

Master of Computer and Information Sciences & Bachelor of Computer and Information Sciences (Honours)

TOPICS for Thesis / Dissertation research work, updated on 27/03/2010. As suggested by supervisors

Supervisor Details	Research Areas / Topics / Projects
<p>Professor Ajit Narayanan Head of School of Computing and Mathematical Sciences (SCMS) ajit.narayanan@aut.ac.nz (Updated)</p>	<ol style="list-style-type: none"> 1. Application of artificial intelligence techniques (e.g. genetic algorithms, neural networks, fuzzy logic, particle swarm optimisation). No previous knowledge of molecular biology is required. 2. Simulations of quantum computing to identify novel quantum algorithms. No previous knowledge of basic quantum mechanics required. 3. Intelligent forensic IT: the application of artificial intelligence techniques to detect computer fraud, including internet fraud (e.g. e-laundering), and computer misuse.
<p>Dr Judith Symonds, SCMS jsymonds@aut.ac.nz (Updated; available for supervision for work starting in 2011).</p>	<ol style="list-style-type: none"> 1. Mobile & wireless computer applications (focus in health and agriculture) 2. Pervasive and ubiquitous systems
<p>Krassie Petrova, SCMS kpetrova@aut.ac.nz (Updated; available for supervision for work starting in 2011).</p>	<ol style="list-style-type: none"> 1. Developing the mobile service space 2. Designing mobile games for mobile learning 3. Mobile information systems and user requirements 4. Developing mobile collaboration support 5. Mobile service adoption (empirical studies)
<p>Dr Jacqui Whalley, SCMS jwhalley@aut.ac.nz (Updated)</p>	<p>Areas of supervision:</p> <ol style="list-style-type: none"> 1. Geographical Information Systems 2. Information Visualization 3. e-Heritage 4. Audio Processing and Visualization 5. Computing and Mathematics in Medicine and Biology 6. Computer Graphics 7. Computer Science Education 8. Search Based Software Engineering (with Dr. Andy Connor) <p>Possible research projects include:</p> <ol style="list-style-type: none"> 1. Visualizing Tribal Genealogies 2. Historic Site Preservation and e-Heritage 3. Visualization of Genomic Data

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	<ol style="list-style-type: none"> 4. Audio Processing and Visualization 5. RFID for managing heritage archives (with Dr. Dave Parry situated in the AURA laboratory) 6. Examining the development of expertise in computer programmers 7. Tools for novice programmers <p>For further information see: http://elena.aut.ac.nz/homepages/staff/J-Whalley/index.html</p> <ol style="list-style-type: none"> 1. Adoption and use of Agile Software Development Methodologies. 2. Agile Modelling.
<p>Mai Senapathi, SCMS, msenapat@aut.ac.nz (Updated)</p> <p>Dr Tony Clear, SCMS, tclear@aut.ac.nz (Updated)</p> <p>See also Dr Clear's detailed description of projects.</p>	<p>Potential areas of supervision: Collaborative Computing, developing and evaluating collaborative technologies and virtual environments; Global Virtual Teams & Global Software Engineering (GSE); Computing Education Research (CER); Software Development/Software Engineering and professional practice; Risk Assessment and Software Development Impact Statements; The nature of research and the research process</p> <p>Specific current projects</p> <ol style="list-style-type: none"> 1) Tablet PCs and explanograms (with Dr Jacqui Whalley) 2) Tablet PCs and explanograms – Moodle Linkages (with Dr Jacqui Whalley) 3) Cybericebreaker enhancements 4) Technology-Use Mediation in Global Software Engineering Teams 5) Extended Bibliometric analysis of research performance in the computing disciplines using electronic databases and search engines.
<p>Dr Nurul I Sarkar, SCMS nsarkar@aut.ac.nz (updated)</p> <p>See also Dr Sarkar's detailed description of projects.</p>	<ol style="list-style-type: none"> 1. -Performance study of 802.11a networks 2. -A study of the impact of walls on the performance of a typical 802.11 network in obstructed office environments 3. -Modelling and performance evaluation of a routing protocol for MANETs 4. -Modelling and optimisation of wireless mesh network MAC protocols 5. -Performance modelling of congestion control mechanisms in wireless mesh networks 6. -A study of routing protocols for wireless mesh networks 7. -An investigation on the impact of traffic distribution on WLAN performance 8. -A study on the combined effect of received signal strength and video streaming on WLAN performance 9. -Modelling and performance studies of ATM networks

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	<p>10. -Improving TCP performance in MANETs 11. -Performance study of VANETs using Wi-Fi 12. -Performance Studies of IEEE 802.16-Based Mobile WiMAX 13. -Modelling and performance evaluation of IEEE 802.15-based WPANs.</p>
<p>Professor Wai (Albert) Yeap, SCMS, Director of Centre for Artificial Intelligence research (CAIR), wyeap@aut.ac.nz</p>	<p>Robotics:</p> <ol style="list-style-type: none"> 1. Join us to implement Yeap's theory of how humans compute a representation of their environment using a mobile robot. You will be working with a team of researchers. [more than one projects available] 2. Develop a mobile robot that appears to be intelligent. 3. Implement a game with two robots, Tom and Jerry, whereby Tom hunts for Jerry in a maze. 4. Implement a mobile robot to move around in Queen Street. <p>Natural Language:</p> <ol style="list-style-type: none"> 1. Join us to test Yeap's theory of how children acquire their first language. You will be working with a team of researchers. [more than one projects available and if you know languages other than English, you could also test the theory in other languages]. 2. Join a team of researchers working on a commercial project involving the processing of English text. <p>Creativity-support tool:</p> <ol style="list-style-type: none"> 1. Implement analogical reasoning for a creativity support tool developed by Yeap and his students.
<p>Shoba Tegginmath, SCMS stegginm@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Ontologies and machine learning 2. Data modelling 3. Web/Database systems 4. Data warehousing
<p>Bobby Yang, SCMS, byang@aut.ac.nz</p>	<p>Areas of interest:</p> <ul style="list-style-type: none"> • robotics • computer networks

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	<p>Projects:</p> <ul style="list-style-type: none"> • Robot indoor navigation. Develop the software for a mobile robot to move about in an indoor space. It can be equipped with sensors localise using radio signals, laser, etc. The indoor space layout is provided. • Rehabilitation robots. A critical step to stroke patients recovering the use of affected limb is intense and repetitive exercises. The project is to investigate and develop a robot arm and the appropriate software to help and encourage patients and monitor progress.
<p>Alan Litchfield, MCIS alitchfi@aut.ac.nz</p>	<p>Research areas of interest:</p> <ol style="list-style-type: none"> 1. Philosophy of Information Systems: The development of a pragmatic holistic philosophy of Information Systems. 2. The impact of Web 2.0 on Information Systems Work Systems. 3. Is Web 2.0 a disruptive technology? 4. Development of tools for tribal genealogical research
<p>Dr Shaoning (Paul) Pang , KEDRI spang@aut.ac.nz See also Dr Pang's detailed description of projects.</p>	<p>Areas of supervision</p> <ol style="list-style-type: none"> 1. Enterprise Data Warehousing, Data Mining and Knowledge Discovery Applications 2. Financial and Business Intelligence 3. Speech & Image Processing, Computer Vision, and Pattern Recognition 4. Mobile Robotics 5. CAD data analysis for Art and Design <p>Research projects</p> <ol style="list-style-type: none"> 1. Machine Learning for Internet Security 2. Research Topics on String Data Analysis 3. Research Topic on Image and CAD Data Analysis (associated with KEDRI-NICT project) 4. Research Topic on Financial Data Analysis
<p>Dr David Parry , SCMS Director of the AUT RFID Applications (AURA)</p>	<ol style="list-style-type: none"> 1. Health informatics – Computing applications in healthcare 2. Radio Frequency Identification (RFID) Data handling and system development

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<p>laboratory</p> <p>dparry@aut.ac.nz</p>	<p>3. Semantic Web, ontologies and information retrieval,</p> <p>Planned projects include:</p> <ul style="list-style-type: none"> • activity representation and analysis, from RFID data • “crowdsourcing” for ontology creation and use in the medical domain • ubiquitous computing in healthcare
<p>Professor Alvis Fong, SCMS</p> <p>afong@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Multimedia processing : Semantic understanding of media contents - a multi-modal signal processing approach 2. Multimedia data management : Annotation, indexing, and retrieval of media contents - a complete semi-automatic (or fully automatic) framework that could be customizable for different application domains (e.g. video library, music library, surveillance footage, etc.), and in the context of Web 2.0. 3. Applied image processing: Adaptation and development of (existing/new) image processing techniques for specific applications
<p>Boris Bacic, SCMS</p> <p>bbacic@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Supervision Areas <ul style="list-style-type: none"> • Video, image, sound and alternative multimodal signal processing, • Sport coaching and biomechanics applicative computation (automation), • Digital media design - computing assisted software design, • Motion data acquisition, processing and visualisation, • Applications (including the areas above) in soft computing, machine learning and evolving (neuro fuzzy evolutionary) systems. 2. Examples of the specific projects <ul style="list-style-type: none"> • Marker and Marker-less motion capture, • Human Pose, body or silhouette estimation, • Scene modelling from video, • Ubiquitous computing for motion acquisition. <p>Prospective students should have a positive attitude and willing to learn or advance in some of the following areas, if needed:</p> <ul style="list-style-type: none"> • Hardware and/or software design i.e. some knowledge in software development and architectures; using languages and tools or being able to acquire new ones,

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	<ul style="list-style-type: none"> Algorithms.
<p>Jim Buchan, SCMS jbuchan@aut.ac.nz</p>	<p>Areas of interest</p> <ul style="list-style-type: none"> Requirements engineering Software engineering Model driven development Problem oriented design Software process improvement Applications of ontologies and their management Knowledge Management <p>Specific Projects and previous supervisions:</p> <ol style="list-style-type: none"> Sharing domain understanding for requirements engineering Ontology-based techniques for domain knowledge sharing and reuse for software development Cognitive complexity in domain problem understanding for software development Understanding the effects of test-driven development on software development An integrated tool set for supporting software development and learning (with Anne Philippot and Dr. Andy Connor) Risk Management in small to medium software development companies (with Prof. S. MacDonell) Requirements prioritisation techniques for large requirements sets Object-relational mapping metrics (with Prof. S. MacDonell) Model based verification of domain and user requirements Knowledge management and reuse using fuzzy ontologies (with Dr. Dave Parry) Retrofitting unit and automated testing to product driven development User-driven ontology development and maintenance
<p>Leo Hitchcock, SCMS, hitchco@aut.ac.nz</p>	<ol style="list-style-type: none"> Cross cultural Issues in Global Collaborative systems software development projects
<p>Dr Philip Carter, SCMS pcarter@aut.ac.nz</p>	<ol style="list-style-type: none"> Usability Action methods
<p>Dr Andy Connor, SCMS</p>	<p>Areas of interest:</p>

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<p>Associate Director of SERL (Software Engineering Research Laboratory)</p> <p>aconnor@aut.ac.nz</p>	<ul style="list-style-type: none"> • Software engineering • Requirements engineering • Project & risk management • Evolutionary computing • Search based software engineering <p>Specific Projects for 2009:</p> <ol style="list-style-type: none"> 1. Applying Search Based Software Engineering (SBSE) to software project estimation 2. Modelling human memory process to inform heuristic search and optimisation 3. Stochastic techniques in IT project management 4. Dynamic management of software development activities 5. Improving particle swarm optimisation using quantum theory and particle physics 6. Visualisation of nitrogen tissue loading to aid learning of decompression theory 7. A comparison of genetic algorithms and tabu search 8. Managing software design rationale at the requirements phase
<p>Petteri Kaskenpalo, SCMS</p> <p>mkaskenp@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Evaluation of software artefact based PhD theses (Starting semester 1, 2010). This master's thesis topic encompasses the surveying of applied research methods of PhD theses that produced a software artifact as part of the study and were published in 2007. Approximately twenty theses are expected to be selected for analysis using a selection criteria and analysis framework, which are to be developed as part of this thesis. The overall aim of the thesis is evaluate how well the used research methods and argumentation aligns with the Design Science Research Process. This thesis topic is strongly linked with ongoing research of the supervisor and the school Software Engineering research cluster. 2. Evaluation of conference-key agreement protocols and their application in a distributed business process (Starting semester 1, 2010). The

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	<p>thesis will evaluate the suitability of suggested conference-key agreement protocols to a distributed business process (to be agreed on), and implement the protocol using a process modelling and execution environment. The work will include some programming work (Java scripting) and laboratory evaluation of the implementation. The candidate should have an interest in computer security, and have a good understanding of cryptographic building blocks.</p>
<p>Dr Sergei Gulyaev, SCMS Director of AUT Centre for Radio physics and Space Research Dr Tim Natusch, SCMS sergei.gulyaev@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Visualisation of data from the first NZ Hydrogen Atomic Clock: Development of software for the Atomic Clock, processing data from the Atomic Clock, producing Frequency Standard Stability plots and other statistics, 3-D visualisation. 2. Using fibre network for distribution of ultra-high precision Time Standards: investigation of network performance for transferring ultra-high precision data, development of computerised statistical model for time series, and analysis of errors involved. 3. Visualisation of Radio Astronomy observations: working with the robotic Radio Telescope in Warkworth, development of programs to open and analyse Radio Telescope recorded data files, 3-D visualisation of Radio Telescope data. 4. Development of networking capacity for the robotic Radio Telescope in Warkworth: investigation of speed of KAREN network, linking Radio Telescope to AUT network, 1G Ethernet implementation, 10G Ethernet investigation, investigation of performances of network protocols (TCP/IP vs. UDP, HS-TCP, BIC ...). 5. Supercomputing with the NZ Supercomputing Centre in Wellington: Radio astronomy data correlation, parallelisation algorithms, e-Research in Radio Astronomy and Space Geodesy. 6. Development of software algorithms for Radio Telescope investigation: implementation of mathematical methods for radio telescope calibration, development of on-line algorithm for Radio Telescope tracking and pointing regimes. 7. Imaging Synthesis in e-Research: Imaging synthesis and visualisation in Radio astronomy, investigation of dynamical evolution of Active Galactic Nuclei – the primordial object in the Universe – based on real astronomical observations.
<p>Professor Steve MacDonell, SCMS Director of SERL (Software Engineering Research Laboratory) smacdone@aut.ac.nz See also Dr MacDonell's detailed description of projects.</p>	<p>A. Managing uncertainty in software engineering</p> <p>Sample research topics:</p> <ol style="list-style-type: none"> A1. Portfolio risk management for smaller software projects A2. Project manager knowledge codification A3. Trade-offs between bidding, pricing and costing A4. Manager/developer influence on project planning and execution A5. Planning/replanning software projects – ongoing release planning A6. Building a fuzzy logic toolset for software project management A7. Modelling processes and systems using system dynamics and simulation <p>B. Empirical software engineering</p>

	<p>Sample research topics:</p> <ul style="list-style-type: none"> B1. Impact of sampling on empirical modelling outcomes B2. Optimising estimation accuracy using multiple methods B3. Assessing the accuracy and sensitivity of recorded effort data B4. Extent of change in metrics data from project inception to project closure <p>C. ICT systems success and failure</p> <p>Sample research topics:</p> <ul style="list-style-type: none"> C1. Identifying and classifying patterns in successful projects C2. Best practice vs. common practice – avoiding mediocrity, maintaining creativity, facilitating innovation C3. Negotiated notions of success among stakeholders C4. System usability measurement methods C5. Process/methodology assessment and refinement in use <p>D. The software/system boundary, and the evolution of autonomous systems</p> <p>Sample research topics:</p> <ul style="list-style-type: none"> D1. New metaphors suitable for considering the development, deployment and management of future software systems D2. Observing systems as they evolve over time D3. Treating software systems as continuous rather than discrete D4. Viewing systems as autonomous organic beings D5. Applying and evaluating agile management practices
<p>Dr Russel Pears, SCMS rpears@aut.ac.nz</p>	<p>1. Areas of Interest</p> <ul style="list-style-type: none"> • Machine Learning and Data Mining • Data Warehousing • Data Compression

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	<p>2. Specific Projects</p> <ul style="list-style-type: none"> • Mining High Speed Data Streams with Decision Trees • Mining Association Rules in High Speed Data Streams • Mining Highly Imbalanced data sets • Machine Learning techniques for improving Dynamic Credit Scoring using Payment Prediction • #Use of Data Compression techniques for optimizing queries in Data Warehouses • Building of Dynamic Network Models for Multivariate Time-Series: Financial Data Behavior, Modeling and Prediction.
<p>Professor Nik Kasabov, Director of AUT Knowledge Engineering and Discovery Research Institute (KEDRI) nkasabov@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Knowledge engineering and knowledge discovery: Methods, systems, applications 2. Evolving intelligent systems 3. Neuro-, fuzzy and evolutionary systems 4. Quantum inspired computational intelligence 5. Bioinformatics 6. Speech-, image and multimodal signal processing 7. Personalised modelling for personalised medicine
<p>Professor Phillip Salis, SCMS Dr Subana Shanmuganathan Geo-informatics Research Group psallis@aut.ac.nz sshanmug@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Data mining <ul style="list-style-type: none"> • Geo-referenced (coded) data analysis • Sensor design/ wireless telemetry systems • Hybrid approaches to analysing disparate data sets 2. Image processing 3. Text mining
<p>Anne Philipott , SCMS aphilpot@aut.ac.nz</p>	<ol style="list-style-type: none"> 1. Software Engineering Support Tool for Novices. Development of a tool that uses intelligence to support novice software developers/development teams and both enables concept learning and reinforces best practice. 2. Software Development Practices 3. Software Development Tools 4. Software Development Methodologies 5. Software Design 6. Agile Development

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<p>Dr Robert Wellington, SCMS rwelling@aut.ac.nz</p> <p>Dr Brian Cusack, SCMS Director CRISM Security bcusack@aut.ac.nz</p> <p>Dr Qun Song, KEDRI qsong@aut.ac.nz</p>	<p>1. Research in the area of IS/IT organisational and human perspectives, and/or implications.</p> <p>1. IT governance 2. Security audit 3. ISO / IEC standards implementation 4. eBusiness</p> <p>1. Fuzzy learning and inference systems 2. Medical decision support systems 3. Personalised modelling</p>
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See also:

- Computing and mathematical sciences research at AUT University at <http://www.aut.ac.nz/study-at-aut/study-areas/computing--mathematical-sciences/research>
- Software Engineering Research Laboratory (SERL) at <http://www.aut.ac.nz/study-at-aut/study-areas/computing--mathematical-sciences/research/research-groups/software-engineering-research-laboratory-serl>
- Knowledge Engineering and Discovery Research Institute (KEDRI), <http://www.kedri.info> ; <http://www.aut.ac.nz/research/research-institutes/kedri>
- Centre for Artificial Intelligence Research (CAIR) at <http://www.aut.ac.nz/study-at-aut/study-areas/computing--mathematical-sciences/research/research-groups/centre-for-artificial-intelligence-research-cair>
- SCMS Staff at <http://www.aut.ac.nz/study-at-aut/study-areas/computing--mathematical-sciences/learning-environment/our-people/our-staff>
- Geoinformatics Research Centre at <http://www.geo-informatics.org>

For enquiries about enrolling in a MCIS/BCIS Hons thesis or dissertation, contact

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aphilbot@aut.ac.nz, rwellinq@aut.ac.nz, spang@aut.ac.nz, bcusack@aut.ac.nz, dbarry@aut.ac.nz, ibuchan@aut.ac.nz, osong@aut.ac.nz, jsymonds@aut.ac.nz, jwhalley@aut.ac.nz,
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