT TRAVELING-WAVE SOLUTIONS.**

Nurul Auni Binti Badri & Assoc.Prof Dr.YudariahBinti Mohammad Yusof

The method of simplest equations of Bernoulli and Riccati is presented to look for exact solutions of nonlinear differential equations. We investigate for traveling-wave solutions of the class of nonlinear PDEs equations

$$\sum_{p=1}^{N_1} \alpha_p \frac{\partial^p Q}{\partial t^p} + \sum_{q=1}^{N_2} \beta_q \frac{\partial^q Q}{\partial t^q} + \sum_{m=1}^M \mu_m Q^m = 0$$

where α_p, β_q and μ_m are parameters. We modify the methodology of the simplest equation to obtain numerous exact traveling-wave solutions of the studied class of equations. The methodology is the idea to reduce the partial differential equation to a system of nonlinear algebraic relationships among the parameters of the equation and its solution. The solutions of the algebraic systems leads to an exact solution.

Dynamics of Blood Flow in Microcirculation for 4-Node Network

Nurul Farhana Binti Zainal Abidin & Pn Wan Rukaida Binti Wan Abdullah

Research about blood flow in microcirculation has evolved since it is important in understanding the rheological properties of blood flow. The rheological peculiarity of blood flow in microcirculation are the Fåhræus effect, the Fåhræus-Lindqvist effect, and plasma skimming. The objectives of this study are to analyze the behaviour of blood flow in microcirculation for four-node network with seven-tube. To accomplish this objective, we solved the mathematical modelling of the blood flow in microcirculation which is a coupled advection-diffusion equations by using MATLAB software that based on the method of lines (MOL) and finite difference method (FDM). By using MATLAB, we display the results and plot a graph about the steady state and dynamics hematocrit for microvascular blood flow for geometrical symmetric and asymmetric four-node network with seven-tube. Our computations indicate that, under physiologically realistic conditions, there is a unique steady flow in the network which is linearly stable. While the simple topologies used in this study are much simpler than network found *in vivo*, our analysis will form a useful basis for understanding more complex networks.

Mathematical Modelling of DNA Splicing Systems with One Palindromic Restriction Enzyme

Nurul Izzaty binti Ismail & Dr. Fong Wan Heng

The mathematical model in splicing system is one of the models in DNA computing that generates languages by using formal language theory. Splicing system was initiated in 1987 as a new manner of relating formal language theory to the study of informational macromolecules. In splicing system, the presence of restriction enzymes allows DNA molecules to be cleaved and reassociated to produce resulting splicing languages by using formal language theory. DNA splicing systems with different restriction enzymes have been discussed by previous researchers. Palindromic enzyme is one of the enzyme types where the enzyme reads the same forward and backward. In this research, generalisations of DNA splicing systems with one palindromic restriction enzyme for one and two cutting sites are represented. Two theorems from these generalisations are shown which are proved by using direct method and induction method respectively. Besides, this research also shows the computation of DNA splicing systems with one palindromic restriction enzyme using C++ visual programming. The resulting splicing languages of DNA splicing system with one palindromic restriction enzyme for one and two cutting sites are then displayed in the graphical user interface. The results from this research simplify the manual computation of resulting splicing languages of DNA splicing systems with one palindromic restriction enzyme, which contributes to the development of splicing systems in DNA computing.

Weibull Proportional Hazards Model On Bladder Cancer

Nurul Natasha Che Said & Noraslinda Mohamed Ismail

Survival analysis is referred as lifetime, survival time or failure time data. It is widely used mostly in medical industry. This study presents the estimation of parameters using Weibull Proportional Hazards Model onto recurrence of bladder cancer, in month for 85 patients that had undergone bladder tumour removal operation. Weibull Proportional Hazard Model is parametric model and is widely used in estimating the parameter. To estimate the parameter, approaches are used by using R-Software and OpenBUGS. This study applies two approaches which is frequentist and Bayesian via R and OpenBUGS. The comparison between the two approaches shows that both of the approaches have the similar results and model.

Laplace's Equation: Theory and Application

Nurul Syafika Binti Zupawi & Hamisan Bin Rahmat

Laplace's equation is one of the elliptic equation and commonly being applied to the ideal fluid flow, mass diffusion, heat diffusion, and electrostatic as it is one of the best steady-state heat equation. Laplace's equation can be solved analytically and numerically by using separation of variable method and finite difference method. By using separation of variable method, we can get the analytical solution in the form of Fourier series. On the other hand, finite difference method used as an alternative to the numerical approach. A MATLAB mathematical programming is used to compute the numerical solution. Thus, the result between analytical and numerical will being compared.

An Ellipsoid is Homeomorphic to A Sphere: A Proof

Nurul Syazwana Dzulkarnain & Prof. Dr Tahir Ahmad

An ellipsoid and a sphere are topologically equivalent to each other. Even though the sphere, because of the high symmetry, seems to be a perfect shape, however many apparently spherical bodies are better represented by an ellipsoid. There exist a homeomorphism between an ellipsoid and a unit sphere. The purpose of this research is to visualize the homeomorphism of an ellipsoid and a unit sphere. The homeomorphism is constructed by composing three bijective functions. The composition is then coded using MatLab to visualize the homeomorphism of the two spherical bodies.

Complex Dynamics of Duopoly Game with Heterogeneous Players

Saiful Haqiqi Bin Hassan & Dr. Faridah Binti Mustapha

In this research, we analyze the duopoly game with heterogeneous players on the dynamics of game. There are two types of players considered, naïve expectation player and bounded rationality expectation player. The difference between these players are on the output level. Player with naïve expectation chooses an output level based on the market price of the previous period. On the other hand, bounded rationality player adjusts their output adaptively, following a bounded rationality adjustment process based on a local estimate of the marginal profit of the previous period. We made an assumption for demand and cost function to be nonlinear. We also study the existence of equilibrium points and its stability. Numerical analysis is used to display the complex dynamics, bifurcations and chaos of the system. This analysis also show that the long-run average profit achieved by naïve expectation player is higher than the bounded rationality player, even though they used similar production methods.

Solitons Solutions of Korteweg-de Vries (KdV) Equation

And It's Conservation Laws

Siti Aisyah Binti Abdullah & Assoc Prof Dr Ong Chee Tiong

The Korteweg-de Vries (KdV) equation is a nonlinear partial differential equation that combines the effects of nonlinearity and dispersion. The balance between these effects may results in wave propagation with soliton solutions. Waves that propagates without changing its shape is called "soliton" and has unique characteristics of waves and particles which retain their identities during interaction. The main objective of this research is to obtain the analytical solution of KdV equation that produces one and two solitons by implementing Hirota bilinear method and to show that the soliton solutions obeys the conservation of mass, momentum and energy. By using Maple computer programming, various interactive graphical outputs for soliton solutions of KdV equation were generated.

Forecasting of Rainfalls by using Gaussian Process Regression

Siti Atikah Zafira Binti Mohd Razali & Dr Ani Bin Shabri

Rainfall is one of the most important water resources in Malaysia especially for living organisms to support their life. In this study, the data collected is at Kota Bharu Kelantan. This data was selected because of increased number of extremely flood especially in highly populated area. As a consequence, it gives a lot of significant impact to the development of the country. In order to help the government having a high economic loss, this time series data is choose. Since the amount of rainfalls is not constant due to rapid changes of climate, the forecasting modelling is being done by using Box-Jenkins Auto regression Integrated Moving Average (ARIMA) approach and the Gaussian Process Regression (GPR) method. In Box-Jenkins method, the best model will be selected based on the smallest AIC number which means before that, the model must fulfilled all the four iterative step which are model identification, model parameter estimation, diagnostic checking and lastly the forecasting. In this section, seasonal ARIMA will be considered to analyse the data. Next, the Gaussian Process Regression method will be used and the forecasting value will be compared to ARIMA model. Both model is investigate by using R software and Microsoft Office Excel. The result will show that both models can be used to undergo forecasting but Gaussian Regression Process will give more precise value of forecasting.

Minimizing Cost in bus Transportation using Linear Transportation Method

Siti Hanis binti Md Hairi & Assoc. Prof Hazimah Abdul Hamid

This thesis presents the linear transportation method on public transportation such as bus express. The linear transportation method approaches using algebra and optimization method to investigate the transportation flow of the bus express with the amount of passenger with the selected routes to the certain points of destinations. The main objective of this thesis to describe the minimum cost of delivering m units (customers/ passenger) to n destinations and to find the best route in order to optimum the bus activities from the main bus station. Besides that, this minimizing cost can give an impact to the bus company's profit. Transportation modeling methods can be solved using linear programming.

The models are studied by the real life problem data and the bus transportation flow of the Mayang Sari Express from destinations to the different destinations was taken as example for this study. The data collected were modeled as Linear Programming model of transportation and represent the problem by using the table and solve it with the Linear Transportation methods to identify an optimal solution.

Application of Differential Transformation Method (DTM) to Enzyme Kinetic Reaction System

Syaza Naurah binti SM Soflee & Halijah binti Osman

This study is about Differential Transformation Method (DTM) for linear and nonlinear ordinary differential equations (ODEs). Basically,DTM is a simple method and fairly easy to solve as it gives the solution in series form for both linear and nonlinear problems. There are fundamental theorems that we need to know in order to solve problems using DTM. Our study emphasizes on problem of a nonlinear system pertaining to Biochemical Reaction Systems specifically the Enzyme Kinetic Reaction System. This nonlinear reaction system focuses on how intermediate metabolic and product are produced from the reaction of enzyme and substrate. The nonlinear differential equation is obtained from the formulation of a mathematical model. Subsequently, the nonlinear system is reduced to a dimensionless system so that it is easier to be solved using DTM. Taking differential transform into the dimensionless system, the approximate analytical solution of the given initial value problem is obtained. The result is compared with known solution from Adomian Method by Mustafa, Yildirim and Kurulay (2013).

Forecasting External Trade of Malaysia using Autoregressive Integrated Moving Average Model and Generalized Autoregressive Conditional Heteroskedastic Model

Teo Wee Chien & Dr. Norazlina Ismail

External trade is one of the factor that affect the economy of a country. The government and policy-makers are responsible to make decision to control and maintain the grow of external trade volume. Hence, an accurate forecasting model is very important for them. In this study, the monthly external trade data of Malaysia is obtained from Department of Statistics Malaysia ranging from January 1971 to December 2016. using Autoregressive Integrated Moving Average (ARIMA), Generalized Autoregressive Conditional Heteroskedastic (GARCH) and hybrid models are used for external trade forecasting. Eviews 9 Student Version is used to analyse the data. The goodness of fit of ARIMA and hybrid models are measured using Akaike's Information Criterion (AIC). GARCH (1,1) is chosen as the model in this study because previous researches show it fit most of the data well. Forecasting accuracy of the three models are accessed using Mean Absolute Percentage Error (MAPE). The model which gives the lowest MAPE is considered as the best model. It can be concluded that GARCH model is better than ARIMA model because it can handle the volatility of the time series data. Nevertheless, the hybrid model gives the lowest forecasting error which suggest that it is the most suitable model to forecast external trade of Malaysia.

Prediction of Paddy Yield using Neural Network

Umie Asyikin binti Rozali & Assoc.Prof Dr Khairil Anuar bin Arshad

Artificial Neural Networks (ANNs) is a method that is used to analyse and forecast in various fields such as finance, business, stock market and other functional area. The purpose of this study is to predict the paddy yield from polybag based on the actual data of paddy from rice field. Annually, rice is still not enough for Asian people since the number of people increases every year. One alternative to overcome this problem is by planting paddy in polybag. The data was collected in Sumatera, Indonesia. Due to the attacks of pests, the data yield cannot be collected. However, by using neural network, we may be able to forecast the paddy yield in polybag based on the data from rice paddy. A total of 25 data were used in this study where 70% data were used as training while 15% data for testing and validation. From the training process, we can predict the output of paddy in polybag by selecting custom predictions. The predictive power of constructed neural networks was measured using accuracy measurements Mean Square Error (MSE). MSE is the best method to obtain the lowest error which is 0.035969. The result shows that forecasting can be made through neural network and it provides the best performance. There is also statistical analysis to determine the most suitable quantities of variables to obtain the best result.

Estimation on Auto Insurance Claim Counts using Zero-Adjusted Inverse Gaussian(ZAIG) Regression Model

Wee Meng Keat & Dr. Arifah Bahar

In this fast-growing world and with almost every family owns an automobile, the market of insurance for automobile should never underestimated, and insurer must take this matter seriously and distribute the risk of major loss. Thus, the study on claim count estimation is significant. Zero-Adjusted Inverse Gaussian(ZAIG) regression model, a mixed discrete-continuous model was used for estimation of claim counts for both zero and positive claims. The data of Singapore automobile insurance from year 1993 to 2000 with a total of 7483 observations was used. This research is done for the purpose of estimating the parameters and modelling of claim counts in automobile insurance. Using ZAIG regression models allow explicitly specifies a log-linear models for the mean claim count (given a claim has occurred) as well as the dispersion of claim count (given a claim has occurred) and logit-linear model for the occurrence of a claim. The fitted models showed that the claim count affected by the covariates. For the model of mean claim counts, it is mainly affected by the exposure of the policy, the age of policy holders, the vehicle age and the number of private cars. While for dispersion of claim count model, it is mainly affected by exposure of the policy, gender insured, vehicle age and the age of policy holders. Lastly, the model for occurrence of a claim is mainly affected by exposure weights, no claims discount, vehicle age and vehicle types.

Hydrological Trend Analysis In Johor Using Parametric And Non Parametric Test

Werda bt Yalling & Dr Norazlina Ismail

This study was conducted to investigate the trend of three hydrological data which is rainfall, temperature and streamflow in Johor and also the relationship between rainfall and streamflow. The data for rainfall and temperature was used in the analysis from ten station in Johor for period of 10 years (2006-2010). However, the data for streamflow was collected between 1985 and 2015 (30 years) for nine station. The Non-Parametric, Mann Kendall and Theil's Sen Estimator was used to test the trend on the hydrological data. The Parametric test, Linear Regression was applied to study the relationship between rainfall and streamflow. The finding of this study indicates that there is no significant trend for annual rainfall in all station. For temperature, the results shows a significant increasing trend in four station which is Batu Pahat, Mersing, Senai and Mardi Alor Bukit Pontian. Only one station, Majlis Daerah Labis that has a significant decreasing temperature trend. For streamflow, analysis shows that one station, Sg Endau have a significant increasing trend. While five station, Sg Bekok, Sg Kahang, Sg Lenggong, Sg Johor and Sg Penggeli have significant decreasing trend and five station have significant decreasing trend. The result for Theil's Sen Estimator is corresponding with the result from the Mann Kendall test. The existence of positive relationship between rainfall and relationship for all station in seven studied district was shown from the result of Linear Regression. Batu Pahat, Mersing and Kulai shows a weak positive relationship while Kluang, Muar, Kota Tinggi and Segamat shows a strong positive relationship.

DIFFERENTIAL TRANSFORMATION METHOD FOR LANE-EMDEN EQUATION

Venisha Thangarajoo & Puan Halijah Binti Osman

Differential Transformation Method (DTM) is a convenient method in handling highly nonlinear differential equations with a less computational work and time. This study is about how to apply DTM in both first and second order ordinary differential equations. The aim of this study is to introduce the DTM as an efficient tool to solve nonlinear differential equations and to develop an efficient and accurate method to solve the Lane-Emden equation $y''(x) + \frac{2}{x}y'(x) + y^m = 0$ subject to some initial conditions. Thus, in this study we have tried to derive and show the technique of DTM applied to one of the widely studied and challenged nonlinear Lane-Emden equation for polytropic index $m = 0, 1, 2, 3, 4$ and 5 . Comparisons have been made from the results obtained from DTM with known analytic solutions. From the results obtained, a very good agreement has been seen between the solution for DTM and analytic solution.

Generalized Linear Models in Insurance Data

Yew Siew Chen & Assoc. Prof Dr Fadhilah Bt Yusof

Insurance is important to reduce or eliminate risk of financial loss of the insured. There are many major types of insurance policies including health insurance which is a type of insurance coverage that pays for medical and surgical expenses incurred by the insured. One of the most important thing in insurance industry is to meet ongoing obligations to policyholders. Since Generalized linear models (GLM) are an extension of the linear modelling process that allows models to be fitted to data that follow probability distributions other than the Normal distribution, GLMs are effective in modelling the insurance data which is usually non-Normal. Prediction of insurance claim amount helps company in planning insurance policies. The health insurance data is obtained from one of the insurance company for the year 2013 all over Malaysia. The claim amount, as the response variable is greater than or equal to zero, thus assumed to follow gamma distribution. Nature of loss, occupation and age group are the explanatory variables. The identity link is chosen as the link function. Maximum likelihood estimation (MLE) method is used to estimate the coefficients of parameters. The goodness-of-fit of the model is checked using likelihood ratio test and deviance. Residuals are analysed and outliers are flagged for further checking. The coefficients obtained build up the model which is used to calculate the estimated claim amount. The model is tested and proved to fit the data. As a conclusion, GLMs are able to predict the future claim amount effectively.

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