CSE Professor Collaborates with Biologists

If you’re a biologist at the University of Minnesota who’s juggling a boatload of data, CSE Professor John Carlis is your go-to guy. He has helped soil scientists clean up their dirty data and ecologists make sense of chimp behavior. Projects have involved ab initio molecule structures, microarray chip design, 1-D plant sequences, 2-D rat brain images, and, unforgottably, 3-D human brain images for Alzheimer’s Disease.

Most notably, for the past four years, he has been part of an interdisciplinary team funded by the NIH and led by Regents Professor Ashley Haase that has successfully studied the earliest stages of HIV-1. (Search at www.pubmed.gov on “Carlis j” or “Haase a” to get to relevant articles.) Three articles appeared in the Journal of continued on page 2

Left: A micrograph image from Carlis’ Nature paper.

GAANN Fellowships to Promote Diversity in Computer Science

A team, led by Professor Maria Gini, was awarded a prestigious grant from the Department of Education. This grant will provide three GAANN (Graduate Assistance in Areas of National Need) fellowships for graduate students.

These fellowships provide salary and tuition for students with excellent academic records who demonstrate financial need and who plan to pursue a Ph.D. in Computer Science. GAANN fellows must be U.S. citizens or permanent residents. The fellowships are for up to three years.

The fellowships will contribute to strengthening our Ph.D. program by improving recruitment and retention of a diverse population of students and by preparing them in a timely manner for an academic or research career.

The team that will supervise the GAANN fellowships is chaired by Maria Gini, and includes Daniel Boley, Victoria Interrante, Amy Larson, Jon Weissman, and Antonia Zhai.
Infectious Diseases, garnering a praising editorial and two issue cover pictures. Another article appeared in Nature [1] and was later given the award for the "Best Basic Science Paper in Retrovirology" in 2005 by the journal Retrovirology. (HIV-1 is a retrovirus.) Doing interdisciplinary work requires acquiring a good deal of knowledge about different fields, and learning the language used by researchers in those fields. If this seems simple, read the next paragraph, which is the abstract from the Nature paper.

“In early simian immunodeficiency virus (SIV) infections and its human counterpart (HIV-1), gut-associated lymphatic tissue (GALT), the largest component of the lymphoid organ system, is a principal site of both virus production and depletion of primarily lamina propria memory CD4+ T cells; that is, CD4-expressing T cells which previously encountered antigens and microbes and homed to the lamina propria of GALT. Reported here is that peak virus production in gut tissues of SIV-infected rhesus macaques coincides with peak numbers of infected memory CD4+ T cells. Surprisingly, most of the initially infected memory cells were not, as expected, activated but were instead immunophenotypically 'resting' cells that, unlike truly resting cells, but like the first cells mainly infected at other mucosal sites and peripheral lymph nodes are capable of supporting virus production. In addition to inducing immune activation and thereby providing activated CD4+ T-cell targets to sustain infection, virus production also triggered an immunopathologically limiting Fas-Fas-ligand-mediated apoptotic pathway in lamina propria CD4+ T cells, resulting in their preferential ablation. Thus, SIV exploits a large, resident population of resting memory CD4+ T cells in GALT to produce peak levels of virus that directly (through lytic infection) and indirectly (through apoptosis of infected and uninfected cells) deplete CD4+ T cells in the effector arm of GALT. The scale of this CD4+ T-cell depletion has adverse effects on the immune system of the host, underscoring the importance of developing countermeasures to SIV that are effective before infection of GALT.”

In simpler terms, SIV and HIV-1 are sneaky retroviruses which hijack the immune system, using its activated (“+”) state to establish a persistent infection very early – after which the host cannot be cured, although treatment can somewhat reverse its effects and prolong life. The establishment takes place very early – before symptoms appear – and does so via a mechanism using T cells that were thought to be resting and thus not susceptible to the virus.

The amount of data that scientists have been able to capture has increased over the years. New data capture tools, microarrays in the HIV-1 studies, reframe scientists with orders of magnitude more data than they are accustomed to handling – from data about a few genes to about 10,000, of those “merely” 200 were "differentially expressed". Clustering by expression levels was of little value and was followed by laborious literature study, more and different experiments, and intense noodling to formulate a systemic diagram that told a coherent story about the changes in gene expression before versus after treatment and the complex molecular mechanisms underlying those changes.

The HIV-1 project has primarily involved Carlis helping to articulate, for a more general audience of scientists, rather than just HIV-1 researchers, a research result argument presented precisely but succinctly. He has applied his one-draft PhD thesis way of work. (See the "One Draft" paper on his webpage.) The core of this way of work has emerged from his data modeling and querying research.

Recently, Carlis has embarked in a similarly complex research adventure with another interdisciplinary team of colleagues looking to find biomarkers for early detection of oral cancer focusing on mass spectrometer analysis of saliva samples.


NSA Names the U a Center for Academic Excellence in Information Assurance Education

The University of Minnesota Information Assurance Center, led by CSE Professors Zhi-Li Zhang, Yongdae Kim, and Nick Hopper, has been recognized by the National Security Agency as a National Center of Academic Excellence for Information Assurance Education (CAEIAE). The goal of the program is to reduce vulnerability in our national information infrastructure by promoting higher education in information assurance (IA) and producing a growing number of professionals with IA expertise in various disciplines.

Under the Center of Excellence Program, universities apply to receive the designation. Each applicant must then pass a rigorous review demonstrating its commitment to academic excellence in IA education. During the application process applicants are evaluated against stringent criteria in teaching, research, and outreach. Designation as a CAEIAE is valid for three academic years, after which the school must successfully reapply in order to retain its CAEIAE designation.

CAEIAEs receive formal recognition from the U.S. government for their role in securing our nation’s information systems. Students attending CAEIAE schools are eligible to apply for scholarships and grants through the Department of Defense Information Assurance Scholarship Program and the Federal Cyber Service Scholarship for Service Program (SFS) from the National Science Foundation (NSF).
Message from Vipin Kumar, Department Head

Judging from the discussions at this years’ biennial meeting of the Computing Research Associations at Snowbird, there is now a growing consensus in the computing community (both academic and industry) that we collectively need to take urgent actions to change the way our field is perceived by the society at large. The demand for computer professionals continues to be strong with healthy growth projected for the years ahead. But across the country, undergraduate enrollments in computer science are down about 40% to 50% since the peak of the Internet boom days. What is even more alarming is that the drop in enrollment for female students has been much more drastic than that for male students, making the gender gap even worse than what it was 5 years ago. While enrollments are now beginning to stabilize at many places (including Minnesota), there will be a great shortage of computer science and engineering graduates in the years ahead unless we can substantially increase the enrollments from the current levels. This will only be possible if we can excite the younger generation as well as women and minorities to pursue careers in CSE in greater numbers.

Our faculty and students have been active in addressing these issues, and this newsletter contains several related items. A team led by Professor Maria Gini just received a highly competitive grant from the Department of Education to support three graduate fellowships in areas of national need (e.g., computer science and engineering). A specific goal of this program is to improve recruitment and retention of a diverse population of students and prepare them for academic or research careers. Kelly Cannon, with the help of her fellow graduate students as well as faculty, organized a day camp to introduce children to our department and to technology in general. The camp was directed towards female, and African American and Hispanic children from 5th through 8th grades.

This was a particularly good year for our faculty and students for receiving awards and recognition. Two of our faculty members received the prestigious McKnight Land-Grant professorship that is awarded to only about 10 young faculty members in the entire university each year. In addition, Nick Hopper received the highly competitive CAREER award from NSF's Faculty Early Career Development (CAREER) Program. Three graduate students received highly competitive awards. Shana Watters was honored by a $10,000 Google Anita Borg Scholarship that recognizes outstanding female students in computer science and engineering who can become active role models and leaders. Katherine Panciera became one of the 60 recipient nationwide of an NSF Graduate Fellowship in the area of computer science and engineering. Andrew Drenner received a University of Minnesota Graduate School Fellowship in a university wide selection. I would also like to congratulate Mark Coyle (BS 1991, PhD 1997) for his recent promotion to the rank of Vice President at Oracle Corporation. Additional information about these awards is included in the newsletter.

The MSSE program continues to grow and flourish under the umbrella of UMSEC, and has now built a sizable base of alumni in the local industry. Earlier this year, UMSEC organized a highly successful symposium, Code Freeze, that brought together an excellent set of speakers as well as MSSE alumni and our industry friends for this 1-day event. Inspired by the success of this event, UMSEC plans to make this an annual event.

To align ourselves with the strategic priorities of the University, this past year our department chose to focus faculty recruiting exclusively in the area of bioinformatics. This is a particularly difficult area to recruit due to its popularity and high demand from many universities and industries. We are very happy to have recruited Ray Kuang from Columbia University who will be joining us this Fall. I would like to thank recruiting chair, Professor Nikos Papanikolopoulos and other committee members, who spent an enormous amount of time and effort in screening and interviewing qualified applicants.

We have just hired a full time staff person, Robyn White, who will be responsible for all external communications for the department and for strengthening relationships with our alumni and industrial partners. Robyn will start work later this summer and will be in touch with you to seek your ideas and suggestions. If you have not done it already, please do sign up on the alumni web page (accessible from our department web page) so we can have up-to-date contact information about you.

Vipin Kumar, Head of the Department of Computer Science and Engineering, and Andrew Odlyzko, Director of the Digital Technology Center, presented CSE alumnus Ted Johnson with a framed print of Professor Baoquan Chen’s scan of the stone arch bridge on Thursday, May 11, 2006, in the Digital Design Consortium’s lab in the Walter Library Digital Technology Center. The Digital Design Consortium was funded through a gift made by Linda and Ted Johnson.

Johnson Presented Scan of Stone Arch Bridge
Faculty Receive Major Awards

Several CSE faculty have received major awards recently. Nick Hopper, receiving the National Science Foundation faculty development (CAREER) award, and Yongdae Kim and Stergios Roumeliotis received the University’s McKnight Land-Grant Professorship. Yi- pin Kumar was named Fellow of the ACM and received the Technical Achievement award from the IEEE Computer Society.

Nick Hopper - NSF CAREER Award

The CAREER program is the NSF’s most prestigious award for new faculty members. The program recognizes and supports the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century. Professor Hopper joins a long list of department recipients: Yongdae Kim, Jon Weissman, William Schuler, Eric Van Wyk, Baoquan Chen, Nikolaos Papanikolopoulos, George Karypis, Victoria Interrante, Joseph Konstan, Zhi-Li Zhang, and Mats Heimdahl.

Nick Hopper

The continued expansion of business, commerce, personal communication, and entertainment on the Internet has influenced our lifestyles in many ways. The availability of round-the-clock instantaneous communication is so convenient that we seldom think about the potential negative consequences of "online living." CSE Assistant Professor Nick Hopper does, however, and he worries. For example: how much does your ISP or your employer know about you? Your ISP could read everything you send through your email account, and even if you use encryption, they can figure out everyone you exchange emails with. Your ISP can track every website you visit, and how often you do so. Tracking such information can allow the ISP to build a detailed profile of its customers, including some information the customers might consider private — for example, the Smiths might want to access an online support group for families of drug addicts, but might not want AOL to know about this. At a more extreme level, a totalitarian government could use such information to monitor and repress its citizens.

Professor Hopper received the NSF CAREER award to study Information Hiding. Protocols for Information Hiding attempt to mitigate information leakage that encryption cannot prevent: steganography protocols attempt to conceal sensitive communication within innocent messages, anonymity protocols attempt to conceal the true sender and recipient of messages, and watermarking or fingerprinting protocols attempt to indelibly mark digital media objects to allow tracing of leaks. Traditional research in this area has featured an "arms race" between companies and researchers who propose and implement systems, and researchers (and hackers) who find new ways to break them. For example, in 2003 the US Navy funded the development of an anonymity system called Tor; this system was broken by researchers at Cambridge University in 2005.

Professor Hopper's approach is to use proof techniques from computability and complexity theory to reason about the security of these techniques. These techniques might let us prove that secure (digital) watermarking is impossible; or that if the Tor system provides at least a little anonymity, then it can be used to build a system that provides a high level of anonymity. Ultimately, the project is expected to result in a better understanding of how we can prevent our communications from leaking private information.

Professor Hopper joined the department in 2004. He received his Ph.D. in Computer Science at Carnegie Mellon University. His research interests include cryptography, computer security and theoretical computer science.

McKnight Land-Grant Professors

Yongdae Kim and Stergios Roumeliotis

The McKnight Land-Grant Professorship program aims to nurture the careers of the University of Minnesota's most promising junior faculty members. This prestigious award provides a year's leave from teaching and $60,000 to support faculty research. This year's winners join past CSE McKnight winners Eric Van Wyk, Baoquan Chen, Victoria Interrante, Zhi-Li Zhang, Mats Heimdahl, and Nikolaos Papanikolopoulos.

Internet applications such as Email and the Web as well as networked applications, such as e-commerce, telemedicine, and voice over IP, have already changed our lives. Furthermore, emerging network infrastructures are being built on top of the Internet (e.g., peer-to-peer overlay networks) or merged with the Internet (e.g., wireless and sensor networks). However, designers of emerging infrastructures and applications often do not consider security as one of their objectives, as evident in the security breaches reported everyday. In March 2006, a bank reissued credit cards used in several countries after detecting several hundred fraudulent cash withdrawals. As this example shows, as more and more private networks (such as government/medical/financial networks) are connected to the Internet, attackers have more opportunities and more incentives to attack our critical infrastructure. Professor Kim's research addresses this problem by building practical, yet provably secure and trustworthy next gener-
Suppose you are a robot trying to land at a specific spot on Mars; right now, you are probably going to get lost. Recent missions to Mars have landed tens of kilometers from their intended targets. Additionally, since spacecraft cannot autonomously detect and avoid hazards on the ground, large flat areas are selected as landing sites -- which guarantees they are not geologically interesting areas. Assistant Professor Stergios Roumeliotis is working to solve this problem. Prof. Roumeliotis' research on vision-aided inertial navigation systems (V-INS) for precisely tracking the position and attitude of spacecraft during their entry, descent, and landing (EDL) phase will significantly improve the pin-pointing capabilities of the next generation oflanders. For the first time landing sites will be targeted within a few meters. This will allow probes to reach areas of geological interest and increase the potential science return of missions to Mars, comets, and asteroids. This multi-year effort in collaboration with NASA's Jet Propulsion Laboratory (JPL) on designing real-time space-relevant estimation algorithms is not limited to EDL. Once the rover lands, it will need to explore the surface of the planet and create detailed maps of its surroundings. Determining the locations of its geological findings is of critical importance for revealing the geological history of the planet. This is a particularly challenging task since Mars rovers cannot rely on GPS. Prof. Roumeliotis' research group (mars.cs.umn.edu) has designed algorithms that solve this problem. Over the next months he and his students will travel to JPL to validate their designs on an actual Mars rover navigating within a mockup of Mars terrain. Furthermore, Prof. Roumeliotis is working on leveraging UMN expertise on V-INS for more earth-bound applications ranging from autonomous navigation of micro-aerial vehicles to instrumenting cameras with miniature inertial sensors for producing 3D photography.

Kumar receives two major awards

Professor and Department Head Vinip Kumar recently received two major awards, one from each of the main computing professional societies. The Association for Computing Machinery (ACM) has awarded Professor Kumar the distinction of Fellow. The ACM Fellows Program honors outstanding ACM members for their achievements in computer science and information technology and for their contributions to the organization’s mission. The selection process is highly competitive: each year only about 20 individuals are selected as ACM Fellows. Kumar is the first Institute of Technology faculty member to be named an ACM Fellow (and only the second from the U of M).

Professor Kumar also received the IEEE Computer Society’s Technical Achievement Award for contributions to the design and analysis of parallel algorithms, graph-partitioning, and data mining. This annual award (which includes a certificate and $2,000 honorarium) is presented for outstanding and innovative contributions to the fields of computer and information science and engineering or computer technology, usually within the past ten, and not more than fifteen years.
Graduate Student Awards

Three CSE graduate students won notable awards this spring. Katherine Panciera received the NSF Graduate Research Fellowship, Shana Watters the Google Anita Borg Scholarship, and Andrew Drenner the University Doctoral Dissertation Fellowship.

Katherine Panciera

While many students were planning for homecoming or working on homework last October, first year Ph.D. student Katherine Panciera was polishing up her application for the National Science Foundation Graduate Research Fellowship. Parts of it were easy: resume, letters of recommendation, GRE scores, etc. The research statement and proposal, however, took much more thought and preparation. But it all paid off. At the end of March, Panciera received the news she'd been waiting and hoping for: she'd won!

Before coming to the U, Panciera had limited CS experience. She had a CS degree, but it was earned in a small department with limited course offerings, and her only specialized study was a summer research project on robotics. The tangible element of robotics interested her greatly, but she didn’t know exactly what she wanted to study. So, to prepare her fellowship application, Panciera spent significant time exploring her other interests, primarily assistive technology and an inherent interest in working with people.

Through this process, Panciera discovered the world of assistive robotics, and, more specifically, developed an interest in assistive robotics for children with autism. She is planning to research, design, and evaluate robots to assist in therapy for these children. Several researchers at other universities have pioneered this area, and the financial support from the NSF fellowship will let Panciera visit and collaborate with these researchers as needed to advance her work.

The fellowship brings multiple benefits, including a generous stipend, tuition benefits, and travel funds. In recent years, NSF has awarded 900 fellowships annually to the 9000 or so students who apply. The fellowships cover a broad range of disciplines, from Biology to Political Science to Environmental Engineering. This year 60 fellowships were awarded to students studying Computer Science, Information Science, and Computer Engineering.

Shana Watters

Shana Watters has been awarded a 2006-2007 Google Anita Borg Scholarship. Watters, a Ph.D. student in Computer Science and a M.A. student in Linguistics, focuses her research on developing a reference resolution system that uses human processing as inspiration. This entails incorporating semantic information and attentional states in addition to using syntactic, grammatical, and surface feature information to better inform a reference resolution algorithm.

Established to honor the legacy of Anita Borg (http://www.anitaborg.org/aboutus/about_anita.html), the scholarship recognizes outstanding female students in computer science or related fields. This year Google received 324 applications from students at 90 different universities across the country and awarded 19 $10,000 scholarships based on the scholarship selection criteria which included: academic performance, letters of recommendation, answers to essay questions, and interviews with members of the review committee.

All 47 finalists, including the 19 scholarship recipients, were invited to Google on April 7th and 8th for an intimate workshop. The workshop culminated with a stimulating and challenging talk by Former Vice President Al Gore on global climate change.

Google will provide financial support to all 19 scholarship recipients to attend the 2006 Grace Hopper Celebration of Women in Computing in San Diego, CA, in October 2006. UMN students are active participants in this conference: in 2004, 17 female computer science students, both graduate and undergraduates, attended the conference in Chicago.

Andrew Drenner

Andrew Drenner has been awarded a 2006-2007 University of Minnesota Graduate School Doctoral Dissertation Fellowship. This Fellowship provides tuition and stipend for one year, letting Ph.D. candidates devote full-time effort to completing their research and writing their dissertation. About 90 Fellowships were awarded to Ph.D. candidates across the University this year.

Drenner is a member of the Center for Distributed Robotics led by Dr. Nikolaos Papanikolopoulos. His thesis work deals with developing methodologies for coordinating large scale robotic team operation for extended duration operations. This is part of a larger effort which requires the design of both hardware and software through collaboration between researchers from Computer Science, Electrical Engineering, and Mechanical Engineering. The work in Drenner’s thesis has potential benefits for the areas of unmanned reconnaissance and surveillance, urban search and rescue, and monitoring of hazardous environments and materials. In the past Drenner has received a National Science Foundation Graduate Research Fellowship as well as the University of Minnesota Graduate School Incoming Student Fellowship.
You cannot accuse the faculty and staff of the University of Minnesota Software Engineering Center (UMSEC, www.umsec.umn.edu) of being superstitious. They selected Friday, January 13, 2006 to kick off their first annual Code Freeze symposium. Amazingly, for a large first time event, everything went off without a hitch!

The symposium was the brain child of Mike Calvo, MSSE 1999 and MSSE adjunct professor. He suggested that UMSEC host an event between fall and spring semester to bring the Software Engineering community together. Ralph Foy, MSSE 2000, wondering if we could get anyone to come to campus in the dead of winter declared, “We should call it Code Freeze.” The name immediately caught on.

Jamshid Vayghan of IBM (2003 CSE Ph.D), agreed to chair the program committee and lined up the keynote speakers, James Rumbaugh and Bran Selic of IBM/Rational Software. Both are pioneers in object oriented modeling and analysis (think OMT and ROOM), have been very active in the Object Management Group, working on UML, Model-Driven Development, and spearheading Model-Driven Architecture. We adopted the theme Enterprise Architecture and Development and began soliciting speakers. The result was an impressive line-up of talent and topics. Other speakers included Dave Hussman of SGF Software, Don Monk from General Mills, Mike Calvo from Citronella Software, Nate Schutta from PTC, Jim Pichler from Digital River, and Scott Costello from Unisys.

Program, topics, and presentation slides are available at http://www.umsec.umn.edu/code_freeze/.

Rumbaugh’s presentation was titled “Changing Business and Software”. He discussed how raising the level of abstraction in application development will have dramatic impacts on the ability to translate business needs into software support. Selic discussed “Model-Driven Development: Its Essence and Opportunities”. He showed how model-driven development is beginning to have a real impact on development of real-time and embedded systems. Fully-automated code generation is a realistic goal, and is already being practiced in some areas.

The other speakers addressed additional interesting topics. Costello discussed the architecture-driven modernization and leveraging the value of existing applications to modernize your application portfolio. Hussman said he finds that success most often involves pragmatic designs incrementally implemented. Creating a shared vision via architectural means need not collide with agile principles and practices. Monk talked about “defense in depth”, a combination of technology, tools, policy and common sense. Calvo focused on current trends towards simplification of enterprise systems development. Schutta described how Ajax lets us provide a web user experience that is nearly indistinguishable from that of a thick client. Virtually every application can benefit from these techniques. Finally, Pichler shared his experience in a local company that survived the dot-com bust by balancing agility with a disciplined approach to business through technology.

The organizing committee would have been happy to attract 100 participants. However, the reality far outpaced expectations: more than 180 people attended! This isn’t even counting the 8 volunteers, 8 speakers, and UMSEC faculty and staff involved with coordinating Code Freeze 2006. The house was packed, there was lots of positive energy and many people came to campus who seldom, if ever, visit. Thanks to the hard work of Kimberly Kramer, John Collins, and the student volunteers, the event executed without a hitch.

UMSEC plans to present Code Freeze as an annual event. If you would like to be involved in Code Freeze’07 or have suggestions for topics/speakers, please contact Kimberly Kramer at kkramer@cs.umn.edu or 612-625-1381. If you would like to be notified of this and other UMSEC events, please sign up for the UMSEC events list at https://www.cs.umn.edu/mm-cs/listinfo/umsec-events.
Last summer, Kelly Cannon led a number of her fellow CSE graduate students in introducing a group of children to the department, and to technology in general, through the 2005 Summer Technology Day Camp.

The camp was directed toward girls, and black and Hispanic children, and had the goal of increasing familiarity with technology among those groups to assist them toward proportionate representation in the IT field. It was largely a success, Cannon says; her personal high point was that all the children seemed to enjoy themselves. Camp activities included:

- **Tours of CSE laboratories.** The children were shown around the robotics, computer vision, and virtual reality laboratories, and tried out the virtual reality hardware. The tour focused on the practical results of computer-science research and also exposed the children to “graduate students of varying sex, age, race, and geographic origin.”

- **Experiments with programmable dog-robots.** The children were exposed to the Sony AIBO robots, at first playing with them, and then writing their own programs to make the robots dance.

- **Construction of electronic circuits and robot kits.** In these activities the children were exposed to the physical side of technology, soldering together LED-flasher circuits and assembling Palm Pilot-based robot kits.

- **Transformation of images using Matlab.**

- **Racing of University-built robots through obstacle courses.**

Cannon planned the camp and compiled written material for all its activities. Many others contributed to the camp’s success. Cannon’s advisor, Professor Nikolaos Papanikolopoulos, worked with her to develop the idea for the camp, and provided partial funding for the camp and time for Cannon to work on it. Papanikolopoulos and fellow professor Maria Gini donated space and equipment. Graduate students Nate Bird, Monica Anderson, Katie Panciera, and Harini Veeraraghavan donated time as counselors. The Digital Technology Center provided space for the camp and breakfast and lunch for the participants.

Cannon was inspired to put the camp together by research showing that women, blacks and Hispanics are underrepresented in the IT field. This is particularly the case in the Institute of Technology and CSE, where blacks and Hispanics are nearly absent; only 2.6% of IT undergraduates are black, and 1.1% are Hispanic. The highest representation of women among all departments is 22.4% (CSE graduate students).

The situation is better nationally and outside of academia although far from perfect. Women hold 29% of IT jobs in America; blacks, comprising 14% of the population, hold 11%; Hispanics have a similar discrepancy with these numbers being 12% and 9% respectively. In 2000, 11.1% of associate’s and bachelor’s degrees in computer science were awarded to blacks, 6.0% to Hispanics.

The research indicates that it is best to intervene in childhood to prevent the growth of apathy about technology. Lack of exposure to computers was cited as a major stumbling-block; according to Prof. Marilyn McClelland of North Carolina Central University, not only minorities but also women are less likely to have a home computer.

Cannon’s background puts her in a good position to help alleviate the problem; she has extensive mentoring experience with minority children, both in the Twin Cities and in Macon, Georgia.

Also playing an enabling role was her panoramic academic career. Though skilled in computer science, she attended Mercer University—a liberal arts college—believing that “only through the humanities could I possibly make the world a better place.” She changed her mind midstream one night when she was pulling a late-nighter studying for the LSAT; now she has three bachelor’s degrees—in Spanish, political science, and computer science—and is a member of half a dozen honor societies.

As a result, she is an adherent of a teaching philosophy born of the liberal arts, not generally followed in the sciences, which favors an holistic approach to learning. No one is “born a computer scientist,” she says, and the way to make computer scientists is to provide an engaging learning environ-
ment from the ground up. The cause of the apathy of today's youth toward science, she says, is "bad P.R." - scientists do not place enough stress on the practical applications and benefits of their work. She values discussion above memorization, as she says rote memorization traps students in "boxes," unable to discover new knowledge for themselves. After Cannon completes her doctorate she intends to become a professor at a smaller college, for which she says her teaching philosophy is a better match.

In finding campers, Cannon targeted the fifth through eighth grades. Younger children would lack necessary patience, she said, and older youth would not benefit as much from the camp, as it prepares its attendees for high-school technology classes. She recruited from St. Peter Claver, a black church, and Aurora Charter, an Hispanic school. Eight boys and seven girls elected to attend; Cannon used her Spanish skills to translate camp material for the benefit of the Spanish-speaking children.

The camp wrought minor wonders on the children, overthrowing their reservations about technology and opening them up to the possibilities of the field. In their own words, they were nervous at first, but not for long: "It was confusing at first, but then it got easier." The campers made remarks such as, "[My least favorite activity was] leaving, 'cause it was fun," and, "We should have more days in summer technology day camp." Out of 13, 6 should like to "work with computers when they grow up;" 10 are "more interested in computers and technology."

As with any first effort, there were teething problems, Cannon says; she put the Matlab activity after the hardware activities, and her low point came when this caused the children to become restless. The children reflected that "it took too long and it was confusing," that "I did not [u]nderstand very well," and that "there were a lot of punctuation marks" (though, admittedly, the latter sentiment is not peculiar to children; anyone who has attempted to make a plot or enter a tall matrix in Matlab has likely been driven up the wall by the sheer volume of punctuation therein.)

That is the primary facet Cannon intends to change this year; for she is to host another camp, supported this time by several more CSE research groups. In keeping with her holistic philosophy, she is to keep the size of this camp small; but she hopes that other academic departments will copy her idea and open up many more children to the wonders of technology.


CSGSA Poster Conference

by P. Coleman Saunders

A gaggle of graduate students milling about a pack of posterboards, lollygagging at laptops and rattling on about research of one sort or another... What could it mean? On March 3, 2006, the Computer Science Graduate Student Association organized and presented their second annual Poster Conference. Over twenty teams of graduate students created posters and presentations describing their recent research efforts. Despite the early morning hours of the conference, it was attended by several hundred students including electrical engineers, a delegation from the Art department, and a large group of prospective CS graduate students. To boost participation, CSGSA offered not only doughnuts for breakfast and pizza for lunch, but also a number of prizes for research quality. Bill Rohde of UniSYS, alumnus Jim Pichler of Digital River, and CSE professors Arindam Banerjee and Mohamed Mokbel were the expert judges who awarded the prizes.

Best Poster went to recommender-system guru Sean McNee for his work "Making Recommendations Better: An Analytic Model for Human-Recommendee Interaction."

CSGSA ex-president and NSF fellowship recipient Kelly Cannon received the award for Best Presentation for her work creating a robotics camp for kids.

The prize for Most Commercially Viable research went to Wolfgang Ketter.

The prize for Most Promising Research Breakthrough went to the computer graphics powerhouse team of Minh Nguyen, Xiaoru Yuan, and Thanh Nguyen.

Overall the conference was a great success. Not only did the event bring the graduate student community together and give us a chance to learn about each other's research, it also increased our exposure to the University and industry community at-large and served as a great opportunity for students to practice presenting their research in an informal and friendly environment. Based on the this year's success, CSGSA plans to turn the conference into an ongoing annual event.
Do you want to learn how to really build software ... and get Upper Division CSci credits at the same time? Are you tired of 1-2 week assignments that just get thrown away when you finish them? Do you want to get evaluated on your ability to build software, rather than your ability to memorize facts for a test? Then consider this class: working together with 10-12 focused students for 30 weeks over two semesters to deliver a useful open source software product to the world!

Chipmark

by Jeremy Osterhouse

The 2005-2006 Chipmark Team

So read the first paragraph in an email invitation from Prof. John Riedl to Computer Science undergraduates. He wanted to give students the opportunity to participate in a unique class, gaining valuable experience building software in a way that isn't possible in a conventional classroom setting. The class also addresses many common student frustrations like working on assignments that are graded, then thrown away, and learning material for a test instead of learning to solve actual problems.

What is Chipmark?

Chipmark is a project that involves a group of undergraduate students from the University of Minnesota, headed by Professor John Riedl. The Chipmark vision is "bookmarks shared everywhere." Chipmark is one of several current online bookmarking services such as del.icio.us and fur.net. These services provide a web site for users to access their bookmarks. Chipmark goes beyond this basic functionality with a Firefox extension and Internet Explorer plug-in that allow a seamless integration with a user's web browser. The next Chipmark release further extends the vision of sharing bookmarks by letting users send links directly to their "buddies".

The project is the team's response to a problem they experienced personally. Traditionally, web bookmarks are stored with a browser on individual computers. This works fine for people who use just one computer. However, many people use several computers. For example, college students may have a computer at home, use computers in a lab at school, and carry a laptop for mobile work. This raises a problem: how does one keep track of bookmarks spread across several computers? Many people end up bookmarking sites on each computer they use and must resort to emailing themselves links or writing them down.

Chipmark solves this problem: instead of storing bookmarks on a computer, they are stored on the Chipmark server, enabling users to access them from any internet-connected computer. The Chipmark team wrote all of the software and manages the server (at www.chipmark.com). Chipmark developers call links "chipmarks"; this play on "bookmarks" gives a nod to the U of M's mascot, Goldy the Gopher - who, according to university lore, is actually a chipmunk.

Real team software development

This project class isn't like other classes. Instead of attending lectures and coding textbook programs every few weeks, the Chipmark team meets twice a week to discuss progress and work together in the same room. The project has different areas of responsibility such as team lead, release manager, and user interface manager. This means that everyone has an area of responsibility and an opportunity for leadership. If any software is going to be changed, the people in charge of the affected areas review the proposed change and must agree to it before work continues.

State of the art software tools

UMN Computer Science majors learn how to program in Java in the second course they take. Chipmark team members apply their Java skills, but they also learn how much more there is to a software project than just writing code. They work with a wide range of industry standard tools including Ant (to build the software), CVS (for change management), Javascript and C++ (for browser extensions), Tomcat and MySQL (to run the Chipmark server), and MRTG (to monitor server status).

Releases

The lifecycle of a real software product typically is much longer than two weeks (time to complete many course assignments) and even a complete 15 week semester. Chipmark team members get the opportunity to work on a software product for 30 weeks. This lets them go through several development cycles. For each new feature, they create a design document that lays out what they want to do and how they plan to do it. They proceed only after the design has been reviewed by Prof. Riedl and other team members. After several features are completed, the whole team freezes development and goes through a release process, testing rigorously before releasing a new version.

Legacy code

Another benefit for Chipmark students is that they work with existing code. Most real software development involves extending existing code rather than working from scratch.

Since 2005-2006 was the second year of the Chipmark project, this year's team inherited code from last year's team and thus had to deal with the central fact of legacy code: you've got to read and understand someone else's code in order to successfully maintain and extend the software.

Real users

As real software, Chipmark has real users. Instead of writing programs for a pro-
fessor and a TA to grade, Chipmark team members serve over 16,000 registered users (with 20 to 50 new users per day). This brings a responsibility to keep Chipmark running smoothly. "Having a large user base is definitely a motivator to test our release thoroughly," says team member Brian Thompson. "Any bugs we miss in our testing go on to make using Chipmark that much harder for our users, and our goal for this project is to make life easier for our users. Part of our commitment to the project is to our users; if we let bugs through the release process, we fail in that commitment."

Chipmark users are not just a silent force, motivating the development team by force of numbers. They send a steady stream of questions, comments, and suggestions to Chipmark support. In April 2006, users sent 40 emails. John Ullrich, the user support lead, faithfully replied to each one. While most of those messages report problems or request support, they also include comments from satisfied users. Ullrich says "Answering user email pays off personally when a user sends in a glowing comment about how useful he finds the service or how he has all of his friends using it."

**Real Problems**

Like any software project, Chipmark runs into its fair share of snags. One feature that the Chipmark team has just released is displaying site icons ("favicons" in web lingo) in the Firefox extension and web interface. Part way through fall 2005, a group led by Tom Piere began work on this feature. He recounts the trouble they faced in implementing their design: "We started with a beautiful design document with an elegant caching scheme to store favicons locally and not hit our server. Unfortunately, we soon discovered caching was a much larger undertaking, and not exactly feasible for our project." With each potential solution, they continued to run into obstacles. After fighting with it for over a semester, the favicon feature is only being released for the Firefox extension.

Graduates of the two Chipmark classes have pursued paths ranging from graduate school to working as software engineers and systems administrators for such companies as Thomson West, Paisly Consulting, Digital Cyclone, and iLoop Mobile.

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**FACULTY NEWS**

The project "Coupled Layer Architecture for Robotic Autonomy (CLARAty)", led by the Jet Propulsion Laboratory, received a One NASA Peer (CLARAty), led by the Jet Propulsion Laboratory, received a One NASA Peer (CLARAty) award, the CTS Research Award, which provides funding to support research in Microsoft's Virtual Earth technology.

Professor Roumeliotis' research group collaborates on two projects with the CLARAty team: "Estimation within the CLARAty Architecture" and "3D Localization for Mars Rovers". The CLARAty team was honored for the accomplishment of creating and applying a software framework for integrating innovations in robotics into rapid insertion into NASA's flight missions. The team promotes reuse of robotic software by providing a flexible framework to support the development and integration of robotic technologies across centers, the benefits of which have been felt by the Mars Exploration Rover mission and the Mars Science Laboratory mission.

Professor Shashi Shekhar has won two awards. The University Center for Transportation Studies (CTS) gave him its 2006 Research Partnership Award for his project on "Metropolitan Evacuation Planning". This award recognizes CTS research projects that have had significant impacts on transportation. Microsoft Corporation awarded him a Virtual Earth Request for Proposal (RFP) Award, which provides funding to support research in Microsoft's Virtual Earth technology.

Professor Shekhar's work on evacuation planning also has been featured in the popular media. His research has shown that in the case of a major disaster, it is better for people to walk (not drive) to evacuate a city. His research has been used to help the state of Minnesota develop its evacuation plan. He was interviewed for an article in the St. Paul Pioneer Press titled "Walk, don't drive, to safety". And FOX 9 News highlighted his work in a cool technology segment of their 5 p.m. news.

Jaideep Srivastava has been elected to the Steering Committee of the PAKDD (Pacific Asia Knowledge Discovery in Databases) series of conferences.

Carl Sturtivant was awarded the 2005-2006 Best Professor of Computer Science by the University of Minnesota Institute of Technology Student Board.

Professor Vipin Kumar gave a keynote talk, “Data Mining in Sensor Networks - Opportunities and Challenges” at the IEEE Conference on Sensor Networks, Ubiquitous and Trustworthy Computing (SUTC 2006), June 6, 2006, Taiwan.

In March, the DTC hosted an Open House to showcase Data Mining projects. This effort involved faculty from CSE, Statistics, and Carlson School. The program was attended by about 200 people, half from the industry. This kicks-off the effort to create a DTC Data Mining Consortium, a focal point for industry to interact with the University in the area of data mining. http://www.dtc.umn.edu/seminars/symposia/mining2006.php has more details.

**STUDENT AND ALUMNI NEWS**

CSE graduate student Kelly Cannon was featured in the Star Tribune article "Program wires kids into the fun of electronics". Kelly is a volunteer for Tronix Team, which is a Park Avenue Foundation program that teaches kids how to build electronic projects.
GRADUATION 2006


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MS and MCS Graduates: December 2005 through June 2006

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<td>Jin Soung Yoo</td>
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<td>Donghyong Kwon</td>
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<td>Brian J. Schuweiler</td>
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<td>John William Chapman Van</td>
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GRADUATION 2006

2006 MSSE Graduates

Joseph Baarsch
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Dean Barker
Maketha Bridges
Ryan Brosch
Roger Collinson
Andrea Fisher
Dalen Gudmunson
Stephen Hanten
Michael Hugo
William Ingle
Marcus Johannesmeyer
Michael John

Jumi Kassim
Abdur Khan
Jeffrey Kouba
David La Tour
Jason Lehmer
Christopher Leitschuh
Erwin Lesmana
Nicholas Lupkes
Craig Martin
Justin Miller
Praveen Mittal
Hahnemann Ortiz
Khyati Pandya

Krishna Pathak
Jenna Pederson
Vern Reinhardt
Jose Rivera
Paul Samargia
Cameron Schaffer
Paul Searls
Michael Sitarz
Daniel Sustacek
Scott Turnquest
Andrew Urbanski

Theses by Honors Undergraduates

Fall 2005

Author: Tariq Bashir
Title: Using ActiveX and OLEDB to Develop a Corporate Database Management and Presentation System
Advisor: Charles Swanson

Spring 2006

Author: Dane Kuipers
Title: Far future orders: the effect on the Trading Agent Competition
Advisor: Maria Gini

Author: Philip Russell
Title: Improved Java-SQL interaction in an extensible languages framework
Advisor: Eric Van Wyk

Author: Eric Sodomka
Title: Decision making with monetary value uncertainty
Advisor: Paul Schrater
Groovy Java
by Professor John Riedl

Groovy is a scripting language that may completely change how you write your Java programs. It could be a language with all of the ease and flexibility that makes scripting languages wonderful, but with the power of Java underneath the hood. We could begin every project in Groovy, producing code fast and furious. Over time, those projects that evolve to become successful would have key parts rewritten in Java, while the main control loop would stay Groovy. When necessary, nearly the whole program could become Java, except for those small parts that are just too painful to convert. If Groovy reaches its potential—which it has not yet!—Groovy could become the language with which you start every project, from 15 minute run-once scripts for data analysis, to a complete rewrite of your Service Oriented Architecture.

Scripting languages, like Perl, Python, PHP, Ruby, and now Groovy, can dramatically improve productivity for those simple little tasks for which it takes longer to open the JDK documentation than to just whip out a complete working script. A scripting language should make at least five important programming tasks easier for you:

1) Basic string manipulations. Strings are first-class objects, and come with a huge set of built-in operations to do everything you can imagine. In particular, selecting and modifying sub-strings should be as easy as array manipulations in lower-level languages.

2) Basic data structures. A word to language designers: lists and maps are here to stay. Nearly every program uses these data structures. The Java designers thought they could get away with including them as classes in an external library. They were wrong. In a scripting language it's as easy to map from an arbitrary string to, well, just about anything, as it is to have an array that maps from integers to other integers.

3) Regular expressions. Nearly every data manipulation program finds a use for regular expressions. Scripting languages make regular expressions directly available to the programmer, with simple syntax for accessing even the most powerful features.

4) Input and output. High-level languages are notorious for making us work hard to get data in and out of our programs. Lisp programmers famously say that the input and output transformations are usually harder than the whole rest of the program. In a scripting language, by contrast, simple input and simple output are simple. You can't always create every complicated I/O class you have ever dreamed of, but if all you want to do is get a table of data in, massage it with some regular expressions, and get it out in an elegant form, a scripting language is for you.

5) Code reuse. A scripting language should have a large repository of user-contributed code, to make things that aren't built into the language easy too. The gold standard here is Perl's CPAN repository—as much for its consistent documentation as for the formidable breadth of the library. In a few cases the available libraries are so powerful they've surpassed the language in importance: no one would willingly use Ruby as a language if they had a choice, but programmers beg to use Ruby on Rails for developing database-driven Web applications.

Here's where Groovy really shines: because it uses Java libraries on top of a Java Virtual Machine, it can use any code written by any user anywhere in Java. Of course it's possible to write explicit Groovy libraries in Groovy, but it's even better that all public domain Java code becomes a de facto Groovy library! All you have to do is take the Java library, put it on your Groovy classpath, and off you go.

The death knell for most scripting languages comes when a project actually becomes important. There's always some part of it that has to be rewritten in an industrial-strength language like Java. With most scripting languages you have to rewrite the whole program—or rearchitect your program so the interfaces between the components are something simple like text streams.

In Groovy it's easy for programs to "grow up" as they become important. You write the "throw-away" version of the program in Groovy. You get it working, demo it, figure out the hard parts and the slow parts. Rearchitect it. Rebuild it. Then, you can rewrite any remaining problem parts in Java. The Java classes you create work in Groovy just like the Groovy classes you replaced them with. You can have the main program be in Groovy, with lots of Java classes for support, or the main program in Java, with Groovy classes to take care of the details. Either way your program moves smoothly between a scripting language and an industrial strength language without friction.

On the other hand, Groovy isn't quite ready for prime-time yet. There are a few important bugs in the compiler still. (I found one over the summer that had me gnashing my teeth: nested for loops sometimes got confused about the scope of the loop variables!) Even more important, the documentation is so spotty that it's hard to tell exactly how a feature is supposed to work. On the one hand, you can use the Java libraries just like in Java. On the other hand, lots of effort has been put into providing syntactic sugar for those libraries—like array syntax for Lists and Maps—but there's no documentation about how the syntactic sugar actually works. Overall, the developers of Groovy need a kick in the pants to quit spending time adding new features, and to focus on delivering a quality scripting language.

If you'd like to play with Groovy, to see what the future might become, you can download binaries and source code from http://groovy.codehaus.org/. I'm thrilled by the potential Groovy has, and will be watching closely to see if the developers can deliver on that potential.
Many Thanks to Our Supporters...

We would like to express our thanks to the following corporations, alumni and friends who have provided generous financial support to the department. We look forward to continuing this partnership in the future.

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