Final Year Project Titles for DMAS (June 2023)

Approved by DCDC (24 May 2023)

Contents

1 Dr Avik De

Lecturer:	Dr Avik De (avikde@utar.edu.my)
Areas of Interest:	Cosmology

Project Title 1:	Restricting model parameters in f(Q) theory of gravity
Background Knowledge:	Calculus I and II
Outline:	We will conduct some simple graphical treatments to find the ranges of different model parameters.
Preparation:	Differentiation and plotting in any mathematical software.

Project Title 2:	Rastall gravity theories
Background Knowledge:	Calculus I and II
Outline:	We will survey the Rastall gravity theories starting from general relativity and investigate its possible generalizations.
Preparation:	Differentiation and plotting in any mathematical software.

2 Puan Azimah Binti Mohd

Lecturer:	Puan Azimah Binti Mohd (azimah@utar.edu.my)
Areas of Interest:	Process Control and Quality Improvement & Operational Research
Project Title 1:	Internal Complaints System using Quality Function Deployment (Qfd)
Supplement Knowledge:	Statistical Quality Control
Outline:	This research was applied to improve the quality of services in company in order to help the services to be delivered more effectively and efficiently by translating customer requirements into operational requirements of the organization.
Preparation:	Basic Microsoft Excel coding
Project Title 2:	An insertion heuristic algorithm for solving the bi-objective transportation problem
Supplement Knowledge:	Operational Research I & Operational Research II
Outline:	The findings of this study are significant to help in distribution management to identify a set of routes that service all the demand points within their time windows at the minimum cost and risk using an insertion heuristic algorithm.
Preparation:	Basic Microsoft Excel coding

3 Dr Chen Huey Voon

Lecturer:	Dr Chen Huey Voon(chenhv@utar.edu.my)
Areas of Interest:	Algebra and Combinatorics
Project Title 1:	Non-negative Matrix Factorization and its applications
Supplement Knowledge:	Linear algebra
Outline:	There are many different ways to calculate the non-negative matrix factorization. In this project, we study the various calculation methods and the applications of non-negative matrix factorization.
Preparation:	Some background in linear algebra and programming skill
Project Title 2:	Exhaustion Numbers of subsets of finite groups
Supplement Knowledge:	Algebra and Combinatorics
Outline:	We shall generate the numerical data that satisfied the conditions of exhaustion number of subsets of finite groups. After that, we need to prove some results in this area.
Preparation:	Some background in algebra and programming skill
Project Title 3:	Total Labelling of graphs
Supplement Knowledge:	Discrete Mathematics and Combinatorics
Outline:	We shall generate the numerical data that satisfied the conditions of total labelling. After that, we need to prove some results in this area.
Preparation:	Some background in graph theory and programming skill

4 Prof. Dr Chia Gek Ling

Lecturer:	Prof. Dr Chia Gek Ling (chiagl@utar.edu.my)
Areas of Interest:	Graph Theory and Combinatorial Designs

Project Title 1:	On Compositions of Magic Squares
Background Knowledge:	UECM1303/UECM1304 Discrete Mathematics
Outline:	A magic square of order n is a square array of integers from $1, 2, ..., n^2$ such that the sum of the entries in each row, each column and each diagonal is a constant. The first part of the project deals with the constructions of magic squares of given orders. The second part deals with the various methods of producing magic squares of larger orders using two given magic squares M_1 and M_2. The resulting square is called the composition of M_1 and M_2.
Preparation:	Analytical reasoning.

Project Title 2:	On the n-Queens Problem
Background Knowledge:	UECM1303/UECM1304 Discrete Mathematics
Outline:	The n-queens problem asks how many ways are there to place n non-attacking queens on an $n \times n$ chess board. Two queens are said to be attacking if they are on the same row, column, or diagonal. This project is about finding the number of ways of placing n non-attacking queens on an $n \times n$ chess board for several small values of n. Some variations of this problem can also be studied.
Preparation:	Analytical reasoning and basic knowledge in graph theory.

5 Dr Chin Jia Hou

Lecturer:	Dr Chin Jia Hou (chinjh@utar.edu.my)
Areas of Interest:	Complex Network Analysis, stock market analysis
Project Title 1:	Complex network analysis on the influential stocks and structure in stock market
Background Knowledge:	R programming for complex network analysis
Outline:	Complex network analysis is a research field that studies complex systems from graph perspective. Stock market is considered a complex system as it consists of stocks that are frequently interacting with each other. This research project aims to constructing networks from the correlation between stocks, followed by the identification of influential stocks and the study of the composition of a chosen stock market index. The centralities of stocks and the degree distribution of the networks of a chosen stock market index will be studied in detail.
Preparation:	R programming, Gephi, basic knowledge in complex network analysis, choose a preferred stock market index
Project Title 2:	Machine Learning Research in Malaysia: A Bibliometric Network Analysis
Background Knowledge:	Knowledge: Willingness to learn software and R/Python programming for complex network analysis
Outline:	The research on machine learning has grown exponentially in the last decade due to the wide application of machine learning in various research disciplines. Bibliometric analysis aims to analyse publications related to scientific contents. Complex network analysis proves to be a viable approach in bibliometric study, as it is implemented in the bibliometric analysis of numerous research fields. In this project, we will study machine learning research in Malaysia using complex network analysis, focusing on the authors, topics, clusters, and trends. The outputs of this project provide us insight into the development and status of machine learning research in Malaysia.
Preparation:	R/Python programming, Gephi, bibliometric analysis tools, basic knowledge in complex network analysis

6 Dr Denis Wong Chee Keong

Lecturer:	Dr Denis Wong Chee Keong (deniswong@utar.edu.my)
Areas of Interest:	Cryptography

Project Title 1:	Cryptographic Primitives in E-Voting System based on Blockchain Technology
Supplement Knowledge:	Voting System
Outline:	In this project, students will investigate various cryptographic primitives used in an E-Voting system based on the blockchain technology. In particular, students will investigate PKE, DSA, Hash function or ZKP. Students will also investigate the possible opportunity in conventional e-voting systems to adapt the blockchain technology, especially in relation to the latest government research roadmap. Lastly, students will also look into various cyber related laws in Malaysia and identify weaknesses or strengths.
Preparation:	UECM3383 Cryptology

Project Title 2:	Art work Preservation with Blockchain Technology
Supplement Knowledge:	Blockchain technology (NFT)
Outline:	Students will perform a thorough survey for Malaysia artwork market in relation to preservation's works and propose a system to improve current artwork management practice. Students are expected to perform data collection and analysis on various artwork available (Malaysia or Worldwide). Based on the analyzed data, students need to propose solutions to improve the current stage of art and identify possible opportunities to adapt the blockchain technology. Students also suggest looking into artwork with NFT enabled and identify their weakness and strength.
Preparation:	N/A

Project Title 3:	Code-based Game-Playing Security Analysis
Supplement Knowledge:	Security proof
Outline:	In this project, student will be introduced to the Code-based Game-Playing procedure, its standard definitions and models which will be used to perform security analysis for various encryption schemes (eg. El-Gamal, Rabin encryption schemes) and signature schemes (eg. RSA, Schnorr, BLS signature schemes). In the meantime, students will derive and investigate variations of Code-based Game-playing models for different types of cryptographic primitives (eg. Signcryption, ID-based primitives, etc.).

Preparation:	UECM3383 Cryptology

Project Title 4:	Code-based cryptographic primitives and its related Hard Problems
Supplement Knowledge:	Code-based cryptographic
Outline:	In this project, students will investigate the code-based primitives (classic McEliece, Ding Key Exchange, McNie, pqsigRM, QC-MDPC KEM and RankSign) available in NIST Post Quantum Cryptography project. The main task is to distinguish between all these primitives based on their hard problem, security proof, efficiency analysis and also problem encounters during the implementation process.
Preparation:	UECM3383 Cryptology

Project Title 5:	Blockchain based Halal Management System
Supplement Knowledge:	Halal Management system
Outline:	In this project, students will investigate the opportunity of implementing the Halal Management system (HMS) under the blockchain technology. First, students will investigate the current weakness and strength of the HMS. Then, the student will propose those blockchain characteristics which can enhance the current system. Based on the previous two investigations, students will propose a system prototype that serves as a preliminary module for Blockchain based HMS. In this project, students need to be familiar with halal certificate related issues and able to study some related halal ISO standards as well.
Preparation:	N/A

Project Title 6:	Semi simple group algebra
Supplement Knowledge:	Algebra
Outline:	In this project, students will investigate the general form of group algebra based on the property of semi simplicity. Students will use character theory to perform computations for some well-known finite groups such as Dihedral and permutation groups. In the meantime, students are expected to construct at least one family of group algebra code based on semi simplicity property with a complete codebook.

Preparation:	UECM3373 Introduction to Coding Theory

7 Ms. Gillian Woo Yi Han

Lecturer:	Ms. Gillian Woo Yi Han (wooyh@utar.edu.my)
Areas of Interest:	Optimisation
Project Title 1:	Optimal feature selection of technical indicators for stocks using proximal gradient method
Background Knowledge:	Fundamental of linear algebra
Outline:	This project will study how to choose the significant indicators used in technical analysis, which focuses on identifying stock movement trends to determine optimal entry and exit points using an optimisation technique.
Preparation:	Python
Project Title 2:	A spectral proximal method with non-monotone line search technique
Background Knowledge:	Fundamental of linear algebra
Outline:	This project will study the non-monotone line search and apply it to the existing sparse optimisation method, spectral proximal method. Previously, this method has been developed with backtracking line search with Armijo condition. We will compare the proposed algorithm with the existing algorithm; theoretically, it should improve the performance of the algorithm.
Preparation:	Python

8 Dr Goh Yong Kheng

Lecturer:	Dr Goh Yong Kheng (gohyk@utar.edu.my)
Areas of Interest:	Statistical mechanics, computational finance, bioinformatics
Project Title 1:	Numerical simulation of Swift-Hohenberg equation
Supplement Knowledge:	Numerical analysis, partial differential equations, Python
Outline:	The Swift-Hohenberg is a 2D partial differential equation that exhibit patterns formation under different parameters. In this project, student are expected to review the equation and solve it numerically by using psedo-spectral method. Student then could explore different patterns formed by changing different parameters and nonlinear noise.
Preparation:	try out some Python tutorials, find and read information on Swift-Hohenberg equations.

9 Dr Goh Yann Ling

Lecturer:	Dr Goh Yann Ling (gohyl@utar.edu.my)
Areas of Interest:	Applied Statistics, Applied Mathematics
Project Title 1:	Comparative Study of Curve Fitting Methods for Improved Decision Making
Supplement Knowledge:	probability and statistics, linear regression
Outline:	The research project requires some understanding in least squares regression. Student will learn how to fit the "best" polynomial through a set of uncertain data points and evaluate the validity of the results for decision making.
Preparation:	Strong background in linear regression, good programming skill.
Project Title 2:	A Comparative Analysis of Statistical Models
Supplement Knowledge:	probability and statistics
Outline:	In the project, the student will conduct the comparative data analysis of statistical models and provide interpretations for the final conclusions. A general introduction is given in `https://en.wikipedia.org/wiki/Qualitative_comparative_analysis`
Preparation:	Good programming skill

10 Ms Hii Siew Chen

Lecturer:	Ms Hii Siew Chen (hiisc@utar.edu.my)
Areas of Interest:	Statistical Quality Control, Applied Statistics, Regression.
Project Title 1:	Awareness of ChatGPT and its usefulness among students in private university in Malaysia.
Background Knowledge:	Statistics and regression
Outline:	Perform a survey on a private university students and study the usefulness of ChatGPT among the students using statistical data analysis.
Preparation:	Strong background in applied regression analysis and good programming skills.
Project Title 2:	A study of a control chart for nonnormal data
Background Knowledge:	Statistical quality control.
Outline:	The project will study a specific control chart when the data is not normally distributed and contaminated.
Preparation:	Strong background in statistical quality control and good R/others programming skill.

11 Dr Kuang Kee Seng

Lecturer:	Dr Kuang Kee Seng (kuangks@utar.edu.my)
Areas of Interest:	Mathematical Theory of Investment, Universal Portfolio
Project Title 1:	Universal Portfolio generated by some positive definite matrices
Supplement Knowledge:	None
Outline:	The student will be introduce with basic theory of universal portfolio and some basic stock trading investment strategies. Meet supervisor for more detail.
Preparation:	Basic Microsoft Excel coding. Matlab would be helpful.
Project Title 2:	Universal Portfolio generated by some probability distribution functions
Supplement Knowledge:	None
Outline:	The student will be introduce with basic theory of universal portfolio and some basic stock trading investment strategies. Meet supervisor for more detail.Meet supervisor for more detail.
Preparation:	Basic Microsoft Excel coding. Matlab would be helpful.

12 Ms Lee Yap Jia

Lecturer:	Ms Lee Yap Jia (yjlee@utar.edu.my)
Areas of Interest:	Universal Portfolio
Project Title 1:	Investment Strategies by the Reverse Kullback-Leibler Divergence Universal Portfolio
Supplement Knowledge:	Information Theory and Portfolio Theory
Outline:	This project aims to produce good investment strategies by studying the empirical performance in the real stock market of universal portfolio.
Preparation:	Microsoft Excel (VBA), R Programming (RStudio)
Project Title 2:	Universal Portfolio Generated by the Kullback-Leibler and Chi-Square Divergences
Supplement Knowledge:	Information Theory and Portfolio Theory
Outline:	This project aims to explore and discuss more applications of minimum distance methods in generating universal portfolio.
Preparation:	Microsoft Excel (VBA), R Programming (RStudio)

13 Dr Liew How Hui

Lecturer:	Dr Liew How Hui (liewhh@utar.edu.my)
Areas of Interest:	Computers and Mathematics

Project Title 1:	Database Query with Predicate Logic
Supplement Knowledge:	UECM1304 Discrete Mathematics
Outline:	This project will explore how predicate logic (one famous implementation is Prolog programming language) is used for database queries systematically. In fact if one constrains Prolog programs to use only atoms, integers and reals (no lists or complex terms) and disallows recursive definitions, one gets a database language that is equivalent to a powerful subset of SQL.
Preparation:	Study books on mathematical logic, relevant resources (e.g. `https://www3.cs.stonybrook.edu/~warren/xsbbook/node11.html`) and software (e.g. `https://www.swi-prolog.org/pldoc/man?section=db`)

Project Title 2:	Mathematics and Software for Analysing Regular Polyhedra
Supplement Knowledge:	UECM1314 Fundamentals of Linear Algebra, Python Programming Knowledge
Outline:	In this project, we will be investigating the mathematical definition, examples, software construction steps and mathematical properties of regular polyhedra and their extensions. For the software construction, the open source software Blender will be used.
Preparation:	Read `https://ericrowland.github.io/investigations/polyhedra.html`, `https://en.wikipedia.org/wiki/Regular_polyhedron`, `https://github.com/alexeylarionov/Polyhedra`, etc.

Project Title 3:	Mathematics of Typesetting with Troff
Supplement Knowledge:	UECM1703 Introduction to Scientific Computing
Outline:	This project will explore the mathematics related to typography, which analyses the mathematical representation behind vector fonts (and bitmap fonts) and the simple and advanced mathematics in breaking paragraphs into lines. The methodology will involve the analysis of truetype and opentype fonts and the decision tree for unicode paragraph breaking.
Preparation:	https://en.wikipedia.org/wiki/Typography and installing GNU/Linux (https://ubuntu.com/ or https://linuxmint.com/)

Project Title 4:	Formal Proving for Logic
Supplement Knowledge:	Discrete Mathematics, Functional Programming
Outline:	Logic is the foundation of mathematics. Logic is supposed to be coded in symbols. In this project, we will investigate how to encode logic using formal provers (e.g. Coq or Isabelle).

Preparation:	Study books and papers related to formal proving.
Project Title 5:	Computer Proving in Elementary Real Analysis
Supplement Knowledge:	Discrete Mathematics, C Programming, Real Analysis
Outline:	Logic is the foundation of mathematics. Logic is supposed to be coded in symbols. In this project, we will investigate how to encode real analysis in a computer program called Coq. Coq is a computer program that allows us to prove mathematics using intuinistic (and classical) logic.
Preparation:	Study Coq (the book "Interactive Theorem Proving and Program Development Coq'Art: The Calculus of Inductive Constructions" by Yves Bertot, Pierre Castéran can be found in the library and also look at https://coq.inria.fr/)

14 Mr. Loh Wing Son

Lecturer:	Mr. Loh Wing Son (lohws@utar.edu.my)
Areas of Interest:	Statistical Machine Learning, Hydrology, Earth Science
Project Title 1:	Infilling Missing Sediment Flux Data using Machine Learning Models
Background Knowledge:	Statistics, Predictive Modelling
Outline:	Water is the most valuable natural resource to all life on Earth. The sediment fluxes addressed in the fluvial systems have a direct indication on the denudational processes. Missing sediment flux data causes several issues such as the loss of important information on the sediment studies and the reduction of statistical power in performing statistical tests. In this project, machine learning models will be developed to infill missing sediment flux data.
Preparation:	Programming knowledge (R / Python / MATLAB)
Project Title 2:	Application of Statistical Machine Learning Approaches in Extreme Sediment Flux Data Modelling
Background Knowledge:	Statistics, Predictive Modelling
Outline:	Sediments play an important role in the hydrological processes and are an absolute necessity for a wide range of organisms. In spite of that, the temporal variations in sediment transportations should be monitored as sediment overload will cause a drastic change in sediment flux and could potentially lead to flood events. In this project, models will be developed for the sediment flux data by applying statistical methods derived from Extreme Value Theory (EVT), and the incorporation of machine learning approaches.
Preparation:	Programming knowledge (R / Python / MATLAB)
Project Title 3:	Optimisation of Machine Learning Based Model for Fine Sediment Settling Velocity Estimation
Background Knowledge:	Statistics, Predictive Modelling
Outline:	Sedimentation involving fine sediment particles is closely related to the hydrological cycle and addressing the sustainability of the aquatic ecosystem. However, it is challenging to study the settling velocity of fine sediments due to the complex hydrodynamic behaviours and explicit assumptions. Instead of overly depending on the pre-defined equations, machine learning models are well-suited for such context. The main goal of this project is to develop approaches in optimising the existing machine learning model to enhance the accuracy for fine sediment settling velocity estimation.
Preparation:	Programming knowledge (R / Python / MATLAB)

15 Dr Ng Kooi Huat

Lecturer:	Dr Ng Kooi Huat (khng@utar.edu.my)
Areas of Interest:	Statistical Process Control, Time Series Forecasting, Applied Statistical Modelling, Data Analysis etc.
Project Title 1:	Change Point Detection in Financial Time Series Forecasting.
Supplement Knowledge:	Elementary Statistics, Time Series Analysis, Applied Statistical Model etc.
Outline:	Change point analysis prevents the omission of relevant data as well as the forecasting that may be based on irrelevant data. The project demonstrates that the change point techniques may increase the accuracy of forecasts.
Preparation:	Knowledge of R Programming.
Software:	R Programming or Other Statistical Softwares.
Project Title 2:	Monitoring of Contaminated Data Using Robust Control Charts
Supplement Knowledge:	Elementary Statistics, Statistical Process Control etc.
Outline:	In this project, we investigate the advantage of using control charts based on robust statistics. Through the use of Monte Carlo simulations, we compare these charts in terms of its robustness and performance.
Preparation:	Knowledge of R Programming.
Software:	R Programming or Other Statistical Softwares.

16 Dr Ng Wei Shean

Lecturer:	Dr Ng Wei Shean (ngws@utar.edu.my)
Areas of Interest:	Linear Algebra
Project Title 1:	Interpolative decomposition and its applications
Supplement Knowledge:	Interpolative decomposition, some programming skill
Outline:	Study the structure of the decomposition and find its applications. Investigate and/or improvised the algorithms used.
Preparation:	Read about interpolation decomposition and learn at least one programming language.
Project Title 2:	A study on the immanant of a matrix
Background Knowledge:	Linear Algebra
Outline:	Study types of immanant (checkout https://en.wikipedia.org/wiki/Immanant) and the properties of the immanant of a matrix. Explore preserver problems on immanant of a matrix.
Preparation:	Strengthening the understanding of Linear Algebra through extensive reading

17 Dr Ong Poh Hwa

Lecturer:	Dr Ong Poh Hwa (ongph@utar.edu.my)
Areas of Interest:	Graph Theory
Project Title 1:	Self-clique Graphs
Supplement Knowledge:	Discrete Mathematics, Graph Theory
Outline:	This project will study the characterization of all connected self-clique graphs with given clique sizes. After that, we need to find some graphs with certain clique sizes.
Preparation:	None.
Project Title 2:	On Isomorphisms of Cayley Graphs
Supplement Knowledge:	Discrete Mathematics, Graph Theory
Outline:	This project will study the isomorphism problems of Cayley graphs and some enumeration results on Cayley graphs. After that, we need to prove some results in this area.
Preparation:	None.

18 Dr Pang Sook Theng

Lecturer:	Dr Pang Sook Theng (pangst@utar.edu.my)
Areas of Interest:	Universal Portfolio, Mathematics Education
Project Title 1:	Performance of some universal portfolios during COVID 19 Pandemic
Supplement Knowledge:	Have knowledge in investment strategy
Outline:	Using different investment strategy in maximizing the return
Preparation:	knowledge in Matlab, Excel or Python.
Project Title 2:	Comparative analysis of Student's live online learning readiness during the COVID-19 pandemic in the higher education sector in Malaysia
Supplement Knowledge:	Knowledge in statistics.
Outline:	Differential the method in analyzing the data.
Preparation:	knowledge in any statistical software

19 Dr Pan Wei Yeing

Lecturer:	Dr Pan Wei Yeing (panwy@utar.edu.my)
Areas of Interest:	Investment Performance
Project Title 1:	Analyzing investment performance
Supplement Knowledge:	Probability and Statistics
Outline:	The proposed title is to analyze the return on an investment portfolio. The investment performance is analyzed by using the risk-adjusted performance measures over a specific period of time.
Preparation:	Knowledge in programming, i.e. R, Python or Java
Project Title 2:	Portfolio optimization using the Barzilai Borwein gradient method approach
Background Knowledge:	Probability and Statistics
Outline:	The proposed title is to select a diverse mix of assets that maximizes an investor's expected return for a specific level of risk. This involves analyzing various investment options and allocating assets in a way that balances risk and return. To evaluate investment performance, risk-adjusted performance measures are utilized over a specific period of time.
Preparation:	Knowledge in programming, i.e., R, Python or Java

20 Mr. Phoon Sheong Wei

Lecturer:	Mr. Phoon Sheong Wei (swphoon@utar.edu.my)
Areas of Interest:	Universal Portfolio
Project Title 1:	Finite order Universal portfolio generated by recursive calculation of the random variables' moment function.
Background Knowledge:	Probability and Statistics
Outline:	This project will study the recursive calculation of the moment function of γ order universal portfolio. Few continuous random distributions will be studied and used in generating the universal portfolio. Please meet the supervisor for more details.
Preparation:	Microsoft Excel (VBA) or R
Project Title 2:	Mahalanobis universal portfolio generated by some positive definite matrix
Background Knowledge:	None
Outline:	This project will study how to form the stock portfolio and how the positive definite matrix will affect the performance of the Mahalanobis universal portfolio. Please meet the supervisor for more detail.
Preparation:	Microsoft Excel (VBA) or R

21 Dr Qua Kiat Tat

Lecturer:	Dr Qua Kiat Tat (quakt@utar.edu.my)
Areas of Interest:	Ring theory
Project Title 1:	On fine clean rings and its graph representations
Supplement Knowledge:	Fundamentals of Linear Algebra
Outline:	The main purpose of this study is to investigate properties of fine clean rings.
Preparation:	Good algebra background
Project Title 2:	On fine clean graph rings
Supplement Knowledge:	Fundamentals of linear algebra, graph theory
Outline:	The main purpose of this study is to investigate properties of fine clean rings and its graph representation.
Preparation:	Moderate algebra and graph theory background and able to do some simple programming.

22 Dr Sim Hong Seng

Lecturer:	Dr Sim Hong Seng (simhs@utar.edu.my)
Areas of Interest:	Optimization Techniques and Applications
Project Title 1:	Physics Informed Neural Network for Solving Nonlinear Partial Differential Equations
Supplement Knowledge:	Calculus I and II, Linear Algebra, Numerical Methods, Ordinary Differential Equations.
Outline:	Optimization techniques will be incorporated in the Physics Informed Neural Network in solving nonlinear partial differential equations. The efficiency of the modified method will be compared with some existing methods in terms of number of iterations and computational time.
Preparation:	MATLAB / Python
Project Title 2:	Application of the conjugate gradient method in portfolio optimization
Background Knowledge:	Calculus I and II, portfolio management, finance
Outline:	The proposed title is to select a diverse mix of assets that maximizes an investor's expected return for a specific level of risk using optimization approaches. This involves analyzing various investment options and allocating assets in a way that balances risk and return. To evaluate investment performance, risk-adjusted performance measures are utilized over a specific period of time.
Preparation:	Python / R Studio

23 Dr Tan Wei Lun

Lecturer:	Dr Tan Wei Lun(tanwl@utar.edu.my)
Areas of Interest:	Rainfall Modeling, Environmental Statistics, Markov Chain, Hidden 'Markov Chain
Project Title 1:	The drought characteristics using Markov chain of monthly rainfall data in peninsular Malaysia
Background Knowledge:	Stochastic Processes
Outline:	This project will study the drought profiles of Peninsular Malaysia using Markov chain based on Standardized Precipitation Index (SPI) of one-month time-scale. Varies statistical analysis will be performed on the rainfall data.
Preparation:	R/Matlab/Python
Project Title 2:	Analysis of global stock index data via complex network approach
Background Knowledge:	Probabilistic and Statistics I & II
Outline:	This project will study the detailed analysis of global stock index data by complex network method. Though this analysis, it would be helpful to investors for making decisions regarding their portfolios or to regulators for monitoring the key nodes to ensure the overall stability of the global stock market.
Preparation:	R/Matlab/Python

24 Mr Tan Zong Ming

Lecturer:	Mr Tan Zong Ming (tanzm@utar.edu.my)
Areas of Interest:	Applied Statistics, Financial Mathematics
Project Title 1:	Research on Stock Analysis and Trading Strategies
Supplement Knowledge:	Financial Statement Analysis, Mathematics Statistic/Predictive Modelling/Statistical Decision
Outline:	Fundamental and Technical analysis on selected public listed company. Construct model to evaluate the public listed company thus estimate the entry and exit price. Monitor the stock price and suggest short-term and long-term stock trading strategics.
Preparation:	Microsoft Excel or any other programming software
Project Title 2:	Research on Candle Stick chart for stock trading
Supplement Knowledge:	Statistics
Outline:	Build Candle Stick chart based on stock price and/or trading volume. Construct model that consists of decision tree that can provide any decision or trading strategics. Compare the performance of the model with other existing technical analysis tools.
Preparation:	Microsoft Excel or any other programming software

25 Dr Teoh Lay Eng

Lecturer:	Dr Teoh Lay Eng (teohle@utar.edu.my)
Areas of Interest:	Operations Research
Project Title 1:	A Viable Multi-criteria Green Fleet Planning for Electric Bus Operations
Background Knowledge:	Applied Mathematics/Statistics/Operations Research
Outline:	In response to the global environmental issue and fossil oil dependency concern, electric bus has been proposed as one of the promising transports in green mobility. Correspondingly, proper-designed fleet planning, with multiple criteria as well as heterogenous buses, is indeed required to assure an environmental-friendly operation of electric buses. Thus, this project aims to propose a viable multi-criteria green fleet planning in supporting electric bus operations. To do this, the student is required to determine heterogeneous electric bus planning (in terms of bus type, quantity, and frequency) to support the operating system environmentally and profitably. And, the proposed approach should be capable of determining the ideal operating route for electric buses. It is anticipated that the proposed fleet planning will reveal useful insights, especially to bus operators, in providing a sustainable and profitable electric bus operation, while assuring an environmental-friendly electric bus system.
Preparation:	This project may require numerous skills related to mathematical/statistical analysis, simulation, and machine learning.
Project Title 2:	A Multi-criteria Decision-making Approach for Charging Stations Planning of Electric Vehicles
Background Knowledge:	Applied Mathematics/Statistics/Operations Research
Outline:	The transportation industry is a significant source of worldwide emissions of greenhouse gases and mitigating these emissions is an essential component of tackling climate change. Correspondingly, vehicles around the world are being converted to electric power to combat climate change and lower pollution levels. Inevitably, a sustainable electric vehicles (EVs) system would require an adequate quantity of charging stations, particularly to meet the uncertain demand of EV users. Thus, this study aims to determine ideal locations for installing charging stations by incorporating numerous significant criteria in supporting EV operating networks. To do this, a multi-criteria decision-making approach will be adopted accordingly to yield the expected output in assuring the availability as well as the adequacy of charging infrastructure for EV operations. And, several comparative analyses will be performed necessarily. It is anticipated that this study will provide useful insights to transportation planners in planning and sustaining EV operating systems viably.
Preparation:	This project may require numerous skills related to mathematical/statistical analysis, simulation and machine learning.

26 Ms Wong Kuan Wai

Lecturer:	Ms Wong Kuan Wai (wongkw@utar.edu.my)
Areas of Interest:	Cryptography, information security
Project Title 1:	Study of cascading chaotic systems
Supplement Knowledge:	Cryptology
Outline:	The student will study existing chaotic systems and apply cascading method to enhance the chaotic behaviors of the chaotic systems. Meet supervisor for more details.
Preparation:	Matlab
Project Title 2:	Chaotic based Image Encryption Scheme
Supplement Knowledge:	Cryptology
Outline:	The student will be introduced with some basic image encryption techniques and the application of chaotic system in the design. Meet supervisor for more details.
Preparation:	Matlab

27 Dr Wong Wai Kuan

Lecturer:	Dr Wong Wai Kuan (wongwk@utar.edu.my)
Areas of Interest:	Applied Statistics, Statistical Quality Control
Project Title 1:	Goodness-of-fit tests for Exponential Distribution
Supplement Knowledge:	Probability and Statistics II
Outline:	Goodness-of-fit tests are used to test whether the data follows a certain distribution. This project will study some goodness-of-fit tests for exponential distribution. Power comparison will be made among the goodness-of-fit tests studied.
Preparation:	Knowledge in programming.
Project Title 2:	A study on $\overline{X}$-chart
Supplement Knowledge:	Probability and Statistics II
Outline:	The construction of control charts is based on the assumption that the data is normally distributed. This project will study the construction of $\overline{X}$-chart when the data is not normally distributed.
Preparation:	Knowledge in programming.

28 Dr Wong Voon Hee

Lecturer:	Dr Wong Voon Hee (wongvh@utar.edu.my)
Areas of Interest:	Statistical Quality Control (SQC), Data Analytics
Project Title 1:	An Improved Voice-to-Text Transcription for Business Solutions
Supplement Knowledge:	Completed industrial training at SunLife Malaysia Assurance Berhad
Outline:	Sun Life Malaysia is looking for the speech analytics solutions to boost the customers' engagement, to offer better customer services and to enhance the business outcomes. To achieve a "bionic" model that seamlessly combines human advisors and automated solutions.
Preparation:	MS Excel / Python / R Programming
Project Title 2:	Customer Lifetime Value Model for Business Solutions
Supplement Knowledge:	Completed industrial training at SunLife Malaysia Assurance Berhad
Outline:	Sun Life Malaysia has strived to strengthen their clients' portfolio by acquiring and retaining the most potential profitable clients. In order for this to be happened, current and potential clients had to be clearly classified in a way that not only specified how much would a client value in the near future, but also in the long run, until its relationship with the company lasted. Customer Lifetime Value (CLV) would be the solution to measure clients according to their potential monetary value over various periods of time. The main objective of this project was to apply survival model into one of the CLV model.
Preparation:	MS Excel / Python / R Programming
Project Title 3:	Operational Research Binary Integer Programming
Supplement Knowledge:	Completed industrial training at SunLife Malaysia Assurance Berhad
Outline:	Sun Life Malaysia is planning to build a collection optimization engine to maximize the collection effort. To make the most of each individual customer contact by determining how business variables – e.g., resource and budget constraints, contact policies, the likelihood that customers will respond and more that will affect outcomes. The system / engine can help in choosing which customers to target to maximize profitability, boost response rates, etc., while taking into account customer preferences, propensities, profitability, costs, contact policies and other goals.
Preparation:	MS Excel / Python / R Programming
Project Title 4:	Machine learning for email filtering and categorizing
Background Knowledge:	None

Outline:	Nowaday, we are receiving tons of emails everyday. Some of these emails are unuseful and consume a lot of storage. Hence, there is a need to develop a method to help us to filter these emails. This project aims to adopt a machine learning method to detect and filter the spam mails and then categorize the useful emails according to the user's preference. Objectives: 1) to adopt a machine learning method which can filter spam mails automatically. 2) to create a machine learning method which is able to group the useful emails according to the title and content. 3) to develop a machine learning method which can help to categorize the useful email according to the user's preference.
Preparation:	None

29 Dr Yap Hong Keat

Lecturer:	Dr Yap Hong Keat (yaphk@utar.edu.my)
Areas of Interest:	Number Theory
Project Title 1:	On Solutions of the Diophantine Equation $x^3 + y^5 = z^3$
Background Knowledge:	Number Theory and C Programming
Outline:	Diophantine equation involving only sums, products and powers in which all the constants are integers and the only solutions of interest are integers. In this problem, we consider the Diophantine equation $x^3 + y^5 = z^3$ where x, y, z are positive integers.
Preparation:	Diophantine Equation and basic knowledge in C programming.
Project Title 2:	On Solutions of the Diophantine Equation $x^4 + y^5 = z^3$
Background Knowledge:	Number Theory and C Programming
Outline:	Diophantine equation involving only sums, products and powers in which all the constants are integers and the only solutions of interest are integers. In this problem, we consider the Diophantine equation $x^4 + y^5 = z^3$ where x, y, z are positive integers.
Preparation:	Diophantine Equation and basic knowledge in C programming.

30 Dr Yap Lee Ken

Lecturer:	Ms Yap Lee Ken (lkyap@utar.edu.my)
Areas of Interest:	Numerical Analysis
Project Title 1:	Numerical Solutions for Delay Differential Equations
Supplement Knowledge:	Numerical methods, C Programming
Outline:	We shall derive numerical methods for solving delay differential equations. The C-program will be compiled to test the efficiency of the numerical methods.
Preparation:	Strong background in numerical analysis and good programming skill.
Project Title 2:	Block Hybrid Collocation Methods for the Numerical Solution of Fourth Order Ordinary Differential Equations
Supplement Knowledge:	Numerical methods, C Programming, Matematica
Outline:	We shall derive numerical methods for solving fourth order ordinary differential equations. The derivation involves interpolation and collocation of basic polynomial. The C-program will be compiled to test the efficiency of the numerical methods.
Preparation:	Strong background in numerical analysis and good programming skill.

31 Dr Yeo Heng Giap Ivan

Lecturer:	Dr Yeo Heng Giap Ivan (yeohg@utar.edu.my)
Areas of Interest:	Operations Research
Project Title 1:	A manufacturing-remanufacturing inventory model with primary and secondary markets
Background Knowledge:	Calculus, Operations Research
Outline:	In this project, an inventory model of a manufacturing system that manufactures new items and remanufactures returned items will be proposed. The remanufactured items have different quality levels and are sold in both a primary and a secondary market. Once the model is developed, it will be solved to find the optimal inventory policy and analyzed to derive managerial insights.
Preparation:	Python
Project Title 2:	A manufacturing-remanufacturing inventory model with circularity indicator
Background Knowledge:	Calculus, Operations Research
Outline:	In this project, an inventory model of a manufacturing system that manufactures new items and remanufactures returned items will be proposed. The demand for the manufactured item and the profits earned are dependent on the circularity level of the inventory system. The circularity level roughly measures how sustainable are the operations of the inventory system. Hence, an important question to be answered is " can running sustainable operations be profitable for manufacturers, and if not, what can be done to make it so?" Once the model is developed, it will be solved to find the optimal inventory policy and analyzed to derive managerial insights, one of which will answer the question posed above.
Preparation:	Python

32 Dr Yong Chin Khian

Lecturer:	Dr Yong Chin Khian (yongck@utar.edu.my)
Areas of Interest:	Applied Statistics and Financial Economics
Project Title 1:	Analyzing PCFCCE using Bayesian Network
Supplement Knowledge:	Probability and Statistics I & II or Statistical Inference, Design of Experiments
Outline:	This project will analyze Partially Confounded Factorial Conjoint Choice Experiments using Baysian Network.
Project Title 2:	Assessing Consumers' Behavior Using PCFCCE
Supplement Knowledge:	Probability and Statistics I & II or Statistical Inference, Design of Experiments

Outline:	This project will use Partially Confounded Factorial Conjoint Choice Experiments to asses consumers' behavior toward certain products.
Project Title 3:	Valuing Equity-Linked death benefits
Supplement Knowledge:	Financial Economics II or Derivative Security and Life Contingencies
Outline:	This project use the Option Pricing and Actuarial Present Value to price equity-linked death benefits.
Project Title 4:	Parameters Estimation for CIR Model
Supplement Knowledge:	Probability and Statistics I & II, Financial Economics II or Derivative Security
Outline:	This project will use Kalman Filter to estimate the parameters in CIR Model.
Project Title 5:	Estimating Limited Fluctuation Credibility Using Exact Distribution
Supplement Knowledge:	Probability and Statistics I & II, Credibility Theory
Outline:	This project will use certain non-normal distribution to estimated the expected number of claims for full credibility.
Project Title 6:	Modelling Claims Using MCMC
Supplement Knowledge:	Probability and Statistics I & II, Credibility Theory and Stochastic Processes.
Outline:	This project will use Markov Chain Monte Carlo simulation to estimated claims premiums.
Project Title 7:	Using GARCH Models to Estimate CTE
Supplement Knowledge:	Probability and Statistics I & II, Applied Stat Models, Loss Models
Outline:	This project will evaluate the performance of GARCH (genralized Auto Regressive Conditional Hetrocedastic) models in modelling daily Conditional Tail Expectation(CTE)of certain portfolios.
Project Title 8:	Interval Estimate of Credibility
Supplement Knowledge:	Probability and Statistics I & II, Credibility
Outline:	This project will find the confidence interval of the variance hypothetical means of the Buhlmann models.