

# FACULTY

OF ENGINEERING AND DESIGN | RESEARCH REVIEW FALL 2009



**Carleton**  
UNIVERSITY

Canada's Capital University

# The Research Review Fall 2009

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## Message from the Dean



**Rafik A. Goubran, Ph.D., P.Eng.**  
*Dean, Faculty of Engineering and Design*

Our Faculty of Engineering and Design at Carleton University is very proud of its track record of innovation and research excellence. Our research-intensive faculty is successful in attracting some of the world's best faculty members and students, and is pleased to provide them with the opportunity to achieve their full potential as scholars and professionals. This report profiles the research achievements of our faculty during the past year and highlights research projects that are currently active.

We are proud of our excellent research facilities equipped with a wide range of state-of-the-art specialized equipment. We take full advantage of our location in the National Capital with its large cluster of research and development industry leaders and start-ups and its world class government laboratories. We maintain very strong collaborations with our industrial partners and look forward to the addition of a major new building on campus that will provide additional research facilities to our professors and students.

It is my pleasure to invite our readers to view this update on the research productivity of our renowned faculty members and to appreciate the breadth and depth of our research programs. I also invite our readers to explore the research opportunities available to prospective graduate students as well as potential areas for collaboration with industrial partners.

# Message from the Associate Dean (Research)

2008-2009 has been another productive year for research in the Faculty of Engineering and Design. I find the rapid growth of research in "green" technology particularly exciting. This research spans the entire faculty, from investigation of advanced photovoltaic materials in the Department of Electronics; the study of wind turbines in the Department of Mechanical and Aerospace Engineering; to the advanced wastewater purification schemes in the Department of Civil and Environmental Engineering just to mention a few.

Sustainable and renewable energy technology will be a centrepiece of activity in the new Canal Building which is now under construction. The university community applauded the announcement by the federal and provincial governments in early June, of an investment of \$52.5 million in the university's Waterfront Project. This represents the single largest capital investment in Carleton's history. The project will see two buildings constructed on campus as part of the university's ongoing efforts to strengthen its capacity to contribute to the research and innovation.

Research activity in general continues to grow across the faculty. The graduate student population has grown to 783. Research quality is reflected in numerous publications in leading journals, presentations at major international conferences, and membership on key editorial boards and conference organizing committees. Many faculty members also actively share their expertise through important consulting roles in government and industry.



**Garry Tarr**  
*Associate Dean (Research)*

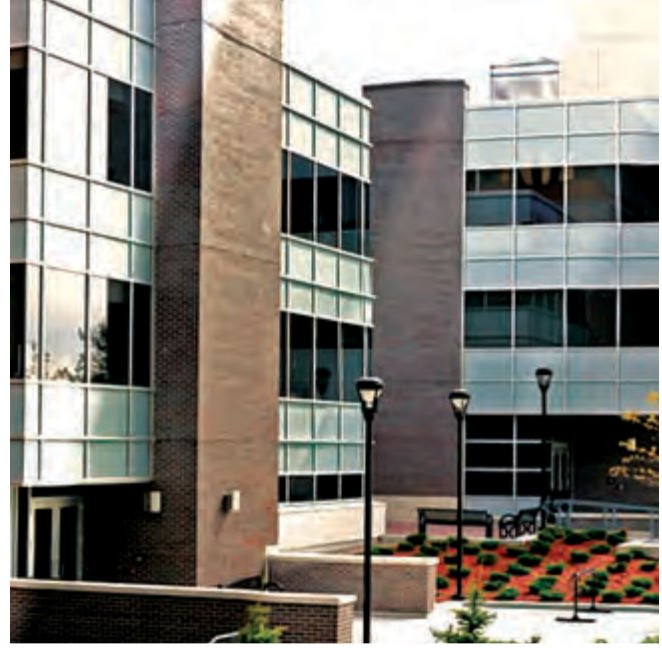
The Faculty of Engineering and Design has always fostered strong partnerships with the many leading government research laboratories and advanced technology private sector companies in the national capital region. These partnerships have continued to grow and flourish in 2009, expanding opportunities for leading edge research for our graduate students, faculty members, and our industrial and government collaborators.

I invite you to explore the snapshot of current Faculty of Engineering and Design research activities provided in the 2009 Research Review. More detail on these activities can be found on our website [www.carleton.ca/engineering-design](http://www.carleton.ca/engineering-design)

A handwritten signature in black ink, appearing to read "Garry Tarr".

## Research Faculty 2008

Azrieli School of Architecture and Urbanism	15
Civil and Environmental Engineering	20
Electronics	21
School of Industrial Design	5
School of Information Technology	6
Mechanical and Aerospace Engineering	32
Systems and Computer Engineering	39
Recently hired or in process	5
<b>Total</b>	<b>143</b>



Carleton University and NRC's Fire Research facility (left), HCI/VSIM building (right).

## Research Chairs:

**Andy Adler**

*Canada Research Chair in  
Biomedical Engineering*

**Jacques Albert**

*Canada Research Chair in Advanced  
Photonic Components*

**Ian Beausoleil-Morrison**

*Canada Research Chair in Modelling  
and Simulation of Innovative Energy  
Systems for Residential Buildings*

**Alex Ellery**

*Canada Research Chair in Space  
Robotics and Space Technology*

**Matthew Johnson**

*Canada Research Chair in  
Energy and Combustion Generated  
Air Emissions*

**Peter Liu**

*Canada Research Chair in  
Interactive Network Computing  
and Teleoperation*

**Banu Ormeci**

*Canada Research Chair in  
Wastewater and Public Health  
Engineering*

**George Hadjisophocleous**

*NSERC Industrial Research Chair  
in Fire Safety Engineering*

# Research Facilities and Infrastructure

State-of-the-art facilities and infrastructure support the research of all departments and schools in the Faculty. These laboratories are housed in the Mackenzie Building, the Minto Centre for Advanced Studies in Engineering, the Azrieli Pavilion and Theatre (location of the David J. Azrieli Institute for Graduate Studies in Architecture), and the Human Computer Interface/Visualization and Simulation (HCI/VSIM) Building. Facilities for research in biomedical engineering and sustainable and renewable energy will soon be augmented by the construction of the new Canal Building with completion expected in the fall of 2010.

The School of Architecture maintains the Carleton Immersive Media Studio with computer facilities for 3D real-time modelling, rendering and animation, 2D CAD, desktop publishing and illustration as well as digital video, sound and image manipulation for research in architecture, urban design, heritage preservation, and related disciplines. The School also maintains design/build studios as well as fabrication facilities for woodworking, metal machining and welding, an assembly room for full-scale projects, a photographic studio, and video editing suites.

The Department of Civil and Environmental Engineering makes extensive use of its Structures Laboratory, which is centred on an 11 m by 27 m strong floor facility used for stress testing of large structural components. The department is also home to the Advanced Geotechnical Research Laboratory, used to study the effects of earthquakes on building materials, and to the Environmental Engineering laboratory, which focuses on advanced approaches to wastewater treatment. The Department is also a partner with NRC in the \$10M Fire Research Facility, which opened in 2005. This facility includes a fully instrumented burn-hall to study fire propagation.

The Department of Electronics is home to the Carleton University Microfabrication Facility, Canada's only flexible research laboratory capable of manufacturing silicon microelectronic components. It is used extensively to support research on integrated sensors and photonic devices.

The Department also hosts the Carleton Laboratory for Laser Induced Photonic Structures (CLLIPS), an advanced facility for the fabrication of fiber Bragg gratings and related devices. There is state-of-the-art support for the design of integrated circuits, including the most advanced industrial simulation software, and comprehensive facilities for testing RF, analog and mixed-signal ICs at frequencies up to 20 GHz. Carleton is a full partner in the Canadian Photonics Fabrication Facility (CPFC), a world-class facility for the fabrication of integrated optical and optoelectronic devices for research and prototyping.

The Department of Mechanical and Aerospace Engineering maintains an advanced wind tunnel facility that is used extensively for testing rotors for helicopters and wind turbines. The Department also has a Bridgman vacuum furnace, fully operational gas turbine engines, servo-hydraulic materials testing equipment, and extensive computer-controlled machine shop capability. Recently laboratories have been added to study the mitigation of pollutants generated in combustion, and for research in microscale electrical co-generation. Several computer networks support

departmental research, with an extensive array of design, analysis and simulation software.

The Department of Systems and Computer Engineering is a partner in the Centre for Advanced Visualization and Simulation, housed in a new \$22 million building constructed in 2007. The Department is also home to the Advanced Real-Time Simulation Laboratory, the Carleton University Biomedical Engineering laboratory (CUBE), the Broadband Communications and Wireless Systems (BCWS) Centre and the Network Management and Artificial Intelligence Laboratory, amongst others. The Texas Instruments and Nortel Networks Digital Processing Lab provides 20 DSP development systems for research on wireless communications, high-speed data and VoIP transmission

All the departments and schools of the Faculty of Engineering and Design maintain high-performance computer networks based on powerful engineering workstations, providing excellent computing, CAD, and computer visualization facilities specific to their research needs.

## Research Highlights

Carleton's Faculty of Engineering and Design has a long history of partnerships and collaboration with government and industrial laboratories locally and globally. This has given a strong practical emphasis to much of the research in the faculty, and has provided unique opportunities for graduate students and faculty researchers. Some highlights include:

- Carleton is a full partner in the Canadian Photonics Fabrication Centre, a world-class facility for semiconductor device research and prototyping operated by the National Research Council.
- Carleton is a full partner with the National Research Council in the Fire Research Facility, a unique facility in Canada for the experimental study of fire propagation.
- Carleton is home to VSIM, a unique multi-million dollar facility for the study of computer-aided visualization and simulation

- Carleton is the only Canadian university selected for Alcatel's Research Partner Program and hosts the Alcatel Advanced Networks Laboratory
- Carleton is a partner with several other eastern Ontario universities in the High Performance Computing Virtual Laboratory (HPCVL) which ranks amongst the fastest 200 computer systems in the world.

Carleton is also unique in the inclusion of the Schools of Industrial Design, Architecture and Information Technology with traditional engineering fields in a single faculty. The Azreili School of Architecture's Immersive Media Studio is a prime example of the benefits of this interaction between disciplines.

# Department of Systems and Computer Engineering

From thermal imaging in cancer detection to next-generation Internet telephony, Department research focuses on computing, particularly systems involving computers as a component. This research focus spans software engineering to algorithms and intelligent systems to real-time systems, which include computers as embedded components. Major strengths also exist in the closely related fields of communications, including signal transmission and reception in wireless, networking, signal and image processing and analysis, and biomedical engineering and instrumentation.

These multidisciplinary core strengths for dealing with complex systems are also applied to important issues and research questions. In biomedical systems, applications include better methods for diagnosing diseases and improved computer-assisted analysis of medical data, such as X-ray images and heart sounds. Better prostheses are resulting from research in signal processing and artificial intelligence.

An emerging frontier in computing systems is the development of new kinds of intelligent systems that integrate new sensor technologies with communications systems and data analysis, which rely on the Department's multidisciplinary strengths. Applications range from security and monitoring of infrastructure such as buildings and bridges to medical uses such as remote monitoring of patient health.

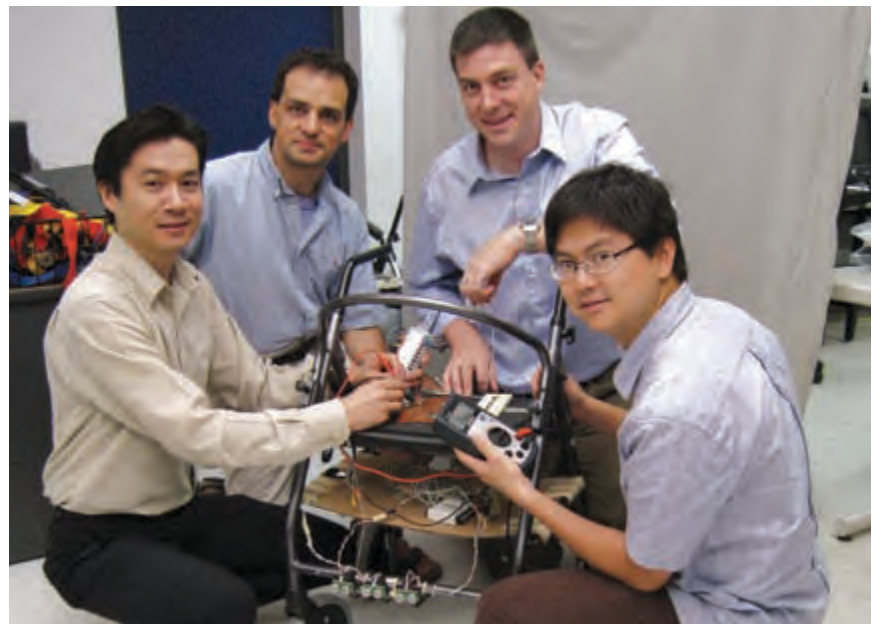
The Department frequently partners with global industrial leaders, major government labs and universities and research institutes in Canada and around the world. International collaborations include the U.S. Department of National Defense, Samsung (Korea), the universities of Oslo, Rennes, Arizona, Sannio, Princeton, Paderborn, INPT, Edinburgh,

Aalborg, Yonsei, Tarbiat Modares, and L'Aquila, the European Union's Framework Programmes, and the Wireless World Research Forum. It is a mark of distinction that the Department is the only Canadian location for a Texas Instruments Elite Digital Signal Processing Laboratory, and for Alcatel-Lucent's Research Partner program. In addition, several industrial partners have donated fully equipped labs for use in research and graduate

training, including Mitel, Nortel, Alcatel-Lucent, and IBM. The Department maintains research projects with these technology leaders as well as leading health research centres such as the Children's Hospital of Eastern Ontario (CHEO), the Ottawa Heart Institute, and SCO Health Centre. The Department is a member of both provincial (Communications and Information Technology Ontario) and federal (Mathematics of Information Technology and Complex Systems) Centres of Excellence. It also participates in the Ottawa-Carleton Centre for Communications Research (OCCCR). Major research themes include the following:

## Computer and Software Engineering

Reliable computer systems underlie many modern systems. This requires careful engineering of software as well as trustworthy hardware-software co-design for systems that involve computers as an embedded element. Research focuses on improved methodologies for the design and testing of effective and dependable systems.



Biomedical engineering researchers instrument a rollator to achieve sonar obstacle avoidance and wireless patient usage and health monitoring.

## Computer Communications, Distributed Systems, and Multimedia

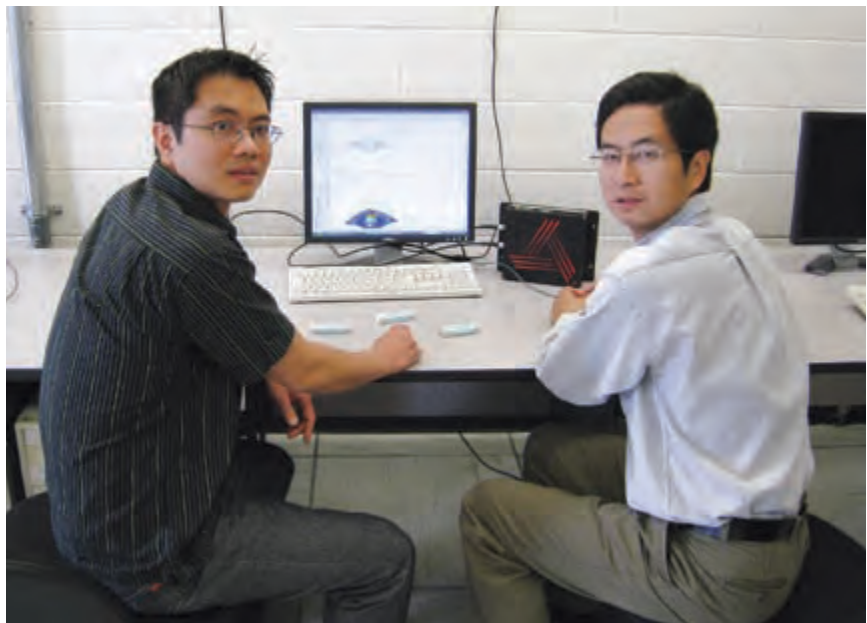
This area focuses on advanced computer networks and on some contemporary computer applications. Research in this area includes traffic modeling, algorithmic performance analysis, MPEG video, multicasting, IP, network security, information assurance, network architecture and applications, multimedia, animation, computer vision, virtual reality environments, and real-time, parallel, and distributed systems.

### Digital and Wireless Communications

Reliable, efficient communication of voice and data (including images and video) is a cornerstone of the modern economy. Research in the Department covers all aspects of communication, including mobile wireless systems, optical networks, network traffic modeling and protocols, cellular, ad hoc, and sensor networks, cross-layer optimization, compression algorithms, Voice-over-Internet-Protocol, and quality of service, etc. Collaborations include those mentioned above as well as Bell, the Communications Research Centre, National Defence Canada, IDT Canada, Intel (USA), and Samsung (Korea).



**Professor Richard Dansereau who is part of the Speech, Signal and Image Processing program.**



**Professors Richard Yu and Jerome Talim who are part of the Computer Communications, Distributed Systems, and Multimedia program.**

### Signal, Speech, and Image Processing

This involves the acquisition and processing of all kinds of data, including acoustic, voice, images, video, biomedical, etc. Applications include noise reduction, speech quality enhancement, Voice-over-Internet-Protocol, and improved video conferencing. As the volume of data increases, work on compression of data and reliable transmission over noisy wireless channels also becomes more important. Another important research thrust is the processing of biomedical signals.

### System and Machine Intelligence

Computer-based systems can undertake more advanced functions as their 'intelligence' increases. Research addresses issues on a broad spectrum of machine intelligence, from classical optimization and control to new methods such as genetic algorithms and swarm intelligence. Applications include improved design of systems, better control of robots, better control of prostheses, and better diagnosis of diseases.

### Biomedical Engineering

Research in biomedical engineering reflects the diverse and interdisciplinary nature of this field. Analysis of biomedical signals is a key thrust, e.g. X-ray, PET ultrasound, electrical impedance tomography and other images, heart sounds, 'electronic nose' sensor data, multi-sensor stethoscopes, etc. The development of biomedical instruments and devices is a second thrust, e.g. the design of improved user interfaces for prostheses, again relying on our strengths in signal processing and artificial intelligence. Finally, there is significant research activity within the field of biomedical informatics, including both bioinformatics and clinical informatics.

### Technology Innovation Management

The development and commercialization of new technologies is a process that is as complex as the technologies themselves. Research in this area focuses on commercialization and business development beyond the laboratory, including methods to grow technology businesses, particularly during the early stages of the technology

lifecycle. Applications involve capturing value from technology in open environments, product development management, venture capital, technology company creation, and management in the development of telecommunications technology intensive products and services.

## Research Groups and Facilities

Labs are equipped with world-class technology under the sponsorship of industry leaders.

### Texas Instruments and Nortel Networks Digital Processing Lab

Carleton is the only Canadian participant in TI's North American ELITE DSP Lab program. The lab is equipped with 20 DSP development systems for work on new technologies for wireless communications, high-speed data and VoIP transmission. Research also centres on advanced wireless devices, advanced Internet access, advanced conferencing terminals, and video processing for image compression and medical imaging.

### Alcatel-Lucent Advanced Networks Lab

Carleton is the only Canadian university selected for Alcatel-Lucent's Research Partner Program, which fosters innovation through strategic research partnerships. The lab is equipped with three ATM switches, bridges, and interface cards. Research focuses on computer networks, with the goal of improving network management, performance, and Quality of Service through rapid analysis and quality control.

### Mitel Networks and Analog Devices Incorporation VoIP Lab

Based on the Mitel Integrated Communications Platform (ICP3200), the lab is equipped with 20 development stations; each with a PC and three phones (analog, digital, IP)

modified to allow full access from the PX through an ICE from ADI. Other equipment includes a speech quality analyzer, speech recognition system, video cameras, and Quality of Service testing equipment. Research concentrates on Internet telephony, next-generation telephone equipment and services, and systems technology. Advanced technology in speech quality enhancement, high-fidelity stereophonic sound for telephones, and voice and speaker recognition is also pursued.

### Broadband Communications and Wireless Systems Centre

One of the largest Canadian university research groups in wireless communications, the Centre's interdisciplinary constituency includes Electronics Department researchers engaged in wireless-related projects. The Ottawa region is an R&D seedbed for industry and government, both major contributors to research at the centre. Research topics cover the wide range of topics in this area, including propagation and channel

modeling, modulation, coding and synchronization, signal processing, radio resource management, multi-hop and cooperative communications, broadband wireless systems, ad hoc and sensor networks, wireless protocols for access multimedia and the Internet, mobile computing, and mobility management.

### Real-Time and Distributed Systems Lab

Performance and resource management aspects of parallel and distributed systems are explored. This includes matching the software architecture to the system requirements and evaluating implementation architectures (e.g. for scalability). New methodologies for hardware-software co-design are also under development, including the formalization of Use Case Maps and ways of designing event-driven software through "Software Computer-Aided-Design". Software performance engineering is also studied, including methods for predicting the performance of concurrent systems.



Some of the members of the Real-time and Distributed Systems (RADS) research centre (from left to right): Gabriel Wainer, Dorina Petriu, Samuel Ajila.

## Companies Founded by Carleton Faculty and Graduates:

*this should not be considered a complete list*

ActivePotato Corp.	Digital Guard Corp.	Lightera Networks Inc.	Sedona Networks
Advanced Bioelectric Corp.	DM Solutions Group Inc.	Lumic Electronics Inc.	Serence Inc.
AmikaNow! Corp.	DOMUS Software Ltd.	Maplebrook Consulting Inc.	SiteBrand Corp.
Angiograms for Software Analysis Inc.	Dreaming Owl	MarketAccess	SoftTV.net
Atsana Semiconductor Corp.	DW Product Development Inc.	Communications Inc.	SOMA Networks, Inc.
AvalonDSP Consulting Inc.	Edigenous Technology	MARSWorks Inc.	Strategic Focus
Avtech Electrosystems Ltd.	Ellistar Sensor Systems Inc.	Maskery & Associates	SuitesOnline.com
Bajai	Espial Group Inc.	MB Foster Associates Ltd.	Sybarus Technologies
Bedarra Corp.	Forensic Computing of Ottawa Inc.	MeetingSoft Inc.	Tanjun Solutions Inc.
Biotech Networks Inc.	Galazar Networks Inc.	Molecular Ligand Technologies	Tarian Software
Blue Gate Integrated Circuit Solutions	GasTOPS	Multiprocessor Toolsmiths Inc.	Tekrib Inc.
Bradley Systems Inc.	GlobalX Communications Inc.	New Paradigm Technologies Inc.	Tempest Consulting
Burnsco Technologies Inc.	Goldak Technologies	non-linear creations	Tempest Management Corp.
Buystream Inc.	Grade (A) Student Inc.	Northwood Geoscience Ltd.	The Object People
Cadabra Design Automation Inc.	Green Avenue Ventures Inc.	Northwood Technologies Inc.	The Puffin Group Inc.
Calligraphics Computer Calligraphy	HardStorage.com	Object Technology International Inc.	Trican Consulting Group
CertainKey Inc.	latroQuest Corp.	Optimal Data Group Inc.	Trican Multimedia Solutions Inc.
CompEngServ Ltd.	ICHU Intranet Learning Inc.	Optovation Corporation	TrueArc Corp.
Computer Based Information Systems	IDS Intelligent Detection Systems Inc.	PC Edge Inc.	TWLinks Inc.
Computer Managed Information Ltd.	Ingenia Communications Corp.	Phibian Technologies Inc.	UpTangent
Corporate Renaissance Group Inc.	InGenius Engineering Inc.	Philsar Semiconductor Inc.	Ventrada Systems Inc.
CPAD Technologies Inc.	InGenius People Inc.	PlanetGiftCertificate.com	Virtual MarketPlace
Crocus Product Design	Integra Solutions	Provenance Systems Inc.	Virtual Wave Inc.
Dedicated Technologies Corp.	Interactive Circuits and Systems Ltd.	RealDecoy, Inc.	WaveAccess Ltd.
Design Interpretive Design Workshop	Isosceles Information Solutions Inc.	Resonance Microwave Systems Inc.	webHancer Corp.
	Kaben Research Inc.	RoadStar GPS	Webmama.com Inc.
	Katsura Investments	Roshnee	Wireless System Technologies
	Kelsar Inc.	RoweBots, Inc.	ZIM Technologies International Inc.
	Learning Dimensions Inc.	S2io Technologies Canada	
		SAGUS Security Inc.	

### Software Quality Engineering Laboratory

Dedicated to developing new methodologies and prototype tools to develop higher quality software, the lab focuses on applied software engineering research. Activities concentrate on the verification and validation of software systems with a particular emphasis on object-oriented systems and high-dependability systems. Model driven development and object-oriented analysis and design with the Unified Modeling Language (UML) are studied, as is software

quality assurance and control based on quantitative methods and experimental software engineering. The lab also researches automated testing of object-oriented, distributed, and real-time systems and automated support for impact analysis of object-oriented designs and change management. Collaborators include the Research Center on Software Technology at the University of Sannio, Italy; Simula Labs, University of Oslo, Norway; Triskell Group, IRISA, University of Rennes, France; Nortel, IBM Rational, Mitel Networks, Telcordia Technologies, and Siemens.

### Advanced Software Engineering Lab

Support from Nortel and Telelogic of Sweden provides equipment for research and graduate education in this facility. The lab has 20 licensed packages of the Telelogic SDT/ITEX suite of software development tools, with follow-up training, and 20 PCs. Work centres on collaborative R&D and fast-track training.



Robotics in Health Care.

### Biomedical Engineering Laboratory

Lab equipment includes a thermographic camera, a sixteen-channel biological signal acquisition system for collecting myoelectric signals, ECGs, and EEGs, AlphaMOS Prometheus and Cyranose electronic noses, electrical impedance tomography and respiratory inductance plethysmography systems, and ultrasonic/piezoelectric sensors and measurement systems. Advanced technologies are under development for diagnostics and treatment. Projects include signal processing and compression of medical data in noisy environments, artificial intelligence systems for estimating clinical outcomes in neonatal intensive care infants and other medical situations, monitoring nerve potentials to diagnose neuromuscular disorders such as carpal tunnel syndrome, myoelectric control of upper arm prostheses, prediction of gene regulation and protein structure and function through bioinformatics, imaging

of regional lung function using electrical impedance tomography, ultrasonic medical imaging and diagnosis as well as applications in telesurgery and telemedicine. Collaborators include the Children's Hospital of Eastern Ontario, University of Ottawa Heart Institute, Health Canada, and the SCO Health Service.

### Advanced Laboratory for Real-Time Simulations

The lab equipment consists of a high-performance computing platform to support an advanced real-time simulation engine (including hardware-in-the-loop and graphics workstations for human interaction). The Lab is devoted to research into real-time modeling and simulation, and into the creation and execution of very large and complex models with strong timing requirements. Research includes mechanisms for automatic generation of executable models derived from specifications of the systems and formal methods for modeling and simulation. Focus

is on very practical projects using advanced development tools and 3D visualisation. Research projects include model-based development of embedded and real-time applications, parallel and distributed simulation techniques, interoperability of executing models, and 3D visualisation. Collaborations of the lab include McGill, Concordia, ACIMS (University of Arizona, USA), Polytech de Marseille, Université de Nice/INRIA Sophia-Antipolis, Université Blaise Pascal (France), The lab is one of the members of Carleton University Centre for Visualization and Simulation (V-Sim).

### Graduate Programs

The M.A.Sc., M.Eng. and Ph.D. in Electrical Engineering are offered through the Ottawa-Carleton Institute for Electrical and Computer Engineering (OCIECE), which is joint with the Department of Electronics at Carleton University and the School of Information Technology and Engineering at the University of Ottawa. This arrangement offers our students access to an extremely wide range of graduate courses in ECE. The M.Sc. in Information and Systems Science is a conversion program offered to applicants who have a background in a technical area other than electrical or computer engineering or computer science, and is joint with the School of Computer Science, and the School of Mathematics and Statistics. The M.A.Sc. and M.Eng. in Technology Innovation Management provide advanced education at the interface of telecommunications technology and technology management. The M.A.Sc. in Biomedical Engineering is offered through the Ottawa-Carleton Institute for Biomedical Engineering (OCIBME) which is joint with several departments at both Carleton University and the University of Ottawa.



**Andy Adler, P.Eng.**

*Canada Research Chair in Biomedical Engineering Professor*

### Research

Development of novel biomedical measurement devices and medical image and signal processing algorithms, and, biometrics imaging and security systems, and the associated algorithms, measurement devices, and privacy and security aspects.

### Application

Electrical Impedance Tomography for monitoring of lung and heart function. Image reconstruction algorithms for ill-conditioned systems with correlated data. Statistical models to compare human versus machine face recognition. Demonstrated vulnerabilities in biometric encryption. Algorithms to measures of biometric information content and sample quality. Measuring parameters for Conducted Energy Weapons safety.

### Activities

- Maintainer: EIDORS open source toolkit for Impedance Imaging Reconstruction ([www.eidors.org](http://www.eidors.org))
- Review Committee, NSERC Strategic Grant Program – Biomedical Technologies, 2006-2008
- Program Committee, Biometrics Symposium, Tampa, FL, USA, 2008
- Program Committee, Biomedical Appl. Elec. Imp. Tomography, NH, USA, 2008
- Developer: Octave open source software ([www.octave.org](http://www.octave.org))
- Member: Canadian Advisory Committee to ISO JTC1/SC37 Biometrics



**Victor Aitken, P.Eng.**

*Chair (Department of Systems and Computer Engineering) Associate Professor*

### Research

Control systems; state estimation; data and information fusion; redundancy; sliding mode systems; non-linear systems; vision, mapping and localization; sensing, control and state estimation methods for navigation and guidance of unmanned vehicle systems; vision, state estimation and information fusion for robotics and biomedical applications.

### Application

The research has been applied in large scale robotic landmine detections systems for the Canadian military, automation of underground mining machines for Canadian industry, and in detection and analysis of eye motion for automation of retinal surgery.

### Activities

- Program Committees:
- IEEE Int. Instrumentation and Measurement
- IEEE Int. Conf. Automation and Logistics
- IEEE Int. Wkshp. Robotic & Sensor Environments
- Reviewer:
- IEEE Transactions
- J. Robotic Systems
- Int. J. Control
- American Control Conference



**Samuel A. Ajila, P.Eng.**

*Associate Professor*

### Research

Software reengineering and maintenance, software evolution and change management, aspect oriented design and programming (aspect composition and testing), and knowledge discovery and acquisition with applications in software engineering. The impacts of knowledge delivery factors on software development effectiveness and the effects of open source software (OSS) on the economics of software development.

### Application

The research has been applied to Software intensive systems (Real Time and Distributed Systems), Industrial processes, and avionic systems.

### Activities

- Reviewer:
- Journal of Systems and Software
  - ACM Transaction on Software Engineering and Methodology
  - Journal of Software: Practice and Experience



Tony Bailetti

*Associate Professor*

### Research

Technology commercialization; distributed product development; growing companies in open environments; open source software; technology company creation. Design and implementation of methods to grow technology businesses, particularly during the early stages of the technology life cycle; capture value from technology in open environments; design and develop complex products.

### Activities

- Vice-President, Research, Executive Council, Engineering and Technology Management Education and Research Council



Amir Banihashemi, P.Eng.

*Associate Professor*

### Research

Digital and wireless communications; information theory and coding; theory and implementation of iterative coding schemes; joint source-channel coding; space-time coding and processing; analog decoding; multimedia transmission over Internet and wireless links; cooperative coding and communication; distributed source/channel coding, compressive sensing.

### Application

Digital and Wireless Communications, Communication Theory, Signal Processing

### Activities

- Director, Broadband Communications and Wireless Systems (BCWS) Centre
- Editor, *IEEE Transactions on Communications*
- Co-chair, *2009 Canadian Workshop on Information Theory*
- TPC Co-chair, *2007 IEEE Globecom – Symposium for Communication Theory*
- TPC Co-chair, *2007 Information Theory Workshop*
- Carleton University Research Achievement Award 2006
- Recipient of one of NSERC's one hundred 2008 Discovery Accelerator Supplements (DAS)



John Callahan

*Associate Professor*

### Research

Product development management; organizational structure/product architecture interaction; telecom industry structure; venture capital. Investigation of the role of technology, customers, investors and management in the development of technology intensive products and services, particularly in the area of telecommunications.



Adrian Chan, P.Eng.

*Associate Professor***Research**

Biomedical engineering; biological signals (ECG, EEG, myoelectric signals); signal processing; pattern recognition; assistive devices; electronic noses.

**Application**

Multi-modal non-invasive sensor systems for remote and/or portable monitoring (e.g Smart Rollator project). Non-linear biological signal processing for prosthetic control and fatigue monitoring. Detection and identification of bacteria using electronic noses.

**Activities**

- Associate Director, Ottawa-Carleton Institute of Biomedical Engineering (2009-present)
- Academic Co-Chair, 30<sup>th</sup> Canadian Medical and Biological Engineering Conference (2007)
- Awards Committee Member, Canadian Medical and Biological Engineering Society (2008-present)
- Website, IEEE EMBS Ottawa Chapter (2005-present)



John Chinneck, P.Eng.

*Professor***Research**

Optimization (i.e. determining an optimal choice when restricted by constraints); mathematical programming; operations research; modelling; linear and non-linear programming; heuristics; infeasibility analysis; developing algorithms to debug optimization models and to speed optimization solutions.

**Application**

Optimization is widely used in engineering and business. An example is optimal scheduling for airlines in delivering passengers at minimum cost against constraints of aircraft maintenance and crew scheduling.

**Activities**

- IBM Faculty Award, 2006
- Editor-in-Chief, *the INFORMS Journal on Computing*
- Editorial Board for *Computational Management Science*
- Guest editor (special issues):
  - *INFORMS Journal on Computing on Operations Research in Electrical and Computer Engineering* (2006)
  - *Computers and Operations Research on Algorithms and Computational Methods in Feasibility and Infeasibility* (2008)
- INFORMS Computing Society 10<sup>th</sup> Conference 2007, Advisory Board
- CPAIOR 2007 Program Committee

- CPAIOR 2008 Program Committee
- CPAIOR 2009 Program Committee
- INFORMS Computing Society 11<sup>th</sup> Conference 2009, Co-Chair



Aysegul Cuhadar, P.Eng.

*Assistant Professor***Research**

Biomedical image/signal processing; image/video processing and compression; speech processing; parallel processing and cluster computing.

**Application**

Reliability of heart rate estimation from noisy ECG signals; Enhancement of cardiac Positron Emission Tomography (PET) images; Error-resilient video coding; Combined source-channel coding for transmission of images/video over wireless channels; Speaker recognition and verification in noisy environments; Compression of medical data for transmission and storage.

**Activities**

Program Committee Member:

- IEEE International Conference on Signal-Image Technology and Internet-based Systems, November 29-December 4, 2009, Morocco.
- IEEE Sixth Workshop on Wireless Ad hoc and Sensor Networks in conjunction with the IEEE International Conference on Distributed Computing Systems June 22, 2009, Montreal, Quebec, Canada.

- International Conference on Imaging Theory and Applications, February 5-8, 2009, Lisbon Portugal.
- IEEE Canadian Conference on Electrical and Computer Engineering (CCECE): Communications and Networking Symposium, May 3-6, 2009, St. John's, Newfoundland, Canada.
- IEEE Canadian Conference on Electrical and Computer Engineering (CCECE): Signal and Multimedia Processing Symposium, May 3-6, 2009, St. John's, Newfoundland, Canada.

Reviewer:

- IEEE Transactions on Medical Imaging
- IEEE Transactions on Image Processing
- IEEE Transactions on Circuits and Systems II
- IEE Proceedings on Vision, Image and Signal Processing
- IEEE Signal Processing Letters
- Elsevier Signal Processing: Image Communications Journal
- SPIE Journal of Electronic Imaging



**Richard Dansereau**

*Associate Professor*

**Research**

Digital signal processing; biomedical signal processing; multimodal and audio-visual signal processing; scalable wavelet video compression; voice over IP (VoIP); signal separation; quality of service (QoS);

video quality metrics; wavelets; fractal measures; non-linear and chaotic dynamic systems; speaker tracking and speech enhancement/separation by correlating acoustic speech and visual lip reading; obtaining clean fetal ECG signals without interference from the signals from the mother; measuring QoS for video conferencing or video on demand.

**Activities**

- Track Chair, Digital Signal Processing, IEEE Canadian Conference on Electrical and Computer Engineering (2006)



**Mohamed El-Tanany, P.Eng.**

*Associate Chair (Graduate Studies), Department of Systems and Computer Engineering Professor*

**Research**

Wireless and wired communication systems; EHF and UWB channels; software defined radio receivers; synchronization of communications receivers; synchronization of OFDM receivers for satellite and mobile radio channels; synchronization of direct sequence and frequency hopped spread spectrum receivers; modelling wireless channels with emphasis on UWB and unlicensed bands above 20 GHz.



**Babak Esfandiari**

*Associate Professor*

**Research**

Agent-based systems; network computing; object-oriented design and languages.

**Application**

Network supervision, soccer robotics and the World-Wide Web.

**Activities**

Program Committees:

- ICCBR 2009 Workshop on Case-Based Reasoning for Computer Games
- IJCAI 2009 Workshop on Explanation-aware Computing (ExaCt 2009)
- IEEE 2009 Sixth International Conference on Ubiquitous Intelligence and Computing (UIC-09)
- IEEE Workshop on Mobile Peer-to-peer Computing (MP2P 2009)
- ACM ICSOC 2008 International Workshop on Enabling Service Business Ecosystems (ESBE 2008)
- OTM 2008 Workshop on Semantic Extensions to Middleware: Enabling Large Scale Knowledge (SEMELS 2008)
- EDOC 2008 Middleware for Web Services (MWS 2008) Workshop
- IEEE/AFCEA 2008 MILCOM Conference
- ECAI 2008 Symposium on Explanation-aware Computing (ExaCt 2008)
- IEEE Workshop on Mobile Peer-to-peer Computing (MP2P 2008)

## Events 2008-2009

### July, 2008

- Department of Electronics Professors Michel Nakhla and Ramachandra Achar win the coveted Best Transactions Paper Award for a publication in IEEE Transactions on Advanced Packaging.

### August, 2008

- Prof. Adrian Chan of the Department of Systems and Computer Engineering wins the Early Career Achievement Award of the The Canadian Medical and Biological Engineering Society.

### September, 2008

- Ph.D. student Jeff Gilchrist of the Department of Systems and Computer Engineering is part of an international team discovering the largest prime number yet found.

### October, 2008

- Prof. David Lau of Civil and Environmental Engineering is a successful participant in an NSERC Strategic Network Grant on “Reducing Urban Seismic Risk”.

### November, 2008

- Prof. Banu Ormeci of the Department of Civil and Environmental Engineering is honoured by the Royal Society of Canada (RSC) for outstanding achievements in innovative water and wastewater treatment research.

### December, 2008

- Profs. Richard Yu, Ashraf Matrawy and Chung-Hong Lung of the Department of Systems and Computer Engineering are awarded \$150K from the Canada Foundation for Innovation to build the Advanced Lab for Heterogeneous Communication Networks.

### January, 2009

- Carleton is ranked 5<sup>th</sup> in Canada for impact in research in Engineering and Computer Science by the ISI Citation Index). The ranking considers the number of indexed publications and their citations between 2003 and 2007. Carleton is ranked 3<sup>rd</sup> in Canada according to the number of indexed publications in the same period.

### February, 2009

- Electronics Ph.D. students Muhammad Arsalan and Atif Shamim and two other Carleton students take 1<sup>st</sup> prize at the Enterprize Canada Entrepreneurial Championship in Vancouver for work on a wireless medical patch device.

### March, 2009

- Prof. Ata Khan is presented with a lifetime achievement award by the Canadian Institute of Transportation Engineers (CITE) for his work on sustainable and intelligent transportation systems.

### April, 2009

- Prof. Andrew Marble of Systems and Computer Engineering and Prof. Jacques Albert of the Department of Electronics win major NSERC Research Tools and Instruments awards, the former for a benchtop spectrometer for magnetic resonance, and the latter for an advanced fiber fusion splicer.

### May, 2009

- Professor Steen Sjolander received the McCurdy Award of the Canadian Aeronautics and Space Institute for his outstanding contributions to education and research in the field of gas-turbine technology.

### June, 2009

- Prof. David Falconer of the Department of Systems and Computer Engineering is awarded an honorary Doctorate of Science by the University of Edinburgh. This award is given based on his outstanding lifetime contributions in the areas of adaptive signal processing for wired and wireless modems and next-generation broadband wireless communications systems.



David Falconer, P.Eng.

*IEEE Fellow  
Distinguished Research  
Professor*

### Research

Communication theory; broadband wireless communication systems; frequency domain space-time processing; communication theory and signal processing applied to advanced communications systems: modulation, coding, adaptive equalization and space-time processing. Air interface, system deployment techniques and radio channel characterization for next-generation wireless access systems, allowing ubiquitous coverage at bit rates up to 100 Mb/s or higher, with full mobility.

### Application

Advanced, future-generation wireless systems.

### Activities

- Recipient of R.A. Fessenden Award (Telecommunications) from IEEE Canada" for outstanding technical contributions to the area of data transmission in both wireline and wireless environments", 2009
- Recipient of Honorary Doctor of Science from University of Edinburgh, June, 2009
- Member of IEEE Technical Committee for Wireless Communications Recognition Award, 2008
- Recipient of 2008 Canadian Award in Telecommunications Research
- Executive Chair of 2008 Wireless Communications and Networking Conference



Greg Franks, P.Eng.

*Assistant Professor*

### Research

Software performance engineering; software engineering; analytic performance modeling; operating systems; model building, solution and analysis process.

### Application

Performance models of distributed computing systems are beneficial at all stages of a project. Models are used to set performance budgets for components, to find feasible designs and locate bottlenecks, and to plan the resources for installed systems, leading to substantial cost savings for a performance-sensitive project.

### Activities

- Finance Chair, WOSP 2007
- Program Committee, WOSP 2008



Monique Frize, P.Eng.

*Professor*

### Research

Biomedical engineering; clinical decision-support systems; thermal medical image collection and analysis; telemedicine; ethics for engineers; women in science and engineering; artificial intelligence tools applied to decision-making in the clinical environment; medical equipment management in developed and developing countries.

### Application

Clinical decision-making tools for physicians and parents, for example estimating pre-term births and delivery mode, outcomes for neonatal intensive care infants, aiding parents in the decision-making process. Thermal imaging to assess pain, potential musculo-skeletal injuries in piano players, level of inflammation in rheumatoid arthritis patients. Development of medical technology management model in industrialized and developing countries.

### Activities

- Editorial Boards for *Biomedical Engineering Online*, and *Medical Engineering & Physics*
- Past President of International Network of Women Engineers and Scientists
- President of INWES Education and Research Institute
- Chair of Pathmakers Council and MRI YSTOP
- Project leader, Affiliated Scientist
- Visiting Professor at Ottawa Hospital Research Institute (OHRI)
- Research Associate at Coventry University



Rafik A. Goubran, P.Eng.

*Dean, Faculty of  
Engineering and Design  
Professor*

### Research

Digital signal processing and its applications in speech processing, biomedical engineering, and sensors. The research projects deal with adaptive systems, beamforming for microphone arrays, echo and noise cancellation, signal enhancement, feature extraction, pattern recognition, and classification.

### Application

Specific research projects in the area of speech processing include speech quality enhancement, Voice transmission over IP networks (VoIP), broadband and stereophonic VoIP, smart VoIP and multimedia terminals, microphone arrays, and voice quality assessment. Specific research projects in biomedical engineering include smart homes for the independent living of seniors, electronic noses, heart and lung sound analysis, multi-sensor stethoscopes, and smart hearing aids.

### Activities

- Guest Editor, IEEE Transactions on Instrumentation and Measurement
- Member of the Human Research Ethics Board, Ottawa Heart Institute
- Member of the Medical Devices Centre Advisory Board, Ottawa Heart Institute



James Green, P.Eng.

*Assistant Professor*

### Research

Bioinformatics; machine learning; pattern classification; proteomics; applications of nonlinear system identification; assistive devices; high performance computing on the Cell BE processor.

### Application

Characterization of protein structure and function from sequence; Prediction of post-translational modification of proteins; Species-specific prediction of protein secondary structure; Hardware acceleration of bioinformatics algorithms; Computational identification of thyroid response elements; Development of novel assistive devices for persons with disabilities and the elderly.

### Activities

- Workshop Organization Committees:
  - Co-Chair, Second Annual Carleton Cell BE Programming Workshop, Carleton University, 13-15 May 2009
  - Co-Chair, CASCON Workshop on the Cell BE and Multi-core Programming Architectures, Toronto, 27 Oct. 2008
  - Co-Chair, CASCON Workshop on the Cell BE Programming Experience!, Toronto, 28 Oct. 2008
  - Co-Chair, Cell BE Programming Workshop, Carleton University, 15-16 May 2008

### ■ Technical Program Committees:

- The Second International Workshop of Real-Time Service-Oriented Architecture and Applications (RTSOAA 2009)
  - 2009 International Conference on Signals, Circuits and Systems (SCS 2009)
  - Signal and Multimedia Processing Symposium, CCECE 2009
- Secretary, IEEE EMBS Ottawa Chapter, 2007-present



Roshdy Hafez, P.Eng.

*Professor*

### Research

Wireless theory; local access technologies: OFDM, CDMA; 3G/4G broadband wireless access; LANs and ad hoc networking; RF design and integrated fibre/wireless local loops with applications in sensors networking and ad hoc coverage extensions; wireless security, monitoring and control; broadband access in rural areas.

### Activities

- Senior Advisor, wireless industrial and government labs



Changcheng Huang, P.Eng.

*Associate Professor*

### Research

Traffic modeling and fast simulation techniques; network congestion control and Quality of Service (QoS) mechanisms; network failure detection and protection mechanisms; Internet architecture and protocols; QoS issues in wireless and sensor networks.

### Application

Virtual Private Networks (VPN)' Peer-to-peer multimedia services; Voice over IP services; environmental monitoring; traffic engineering for carrier networks.

### Activities

- Technical Program Committee Member for International Conferences and Workshops
- Chair, IEEE International Workshop on Computer-Aided Modeling, Analysis and Design of Communication Links and Networks (CAMAD) 2008
- Co-Chair, Mobile Computing Symposium, International Wireless Communications and Mobile Computing Conference (IWCMC) 2008



Douglas King

*Assistant Professor*

### Research

Technology Innovation Management; Privacy and IT security policies; IT security infrastructure; Project management best practices; Collaborative work environments; High-volume web site engineering; Repositories and their access protocols; Copyright management; Electronic notaries; Accountable supply-chain management in the service-based application domain.

### Application

Software engineering and project management environments; Enterprise directories; Public Key Infrastructure; Smart-cards; Government On-Line initiatives; Open source software, ecosystems, and open environments; Information and communications technology; Growing new technology companies.

### Activities

- Member of the Technology Innovation Management program
- Talent First Network: Research Centre in Technology Innovation, Carleton University Member
- Talent First Network: Lead-to-Win, Commercialization Mentorship Lead
- Founder of three high-technology companies
- Leader of several technical and non-technical committees within the Government of Canada and NATO
- Author of over 30 Government of Canada and Government of Ontario reports



Thomas Kunz

*Professor*

### Research

Ad hoc networks and sensor networks: network protocol issues, middleware, and innovative applications, e.g. Quality of Service (QoS) support; maximizing the network capacity through appropriate MAC and routing protocols; performance and fairness of TCP; clock synchronization and localization protocols.

### Activities

- Technical Adviser, Communications Research Centre, Industry Canada
- Technical Program Committee Member for International Conferences and Workshops
- Editorial Board Member, Open Source Business Resource
- Organizing Committee Member, IEEE Wimob 2009



**Yvan Labiche, P.Eng.**

*Associate Professor*

**Research**

Software verification and validation, software testing; Software maintenance; Software engineering; Model-based software engineering, Unified Modeling Language (UML); Empirical software engineering, Technology evaluation.

**Application**

Medical Imaging Software, Aerospace Software, Telecom Software.

**Activities**

- Program Committee Member: IEEE ESEM, IEEE ICSM, IEEE ICST, ACM GECCO



**John Lambadaris**

*Associate Professor*

**Research**

Applied stochastic processes; stochastic optimization; queuing theory; mixed signal electronic design; communication systems hardware. Analysis and modeling

of traffic in modern computer and communication networks; voice over IP (VoIP); architectures and performance evaluation; optimal control of optical networks; resource allocation and routing; congestion control for Internet; active queue management and scheduling algorithms; security applications wireless sensor networks for remote control, surveillance and security, RF board design-RF tranceiver architectures-signal integrity.

**Activities**

- Co-founding member of the Research Center for Technology Innovation (RCTI), [http://www.ottawatechwiki.com/wiki/index.php?title=Carleton\\_University](http://www.ottawatechwiki.com/wiki/index.php?title=Carleton_University)
- Co-founder and President of Sombra Labs Inc. a company specializing in wireless remote control
- Regular reviewer for IEEE



**Peter Xiaoping Liu, P.Eng.**

*Canada Research Chair in Interactive Networking Computing and Teleoperation Assistant Professor*

**Research**

Network-based tele-operation and tele-robotics; context-aware networks, robotic surgery; surgical simulation; haptics; wireless sensor networks; robots and intelligent systems.

**Application**

Telesurgery; minimally invasive surgery; surgery training systems.

**Activities**

- Associate Editor, IEEE/ASME Transactions Mechatronics
- Associate Editor, Journal of Intelligent Service Robotics
- Associate Editor, Control and Intelligent Systems
- Associate Editor, International Journal of Robotics and Automation
- Associate Editor, International Journal of Advanced Media and Communication
- Associate Editor, Journal of Mechatronics and Applications
- General Chair, 2008 IEEE International Workshop on Haptic Audio Visual Environments and Games



**Chung-Horng Lung, P.Eng.**

*Associate Professor*

**Research**

Software Engineering; software architecture; software re-engineering; domain engineering; generative programming; design patterns; software performance engineering; autonomic computing; Computer Networks; traffic engineering; security, network measurement, quality of service (QoS); wireless ad-hoc networks; sensor networks; methods to facilitate tele-operations from the network perspective; Distributed Systems: Web services, load balancing, and XML routing and filtering.

**Application**

In increasing system/software performance and improving software quality. In improving network performance and enhancing network robustness.

## Activities

Organization or Program Committee member:

- 8<sup>th</sup> International Workshop on System/Software Architectures (2009)
- 1<sup>st</sup> International Conference on Ad Hoc Networks (ADHOCNETS) (2009)
- 3<sup>rd</sup> International Conference on Sensor Technologies and Applications (2009)
- 2<sup>nd</sup> International Conference on Simulation Tools and Techniques for Communications, Networks and Systems (2009)
- 6<sup>th</sup> International Conference on Information Technology: New Generations Sensor Networks Track (2009)
- First International Conference on Simulation Tools and Techniques for Communications, Networks and Systems (2008)
- IEEE International Conference on Sensor Networks, Ubiquitous and Trustworthy Computing (2008) International Conference on Systems and Networks Communications (2008)
- 7<sup>th</sup> International Workshop on System/Software Architectures (2008)
- IEEE International Conference on Automation and Logistics (2008)



**Samy Mahmoud, P.Eng.**

*Professor*

## Research

Radio-over-fibre; broadband wireless networks; sensor networks; optical communications; VLSI in

telecom; biomedical devices; large-scale wireless networks where many devices and other intelligent systems are interconnected; new architectures for wireless networks incorporating radio-over-fibre systems, sensor networks and optical communications; speech processing for telecommunication systems; transmission of multimedia signals over high-speed networks.

## Activities

- Chair, Technical Program Committee, NCIT
- Program Chair, multi-year research project on optoelectronic and photonics fabrication associated with Canadian Photonics Fabrication Centre, developed jointly with National Research Council of Canada



**Shikharesh Majumdar, P.Eng.**

*Professor*

## Research

Resource management on Grids and Clouds; Web Services-based interoperable systems; XML filtering and forwarding; design of middleware to optimize interoperability; operating systems; grids: computing, data and sensor; telecommunication systems; distributed systems; high performance systems; impact of both wireless and optical networks on resource management and performance; performance modeling; management of telecommunication server clusters that switch both voice and data traffic; high performance parallel Web servers.

## Application

Utility computing, cloud computing, scientific computing, high performance systems, telecommunication systems, medical information systems, enterprise extranets.

## Activities

- Area Editor Simulation Modeling Practice and Theory
- Associate Editor, Bulletin of the IEEE Computer Society
- National Examiner (Operating Systems), Association of Professional Engineers
- General Chair - ACM International Workshop on Software and Performance, 2007
- Member of Program Committee: SRMPDS 2009, CSNR 2009, MS 2009, ADVCOMP 2009, MSI 2009, INTENSIVE 2009, SRMPDS 2008, CSNR 2008, MS 2008, WOSP 2008, DASD 2008, CSNR 2007, MS 2007, DASD 2007, ADVCOMP 2007, SRMPDS 2007, MS 2006, CSNR 2006, DASD 2006



**Andrew Marble**

*Assistant Professor*

## Research

Integrated systems combining hardware, pulse sequences, and signal processing techniques for low field NMR and MRI. Magnetic resonance, the technology behind an MRI scan, is a powerful tool for medical diagnostics and other non-invasive sensing applications.

*continued »*

However, its utility and availability has been traditionally limited by the need for large, expensive instrumentation like the hospital MRI machines familiar to most people. Research includes expanding the applicability of magnetic resonance by designing small, low cost dedicated scanners. Current scanners are big for a reason: the size and shape are necessary to generate the carefully controlled magnetic fields needed for an MRI scan.

Development of new optimization techniques which allow the same type of magnetic fields to be created from much more compact instruments is underway. Using these ideas along with new signal processing and control techniques, a family of small, low cost MRI equipment is being designed and built, with applications in nondestructive testing for both healthcare and material science.



Ian Marsland, P.Eng.

*Associate Chair  
(Undergraduate Studies),  
Department of Systems and  
Computer Engineering  
Assistant Professor*

### Research

Digital communication; wireless communication; equalization; MIMO systems; iterative detection and decoding; error control coding; advanced receiver architectures for efficient wireless communication systems.

### Application

Wireless systems that are capable of serving more people with increased reliability and transmission speeds.

### Activities

- TPC – 4th Workshop on Broadband Wireless Access



Steven M. Muegge

*Lecturer*

### Research

Engineering management; new product development; commercialization of technological innovation; open sourcing as a competitive strategy; organization and strategy of technology companies.

### Application

Open source software, ecosystems, and open environments; information and communications technology; growing new technology companies.

### Activities

- Member of the advisory board, The Open Source Business Resource (OSBR), [www.osbr.ca](http://www.osbr.ca)
- Member, Research Centre in Technology Innovation, Carleton University
- Member, Talent First Network



Yuu Ono, P.Eng.

*Associate Professor*

### Research

Sensors, technique and system for Biomedical monitoring/diagnosis/characterization; ultrasound measurement and imaging.

### Application

Physiological monitoring; medical imaging and diagnosis; biological tissue characterization; real-time monitoring, control and optimization of material processes; materials characterization; and non-destructive evaluation of products and structures.

### Activities

- Vice-Chair, IEEE EMBS Ottawa chapter, Aug. 2007-present



Trevor W. Pearce

*Associate Professor*

### Research

Real-time systems; real-time operating systems; embedded systems; modeling and simulation; real-time simulation; simulation interoperability; human-in-the-loop and hardware-in-the-loop simulation; simulation standards.



Dorina C. Petriu, P.Eng.

*Engineering Institute of Canada Fellow  
Director (Carleton School of Information Technology)  
Professor*

### Research

Software performance engineering; Model-Driven Development of real-time software; Model transformations; Automating the transformation of UML design specifications into performance models.

### Activities

- Contributor to the development of OMG standard *UML Profile for Modeling and Analysis of Real-Time and Embedded systems (MARTE)*

Editorial Boards:

- Journal of Software and Systems Modeling (SoSyM)
- International Journal of Advanced Media and Communication
- Guest Co-Editor, Journal of Systems and Software, Special Issue: Software and Performance, Vol. 80, Number 4, 2007

Conference Committees:

- PC Chair, (2010) International Conference on Model Driven Engineering Languages and Systems (MODELS'2010)
- Steering Committee and Program Committee (2010), The ACM Workshop on Software and Performance (WOSP)
- Program Committee (2009), International Conference on Model Driven Engineering Languages and Systems (MODELS'2009)
- Program Committee (2009 and 2008), International Conference on Quality of Software Architectures (QoSA)
- Program Committee (2009 and 2008), International Workshop on Non-functional System Properties in Domain Specific Modeling Languages (NFPinDSML), affiliated with MODELS
- Program Committee (2009), International Workshop on the Quality of Service-Oriented Software Systems (QUASOSS)
- Program Committee (2009), Software Engineering and Advanced Applications Special Session on Model Driven Engineering (SEAA-MDE)
- Program Committee (2008), International Conference on Quantitative Evaluation of SysTems (QEST)

- Program Committee (2008), SPEC International Performance Evaluation Workshop (SIPEW'2008)
- Program Committee, 2008 International Workshop on Model Based Architecting and Construction of Embedded Systems (ACES MB) affiliated with MODELS'2008

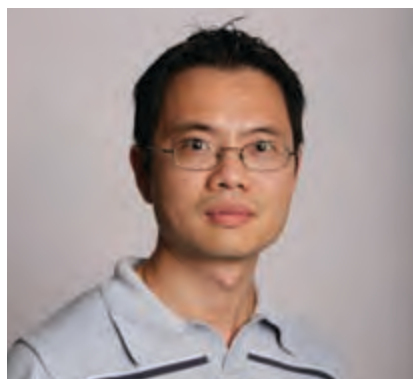


Howard Schwartz, P.Eng.

*Professor*

### Research

Adaptive control; robot control; non-linear control; system identification and estimation. Investigation of methods of computer learning, with focus on robotic applications. Algorithms related to methods of system identification and estimation are developed to automatically adjust and adapt robot behaviour. Ideas associated with evolutionary psychology and game theory are also being investigated.



Jérôme Talim, P.Eng.

### Assistant Professor

#### Research

Clustering, Security and routing in wireless sensor networks: the objective consists of designing a set of protocols supporting secure and reliable communication in sensor networks, taking into account the systems constraints and limitations. Web 3.0 applications: the research focuses on the characterization of the data content and the measure of their interests to users.

#### Application

Monitoring and tracking systems destined to public places such as hospitals, stores. Social Web applications and collaborative environment. Characterization of user profile.

#### Activities

- Contributor to open sources development software
- Regular reviewer of IEEE



Gabriel A. Wainer

### Associate Professor

#### Research

Modeling and simulation methodologies; real-time and embedded systems; DEVS formalism; parallel and distributed simulation; cellular automata and cellular modeling. Development of advanced simulation techniques. Distributed Simulation. Web-Service oriented simulation.

#### Application

Forest fire spreading. Simulation of biomedical applications. Embedded real-time software development. Computer networks performance. Logistics and distribution. Defense and emergency response. Crowd and evacuation simulation.

#### Activities

- General Chair of the *SCS Spring Computer Simulation Conference*. San Diego, CA. 2009
- General Co-Chair of *SimuTools 2009*, Rome, Italy. 2009
- Member of the International Advisory Board of the 2<sup>nd</sup> International Conference on Computer Science and its Applications. Jeju, Korea. 2009
- Member of the Organizing Committee of the 2<sup>nd</sup> Carleton Cell BE Programming Workshop. Ottawa, ON. 2009
- Track Organizer. *I3M Conference*, Tenerife, Spain, 2009
- Member of the IPC of the *ValueTools 2009*. Pisa, Italy
- Member of the IPC of the *NSTools Workshop 2009*. Pisa, Italy

- Member of the IPC of the *Advanced Computer Simulation track*, ACM SAC. Honolulu, Hawaii, 2009
- Member of the IPC of the *Summer Computer Simulation Conference 2009*. Istanbul, Turkey
- Member of the IPC of 2009 *International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS'09)*. San Jose, CA. 2009. Istanbul, Turkey
- Member of the IPC of *Agent-Directed Simulation 2009*, San Diego, CA
- "Introduction to Parallel DEVS simulation". Keynote presentation at *HPCLatam 2009*, Latin-American conference on High-Performance Computing. Mar del Plata, Argentina. 2009
- "Discrete event modeling and simulation: present, past, future". Plenary Speaker at the *2009 MS&G Student Capstone Conference*. VMASC. Old Dominion University. Norfolk, VA. 2009
- "An Introduction to the DEVS formalism". Tutorial at the *SCS Spring Simulation Conference*. San Diego, CA. March 2009
- "The DEVStone Benchmark: uniform methodology for Simulation Benchmarking". Invited Talk. *DEVS Symposium, SCS Spring Simulation Conference*. San Diego, CA. March 2009
- Panel Session speaker: Fidelity of Modeling and Simulation experiments. *SIMUTools 2009*. Rome, Italy
- General Chair of the *SCS Spring Computer Simulation Conference*. San Diego, CA. 2009
- General Co-Chair of *SimuTools 2009*, Rome, Italy (2009)



**Michael Weiss**

*Associate Professor*

**Research**

Open source ecosystems, service-oriented architectures, mashups/ Web 2.0, business process modeling, product architecture and design, and use of patterns.

**Activities**

- Member of the Technology Innovation Management program
- Professor of Computer Science at Carleton University (2000 -2007)
- Member of the Strategic Technology group at Mitel and leader of Advanced Applications group
- Author of over 90 peer-reviewed publications in leading journals and conferences

deriving models from annotated software designs in UML; deriving models from traces and other measurements; model-solving algorithms; strategies and tools for performance improvement; usability of modeling; accuracy of solutions; architectural patterns for high-performance systems. Autonomic control based on models, and estimation of model parameters and structure by tracking filters.

**Application**

Many applications from web services and enterprise computing through communications switching systems and voice-over-IP to embedded systems. Autonomic systems, component-based software, product lines, modeling of mechanisms that enhance reliability and security.

**Activities**

- General Co-Chair, IEEE Vehicular Technology Conference (VTC) 2010-Fall
- Technical Program Chair, IEEE Wireless Communications and Networking Conference (WCNC) 2008
- Steering Committee Member, IEEE Wireless Communications and Networking Conference (WCNC)
- Carleton University Research Achievement Award 2009
- Former Chair, IEEE Technical Committee on Personal Communications
- Funded projects with Samsung Advanced Institute of Technology (SAIT, Korea), Huawei (China), and Communications Research Centre of Canada (CRC)
- 17 tutorials in world's leading international conferences
- Adjunct professor at King Saud University Advanced Technology Research Center (Riyadh, Saudi Arabia)



**Halim Yanikomeroglu, P.Eng.**

*Associate Professor*

**Research**

Physical, medium access, and networking layers, and the cross-layer aspects of wireless communications systems and networks; radio access network (RAN) architectures; relay/multihop/mesh networks; cooperative communications; radio resource management; multiple access; B4G, 4G, LTE-A, 802.16m, 802.11s; sensor networks; cognitive radio, spectrum, opportunistic spectrum access; interference modeling.

**Application**

Wireless communications systems and networks; sensor networks; mobile communications.



**Murray Woodside, P.Eng.**

*Distinguished Research Professor*

**Research**

Improving the performance of complex distributed computer software by the use of performance models;

## A Brief History of the Faculty of Engineering and Design

- 1942:** Carleton College is founded.
- 1945:** First-year engineering classes are offered in the Faculty of Arts and Sciences.
- 1957:** The School of Engineering is established.
- 1963:** The Faculty of Engineering is established.
- 1968:** The School of Architecture is established.
- 1973:** School of Industrial Design is established.
- 1981:** The degree in Computer Systems Engineering is established.
- 1986:** An annex on the top floor of the Architecture Building is constructed to provide additional space for the Faculty of Engineering.
- 1988:** Canada's first Bachelor of Engineering program in Aerospace Engineering is established. Bell-Northern Research Ltd. and NSERC provide funding for an Industrial Research Chair in computer-aided engineering in the Department of Electronics. The Departments of Electronics and Systems and Computer Engineering are major partners in the Telecommunications Research Institute of Ontario (TRIO), one of seven Centres of Excellence chosen by the provincial government for scientific research.
- 1992:** The Minto Centre for Advanced Studies in Engineering is opened. The new Bachelor of Engineering program in environmental engineering is established in the Department of Civil and Environmental Engineering
- 1994:** The M.Eng. program in Telecommunications Technology Management is inaugurated.
- 1997:** New undergraduate program in Communications Engineering established. Co-operative education programs are offered in all engineering programs.
- 1998:** New undergraduate programs established in Engineering Physics and in Software Engineering.
- 1999:** A \$6.4-million expansion to the Minto Centre for Advanced Studies in Engineering is approved. Three new floors provide additional teaching and research space to accommodate significant growth in informational technology programs. New M.Eng. and Ph.D. programs in Environmental Engineering are established.
- 2001:** Industrial Research Chair in Fire Safety Engineering is established in the Department of Civil and Environmental Engineering.
- 2002:** Carleton University and Algonquin College establish the Carleton School of Information Technology, which offers an undergraduate Bachelors of Information Technology.
- 2003:** \$18 million Azrieli Pavilion approved to house the Carleton School of Information Technology, the National Capital Institute of Telecommunications, and the graduate program in Architecture.
- 2006:** The graduate Joint Institute for Biomedical Engineering is established, involving the Departments of Systems and Computer Engineering and Mechanical and Aerospace Engineering and several other departments at both Carleton and the University of Ottawa. The Joint Institute offers a new M.A.Sc. program in Biomedical Engineering. An undergraduate program in Biomedical and Electrical Engineering is also inaugurated.
- 2007:** A new \$22 million building to house the Centre for Advanced Visualization and Simulation and the Human-Computer Interface Institute opens. A new stream, Space Systems Design, is added to the undergraduate program in Aerospace Engineering.
- 2008:** The School of Architecture is renamed the Azrieli School of Architecture and Urbanism in honour of a \$5.5M endowment to the school by alumnus Dr. David J. Azrieli. New undergraduate programs in Biomedical and Mechanical Engineering and in Sustainable and Renewable Energy Engineering are launched, as is a new Masters degree program in Industrial Design.
- 2009:** Construction begins on the Canal Building, which will provide space for expansion of research and teaching activity in biomedical engineering and sustainable and renewable energy.

## Research in the Faculty of Engineering and Design at Carleton University

The Faculty of Engineering and Design at Carleton University combines the engineering disciplines of Civil and Environmental Engineering, Electronics, Mechanical and Aerospace Engineering, and Systems and Computer Engineering with the design-oriented schools of Architecture, Industrial Design, and Information Technology. This unique Faculty is research-oriented, attracting millions of dollars in research funding every year, and drawing talented researchers including several Canada Research Chairs, and industrial donations of exceptional advanced research laboratories. Our dynamic graduate programs include some of the largest in their disciplines in Canada. See inside for details, or visit us online at [www.carleton.ca/engineering-design/research](http://www.carleton.ca/engineering-design/research).

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