@dcs

2010

Computer Science
UNIVERSITY OF TORONTO

The Art of the Impossible:

The theory research group explores and defines the boundaries of computing

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inside:

Message From The Chair

Welcome to **@dcs**, the annual newsletter of the Department of Computer Science. As always I welcome the opportunity to share news and activities, and offer a brief glimpse of life within DCS with our friends, colleagues and partners.

I want to open by expressing the great sadness experienced across the Department at the unexpected loss of one of our colleagues and close friends in January. Professor Sam Roweis was a member of DCS from 2001-2009, an outstanding scientist, and an enthusiastic and engaging teacher and mentor. Sam will be sorely missed.

The most prominent activity in DCS this year has been academic planning, as we chart our course for the next five years. Part of the planning exercise involves self-study, a critical assessment of our strengths – so we can leverage these as we plan for the future – and our weaknesses – so we can address them as we move forward. Naturally, there are always things that we can do better, and as the planning exercise within the Faculty of Arts & Science draws to a close in the late spring, we'll have further developments to share with you. But our self-study – a 42-page examination of our activities over the past five years – was especially gratifying for me, because it illustrated what a fantastic group of faculty, staff, students, and alumni make up the DCS family. Moreover, it is obvious that the whole is much greater than the sum of its parts.

Our self-study documents phenomenal research accomplishments alone. We've graduated more MSc and PhD students in the last five years than at any point in our history, with these students going on to positions at top-tier international universities, leading industrial research labs, or cutting-edge companies, or starting their own companies (*see the article on Thoora on page 12*). Our innovation in undergraduate education is second-to-none, as more of our undergraduates become engaged in

"Two international rankings this past fall confirmed the excellence we found in our own [departmental] self-study..."

research activities, service learning and other novel ways of engaging with our faculty and the world at large.

Two international rankings this past fall confirmed the excellence we found in our own self-study: DCS was ranked 8th internationally in the 2009 Shanghai Jiao Tong University Academic Ranking of World Universities (ARWU) in computer science; and the University of Toronto was ranked 8th in the world by the Times Higher Education-QS World University Rankings in the area of Engineering and Information Technology.

Moving on to more recent events, let me mention just a few important recognitions and developments on the research front. DCS (in collaboration with the Knowledge Media Design Institute) was awarded a $6M CFI/ORF grant to develop a new Center for Collaborative and Interactive Digital Media (CCDIM). The CCDIM will provide some amazing new research space on the 4th and 5th floors of the Bahen Center for collaborative research on

Editor's Note

2009-10 continues to be quite a year: our Research in Action showcase has gone from presenting 20 projects in 2008 to 52 projects at this past November's event; we also congratulated the latest CS graduates with a new Convocation celebration program created in 2009; our innovations in teaching have inspired a new newsletter section – check out some course highlights and information about our new Master's program on pages 6 and 7. As usual, we've included stories about our students, faculty and staff, and a profile of a start-up company that was founded by an alumnus (and currently employs a large number of our grads). Whether you're hoping to attend our department as a student, collaborate with our researchers, or are simply interested in learning about what we're up to here at the department, you'll find something in the 2010 issue of **@dcs**!

Sara Franca

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DCS Students Attend Annual Software Engineering Conference

From February 21st to 23rd, hundreds of undergraduate computer science students from across Canada gathered at CUSEC, the Canadian Undergraduate Software Engineering Conference, held annually in Montreal.

The event is mostly student-run and was co-chaired this year by Andrew Louis, a DCS alumnus. Delegates from each university were chosen to organize the trip for students from their own schools. Approximately 25 students from the three U of T campuses attended, and the Department of Computer Science provided a significant subsidy for students from the St. George campus.

Among the speakers were industry leaders from IBM, Twitter, EA, Yahoo and NEXJ. One particular highlight was keynote speaker Douglas Crockford, the founder of JSON. Students had the opportunity to listen to and mingle with the speakers and each other throughout the event. Special events during CUSEC included tours of EA in Montreal, a

CUSEC 2010.

two-day career fair, and a DemoCamp in which students showed off projects they had been working on. Students found this year's event to be a great experience; 2nd year DCS Software Engineering student Steven Isao Deutscher-Kobayashi noted, "CUSEC opened my eyes to many new ideas that left me feeling more connected to my area of study and the industry."

"CUSEC ... left me feeling more connected to my area of study and the industry."

Steven Isao Deutscher-Kobayashi

CSSU 2009-2010

By all accounts, the new executive of the Computer Science Student Union (CSSU) has had an extremely successful year, establishing new initiatives and expanding existing traditions. CSSU has made a particular emphasis on entrepreneurial leadership this year, hosting guest speakers from both well-established companies and successful start ups, bringing the undergraduate community into contact with some of the most successful and innovative minds industry has to offer, including guest speakers from companies such as Yahoo! and Apple. Alongside this new entrepreneurial focus, CSSU offered unique social events, such as dressing up and operating a Belgian waffle house to serve hungry undergraduates. As an orientation activity for new students, the student union organized a scavenger hunt around Bahen in order to familiarize new students with the building. Finally, as the term came to a close and winter reached its coldest, the CSSU warmed up with hot chocolate and a skating event at downtown Toronto's Nathan Phillips Square. With record-breaking attendance levels, CSSU enjoyed a successful year, making a major contribution in helping build a stronger undergraduate community.

Undergraduate Liaison and lecturer François Pitt chats with CSSU Vice President Elias Adum and President Eran Henig at the November UG awards reception.

(Left) First Year Liaison Balraj Jutla works in the "DCS waffle house."

RESEARCH PROFILE: TimbreMap

WHAT: A sound-based iPhone application to aid the visually impaired with indoor and outdoor map exploration. It conveys map patterns using directional, audio feedback based on how the user touches the screen.

WHO: Graduate students Alyssa Rosenzweig and Jing Su - supervised by Khai Truong (Human Computer Interaction) and Eyal de Lara (Networks & Systems), respectively.

THE CONCEPT: Frustrated that touch screen devices are primarily limited to those with satisfactory vision, Rosenzweig and Su

came up with the idea of TimbreMap. Similar to the iPhone's useful map application, which allows users to explore locations and find paths to destinations, they investigated exploration applications for the visually impaired. Rosenzweig and Su wanted to explore if touch-based interfaces can be effectively used to convey spatial and positioning information to visually impaired users.

HOW IT WORKS: TimbreMap conveys spatial layouts using directional, audio feedback from touch interaction. As a user touches the phone's surface, audible information lets the user know what exactly is being shown on the touch screen (e.g., what does the map look like). In order to express a complex layout such as a building floorplan, as the user interacts with the touch screen to discern the specific pattern, the system provides either explicit (e.g., hearing 'left' when the finger needs to follow a path that is going left) or implicit hints (e.g., a sound effect in the blank, undefined space) to indicate what a pattern looks like.

TESTING: TimbreMap went through several phases of iterative design as well as two user studies, one evaluating the system's ability to convey a basic pattern (e.g., slanted line) and the second to apply those techniques to the user constructing a mental map of a complex layout (e.g., building floorplan). All of the volunteers were nearly or completely blind.

FUTURE: While TimbreMap currently requires some practice to utilize it, the research prototype provides data which strongly suggests the technique is viable and effective. This project has the potential to make a huge impact, enabling the visually impaired to use a touch screen map application. Through additional programming and developmental effort, the technique may become a commercially available application. While the current research was conducted on an iPhone because it allows for multi-touch interaction and has a capacitive (as opposed to resistive) touch screen, TimbreMap has the potential to be implemented on other touch-based smart phones (e.g., Blackberry Storm).

An experiment participant interacts with the test iPhone device.

Team of Graduate Students Finds Success at HackU

Last October, Yahoo!'s HackU program made a stop in Canada, and hosted a week of tech sessions and a programming competition for students at the University of Toronto and the University of Waterloo. HackU is a three-day event consisting of guest speakers, technical showcases, and a 24-hour code-a-thon, in which teams of 2-3 students compete to create the most impressive hack possible. The winning hack was named "Pagical" and was built by a team of three University of Toronto Computer Science graduate students: Aran Donohue and Rory Tulk from the Software Engineering group, and Andrew Trusty from the Human Computer Interaction research group. After HackU, the Pagical team was invited to pitch their creation to YCombinator, a prominent Silicon Valley startup incubator.

Pagical lets users easily make documents that include content from outside sources, such as a Google Spreadsheet, Twitter, or any other web page, and stays up to date "automagically". This makes creating detailed, data driven documents nearly effortless, as well as enabling the user to combine existing web services in interesting ways. Multiple users can work on documents at the same time, just like in other popular online document editors.

At around 2:30 am, fourteen furious hours into the competition, the first version was working. The final changes were committed mere seconds before judging began. A more stable, second version was completed after the competition with two weeks of extra effort.

The Pagical application was impressive enough to catch the attention of Yahoo! recruiters, as well as the YCombinator startup incubator. While this did not result in a new enterprise, it earned the team a trip to California to pitch their product to the investors.

Grad Student Hassanzadeh Awarded IBM PhD Fellowship

This February, Oktie Hassanzadeh was the recipient of a distinguished 2010-11 IBM PhD Fellowship award. This awards program is an intensely competitive worldwide program, which honours exceptional PhD students who have an interest in solving problems that are important to IBM and fundamental to innovation in many academic disciplines and areas of study.

Oktie, supervised by Renée Miller, has had internships in two IBM labs (IBM T.J. Watson Research and IBM Almaden) and the support of several staff members and senior managers inside IBM, who worked with him during his internships. Oktie's work at IBM has so far resulted in two patent applications and several research papers, and his current research foci include data cleaning and integration, semantic link discovery, and web data management.
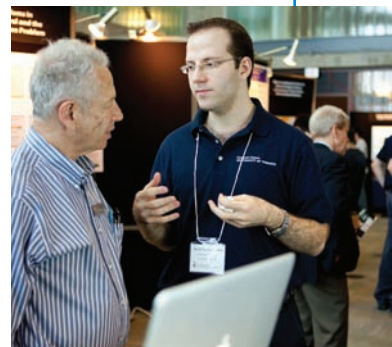
THE ART OF THE IMPOSSIBLE: The Theory group explores and defines the boundaries of computing

The DCS Theory research group has built an international reputation for exploring fundamental questions in computing. Mike Molloy articulates an underlying theme: "As theoreticians, we wish to rigorously establish what is and is not computationally possible." Theory uses mathematical techniques to understand the nature of computation and to design and analyze algorithms for fundamental problems. It's a sizeable group, composed of faculty members Allan Borodin, Mark Braverman, Stephen Cook, Derek Corneil, Faith Ellen, Vassos Hadzilacos, Avner Magen, Mike Molloy, Toniann Pitassi, Charles Rackoff, Sam Toueg and Alasdair Urquhart.

Unlike some areas of computer science that must constantly react to changing technology, theoretical computer science deals with fundamental issues that tend to remain stable over time. Some issues, such as those addressed in Stephen Cook's Turing Award-winning work on NP completeness, have been worked on for forty years and have led to the creation of new fields such as complexity-based cryptography. In the September 2009 Communications of the ACM, Lance Fortnow says, "The P versus NP problem has gone from an interesting problem related to logic to perhaps the most fundamental and important mathematical question of our time, whose importance only grows as computers become more powerful and widespread."

"There are computational problems that are provably not possible to solve," Avner Magen says. "For many problems, while proofs currently elude us, we have strong evidence that it is not possible to solve them within any reasonable amount of computational time or memory." In fact, these include many of the most important problems in computer science. While this may sound like bad news to some, for theoreticians, it is one of the greatest triumphs of their field. This is a fascinating and fundamental property of the intrinsic nature of computing, and its discovery has had a deep and lasting impact far beyond computer science, affecting any area where researchers wish to solve such problems on a large scale.

These researchers are then challenged by the pursuit of alternative solutions to intractable problems. "We know we may only obtain non-optimal solutions but with proven approxima-

> ''We wish to... establish what is and is not computationally possible.''
>
> Mike Molloy

tions for many optimization problems," Cook explains. Faith Ellen elaborates that "exploring limitations can lead to innovative new algorithms, and understanding limitations by itself can be very informative."

The students attracted to this area are determined, smart, creative, passionate, and precise, and great at math. PhD student Anastasios

Brendan Lucier and Yevgeniy Vahlis work in the lab.

Some Theory Research Highlights

CRYPTOGRAPHY: In most computing applications, one typically is searching for an efficient algorithm. Cryptography turns the notion on its head, with "the key assumption being that we are not able to efficiently solve certain problems," using impossibility to keep information protected. Charles Rackoff focuses his research on cryptography, security and security protocols, and has been currently working with his students in the area of Leakage-Resistant Computation, that is, computing securely even if the hardware is leaking some information (e.g., by "side-channel attacks" such as monitoring power consumption) in an unknown manner.

COMMUNICATION COMPLEXITY: Mark Braverman will soon be joining the Theory group as its newest faculty. He is currently at Microsoft Research New England, exploring topics like computational learning theory and communication complexity, which is concerned with theoretical bounds on the amount of data that needs to be sent over a network in order to solve a certain problem. In a recent line of work, Braverman and his team have been exploring under what circumstances a protocol can be compressed into a more efficient one. These new results have implications for understanding the connection between information and communication in protocols and provable limitations on privacy in networked protocols.

DIFFERENTIAL PRIVACY: Differential privacy is a formal framework for studying how to provide global, statistical information to the public, while preserving individual privacy. In a nutshell, differential privacy requires that the published results of statistical analysis be "essentially the same" in a probabilistic sense, independent of whether any individual opts into or out of the data set. Toniann Pitassi, together with colleagues at Microsoft Research, has been investigating differential privacy in several new settings: situations where continual output is required, and situations where there are multiple databases. This gives rise to a differentially private model of communication complexity. Pitassi and coauthors have shown a surprising new connection between differentially private protocols and message compression, which in turn characterizes which functions can be computed in a privacy-preserving manner.

DISTRIBUTED COMPUTING: MSc student Phong Chuong, his advisor Faith Ellen, and a colleague at University of Texas have recently developed a new method for automatically converting any implementation of a sequential data structure into a provably correct and efficient concurrent implementation. The resulting implementations are particularly well suited for use with transactional memory, where a process requesting a data structure operation can decide to withdraw its request any time before the operation is completed.

ALGORITHM DESIGN: Visiting Danish PhD student Morten Nielsen, Allan Borodin and Charles Rackoff introduced a formal model for greedy algorithms which later provided the basis for some forms of dynamic programming and primal dual algorithms. PhD student Brendan Lucier and Borodin use the greedy model to study auctions that use a greedy allocation mechanism. PhD students Georgiou and Benabbas, together with Avner Magen and collegaues at UC Berekely, NYU and the Weizmann Institute are studying certain algorithmic paradigms that are based on convex optimization. They mainly consider classical optimization problems for which there are large gaps between the quality obtained by state-of-art algorithms and the quality that we know cannot be obtained. Recent studies show strong evidence that for a large class of problems, these optimization tools will perform as well as any other algorithm.

EXPLORING SOLUTIONS TO EVERYDAY PROBLEMS: Computer Science Course Takes Students Out of the Classroom and Into the City

"Good ideas are often simple ones." Keeping this in mind, undergraduate Alexander Lee and graduate students Akhil Mathur, Dejana Bajic and Tyler de Witt developed an approach for managing wait times with Short Message Service (SMS, or text-messaging). "Q-me", as it is called, was created as a part of a Department of Computer Science's capstone course developed for upper-year students.

This semester's capstone theme was "Government 2.0", and provided a platform for CS-related concepts and research that can make a positive change in the lives of Torontonians, using the data the City of Toronto has recently released to the public. (Toronto Open Data was launched at the Toronto Innovation Showcase forum in November 2009.) The key idea behind the Q-me project was to make it more efficient and comfortable for people to wait in places with particularly long line ups, such as passport offices and court services departments. After analyzing this issue, the team of CS students proposed a solution: sending text alerts to customers waiting in the queues (http://qme.tyler-dewitt.com/).

"Q-me" proves to be a very useful and cost-effective solution. The customers are periodically sent text messages informing them of their current position in the line. The phone numbers are provided voluntarily, unlinked with names and automatically stored in a database used for sending text alerts. "Q-me" could be helpful in a range of places, such as restaurants, doctors' offices, and at entertainment venues.

The capstone course also generated other interesting projects, including "i-Protect", in which users were granted the ability to see who had accessed their medical records. Another project, ServiceSeeker Toronto, helped users find the best place to live. The system takes into account priority of surrounding services desired by users and ranks them in an ascending order. The users can then zoom in and see an interactive 2D map with the potential properties as 3D graphics.

While these projects and others were built in class, the student groups found that the experience allowed them to hone their teamwork and networking skills. Students collaborated with team members, set up schedules and met with different city departments. As an added bonus, the students in the course had an opportunity to present at the City of Toronto's Innovation Showcase 2009.

Such courses provide great opportunities for both graduate and undergraduate students: undergraduate students leave with enhanced coding skills, and graduate students often chance upon thesis ideas. Of course, everyone benefits from making useful contacts within industry.

Professor Greg Wilson, who taught the course this past semester, viewed this as "an opportunity for students to venture into the real world. They can get practical experience, put theory to test and build a better rapport with the city they live in." Students are often humbled and surprised by the many interesting and challenging real-world problems that they can solve, while getting course credit. Greg noted, "It's important for the university to engage with the city; people need to make courses like this a priority."

CS Course Highlights

CSC 207: SOFTWARE DESIGN, taught by Paul Gries and Jim Clarke

In this undergraduate course, DCS students learn about tools every professional programmer should know about: version control, regular expressions, design patterns, teamwork, agile development, professional IDEs etc. 207 typically puts students into teams to complete a large Java project. What makes this course different is that last fall, students had the option to do a project outside the lab, for a non-profit organization. Two examples of such projects undertaken included a cellphone-based image browser for art in the Art Gallery of Ontario's collection and a Blackberry-based Remote Lab Experiment Monitor at the Ontario Cancer Biomarker Network.

CSC 290: COMMUNICATION SKILLS FOR COMPUTER SCIENTISTS, taught by Lil Blume

This undergraduate course offers targeted instruction and significant practice in the communication skills required for careers in computer science, something that is very important and too often overlooked. Participants are required to make oral presentations which are captured by multimedia web technology. They then have ample opportunity to review and refine their speaking skills and habits. Students also develop insight and build skills to help them work effectively in a team environment.

Students who have taken 290 discovered a significant improvement in their communication skills, making them more confident in scenarios such as collaborations with classmates on research, business interviews, and other interactions outside the classroom.

CSC 2526: TOPICS IN UBIQUITOUS COMPUTING: AUTISM & TECHNOLOGY, taught by Khai Truong

The topics presented in this graduate course typically vary from year to year; this past fall focused on Autism & Technology, and was presented in a lecture-style format. Ubiquitious computing concepts were grounded on how they could be applied towards helping to attack the problems presented by autism to either the individual and/or that individual's care giver. Students in the course worked on term-long projects individually or in pairs where they designed projects that could be potentially useful to this community. An example of these projects included a tool for assessing the written language patterns used by those on the autism spectrum.

ANSWERING THE CALL: DCS Professional Master's Program Set to Launch in Fall 2010

Over the last couple of years, the department has undertaken an ambitious, exciting enterprise: establishing a professional master's program within the field of computer science. As of this coming Fall, DCS is pleased to offer a new graduate degree: a Master of Science in Applied Computing. Students will spend the first eight months studying with the department's leading CS researchers, and then dedicate eight months to participating in an industrial internship.

The idea of a professional master's in computing came about as faculty members observed a number of graduate students joining the department for a graduate level education, but without necessarily hoping to be engaged directly in research. "Many students pursue graduate work because they want to put themselves into a better position to get better jobs," Professor Allan Borodin comments. "However, our students felt they would be better served by something that emphasized *applying* knowledge rather than discovering new knowledge. We wanted to be able to offer another academic option, in addition to our existing research degree."

This new program not only provides benefits to our students and faculty – the MScAC offers very real advantages to the industry partners who will be involved in the program, acting as mentors and hiring interns. The incredibly positive response from a range of local companies confirms this. "Our program is an inexpensive way for industry to stay current with research activity in computer science," Greg Wilson, a faculty member in the department, notes. "Companies can have a well-educated graduate student working on research problems within a company… without interrupting a student's thesis work." Borodin adds, "Not only is this great for the company, and a great experience for the student, but it also exposes the department to some of the challenges out there today. There are lots of interesting problems out there in industry, and this is a great way for DCS faculty and students to discover what these problems are."

In addition, Wilson observes, "while this program will work for companies of all sizes, we are really encouraged by the response we have gotten from smaller companies. This is an opportunity for industry to tap into U of T and get to know us, and provide an easier mechanism for tech transfer." In fact, it is this aspect of the pro-

gram that makes it so unique. "Unlike many 'professional' Masters programs," Chair Craig Boutilier remarks, "the internship will see students take research ideas from the laboratory and put them into practice in an industrial setting under the supervision of a faculty member. This will provide students training in the development and deployment of novel research techniques, and will facilitate knowlege transfer by getting important research ideas developed by DCS faculty and graduate students out of our labs more quickly. This is one of the only computer science programs of its kind in North America." The program is now something else the department can offer potential industrial partners, along with activities such as the successful undergraduate internship program, the Professional Experience Year.

It is managing the relationship between our students and companies that is both the most challenging and the most unique aspects of the MScAC. "This new program is not 'co-op', Wilson emphasizes. "This is a very carefully considered match between students and industry." Industry might be surprised to discover, for example, that there may not always be an obvious match between the business area they are in and the research they believe they need. Wilson uses the example of a large online retailer that approached DCS a few months ago: "They wanted a better system for recommending new products to customers based on past purchasing and browsing patterns. As a first step, four graduate students from our department spent several weeks trying out state-of-the-art algorithms on the company's data. The end result was that if they wanted a dramatic improvement, they would need to gather more information – they simply couldn't do much better with the data they had. This probably saved the company several programmer-years of frustration." Careful processes will be in place to determine what each company is looking for, what the department can provide, and what research might serve the need best. The MScAC is situated in a prime spot: a city like Toronto, with such a diverse range of companies of all sizes, working with such a broad range of research problems, should meld nicely with a department like DCS, which offers its own particularly diverse range of research expertise.

The program will ramp up slowly: this fall, only six students will be selected to participate, and it is anticipated that future enrollment will stay around 24 students. By keeping the group small, the department will build the strongest program possible, and ensure we provide the highest-quality experience to both students and industry. That being said, the department is looking for a different type of student, not a different quality of student. Borodin says, "We want students to recognize that this professional master's is not the 'easy version' of a graduate degree; it will still be just a rigorous as our research MSc and make serious demands on people's time." Wilson is quick to also note that "participating students are expected to be fully integrated into our community: going to seminars, being a real part of our research culture."

Clearly, this program is a creative response to a new climate of industrial and academic expectations. Wilson remarks, "The world off-campus is becoming more diverse – we see different business models on all kinds of scales… even with students, we're observing a different attitude towards career paths… this has challenged us to be more flexible and we've come up with a solution that's proving to be pretty attractive to students and companies alike."

See the MScAC webpage at www.cs.toronto.edu/mscac.

> **"This is one of the only computer science programs of its kind in North America."**
>
> Craig Boutilier

Grad student Michael Reimer presents research on "Improving Matching in the Tesseract OCR Package," work done in collaboration with the Adaptive Technology Resource Centre as a part of a DCS consulting course in 2009. The MScAC was designed to give students more opportunities like this, but with a longer timeline for a richer overall experience.

Derek Corneil: Retiring after 40 years with DCS

What do you like the most about the field of Computer Science? As a mathematician, I find it fascinating how CS is impacting many other branches of the mathematical sciences.

What has made DCS special for you? I am a "charter member" of DCS, having started my MA work (the CS degree was originally an MA) in the fall of 1964 when the graduate department started. There were 7 of us in the initial MA program and it was "preferable, but not required, that applicants know how to program" – only 3 out of 7 passed that hurdle, since this was well before there were any undergraduate CS courses.

In answer to your question, "the high research profile of our faculty and graduate students, as well as the collegiality of the staff". DCS has always been a fun place to work.

What research project have you enjoyed working on the most? That's a tough one. I guess it is the "Asteroidal triple free (AT-free) graphs" work with Stephan Olariu and Lorna Stewart. This is a family of graphs introduced in the early 1960s that had received very little attention before we studied them and showed that they have some interesting properties that generalize a lot of results known for various subfamilies.

Who has had the most impact on you and your research? That's an easy question - my PhD supervisor, Kelly Gotlieb. I modelled my graduate student supervising style after him, and, of course, he had a great influence on me as a researcher. Most importantly, as I was completing my PhD, I was hesitant to follow an academic career since I was worried that the time commitment would not allow for a full family life. Seeing Kelly, Phyllis and their children showed Barb and me that it is possible to have the best of both worlds.

What was your favourite course to teach? SCI199 - Beautiful Algorithms. This is a seminar first year course where I had a chance to explore what I feel to be the heart of CS. (Of course, I also had a chance to put an emphasis on graph algorithms.)

What accomplishment to date are you most proud about? Surviving being chair of the department from 1985 to 1990!

What are your hobbies? Telling and writing children's stories for our 10 grandchildren; collecting formal antique Canadian furniture, and more recently, art; camping and other outdoor recreation; all sports that I'm still able to play.

What are your plans after DCS? WHOA! I decided to retire so that I would have more time for research and family. I'm treating retirement as a "permanent sabbatical" and will be centered at DCS. You can't get rid of me that easily.

What is the fondest memory you have of DCS? After being with the department for over 45 years, there is no single such memory. Instead, it's a more general feeling of always having been very honoured to be a part of DCS and the University of Toronto. I have always felt that I have the best job in the world.

What will you miss most about leaving DCS? Sorry, I hope it's way too early to answer that question!

Awards

HERTZMANN NAMED OUTSTANDING YOUNG CS RESEARCHER

This March, faculty member Aaron Hertzmann has been awarded the CACS/AIC Outstanding Young Computer Science Researcher prize for 2009.

This prize is sponsored by the Canadian Association for Computer Science/Association informatique canadienne and recognizes young computer science faculty members at Canadian universities within 10 years of their Ph.D. who have made highly significant contributions in their careers, particularly to research.

Aaron, whose research focuses on questions in computer graphics, computer vision and machine learning, was one of only three computer scientists in Canada selected for this honour.

MILLER NAMED ACM FELLOW

This past December, Renée Miller was appointed a Fellow of The Association for Computing Machinery (ACM).

ACM Fellows are recognized for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community. This year's 47 Fellows come "from the world's leading universities, industries, and research labs, [creating] advances in computer theory as well as practice. These accomplishments... play a crucial role in driving innovations that are necessary to sustain competitiveness in an information-based society."

Renée has been recognized "for innovations in metadata management, especially the creation of tools to integrate, transform, query and analyze information."

BRUDNO RECEIVES 2010 SLOAN FELLOWSHIP

DCS faculty member Michael Brudno has been awarded a 2010 Alfred P. Sloan Research Fellowship this February.

These awards are intended to enhance the careers of the very best young faculty members in specified fields of science. This year, 118 fellowships were awarded in 7 fields: neuroscience, mathematics, molecular biology, chemistry, economics, physics, computer science. Mike's Sloan is in Molecular Biology (one of 12 molecular biology recipients across North America, and one of only five University of Toronto recipients in all disciplines).

Mike and his team are developing computational methods that will reliably detect genomic differences among humans using next-generation sequencing, a technology that is dramatically changing the way biologists acquire and analyse genomic data. Such advanced tools promise to revolutionize medical diagnostics and improve medical treatment.

STAFF PROFILE: Joan Allen

Where were you before your role at DCS?
I've been at the University for 25 years; I started with the Faculty of Physical Education and from there I went to Pharmacy, then to SGS. Finally, I was at the Computer Systems Research Institute until we merged with DCS.

What made DCS special for you?
I enjoyed the variety of tasks that I was given to do.

What is the fondest memory you have of DCS?
The people, especially the Database, Systems, Software Engineering and DGP research groups. They were very supportive, and always treated me as an equal. I will always miss Ken Sevcik's smile and kindness, Alberto Mendelzon's sense of humor, and the dog and camping stories with Dave Wortman - and all of the homegrown vegetables that Dave would leave on my desk! The parties with [faculty members] Renée, Marsha, Karan and Ravin… I had a couple of headaches after them! Most of the other faculty came later and they were all great to work with. Of course, I couldn't forget the students, who were fantastic. They included me in many of their celebrations, showed their appreciation for the work I did for them, and always remembered me when they went to conferences and brought me back trinkets from all over the world. They were all very kind.

What is the most interesting project that you worked on here?
I worked with Steve Halpern of the Math Department on the bid to get the Fields Institute housed at U of T, doing research for him. (This was also when Dave Wortman showed me how to use Latex.) Some other projects that I enjoyed working on include the John Mylopoulos Retirement Celebration in the spring of 2009 and the PODC/CONCUR Conference with Marsha.

What have you been doing since retiring from DCS?
Aside for my continuing support for Professor Ron Baecker in the Knowledge Media and Design Institute, I plan on spending more time with family and friends, travelling, doing home renovations that I have been putting off and just doing nothing if I feel like it!

What do you enjoy doing in your spare time?
I love to garden, read, do Japanese Punch Embroidery (BUNKA), try new recipes, and attend live theatre.

What will you miss most about leaving DCS?
As I mentioned before, I have made many friends over the years and I will miss them.

Staff Q&A

Relu Patrascu
Research Computing Support Specialist

What is your favourite part of your job?
The best part of my job is helping people and being able to make a positive difference in their work, as well as the challenge of working in a constantly changing research environment.
What do you enjoy doing in your spare time?
In my spare time I enjoy being with my family, nature outings, audio hi-fi design, and photography.

Linda Chow
Graduate Program Assistant

What is your favourite part of your job?
I've now been with DCS for almost 10 years and can say that I thoroughly enjoy assisting and counselling our graduate students with their programs.
What do you enjoy doing in your spare time?
I enjoy being with my family, walking through Old Unionville, and Toogood Pond Park.

Congratulations to Sara Burns
on receiving the Dean's Distinguished Service Award this spring!

The Distinguished Service Award is highly competitive, and is presented annually to a non-academic staff member who has, over the course of their years of service to the Faculty of Arts & Science at the U of T, distinguished themselves in a way that is beyond the expectations of administrative peers, academic colleagues and students. Sara was honored for her dedication and for "striving to make the department the best possible place to work and study."

GIVING TO DCS: I would like to contribute $ _____ to the Computer Science Departmental Trust.
Gifts to this project are used in the areas of greatest need, supporting student activities such as the Student Mentorship Program, special seminars and the First-Year Learning Communities program.

For more information, contact us at dcs-donations@cs.toronto.edu

Or visit **donate.utoronto.ca/computerscience**

Please send this form with your donation and full contact information to:
Annual Fund Office
21 King's College Circle
Toronto, ON M5S 3J3

In Focus

Message from the chair

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all aspects of digital media. Professor Renée Miller leads the Business Intelligence Network, a new $5M NSERC Strategic Network that brings together academic and industrial researchers from across the country. We received a number major faculty honors this year. Among them: Renée Miller was named as a Fellow of the ACM; Michael Brudno received a Sloan Research Fellowship and an Ontario Early Researcher Award; Mike Molloy and Richard Zemel received NSERC Discovery Accelerator Supplements; and Nick Koudas and Marsha Chechik received IBM Faculty Awards. Let me also recognize Mark Braverman, whose PhD thesis was awarded the 2009 Canadian Mathematical Society Doctoral Prize (the second DCS student to win the prize in three years). After spending two years at Microsoft Research, Mark will rejoin DCS as a faculty member, jointly appointed in the Department of Mathematics.

One of the most exciting developments this past year has been the development and approval our a new graduate program, the Masters of Science in Applied Computing. The MScAC offers a novel approach to graduate study, and will facilitate knowledge transfer and industrial engagement (*see story on page 7*).

Our undergraduate program continues to provide a superb educational experience and opportunities for research, industrial experience, and contributions to the community through service learning. We've added service learning components to five of our courses, spanning all four years of our program. And we're seeing increasing numbers of undergraduates come back to computer science after the North American drop in CS enrolments over the past seven years. This year saw DCS program enrolments increase by 13.4%, and more importantly, our gateway first-year courses saw increases of 32-52%. Given the insatiable demand for computer science graduates – recent studies suggest CS will account for 60% of all growth in science and engineering jobs over the next decade – this is fantastic news!

Before closing, I want to thank Sven Dickinson, who served as Acting Chair of DCS during 2008-09 while I was on research leave. He did a terrific job and didn't miss a beat.

As always, I encourage you to keep in touch. Let us know what you're up to personally or professionally. And if you're interested in engaging in any aspect of departmental life, whether keeping up to date or making contributions to our many activities in teaching, scholarship, or public outreach, don't hestitate to contact us!

Until next time **@dcs**,

Craig Boutilier
CHAIR, DCS

The Department Reaches Out

DCS faculty, staff and students came together this past December to give back to the community. Volunteers gathered at the Scott Mission, located a couple of blocks away from campus at College and Spadina, to serve meals to the city's homeless and assist in different areas at the mission. Since 1941, the Scott Mission has helped serve the poor and needy in the community.

In October, Lynda Barnes (Departmental Assistant) and Carolyn Ursabia (Administrative & Financial Assistant) came up with the idea of participating in a Thanksgiving food drive to support the Scott Mission. This December they suggested that DCS take things to the next level.

On December 17, thirty-five volunteers from the department signed up to help out at the Mission over two shifts. Jobs included preparing and serving full meals to about 300 people, putting together care packages in the Food and Clothing Bank, watching children in the Scott Mission Daycare, and assisting with clerical duties in the Business Office.

DCS has had a very successful start with these community efforts. During the food drive in October, faculty, staff and students contributed 12 boxes of non-perishable food and some funds to the food and donation drive; remarkably, this impressive amount was brought in in just a week's time. There was also a friendly element of competition involved: DCS folks in Sandford Fleming and Pratt competed with those in Bahen to collect the most food items. This spirit of competition inspired the volunteers and also added a lighthearted tone to the drive: it should be noted that the Sandford Fleming/Pratt group won the hand crafted trophy after collecting the greatest number of food items.

Though the December volunteer effort did not include a "contest" for the trophy, staff, faculty and graduate students readily volunteered their time. It was a productive day and the volunteers had a great time. According to Barnes, it was also "an opportunity for DCS to give back to the local community where many of us live and all of us work".

In fact, these DCS community efforts have inspired some other outreach ideas. A number of people have begun talking about starting a

> **"[This is] an opportunity for DCS to give back to the local community where many of us live and all of us work."**
>
> Lynda Barnes

knitting/crocheting club to make scarves and other items to later donate to the Scott Mission; others have come forward, hoping to volunteer at the Mission on a more regular basis. DCS hopes to plan for similar events in the current year and to further increase volunteer involvement at other organizations. This past Easter, in fact, the department organized another successful food drive. Judging from the feedback by participants, there should be no trouble finding helping hands and generous contributors for these future opportunities!

Events like the Thanksgiving Food Drive and the Christmas volunteering effort not only serve as an opportunity for individuals to help the needy, but also help foster a sense of community within the department. Volunteers leave with a rewarding experience, knowing, as Ursabia put it, "It could be anyone using the Scott Mission's services, so by volunteering our time, we do our part to help the less-fortunate get back on their feet." In a letter sent to DCS, the Scott Mission noted, "The kindness shown by the Department of Computer Science at the University of Toronto has enabled us to continue our work among the city's poor at this special time of the year."

INDUSTRY START-UP: Thoora

Started at U of T and based in Toronto, Thoora is a next-generation news service which identifies the most interesting stories online – highlighting social buzz in real time. This past September, Thoora was one of the three Canadian companies selected in San Francisco as a finalist for the TechCrunch50 conference, an organization created to identify and launch the most exciting new start-ups.

Thoora's team has strong roots in DCS. In Fall 2007, founder Chul Lee (DCS PhD) approached Kyu Lee and Byron Ma (undergraduates) with an interesting research project to work on. With the support of Professor Renée Miller, and working closely with Lee's supervisor, Professor Allan Borodin, they started studying blogs and forum data.

In Spring 2008, Thoora got its commercial break, receiving funding by Rogers' New Ventures program. The company rapidly increased in size with the addition of more members from the department.

Currently running in public beta, Thoora searches the entire blogosphere, Twitter and traditional social reaction to provide users with quick access to news. By inverting the traditional social reaction pyramid, it uses proprietary, cutting-edge filtering, clustering, and ranking algorithms to identify the stories with the strongest 'signals'. These signals are based on indicators like the "highest activity," "most-commented-on" and the "most-posted." Thoora then ranks the stories based on the strength of the reaction generated.

Thoora's automated approach integrates three content categories – blogs, Twitter, and traditional media coverage. It tears down the silos between social and traditional media to give readers a richer perspective on stories that really matter. This makes it easier for the average user to digest and follow up on large amounts of information, which might otherwise be overwhelming.

Thoora is unconventional in that it puts a spotlight on new voices. It takes into account the originality, quality and relevance of blog posts. Ultimately, readers win, for they get quick and unbiased access to the news making waves on the web.

Thoora continues to have a strong connection to DCS. The company currently employs 4 DCS PhD graduates (Lee, Periklis Andritsos, Francisco Estrada, Darius Braziunas) and 5 DCS undergraduates (Kyu Lee, Byron Ma, Mike Cvet, Ian Chan, Ken Struys).

On the benefits of hiring so many people from the same school, Lee replied, "DCS has provided us with what we consider the top talent in Canada – the PhDs have the required broad research experience and the DCS undergraduates have a strong preparation in both practical and theoretical aspects of CS. Thoora really benefits from such a fantastic combination."

> "[Thoora] tears down the silos between social and traditional media to give readers a richer perspective on stories that really matter."
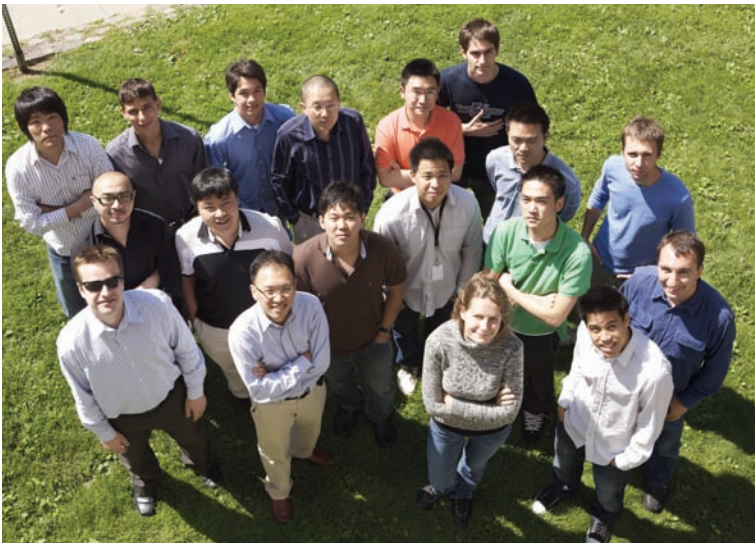
The Thoora Team

The Art of The Impossible

(continued from page 5)

Zouzias, working in Algorithms with supervisor Magen, comments, "I'm in a promising field believed by some to revolutionize our way of thinking about the world. I am proud of working in this group together with people that have formalized fundamental concepts on computer science, including computational hardness." Zouzias and his fellow students are exploring various career possibilities: "Coming out of a research area like Theory, we have a lot of opportunities available to us.

While Theory has traditionally been an area that sends graduates into academic positions,

more and more of the research group's alumni are finding themselves recruited into jobs at computer software and hardware companies, search engine companies, computer game companies, and positions in finance. Computational theory is a scientific field that touches virtually all facets of computing, including recent developments in algorithmic game theory (e.g., how algorithmic constraints impact classical economic results about self interested agents), algorithmic social networks (e.g., how influence spreads in large online social networks), and cloud computing (where the theory of dis-

tributed computing provides the underlying framework). All of these areas raise the question, 'to what extent can mathematical computational perspectives help?'

To hear the Theory faculty members discuss their research area and enthuse about its connections and possibilities is both exciting and makes one feel like they have fallen down Alice's rabbit hole. To be working on the fundamentals of computer science is daunting, as it requires one to look at CS as a whole, and in a more historical sense. As Borodin remarks, "we want to do work that has a lasting impact over decades."