Message From Head of Department

I hope you enjoy reading about the exciting things that have been happening recently in the Computer Science Department. With all of the hirings that we’ve done since 2000, the face of the Department has changed considerably. From new research projects to new course offerings, the environment continues to grow and evolve.

Our department is in the first year of a two-year process of deploying new undergraduate courses that include topics such as CS 409 Interactive Entertainment Software, CS 280 Social and Professional Aspects of Computer Science and CS 215 Web Oriented Programming. We’ve included examples from several new courses in the newsletter (Page 9). There is also exciting news about our research programs, job opportunities in information technology and new arrivals to the department.

My time as Department Head has ended. It was an enjoyable eight years spent with a terrific group of people. My sincere thanks to all of them and to the many students who contribute so much to the success of the department. Best wishes to Dr. Xue Dong Yang as the new Department Head.

Dr. Brian Maguire
Wanted: Information Technology Professionals

The demand for Information Technology (IT) workers has returned. Not since the bubble years of the late 1990s have there been so many opportunities for Computer Science Co-op students and new graduates.

In an effort to recruit the best and brightest, employers are going beyond traditional recruiting methods to better establish their brand with future employees. The Computer Science Department and the Co-op Office have been hosting employer presentations regularly. On September 15th Shell Canada visited the University of Regina to reaffirm their standing as a competitive choice for future IT Co-op students and graduates. Ed Teron, Manager of Shared IT Infrastructure at Shell Canada, lead a team of long-time employees, recent hires, and former Co-op students. The delegation offered a presentation that enhanced awareness of the Shell Co-operative Education hiring opportunities by announcing 22 new IT jobs for Co-op students. While there are also many opportunities for new grads, Shell utilizes Co-op placements as a “long term interview,” resulting in post-grad job offers for Co-op students prior to the completion of their academic programs.

Following a pizza lunch meet-and-greet with the students, the Shell delegates spent time with University researchers and faculty. In particular they were fascinated by the newest ongoing IT acoustics, graphics, and multimedia research. The University community should be congratulated for enthusiastic participation, resulting in tremendous support for the Shell Canada visit and event.

The Department of Computer Science and the Career Centre are committed to continuing to work together to successfully bring students and employers together. Watch your e-mail for invitations to future events!

Shell Canada Scholarships

An innovative scholarship program established by Shell Canada will provide Computer Science students at the U of R with scholarships as well as the possibility of employment with the company. Shell’s $150,000 donation to the University’s Building Dreams and Futures campaign will create three new scholarships for Computer Science students: the Shell Canada Aboriginal Scholarship in Computer Science and two Shell Canada Scholarships in Computer Science. Award recipients will have the opportunity to interview for potential work term placements or employment opportunities with Shell Canada.

“We recognize that helping Canadian students get the best education is critical to the success of our country and our company,” says Clive Mather, president and CEO, Shell Canada.

The scholarships are $2,500 each and are based on academic achievement. They will be presented annually to third- or fourth-year Computer Science students, commencing in Fall 2007.

Shell Canada Limited is a large integrated petroleum company in Canada with three major businesses. Exploration and Production explores for, produces and markets natural gas and natural gas liquids. Oil Sands is responsible for an integrated bitumen mining and upgrading operation and Shell Canada’s in situ bitumen business in Alberta. Oil Products manufactures, distributes and markets refined petroleum products across Canada.

Building Dreams and Futures is an ambitious campaign to raise $100 million for priority areas of the University of Regina, including student and research support, the Centre for Kinesiology, Health and Sport and emerging priorities. Funds are being raised from a variety of funding sources, including donations from individuals, corporations, and community organizations. Information on the campaign and how to make a contribution is available at 1-877-779-4723 or www.uregina.ca/campaign.
Google posted a job advertisement a few months ago seeking people to build large-scale Bayesian networks for their popular search engine. It was mentioned that word replacement is often necessary when searching the web and that Google will use Bayesian networks to do a better job than their current techniques. Bayesian networks have also been applied in building intelligent agents, such as Office Assistant, and adaptive user interfaces by Microsoft, process control by NASA and Lockheed, software diagnosis by HP and Nokia, and medical diagnosis such as the Heart Disease Program at the Massachusetts Institute of Technology and The Pathfinder Project for lymph node diseases at Stanford University.

The founder of Bayesian networks, Judea Pearl, emphasizes the importance of structure in probabilistic inference by opening his chapter on Markov and Bayesian networks with the following quotation: “Probability is not really about numbers; it is about the structure of reasoning.”

We have argued that probabilistic reasoning theory without the numbers is relational database theory. For instance, the inference algorithm used in HUGIN, a celebrated probabilistic expert system, is practically identical to a semijoin program, an inference algorithm used in the relational database community. A critical difference however is that the database community discovered this inference algorithm based only on a restrictive class of dependencies (non-embedded dependencies). In contrast, HUGIN uses the same algorithm even though a given Bayesian network can constrain both embedded and non-embedded independencies. This clearly shows that the Bayesian network community is not fully exploiting the independencies available in a Bayesian network.

By utilizing independencies that remain unnoticed in all previous algorithms, we proposed the first ever Bayesian network inference algorithm that precisely articulates the structure of the probability information propagated in the network during inference. Having crystal clear structure allows us to make more intelligent decisions during inference. Using several real-world Bayesian networks, we have shown an average run-time improvement of 29% over the leading inference technique. Our research paper describing the foundation of this improvement was selected as the very first paper presented at the 2006 Canadian Conference on Artificial Intelligence.

There is a lot of other exciting research taking place in my lab. Two Ph.D. students, Mr. Hong Yao and Mrs. Shan Hua, assisted in the development of the above inference technique. Mrs. Shan Hua is also examining the visualization of Bayesian network inference. We hope this work will make Bayesian networks accessible to a much larger audience. Mr. Wen Yan, another Ph.D. student, is starting work on the application of Bayesian networks in web search. One goal is to reduce the number of web pages returned during a web search session. Mr. Ken Konkel, an M.Sc. student, is close to completing the implementation of a state-of-the-art parallel Bayesian network inference algorithm. This is especially useful as nowadays computers are being built with multiple CPUs. Ken also conducted the experiments mentioned above on a Supercomputer with 24 CPUs. Ms. Junying Chen, another M.Sc. student, will investigate how Bayesian networks can be exploited in natural language processing.

Bayesian networks and databases are two skill sets that businesses are seeking. If you are hard working and want to pursue a graduate degree studying either of these two topics, please email me at butz@cs.uregina.ca.
The University of Regina New Media Studio Laboratory (NMSL) was established by a Canada Foundation for Innovation (CFI) grant in 2002. It was created to facilitate multidisciplinary research by bringing together faculty and graduate students from Computer Science, Engineering, and Media Production and Studies. As two of the nine principal investigators of the Lab, Dr. Yiyu Yao and I, along with our graduate students, have conducted several research projects in NMSL. The graduate students of my research group have given numerous demonstrations to external visitors in the past years. I highlight a few achievements below.

**Visualization in Web Search**

Most web search engines interfaces support a model of interaction based on traditional information retrieval: typing text query terms and examining a list of textual search results. Since the ability to read and assess textual information is a limiting factor in information retrieval systems, visual representatives of aspects of the user’s queries as well as the search results can allow the users to more effectively interpret and make sense of the information provided. O. Hoeber, a Ph.D. student, has developed two interfaces, called HotMap (Figure 1) and Concept Highlighter, to help us understand the complexities of web search results exploration.

The overview map (on the right-hand side of Fig. 1) provides a compact representation of 100 or more document surrogates in a single compact view. The detailed view (on the left-hand side) shows the specific information about each document surrogate, and provides a link to the document. “Hot” documents can be easily identified at a simple glance, particularly for those documents that would be buried deep down the list by popular current web search engines. On the other hand, another tool, called VisiQ (Fig. 2) supports interactive query refinement by visually depicting the query space and allowing users to choose terms suggested by a hierarchical knowledge base to add or remove terms from their queries.
Artificial Intelligence (AI) research and education can easily be framed through a paradigm of intelligent agents. This makes intelligence in robots a strong motivator of AI. This embodiment contrasts with the majority of computer science subfields, in which computers interact with the real world differently than we do. A robot is more than an experimental platform or a hook that can draw undergraduate and graduate students to the AI discipline. It is a fundamental facet of the AI research field.

In the robotics lab of our department, several fundamental and applied AI subareas are being investigated through a suitable robotics platform, including several Amigobots, Lego Mindstorms and a generic tool kit from which to run these robots. This latter system has been developed mainly by Colin Witow during the completion of his Masters’ thesis and enables a user to operate and interact with different types of robots via a friendly graphic interface. The user can, for example, select a given task, the resources (robots) needed for this task, and the AI solving methods used to obtain the solution (plan) required to achieve the task. One or more plans will then be proposed to the user who will decide to simulate the execution of the planer or to execute this later using the chosen robots. Undergraduate students Vili Bogdan, Ricky Sum, Kevin Bedel, Jieshan Liu, Roger Barbour, and Qiong Wu have contributed to this project by implementing several image processing techniques and AI algorithms based on tree search, stochastic local search, generic algorithms, and neutral networks.

One of the challenging tasks we are currently conducting in the robotics lab is multiple robot motion planning in a dynamic and unknown (or partially known) environment. Motion planning algorithms for a single mobile robot have been intensively discussed in the previous years. In an environment that contains only stationary obstacles, path planning methods guarantee to return optimal paths in polynomial time, if any exist. However, planning in a dynamic environment with moving obstacles is harder and requires an exponential time cost algorithm, even for a two-dimensional space. Moreover, the problem is more challenging if we are dealing with multiple mobile robot motion planning under uncertainty. Indeed, a key issue in handling the uncertainty in an evolving world is how to model it so that it can be effectively accounted for at the multiple robot motion planning stage.
Computer games, movies and multimedia applications are making more and more use of high-tech audio and it is the mandate of the newly established aRMADILo to explore and develop techniques and technologies in the context of this rapidly growing research area. aRMADILo stands for the Rough Music and Audio Digital Interaction Lab and was co-founded by Dr. David Gerard and Dr. Dominic Slezak with initial grants from the Canadian Foundation for Innovation and the Saskatchewan Innovation and Science Fund.

aRMADILo has facilities for studying audio from the waveform level through to the symbolic level. High quality microphones and a sound isolation enclosure (the cube of silence) allow for the in-situ multi-channel recording of human and environmental sounds. A collection of midi-base musical instruments, including keyboards, a drum kit, trumpet, clarinet and guitar, allow for the study of the highly detailed human control information necessary to make music. Four high-end dual-processor, dual-display workstations and 2TB file space provide the computer power required to analyze, classify, and interactively explore the work of computer audio. Cubase, Matlab and MacMSP are three of the software packages resident in the lab, adding support for recording and mixing, analyzing, and developing interactive applications. Each workstation has high quality head phones and the lab has three surround sounds systems, in 5.1, 7.1 and octophonic configurations.

Areas of investigations explored by aRMADILo include surround sound and audio realism, music information retrieval and library searching, and music interfaces and instrumentation. JJ Nixdorf is a graduate student working on new interfaces and implementations for real-time surround sound. Most modern performed music is presented in one or two channels (Mono or Stereo), but many musically interesting effects could be utilized if full spatialization were available to performed music. Spatialization is the modification of sounds source to come through a group of speakers at varying amplitudes providing the perception of the sound coming from a particular location. These effects are pre-composed (in the case of movies) and occasionally rendered on the fly (in the case of video games) but little work has been done to date on real-time interaction with spatialized sound sources. JJ’s work involves the development of a usable interface allowing the manipulation of multiple sound sources in a virtual space, as well as the development of the underlying algorithms to move the sounds sources appropriately. His system could also be used to compose sound effects in real time, acting to the foley artist or to provide spatialization of actor voices in a theatre piece on stage.

CS 890 CG is the graduate level Audio Topics course run by Dr. Gehard every couple of years. In it, graduate students explore topics that relate to, but are not necessarily limited to, the mandate of aRMADILo. In this past offering of the course, several students undertook interesting projects that made use of the facilities available in aRMADILo. These projects included a predictive music visualization system that produced winamp-like visualization based on what was about to happen in the music track, thus evoking a stronger connection between the sound and the visuals; an automatic face animation system that received speech from a microphone, extracted phoneme information, and produced corresponding mouth motion; and a study of the differences in spatialization perception between different people using the head-related transfer function.

Other research projects of note related to the lab include explorations of alternate interfaces for music and alternate use of music interface knowledge, development of music interface systems for people with disabilities, and composition of multimedia art work and instillations.

There are many opportunities for research work in aRMADILo for interested graduate students or upper-level undergrads. For more information, contact Dr. David Gehard at david.gehard@uregina.ca, explore the aRMADILo website at http://armadilo.cs.uregina.ca/, or drop by the lab, which is located in the lab building, room 143.
Liqiang Geng is celebrating being awarded the degree of Doctor of Philosophy, the University of Regina’s highest academic degree. He also holds a Bachelor of Engineering and a Master of Science in Engineering with a major in Computer Application from Hefei University of Technology in China.

Dr. Geng’s doctoral work focused on efficient summary mining based on user expectations. Summary mining is one of the key issues in Online Analytical Processing (OLAP) systems. An OLAP system finds many summaries from large databases and presents these summaries to the user. It is tedious for the user to navigate through these summaries to select the interesting ones. Dr. Geng proposed a software architecture called the GenSpace summary mining architecture, that uses probability based belief revision techniques to automatically find interesting summaries that are far from the user’s expectations. Various pruning techniques are proposed to improve the efficiency of the mining process. Good experimental results on the real data sets showed the effectiveness of the proposed techniques.

During his studies at the University of Regina, Dr. Geng participated in various research projects in the Department of Computer Science, TRLabs, and the Energy Research Unit. He has an enviable publications record with 12 papers in referred conferences, journals, and books.

Dr. Geng wishes to thank his supervisor and committee members, as well as family and friends. He also acknowledges the Faculty of Graduate Studies and Research and the Department of Computer Science of the University of Regina, TRLabs, Farm Credit Canada, and the Natural Sciences and Engineering Research Council of Canada for financial support during his studies.

Congratulations to Dr. Daryl Hepting and two colleagues from Arts, Drs Chris Oriet and Katherine Arbuthnott, for their successful proposal for funding through the CFI Leaders Opportunity Fund, “Regina Integration Cognitive Experimentation (RICE) Lab.”

Congratulations to those faculty members who received Tenure as Associate Professors effective July 1, 2006: Dr. Daryl Hepting, Dr. Samira Sadaoui, and Dr. Boting Yang.

Qiong Wu - University Prize in Science, Fall 2006
The University Prize in Science is awarded to the most distinguished student graduating with a first degree from the Faculty of Science.

Qiong graduated from the Joint International Degree program with Shandong University with a Bachelor of Science degree (Great Distinction) in Computer Science with a minor in Mathematics. She has been presented with numerous awards for her academic achievements including an Academic Gold Scholarship, an Academic Silver Scholarship, the John Spencer Middleton and Jack Spencer Gordon Middleton Scholarship, the Canadian Information Processing Society Bursary and Queen City Section Bursary. She has also been on the Dean’s Honour List through the duration of her academic career.
New Faces

Junying Chen
Supervisor: Dr. Cory Butz
Research Interest: Data Mining

YanFei
Supervisor: Dr. Philip Fong
Research Interest: Software Engineering

HaoGuo
Supervisor: Dr. XueDong Yang
Research Interest: Computer Graphics

Syed Hassan
Supervisor: Dr. Daryl Hepting

Xun Huang
Supervisor: Dr. ChangNian Zhang
Research Interest: Computer Networks

Shahid Hussain
Supervisor: Dr. Daryl Hepting

Dongwon Kim
Supervisor: Dr. JingTao Yao
Research Interest: Application Performance

Leila Latifi
Supervisor: Dr. Daryl Hepting

Xiaxia Li
Supervisor: Dr. Brien Maguire
Research Interest: Multi Media Tech. Software Eng.

Pan Liu
Supervisor: Dr. Philip Fong
Research Interest: Software Engineering

Garrett Nicolai
Supervisor: Dr. Robert Hilderman
Research Interest: Artificial Intelligence

Lijuan Peng
Supervisor: Dr. David Gerhard
Research Interest: Human Computer Interaction

Changseok Roh
Supervisor: Dr. Brien Maguire

Mondelle Simeon
Supervisor: Dr. Robert Hilderman
Research Interest: Parallel and Distributed Processing

Yu Song
Supervisor: Dr. JingTao Yao
Research Interest: Database & Computer Network

Hongya Sun
Supervisor: Dr. Philip Fong
Research Interest: Programming, Multimedia and Network Communication

Jin Wei
Supervisor: Dr. ChangNian Zhang
Research Interest: Artificial Intelligence

Peijia Xu
Supervisor: Dr. Brien Maguire
Research Interest: Software Development

Xiaojing Zhang
Supervisor: Dr. JingTao Yao
Research Interest: Information Processing in e-commerce

Zhen Zhao
Supervisor: Dr. Philip Fong
Research Interest: Software Security

Bing Zhou
Supervisor: Dr. YiYu Yao
Research Interest: Web Intelligence
CS Students Participate in Annual Graduate Conference

Computer Science students continue to show their support for innovation and research by participating in an annual graduate student research conference organized by the University of Regina Graduate Students’ Association entitled, ‘Putting Theory into Practice: Transferring Creativity into Community Wisdom’. The goal of this interdisciplinary conference is for senior undergraduate and graduate students at the University of Regina to present their research at a level that can be understood by members of the general public. Currently in its second year, the conference has included prominent keynote speakers, Dr. Roberta Bondar (2006) and Maude Barlow (2007). Dr. Bondar was Canada’s first woman astronaut and the world’s first neurologist in space, while Ms. Barlow is the National Chairperson of the Council of Canadian Citizens, Canada’s largest citizen’s advocacy organization, and works diligently to stop the commodification of the world’s water. Presentations given by Computer Science students include:


We hope to see another strong turn out for next year’s conference. Notices for organizing committee members, event volunteers, and the call for participation will be distributed by the Graduate Students’ Association.

Computer Science Thanks Visiting Scholars

Dr. Marcin Stanislaw Szczuka from Institute of Mathematics, Warsaw University, Warsaw, Poland August 1 to December 30, 2006.

Dr. Mohua Banerjee from Department of Mathematics & Statistics, Indian Institute of Technology (IT), Kanpur, India September 1 to November 30, 2006.

Dr. Piotr Tomasz Wasilewski from Psychology Faculty, Warsaw University, Warsaw, Poland May 16 to July 30, 2006.

New Courses

**Computer Science 215 – Web Oriented Programming**

CS 215 is oriented towards network programming. Its lecture component consists of a comprehensive study of Java programming language on both an introductory and advanced level. The network programming component involves applets, elements of concurrent programming (multithreading), client and server program development and network database connectivity.

The students get hands-on experience in the labs which, in addition, introduce network program development products and Java Script.

**Computer Science 280 - Social and Professional Aspects of Computer Science**

This is a new required course for CS students which explores the changes that computer technology has made to our interactions and society, from privacy concerns to music downloads to computer crime.

We will examine the history of computing and the internet, we will debate current philosophical, legal and moral implications of new technologies, and we will see how countries treat these issues differently. We will also investigate ethical and professional responsibilities of a computer scientist, considering official codes of conduct and specific case studies.

**Computer Science 409 – Interactive Entertainment Software**

This course teaches the design and implementation of interactive entertainment software, including computer games. Topics include: interactivity, principles of interactive entertainment, hardware platforms, current software development tools and languages, game loop, real-time requirements, design of virtual worlds and characters, incorporation of multimedia resources, evaluation, and aesthetics.
Computer Science Student’s Society (CSSS) News

The Computer Science Student’s Society is excited about the upcoming year. We plan to continue to offer services and exciting educational events to all of our members.

A big thank you to the executive members for the 2006 – 2007 academic year: Adam Knutson (President), Nathan Anderson (Vice-President), Aaron Deobald (Treasurer), Matthew Demyen (Secretary), Jasmine Kulbida (Events Director), Ben Barnard (Membership Director), Mike Hamilton (Communications Director), David Hopkins (General Executive), Nick D’Autremont (General Executive) and Jeff Cliff (General Executive). Elections for the 2007-2008 executive were held in March 2007.

We are upgrading our forum this year for better security and usability. We are continuing to add pictures to the gallery of the events we hold throughout the past year.

We are planning on focusing more time for all ages events as well as our Beer and Pizzas. We started off the year with our first Beer and Pizza scheduled on September 14th. The following Saturday we held our first Video Games Night in the multipurpose room for all CS students. We had video games, board games and pizza and snacks available. Over the next several months we plan on having two more Beer and Pizzas, a CIPS Pool Night or other CIPS event, a Wonderland Arcade Night, Bowling Night, a Curling Bonspiel, a Mini Golf Tournament, and a Badminton Tournament, just to name a few.

In March 2006 we held our first Graduate Banquet. It was well received by students, faculty, and industry. A second annual dinner is anticipated. Stay tuned for more information.

We are currently looking for some sponsors for this year’s memberships. R-Dot, the local LAN group, is a continuing partner with CSSS and always offers our members a deal at their events. Great Western has agreed to be our sponsor this year and they will provide us with beer and prizes for our Beer and Pizza events.

We are once again offering members free software through the MSDNAA using the online checkout service.

We hope to once again join several sports leagues, including indoor/outdoor soccer and volleyball. Last year the CSSS won the U of R Recreation Award for most involved team. We now have a plaque to hang up on the wall.

This year should be busy and exciting. As always, our continuing goal is to recruit more first- and second-year students to help keep the CSSS strong for future years to come.

Congratulations to Mr. Ken Konkel, an M.Sc. student working with Dr. Butz, for receiving an NSERC Industrial Postgraduate Scholarship worth $35,000.

CSSS Graduate Banquet and Dinner

This year the CSSS, with much help from the CS Department, held our first annual Graduate Banquet and Dinner. It was held on March 23rd, 2006 at the Queensbury Convention Centre. We had approximately 140 people in attendance, which consisted of students, staff and industry. We hired “Round Midnight”, a local jazz band fronted by Ross Purse, to play during the cocktail hour. Our guest of honour this year was Dr. Larry Symes. Not only did Dr. Symes make a presentation, but two of his long-time associates and friends made some remarks about him. Our guest speakers were Dr. Stephen McClatchie and Dr. Cam Blachford.

After Dr. Symes had spoken, we introduced all of the graduating undergraduate and graduate students that were attendance. We also supplied a complimentary program and student booklet to attendees. This booklet contained the listing of the evening’s events, as well as mini-resumes of the graduating students. This was to help the industry put the student’s names to faces. All in all, the event was well received and deemed a success. We hope that upcoming banquets will be even bigger and better than the first.
The 2006 Executive of the CSSS

Aaron Decbald
Ben Barnard
Nicholas Dautremont
Nat Anderson
Mike Hamilton
Matthew Demyen
Jeff Cliff
Jasmine Kulbida
David Hopkins
Adam Knutson
Rita Sarman

I am a new graduate from the University of Regina. I graduated in June of 2006 with a degree in Computer Science. I enjoyed my study in this area.

As I was getting close to finishing my degree (early in February), I started applying for jobs and secured an offer from SaskTel. I had previous experience as a two-time summer term clerical associate with this company which helped me learn the company environment and policy.

Now, I work there as a Programmer Analyst in the Data Warehouse. I am always learning something new, either from formal training or from day-to-day experiences. With my co-workers’ help and cooperation, I feel very comfortable and enjoy my work every day. Getting a job at SaskTel right after my graduation is like a dream come true for me.

Simon Orr

Solvera is a consultant group dedicated to delivering innovation IT solutions to their clients. Solvera’s services range from management consulting to running critical systems. Clients are helped in developing effective business strategies and improving their business processes. Projects with Solvera include works for SaskPower, SaskTel Mobility, CUETS and a few others. As a consultant for Solvera, I will be providing ongoing support, maintenance and enhancement as it relates to specific modules and the integration to other modules. Continuous documentation is expected, as the business and development process is strictly adhered to.