# Dissertation Topics/Research area Information

**Master of Computer Science**  
(Updated: 6 February 2014)

## Department of Information Systems

| Dr. Sri Devi Ravana | 1) **Information Retrieval Evaluation Methods** 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/)  

|  | 3) **Retrieval algorithms**  
Information Retrieval algorithms – document indexing techniques, etc.  

|  | 4) **Web information systems**  
E-government, E-learning, etc.  

For Research Assistant opportunity and more information on my research interest see [http://web.fsktm.um.edu.my/~sdevi/](http://web.fsktm.um.edu.my/~sdevi/) |
| Mrs. Azař Norman | **Information systems security management (ISSM)**  
|------------------|--------------------------------------------------|
|                  | a) Enabling- augmenting, catalyzing or supporting solutions for complex and dynamic organization setup  
|                  | b) Constraining- create new problems, difficulties, inconveniences, diverting attention and resources from needed organizational change  
|                  | c) Multifaceted concerns- entwining between information system stakeholders (internal-external parties)  
|                  | Example research topic/context:  
|                  | • ISSM maturity relevance and affordance in reaching organization goal  
|                  | • Promote and breed ethical behaviors in the business entity and the reflection of these excellent behaviors towards the community e.g. enable business model in social entrepreneurship and social problem.  
|                  | • Culture influences in creating ISSM good business governance  
|                  | • ISSM and specialize context e.g. security management on Holy Quran applications  
|                  | ISSM as part of secondary or tertiary education syllabus-pros and cons, appropriation, adoption, diffusion and infusion |

| Mrs. Suraya Hamid | **1) ICT, Social Networking, Online Behaviour and its impact on Education**  
|------------------|-------------------------------------------------------------------------------|
|                  | Research in this are looks into the use of ICT in particular social networking technologies in the workplace and in the education field. The behaviors of the users (i.e the workers, the lecturers and students) when they are using these technologies to achieve certain outcomes of impacts. Potential research topics include: Enterprise Social Networking (ESN), Online Social Networking (OSN) in Education, Factors Driving ESN and OSN, Implications of ESN and OSN  
|                  | **2) Information Services and E-learning**  
|                  | Research in this area looks into the innovations in the provision of information services of government activities, delivery of teaching and learning via ICT, and the use of Information Systems to achieve environmental sustainability. Potential research topics include: e-Government, e-Learning, and IS for Sustainability (Green IS)  
|                  | **3) Others**  
|                  | I also have other research interests in the relationship between culture and Information Systems, and teaching and learning across culture. I am interested in any appropriate research methodology. For example mixed method approach (combination of quantitative and qualitative methods) as well as any other suitable methods. The topics, methods are tentative and will be identified later. |

<p>| Dr. Tutut Herawan | <strong>Soft Computing</strong> - Rough and Soft Set Theories for decision making, optimization, data mining. |</p>
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<tr>
<th>Dr. Fariza Hanum Md. Nasaruddin</th>
<th>Management of Forensic Data for Police Investigation</th>
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<tbody>
<tr>
<td><a href="mailto:fariza@um.edu.my">fariza@um.edu.my</a></td>
<td>This research is to investigate the various data involved in Police Investigation and to classify them to groups so that a proper database can be designed for the use of an management system of the data. The research need also to study the flow of data from the moment they are collected all the way to the forensic process and the results. The management system should alert the investigating officer on the delay of any results and many other monitoring processes.</td>
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**Investigating Critical Thinking Skills in HLI Students and Proposing a Suitable Tool for Learning the Skill**

To identify the elements or the essential aspects of critical thinking, to investigate whether the students at higher learning institutes (HLI) possess CTPS skills. Then, this research will proceed to discover the suggested techniques and teaching strategies to promote critical thinking and problem solving (CTPS) skills and to investigate the adoption of these techniques and strategies in HLI in Malaysia. Limitations of such techniques and strategies will be identified and as a result a tool will be designed and developed to assist in cultivating CTPS skills to students at HLI.
| Dr. Kasturi Varathan | 1) **Mining the Social Media**  
To investigate and identify high quality information from the social media to achieve specific goals such as predicting results, analyzing patterns, mining opinion, identifying trends, etc.  
2) **Question Answering Systems**  
With the current search engine, a query is answered with a set of relevant documents. With the vast amount of documents available, it is very hard for the end users to go through each one of it in order to retrieve the exact answer that they are looking for. QA systems help to retrieve the exact answer that fits the query posed. This research will also explore factoid or non-factoid queries and extract answers for these queries from the underlying knowledge representation.  
3) **Semantic Retrieval**  
Semantic retrieval improves search accuracy by incorporating meaning in the retrieval. There are many approaches available such as ontology, logic, semantic term matching, classification techniques, clustering, etc which can be adopted in this research for retrieving desired documents or information from the web or corpus. | kasturi@um.edu.my |
| --- | --- | --- |
| Dr. Maizatul Akmar Ismail | 1) **Help seeking and Information Searching for learning resources**  
Exploring various ways of help seeking and information searching techniques, relevant tools and technologies. Research would also cover the evaluation of the explored techniques and methods, using various information systems’ theories and models. | maizatul@um.edu.my |
| Dr. Teh Ying Wah | 1) **Data Mining in Time Series data**  
To analyse time series data such as KLSE data set to extract meaningful pattern.  
2) **Query Processing in Cloud platform**  
To design and implement multi-tenancy cloud for query processing.  
3) **Data Stream mining**  
Predict class from incoming data stream such as sensor data. | tehyw@um.edu.my |
| Dr. Vimala Balakrishnan | 1. **Information retrieval** - topics include improving search results using feedback techniques, semantic analyses approach, opinion mining etc.  
2. **Recommender Systems** - include techniques for information retrieval, filtering mechanisms, agent based systems etc. | vimala.balakrishnan@um.edu.my |
Dr. Norjihan Abdul Ghani
norjihan@um.edu.my

1) Database security, Personal Data Protection, Trust Management

Securing and protecting the personal data is important when it is collected, used and stored for various purposes. Besides this, trust is required between parties that involved when disclosing personal information to ensure that information will be used by trusted users.

2) Information Security Behaviour

Information Security (InfoSec) research is far reaching and includes many approaches to deal with protecting information especially when it comes to personal data and technical resources available within computer based systems. It can be achieved by two approaches; technology and human behaviour. This topic is focusing more on the second approach; human behaviour.

- To discuss and evaluate any issues regarding information security such as
  i) Awareness, and
  ii) Behaviour
- Any topics that related to these issues in any domains; for example:
  i) E-commerce
  ii) E-health
  iii) E-government
  iv) Social network

However, we also welcome any students who interested in technology approach.

3) Improving Information Security in Critical Infrastructure

Industries such as banking, government, health, telecommunications, water and energy are categorized as CNII (Critical National Information Infrastructure). This research need to develop a framework to improve information cyber security in any specified critical infrastructure that have been identified above.

Dr. Nor Liyana Mohd Shuib
liyanashuib@um.edu.my

1. Recommender System, DSS, Expert System and Educational Technology (e-learning)

To develop new retrieval, adaptive or filtering method to recommend Learning Material based on Learning Style.

2. Facebook and Data Mining

To investigate, extract, mining and analyse Facebook data.

Assoc. Prof. Salimah Mokhtar
salimah@um.edu.my

1) Scaffold Modeling in Personal Learning Environment (PLE)

To investigate the feasibility to design and develop a learning environment, which is called Personal Learning Environment for higher education to support scaffolding by utilizing the Web 2.0 applications in education as an extension to existing e-learning platform such as the Learning Management System (LMS).

Department of Computer System and Technology

Dr. Nor Badrul Anuar
badrul@um.edu.my

1) Security and Privacy

The research aims to identify privacy issues related to social networking sites (e.g. twitter and facebook) and propose a model to reduce them.
1) **Image and Signal Processing**
To study and improve existing feature extraction techniques for image and signal classification

2) **System on Chip and Embedded Design**
To design and implement hardware architecture utilizing parallel and pipelining techniques in order to speed up execution time.

Assoc. Prof. Dr. Abdullah Gani
abdullah@um.edu.my

**Big Data on Mobile Cloud Computing**
This research investigates techniques for optimising Big Data utilisation on Mobile Cloud Computing platform. This includes resource discovery, scheduling, quality of service, and application framework.

Further details can be found at [http://mobcc.fsktm.um.edu.my/index.php/Project](http://mobcc.fsktm.um.edu.my/index.php/Project)

Dr. Por Lip Yee
porlip@um.edu.my

1) **Graphical Password**
Graphical password has been proposed as an alternative authentication method to replace alphanumeric password. The main focus of this research is to overcome certain security threats such as shoulder-surfing and FOA attacks. See more details on the following link: [http://ip158.fsktm.um.edu.my/lypor/publication.htm](http://ip158.fsktm.um.edu.my/lypor/publication.htm)

2) **Information Hiding**
Data hiding is the art and science of inserting payload (external information) into a host content. Earlier information hiding methods merely embed payload into a cover (e.g., text document, image and audio). In this research, we are focusing on text-based information hiding method. Our main focus of this research is to improve the capacity of embedding payload into a cover using novel method. Follow the link below for more details: [http://ip158.fsktm.um.edu.my/lypor/publication.htm](http://ip158.fsktm.um.edu.my/lypor/publication.htm)
Further support the need for ubiquitous mobile pre-hospital health services i.e. end-to-end telemedicine service in a moving vehicle in a rural or urban area seamlessly and efficiently. The ambulance moving from an emergency scene to the hospital and vice-versa, taking advantage of the VANET network, could receive or transmit the required information (two way real time audio and video communication, high quality image and medical data transmission) through other nearby vehicles, roadside units in order to connect to the internet and the hospital, using 3G/4G networks. In addition, VANET-based services like wireless vehicle warning instead of ambulance siren, traffic light preemption and route optimization can assist the ambulance to move through the dense city traffic. However, in a real operational scenario, the network implementation requires combination of technologies and techniques which is a challenging task.

**Multimedia Unit**

| Mrs. Hannyzzura Pal @ Affal hannyz@um.edu.my | 1) **Mobile Food Analysis for Malaysian Community (1 candidate)**  
This project requires both investigation and development of a mobile application to assist Malaysian community to monitor their daily calorie intake from foods consumed. The application will cover 4 main areas namely the food detection (using color and shape features), food portion estimation, calorie estimation and information visualization. These functions are acquired by a mobile device (e.g. android phone) and computed using specific image processing techniques. The project has had a prototype built and the candidate is expected to improve significantly the whole processes involved.  

*Requirement: Candidate must have Matlab programming skill.*  

2) **Adaptive Learning Environment via Visualization Strategy for Problem Solving Skills (2 candidates)**  
The project will emphasize on investigating, designing and developing educational tools that can cater the acquisition of problem solving skills. While capturing such skills is necessary, technique for assessing students’ progress in accomplishing the skills/transfer is equally important. Each candidate is to review the issues on Problem Solving (PS) including its processes, strategy variations, and problem/obstacles in solving one and to conduct surveys to identify the current problems or difficulties in implementing and exercising problem solving teaching and learning approach of higher education courses. Results obtained will be used to design and develop an adaptive learning environment that caters the acquisition of problem solving skills using a teaching and/or learning strategies namely, learning via animated and simulated environments.  

3) **Adaptable and Reusable Multimedia Learning Objects For Tutors (1 candidate)**  
This project is to develop an authoring tool that supports the design of adaptable and reusable multimedia learning objects (MLO) from a learning object repository for tutors (teachers/academicians). The candidate is required to investigate the current issues and problems related to MLO, to identify the framework, and to develop a tool emphasize on the design and development of the learning objects.
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<th>Research topics/titles</th>
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| Dr. Nurul Fazmidar Mohd Noor| fazmidar@um.edu.my              | 1) **3D Data Visualization of Journal Impact Factor**<br>This project is to investigate how to visualise data on Journal Impact Factor in 3D virtual environment. The data may be clustered according to colour, size, shape or animate. User can navigate in the environment searching for the info and clicking on point of interest.  
2) **Apps for FCSIT Students**<br>This project is to develop an application for iPhone or Android which helps university students organizing their classes, assignments, prompt important messages and other features. |
| Dr. Amirrudin Kamsin        | amir@um.edu.my                  | **Research topics/titles:**  
• Designing and evaluating Personal Task Management (PTM) tools  
• Investigating Personal Task Management (PTM) behavior and developing requirement for tools to assist the behavior.  
• Investigating and developing requirements for teaching and learning tools for disabled students.  
• Designing and evaluating online banking/investment websites/tools.  
• Investigating and developing requirement for tools for smart home.  
• Investigating and developing requirement for tools for e-agriculture.  
• Investigating Personal Financial Behaviour and designing tools to facilitate the behavior.  
• Developing Quran/Hadiths authentication system.  
• Investigating and evaluating the use of medical devices. |
| Dr. Ainuddin Wahid          | ainuddin@um.edu.my              | 1) **Image Source Identification for Social Media Images**<br>To detect or identify the camera used to capture images uploaded into social media such as facebook. Required Skills: Image processing and Matlab.  
2) **Device Identification for Skype Conversation**<br>To detect and identify the device used while having a Skype conversation. Required Skills: Audio processing and Matlab. |
### Department of Artificial Intelligence

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<tr>
<th>Researcher</th>
<th>Project Title</th>
<th>Description</th>
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<tr>
<td>Dr. Norisma Idris <a href="mailto:norisma@um.edu.my">norisma@um.edu.my</a></td>
<td>1) Identification of Summarizing Strategies using Similarity Measure</td>
<td>To develop an automated summarization assessment that can be used to identify semantic level of students' summarizing strategies using similarity measure.</td>
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<td>2) Automatic Diagnosis of Students' Summarizing Strategies</td>
<td>To automate the diagnosis of students' summarizing strategies, i.e., to determine whether the strategies are correctly used by students and to provide a recommendation on how to use the strategy correctly.</td>
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<td>Mr. Md Nor Ridzuan Daud <a href="mailto:ridzuan@um.edu.my">ridzuan@um.edu.my</a></td>
<td>1) Predictive Analytics: Mining Healthcare Data</td>
<td>The goal is to develop a breakthrough algorithm (predictive model) that uses available patient data to predict and prevent unnecessary hospitalizations, using real world US Healthcare data. The outstanding algorithm has a potential to win up to USD230K provided by The Heritage Provider Network (HPN).</td>
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<td>Prof. Dr. Loo Chu Kiong <a href="mailto:ckloo@um.edu.my">ckloo@um.edu.my</a></td>
<td>1) Handling Many Objectives Optimization using Shuffled Complex Evolutionary Algorithm</td>
<td>Handling many-objective problems is one of the primary concerns to EMO researchers. In this paper, we suggest a reference-point based many-objective Shuffled Complex Evolutionary Algorithm that emphasizes population members which are non-dominated yet close to a set of well-distributed reference points. The proposed algorithm is applied to a number of many-objective test problems having three to 10 objectives (constrained and unconstrained) and compared with a recently suggested EMO algorithm.</td>
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2) Development of Interactive Particle Swarm Optimization with user references measurement.

The number of evaluations that IEC can receive from one human user is limited by user fatigue which was reported by many researchers as a major problem. In addition, human evaluations are slow and expensive as compared to fitness function computation. Hence, one-user IEC methods should be designed to converge using a small number of evaluations, which necessarily implies very small populations. Several methods were proposed by researchers to speed up convergence, like interactive constrain evolutionary search (user intervention) or fitting user preferences using a convex function (Takagi, 2001). IEC human-computer interfaces should be carefully designed in order to reduce user fatigue. The main objective of this project is to develop an Interactive PSO using wearable EEG sensor for user preferences measurement to reduce the user fatigue.

3) A study of unwarping technique for omnidirectional vision

A camera normally has a field of view that ranges from a few degrees to, at most, 180°. This means that it captures, at most, light falling onto the camera focal point through a semi-sphere. In contrast, an ideal omnidirectional camera captures light from all directions falling onto the focal point, covering a full sphere. In practice, however, most omnidirectional cameras cover only almost the full sphere and many cameras which are referred to as omnidirectional cover only approximately a semi-sphere, or the full 360° along the equator of the sphere but excluding the top and bottom of the sphere. In the case that they cover the full sphere, the captured light rays do not intersect exactly in a single focal point. This project will develop an algorithm to unwarp and optimize an omnidirectional image for robotic vision.

4) A study of 3D image reconstruction using Kinect sensor and 3D feature extraction.

The rapid development of imaging techniques has led to a dramatic increase in the amount of volumetric image data that needs to be processed. Especially in the field of biomedical imaging, the third dimension becomes more and more important as it enables studying organisms in their natural constellation. Objects and organisms need to be located and analyzed in any number, at every position, and in every orientation. This means volumetric data yield not only more demanding constraints regarding computational efficiency, but also the interrelationship of neighboring intensity values becomes more complex. One of the most relevant issues is to cope with 3D rotation. The project will study the use Kinect sensor for object 3D image reconstruction, and use a Fast Rotation Invariant 3D Feature Computation Utilizing Efficient Local Neighborhood Operators.

Dr. Rukaini Hj. Abdullah
rukaini@um.edu.my

1) Summary Assessment System: Identification of topic sentences in English text.

The objective of this research is to design an algorithm to identify the topic sentence(s) in an English text based one or combination or all of the methods (cue words/position/conjunction/etc). The accuracy of this algorithm will be tested against human experts.
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<th>Dr. Noorhidawati Abdullah</th>
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<td><a href="mailto:noorhidawati@um.edu.my">noorhidawati@um.edu.my</a></td>
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1) **Information seeking behavior**
   - Information seeking behaviour - for specific group of people (2 specific topics are available)
   - Web 2.0 (specifically on social tagging)
   - Digital library
   - E-book user study
   - Bibliometrics & citation analysis study

2) **Collaborative tagging for Digital library of Malay Manuscript**