Note: Please refer to faculty website at www.fsktm.um.edu.my for detail CV of the supervisors below and for their contact details. Please email them to fix appointment and discuss the research topic.

Supervisor name: Dr. Vimala Balakrishnan
Research Area: Opinion mining
Research Title: Automatic classifications of sentiments for the online community: A case study in the Healthcare Sector
Brief description: Study aims to gather, clean and automatically classify users' opinions based on either machine learning or lexicon based approaches. Opinions to be gather via the social media, or any other sources deemed suitable.

Supervisor name: Dr. Sri Devi Ravana (sdevi@um.edu.my)
Research Area: Information Retrieval/Search engine effectiveness
Research Title: Evaluation Methodologies in Information Retrieval Systems Experimental Evaluation
Brief description: Developing evaluation methodologies to assess how well a retrieval system such as search engine meets the information needs of its users
- New/enhanced evaluation metrics to score systems
- New experimental methods such as crowdsourcing for creation of relevance judgments
- Will involve statistical sampling
- Test collections will be provided such as TREC (http://trec.nist.gov/)
- Suitable for candidates who do not wish to collect new data analyse and instead work with existing data to generate new ideas in a form of new algorithms/methodologies
- You will be introduced to R programming language (http://www.r-project.org/)

Supervisor name: Dr. Sri Devi Ravana (sdevi@um.edu.my)
Research Area: Data Analytics and Crowdsourcing
Research Title: Crowdsourcing for natural disaster detection in Malaysia
Brief description: Candidate will be conducting crowsource experimentation using platforms such as Crowdflower. Main aim is to investigate how this crowsource platform can help in detecting natural disaster early or perhaps how they may be able to help during the disaster and help the recovery stage.

Supervisor name: Dr. Nurul Fazmidar Mohd Noor.
Research Area: Data Visualization
Research Title: InfoBanjir: River Level Data Visualization
Brief description: This project is to investigate how to visualize water level in rivers.

Supervisor name: Dr. Ainuddin Wahid Abdul Wahab
Research Area: Digital Forensic
Research Title: Noise Reduction and Sound Synthesis for Audio Enhancement
Brief description: This research will look at the process of removing unwanted sound like static, hump or distracting background noise from an audio. The goal is to reveal or uncover the dialogue, conversation or specific sound in the audio recording.
Supervisor name: Dr Raja Jamilah Raja Yusof

I) Research Area: Human Computer Interaction (HCI)
Research Title: Gestural Interface implementation and usability evaluation using task analysis

Brief description:
Our current interaction with computers are limited to certain devices such as touch screen, mouse, keyboard and joy stick. However, these technology was created many years ago approximately in the 1960s. For example the sketch pad was invented by Ivan Sutherland for his 1963 Phd thesis. The mouse was also created about the same time by Douglas Egelbart. Recently, the gestural interface was created in the quest of searching for futuristic human computer interaction medium. The first Hollywood movie featuring gestural interfacing was from Minority Report which was carefully structured by John Underkoffler from MIT Tangible research lab. However, the Gurus of HCI, Don Norman and Jakob Neilsen pointed out that the gestural interfaces should go through more rigorous usability test and evaluation.

The objective of this project:
  i) To study gestural interfaces implementation and evaluation issues
  ii) To implement a simple gestural interface
  iii) To analyse the implemented interface using task analysis techniques
  iv) To evaluate the interface through usability testing and evaluation

Software/Hardware:
  i) Wii Remote
  ii) Sensors
  iii) Java / C++ development environment

Supervisor name: Dr Raja Jamilah Raja Yusof

II) Research Area: Human Computer Interaction (HCI)
Research Title: Authentication through keyboard or mouse interaction print

Brief description:
Authentication or validation of users for using application system or getting access to certain data or facility are a necessity for securing the actions. Currently, common authentication techniques are through username-password keyed in, image patterns, iris biometric and fingerprint. In this project the candidate is required to explore the possibility of interaction print through the mouse or keyboard. The authentication system should be able to detect the user by getting the personal habits of users on using the mouse or the keyboard.

The objective of this project:
  i) To study and implement the mechanism of getting the personal habit of users using the mouse and keyboard
  ii) To investigate the personal habit of users using the mouse and keyboard through an implemented interface
  iii) To evaluate the accuracy of the implemented authentication interface.

Supervisor name: Dr Raja Jamilah Raja Yusof

III) Research Area: Human Computer Interaction (HCI)
Research Title: Autonomous car algorithms usability study

Brief description:
Cars are possibly one of the most useful invention that had benefited the human kind since it was first invented. However, cars were not designed to fit the physical and psychological capabilities of human. For example normal human being are known to not be able to sit and focus on one particular item for a long time without doing anything else. In such cases, human would like to occupy themselves of doing something in time of idle for that period of time. Human are easily distracted or they just get bored and tired of the
idleness and would naturally fall to sleep. This also usually happens when people drive a car. Unfortunately, when accidents occur it is the human that are blamed instead of the bad designed of cars. Autonomous car is a solution to this problem.

Therefore, in this project, autonomous car algorithms will be investigated and analysed in terms of usability (effectiveness, efficiency, utility and safety) issues. Autonomous car algorithms should ideally be error free to prevent road accidents.

The objective of this project:
1) To study and investigate existing autonomous car algorithms
2) To implement and stimulate an algorithm for autonomous car
3) To evaluate the algorithm in terms of effectiveness, efficiency, utility and safety

Supervisor name: Dr Raja Jamilah Raja Yusof

IV) Research Area: Human Computer Interaction

Research Title: Heuristics to evaluate interactivity effects on text memorization retention after using different medium of writing: the pen, the laptop and the smart phone.

Brief description: One of the usability goals in Human Computer Interaction is efficiency, how quickly one is able to perform certain tasks (Nielsen, 2012). In context of educational settings using technology, related memorization study are very minimal although the result can give a major impact in setting up guidelines on supporting memorization using technology. In the context of text memorization, such as historical facts, language rules such as in the Arabic language, formulas and others, many memorization approaches can be used to achieve memorization of these items. Some example are using Connect & Link (The Link Method), Make a Story (The Story Method), Associate Objects with Familiar Locations (The Loci Method) and others (Howes, 2015). In the context of Muslim culture, the memorization of the Qur’anic Text is also done through writing. According to a recent study (Mueller, 2014) using pen and paper, NOT laptops, to take notes boosts memory and the ability to retain and understand concepts. However, this study concentrate on notes taking while in a lecture setting. This study however, propose to investigate memory retention ability of a given text (in Malay, English and Qur’anic Arabic languages) after the text is written using pen and typed using laptop and smart phone. A Qualitative research study is proposed. A prototype is expected to be developed and evaluated for measuring the effectiveness of the three input styles for memorization through writing.

Brief description:

Objectives(s) of project:
1) To investigate the effect of text memorization retention:
   i) After writing the text using the pen
   ii) After typing the text using the laptop
   iii) After typing the text using the smart phone
2) To study the above using written text in Malay, English and Qur’anic Arabic.
3) To develop and evaluate a prototype to measure memorization effectiveness base on the above input
Supervisor name: Dr Lim Chee Kau
Research Area: AI
Research Title: Portfolio Inquire System
Brief description:

One of the problems faced by some large organizations is, even though they have quality management system and the portfolio of each staff is well defined, but outsiders or even colleagues of other departments find difficulties in getting the corresponding staff to attend to their inquiries. This project is aim to develop a system so that a user can find a corresponding staff by entering the keywords of their inquiry. A fuzzy mapping procedure will run on the backend to match the inquiry to the portfolio of staff.

Lecturer: Associate Professor Dr. Ow Siew Hock
Tel.: 03-7967 6366
Email: show@um.edu.my

Research Area: Text Analytics and Software Engineering
Title of project: Analysis, Classification and Extraction of Share Market News Releases
Objectives of project:

1. To analyse and classify the different types of share market news releases according to its main focus which include release of dividend, change of board of directors of a company, launching of new product, news about price drop of petroleum, etc., by companies listed in the main market of BURSA Malaysia. Then, develop a of share market news classification database.

2. Based on the news releases by companies listed in the main market of BURSA Malaysia, develop a news extraction system that incorporates text analytic techniques to extract the essence of the news, and classified them according to the classes defined in No. 1 above, together with the details of the news.

   For example, for news about release of dividend of a company, the details that should be recorded include the date the dividend news is released, the company name and stock code, the amount or percent (%) of dividend, government tax (if dividend is not tax exempted, and the percent of tax imposed), entitlement date, Ex-date, payment date of dividend, etc.

3. Analyse 200 or more news releases using the news extraction system to evaluate the accuracy of share market news extraction and classification results.

Brief description:
The share market prices of all companies are affected by news releases. The news could produce a positive or negative impact on the market price of a particular company in a country or create a global impact on the market prices of all companies worldwide. This research aims to develop a classification scheme to catalog the different types of news releases according to its main focus so that its impact could be analysed after the news have been released.

Students shall first analyse all the different types of share market news to develop a comprehensive classification scheme to categorise the news. A news (text) extraction system shall be developed to retrieve the main focus/issue of the news. The details of the news will be recorded systematically for the use of prediction of share market prices based on news releases.

Expected outputs:
1. A comprehensive classification scheme of share market news releases.
2. A news extraction system to classify the share market news according to the classification scheme developed.

Tools/Programming languages to be used: Suitable programming language(s), database, development tools, graphical tools, and any other related tools and technologies. However, students are required to discuss with project supervisor and all other project team members who embarked on this research to decide on the programming languages, tools and technologies to be used.

Lecturer: Associate Professor Dr. Ow Siew Hock
Tel.: 03-7967 6366
Email: show@um.edu.my

Research Area: Artificial Intelligence, Data Analytics, and Software Engineering

Title of project: Share Market Price Prediction Model based on Company News Analyses

Objectives of project:
1. To analyse the trend of share market prices of a company listed in the BURSA Malaysia after the news about dividend or other share-related news have been released by companies from a specific sector, using data mining technique.
2. To establish different share market price prediction models for different sectors based on the findings from the share market price analyses obtained from No. 1 above.
3. To develop a share market price predicting system that incorporates the share market price predicting model (from No. 2 above).
4. To evaluate the accuracy of the share market price predicting model using the share market prices of the companies listed in the BURSA Malaysia website.

Brief description:

This research aims to formulate different share market price prediction models (it can be a mathematical formula) by analysing the trends of the share market prices after the dividend news or any other share-related news have been released by the companies from different sectors. Students must choose companies listed in the main market of BURSA Malaysia from one of the sectors such as finance, properties, hotels, trading/services, etc. Based on the trends (findings) of the past 10-20 years of share market prices, establish different share market price prediction models to predict the increase or decrease in the share market prices of the companies after the companies have released their next dividend news or any other share-related news such as share offer for sale, or news about rights issue.

Students shall develop a mobile application that incorporates the different prediction models. The system shall record details about the companies (company name and stock code), the profits gained by the companies for the financial reporting period, and details about the dividend (% of dividend, government tax (if dividend is not tax exempted, the % of tax imposed), payment date of dividend, etc.). The system shall show the predicted trends in tabular and graphical formats. Both formats shall show the predicted percent of increase or decrease in the share market prices from the next day that the dividend news or share-related news have been announced until the payment date of the dividend or the related event (e.g.: rights issue date). The accuracy of the different prediction models shall be evaluated using the data from the BURSA Malaysia Website or related sources (i.e. using the past as well as the current year's share market prices, dividend data, etc.).
Expected outputs:
1. Different share market price prediction models to predict and show the trends of the share market prices of companies from different sectors for the period after the next company dividend news or any share-related news have been released until the dividend payment date (period DAD-DPD) or related event date (period SRAD-RED).

2. A share market price prediction system (mobile application) to illustrate and predict the trends of share market prices of the companies from different sectors for the period DAD-DPD or SRAD-RED.

Note: DAD-DPD: Dividend Announcement Date-Dividend Payment Date; SRAD-RED: Share-Related Announcement Date-Related-Event Date

Tools/Programming languages to be used: Mobile development tools, graphical tools, and any other related tools and technologies. Students are required to discuss with project supervisor and all other project team members who embarked on this research to decide on the programming languages, tools and technologies to be used.

Lecturer: Associate Professor Dr. Ow Siew Hock
Tel.: 03-7967 6366
Email: show@um.edu.my

Research Area: Information System, Game Development, and Software Engineering
Title of project: An Experimental Study on the Use of Computer Games to Improve the Memory of Alzheimer's Patients

Objectives of project:
1. To understand the memory status of Alzheimer’s patients.
2. To design and develop simple computer games for Alzheimer’s patients.
3. To evaluate the effectiveness of the computer games in improving the memory of Alzheimer's patients.

Brief description:

Dementia is a decline in mental ability resulting from the damage to the brain cells which can interfere daily life. Alzheimer's is the most common type of dementia. According to the World Alzheimer's Report 2015, over 46 million people live with dementia worldwide. This number is estimated to increase to 131.5 million by 2050. Although many research works have been done in finding a cure for Alzheimer's disease, no specific treatment has yet been developed to alleviate Alzheimer's disease. This research is initiated to explore whether computer games can help to improve the brain health of Alzheimer's patients. Three simple and easy-to-use computer games – Find the Pair, Sequencer, and Lingo Game, which can run on iPad will be developed. Forty Alzheimer's patients will be invited to participate in an experimental study. A test of memory will be conducted on Alzheimer's patients before and after they play the games. A hypothesis will be developed and tested to prove whether the computer games can help to improve the memory of Alzheimer's patients. The Alzheimer's patients from the Alzheimer's Disease Foundation Malaysia (ADFM) will be invited to participate in the experimental study. This research also aims to identify which of the computer games is the most effective. The findings of the research will contribute to the well-being of the Alzheimer's patients worldwide.

Expected outputs:
Two major outcomes will be produced from this research. They are:
1. Three simple and easy-to-use computer games for the Alzheimer’s patients.
2. The experimental study and its findings on the use of computer games to improve the memory of Alzheimer’s patients will be documented in a project report and disseminated to all Alzheimer’s Disease Foundations in Malaysia for sharing of research findings.
Tools/Programming languages to be used: Any programming language(s), graphical tools, database, game development tools and technologies that are suitable for developing the three computer games that can run on iPad.

Number of Students: 2

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**Supervisor name:** AP Dr Maizatul Akmar Ismail  
**Research Area:** Information Systems  
**Research Title:** Recommendation of Advertising Strategies using Social Media Analytics  
**Brief description:** The use of recommendation system approach to recommend the most suitable advertising strategy using social media analytics

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**Supervisor name:** AP Dr Maizatul Akmar Ismail  
**Research Area:** Information Systems  
**Research Title:** Detection of Fabricated Information using Social Media Analytics  
**Brief description:** The use of social media analytics / sentiment analysis to detect fabricated information

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**Supervisor name:** Tey Kok Soon  
**Research Area:** Renewable Energy  
**Research Title:** Forecasting of Solar Energy Power Generation  
**Brief description:** Using forecasting algorithm to forecast the energy generated from the solar system by using the collected data such as solar intensity, wind, temperature. Student need to develop the forecasting algorithm and user interface software. All the data required by the forecast are collected and ready to be used.

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**Supervisor name:** Dr. Rohana Mahmud  
**Research Area:** Natural Language Processing and Big Data  
**Research Title:** Lexical Semantic Ontology for Big Data Harmonization  
**Brief description:** Human natural languages are ambiguous, where each word sometimes can have many meanings. Word senses disambiguation (WSD) methods had been applied to reduce the ambiguity. Somehow, with the current big data platform, we need a better model to capture the right meaning of words within their context. The proposed research is to provide a corpus of lexical semantic ontology of a selected domain, which able to harmonize the different terms usages into one interpretation.

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**Supervisor name:** Dr. Rohana Mahmud  
**Research Area:** AI in Education, NLP and ML  
**Research Title:** Automated Essay Composer using discourse structure elements  
**Brief description:** Essay composition requires many factors such as the content ideas, the genre type and also the discourse structures elements. The research will identify and learn the most important discourse elements, which will be integrated as a model for building an automated essay composer system.

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**Supervisor name:** Dr. Rohana Mahmud  
**Research Area:** Intelligent System, NLP and ML  
**Research Title:** Multiple text clues for knowledgebase enrichment  
**Brief description:** Intelligent system requires dynamic knowledgebase (kb) that contain facts, rules, experiences and integrated resources of the domain. One method to enrich the KB is by learning the users’ common usage of text in decision making processes.
Supervisor name: Dr. Rohana Mahmud
Research Area: NLP and Speech Processing
Research Title: Questions and Answering System using selected Malaysian Dialect
Brief description: Malaysia with its multicultural communities, which uses various native languages including different dialects are an interesting case study for an integrated machine translation system. The research will focus on one state’s dialect and model how the native speakers able to adapt it with the standard language for Q&A purposes.

Supervisor name: Unaizah Obaidellah
Research Area: Cognitive Science (Artificial Intelligence); Human behaviour assessment; Learning; Computer programming
Research Title: Assessing visual attention of novice students in solving computer programming problems.
Brief description: The aim of the research is to investigate the approaches novice computer science students adopt in solving computer programming along with an analysis of their cognitive performance. Analysis will include the assessment of visual attention and emotional state with respect to the task that will be evaluated.

Supervisor name: Unaizah Obaidellah
Research Area: Image processing; Application development
Research Title: Diagnostic tool for screening cognitive impairment
Brief description: The aim of the research is to develop an intelligent diagnostic tool that screens for potential cognitive impairment among the elderly. A few tests/screening instruments will be considered in the assessment for the development of the tool.

Supervisor name: Unaizah Obaidellah
Research Area: Artificial intelligence, Data mining, deep learning
Research Title: Tracking family health history
Brief description: The research will investigate on the identification of family traits and historical health background to detect individuals with high risk of critical health problems.

Supervisor name: Dr. Norjihan Abdul Ghani
Research Area: Information security and privacy
Research Title: Technique in Ensuring the Personal Data Privacy during the Single Sign-On
Brief description: Nowadays, single sign-on is widely used which they now authenticate you on other web sites. Single sign an now-on is when we can log in to access social networking based sites via other sites for example major online newspapers to see what your friends are interested in or saying about these news items. Within social media, there may be problems faced by users when others release information about them, which could include any number of variables including from leakage of original information to fabrication of bogus profiles. This research is trying to propose a method on what we can do in ensuring the security and privacy of the personal data usually during the single sign-on.

Supervisor name: Dr. Norjihan Abdul Ghani
Research Area: Information security and privacy
Research Title: Access Control in Big Data
Brief description: To provide a secure a access control to overcome the data protection limitations in the era of big data. Social media able to create new generation of data and which have the correlation between them. This may leads to conflict between data protection principles and big data advantages itself. Thus,
we need an access control system to tackle the issues of data in big data and at the same time still fulfil the data protection principles.

Supervisor name: Dr. Kasturi Dewi Varathan  
Research Area: Big Data Analytics  
Research Title: Opinion mining and Sentiment Analysis  
Brief description: In this research, the candidate is required to perform data analytics methods in retrieving the significant features that contributes to opinion mining and sentiment analysis in a specific field. A model will be created and the identified features will then be applied and evaluated.

Supervisor name: Dr. Kasturi Dewi Varathan  
Research Area: Information Retrieval  
Research Title: Topic Modelling from Unstructured Text Documents  
Brief description: In this research, the candidate is required to perform topic modelling based on unstructured text documents (ex: - abstract, opinions, news, etc). The output of this research is to extract and list down the topics that the documents contained automatically.

Supervisor name: Dr. Kasturi Dewi Varathan  
Research Area: Big Data Analytics  
Research Title: Comparative Opinion Mining  
Brief description: In this research, the candidate is required to extract comparative opinions from opinions. Then, the extracted opinions will then be analysed and evaluated. An evaluation method will be created in evaluating the comparative opinions and the output will then be given to the user.

Supervisor name: Dr. Siti Soraya Abdul Rahman  
Research area: Artificial Intelligence and Cognitive Science  
Research title: Cognitive-based approach to student modeling  
Brief description: This research will explore cognitive-based approach to knowledge representation and reasoning technique to capture (and assess) students’ structural knowledge for student modeling -- that then could be potentially used to develop adaptive feedback in e-learning system.

Supervisor name: Dr. Hamid Abdullah Jalab  
Multimedia unit, department of computer system and technology  
hamidjalab@um.edu.my  
Research Area: Image processing  
Research Title: Image forgery detection  
Brief description: One of the principal problems in digital image forensics is determining if a particular image is authentic or not without any support of embedded security information. This can be a crucial task when images are used as evidence to influence the judgment, such as in court of law. With the availability of the powerful image editing software and high resolution equipped cameras, image forgery is becoming more popular. The main goal of image forgery detection is to detect the forgeries inside the suspicious images.  
There are three main open problems:  
The first problem is to find a robust feature extraction method; the second problem is to reduce the computational time of the block matching step, and the third problem is to decrease the false positive rate after image matching of duplicated regions.
Supervisor Name: Dr. P. Shivakumara
Problem-1: Garbage Identification
Area: Image Processing and Pattern Recognition
Description: We need to take input of different garbage images for identification. The main challenge here is that we can have infinite variations in garbage collection. In this situation, we need a method which is invariant to those variations. This will be useful to prevent the dangerous disease like Dengue, Malaria etc.

Supervisor Name: Dr. P. Shivakumara
Problem-2: Defect Image Identification
Area: Image Processing and Pattern Recognition
Description: In case of supermarket, usually, customers do not keep the items in proper place when selected item is not required and choose the better than selected one. In this case, we need to identify the item which is not placed in proper place by studying patterns of the items.

Supervisor Name: Dr. P. Shivakumara
Problem-3: Fake Audio Identification
Area: Image Processing and Speech Processing
Description: Creating fake audio is a quite common for the crime. We need to study the patterns which distinguishes fake audio from original audio.

Supervisor Name: Dr. P. Shivakumara
Problem-4: Camera man Identification based on Images
Area: Image Processing and Pattern Recognition
Description: In case of forensic applications, identifying the person who capture the photo is challenging issue. In this work, we need to analyze the content of the many images captured by different persons. As number of person increases, the complexity of the problem increases. This solution can be used to analyze the camera man mind, personality, interest, hobby etc.

Supervisor Name: Dr. P. Shivakumara
Problem-5: Recognizing Family Photo from Other Photos
Area: Image Processing and Pattern Recognition
Description: This problems helps us to retrieve the family photos from the family album. In this case, we need to separate family photos with other photos.

Supervisor Name: Dr. P. Shivakumara
Problem-6: Age of the Image by Analyzing Content of the Image
Area: Image Processing and Pattern Recognition
Description: Is there any way to estimate age of the images? It is possible when we study the skin of the persons in the images. This is useful for forensic applications such as fake image identification etc.