CHAIR’S MESSAGE

The summer was a welcome break for all of us after a busy spring semester. As we begin the new academic year, we welcome our new members. It gives me great pleasure to announce the arrival of our newest faculty member, Bruce Maggs. A world-renowned leader in parallel and distributed systems, Bruce moved here from Carnegie Mellon University. He also works as VP of Research and Development at Akamai Technologies. We are also delighted to have new students—both graduate and undergraduate. Congratulations to our recent graduates. We wish them all the best as they start a new phase in their lives.

I am always proud to share the accomplishments of the members of the Department. Xiaobai Sun was promoted to the rank of Full Professor. A highly regarded computational scientist, she is well known for blending mathematical, algorithmic, and engineering issues. Kamesh Munagala received a prestigious Alfred P. Sloan Fellowship. Last year he received an NSF CAREER award for his work on stochastic optimization. Alex Hartemink was named a Bass Professor for his excellence in research and teaching. Currently on a sabbatical leave, Alex is spending a year teaching at a school in Kenya. Spring 2009 graduates Alex Keybl, John Pena, and Tiffany Yam received the Department’s Alex Vasilos Memorial Award for their excellence in academic achievement and undergraduate program support.

As always, we were busy hosting several events during the spring and summer. Two new students, Sophia Cui and Peng Shi, joined our C-SURF program, a program designed to provide undergraduates with an intensive research experience. Building on the success of the last year’s workshop, Susan Rodger once again organized a workshop on Alice, educational software that provides innovative methods for teaching computer programming. Jeff Forbes organized the RoboCup Junior Regional Competition, in which eleven middle- and high-school teams participated. The Department also hosted a vibrant summer internship program for undergraduates. The students conducted a wide variety of research in computational economics, computational biology, networking, and robotics. Others assisted with the HarambeeNet and Alice workshops. All agree it was a valuable and rewarding experience.

Be sure to check out our website to learn the latest news about the Department and to be a part of our community. If you are in the RTP area, we hope you will stop by for a visit.

Best wishes,

Pankaj K. Agarwal
CS WELCOMES PROFESSOR BRUCE MAGGS

WITH GREAT PLEASURE, the Department welcomes its newest faculty member, Professor Bruce Maggs. Maggs joins the Duke community after fifteen years of research and teaching in parallel and distributed systems at Carnegie Mellon University. After receiving his SB, SM, and PhD degrees from MIT and working as a research scientist at the NEC Research Institute in Princeton, Maggs joined Carnegie Mellon. In 1998, while on sabbatical at MIT, he helped launch a start-up company called Akamai Technologies. Today, Akamai is an international content delivery network that handles hundreds of billions of Web interactions every day for websites like Apple iTunes and Microsoft Windows Update. Working at Akamai as VP of Research and Development sparked Maggs’ interest in massive data sets, a major focus of his research today. (Read more about Maggs’ research projects on page five of this issue.) “I have tremendous respect for the Duke faculty,” says Maggs, who met many of his new colleagues as a visiting professor at Duke during the 2007-2008 school year. “And the students are fantastic and bright.”

Maggs is no stranger to Duke: His grandfather was a law professor at the University, which proudly supports an endowed chair in his name. When he’s not in his office, you can catch Maggs on the hockey rink or softball field, or out zipping around Chapel Hill on his trusty electric scooter.

XIAOBAI SUN PROMOTED TO PROFESSOR

THE DEPARTMENT proudly announces that Duke University has promoted Xiaobai Sun to the rank of full Professor. A member of the scientific computing faculty at Duke, Sun specializes in numerical analysis with a focus on the differences and relationships between continuous and discrete models for computation. “Xiaobai is highly regarded for the depth as well as breadth of her work, and she is well known for blending mathematical, algorithmic, and engineering issues,” says Department Chair Pankaj Agarwal. “I am thrilled to see her getting this well-deserved recognition.”

Sun is currently Principal Investigator on a $2.6 million grant from DARPA, the U.S. Defense Department Agency. The grant currently funds the FANTOM project, Framework For Accelerating Numerical Transforms On Microchips, developed by Sun and Professor Nikos Pitsianis in conjunction with researchers at Arizona State and Pennsylvania State University. The project works to better application performance in size, speed, and weight along the computational spectrum from continuous models to digital computer architecture, tackling both hardware and software needs and constraints. Among other achievements, the system has been used to automate and speed hardware development and to accelerate signal and image processing. Additionally, Sun and her students maintain active on-campus collaborations, one with ECE professor David Brady, leader of the Duke Imaging and Spectroscopy Program, on optical imaging and spectral reconstruction, and another with G. Allan Johnson, Professor of Radiology and Physics, on MRI image processing.

When congratulated on the honor of being promoted, Sun was eager to recognize her peers. “In this department, the other faculty members are very inspirational,” she says. Department leadership brings out the best in each faculty member, she adds, and it is a testament to the Department that it is able to actively recruit additional strong faculty to the ranks.
JOEY JOINING A SELECT GROUP of Duke faculty, Alexander Hartemink has been named a distinguished Bass Professor for excellence in research and teaching. His new title will be Alexander F. Hehmeyer Associate Professor of Computer Science.

“A brilliant scholar, Alex has earned the admiration and respect of everyone,” says Department Chair Pankaj Agarwal. “This prestigious professorship is the perfect way of recognizing his extraordinary teaching and research accomplishments.”

In addition to distinction in research, the Bass Professorship recognizes excellence in undergraduate teaching. Each year, Hartemink teaches an undergraduate class in computational genomics that attracts a wide variety of students, including computer science, biology, engineering, math, and chemistry majors. Additionally, undergraduates often work in Hartemink’s research group, attending lab meetings alongside Master’s and PhD students.

Giving undergraduates opportunities to do research can be invaluable for their intellectual development, he says. Bass Fellows are chosen for a five-year term and attend annual dinners at which they interact with other Fellows from around campus. “They are a great group of people,” says Hartemink, who attended his first dinner this April. “I’m looking forward to deeper interactions with my colleagues over the next few years.”

THE DEPARTMENT IS PLEASED to announce that Kamesh Munagala, Assistant Professor of Computer Science, has been awarded a prestigious Sloan Research Fellowship. He is one of only sixteen computer scientists from across the U.S. and Canada to be honored with the award this year.

Established in 1955, the Sloan Research Fellowships are designed to “stimulate fundamental research by early-career scientists and scholars of outstanding promise,” according to the Alfred P. Sloan Foundation website. Past Sloan Fellows have gone on to win numerous awards later in their careers, including thirty-eight Nobel Prizes and sixteen Fields Medals, the top honor in mathematics. Past Department recipients of the Sloan Fellowship are Professors Pankaj Agarwal, Vincent Conitzer, Ronald Parr, Alexander Hartemink, and Mauro Maggioni.

“It is a great honor to be named a Sloan Fellow, and it will contribute to increased national recognition for the entire Department,” says Munagala. “I am very grateful to my department and colleagues for their support and encouragement.”

Fellows receive $50,000 over a two-year period to fund research of their choice. Munagala plans to use the funding to continue his research in approximation algorithms, particularly for stochastic control problems with applications to managing uncertainty and incomplete information in databases, communication systems, and multi-agent systems. Much of the funding will be used to support graduate students and for travel.

This past April, Munagala also received the Best Paper Award at the 18th International World Wide Web Conference (WWW) for Hybrid Keyword Search Auctions, a publication written with Ashish Goel of Stanford University.
A DUKE-LED TEAM has brought powerful software to the never-ending arms race between antibiotics and germs. Working together, computer scientists and biochemists have developed and laboratory-tested a computer program that can show experimentalists how to change the machinery that bacteria use to make natural antibiotics.

The program—a set of computer rules known as the algorithm “K*” (pronounced K Star)—is able to sort through all the possible shapes and changes of a key enzyme that produces a natural antibiotic called gramicidin S, says Professor Bruce Donald. The new technique might pave the way toward more automated redesign of old drugs to foil drug-resistance in germs.

“It really excites us that we can redesign enzymes on a computer, make them in the laboratory, and have them work as planned,” said Donald, who leads the research effort. The work was funded by a grant from the National Institutes of Health.

The search for new antibiotics usually begins by directly modifying existing compounds. But his group instead predicted mutations to enzymes from an antibiotic-making microbe, using K* to search faster and cheaper for the best designs. “It is essentially a new pathway to make novel antibiotics,” says Donald. “There are many possible changes you can make to a protein, but the algorithm can test out orders of magnitude more variations than laboratory experiments alone.”

Other protein design algorithms have been proposed, and some of those even attempt to account for the way key parts of real proteins move around in three dimensions. But the latest version of K* lets protein backbones and side chains wiggle more like they would in real life. Moreover, it simultaneously evaluates what Donald calls “an entire album, or ensemble,” of possible shape shifting. “Thus it not only addresses flexibility, it embraces it,” he says. “So we might be able to quickly discover things that would take a very long time through purely experimental techniques. It should, in principle, be possible to redesign any enzyme simply by inputting the protein’s shape into the algorithm and telling it what you want it to do.” The K* algorithm software is available as open source code for other researchers to evaluate and use.

It has been nearly a ten-year effort to develop reliable enzyme design algorithms, says Donald. In the process, his group has fostered a long collaboration with Amy Anderson of the University of Connecticut to biochemically test the algorithm’s accuracy using the Gramicidin S Synthetase enzyme system, which produces the natural antibiotic in Bacillus brevis bacteria.

In a Proceedings of the National Academy of Sciences report published last February, Ivelin Georgiev, a recent CS PhD graduate and one of K*’s designers, used the latest version of the algorithm to redesign the first step in the biochemical assembly line needed to make the antibiotic.

“Redesigning that first step is a big achievement,” says Donald. “We are now beginning work on redesigning the half dozen subsequent steps downstream.”

The algorithm includes a “dead-end elimination” feature that can run through all possible chemical interactions and flexible molecular architectures to weed out scenarios that cannot work. Calculating just one redesign might take up to a week in the 230-processor computer cluster housed in Donald’s lab, he says. After all the calculations were completed, biochemist Cheng-Yu Chen, another of Donald’s graduate students, confirmed the algorithm’s predicted designs in Donald’s biochemical wet lab, using bacteria to synthesize some “quite big and tricky proteins,” says Donald. “It was not at all trivial to do that, and testing the functions of each protein was even trickier.”

“While gramicidin S is probably not a really useful antibiotic against emerging infectious diseases, it’s a great model system for studying how such enzymes work, because we know a lot about its 3-D shape,” says Donald. “It should, in principle, be possible to redesign any enzyme.” That might include revamping the machinery that makes other workhorse enzymes in gramicidin’s family, such as penicillin and vancomycin.

Adapted from a Duke News article published on February 17, 2009.
BUILDING THE RIGHT SYSTEM

AROUND THE WORLD, Akamai Technologies operates 50,000 servers in over 1,500 locations, handling twenty percent of today's Web traffic. So it's no wonder that as Vice President of Research and Development at Akamai, Bruce Maggs became interested in studying large distributed systems and massive data sets. “The key to innovation in Internet infrastructure is the proper engineering of large distributed systems. Working at Akamai, I started to think this would be an interesting area in which to do research,” says Maggs. As a new faculty member in the Department (see his profile on page two), Maggs arrives on campus with several research projects that address large distributed systems within various areas of concern, from business energy costs to database bottlenecks to denial of capability attacks.

In much of his research, Maggs uses an innovative strategy to analyze data: He collects massive data sets on networking behavior from Akamai’s content delivery network (CDN) and combines them with other data sets to gain new perspective in a particular area. For example, in a paper presented this summer at the ACM SIGCOMM 2009 conference, Maggs and colleagues at Akamai and MIT analyzed the energy costs of existing distributed systems. Massive Internet-scale and cloud computing systems today utilize hundreds of thousands of servers, which can require megawatts of electricity, enough to power thousands of homes. The cost of such energy can range from $3.7 million per year (eBay) to $38 million per year (Google), the researchers estimate. By comparing historical electricity prices with network traffic data from the Akamai CDN, the team found that companies might save millions in electricity costs each year by routing client requests to locations where energy is cheapest, as energy prices regularly fluctuate from area to area and hour to hour. The process could be done using routing systems that most large distributed systems already have in place.

Another ongoing project in Maggs’ repertoire is a study of improving bottlenecks at central database servers for websites that use dynamic content—images and text generated in real-time and customized for users. As more and more websites add dynamic content, from welcome screens to advertisements, it is becoming harder to scale the technology. “We need a database scalability service,” says Maggs. He and colleagues at Carnegie Mellon and Google are working to do just that by building layers of caches that store dynamic content locally, instead of at distant, backlogged databases. “But it’s tricky,” Maggs warns, as researchers must figure out how to maintain local cache consistency as the database is updated.

Last summer, at the 34th International Conference on Very Large Databases (VLDB), the group introduced Ferdinand, a first-of-its-kind cooperative proxy architecture for dynamic content delivery that uses distributed database query result caching and scalable consistency maintenance.

Maggs also has a strong interest in database security and has another project in the works that follows on the heels of previous research from Professor Xiaowei Yang on network capabilities, a solution to denial of service attacks, during which a malicious host can flood a server with unwanted traffic. Capabilities are like golden tickets to a website, establishing priority connections for “good” traffic. But attackers have learned to prevent any capabilities from being sent in “denial of capability” attacks. As a new way to prevent such attacks, Maggs has developed a partial solution. “It would require all users to provide evidence that they are legitimate by performing some kind of computational work, like solving a puzzle,” says Maggs. Even if attackers can figure out how to solve some type of short computation, they will have to invest some of their resources into doing so, effectively slowing the attack. Together with Yang and Professor Landon Cox, Maggs plans to continue to explore network security issues.
ALICE IS BACK

WITH GREAT ANTICIPATION, Adventures in Alice Programming returned to Duke! After a successful three-week workshop last year led by Professor Susan Rodger, middle and high school teachers again filled the Department this summer to learn how to teach Alice, an educational software that encourages students to program by building virtual worlds populated by animated 3D objects.

Funded by the National Science Foundation and IBM, the summer began with a follow-up workshop for previously participating teachers. "Last summer they developed lesson plans to use during the school year, and now they've come back to talk about what they've been doing," says Rodger. At the same time, Wanda Dann of Carnegie Mellon University and Steve Cooper of Saint Joseph's University, Rodger's co-recipients of an NSF grant for Alice, ran workshops on Alice 3.0, the new version of the program.

Following the initial workshops, a day-long Alice Symposium welcomed educators from around the country to present papers on Alice. Duke's own Rachael Brady, director of the Visualization Technology group, gave the keynote address.

The summer concluded with three one-week workshops to introduce new teachers to the software. "I had over 400 teachers apply for the 120 spots," says Rodger. "There is a lot of interest in Alice."
ALUMNI PROFILE: SUSAN ATHEY

SUSAN ATHEY remembers her first foray into economics. In 1988, then a young CS undergrad at Duke, Athey landed a job administering a Unix workstation for an economics professor. Though she was hired for her computing skills, it wasn’t long before Athey’s talent in another field began to shine. “I had always been interested in programming,” recalls Athey, now a Professor of Economics at Harvard University, “but the business aspects of computing were very compelling.”

Athey’s first research project was a study of how computers are bought and sold at auctions, and in 1991 she graduated magna cum laude with a triple major in economics, mathematics, and computer science.

Today, only thirty–eight years old, Athey is a world-renowned economist and winner of the 2007 John Bates Clark Medal, a prestigious economics award second only to the Nobel Prize. She is the first female economist to receive the award. After Duke, Athey attended the Stanford Graduate School of Business and graduated with a PhD in economics and an entourage of two dozen universities eager to hire her. Athey chose MIT, where she made tenure in only six years. She returned to Stanford in 2001 and finally settled at Harvard in 2006.

Athey has been called an “applied theorist” for her work in both extremes of the economics spectrum: applied economics and basic research. She has investigated a wide variety of topics, including diversity and mentoring at organizations, U.S. timber auctions, and secret industry agreements.

But her research is united by a single goal—to create tools that enable economists to make and test predictions about how organizations will act in the marketplace. Currently, Athey is studying auctions and online advertising, working to develop auctions that will promote the best quality matches between advertisers and consumers online.

Computing remains an important part of Athey’s work. “I still write my own programs,” she says. “Having expertise in computing remains an important part of my research.”

Athey’s list of accomplishments is long, including an honorary doctorate from Duke, but she still remembers the early days of her career. “Duke professors really reached out to me and were excited when I was interested in research,” she says, recalling Professors Owen Astrachan, Donald Rose, and Carlo Ellis. “I felt like they saw something in me that I didn’t necessarily see in myself, and they took the initiative to encourage my studies.” Such encouragement certainly paid off, as there is no end in sight for this talented computer-savvy economist.

UNDERGRADUATE STUDENT PROFILE: SOPHIA CUI

SOPHIA CUI had a plan: study economics, become an investment banker, make millions. But during her first semester at Duke, sitting miserably in an introductory economics class, Cui had a revelation. “If you’re going to spend four years studying something, you might as well enjoy it,” she thought. Drawn to the problem-solving challenges of CS—“You have to get the cogs turning,” she says with a smile—Cui switched her major to computer science.

Right after freshman year, Cui began her first CS project with Rachelao Brady, director of Duke’s Visualization Technology Group. At the soundSpace exhibit at the North Carolina Museum of Life and Science, an interactive room that translates movement into sound, Cui undertook the challenge of additionally translating the movement into images of birds fluttering across a screen. “From there, I started to develop an interest in visualization and design,” says Cui.

Cui continued to work with Brady into her sophomore year and was accepted into the C-SURF program. As part of the program, Cui began a research project with Brady and mentor Eric Monson last summer developing a tool for organization and visualization of massive data sets. Ambitious, Cui crammed a full nine weeks of research into six weeks so she could spend the rest of the summer doing research and development at a start-up in Silicon Valley. “I tend to do a lot of things,” laughs Cui, bright-eyed and enthusiastic despite her busy lifestyle.

A Canadian-American with a talent for graphic design, Cui is Duke’s resident T-shirt designer, winner of three campus design competitions, including the Last Day of Classes shirt. She is also the design talent behind the wall of screens in the Link!, a studying and teaching facility in the lower level of the Perkins library. Looking into the future, Cui hopes she can keep combining her many interests and talents in graduate school. “I want to continue to be creative and still do programming,” she says.
**GRADUATE STUDENT PROFILE: LIRONG XIA**

LIRONG XIA made a decision: he would study mathematics in college, for which he had a natural affinity. But his father had other ideas. Mr. Xia brought a computer scientist home to meet his son, and both urged the young man to try computing instead. “At the time, I didn’t know which was better, but I decided to follow their advice,” says Xia, now a CS PhD candidate at Duke. He remains pleased with his decision, “but I still prefer theoretical problems to programming,” he laughs.

Xia completed his undergraduate degree in CS at Tsinghua University, the MIT of China, and stayed on for graduate work until 2007. But he first set his sights on Duke in 2006. One day while browsing through conference papers, Xia came across a study on voting theory by the Department’s own Vincent Conitzer. Voting theory, the design and analysis of rules applied to group decisions, appealed to Xia’s interests in both CS and math. “I realized I could apply a lot of mathematics to voting problems,” he recalls.

Xia received a James B. Duke fellowship to attend Duke, a competitive campus-wide merit scholarship, and joined Conitzer’s lab in the fall of 2007. Once on campus, Xia decided to study computational social choice, the computational aspects of voting when overwhelming amounts of information are involved. “He’s very independent, driven, and motivated,” says Conitzer. “We’re very lucky to have him here.”

Xia’s research spans two major topics: manipulation of voting systems and multi-issue domains. During any type of voting, participants may try and manipulate the system, lying about their real preferences in the hopes of strategically altering the result. Xia studies how to prevent such manipulation by adding computational complexity to voting rules, so even if it is possible to manipulate a system, it will be impossibly difficult (NP hard) to do so. For most CS researchers, unsolvable problems are bad news. For Xia, they are the ideal solution.

In a second line of research, Xia studies voting in multi-issue situations, in which parties make a variety of decisions, each conditional on the one before it. For example, if a group of people are going out for dinner, a person’s vote for a restaurant may change depending on the day and time the group chooses to eat. With many choices, multi-issue voting rapidly becomes computationally complex. Xia is working to find solutions that speed up the process, hoping that an efficient system for multi-issue voting will make the procedure more useful in real life situations.

This year, Xia co-authored an unprecedented five papers at the prestigious 21st International Joint Conference on Artificial Intelligence (IJCAI-09). “He’s had an extremely successful year,” says Conitzer. Xia, who is also pursuing a Master’s degree in economics, attributes that success to Department support, especially from his advisor. “Vince gives me a lot of freedom to develop my research,” says Xia. “I owe him thanks for his help and support.”
**RECENT GRADUATES**

**PHD DEGREES**

**Ivelin Georgiev**  
Advisor: Bruce Donald  
Novel Algorithms for Computational Protein Design with Applications to Enzyme Redesign and Small-Molecule Inhibitor Design

**Raluca Gordan**  
Advisor: Alexander Hartemink  
Protein-DNA Binding: Discovering Motifs and Distinguishing Direct from Indirect Interactions

**Anita Lungu**  
Advisor: Daniel Sorin  
Verification-Aware Processor Design

**Urmia Majumder**  
Co-advisors: John Reif and Thom LaBean  
Molecular Computing with DNA Self-Assembly

**Jeff Phillips**  
Advisor: Pankaj K. Agarwal  
Small and Stable Descriptors of Distributions for Geometric Statistical Problems

**Constantin Pistol**  
Co-advisors: Alvin Lebeck and Chris Dwyer  
Structures, Circuits and Architectures for Molecular Scale Integrated Sensing and Computing

**Aydan Yumerefendi**  
Advisor: Jeffrey Chase  
System Support for Strong Accountability

**MS DEGREES**

**Karen Dana**  
Advisor: Jeffrey Chase  
The Problem of Honest Shirkimg in Content Swarms

**Amita Devaraj**  
Advisor: Kishor Trivedi  
Uncertainty Propagation in Analytic Models Using Monte Carlo Methods

**Herodotos Herodotou**  
Advisor: Shivnath Babu  
zTuned: Automated SQL Tuning through Trial and (Sometimes) Error

**Jeffrey Martin**  
Advisor: Bruce Donald  
Algorithms for Structure Determination of Symmetric Proteins from Nuclear Magnetic Resonance Data

**Stephen Odaibo**  
Advisor: Xiaobai Sun  
Microvasculature-Adaptive Discretization of Tumor and Tissue

**Sam Sleem**  
Advisor: John Reif  
Developing Scalable Abilities for Self-Reconfigurable Robots

**Seda Vural Remus**  
Advisor: Carlo Tomasi  
Semi-Supervised Fisher Linear Discriminant (SFLD)

**UNDERGRADUATE DEGREES**

**MAJORS**

Grant Bond  
Aneesh Butani  
Zachary Cancio  
Ruijun Chen  
Matthew Colarese  
Andrew Cook  
Edward Cronauer IV  
Ashley DeMass  
Gregory Filipus  
Bryan Fleming  
Julia Foran  
Peter Franklin  
Daniel Garrison  
Darrell Gaspar  
John Hartzog  
Nicholas Ho  
William Horning  
Andrew Hsiao  
Alex Hu  
Alexander Hunter  
Benjamin Isaacscon  
Micah Jasper  
Jonathan Jou  
Boyuang Jang  
Thomas Kenney  
Alexander Keybl  
Nicholas Kurtzman  
Ray Kwon  
Zaraorv Lamba  
Sejin Lim  
William Linton  
Raitisa Markova  
Jonathan Mathew  
Ryan Minogue  
Justin Mullin  
Andrew Nelson  
Jonathan Odem  
Nicholas Patrick  
Tritan Patterson  
John Pena  
George Rossin  
Benjamin Shefton  
Oliver Sherouse  
Harish Srinivasan  
Abhishek Thapa  
Andrew Tremblay  
Michael Tonick  
Neelomohan Vadoothker  
Kenneth White  
Congyi Wu  
Tiffany Yom  
Ray Zeller  
David Zhang

**MINORS**

Laura Angle  
Evan Beard  
Joel Burrell  
Yifan Li  
Max Masnick  
Carolyln Meyer  
Jaymeson Morris  
Deborah Nelson  
Yang Qin  
Crystal Senko  
Nidhi Tripathi  
Laura Angle  
Evan Beard  
Joel Burrell  
Yifan Li  
Max Masnick  
Carolyln Meyer  
Jaymeson Morris  
Deborah Nelson  
Yang Qin  
Crystal Senko  
Nidhi Tripathi
NEW COMPUTER SCIENCE STUDENTS

PHD
Andrew Brown
NC State University
Systems
Qiang Cao
Wuhan University
Networks, Security
Sudhanshu Garg
I.I.I.T.—Hyderabad
Theory, Computational Geometry
Jun Hu
Wuhan University
Numerical Analysis, Machine Learning
Yin Lin
Shanghai Jiaotong University
AI, Vision, Robotics
Jeffrey Martin
Duke University
Computational Biology
Matthew Matlock
University of Tulsa
Artificial Intelligence
Jason Pazis
Technical University of Crete
Machine Learning, Robotics
Ion Valentin Pistol
University of Craiova
Architecture, Distributed Systems
Bi Wu
Duke University
Distributed Systems
Xin Wu
Tsinghua University
Systems, Networks
Jie Xu
Brandeis University
Computational Biology
Xuanran Zeng
National University of Singapore
Distributed Systems

MS
Liang Dong
Beijing University
Systems
Gang Luo
Hauzhuong University of Science
Machine Learning, AI
Ryan Tate
US Military Academy—West Point
Networks, Databases
Xuting Zhao
Peking University
Artificial Intelligence

UNDERGRADUATE MAJORS
Michael Ansel
Nikhil Arun
Maggie Bashford
Cameron Behar
Michael Bell
Christopher Carlan
Hooyu Chen
Van Dang
Se-Gil Feldsott
Jeffrey Forte
Nicholas Hawthorne
David Herzkes
Matthew Jacobson
Micah Jasper
Go-Young Joung
Kostadin Kostadinov
Lindsay Kubasik
Chengyu Li
Elizabeth Liang
Peter Linnartz
Patrick Lu
Joshua Lund
Lakshya Madhok
Muntasir Natour
Vitor Olivier
Matthew Prorok
Trevor Reid
Daniel Shapiro
Antony Thomas
Tian Tian
Dylan Wengert

UNDERGRADUATE MINORS
Barbara Bao
Shwetadwip Chowdhury
Justin Goldsmith
Nils Hultgren
Tanner Schmidt
Teoman Yavuzkurt
Chi Zhang

PAPER NAMED TOP PICK
A NETWORK OF SENSORS atop city light poles and buildings may someday monitor traffic patterns, pollution, and the weather. But first, researchers must find ways to effectively and reliably place sensors in complicated urban environments.

A new publication by PhD candidate Shashidhara Ganjugunte, along with Pankaj Agarwal and Esther Ezra, presenting an efficient and simple algorithm for sensor placement was recently named Best Paper on the Algorithms and Analysis track at the fifth annual IEEE International Conference on Distributed Computing in Sensor Systems (DCCSS ’09).

“We modeled the urban environment as a polygon with obstacles,” says Ganjugunte, “and tried to develop an algorithm to decide where the sensors should be placed to cover as much area as possible.” Their solution demonstrates that, by sampling, one can identify certain “landmark” locations, and if sensors are placed to cover these landmarks, then they cover almost the entire area. The number of landmarks required is surprisingly small, the team found, so only a small number of sensors are needed.

Ganjugunte presented the paper, Efficient Sensor Placement for Surveillance Problems, at the June DCCSS conference in Marina Del Rey, California.

STUDENT WINS
DUKEMOBILE COMPETITION
JP CAFARO, a senior with a dual ECE/CS major, was recently selected as winner of the DukeMobile competition, a contest hosted by the Office of Information Technology and the Office of Public Affairs and Government Relations. Students were challenged to come up with innovative and Duke-centric applications to add to the DukeMobile suite of apps for iPhone and iPod Touch devices (www.medu.com/duke/).

Cafaro will develop his winning idea—a narrated, illustrated campus tour—with another Duke student, Matthew Isabel, and Christoph Gutten-tag, Dean of Undergraduate Admissions.

A NETWORK OF SENSORS atop city light poles and buildings may someday monitor traffic patterns, pollution, and the weather. But first, researchers must find ways to effectively and reliably place sensors in complicated urban environments.

A new publication by PhD candidate Shashidhara Ganjugunte, along with Pankaj Agarwal and Esther Ezra, presenting an efficient and simple algorithm for sensor placement was recently named Best Paper on the Algorithms and Analysis track at the fifth annual IEEE International Conference on Distributed Computing in Sensor Systems (DCCSS ’09).

“We modeled the urban environment as a polygon with obstacles,” says Ganjugunte, “and tried to develop an algorithm to decide where the sensors should be placed to cover as much area as possible.” Their solution demonstrates that, by sampling, one can identify certain “landmark” locations, and if sensors are placed to cover these landmarks, then they cover almost the entire area. The number of landmarks required is surprisingly small, the team found, so only a small number of sensors are needed.

Ganjugunte presented the paper, Efficient Sensor Placement for Surveillance Problems, at the June DCCSS conference in Marina Del Rey, California.

JP CAFARO, a senior with a dual ECE/CS major, was recently selected as winner of the DukeMobile competition, a contest hosted by the Office of Information Technology and the Office of Public Affairs and Government Relations. Students were challenged to come up with innovative and Duke-centric applications to add to the DukeMobile suite of apps for iPhone and iPod Touch devices (www.medu.com/duke/).

Cafaro will develop his winning idea—a narrated, illustrated campus tour—with another Duke student, Matthew Isabel, and Christoph Gutten-tag, Dean of Undergraduate Admissions.
STUDENT PUBLICATIONS/PRESENTATIONS

Nedyalko Borisov
Why Did My Query Slow Down?, Biennial Conference on Innovative Data Systems Research (CIDR 2009)
DiaDS: Addressing the “my-problem-or-yours?” Syndrome with Integrated SAN and Database Diagnosis, 7th USENIX Conference on File and Storage Technologies (FAST 2009)
DiaDS: A Problem Diagnosis Tool for Databases and Storage Area Networks, 35th International Conference on Very Large Databases (VLDB 2009)

Azbayar Demberel
Reflective Control for an Elastic Cloud Application: An Automated Experiment Workbench, HotCloud ’09 Workshop with the 2009 USENIX Annual Technical Conference

Sangyun Du
Fa: A System for Automating Failure Diagnosis, 25th International Conference on Data Engineering (ICDE 2009)

Shashidhara Ganjugunte

Peter Gilbert
Experimenting in Mobile Social Contexts Using JellyNets, 10th International Workshop on Mobile Computing Systems and Applications (HotMobile 2009)

Mingyu Guo
Combinatorial Prediction Markets for Event Hierarchies, 8th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009)
Welfare Dominated Graves Mechanisms, 5th Workshop on Internet and Network Economics (WINE 2009)

Xin Guo
Domain-oriented Edge-based Alignment of Protein Interaction Networks, 17th International Conference on Intelligent Systems for Molecular Biology (ISMB 2009) & 8th European Conference on Computational Biology (ECCB 2009)

Herodotos Herodotou
Automated SQL Tuning through Trials and (Sometimes) Error, 2nd International Workshop on Testing Database Systems (DBTest 2009)

Josh Letchford
An Ethical Game-Theoretic Solution Concept for Two-Player Perfect-Information Games, 4th Workshop on Internet and Network Economics (WINE 2008)

Harold Lim
Automated Control in Cloud Computing: Challenges and Opportunities, 1st Workshop on Automated Control for Datacenters and Clouds (ACDC09)

Anita Lungu

Constantin Pistol
Architectural Implications of Nanoscale Integrated Sensing and Computing, 14th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLD ’09)

Sharath Raghvendra
Approximate Euclidean Shortest-path Amid Convex Obstacles, ACM/SIAM Symposium on Discrete Algorithms (SODA 2009)

Risi Thonangi
Weighted Proximity Best-joins for Information Retrieval, 25th International Conference on Data Engineering (ICDE 2009)

Yi Zhang

KEEP IN TOUCH!

CONGRATULATIONS to the following alumni who have recently received awards or taken new jobs.

Julia Foran (BS, ‘09)
Comscore
Seattle, WA

Christopher LaPilla (MS, ’08)
Modality Inc.
Durham, NC

Jeff Phillips (PhD, ’09)
Postdoctoral Researcher
University of Utah
Salt Lake City, UT

Jaidev Patwardhan (PhD, ’09)
Apple Computer
Sunnyvale, CA

Constantin Pistol (PhD, ’09)
Microsoft
Sunnyvale, CA

Alex Schearer (BS, ’08)
Microsoft
Seattle, WA

Andrew Waterman (BS, ’08)
Graduate School
University of California
Berkeley, CA

Congyi Wu (BS, ’09)
Microsoft
Research Triangle Park, NC

Tiffany Yam (BS, ’09)
Citigroup
New York City, NY

Aydan Yumerefendi (PhD, ’09)
Blue Stripe Software
Marrivile, NC

David Zhang (BS, ’09)
Microsoft
Redmond, WA

If you received a degree from the Department of Computer Science, please fill out our online alumni registration form (www.ca.duke.edu/people/alumni).