Final Year Project Titles for DMAS (Jan 2023)

Contents

1 Ms Aida Adha Binti Mohd Jamil

Lecturer:	Ms Aida Adha Binti Mohd Jamil (aidaadha@utar.edu.my)
Areas of Interest:	Statistics, Data Analysis
Project Title 1:	Survival Analysis on Clinical Data
Supplement Knowledge:	Applied Statistical Models
Outline:	This project is to analyze clinical data in order to describe factors associated with trends over time in the persistence and survival rates. The suitable hazard model has to be fitted and clinical outcomes are determined to be used to monitor the efficiency of treatments.
Preparation:	R programming
Project Title 2:	Missing Data Imputation on Environmental Data
Supplement Knowledge:	Applied Statistical Models
Outline:	The pattern of missing data and techniques will be determined to estimate the missing observation. The finding of this study will propose a feasible method of imputing missing values in any real dataset.
Preparation:	R programming, or Python

2 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.

3   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

4   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

5 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 Power Domination in Graphs
Background Knowledge:	UECM2313 Graph Theory
Outline:	Given an electric power system S, one wishes to place as few number of measuring devices as possible (for economic reason) to S and at the same time keeping the system under monitored. This problem, known as the Power Dominating Set Problem, can be formulated as a variation of the well-known dominating set problem in graph theory. This project involves the investigation on the power dominating set with minimum cardinality for several well-known families of graphs.
Preparation:	Analytical reasoning and basic knowledge in graph theory.
Project Title 2:	Geometric Dissection
Background Knowledge:	UECM1034 Calculus II
Outline:	Geometric dissection is the problem that deals with the partitioning a given figure into pieces that can be reassembled into another given figure having the same area. The topics to be explored include: some special dissection such as Dudeney's dissection and some problems related to geometric dissection. In time permits, Hilbert's Third Problem which asks whether two polyhedra of equal volume are equidecomposable will be studied.
Preparation:	Analytical reasoning.

6 Dr Chin Jia Hou

Lecturer:	Dr Chin Jia Hou (chinjh@utar.edu.my)
Areas of Interest:	Complex Network Analysis, Metaheuristic
Project Title 1:	Uncovering Communities in Complex Networks using Ant Colony Optimization
Background Knowledge:	Willingness to learn software and R/Python programming for complex network analysis
Outline:	Community structure is one of the most important properties of a complex network. Naturally, entities with similar attributes are more likely to form a community. Community detection is important in the sense that it provides insights into the traits, functions, or properties of communities in a network. In this project, we will employ ant colony optimization (ACO) to optimize a measurement to develop a community detection algorithm. Benchmark and real-world networks of various sizes are used to evaluate the efficiency of the proposed algorithm.
Preparation:	R/Python programming, Gephi, basic knowledge in complex network analysis
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

7 Dr Chong Zhi Lin

Lecturer:	Dr Chong Zhi Lin (chongzl@utar.edu.my)
Areas of Interest:	Statistical Quality Control
Project Title 1:	Design of the Shewhart Median Scheme Based on the Percentile-Based Approach when the Process Parameters are Unknown
Background Knowledge:	UECM2293 Statistical Quality Control

Outline:	Quality of services and products is vitally viewed in the current competitive and challenging business environment. To ensure high-quality services and products, Statistical Process Control (SPC) is widely applied. The Shewhart median ($\tilde{X}$) scheme is a good substitute to the Shewhart mean ($\overline{X}$) scheme. The rationale is because compared to the Shewhart $\tilde{X}$ scheme, the Shewhart $\overline{X}$ scheme is not robust to contamination, outliers, and even slight deviation from the normality assumption. The Percentile-Based (PL) approach allows the design of control schemes where practitioners can ensure the desired conditions on in-control (IC) and out-of-control (OOC) run length (RL) performances are satisfied with chosen probabilities. In other words, using the PL approach, we can guarantee the IC and OOC RL performances with desired probabilities. Note that in real-life situation, the process parameters are usually unknown, hence it would be interesting to study the Shewhart $\tilde{X}$ scheme based on the PL approach when the process parameters are unknown.
Preparation:	Knowledge in programming and control chart
Project Title 2:	Performance comparison of the Max-EWMA Scheme and Other Schemes based on the Expected Average Run Length criterion
Background Knowledge:	UECM2293 Statistical Quality Control
Outline:	Control charting techniques for monitoring the magnitude and frequency of an event are important in many industries. Recently, the maximum exponentially weighted moving average (Max-EWMA) chart is proposed for jointly monitoring the magnitude and frequency of an event at the same time. The Max-EWMA chart's statistic is based on the maximum of the absolute values of two EWMA statistics - one for controlling the magnitude and the other for the frequency of an event. The Max-EWMA scheme in the literature is design based on the Average Run Length (ARL) criterion. However, in practical situation, the shift sizes are usually unknown. In this research, we design the Max-EWMA scheme based on the Expected Average Run Length criterion to account for unknown shift sizes situation, and compare this scheme with other competing schemes.
Preparation:	Knowledge in programming and control chart, R programming

8   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:	UECM3383 Cryptology, UECM3373 Introduction to Coding Theory
Outline:	Study and construct cryptographic primitives such as PKE, DSA, ZKP, etc use in E-Voting system based on blockchain technology.
Preparation:	UECM3383 Cryptology, UECM3373 Introduction to Coding Theory
Project Title 2:	Heritage Building Preservation with Blockchain Technology
Supplement Knowledge:	UECM3383 Cryptology
Outline:	Preform a thorough survey on Malaysia heritage building preservation's works and propose a system to improve current practice.
Preparation:	UECM3383 Cryptology

9   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

10 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.
Project Title 2:	Probability distribution construction via Deep Learning
Supplement Knowledge:	Python, taken predictive modelling or data mining
Outline:	The idea is to use Generative Adversarial Network (GAN) to construct the marginal and conditional probability of some events from data. GAN is a deep learning algorithm. When given a set of sample data, GAN will be able to generate data that is similar to the input sample. In recent years there were operations in cyberspace to crackdown media generated from the DeepFake algorithm. This DeepFake is an example of a GAN application. Other applications of GAN are in recommender systems and artist styles classification. The idea of the algorithm is the competition between two AI entities: a generator and a discriminator. One tries to generate artificial data, and one tries to uncover the imposters. Once the algorithm is trained, the generator will be able to generate artificial samples that are similar enough to the input data. In this project we would like to try out if this method if it can help to construct probability distributions from sample data non-parametrically.
Preparation:	Be familiarize scikit-learn and tensorflow. Revision on probability distributions.

11 Dr Goh Yann Ling

Lecturer:	Dr Goh Yann Ling (gohyl@utar.edu.my)
Areas of Interest:	Applied Statistics, Applied Mathematics
Project Title 1:	Curve Fitting in Industry
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.
Preparation:	Strong background in linear regression, good programming skill.
Project Title 2:	Big Data Analysis in Business
Supplement Knowledge:	probability and statistics
Outline:	In the project, the student will conduct the data analysis in business and provide interpretations for the final conclusions.
Preparation:	Good programming skill

12 Ms Hii Siew Chen

Lecturer:	Ms Hii Siew Chen (hiisc@utar.edu.my)
Areas of Interest:	Statistical Quality Control, Applied Statistics
Project Title 1:	A study of robust statistics in analyzing data.
Supplement Knowledge:	Students must have strong robust statistics knowledge.
Outline:	An introduction to robust statistics and will study some methods in analyzing data. Meeting with supervisor for further discussion.
Preparation:	Good R-programming skill.
Project Title 2:	A study of a specific control chart in various areas.
Supplement Knowledge:	Students must have strong statistical quality control knowledge.
Outline:	An introduction to a specific control chart and a study of its application. The details will be discussed when meeting with supervisor.
Preparation:	Good R-programming skill.

13 Mr Kuang Kee Seng

Lecturer:	Mr 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.

14 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)

15 Dr Liew How Hui

Lecturer:	Dr Liew How Hui (liewhh@utar.edu.my)
Areas of Interest:	Computers and Mathematics
Project Title 1:	Mathematics of 2D Modelling
Supplement Knowledge:	UECM1703 Introduction to Scientific Computing
Outline:	This project will explore the mathematics related to 2D modelling, which is used in typesetting and Calculus (e.g. the drawing of function graph). The methodology will involve the identification of mathematical representations and operations related to 2D graphics and the various mathematical techniques to generate 2D patterns.
Preparation:	https://en.wikipedia.org/wiki/2D_computer_graphics
Project Title 2:	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 3:	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 4:	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/)

16   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)

17   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.

18   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:	Compound-commuting mappings on skew-Hermitian matrices
Supplement Knowledge:	Linear Algebra
Outline:	Classify compound commuting mappings on skew-Hermitian matrices
Preparation:	Strengten the background of Linear Algebra by extensive reading

19   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.

20   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

21 Dr Pan Wei Yeing

Lecturer:	Dr Pan Wei Yeing (panwy@utar.edu.my)
Areas of Interest:	Computers and Mathematics
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:	Relationship between health expenditure and life expectancy
Background Knowledge:	Probability and Statistics
Outline:	The proposed project is to examine whether or not there is a relationship between healthcare expenditure and national life expectancy in order to gain perspective on how to efficiently increase the quality of health in a state.
Preparation:	Knowledge in programming, i.e., R, Python or Java

22 Mr. Phoon Sheong Wei

Lecturer:	Mr. Phoon Sheong Wei (swphoon@utar.edu.my)
Areas of Interest:	Universal Portfolio
Project Title 1:	Type I Reciprocal of Price Relatives Universal Portfolio
Supplement Knowledge:	None
Outline:	This project will study how to form the stock portfolio and the empirical stock performance of Type I reciprocal of price relative universal portfolio. Few positive definite matrices will be used in generating the universal portfolio. Please meet the supervisor for more detail.
Preparation:	Microsoft Excel (VBA) or R
Project Title 2:	Mahalanobis universal portfolio generated by $(2k+1)$-bandwidth Toeplitz matrix
Supplement Knowledge:	None
Outline:	This project will study how to form the stock portfolio and how the Toeplitz matrix will affect the performance of the Mahalanobis universal portfolio. Please meet the supervisor for more detail.
Preparation:	Microsoft Excel (VBA) or R
Project Title 3:	A study on Malaysia's stock selection based on the ratio analysis
Background Knowledge:	Financial Statement Analysis
Outline:	This project will study how to select Malaysia's stock from the market based on the ratio analysis, such as price to Earnings, Price to Book ratio, and other financial and risk & return ratios. Please meet the supervisor for more detail.
Preparation:	Microsoft Excel (VBA) or R

23   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
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.

24   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:	Solving of Linear System using Optimization Techniques
Supplement Knowledge:	Calculus I and II, Linear Algebra, Numerical Methods
Outline:	Optimization techniques will be modified in order to solve linear system of 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

25 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

26 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

27 Dr Teoh Lay Eng

Lecturer:	Dr Teoh Lay Eng (teohle@utar.edu.my)
Areas of Interest:	Operations Research
Project Title 1:	Behavior Modeling of Vulnerable People for Flood Evacuation under Uncertainty
Background Knowledge:	Operations Research/Statistics
Outline:	Flood emerges as one of the crucial challenges to many countries due to their threat to the well-being and safety of populations. In particular, the reaction of evacuees toward the flood evacuation is found to be dynamic. Furthermore, the mobility of the evacuees (especially the vulnerable people) complicates the flood evacuation strategy. Thus, this study aims to model the evacuee behavior for flood evacuation explicitly, by focusing on vulnerable people which may comprise the elderly, children, pregnant ladies, and/or persons with disabilities. To do this, numerous machine learning techniques will be applied to perform the relevant data analysis (under several scenarios) in order to yield the expected modeling framework of demand. Besides, the corresponding likelihood of the identified groups will be quantified accordingly for further evacuation planning. It is anticipated that this study will provide useful insights to emergency planners in operating flood evacuation strategies effectively.
Preparation:	This project requires fundamental skills in machine learning, probability theory, and statistical analysis. Besides, knowledge of computational programming (preferably R programming) is required for data analysis and modeling purposes.
Project Title 2:	A Stochastic Green Fleet Planning for Electric Bus Operations
Background Knowledge:	Operations Research/Statistics
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, a proper-designed fleet planning (in terms of demand and supply analysis) is indeed required to assure an environmental-friendly operation of electric buses. Thus, this project aims to perform demand and supply analysis (for fleet planning purposes) in operating electric buses under uncertainty. To do this, the student is required to model the varying demand level appropriately (demand aspect) so that the corresponding green fleet planning decision-making (supply aspect) can be made at a desired level for a heterogeneous bus fleet. It is anticipated that the fleet planning will reveal useful insights, especially to the bus operators, in providing a sustainable and profitable electric bus operation, while assuring environmental-friendly electric bus system.
Preparation:	This project requires numerous skills, including statistical analysis, simulation, optimization and machine learning for the relevant scope.

28   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

29   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
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. Power comparison will be made among the goodness-of-fit tests studied.
Preparation:	Knowledge in programming.
Project Title 2:	Statistical control charts
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 selected control chart(s) when the data is not normally distributed.
Preparation:	Knowledge in programming.

30 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

31   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.

32   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.

33 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

34 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.