Computer Science at the U of C

2004/2005

UNIVERSITY OF CALGARY

FACULTY OF SCIENCE

CPSC 2004/2005

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Message from the Head

The Department of Computer Science has had an extremely productive year in 2004 and I am pleased to be able to bring you this report describing just a few of the activities undertaken by our faculty, staff, and students. The Department grew again this year, though more slowly than in the past, as three new faculty members were added to our ranks. We have seen a slight decrease in the total number of undergraduates entering the program through the first year but the number of students graduating from the various programs has remained consistent because of transfer students entering at the third year. Our graduate student population has remained at the same level, but the proportion of doctoral students has increased substantially. We have also seen increases in our PDF numbers. All of this combines to provide strong indicators that the research intensity in the Department has continued to increase this year, as it has over the past few years.

The Department has identified four focus areas and most of the faculty and research groups fit within them. These areas are: Quantum Computing & Cryptography, Evolutionary Software Engineering, Distributed Systems & Algorithms, and Visual & Interactive Computing. However, there are also a few individuals that work in areas unrelated to these foci and many work in more than one area or find ways to make these foci truly interdisciplinary.

Unfortunately, any report such as this must be summative in nature so as you read through the activities of the various faculty members, please keep in mind that this is only a subset of the full breadth of our activities. Given the summative nature of the report, I would encourage you to contact any of the faculty members about topics related to their areas of interest. I am confident that they will be very interested in establishing new collaborations and sharing their excitement over their research activities.

Ken Barker

Computer Science at the University of Calgary

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About CPSC

The Department of Computer Science, by the nature of its business, continues to grow and flourish. In 1999, the Government of Alberta awarded the University of Calgary the funds to double the size of Computer Science in conjunction with Electrical and Computer Engineering. Today, we have 44 full-time academic staff, with state-of-the-art research and teaching computing equipment covering two buildings.

Research Focus

The University of Calgary is committed in advancing its role as a research university. Our Department places a priority on research. We continue to expand and enhance our profile by augmenting existing strong research groups with new computer scientists and by developing groups in emerging research areas. Newcomers are welcomed into a vibrant research atmosphere, with high quality research publications. Within the four umbrella areas (Visual & Interactive Computing, Quantum Computing & Cryptography, Evolutionary Software Engineering and Distributed Systems & Algorithms) faculty members, their students, associate researchers and collaborators come together to delve into more specific research topics.

The research culture is very open with collaboration between researchers in this and other departments and faculties of the University, Canada, and international institutions. There are already several research projects involving members of industry including the large local oil industry. The continued growth of the City of Calgary attracts a wider variety of companies, creating opportunity for ties with the environment, biosciences and health and wellness industries. Students are encouraged to become part of the worldwide community of researchers as early as possible, through workshop, conference and journal publication, and through networking with those they have met at research meetings. Several journals are edited in the department, as well as many international scientific meetings are hosted by Faculty annually.

Noteworthy

Dr. Sheelagh Carpendale was appointed as a Tier II Canada Research Chair in Information Visualisation (held jointly in the Faculties of Science and Communication and Culture). The appointment is for five years effective July 1, 2004.

Dr. Saul Greenberg was named to the ACM CHI Academy, an honorary group of individuals who have made substantial contributions to the field of human-computer interaction. These are the principal leaders of the field, whose efforts have shaped the disciplines and led the research in human-computer interaction.

Dr. Przemek Prusinkiewicz was appointed as a University Professor for a five-year period July 1, 2004 - June 30, 2009.

Dr. Brian Unger received the CANARIE IWAY (Information Highway) Award for his outstanding contribution to Canada's Information Society.

Dr. Robert Walker received a 2005 IBM Faculty Award. This is in recognition of his achievements and the excellence and quality of his research.

Dr. Michael Williams was awarded an Honorary Degree of Doctor of Science, in recognition of the significant contribution he has made to computing science, particularly in the history of computing.

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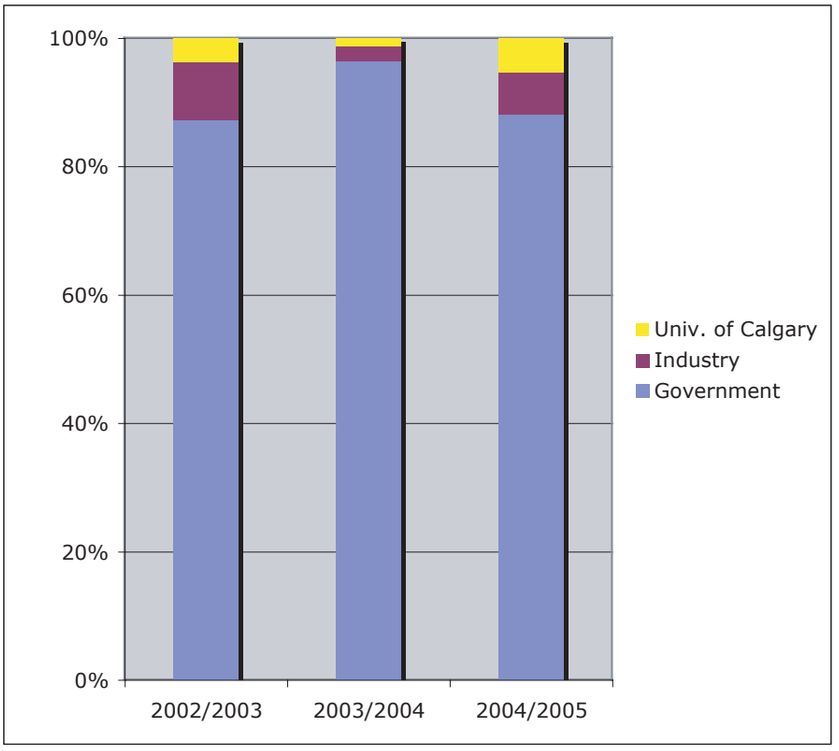
Research Support

To achieve and maintain high quality research it is crucial to secure funds in support of students, research personnel, post doctoral fellows and collaboration. In 2004/2005 faculty were successful in securing awards from Goverment, Industry and the University of Calgary. The total of these funds is as follows:

Government	**$ 4,458,381**
Industry	**$ 337,596**
University of Calgary	**$ 274,389**



Graduate Students Scholarships

Name	Award
Fabricio Anastacio, MSc	iCORE International
Russel Apu, PhD	iCORE International
Yuliang Bao, MSc	NSERC PGS & iCORE
Pankaj Bhawnani, MSc	iCORE International
John Brosz, MSc	Province of Alberta Graduate Scholarship
Ian Burleigh, PhD	Dean's Entry Scholarship
Xiaozhen (Jean) Cao, PhD	TR Labs & NSERC Industrial Scholarship
Sonny Chan, MSc	Julie Payette NSERC & iCORE
Erwin de Groot, PhD	iCORE International
Gengshen Du, PhD	Dean's Entry Scholarship
Angela Duta, PhD	iCORE International
Kathryn Elliot, MSc	NSERC PGS & iCORE & TR Labs & Alberta Ingenuity
Alan Fedoruk, PhD	NSERC PGS & iCORE
Martin Fuhrer, MSc	Province of Alberta Graduate Scholarship
Jie Gao, PhD	Dean's Entry Scholarship
Abhinav Gupta, MSc	Alberta Ingenuity & iCORE
Gustav Gutoski, MSc	Province of Alberta Graduate Scholarship
Mark Hancock, PhD	NSERC PGS & iCORE
Andreas Hirt, PhD	CGS NSERC & iCORE
Gwen Houtzager, MSc	NSERC PGS & iCORE
Cameron Kiddle, PhD	NSERC PGS iCORE
Chiu Wa Anthony Lo, MSc	Province of Alberta Graduate Scholarship
Kristopher Luttmer, MSc	Province of Alberta Graduate Scholarship
Alok Madhukar, MSc	TR Labs
Aniket Mahanti, MSc	NSERC PGS & iCORE

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Graduate Students Scholarships continued

Name	Award
Jeffrey Mahovsky, PhD	University of Calgary Silver Anniversary Graduate Fellowship Award
Christopher Mann, MSc	NSERC Industrial Scholarship
Grigori Melnik, PhD	NSERC PGS & iCORE & University of Calgary Silver Anniversary Graduate Fellowship Award
Petra Neumann, PhD	Alberta Ingenuity & iCORE
Carman Neustaedter, PhD	NSERC PGS & iCORE & TR Labs
Luke Olsen, MSc	CSG NSERC & iCORE
Marcin Pilat, PhD	CSG NSERC & iCORE
Kelly Poon, MSc	NSERC PGS & iCORE
Shantha Ramachandran, MSc	NSERC PGS & iCORE
M. Omolade Saliu, PhD	iCORE International
Reginald Sawilla, PhD	CGS NSERC & iCORE & Alberta Ingenuity
Stacey Scott, PhD	Alberta Ingenuity & iCORE
Stephanie Smale, MSc	NSERC PGS & iCORE
Richard Smith, PhD	NSERC PGS & iCORE
Shui-Chun Charlotte Tang, PhD	Alberta Ingenuity & iCORE
Julia Taylor-Hell, MSc	NSERC PGS & iCORE
Kimberly Tee, MSc	NSERC PGS & iCORE
Edward Tse, PhD	Alberta Ingenuity & iCORE
Ajumobi Udechukwu, PhD	CGS NSERC & iCORE
Torre Zuk, PhD	NSERC Industrial Scholarship

Research Personnel

Post Doctoral Fellows

Anton, Francois	*Computer Graphics (Wyvill)*
Dabbaghian-Abdoly, Vahid	*Computational Algebra (Eberly)*
Isenberg, Tobias	*Applying non-photorealistic rendering to information visualization (Carpendale)*
Kiddle, Cameron	*High performance network simulation (Unger& Simmonds)*
Mhalla, Medhi	*Theoretical Computer Science (Watrous & Hoyer)*
Roehrig, Hein	*Theoretical Computer Science (Watrous & Hoyer)*
Rolland-Lagan, Anne-*Gaelle*	*Biological Modeling and Visualization (Prusinkiewicz)*
Streit, Lisa	*Biological Modeling and Visualization (Prusinkiewicz & Costa Sousa)*
Uzoka, Michael	*Large Scale Systems Management(Barker)*
Wu, Yujing	*Wireless networks (Williamson)*

Researcher	Area of research/Lab
Arlitt, Martin	*Wireless Networks/Williamson/Unger/Simmonds*
Bauld, Eric	*Decision support/Ruhe*
Bowes, Jeff	*Databases/Barker*
Cossette, Brad	*Decision support/Ruhe*
Curry, Roger	*High Performce Grid/Unger/Simmonds*
Federl, Pavol	*Biological Modeling/Prusinkiewicz*
Fox, Mark	*High Performce Grid/Unger/Simmonds*
Garth, Victor	*BioInformatics/Barker*
Goodlad, David	*Decision support/Ruhe*
Halepovic, Emir	*Wireless Networks/Williamson*
Houtzager, Gwen	*Wireless Networks/Williamson*
Jaeger, Shannon	*Software Engineering/Walker*
Karwowski, Radek	*Biological Modeling/Prusinkiewicz*
Lane, Brendan	*Biological Modeling/Prusinkiewicz*
Markatchev, Nayden	*Wireless Networks/Williamson*
Mirtchovski, Andrey	*High Performce Grid/Unger/Simmonds*
Ngo The, An	*Decision support/Ruhe*
Schmidt, Ryan	*Information visualization/Carpendale*
Simmonds, Robert	*High Performce Grid/Unger*
Spiers, Greg	*Decision support/Ruhe*
Stephenson, Graham	*Computer Graphics/Wyvill*
Sun, Hongxia	*Wireless Networks/Williamson*
Vize, Peter	*BioInformatics/Barker*
Wu, Qian	*Wireless Networks/Williamson*
Zhou, Bin	*Decision support/Ruhe*

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Research Personnel continued

Graduate students

Adewale, Idowu O
Albourae, Thamer
Apu, Russel
Bajwa, Harpreet
Bhawnani, Pankaj
Boyden, Sean
Boyle, Mike
Brosz, John
Brunn, Meru
Cao, Xiaozhen (Jean)
Carroll, Seamus
Chau, Thomas
Cherlin, Joseph
Cieslak, Mikolaj
Curry, Roger
DeGroot, Erwin
Diaz-Marino, Rob
Du, Gengshen (Kelly)
Fanea, Elena
Foster, Kevin
Fuhner, Martin
Galbraith, Callum
Gaurav, Abishek
Gavinsky, Dmitry
Gerhardt, Heath
Gong, Mingwei
Gopalan, Janaki
Gupta, Abhinav
Gutoski, Gus
Hancock, Mark
Hanlen, Lance
Harrington, Dana
Heard, Jason
Hirt, Andreas
Hoar, Ricardo
Jackson, Lillanne
Jain, Gaurav
Kamaluddeen, Nuha
Kendrick, Nathan
Kiddle, Cameron
Kidney, Jordan
Lemos, Robson
Li, Jingzhou
Li, Zhizhong
Liu, Lawrence
Liu, Yu
Luttmer, Kristopher
Madhukar, Alok
Mahanti, Aniket
Mahmud, Shafquat
Markatchev, Nayden
Mason, Katherine
McElroy, James
McEwan, Gregor
McIntyre, Mark
Melnik, Grigori
Minhaz, Mohammad
Mirtchovski, Andrey
Munteanu, Dan
Osborn, Wendy
Pakdel, Reza
Parvez, K Nadim
Pattison, Eric
Prakash, Jerrall
Rahman, Rashed
Rashid, Jibran
Read, Kristopher
Rizk, Philip
Rogers, Keith
Saliu, Omolade Moshood
Schmidt, Ryan
Shen, Wei
Shirmohammadi, Mitra
Siadat, Jamal
Smith, Colin
Suen, Garret
Taleb, Hala
Tat, Annie
Taylor-Hell, Julia
Trinh, Quang
Wang, Chengfeng
Wang, Yuhang
Wecker, Larkin
Williams, Adepele
Wong, Nelson
Wormsbecker, Ian
Xiao, Fang (Shelly)
Xiong, Wenliang
Zannier, Carmen
Zeng, Min
Zhang, Hongchao
Zhang, Yonghua (Michael)
Zheng, Wei Wei

Undergraduate students	Supervisor
Ainsworth, Gillian	*Parker*
Becerra, Gabriel	*Kremer*
Burrell, Michael	*Cockett*
Charkhandeh, Shahin	*Ruhe*
Chung, Keith	*Jacobson*
Davison, Timothy	*Denzinger*
Degraaf, Reinderd	*Jacobson*
Diaz-Marino, Robert	*Greenberg*
Drews, Jason	*Parker*
Gavinski, Alyssa	*Jacob*
Hoang, A	*Gavrilova*
Joevenazzo, Jill	*Boyd*
Loose, Kevin	*Denzinger*
Nguyen, Diana	*Scheidler*
Nuytten, Paul	*Jacob*
Olsen, Luke	*Boyd*
Owoc, Jan	*Parker*
Penner, Eric	*Carpendale*
Poliakov, Ilia	*Jacob*
Runions, Adam	*Prusinkiewicz*
Sayles, Max	*Boyd*
Schur, Alvin	*Denzinger*
Sessini, Phillipa	*Mahanti*
Taerum, Torin	*Costa-Sousa/Samavati*
Tsang, Kenny	*Ruhe*
Zhang, Hongchao	*Watrous*
Zhang, John	*Rokne*

Visitors

In 2004/2005 we welcomed several longer term visitors to our Department. Some are visiting professors on sabbatical from their home university while others are students who have come to Calgary to work with the faculty in Computer Science.

Bartning, Bodo	*University of Applied Science, Emden, Germany*
Hinrichs, Uta	*University of Magdeburg, Germany*
Jorge, Joachin	*Lisbon Institute of Technology, Portugal*
Smith, Anthony	*University of Waikato, New Zealand*
von Mammen, Sebastien	*University of Erlangen, Germany*

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Seminars

Computer Science throughout the year has encouraged and supported information sharing by hosting seminars presented by individuals within the Department and by Invited Speakers.

Distinguish Lectures

Shari Lawrence Pfleeger	Seeing Is Not Believing: Why You Should Ask Probing Questions About Software

Invited Speakers

David Zhang	Palmprint Authentication
Jalal Kawash	Mutual Exclusion for a Class of Distributed-Shared Memories
Deok-Soo Kim	Euclidean Voronoi diagram for spheres in 2 and 3D applications
Andrew Bangham	The Art of Scale-Space and Non-Photorealistic Rendering
John O'Leary	Formal Verification in Intel CPU Design
Ganesh Gopalakrishnan	An Efficient Execution Verification Tool for Memory Orderings
Robert Biddle	Notes on Postmodern Programming
Hideaki Suzuki	Artificial Chemistry Systems and Computation
David Nicol	Models of Counter-Worm Defenses
Zoran Kacic-Alesic	iCORE talk at U of C
Charles Pfleeger	You Get What You Pay For -or- Why We Have So Many Security Problems with Our Software
Tony Smith	Pseudotext Data Expansion And The Discovery Of Proteomic Knowledge In Protein Data
Thomas W. Williams	Design for Testability: The Path to Deep Submicron
Cris Kuhlemeier	Experiments on phyllotaxis
Paul Dourish	From Privacy and Security to Collective Information Practices
Bryan Cantrill	The Solaris Renaissance: Opportunities in Education

Graduate Seminars

Michael Boyle	Privacy in Video Media Spaces
Carman Neustaedter	Foundations of Interpersonal Awareness
Ian Burleigh	An agent-based Model of the Lactose operon
Young Lee	Face Detection and Recognition Using Linear Classifiers
Adesola Omotayo	Multi-Layer Analysis of Web Browsing Performance for Wireless PDAs
Kris Luttmer	Quantum Computing and Entanglement
John Brosz	Silhouette Rendering Based on Stability Measurement
Jordan Kidney	A small introduction to the application of Artificial Intelligence to computer security
Harry Wang	A Multi-Resolution Approach to Singular Point Detection in Fingerprint Images
Gus Gustoski	Quantum Refereed Games

Workshops and Conferences

Barker, Ken	Very Large Databases - VLDB 2004 (Registration)
Cockett, Robin	Foundational Methods in Computer Science (FMCS 2004)
Jacob, Christian	6th International Mathematica Symposium (IMS 2004)
Maurer, Frank	Canadian Agile Methods Workshop 2004 (CAN 2004)
Maurer, Frank	Canadian Agile Methods Workshop 2005 (CAN 2005)
Ruhe, Guenther	Software Engineering Knowledge Engineering 2004 (SEKE 2004)

Faculty

JOHN AYCOCK, *Assistant Professor*

Research Interests:

John has been researching computer viruses, worms and other malicious software for several years, and is now starting to look at spam and spyware too. These are huge problems in our computer-dependent society, and it is vital that future threats are identified and countered.

One reason for lapses in computer security is program error. John also looks at software tools and programming languages which make the programming task easier and less error-prone.

Selected publications 2004/2005:

- J. Aycock. Extending Old Compiler Tools with Meta-Tools. 2004 International Conf. on Software Engineering Research and Practice, pp. 841-845.
- J. Aycock, K. Barker. Creating a Secure Computer Virus Laboratory. 13th Annual EICAR Conf., 2004, 13pp.
- J. Aycock. A Brief History of Just-In-Time. ACM Computing Surveys 35, 2 (June 2004), pp. 97-113.

Projects:

- AGATE, an experimental system representing computer programs with dynamic context-free grammas.
- SPARK, a toolkit for implementing domain-specific languages in Python.

Graduate Students:

Reinderd DeGraaf, MSc - Applied network security (co-supervisor M. Jacobson).
Yu Li, MSc - Efficient implementation of dynamic grammar systems.
Margaret Nielsen, MSc- The beauty and aesthetics of computer programs.
Kelly Wilson, MSc - A specification langauge approach to automatic network server code generation.

http://pages.cpsc.ucalgary.ca/~aycock/

Denilson Barbosa, *Assistant Professor*

Research Interests:

Denilson has been working on Web information systems for the past several years, with emphasis on semistructured data and XML content. XML is the preferred format for encoding and exchanging data on the Web, playing a key role in enabling Web Services, and is also becoming the standard among typical office applications. Denilson is also working on performance and tuning of data management systems.

Selected publications 2004/2005:

- M. Consens, D. Barbosa, A. Teisanu, L. Mignet. Goals and Benchmarks for Autonomic Configuration Recommenders. 2005 ACM SIGMOD International Conference on Data Management (to appear).
- D. Barbosa, A.O. Mendelzon, L. Libkin, L. Mignet, M. Arenas. Efficient Incremental Validation of XML Documents. 20th International Conference on Data Engineering (ICDE 2004). pp 671-682.

http://pages.cpsc.ucalgary.ca/~denilson/

Faculty

KEN BARKER, *Professor and Head*

Research Interests:

Ken's research interests are quite wide-ranging under the general umbrella of database systems. Much of recent work has focused on various applications of data mining but contributions have also been made to areas of health informatics, mobile data management, XML repositories, data design, data integration, data security, and bioinformatics.

Selected publications 2004/2005:

- Camorlinga S. and K. Barker. Emergent Search in Large Distributed Systems, Proceedings of the 8th International Conference on Parallel Problem Solving from Nature Workshop on Games and Emergent Behaviours in Distributed Computing Environments, Birmingham, UK, September 2004.
- Bao, Y., R. Alhajj and K. Barker. Hybrid Cache Invalidation Schemes in Mobile Environments, Proceedings of IEEE/ACS International Conference on Pervasive Services, Beirut, Lebanon, July 2004.
- Chu, N.C.N., A. Williams, R. Alhajj and K. Barker. Data Stream Mining Architecture for Network Intrusion Detection, Proceedings of IEEE International Conference on Information Reuse and Integration, Las Vegas, USA, November 2004.
- Aycock J. and K. Barker. Virus Writing 101, ACM SIGCSE, February 2005.

Project:

- XML Data Design, Mobile Cache Management, Emergent Computing, and Data Mining.

Graduate Students:

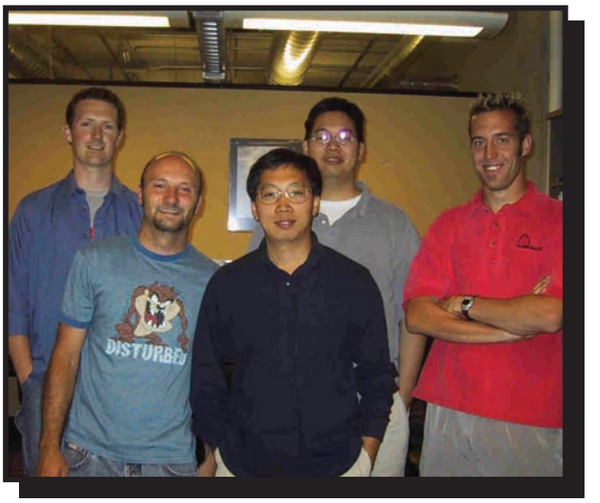
Malik Agyemang, PhD - Outliner Mining.
Ajumobi Aoudechu, PhD - Data Mining.
Yuliang Bao, MSc - Data Mining.
Yingqi Chen, MSc - Fragmentation Design in XML.
Steven Choy, MSc - XML models.
Nelson Chu, PhD - Tuple Space in Grids.
Anguo Dong, MSc - Data Mining.
Jun Du, PhD -Database Design.
Angela Duta, PhD - XMLSecurity.
Janaki Gopalan, MSc - Bioinformatic Data Mining.
Adesola Omotayo, MSc - Transaction Management.
Wendy Osborn, PhD - Spatial Indexing.
Rashed Rahman, PhD - Replicas on Grids.

http://pages.cpsc.ucalgary.ca/~barker/

JEFFREY BOYD, *Associate Professor*

Research Interests:

Jeffrey's research is in the area of computer vision, focusing on the analysis of motion. Much of his work has been in the area of biometric recognition of people by their gait. He co-authored an early paper that described a method that could identify individual people by looking at temporal patterns in the descriptions of walking figures. As worldwide interest in biometrics grows, Jeffrey is refining techniques in an effort to build machine systems that emulate the way humans interpret the motion they see. Jeffrey also does work on multi-media information systems that extract descriptions of dynamic scenes from video cameras, and build models of the scene for archival, transmission, and display for remote viewers. These systems combine low-level video processing algorithms with XML documents exchanged over a network to build elaborate systems for multimedia surveillance. Applications of the work include multimedia network broadcoast of sporting events, surveillance for traffic and security, and interactive art.



Selected publications 2004/2005:

- J. Boyd. "Synchronization of oscillations for machine perception of gaits", Computer Vision and Image Understanding, Vol. 96, 2004, pp. 35-59.
- J. E. Boyd, H. Hushlak, C. Jacob, P. Nuytten, M. Sayles. "SwarmArt: Interactive Art from Swarm Intelligence.", in proceedings of ACM Multimedia 2004, October 12-14, 2004, New York, NY.

Projects:

- Human motion analysis: the development of a machine vision systems that evaluate human athletic performance by emulating the way humans interpret the motion of athletes.
- Tracking Systems for Multimedia Sports Broadcast: Systems that extract object trajectories of humans and other moving objects from video sequences. The extracted information is used to build dynamic scene models that we can archive, transmit over a network and display. One significant application we are developing is tracking hockey players in order to analyze their motion for coaching purposes, or for broadcast to viewers.

Graduate Students:

Seamus Carroll, MSc- Cooperative aerial surveillance (co-supervisor J. Denzinger).
Jill Joevenazzo, MSc - Gait perception using passive dynamic walkers.
Nathan Kendrick, MSc - Machine visdion analysis of athletic performace in runners.
Quoc Nguyen, MSc - Computer Vision.
Michael Zhang, MSc - Pixel tracking in video with applications to sports.

http://pages.cpsc.ucalgary.ca/~boyd/

Faculty

Sheelagh Carpendale, *Associate Professor & Canada Research Chair in Information Visualization*

Research Interests:

As a researcher in information visualization methodologies, Sheelagh explores different ways of making the invisible visible, and develops new interaction methods to support people actively exploring and manipulating informaition spaces. The goal is to promote comprehension by creating effective visual tools. Creating visualizations poses problems both in terms of developing appropriate information representations and presenting those representations in a manner that is meaningful to the user. While her research has concentrated on the second point, presentation issues, Sheelagh includes sufficient representational research in order to ground her work in real data, real tasks and real users.

Selected publications 2004/2005:

- Scott, S.D., Carpendale, M. S. T, & Inkpen, K. M. (2004) "Territoriality in Collaborative Tabletop Workspaces" In Proc. of the ACM Conf. on Computer-Supported Cooperative Work CSCW'04, CHI Letters Vol. 6(3), ACM Press. pp. 294-303, Chicago, Il., USA, November, 2004.
- Carpendale, M. S. T., Light, J. and Pattison, E. "Achieving Higher Magnification in Context." In Proc. of the 17th ACM Symposium on User Interface Software and Technology UIST04, CHI Letters Vol.6(2), ACM Press, pp. 71-80, Santa Fe, New Mexico, October, 2004.
- Sonnet, H., Carpendale, M. S. T., Strothotte, T. "Integrating Annotations with a 3D Explosion Probe." In ACM Advnaced Visual Interfaces, ACM Press. pp. 61-70. Hallipoli, Italy, May, 2004.

Projects:

- Elastic presentation.
- Collocated collaboration.
- Interactions on large displays.
- Visualizing human dialogues.
- Visualizing uncertainty in data.

Graduate Students:

Elena Fanea, MSc - Visualizing multi-dimensional data.
Mark Hancock, PhD - Collaborative tabletop interfaces.
Jeroen Keijser, MSc - Presence in virtual Reality (co-supervisor K. Barker).
Kaye Mason, PhD - Modelling with rendering primitives.
Petra Neumann, PhD - Information visualization.
Eric Pattison, MSc - Semantic zooming.
Charlotte Tang, PhD - Asynchronous, Collocated Collaboration (co-supervisor S. Greenberg).
Stacey Scott, PhD - Territoriality on tabletop displays (co-supervisor K. Inkpen).
Annie Tat, MSc - Visualizing Human Dialog.
Nelson Wong, MSc - EdgeLens: Interacting with large graphs.
Torre Zuk, PhD - Visualizing uncertainty in data.

http://innovis.cpsc.ucalgary.ca

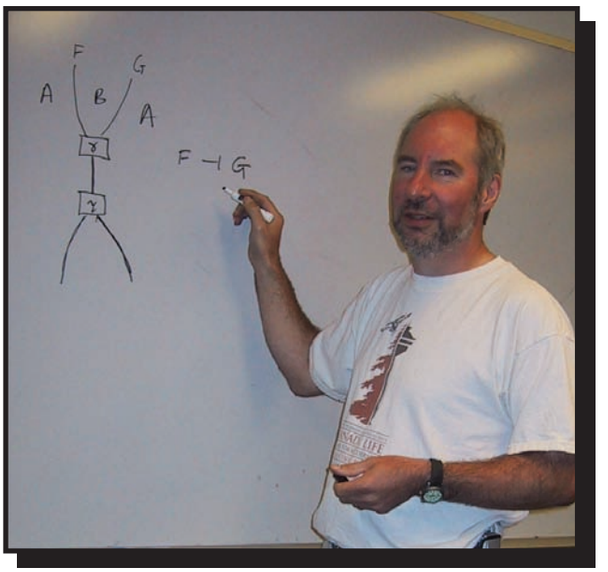
Robin Cockett, *Professor*

Research Interests:

Dr. Cockett and his students use categorical proof theory to understand program semantics and to design programming languages with special formal properties. For example; How can one design a concurrent programming language which cannot deadlock or livelock? Using the proof theory of linear logic it is actually possible to provide such a system, however, this is far from the end of the story. There remains practical issues: How complex is the required semantic checking (type checking, linearity constrains etc.); What is the operational semantics of such a language (e.g. abstract machines, interface with operating system etc.); How expressive is such a language (useability and theoretical expressive power), etc.

Selected publications 2004/2005:

- Cockett, J. R. B. and Pastro, C. "A language for multiplicative-additive linear logic." Proc. of the CTCS 2004, to appear in Electronic Lecture notes in Computer Science.
- Cockett, J. R. B., Koslowski J. and Seely, R. A. G. "Moprphisms and modules for poly-bicategories." Theory and Applications of Categories 11 (2203 15-74).



Projects:

- Channel based concurrency (with C. Pastro and L. Santocanale).
- Classical restriction categories (with Ernie Manes and X. Guo).
- Computability and realizability theory for restriction categories (with P. Hofstra and X. Guo).
- Smooth and differential categories (with R. Blute and R. Seely).
- Program transformation tools for datatypes (with V. Vene).
- Flow graph optimization for compilers (with M. Burrell).
- Type checking for termination and uniqueness in the CHARITY programming language (with D. Harrington).

Graduate Students:

Brett Giles, MSc - A compiler and run time environment for a Quantum Programming Language.
Xiuzhan Guo, PhD - Foundations of computability and restriction categories.
Dana Harrington, PhD - Theoretical foundations for a type system which permits memory reuse optimizations in declarative languages.
Keith Rogers, MSc - A circular proof system, and its underlying catergory theory.

http://pages.cpsc.ucalgary.ca/~robin

Faculty

Mario Costa Sousa, *Assistant Professor*

Research Interests:

Mario's research interests are scientific and medical visualization, computer graphics and animation techniques. He performs research in non-photorealistic rendering (NPR), illustrative visualization, 3D modeling and volumetric display software.

Selected publications 2004/2005:

- Mario Costa Sousa, Faramarz Samavati, Meru Brunn. Depicting Shape Features with Directional Strokes and Spotlighting Computer Graphics International '04.
- Kevin Foster, Mario Costa Sousa, Faramarz Samavati, Brian Wyvill. Reverse Subdivision Multiresolution for Polygonal Silhouette Error Correction 4th International Workshop on Computational Geometry and Applications 2004.

Projects:

- Research and development of NPR methods for 3D model construction/analysis, natural media simulation, rendering techniques and systems for computer-generated illustrative visualization and composition in two main contexts: (1) Traditional illustration, by providing tools to help scientific and medical illustrators with the complexities of their work, preserving their style and adapting to their preferred ways of thinking and working; (2) Scientific analysis and visualization, by mainly providing novel ways on visualizing scientific data, physical phenomena, simulations, etc., and by presenting abstractions to users in ways that reconcile expressiveness and ease-of-use.

Graduate Students:

Fabricio Anastacio, MSc - Sketch-based Modeling and Rendering of Plants (co-supervisor P. Prusinkiewicz).
John Brosz, MSc - Multiresolution Terrain Modeling and Rendering (co-supervisor F. Samavati).
Meru Brunn, MSc - Modeling and Rendering Artistic Lines by Example (co-supervisor F. Samavati).
Joseph Cherlin, MSc - Artistic Modeling and Rendering of 3D Form.
Kevin Foster, MSc - Precise Ink Illustrations of 3D Polygonal Models (co-supervisor B. Wyvill).
Pauline Jepp, PhD - Interactive Sculpting Using Implicit Methods(co-supervisor B. Wyvill).
Torin Taerum, MSc - Computer-generated Medical Illustrations(co-supervisor F. Samavati).

http://pages.cpsc.ucalgary.ca/~mario/

JÖRG DENZINGER, *Associate Professor*

Research Interests:

Jörg's research is in the areas of Artificial Intelligence and Multi-Agent Systems. One of his main interests is learning cooperative behaviour of agents. This encompasses developing appropriate agent architectures, basic learning and evaluation methods for behaviour (from the perspective of an individual, perhaps selfish, and of a team), specialized adaptation methods and methods to model other agents. The application areas he is interested in range from computer games to finding security problems in systems. His second major research topic is distributed, knowledge-based search. This deals with developing cooperation concepts so that several computers can work together on problems such as scheduling, theorem proving, optimizing processes or searching the Internet. The conceptual problems to be solved include how to define tasks for the individual programs, what types of information to communicate between them, what information to select to be communicated, how to deal with conflicting information, or what use to make out of the received information.

Selected publications 2004/2005:

- Denzinger, J., Hamdan, J. "Improving Modeling of other Agents using Tentative Stereotypes and Compactification of Observations." Proc. IAT 2004, Beijing, 2004, pp. 106-112.
- Denzinger, J., Williams, T. "Using evolutionary learning of behavior to find weaknesses in operating systems." Proc. PRICAI 2004, Auckland, 2004, pp. 381-390.
- Chan, B., Denzinger, J., Gates, D., Loose, K., Buchanan, J. "Evolutionary behavior testing of commercial computer games." Proc. CEC 2004, Portland, 2004, pp. 125-132.
- Denzinger, J., Schur, A. "On Customizing Evolutionary Learning of Agent Behavior." Proc. AI 2004, London, On, 2004, pp. 146-160.

Projects:

- Smart Geophysical Information System.
- Intelligent Agents in Commercial Computer Games.
- Evolving Attach Teams to Test and Improve Computer Security.

Graduate Students:

Seamus Carroll, MSc - Cooperative aerial surveillance (co-supervisor J. Boyd).
Alan Fedoruk, PhD - Cooperative search with global and agent-specific goals.
Jie Gao, PhD - Cooperative distributed data mining of health records.
Jordan Kidney, MSc - Applying Multi-Agent systems to the testing of databases.
Majid Mousavi, PhD - AI techniques for transforming behavior diagrams into statecharts (co-supervisor A. Eberlein).
Keith Randall, MSc - Learning techniques to solve difficult (NP-hard) optimization problems.

www.cpsc.ucalgary.ca/~denzinge/denzinger.html

Faculty

WAYNE EBERLY, *Professor and Associate Head, Undergraduate Affairs*

Research Interests:

Wayne's research concerns the design and analysis of algorithms for problems in computer algebra. Randomized algorithms, and algorithms for computations over finite fields have been the focus of much of Wayne's recent work. This research generally attempts to analyze and improve algorithms for fundamental computational problems, such as the solution of systems of linear equations. Since fundamental problems are studied, potential applications of this work are diverse.

Wayne's work is also informed by experimental work and the evidence about the performance of various heuristics in realistic applications that such work can provide. In particular, Wayne's recent work attempts to explain the behaviour of heuristics that have recently been used to solve large sparse systems of equations that are formed when the "Number Field Sieve" algorithm is used for integer factorization. His analytical work can (and has) provide explanations for poorly understood phenomena reported in the experimental literature, as well as modifications of algorithms in order to deal with infrequent failure conditions that experimental work might miss.

Selected publications 2004/2005:

- W. Eberly. Reliable Krylov-Based Algorithms for Matrix Null Space and Rank. Proceedings, 2004 International Symposium on Symbolic and Algebraic Computation, Sander Spain, 2004; pp. 127-134.
- W. Eberly and M. Giesbrecht. Efficient Decomposition of Separable Algebra. Journal of Computation 37 (2004), pp. 35-81.

Projects:

- Analysis of Block Lanczos and Block Wiedemann Algorithms: An analysis and improvements of heuristics that are currently used to solve large, sparse systems of equations in number-theoretic applications (including modern integer factorization algorithms), resulting in randomized algorithmsthat are both efficient and provably reliable in all cases.
- Decomposition of Matrix Algebras: Efficient and reliable algorithms for use by mathematicians in their experimental work to investigate properties of groups, rings, and similar structures. Several of the algorithms proposed to date have been implemented in the computer algebra systems Magma and GAP and are now in use.

Graduate Student:

Wei Wei Zheng, PhD - Design and analysis of algorithms for large sparse matrix computations.

http://www.cpsc.ucalgary.ca/~eberly

Reda Elhajj, *Professor*

Research Interests:

Reda's primary research is focused on object-oriented databases, data integration and re-engineering, data mining, multiagent systems, character recognition, bio-data mining and analysis.

Selected publications 2004/2005:

- O. Abul, R. Alhajj, F. Polat and K. Barker. "Finding differentially expressed genes for pattern generation," Bioinformatics, Vol.21, No. 2, pp.445-450, 2005.
- M. Kaya and R. Elhajj. "Fuzzy OLAP Association Rules Mining Based Modular Reinforcement Learning Approach for Multiagent Systems," IEEE Transactions on Systems, Man, and Cybernetics-B, Vol.35, No.2, 2005.
- M. Kaya and R. Elhajj. "Modular Fuzzy-Reinforcement Learning Approach with Internal Model Capabilities for Multiagent Systems," IEEE Transactions on Systems, Man, and Cybernetics-B, Vol.34, No.2, pp.1210-1223, April 2004.

Project:

- Data mining, Biocomputing and Bioinformatics, XML and Data Re-engineering.

Graduate Students:

Muhaimenul Adnan, MSc - Incremental data mining.
Fatima Ashraf, MSc - Data Mining.
Sajib Barua, PhD - Data Mining.
Dany Gebara, MSc - Development of a new approach that utilizes wavelets for image mining.
Keivan Kian Mehr, MSc - Data Mining.
C. Anthony Lo, MSc - XML database and view maintenance.
Tanzel Ozyer, PhD - Web Mining.
Ajumobiu Udechukwu, PhD - Data Mining

http://www.cpsc.ucalgary.ca/~alhajj

Faculty

Marina Gavrilova, *Assistant Professor*

Research Interests:

Marina's research is on applications of geometric algorithms to applied problems in computer modeling and simulation of natural phenomena. Related issues such as data representation, numerical stability, visualization and efficient analysis of models are of interest. Specific areas where the developed methodologies are applied include mechanical and biological systems, granular-materials models, terrain visualization, GIS (geographical information systems) and biometric technologies.

Selected publications 2004/2005:

- Gavrilova, M. "Empirical Studies of Optimization Techniques in the Event-Driven Simulation of Mechanically Alloyed Materials." Jrnl. of Supercomputing, Special Issue on Iterative Solving Environments and Optimization Techniques in Computer Simulatin, Vol. 28 (2), May, 2004, Kluwer Academic Publisher, pp. 165-176.
- Hesse, M. and Gavrilova, M. "An Efficient Algorithm for Real-Time 3D Terrain Walkthrough." Intl. Jrnl. of CAD/CAM, Vol. 3 (2), pp. 111-117, 2004.
- A. Lagano, M. Gavrilova, O. Gervasi, V. Kumar, Y. Mun and K. Tan. Lecture Notes in Computer Science Book of Proceedings, Springer-Verlag, comprising refereed submissions to Intl. Conference on Computational Science and Its Applications 2004, LNCS 3043, 3044, 3045, 3048, ISBN 3-540-22060-7, Softcover, 2004.

Projects:

- Spatial Autocorrelation Research.
- Computational Sciences (GEOIDE).
- Biometric Technologies (CFI).

Graduate Students:

Russel Apu, MSc - Adaptive Mesh generation for Terrain Modeling and Other Applications.
Yuan Luo, MSc - Voronoi diagram methodology for face and palmprint recognition.
Chengfeng Wang, MSc - Topology-based Approach to Fingerprint Recognition and Synthesis.
Lakin Wecker, MSc - Multi-resolution approach to iris synthesis (co-supervisor F. Samavati).

www.cpsc.ucalgary.ca/~marina

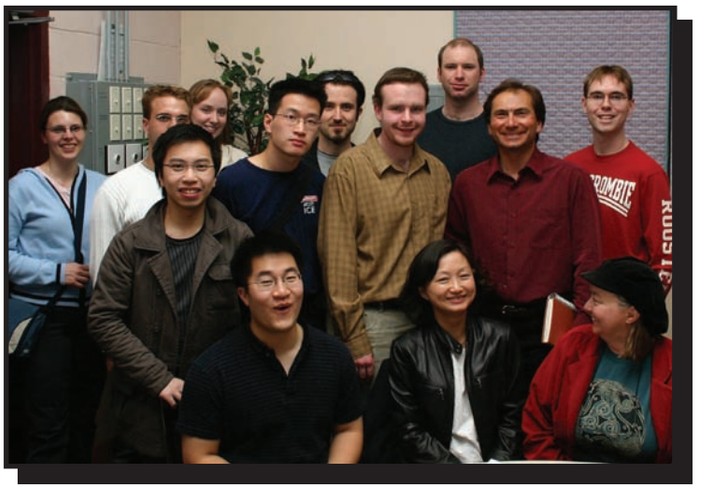
Saul Greenberg, *Professor & Associate Head, Graduate Affairs*

Research Interests:

Saul is an active researcher in Human Computer Interaction, a sub-area of Computer Science concerned with methods and principles on how to design computer interfaces so that people can interact effectively with them. He specializes in computer supported cooperative work, where he investigates how people work together, how the computer and related technologies (groupware) affect group behaviour, and how software can be designed to support and augment group work. He also investigates context-aware computing, where computers can be crafted to fit within their environment in a way that encourages natural interaction.

Selected publications 2004/2005:

- Greenberg, S. (2004) "Physical User Interfaces: What they are and how to build them." ACM UIST'04 Symposium on User Interace Software and Technology (Santa Fe, NM), October 24-27, P161. Abstract of Invited Survey.
- Greenberg, S. (2004) "Enhancing Creativity with (Groupware) Toolkits - Abstract of Keynote Presentation. Proc. 5th Australasian User Interface Conference, Vol. 28 in the CRPIT Conferences in Resarch and Practice in Information Technology Series, (Dunedin, NZ January), Australian Computer Society Inc., p3.



Project:

- NECTAR

Graduate Students:

Michael Boyle, PhD - Applying models of privacy to media space design.
Roberto Diaz-Marino, MSC - Toolkit using the DiamondTouch multi-user multi-touch tabletop surface.
Kathryn Elliot, MSc - Displaying communication information in the home using ambient displays.
Gregor McEwan, MSc - The Community Bar: A system promoting casual interaction.
Carman Neustaedter, PhD - Interpersonal awareness within domestic settings.
Stephanie Smale, MSc - Groupware.
Anthony Tang, MSc - Embodiments in mixed presence groupware.
Charlotte Tang, PhD - Collaboration support and information flow in a medical environment (co-supervisor S. Carpendale).
Kimberley Tee, MSc - Informal awareness and casual interaction.
Edward Tse, PhD - SDGToolkit.

http://www.cpsc.ucalgary.ca/~saul

Faculty

Moustafa Hammad, *Assistant Professor*

Research Interests:

Moustafa's current research interests lie in the area of Database Systems. Specifically, his work focuses on proposing, building, and evaluating database technologies for non-traditional data types. The following are some of the research avenues that he is currently exploring. (1) Stream Data Systems: Specifically, query processing and storage management of applications that receive endless amounts of data (data streams). Such applications include sensor-based environments, earth sciences, "real time" business processing, object's tracking, and network monitoring. (2) Multimedia Databases: Specifically, video modeling, access control, buffer management, and video query processing. (3) Spatio-temporal Databases: Specifically, designing efficient index structures and querying moving objects. (4) Architecture-aware database design: Specifically, the efficient utilization of the underlying hardware in the database design such as memory systems (e.g., caches) and the multi-threaded CPU pipelines, while designing database components.

Selected publication 2004/2005:

- Walid G. Aref, Ann C. Catlin, Ahmed K. Elmagarmid, J. Fan, Moustafa A. Hammad, Ihab Ilyas, Mirette Marzouk, Sunil Prabhakar, X. Zhu. "VDBMS: A Testbed Facility for Research in Video Database Benchmarking." ACM Multimedia Systems Journal, Special Issue on Multimedia Document Management Systems, Volume 9, Number 6, Pages 575-585, June 2004.

Project:

- A Scalable Data Management Framework for Streaming Data Sources.

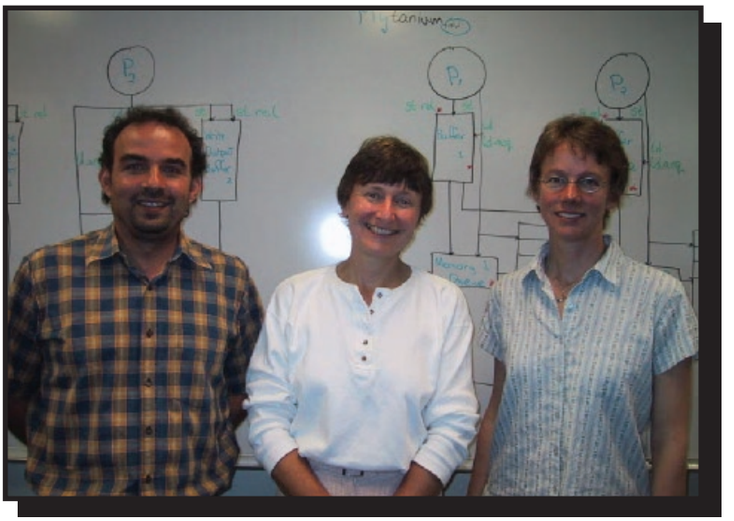
www.cpsc.ucalgary.ca/~hammad

LISA HIGHAM, *Associate Professor*

Research Interests:

Lisa's research concerns the design and analysis of distributed algorithms. One specific research interest is fault tolerance. Current systems consist of many processors and other components and hence are increasing likely to fail in some way as their size and interconnection complexity grows. So robust algorithms that can withstand or recover from various faults are required. For example, a self-stabilizing distributed system can recover from an arbitrary transient fault without external intervention or re-initialization, and eventually resume correct behaviour.

Another research interest is memory consistency. Multiprocessors employ a variety of buffering, caching, and communication techniques that enhance speed but can result in unexpected computations. We developed a framework for precisely defining the memory behaviour of multiprocessor systems, and now use this framework to compare multi-processor machines, design efficient programs for them, and to port programs between them.



Selected publications 2004/2005:

L. Higham and J. Kawash. Implementing Sequentially Consistent program on processr Consistent Platforms. Technical Report 2004-738-03, February, 2004.

L. Higham, L. Jackson and J. Kawash. Specifying Memory Consistency of Write Buffer Multiprocessors. Technical Report 2004-758-23, August, 2004.

Projects:

- Itanium Memory Consistency.
- Models for Self-stabilization.

Graduate Students:

LillAnne Jackson, PhD - Porting between machines with different memory consistency guarantees.

Nuha Kamaluddeen, MSc - The design of obstruction-free distributed algorithms.

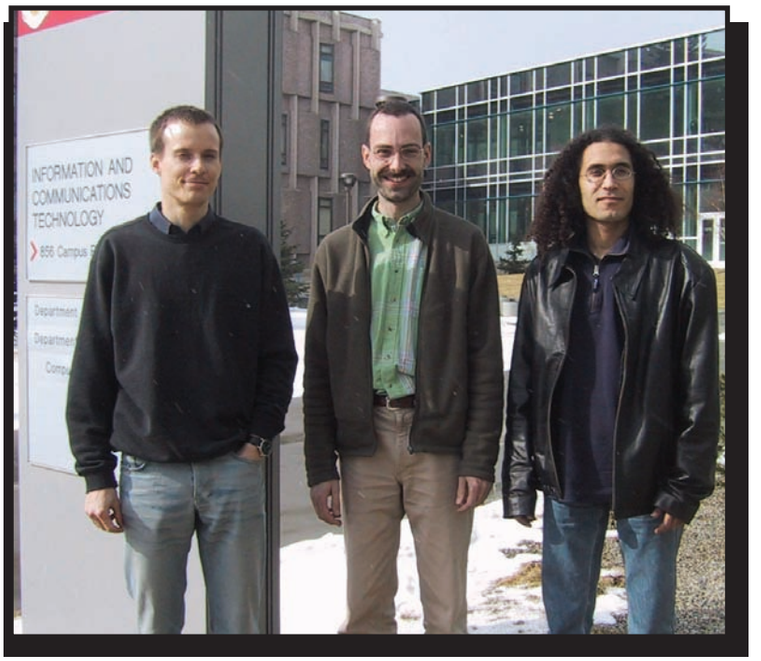
www.cpsc.ucalgary.ca/~higham

Faculty

Peter Hoyer, *Assistant Professor*

Research Interests:

Peter Hoyer is interested in theoretical aspects of computer science and in the relationship between physics and computer science. His research is mainly on algorithms, data structures, and complexity theory, with a focus on algorithms for quantum computers. A quantum computer is a computational device that is based on quantum physics as opposed to being based on bits as a traditional computer. His research goal is characterizing problems that can be solved efficiently with the help of quantum mechanics. Problems that on the surface seem very complex, yet contain an internal well-behaved structure, are particularly well-suited for being solved on quantum computers. His research methodologies are theoretical and aims at a fundamental understanding. His research is part of an effort to say what it means to compute something on a very basic level.



Selected publications 2004/2005:

- "Quantum query complexity of some graph problems" by Christoph Dojeit, Mark Heiligman, Peter Hoyer and Mehdi Mhalla. Proc. of 31st Intl. Colloquium on Automata, Languages, and Programming, 2004. Best paper award.
- "Quantum amplitude amplification and estimation" by G. Brassard, P. Hoyer, M. Mosca, and A. Tapp. In Quantum Computation and Quantum Information: A Millennium Volume, AMS Contemporary Mathemaatics Serices, Vol. 305, 2002.

Project:

- Develop new quantum algorithms, understand their relationship with algorithms, and prove lower bounds.

Graduate Student:

Hongchao Zhang, MSc - Quantum and classical analysis of boolean functions.

www.cpsc.ucalgary.ca/~hoyer

CHRISTIAN JACOB, *Associate Professor (Joint appointment with the Department of Biochemistry & Molecular Biology)*

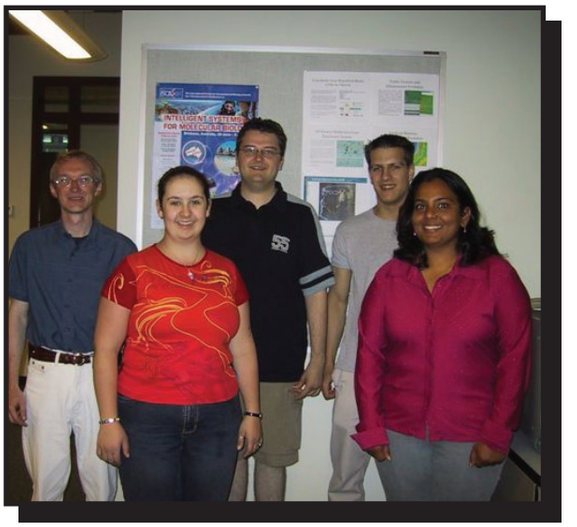
Research Interests:

Christian's Evolutionary & Swarm Design Group (www.swarm-design.org) is interested in building agent-based simulations of mostly biological systems for different levels of granularity, from vehicular and pedestrian traffic simulations to the modelling of army ant raids. More recently, as a consequence of our collaborations with colleagues in the Faculty of Medicine, we have focused on 3-dimensional agent-based models of biomolecular systems, such as gene regulatory networks, bacterial chemotaxis, immune system reactions, and blood clotting. These mathematical and computer models open new opportunities for biological and life sciences, bioinformatics and computational biology research in order to understand systems with a massive amount of parallel interactions and their emergent properties.

Christian collaborates with Prof. Jerry Hushlak from the Department of Art to investigate how to use evolutionary swarm intelligence systems to build virtual "swarm sculptures" (www.swarmart.com) and interactive computer installations that illustrate principles of emergence in Art & Science.

Selected publications 2004/2005:

- J. Boyd, G. Hushlak, and C. Jacob. Swarmart: Interactive art from swarm intelligence. In ACM Multimedia. ACM Multimedia, ACM, October 2004.
- C. Jacob and I. Burleigh. Biomolecular swarms: An agent-based model of the lactose operon. Natural Computing, 2004.
- C. Jacob, J. Litorco, and L. Lee. Immunity through swarms: Agent-based simulations of the human immune system. In Artificial Immune Systems, ICARIS 2004, 3rd International Conference, Catania, Italy, 2004. LNCS 3239, Springer.



Projects:

- Agent-based simulations of biomolecular systems.
- Simulations of gene regulatory systems (Lactose operon, Lambda switch).
- Evolutionary design of swarm dynamics.
- Evolutionary optimization.

Graduate Students:

Ian Burleigh, PhD - Evolutionary computer music.
Lance Hanlen, MSc - Evolution of social networks.
Jenny Kashmirian, MSc - Immune system modelling.
Namrata Khemka, MSc - Particle swarm optimization for complex optimization problems.
Paul Nuytten, MSc - Agent-based modelling of neurons and neural network architectures.
Marcin Pilat, PhD - Simulations of morphological and behavioural ecologies.

http://www.cpsc.ucalgary.ca/~jacob

Faculty

MICHAEL JACOBSON, JR., *Assistant Professor*

Research Interests:

Mike's main areas of research are cryptography (data security) and computational number theory. In particular, he is involved in investigating the suitability of certain number-theoretic structures and problems as bases for public-key cryotosystems, enabling applications such as secure key-exchange and digital signatures. The efficiency of such cryptosystems is tested by implementing the best-known algorithms and devising improvements. The security is tested by developing sequential and distributed algorithms for solving the underlying number-theoretic problem.

Selected publications 2004/2005:

- The security of cryptosystems based on class semigroups of imaginary quadratic non-maximal orders. In ACISP 2004 (Sydney, Australia), vol. 3108 of LNCS, 2004, pp. 149-156.
- Imaginary cyclic quartic fields with large minus class numbers. In Algorithmic Number Theory - ANTS-VI (Burlington, Vermont), vol. 3076 of LNSC, 2004, pp. 280-292. (with H.C. Williams and K. Wooding).
- Hyperelliptic curves and cryptography. In High Primes and Misdemeanors: Lectures in Honour of the 60th Birthday of H. C. Williams, vol. 41 of Fields Institute Communications, 2004, pp. 255-282 (with A. J. Menezes and A. Stein).

Projects:

- Improving the efficiency of public-key cryptographic protocols based on elliptic curves and low-genus hyperelliptic curves.
- Improving the efficiency of public-key cryptographic protocols based on quadratic and cubic number fields.
- Improving index-calculus algorithms for computing class groups and discrete logarithms in class groups of quadratic number and function fields.
- Developing new, improved algorithms for unconditional class group and regulator computation in quadratic fields, and for various computations related to algebraic number theory.

Graduate Students:

Andy Chan, MSc - Efficient implementation of elliptic curve cryptosystem.
Rennie de Graaf, MSc - Applied network security (co-supervisor J. Aycock).
Andreas Hirt, PhD - Ananymous Network Communication (co-supervisor C. Williamson).
Gaurav Jain, MSc - Mobile IP security.
Shantha Ramachandran, MSc - Unconditional class group computation in quadratic fields.
Reg Sawilla, PhD - Database Security and Privacy.
Nick Sullivan, MSc(Mathematics) - Ideal arithmetic in function fields (co-supervisor R. Scheidler).

www.cpsc.ucalgary.ca/~jacobs
cisac.math.ucalgary.ca

Robert Kremer, *Associate Professor*

Research Interests:

Rob's research interests focus on agent based systems, concept mapping, and formal methods. He is currently developing a flexible and easy-to-use infrastructure for agent development as a research tool. This will lead to the ability to test the effectiveness of various conversational strategies, for example, Is the "traditional" conversation protocol approach better or worse than the social commitment approach to complex agent-based conversations? This work dovetails with previous work on concept mapping systems, in that the agent infrastructure supports a multi-user interface and data store for the concept mapping system. Conversely, the concept mapping system will form a sophisticated view (and controller) of the agent environment. A formal model of the agent infrastructure is also under development.

Selected publications 2004/2005:

- Flores, R.A. & Kremer, R.C. (2004) A Pragmatic Approach to Build Conversation Protocols using Social Commitments. Poster in Proc. of the 3rd International Joint Conference on Autonomous Agents and Multi Agent Systems, (AAMAS 2004), New York, USA, July 19-23, 2004. To appear.
- Flores, R.A. & Kremer, R.C. (2004) A Principled Modular Approach to Construct Flexible Conversation Protocols. In A.Y. Tawfik and S.D. Goodwin (Eds.), Advances in Artificial Intelligence, Lecture Notes in Computer Science, Vol. 3060, Springer-Verlag, pp. 1-15. ISBN: 3-540-22004-6.

Projects:

- Development of the CASA agent based infrastructure. Implementation of a formally-specified social commitment protocol under CASA.

Graduate Students:

David Baker, MSc - Course based.
Filip Balas, MSc - Agent based systems.
Gabriel Becerra Ayala, MSc - Constraints satisfactin approach to agent based negotiation.
Guy Davis, MSc - Course based.
Jason Heard, MSc - Detecting broken social commitments in open multi-agent systems.
Ibrahim Jadalowen, MSc - Course based.
Chad La Fournie, MSc - Course based.
HuiMing Luo, MSc - Course based.
Jerrall Prakash, MSc - Implementation of a multi-agent system network security.
Paul Werbicki, MSc - Programming language interoperability.

http://sern.ucalgary.ca/%7Ekremer/

Faculty

CHRISTIANE LEMIEUX, *Assistant Professor (Joint appointment with the Department of Mathematics)*

Research Interests:

Christiane is studying quasi-Monte Carlo methods, which can be seen as a deterministic version of the Monte Carlo method. These methods are mostly used for multi-dimensional numerical integration, and they try to improve upon the Monte Carlo method by using more uniformly distributed samples to build their approximation. Christiane's current research is mostly focused on using quasi-Monte Carlo methods in complex applications, and finding better parameters for different quasi-Monte Carlo constructions.

Selected publications 2004/2005:

- C. Lemieux. "Quasi-random number techniques", book chapter to appear in "Handbook in Operations Research and Management Science: Simulation", Elsevier, 2005.
- F. J. Hickernell, C. Lemieux and A. B. Owen. "Control Variates for Quasi-Monte Carlo", to appear in Statistical Science, 2005.
- H. Ben Ameur, P. L'Ecuyer and C. Lemieux. "Combinations of general antithetic transformations and control variables", Mathematics of Operations Research, 29, 946-960, 2004.

Projects:

- Using simulation and diffusion approximations to model plant development.
- Quality measures and parameter searches for quasi-Monte Carlo constructions.
- Pricing American options using quasi-Monte Carlo methods and other variance reduction techniques.
- Using highly-uniform sampling in Metropolis-type algorithms.

Graduate Students:

Mikolaj Cieslak, MSc - Solving chemical processes usually represented as a set of coupled ordinary differential equations using Gillespie's stochastic method (co-supervisor P. Prusinkiewicz).
Jennie La, MSc - (Department of Mathematics and Statistics).

www.math.ucalgary.ca/~lemieux

KENNETH LOOSE, *Associate Professor*

Research Interests:

Kenneth's research focuses on two distinct areas - Computer Science Education and the role of users in software evaluation. He has spent some time looking at the role of discrete mathematics in the undergraduate program, specifically with respect to student mathematical maturity and its effect on the ability of students to effectively learn discrete math. Looking to expand this to also include linear mathematics and calculus to attempt to determine if there is an optimal sequence for the mathematics that is currently required for Computer Science majors. In the area of software evaluation, Kenneth's is focusing on the use of investigative techniques more common to the Social Sciences but that are applicable to finding relationships among users and the software that they use. This is in many ways an analysis of users and particular software to identify relationships affecting the interaction of the user with the software. In both areas, he is especially interested in games programming and software.

Kenneth is currently involved with an interdisciplinary group that is working toward creating a network of researchers involved in educational games. This is partially funded by a grant from SSHRC. He is also working on data from the last eight years that includes performance in the three areas of mathematics that are required for Computer Science students. This should add significantly to findings already obtained in looking at discrete mathematics performance. A final major project is one in which he wishs to create a profile of skills that are critical components in computer games, especially educational computer games - an area that is receiving increased recent attention.

Graduate Student:

Jessica Mason, MSc - Profiling educational games user to identify critical game components.

http://www.cpsc.ucalgary.ca/Dept/contact.php?profile=loose

Faculty

ANIRBAN MAHANTI, *Assistant Professor*

Research Interests:

Anirban's research interests are in the areas of performance evaluation of distributed computer systems and computer networks. His specific research interests include multimedia streaming systems, Web performance, network measurement and modelling, network protocols and architectures, and distributed systems.

Selected publications 2004/2005:

- A. Mahanti and D. Eager, "Adaptive Data Parallel Computing on Workstation Clusters", Joournal of Pralle and Distributed Computing, Vol. 64, No. 11, November, 2004, pp. 1241-1255.
- A. Mahanti, "Scalable Reliable On-demand Media Streaming Protocols", Ph.D. Thesis, Dept. of Computer Science, University of Saskatchewan, March, 2004.

Projects:

- Multimedia Streaming Protocols and Performance.
- Performance Evaluation of Streaming Media Applications.

Graduate Students:

Sean Boyden, MSc - Characterizing TCP-friendliness of Real-Video Streams (co-supervisor C. Williamson).
Nadim Parvez, PhD- TCP Protocols for Wired/Wireless Networks (co-supervisor C. Williamson)

http://pages.cpsc.ucalgary.ca/~mahanti

Frank Maurer, *Professor and Associate Head, Research & Planning*

Research Interests:

Frank's research interests include agile software methodologies (such as Extreme Programming, Scrum DSDM, etc.), software engineering approaches for e-Business software development, web engineering, globally distributed software development, and experience and knowledge management. Frank is the head of the e-Business engineering group at the University of Calgary and serves as the Associate Head Planning and Research.

Selected publications 2004/2005:

- T. Chau, F. Maurer. Tool Support for Inter-Team Learning in Agile Software Organizations, in Proc. of the Workshop on Learning Software Organizations 2004, Springer, 2004.
- G. Melnik, F. Maurer. Direct Verbal Communication as a Catalyst of Agile Knowledge Sharing. Proc. ASD 2004, IEEE, 2004.
- G. Melnik, K. Read, F. Maurer. Suitability of FIT User Acceptance Tests for Specifying Functional Requirements: Developer Perspective. Proc. XP/Agile Universe 2004, Springer, 2004.

Graduate Students:

Harpreet Bajwa, MSc - Testing processes for portlet-based applications.
Thomas Chau, MSc - Inter-Team Learning for Agile Software Processes.
Kobe Davis, MSc - course-based.
Trevor Foraie, MSc - course based.
Harprit Grewal, MSc - course based.
Lawrence Liu, MSc - Tool support for agile planning.
Chris Mann, MSc - Effectiveness of agile practices in a small team industrial setting.
Grigori Melnik, PhD - Capability evaluation of agile methods of software development.
Kristopher Read, MSc - Acceptance testing in agile teams.
Wenliang Xiong, MSc - Tool support for portlet testing.
Carmen Zannier, PhD - How do software designers make decisions.

http://ebe.cpsc.ucalgary.ca/Frank.Maurer

Faculty

JAMES PARKER, *Professor*

Research Interests:

Jim is currently working on computer game technology, especially the synthesis and coding of digital audio. This includes creating sound effects and music, and manipulating, classifying and recognizing. He has been involved in pattern recognition and computer vision research for over 20 years, and applies this knowledge to practical projects. He and his students have designed and built a number of computer games. His students are currently working on pattern recognition in biometrics (signature, face, and voice recognition), virtual reality, games and entertainment technology (audio analysis and synthesis), and natural computer interfaces (gesture and gaze recognition, similarity search for pictures and sounds). He is the founder of the Digital Media Lab, which works with local and distance game developers and animation groups, and has research ties with the Banff New Media Institute, Education, Kinesiology, Fine Arts, and Engineering.

Selected publications 2004/2005:

- J.R. Parker and Keith Chung. Index-Frame Audio Transmission, ACM Multimedia, New York, October 10-16, 2004.
- J.R. Parker and B. Behm. Creating Audio Textures by Example: Tiling and Stitching, International Conference on Acoustics, Speech, and Signal Processing (ICASSP'04), Montreal, Canada.

Projects:

- Caching of audio files in computer games: Implementing a sound file scheduling algorithm that will be integrated into a game.
- Query by example for sound: Given a sound file, find others in a set of files that sound like it.
- Determining Body Pose In Images: An image that includes a human body is given - What is the angle of the arms/legs? There is a very practical use for this, if it can be accomplished in a fast enough time.

Graduate Students:

Lani Bateman, MSc - Speaker recognition using signal processing and learning.
Sonny Chan, MSc - Medical Image Analysis.
Ai Duong, MSc - Gaze Determination.
Shannon Jaeger, MSc - Virtual reality and games for teaching.
Young Lee, MSc - Face detection/recognition using linear classifiers.
Christopher Marriott, PhD – Joint with Philosophy: epistemological basis of A.I.
John Heerema, MSc (Int. Stud.) - A computer hearing system to coach music students.
Hugh Tyreman, MSc(Kines) - Goaltender Coaching with Virtual Reality: 2D/3D/Immersive.
Lori Shyba, PhD (Int. Stud.) - Virtual and Interactive Theatre.

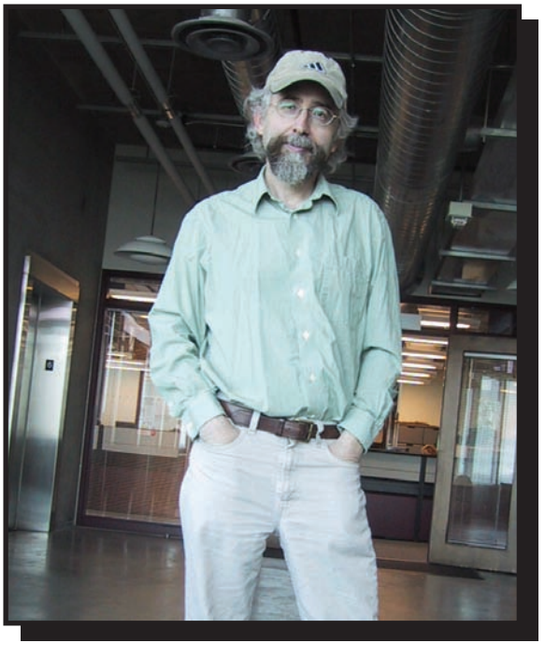
http://pages.cpsc.ucalgary.ca/~parker

PRZEMYSLAW PRUSINKIEWICZ, *Professor*

Research Interests:

Dr. Prusinkiewicz's and his students look at facilitating the modeling of plants using the conceptual framework of Lindenmayer Systems (L-Systems). They investigate the dynamics of reciprocal interaction between plants and their environment and explore the relationships between various theoretical models used to describe plant architecture. This makes it possible to understand the data required, the limitations and capabilities necessary to model plants that result in images which are photorealistic and highly complex.

They have developed and continue to improve a software environment for conducting simulated experiments, called a "Virtual Laboratory". L-Studio is also software they developed that simplifies use of the L-system-based modeling and simulation program cpfg. It is a source of satisfaction that their software is used to support several research programs on plant development and in computer graphics worldwide.



Selected publications 2004/2005:

- M. Fuhrer, H. W. Jensen and P. Prusinkiewicz. "Modeling hairy plants." Proc. of Pacific Graphics 2004, pp. 217-226.
- E. Coen, A-G Rolland-Lagan, M. Matthews, A. Bangham and P. Prusinkiewicz. "The genetics of geometry." Proc. of the National Academy of Sciences 101 (14), 4728-4735.
- P. Prusinkiewicz. "Self-similarity in plants: Integrating mathematical and biological perspectives." In M. Novak (ed.), Thinking in Patterns: Fractals and Related Phenomena in Nature, pp. 103-118.

Projects:

- Modeling plants from genes to phenotypes.
- New programming paradigms and languages for modeling, simulation and visualization of biological systems.

Graduate Students:

Mikolaj Cieslak, MSc - Solving chemical processes usually represented as a set of coupled ordinary differential equations using Gillespie's stochastic method (co-supervisor C. Lemieux).
Martin Fuhrer, MSc - Photorealistic rendering of plants by simulating natural phenomena.
Colin Smith, MSc - Techniques of modelling dynamically growing surfaces in a biological context.
Richard Smith, PhD - Computational models of spiral phyllotaxis.
Julia Taylor-Hell, MSc - Physically-based modelling of trees for computer graphics.

http://pages.cpsc.ucalgary.ca/~pwp
www.algorithmicbotany.org

Faculty

JON ROKNE, *Professor*

Research Interests:

Jon's research interests span the areas of interval analysis, global optimization, computer graphics and solid modeling. Within these areas he aims to develop algorithms for solving a variety of problems such as robust computations of intersection tests, finding good inclusion for functions over intervals computing zeros of function, etc. He has also worked on global illumination as applied to the modeling of plants and on physically based computer graphics.

Selected publication 2004/2005:

- Gladimir G. V. Baranoski and Jon. G. Rokne: Light Interaction with Plants. Horwood Publishing, 2004.

Projects:

- Computer-aided desing algorithms.
- Interval analysis algorithm.
- Physical based computer graphic simulations.
- Geometric computations.

Graduate Students:

Julie Andreotti, MSc - Simulationg the Spectral and Intensity characteristics of the Aurora.

Kelly Poon, MSc - Physically-based techniques to model flowers that are difficult to model by hand.

Raudeep Sekhoon, MSc - Realistic implementaiton of veins in leaves.

Ye Wang, MSc - NPR implementation of Chinese caligraphy and painting.

http://pages.cpsc.ucalgary.ca/~rokne/

GÜNTHER RUHE, *iCORE Professor in Software Engineering. (Joint appointment with the Department of Electrical & Computer Engineering)*

Research Interests:

Geunther Ruhe is an iCORE Professor. This is a joint appointment in the Departments of Computer Science and Electrical and Computer Engineering. His research is in the area of intelligent support, in particular for design and analysis of releases in incremental software development, analysis of software requirements, project management, and selection of components-of-the shelf (COTS) products. A new generation of intelligent decision support tool has been designed, implemented and initially evaluated. ReleasePlanner™ is a tool suite that provides flexible and web-based tool support for assigning requirements of features to releases so that the most important risk, resource, and budget constraints are fulfilled.

Selected publications 2004/2005:

- G. Ruhe, A. Ngo-The. Hybrid Intelligence in Software Release Planing. Intl. Jrnl. of Hybrid Intelligent Systems, Vol. 1(2004), pp. 99-110.
- D. Greer, G. Ruhe. Software Release Planning: An Evolutionary and Iterative Approach. Information and Software Technology, Vol. 46 (2004), pp. 243-253.

Projects:

- Intelligent support for release and design decision of evolvable software systems.
- Intelligent design decisions.
- Simulation-based decision support for software quality assurance (SimQuali).
- Soft Computing for decision support in release planning.

Graduate Students:

Thamer Al Boura'e, MSc - Impact Analysis for Parametric Release Planning.
Ahmed Al-Emran, MSc - Intelligent tool support for software decision.
Pankaj Bhawnani, MSc - Decision Support for Release Decisions based on Reliability Analysis.
Yongzue Cai, MSc - course based.
Gengshen Du, PhD - Intelligent Explanation for Software Release Planning.
Kendra Hamilton, MSc - course based.
Hossein Horrian, MSc - course based.
Jingzhou Li, PhD - Effort Prediction for Release Planning Using Collaborative Filtering.
Zhizhong Li, MSc - Management of Tabular-based Requirements using Rough Sets.
Sebastian Maurice, MSc - Decision Support for Value-Based Software Engineering Release Planning.
James McElroy, PhD - Use Case Analysis for Planning of Releases.
Abdallah Mohamed, PhD - COTS Software Product Selection.
Omalade Saliu, PhD - Decision Support for Software Release Planning in Evolving Systems.
Yuhang Wang, MSc - Machine Learning for Improving Performance of Software Inspections.

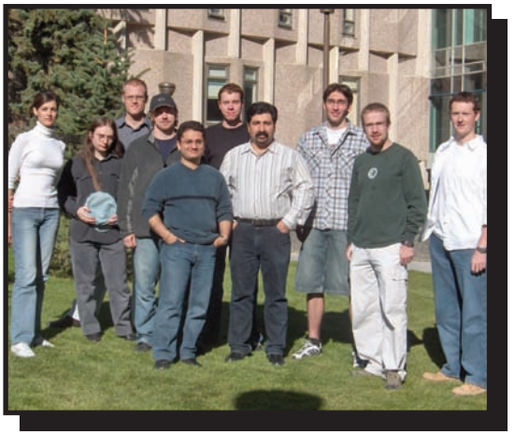
http://sern.cpsc.ucalgary.ca/~ruhe

Faculty

FARAMARZ SAMAVATI, *Assistant Professor*

Research Interests:

Faramarz's main research focus is the exploration and advancement of modeling techniques in computer graphics. His group is interested in parametric surfaces (Splines and NURBS), subdivision surfaces and multiresolution. They explore applications of these modeling techniques in rendering, animation, simulation, and visualization as well as the connections with other modeling techniques such as procedural and implicit modeling. Faramarz's recent research has been focused in the area of multi-resolution. This kind of modeling is appropriate and efficient for applications such as compression, flexible editing, progressive transition, levels of details, and style capturing. His group has introduced a new successful approach for multi-resolution through reversing subdivision schemes.



Selected publications 2004/2005:

- Faramarz F. Samavati and Richard H. Bartels. "Local Bspline Wavelets", In Proceedings of, International Workshop on Biometric Technologies, University of Calgary, June 2004.
- Mario Costa Sousa, Faramarz F. Samavati and Meru Brunn. "Depicting Shape Features with Directional Strokes and Spotlighting", In Proceedings of Computer Graphics International 2004.
- Kevin Buchin, Mario Costa Sousa, Juergen Doellner, Faramarz F. Samavati and Maike. Walther. "Illustrating Terrians using Direction of Slope and Lighting", Proceedings of 4th ICA Mountain Cartography Workshop, October 2004.
- John Brosz, Faramarz F. Samavati and Mario Costa Sousa. "Silhouette Rendering Based On Stability Measurement", Spring Conference of Computer Graphics 2004 (SCCG '04), April 2004.

Project:

- Multi-resolution in Computer Graphics.

Graduate Students:

John Brosz, MSc - Multiresolution Terrain Modeling and Rendering.
Meru Brunn, MSc - Modeling and Rendering Artistic Lines By Example (co-supervisor M. Costa-Sousa).
Joseph Cherlin, MSc - Artistic Modeling & Rendering of 3D Forms (co-supervisor M. Costa-Sousa).
Luke Olsen, MSc - Local Multi-resolution Filters In NPR.
Reza Pakdel-Sefidgar, MSc - Incremental Adaptive Subdivision.
Aaron Severn, MSc - Boolean Operation on Subdivision and Multiresolution Surfaces.
Mitra Shirmohammadi, MSc - Modeling and rendering.
Torin Taerum, MSc - Interactive feature extraction and rendering methods for MRI data using Multiresolution (co-supervisor M. Costa-Sousa).
Lakin Wecker, MSc - Modeling and applications (co-supervisor M. Gavrilova).

http://pages.cpsc.ucalgary.ca/~samavati/

Renate Scheidler, *Associate Professor (Joint appointment with the Department of Mathematics)*

Research Interests:

Renate's principal areas of interest include computational number theory and cryptography. Specifically, her research explores algorithms for finding invariants of algebraic number fields and function fields, as well as the design and analysis of cryptographic systems whose security is based on the problem of computing such invariants. Currently, the best known methods for finding invariants are sub-exponential and frequently exponential, so the cryptosystems in question are very secure. She is interested in faster cryptographic and number theoretic algorithms. as well as. efficient implementations.

Selected publications 2004/2005:

- M. J. Jacobson, Jr., R. Scheidler and A. Stein. Faster Cryptographic Key Exchange on Hyperelliptic Curves, submitted to CRYPTO 2005.
- R. Scheidler and A. Stein. Class Number Algorithms in Cubic Function Fields. University of Calgary Yellow Series 842; submitted to Journal of Number Theory.
- R. Scheidler. Algorithmic Aspects of Cubic Function Fields. Proceedings of the Sixth Algorithmic Number Theory Symposium ANTS-VI, Lecture Notes in Computer Science 3976, Springer, Berlin 2004, 395-410.

Projects:

- Algorithms and Cryptography in Algebraic Function Fields.
- Novel Implementation of Cryptographic Algorithms on Custom Hardware Platforms.
- Efficient Arithmetic in Global Quadratic Fields.
- Privacy and Number Theoretic Cryptography.
- Construction of Hyperelliptic Function Fields of High Three-Rank (with M. Bauer, M. J. Jacobson, and Y. Lee).
- Cubic Function Fields from Quadratic Infrastructure (with M. J. Jacobson, Y. Lee, and H. C. Wiliams).

Graduate Students:

Richard Cannings, MSc - On the Security of the BB84 Quantum Key Distribution Protocol.
Nick Sullivan, MSc - Ideal Arithmetic in Function Fields(co-supervisor M. Jacobson).
Tanja Lange, MSc - Identity Based Elliptic Curve Cryptosystems.
Daniel Weimer, MSc - An Adaptation of the NICE Cryptosystem to Real Quadratic Orders (co-supervisor M. Jacobson).
Qingquang Wu, PhD - Quartic Function Fields.

www.math.ucalgary.ca/~rscheidl
www.cisac.math.ucalgary.ca

Faculty

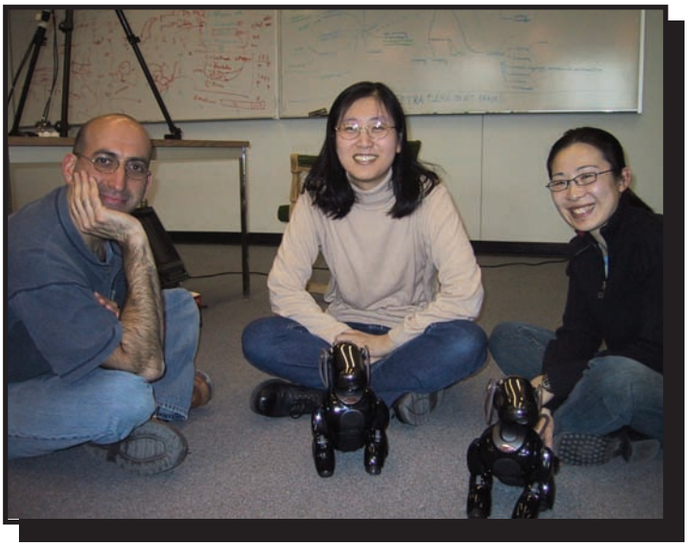
Ehud Sharlin, *Assistant Professor*

Research Interests:

Ehud is interested in physical interfaces between humans and computers, tangible user interfaces, human-robot interaction, and virtual and mixed reality interfaces. Physical interfaces rely directly on the physical world using its extremely rich collection of objects, tools, interaction rules and concepts, all well learned and well practiced by humans from their everyday experiences. Good physical interfaces embody function and content and can be very intuitive and simple to use.

Selected publications 2004/2005:

- E. Sharlin, M. Costa Sousa. " Drawing in Space using the 3D Tractus", in New Directions in 3D User Interfaces, IEEE Virtual Reality workshop 2005. Bonn, Germany. March 2005.
- E. Sharlin, B. Watson, Y. Kitamura, F. Kishino, Y. Itoh . "On tangible user interfaces, humans and spatiality", Personal and Ubiquitous Computing, Volume 8, Issue 5, September 2004.
- E. Sharlin, Y. Itoh, B. A. Watson, Y. Kitamura, S. Sutphen, L. Liu and F. Kishino. "Spatial Tangible User Interfaces for Cognitive Assessment and Training", BioADIT 2004, Lecture Notes in Computer Science, volume 3141, The Swiss Federal Institute of Technology (EPFL) Lausanne, Switzerland, 2004.
- E. Sharlin, B. A. Watson, Y. Kitamura, D. Rorabeck, R. Lederer, S. Sutphen, M. Takimoto, F. Kishino. The Tangible Pathfinder—Design of a Wayfinding Trainer for the Visually Impaired, poster at Graphics Interface, London, ON, Canada, 2004.



Projects:

- Cognitive tangible user interfaces: A set of tangible user interfaces for cognitive assessment and training tasks.
- The tangible pathfinder: A tangible user interface directed at assisting a visually impaired user in autonomously learning a new place, self-assessing the resulting cognitive map and eventually enabling on-site navigation of the new environment.
- .Robotic emotion: Synthetic personality in robots and its effect on human-robot relationship.
- Iolaus: A robotic partner; development of a prototype for socially acceptable information-supporting robotic partner.
- The 3D Tractus (with Mario Costa Sousa): A tangible user interface for intuitive drawing in three-dimensional space using a physical drawing board metaphor.

http://pages.cpsc.ucalgary.ca/~ehud/

Robert Simmonds, *Adjunct Assistant Professor*

Research Interests:

Dr. Simmonds performs research into parallel discrete event simulation, parallel network emulation and into several aspects of grid computing. The main grid computing activities includes a project that aims to understand many issues relating to monitoring grid environments. The aim is to produce models of computer, network and monitoring components and models of different monitoring activities. This should enable monitoring requirements to be mapped programmatically to a grid environment. Another grid related project is considering how the availability of schedulable end-to-end lightpaths on wide area networks changes the data replication and caching decisions for a grid data management system.

Selected publications 2004/2005:

- Kiddle, C., Simmonds, R., and Unger, B.W. (2004). "Performance of a Mixed Shared/Distributed Memory Parallel Network Simulator", Workshop on Parallel and Distributed Simulation (PADS 2004), Kufstein, Austria, May.
- Mirtchovski, A., Simmonds, R. and Minnich, R. (2004). "Plan 9: An Integrated Approach to Grid Computing", IPDPS-04, Santa Fe, April.

Projects:

- Model based grid monitoring (Joint project with HP Labs, Palo Alto).
- Proactive Data Management.
- Internet Protocol Traffic and Network Emulator (IP-TNE).

Graduate Students:

Idowu Adewale, MSc - User oriented monitoring for grid environments.
Abhishek Gaurav, MSc - Caching and replication strategies for grid data management.
Nayden Markatchev, MSc - Data management in grid invironments.
Andrey Mirtchovski, MSc - Use of distributed operating systems in grid environments.
Philip Rizk, MSc - Web Services Resource Framework (WSRF) based data management in grid environments (co-supervisor B. Unger).

http://grid.ucalgary.ca

Faculty

Brian Unger, *Professor*

Research Interests:

Brian's research interests focus on the parallel and distributed simulation of computer communication networks. Key research problems include the design and development of efficient optimistic and conservative synchronization methods, modeling large, complex, non-homogeneous networks such as the Internet, and Alberta's Supernet, and integrated network simulation and emulation methods. Brian's work in these areas is pursued in collaboration with Rob Simmonds, an Adjunct Professor of Computer Science.

Recent areas of interst include high end computational Grids and the modeling and simulation of interacting intelligent agents.

Selected publications 2004/2005:

- Kiddle, Cameron, Simmonds, Rob, Unger, B.W. (2005) "Improving Scalability of Network Emulation Through Parallelism and Abstraction", accepted, 38th Annual Simulation Symposium.
- Kiddle, C., Simmonds, R., and Unger, B.W. (2004) "Performance of a Mixed Shared/Distributed Memory Parallel Network Simulator", Workshop on Parallel and Distributed Simulation (PADS 2004), Kufstein, Austria, May.

Projects:

- Canadian DataGrid - Proactive Data Management.
- Model Driven Open Data Collection.

Graduate Students:

Roger Curry, MSc - Parallel simulation applied to fast sequential simulation.
Cameron Kiddle, PhD - Scalable Network Emulation.
Philip Rizk, MSc. - Web Services Resource Framework based data management in grid environments co-supervisor R. Simmonds).
Hala Taleb, MSc - TCP modeling toolkit.
Kitty Wong, MSc - Load balancing in network modeling and simulation.

http://pages.cpsc.ucalgary.ca/~unger/

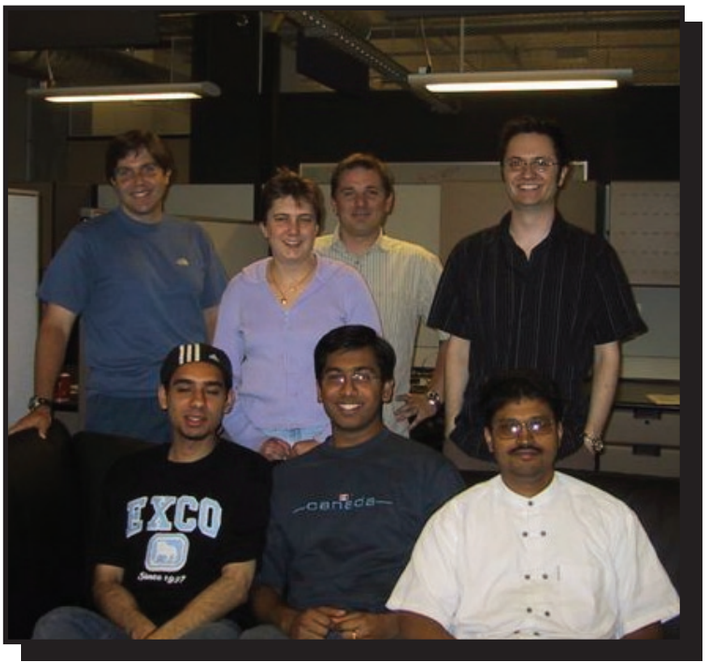
Robert J. Walker, *Assistant Professor*

Research Interests:

Rob's primary research concerns easing problems of software evolution and reuse. This centres around the observation that software is developed assuming that one sees essentially the entire "world" — you know what classes exist, what libraries are in use, their exact interfaces and properties, etc. The reality is that libraries, standards, and languages all change over time. By isolating a module from the world around it, but still allowing it to interact with the world, we could make our modules less likely to need to change. Rob has created a mechanism called implicit context for permitting such apparent isolationism.

Selected publications 2004/2005:

- R.J. Walker and K. Viggers. Implementing protocols via declarative event patterns. In Proc. ACM SIGSOFT Int'l Symp. Foundations Softw. Eng., 2004.
- S. Clarke and R.J. Walker. Generic aspect-oriented design with Theme/UML. Chapter 19 in Aspect-Oriented Software Development, Addison-Wesley, 2004.
- R.J. Walker, E.L.A. Baniassad, and G.C. Murphy. An initial assessment of aspect-oriented programming. Chapter 23 in Aspect-Oriented Software Development, Addison-Wesley, 2004.



Projects:

- Context insensitivity for software evolution and reuse.
- Lightweight empirical methodologies.
- Aspect-oriented software development and its assessment.

Graduate Students:

Reid Holmes, PhD - Practical large-scale software reuse.
Shafquat Mahmud, MSc - Evaluation of the Theme/UML approach to software design.
Mark McIntyre, MSc - language-independent tool support for implicit context.
Jamal Siadat, MSc - Evaluating aspect-oriented programming in computer network software.
Kevin Viggers, MSc - Declarative event patterns: Statically and efficiently making historical queries in program executions.

http://pages.cpsc.ucalgary.ca/~rwalker/

Faculty

JOHN WATROUS, *Associate Professor and Canada Research Chair in Quantum Computing*

Research Interests:

John's research focuses on quantum computation and information. This area of research is concerned with models of computation based on quantum mechanics, and on the information-theoretic properties of quantum mechanical systems. In particular, he is interested in quantum computational variants of interactive proof systems, quantum algorithms for group-theorectic problems, and properties of quantum entanglement.

Selected publications 2004/2005:

- J. Watrous. Limits on the power of quantum statistical zero-knowledge. Proc. of the 43st Annual Symposium on Foundations of Computer Science, pages 459--468, 2002.
- J. Watrous. On the complexity of simulating space-bounded quantum computations. Computational Complexity 12: 48--84, 2003.
- J. Watrous. Many copies may be required for entanglement distillation. Physical Review Letters 93(1): article 010502, 2004.
- C. Marriott and J. Watrous. Quantum Arthur-Merlin games. Proc. of the 19th Annual IEEE Conference on Computational Complexity, 2004.
- G. Gutoski and J. Watrous. Quantum interactive proofs with competing provers. Proc. of the 23rd International Symposium on Theoretical Aspects of Computer Science, 2005.

Graduate Students:

Dmitry Gavinsky, PhD - Quantum communication complexity.
Heath Gerhardt, PhD - Quantum information to improve our ability to communicate and process information.
Gus Gutoski, MSc - Complexity of quantum interactive proof systems with competing provers.
Kris Luttmer, MSc - Mixed state entanglement.
Jibran Rashid, MSc - Quantum algorithms for computing NASH Equilibria and the geometry of Bell/Cirelson Inequalities.

http://pages.cpsc.ucalgary.ca/~jwatrous

Carey Williamson, *iCORE Professor and NSERC/iCORE/Telus Mobility Industrial Chair*

Research Interests:

Carey's general research interests are in computer networks and computer systems performance evaluation. Specific interests include Internet protocols, wireless networks, network traffic measurement, workload characterization, network simulation, and Web server performance. A self-described "Internet mechanic", Carey focuses a lot of his research on the interactions between Internet protocols, and the resulting impacts on user-perceived performance. Much of this work is experimental, with an applied focus on industrially-relevant network performance problems. He is currently an iCORE Professor in "Broadband Wireless Networks, Protocols, Applications, and Performance" and holds an NSERC/iCORE/TELUS Mobility Industrial Research Chair in Wireless Internet Traffic Modelling.

Selected publications 2004/2005:

- G. Bai and C. Williamson. "Time-Domain Analysis of Web Cache Filter Effects", Performance Evaluation, Vol. 58, pp. 285-317, 2004.
- M. Arlitt and C. Williamson. "Understanding web Server Confirguration Issues", Software: Practice and Experience, vol. 34, pp. 163-186, 2004.
- T. Kuang and C. Williamson. "A Bi-directional Multi-Channel MAC Protocol for Improving TCP Performance or Multi-Lop Wireless Ad Hoc Netowworks", Proc. of ACM/IEEE MSWiM, pp. 301-310, Venice, Italy, October 2004.

Projects:

- Wireless Internet Traffic Modeling.
- Portable Networks.
- Multi-channel MAC Protocols for Wireless Networks.

Graduate Students:

Sean Boyden, MSc - Characterizing TCP-friendliness of Real-Video Streams (co-supervisor A. Mahanti).
Jean Cao, PhD - QoS Support for Mobile Applications in Wireless Networks.
Mingwei Gong, PhD - Scheduling Issues in Wireless Networks.
Andreas Hirt, PhD - Anonymous Network Communication.
Gwen Houtzager, MSc - WebProxy Cache Placement.
Alok Madhukar, MSc - P2P Traffic Classification.
Aniket Mahanti, MSc - Web Proxy Cacing.
Nadim Parvez, PhD - TCP Protocols for Wired/Wireless Networks (co-supervisor A. Mahanti).
Ian Wormsbecker, MSc - Multi-Channel MAC Protocols.

http://pages.cpsc.ucalgary.ca/~carey/

Faculty

Brian Wyvill, *Professor*

Research Interests:

Brian's research interests centers around the theme of computer animation. In 3D modelling he (and his brother Geoff Wyvill) have designed methods for interacting and rendering implicit surfaces. These models, called SOFT objects, are very useful in animation for representing deformable surfaces. More recently, he has been working on the BlobTree, which includes blends, CSG boolean operations, Barr warps, and texturing of implicit surfaces. He is currently working on new mehtods for controlled blending, animation, precise contact modelling and volume control.

Selected publications 2004/2005:

- C. Galbraith, L. Mundermann and B. Wyvill. "Implicit Visualization and Inverse Modeling of Growing Trees." Proc. of EuroGraphics 2004, Vol. 23 (3), pp. 227-248.
- J. Mahovsky and B. Wyvill. "Fast Ray-Axis Aligned Bounding Box Overlap Tests With plucker Coordinates." Journal of Graphics Tools, AK Peters Ltd, Vol. 9 (1), pp. 37-48, 2004.
- B. Wyvill, K. van Overveld and S. Carpendale. "Creating Cracks for Batik Renderings." NPAC 2004 Proc. of the 3rd Intl. Symposium on Non-photorealistic animation and rendering, ACM SIGGRAPG and Eurographics, pp. 61-70.
- C. Galbraith, P. MacMurchy and B. Wyvill. "BlobTree Tree." Proc. Computer Graphics International'04, IEEE Computer Society, pp. 78-85, 2004.

Projects:

- Better Blending between Multiple Nodes of the Blobtree.
- BlobTree Modeling System.

Graduate Students:

Erwin deGroot, PhD - Development of a new method to speed up raytracing Blobtrees.
Kevin Foster, MSc - Precise Ink Illustrations of 3D Polygonal Models (co-supervisor M. Costa Sousa).
Martin Fuhrer, MSc - Photorealistic rendering of plants by simulating natural phenomena (co-supervisor P. Prusinkiewicz).
Callum Galbraith, PhD - Procedural modeling and the use of implicit surface for surface description.
Pauline Jepp, PhD - Interactive Sculpting Using Implicit Methods(co-supervised with M. Costa Sousa).
Jeffrey Mahovsky, PhD - Speeding up ray tracing with reduced-precision arithmetic.
Ryan Schmidt, MSc - Computer graphics.
Alton Yu, MSc - Computer graphics and modelling.

http://pages.cpsc.ucalgary.ca/~blob/

Faculty:

Anton Colijn - Faculty Association
Richard Cleve - Quantum Computing (on leave)

Instructors

Katrin Becker
Don Bidulock
Frank Deur
Donna Fremont
Ivo Jirasek
Rose Joshua
Leonard Manzara
Craig Schock
James Tam
Nathaly Verwaal
Chris Walpole

Adjunct Professors:

Don Ariel
Nader H. Bshouty
Hakan Erdogmus
Abram Gamer
Jalal Kawash
Tom Keenan
Ross Mitchell
Christoph Sensen
Ian Witten

Emeritus Faculty:

Graham Birtwistle
Mike Brebner
Brian R. Gaines
David Hill
John Kendall
Mildred L. G. Shaw

CPSC 2004/2005

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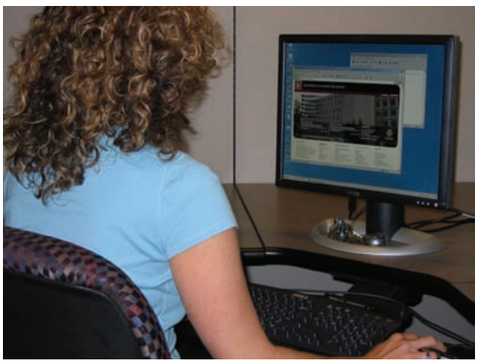
Math Sciences Bldg

ICT Building



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