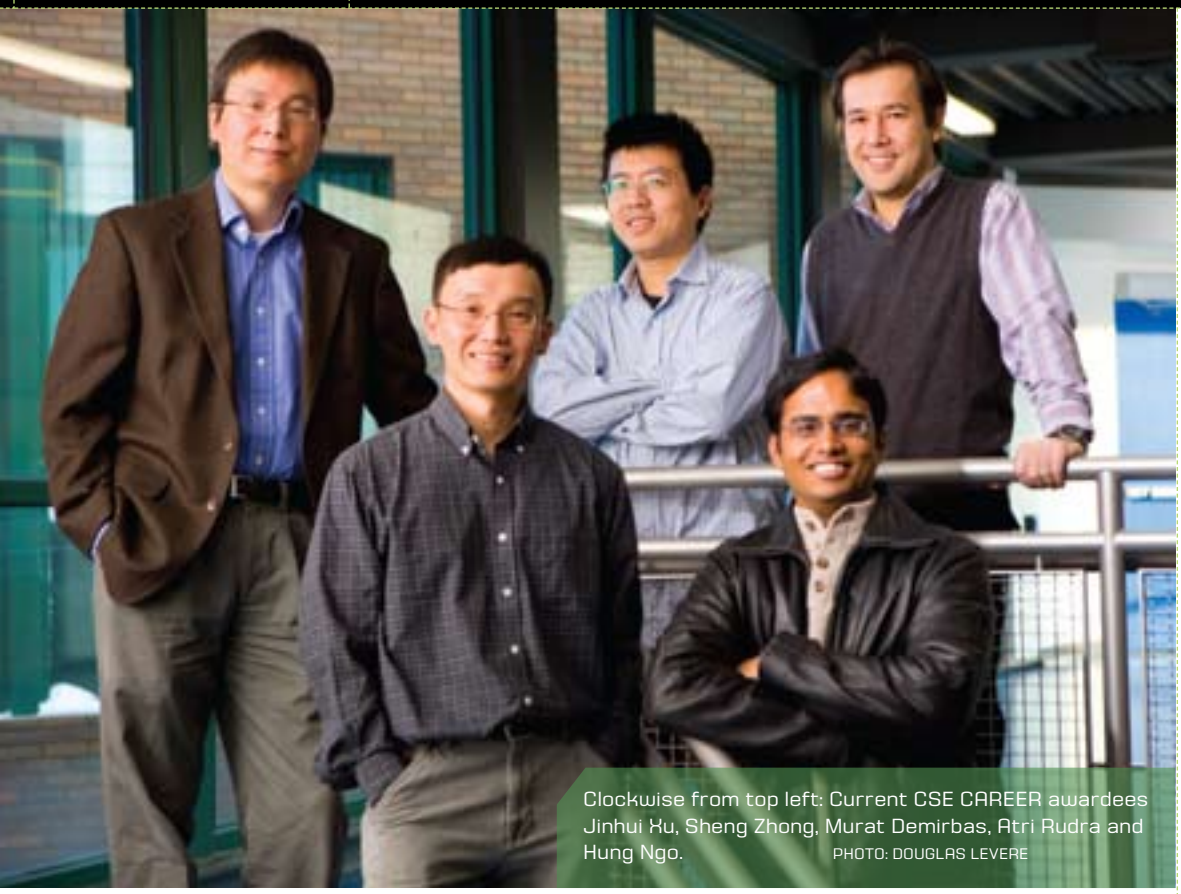
NEWS FOR ALUMNI AND FRIENDS OF THE UB DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSELINKS



Clockwise from top left: Current CSE CAREER awardees Jinhui Xu, Sheng Zhong, Murat Demirbas, Atri Rudra and Hung Ngo. PHOTO: DOUGLAS LEVERE

HIGH-FLYING CAREERS

The CSE department is enjoying some well-deserved excitement as a record five of its faculty members have received the prestigious Faculty Early Career Development (CAREER) Award from the National Science Foundation.

The CAREER award is one of the NSF's highest recognitions of junior faculty who "exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations." Applicants must be tenure-track and hold a Ph.D. at the time of application, and must not have competed for the award more than twice before. The funding is typically in the range of $400,000-$500,000 for a period of five years.

"This is an unprecedented achievement for our department," says Bharat Jayaraman, CSE chair. "The NSF CAREER program is very prestigious and competitive, and the success rate for proposals is only 15 to 20 percent. We are very proud of our awardees."

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REACHING THE NET GENERATION

Bina Ramamurthy never imagined that a $50 router would transform how she teaches—and how students understand—embedded computing.

Embedded devices are small computers that run everything from iPhones to the Mars rover.

A few years ago, Ramamurthy, a veteran CSE teaching associate professor, first began to notice how embedded system education was taking off at other universities, and wanted to update UB's curriculum accordingly. "We wanted courses that were state of the art, yet accessible to everyone," she says.

Students use ubiquitous embedded devices as a matter of course, but even college-level CSE majors have trouble understanding their technical foundations—how the devices work on the inside.

Ramamurthy then discovered that hackers had been making simple modifications to Cisco's popular LinkSys wireless router to manipulate and control its open-source Linux environment.

By popping open the router's case to expose the internal circuit board and adding more serial consoles, the router can easily be transformed into a micro-computer that can

CONTINUED ON P.03 »

MESSAGE FROM THE CHAIR

GREETINGS FROM BUFFALO!

On behalf of the faculty, staff and students of the CSE department, I wish all our alumni and friends the very best for the new year.

The recent financial crisis has affected UB in a major way, and the department and the school are striving to maintain the high quality of their educational and research programs in a setting of budget reductions and other cutbacks.

Despite these troubled financial times, the plans for our new building are going forward. During the past year, we held numerous meetings with the architects (Perkins and Will) in order to design the various laboratories and work spaces in the new building. The groundbreaking of the new building is set for Friday, April 24, 2009. We are planning our annual CSE graduate conference on this date, as well as an alumni get-together on the following day. We would be delighted if you could join us on this occasion.

Faculty continue to excel in research and receive external recognition. We are thrilled about the recent NSF CAREER awards to our faculty (see cover story), and the CSE department has set for itself a new record of five active NSF CAREER awards. At the senior faculty level, Aidong Zhang was elevated to the status of IEEE Fellow, becoming the fifth IEEE Fellow in the department (see Page 3).

The CSE department is planning an overseas edition of a new master's degree program in embedded systems. We will initially target this program at working professionals in the IT industry in Bangalore, which is regarded as the Silicon Valley of India. The program is expected to start next summer and will be offered in collaboration with our partner institution, Amrita University. CSE faculty participating in the program will travel to Bangalore during the summer and winter breaks to deliver lectures.

Last November, we held a party in appreciation of our doctoral students in the lounge of the Marriott next to campus. The event was enjoyed by faculty and students alike, and we hope to make it a regular feature in the future.

Looking forward to seeing you on April 24 at UB!

With best regards,

Bharat Jayaraman
Professor and Chair

CAREER | CONTINUED FROM P.01 »

The current NSF CAREER awardees—Murat Demirbas, Hung Ngo, Atri Rudra, Jinhui Xu and Sheng Zhong—share many common research interests in the area of computer networks and algorithms. Demirbas, Ngo and Zhong work in the areas of wireless sensor networks, optical networks, and mobile ad hoc networks, respectively, while Rudra and Xu explore efficient algorithms for computing approximate solutions and computational geometry, respectively.

Murat Demirbas is investigating the design and implementation of an in-network collaboration and coordination framework for wireless sensor networks (WSNs). By addressing the communication and concurrent execution challenges under the hood of its simple abstractions, the framework provides a platform for developing and deploying distributed control applications such as multi-robot cooperative control applications and WSN-robotics integration for distributed sensing. Demirbas will demonstrate this framework by developing a distributed multiple-pursuer/multiple-evader tracking application in WSNs.

Hung Ngo's research addresses the problem of switching speed, the main underlying bottleneck in optical switching network infrastructures. His NSF project aims to resolve this problem with a rigorous framework that bridges research and education on various areas of computer science and mathematics. Ngo will study the complexity of multichannel switching networks and investigate the design of optimal or near-optimal networks, efficient routing algorithms on these networks, and probabilistic analytical models.

Atri Rudra's NSF project will study efficient techniques for computing approximate solutions to problems involving very large amounts of data, especially for handling the increasing number of errors that will occur as we pack more data into physical media. Rudra will also develop algorithms that efficiently handle large data with limited resources, and pricing algorithms that process data controlled by agents who might "game" the system for their selfish gains.

Jinhui Xu is developing efficient geometric techniques for problems arising in cardiovascular interventional procedures, such as angiography, angioplasty and stent implant. Xu's research will improve the quality of projection imaging (such as angiogram and CT imaging) and the guiding of stent implant procedures. The application of computational geometry techniques to medical problems will result in advances in both computational geometry and medicine, and has the potential to be used in many other areas.

Sheng Zhong is developing economic incentives for mobile ad hoc wireless networks, where each node belongs to an independent organization or individual and may not always want to behave cooperatively. Lack of cooperation can adversely impact the performance of the network or the entire network may become dysfunctional. Zhong will study the design of an enforceable economic mechanism that will provide sufficiently strong incentives for cooperative behavior and security protection against cheating. –JM

SCHOLARSHIPS AND JOBS FOR CSE STUDENTS

Next fall, UB will offer a new scholarship program that will train students at UB and other universities in cybersecurity and information assurance. The scholarships were established by the National Science Foundation (NSF) to help address the dearth of skilled professionals in the IA and security fields at various federal agencies.

With support from a four-year $868,000 NSF Federal CyberService Award, UB's Center of Excellence in Information Systems Assurance Research and Education (CEISARE) will provide full, two-year scholarships to a total of 10 undergraduate and graduate students studying engineering, computer science, and other disciplines who agree to study cybersecurity and information assurance at UB for two years, complete a paid internship and, upon graduation, work for a federal, state or local agency. The program's first enrollee is a UB student in the Department of Management Science and Systems in the School of Management.

Undergrads must be juniors, and grads must be in their first year of study, in fall 2009 in order to apply. Applications will be reviewed through a nationwide competitive process. For more information, contact **Shambhu Upadhyaya** (shambhu@cse.buffalo.edu), **H.R. Rao** (mgmtrao@buffalo.edu), **Thomas Cusick** (cusick@buffalo.edu) or **Mark Bartholomew** (bartholo@buffalo.edu). Visit www.cse.buffalo.edu/caeiae for updates.

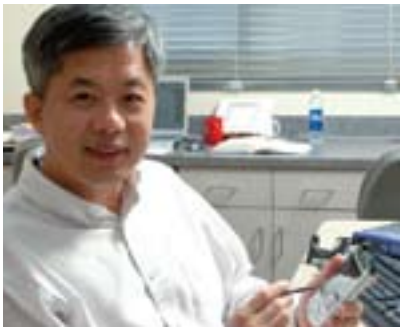
In other news, CEISARE has been redesignated as a National Center of Academic Excellence in Information Assurance Education for the academic years 2008-13. The center has also been certified to have met requirements for the Information Systems Security Professionals, NSTISSI No. 4011 and Systems Administrators, CNSSI No. 4013 for 2008-13.

ZHANG NAMED IEEE FELLOW

Aidong Zhang has been named a 2009 IEEE Fellow for her contributions to multimedia data indexing. IEEE Fellows are an elite group of leaders and innovators in electrical and electronic technology. Zhang has been a senior member of IEEE since 2007 and was profiled in the previous issue of CSE Links.

CHEN RECEIVES IEEE AWARD

In 2008, **Chang Wen Chen** received the Best Paper award from IEEE Transactions on Multimedia for his June 2007 paper, "Joint Source-Channel-Authentication Resource Allocation for Multimedia over Wireless Networks."



In his paper, Chen and his co-authors propose a novel framework for security issues of wireless transmission

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Students in CSE's NEXOS computer lab write and test their own open-source codes using low-cost wireless routers.

execute programs and interface with modified firmware, alone or within a scaled server environment.

At a 2007 SIGCSE conference, Ramamurthy saw posters on embedded computing by researcher Dennis Brylow. Brylow developed a translation of XINU—a simple, Unix-like operating system—whose new platform is the LinkSys WRT54G router. Brylow's students at Marquette University in Milwaukee, Wis., use the embedded device at his experimental XINU laboratory to create and test their own open-source codes.

"It's better than a simulation or computer model, because kernel images are loaded onto a backend machine built out of a stack of WRT54GL devices (as shown in the photo above), giving students hands-on experience with real hardware without dumbing it down or relying on simulations," Ramamurthy says. Once the embedded XINU system is established, it can be made to run code designed by the students themselves, in any workstation with a serial port and a network connection.

Ramamurthy is now principal investigator, with Brylow as co-PI, on NEXOS: Next Generation Embedded Operating Systems, a multiphase project funded by a two-year National Science Foundation grant. The project's goal is to develop a pedagogical model that uses embedded systems curricula, lab-based learning environments, and field trips to local computer-based industries in order to teach embedded systems to high school and college students. Under the grant, a new CSE course, "Embedded and Realtime Operating Systems" (CSE321), was created for UB sophomores last fall.

The best part about using the embedded router device is that it is inexpensive and easily scalable to any sized classroom or computer lab. Each unit costs less than $100, including parts, putting a roomful of networked devices within reach even for high school computer departments with basic skills and resources.

Ramamurthy and Brylow hope to prove that the NEXOS model can help bridge the learning gap between basic lower-level classes and more advanced OS courses, and connect traditional curricula at UB and local high schools with Net Generation students. —LNM

INTELLIGENT BY DESIGN

STUART SHAPIRO

Shapiro has been exploring new forms of logic, in particular the logic of natural languages, since he began working at UB in 1977.

PHOTO: KATHERINE DRESKIN

Stuart Shapiro's research at UB involves everyone from artists and engineers to physicians, cognitive scientists and computer scientists. But perhaps his longest and most fruitful partnership has been with SNePS—an intelligent software program built for knowledge representation, reasoning and acting that he has been perfecting for more than 30 years.

In fact, Shapiro, professor of computer science and engineering, says the earliest version of the project that became SNePS—formerly Semantic Network Processing System, now only an acronym—was born in the late 1960s at the University of Wisconsin, during his time earning a master's and doctorate in computer science.

Over the years, SNePS has been configured to respond to spoken language, answer queries submitted in written text and react to human agents in the physical—as well as virtual—world.

"A person could do all these different things," says Shapiro. "The goal is to get a program to do understanding and reasoning in whatever domain you tell it about."

This is possible due to a sophisticated computational model that attempts to replicate the same processes that occur as a person reads a book or listens to spoken language, he says, one that doesn't just memorize information but also manipulates it in order to produce new ideas.

"My approach is motivated by natural language competence—the ability to understand and produce natural language—in order to build representations and produce natural language from what's inferred from it," he says, noting that since language is semantic in nature, it can be represented and manipulated using logic.

But the most common forms of logic—metamathematics or "the mathematics of mathematics"—are not a perfect match for those interested in representing natural language, adds Shapiro, who also holds a bachelor's in mathematics from MIT.

"The logics developed by people like Gottlob Frege and Bertrand Russell were used largely for mathematics," he says, "and people who've tried to use those same logics for the purposes I'm talking about have identified deficiencies."

For at least the last 100 years, Shapiro notes, philosophers, mathematicians, and computer scientists, particularly those interested in artificial intelligence, have sought to create "logics that seem more appropriate for 'common sense reasoning'—the sort of understanding and reasoning that people do in everyday life."

Exploring these new forms of logic has been the focus of Shapiro's career since joining UB in 1977. In fact, soon after coming to UB, he joined an informal faculty group interested in cognitive science—a group that became UB's Center for Cognitive Science in 1990. In addition to being director of this center from 2004 to 2008, Shapiro served as founding chair of the Department of Computer Science and Engineering.

One of the most recent and unique applications of Shapiro's research has been a collaboration with the Intermedia Performance Studio in the Department of Media Study, in which short plays are acted out by human actors alongside "intelligent agents," including not only physical "robots," but also bright balls of projected light and computer-generated characters that read their lines using a speech synthesizer. Shapiro, whose SNePS supplies the brains for these creations, has been a co-PI on two grants—together worth $60,000—from the Robert and Carol Morris Fund for Artistic Expression and Performing Arts.

Moreover, Shapiro says SNePS has been at the core of all his major research projects, including two other UB collaborations in which he is currently participating. The first project involves using artificial intelligence on disparate data—for example, radar sensor data and human informants—in order to uncover hidden connections and provide a certain level of automatic interpretation before data even reach human intelligence analysts.

"A lot of this is Iraq War-driven," he says, noting the project's strong national security applications.

The other project aims to improve electronic medical records on patients suffering from psychiatric diseases, by developing a system that automatically recognizes and alerts physicians about potentially dangerous discrepancies—such as drug prescription information—found in multiple documents on the same patient.

Support for these projects since 2006 includes nearly $300,000 from UB's Center for Multisource Information Fusion and $148,000 from the John R. Oishei Foundation, respectively. Shapiro is a co-PI on both grants.

—KEVIN FRYLING

of multimedia. Wireless networks are generally more vulnerable to intrusions than wired networks. The paper describes a framework for encoding and authenticating multimedia to be delivered over heterogeneous wireless networks. Experimental results show Chen's approach is able to achieve the desired authentication of multimedia over wireless networks.

WIRED FEATURES CSE RESEARCH

A shoeprint is one of the most common clues found at crime scenes, and it landed **Sargur (Hari) Srihari,** SUNY Distinguished Professor in the Department of Computer Science and Engineering and founder of the Center of Excellence for Document Analysis and Recognition (CEDAR), in a featured story on Wired's "Threat Level" blog this fall about online privacy, security and politics. After capturing the sole imprints from thousands of shoes sold by online stores, Srihari created a search engine based on a database of images that can identify a print by brand and model.

SUPPORTING CSE

As the new year begins, we'd like to take the time to thank the following alumni and friends who have given generously to the Department of Computer Science and Engineering so far this academic year. The funds CSE receives are always appreciated and help contribute to our research and teaching mission. We encourage you to continue to help support CSE with our activities by filling out the attached card in this issue.

Anonymous; ATTO Technology Inc.; Ms. Penny J. Blumstein; Mr. Richard L. Blumstein; Kevin J. Guarino; Harris Corp.; Intel Corp.; Kodak; Phoenix World Wide Industries; Dr. Anil M. Shende

THEORY WORKSHOP
THE "EAGLE" TAKES OFF

The Department of Computer Science and Engineering hosted the first annual Eastern Great Lakes (EaGL) Theory Workshop on Sept. 6-7. It drew attendees from 14 U.S. and Canadian institutions to network and hear presentations by such celebrated speakers as Steve Cook from the University of Toronto and winner of the Turing Award; and MacArthur fellow Jon Kleinberg from Cornell University.

The workshop was the brainchild of Alan Selman and Atri Rudra on the CSE faculty and Robert Kleinberg, an assistant professor in the computer science department at Cornell. They estimated that there would be an eager audience among new junior faculty in the theory field at schools within a 3-4 hour drive of Buffalo—both Rudra and Kleinberg fit that profile, so they could make that projection with some confidence.

Stephen A. Cook, one of the giants in the theory field, addressed the workshop on proof complexity and computational complexity.

They also thought a regional workshop with a cost for sending a graduate student of about $200, compared with $1,000 for a national conference, would be a draw. For the six presentations, they balanced recognized stars with up-and-coming talent.

Their calculations were sound. They expected perhaps 60 registrants and totaled 90, with the largest number coming from Carnegie Mellon University, Cornell, Penn State, UB, Rochester Institute of Technology and the University of Toronto.

The department provided seed funding for the workshop, which the organizers used to fund the presenters and registration scholarships for about 30 graduate students. Kleinberg, Rudra and Selman are now talking with the National Science Foundation about funding for the next year, for which they have already locked up part of the program. Ultimately, they'd like to secure corporate sponsorship.

"It was a great thing—and a rare thing—for the students to get all these celebrated people together in one place," Rudra says.

Rudra also credits the size of the workshop—not too small, not too large—with stimulating a nice interaction between students and faculty from different schools. "When you go to the big conferences, you tend to talk with the people you know, but here there was more opportunity to intermingle."

He hopes those opportunities may eventually produce collaborations that can trace their origins back to Buffalo—where the EaGL took flight. —JM

OFF TO A GOOD START

Returning and new students, faculty and staff enjoyed hot dogs, hamburgers and a warm fall day at the annual CSE picnic, held September 18 outside Bell Hall on the North Campus.

A NEW SPOT FOR STUDY

A corner of Lockwood Library formerly used to store binders and dissertations is now home to CSE's new study space for teaching and research assistants. Complete with computer terminals and study carrels, the space was unveiled to students and faculty at a reception held on November 12.

Left to right: Michael Prentice, Swapnoneel Roy, Cuneyt Akcora, Amit Nagar and Jonathan Bona.

PHD FRIDAYS

More than 50 PhD students and around 16 CSE faculty unwound at Houlihan's on Flint Road for the inaugural T.G.I.F. gathering on November 21. The event was a welcome respite from work and the first of many happy hours and potluck dinners to be hosted by the department.

Left to right: Chang Su, Pradipto Das and Jianmei Yang share drinks and laughs.

Lester A. Gerhardt MS '64, PhD '69 Lester earned his graduate degrees during a ten-year stint with Bell Aerospace Corp., where he was involved in visual simulation of space flight including the Apollo program's moon landing. He joined Rensselaer Polytechnic Institute in 1970 and became the first chairman of the electrical, computer and systems engineering department. Since the early '90s, he has been associate dean of engineering, responsible for research and graduate programs in the RPI School of Engineering. He also served as founding director of the Center for Manufacturing Productivity and as director of the Center for Industrial Innovation.

Lester has served as a delegate to NATO; consultant to the governments of Singapore, Portugal, Canada, Germany and the United Kingdom; co-founder of the ongoing Global Engineering Education Exchange Program; and served on the International Advisory Board of the ASEE.

Vincent Cordaro BS '77 Vincent works for URS Washington Division, Savannah River Site in Aiken, S.C.

Larry Krantz BS '77 Larry is founder and president of Contemporary Innovations LLC, a marketing and promotions provider for small and medium sized technical companies and nonprofit organizations. He also is executive director of the University of California-Santa Cruz Storage Systems Research Center, where he is responsible for building industry awareness and participation in both the UC-Santa Cruz research programs, as well as industry affiliate programs located in Silicon Valley.

Lawrence F. Durfee MS '79 Lawrence is a staff engineer for Fairchild Semiconductor Corp., Automotive Applications, in North Branch, N.J. His research interests include robotics and industrial automation.


Kluger

Larry Kluger MS '81 After having worked in Silicon Valley (at Xerox-Palo Alto, Sun Microsystems and Remedy Corp.), Larry is launching a start-up, Master Agenda LLC, in New York, N.Y., a software company for conference organizers. He writes that he also lobbies Congress on behalf of the American-Israel relationship, and serves as board member of the Pardes Institute of Jewish Studies in Jerusalem and as board member and co-chair of the Limmud NY Jewish learning conference.

Michael Valcourt MS '90 Michael is a senior planner in network planning/FiOS TV at Verizon Communications.

Kent Yen BS '93 Kent is an electronics engineer and manager in the U.S. Navy, based at San Diego, Calif. His research interests include algorithms, parallel processing, distributed systems, computer vision and image processing, databases, information retrieval, data structures, probability and statistics.


Chan

Alex Lipchen Chan PhD '97 Alex, a senior member of the IEEE, has been working since 1995 as a research scientist at the U.S. Army Research Laboratory in Adelphi, Md., where his research interests include automatic target recognition, artificial neural networks, vector quantization, image processing and computer vision.

James Quinn BS '02 James is earning a master's degree (physician assistant) in clinical medical sciences at Barry University, Miami Shores, Fla.


Loganathan

Narender Loganathan MS '04 Narender is a developer for MeetMoi, a location-based mobile dating service based in New York City. He moderates the CSE alumni group on LinkedIn and enjoys amateur blogging on economics.

Amalia I. Rusu-Sprincenatu PhD '07 Amalia is an assistant professor of software engineering at Fairfield University in Fairfield, Conn. Her research interests are document image analysis, machine learning, pattern recognition, image processing, computer vision, artificial intelligence, human computer interaction, digital libraries, computer security, digital forensics, biometrics, software engineering and computer science education.


Jadliwala

Murtuza Jadliwala MS '04, PhD '08 Murtuza is a senior researcher at the Laboratory for Computer Communications and Applications, Ecole Polytechnique Federale de Lausanne in Lausanne, Switzerland. He specializes in wireless sensor and ad hoc networks, computer security and privacy, approximation algorithms and combinatorial optimization.

ATTENTION ALUMS!

Friday, April 24 is the groundbreaking ceremony for the new building that will house CSE. On April 25 we will host a special CSE alumni event. Plan to join us. Details are at www.cse.buffalo.edu.
If we don't have your email address, send it to elesny@cse.buffalo.edu so we can tell you about other upcoming CSE alumni events.

George Herold PhD '93

George is a senior scientist at Teachspin Inc. in Buffalo, N.Y., and works with solid state physics, atomic physics and noise. He writes that he enjoys "repairing my 1949 TE-20 Ferguson Tractor."

CSELINKS
NEWS FOR ALUMNI AND FRIENDS OF THE UB DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The University at Buffalo is a premier research-intensive public university, the largest and most comprehensive campus in the State University of New York system. UB's more than 28,000 students pursue their academic interests through more than 300 undergraduate, graduate and professional degree programs. Founded in 1846, the University at Buffalo is a member of the Association of American Universities.

CSE Chair: BHARAT JAYARAMAN
Executive Officer: MARIANNE SULLIVAN

Editorial: JUD MEAD, LAUREN NEWKIRK MAYNARD
Design: CELINE TAN

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THE BLOOMBERG CREW

Front row: Wilson Jean-Baptiste BS '92, Kamal Meka MS '06, Surabhi Abhyankar MS '06, Swapnil Khedekar MS '04, Vikrant Dogra MS '06, Amol Kothari MS '06, Mingen Lin PhD '07. Back row: Charles Santos, Ameya Thakur MS '08, Ellora Praharaj MS '08, Bharath Sankararaman MS '08, Mike Wiesemann BS '06, Mohit Devnani MS '06.

After they graduate, CSE alums fan out across the country and throughout the world, and a good number of them have come to roost at Bloomberg LLP, the financial software services, news and data company founded by New York City mayor Michael Bloomberg. CSE Links caught up with several of them at the Manhattan newsroom in the sparkling new Bloomberg Tower.

"Bloomberg is a very exciting place that offers a unique blend of core technology and working and learning in the financial domain," says Bharath Sankararaman, financial software developer for Bloomberg's R&D department. "It's fantastic how you interact closely with your managers, colleagues, sales team and pretty much everyone that makes an application happen. In a nutshell, the challenge of the job, a progressive learning curve, smart people and great benefits make it work for me here."

Sankararaman mentions such perks as a cool, high-tech work environment complete with aquarium tanks, artwork and "a well-stocked pantry," and countless opportunities for exploring new ideas and topics through Bloomberg's seminars and training programs.

Charles Santos, senior quality assurance engineer and project manager for internal systems at Bloomberg, agrees. He's been working at the company for nearly three years and in the QA field for more than 13.

"I get to test and play with various technologies from all the divisions within Internal Systems and ensure a quality product for our internal and external business users," Santos says, citing operating systems and information retrieval coursework at CSE as coming in handy in his day-to-day work.

"UB gave me the sound technical background to try out various fields until I found a niche that I enjoyed," he says. —LNM