A happy new year to all of you! Like everyone else we are facing the challenge of dealing with the severe economic downturn. However, I am confident that with the help of the leadership at Duke, we will tackle this challenge in the creative and strategic manner that has been the hallmark of our past successes. Notwithstanding uncertain times, our faculty and students accomplished a great deal in the last few months. Herbert Edelsbrunner was elected to the German Academy of Sciences. A recipient of NSF's Alan T. Waterman award and a member of the American Academy of Arts and Sciences, Herbert is a pioneer in the field of geometric computing. One of our young faculty members, Kamesh Munagala, received the prestigious NSF CAREER award for his project on stochastic control policies for information acquisition and exploitation. Bruce Donald and his research group were featured in the news media for their software package that simulates modifications to an enzyme used to make a common antibiotic. Five of our faculty members, Shivnath Babu, Jeff Chase, Landon Cox, Richard Lucic, and Susan Rodger, received IBM faculty awards. Three new undergraduate students were selected to join our C-SURF program designed to provide outstanding undergraduates with an in-depth research experience. Congratulations to Sophia Cui, Peng Shi, and Sean Yu for becoming the latest C-SURF fellows. We are working with selected nonprofit organizations to help reduce the "digital divide" in the developing world. To this end, we donated several laptops to a secondary school in a small village in India, and to a primary girls school in Kenya. Once again, the Department was one of the sites of the ACM Mid-Atlantic Programming Contest in which over one hundred teams participated. The Duke team consisting of Matt Rognile, Nadeem Kolia, and Siyang Chen, coached by Owen Astrachan, will be heading to the World Finals in Stockholm, Sweden, on April 18-22, 2009. Congratulations to the team members and their coach. We hosted a number of other events as well. During the annual Department meeting and picnic, new members of the Department were introduced and the graduate student achievement awards were presented. The Department gave a special award to Jeff Phillips to recognize his extraordinary service to the Department and his valuable contributions to our graduate program. Despite the troubled economy, TechConnect 2008 was a great success. Hosted by the Department of Computer Science, the Pratt School of Engineering, and the Career Center, TechConnect provided an opportunity for CS and engineering students to network with company recruiters.

Finally, I invite you to check out our Web site to learn the latest news about the Department and to be part of our community. If you are in the RTP area, we hope you will stop by for a visit. We look forward to hearing from you.

Best wishes,
Pankaj K. Agarwal

Pankaj K. Agarwal, Chair

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KAMESH MUNAGALA RECEIVES NSF CAREER AWARD

THE DEPARTMENT extends its congratulations to Assistant Professor Kamesh Munagala, recently honored with the prestigious National Science Foundation CAREER award. The award is given “in support 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,” according to the NSF. Other recent NSF CAREER award recipients in the Department include Landon Cox, Shivnath Babu, and Ronald Parr.

Announced in July, the grant will provide Munagala with $400,000 of NSF funding over five years to continue his work in stochastic control theory. “It’s quite an honor,” says Munagala, who will utilize the funds to support graduate students in his lab and for travel expenses. The project funded by the award will tackle problems of uncertainty and incomplete information in computing and communication systems. In particular, Munagala will explore the design and analysis of algorithms that manage the trade-off between exploration and exploitation of information in uncertain environments (read more about his research on page 4). In collaboration with Assistant Professor Vince Conitzer, Munagala is also examining such topics in an economic context. “It’s quite an honor,” says Munagala, who will utilize the funds to support graduate students in his lab and for travel expenses. The project funded by the award will tackle problems of uncertainty and incomplete information in computing and communication systems. In particular, Munagala will explore the design and analysis of algorithms that manage the trade-off between exploration and exploitation of information in uncertain environments (read more about his research on page 4). In collaboration with Assistant Professor Vince Conitzer, Munagala is also examining such topics in an economic context. “This award is a well-deserved recognition for Kamesh’s outstanding research,” says Department Chair Pankaj Agarwal. “His proposed research will not only have a long-lasting impact on optimization algorithms, it will also strengthen the ties between theoretical computer science and machine learning.”

Now in his fifth year in the Department, Munagala came to Duke after completing a PhD and postdoc at Stanford University. In 2004, he created and has since taught a new graduate class on approximation algorithms.

CARLA ELLIS APPOINTED TO NSF CISE ADVISORY COMMITTEE

IN SEPTEMBER, Professor Emerita Carla Ellis was appointed to the NSF Directorate for Computer and Information Science and Engineering (CISE) Advisory Committee. Ellis joins a distinguished team of industry and academic leaders responsible for advising Jeannette Wing, the new CISE assistant director, on planning and policy formulation. The group’s initiatives include the national advancement of computer science and broadened participation in computing across a diverse demographic. “I was excited to learn that Carla was selected for this important position,” says Department Chair Pankaj Agarwal. “Both NSF and the computer science community will benefit tremendously from Carla’s leadership and experience.”

“It’s an exciting time, with the new administration coming in, for science to take an increasing national role,” says Ellis, who will specifically advise Wing on sustainability in computing. “I think it’s a great time to be able to push the CISE agenda.”

After twenty-two years in the Department, in what can only loosely be called retirement, Ellis is building her dream house in the Pacific Northwest while remaining an active board member of the Computing Research Association (CRA) and member of CRA-W. She is also the current Editor-in-Chief of ACM Transactions on Computer Systems.

NEW GRANTS AWARDED

Pankaj Agarwal
STREAM: Scalable Techniques for high Resolution Elevation data Analysis and Modeling
Sponsor: ARD

Shivnath Babu
CAREER: Querying and Controlling Systems (REU Supplement)
Sponsor: NSF

Jeff Chase
Deploying a Vertically Integrated GENI “Island”: a Prototype GENI Control Plane (ORCA) for a Metro-Scale Optical Testbed
Sponsor: UNC/RENCI

Vince Conitzer
Computational Social Choice: Aggregating Preferences in Combinatorial Domains
Sponsor: NSF

Vince Conitzer
Prediction Markets, Mechanism Design, and Computation
Sponsor: Yahoo! Research

Herbert Edelsbrunner (PI - Philip Benfey)
GEPR: Genome-wide Analysis of Root Traits
Sponsor: NSF

Thom LaBean
Collaborative Research: Biomolecular Self-Assembly of Functional Nanostructures for Computing and Communications
Sponsor: NSF

Thom LaBean
Experimentally Probing the Origins of Macromolecular Structure
Sponsor: Foundational Questions Institute (FQXi)

Alvy Lebeck
Collaborative Research: Circuit and Systems Architectures for Self-Assembled Nanoscale Computers (REU Supplement)
Sponsor: NSF

Alvy Lebeck (PI - Chris Dayer)
EMT: Expanding the Computing Domain with Self-assembled Nanophotonics
Sponsor: NSF

Kamesh Munagala
CAREER: Light-weight Near-optimal Stochastic Control Policies for Information Acquisition and Exploitation
Sponsor: NSF

John Reif (Co-PI - Thom LaBean)
EMT/Nano: Autonomous Programmable DNA Devices using DNAzymes
Sponsor: NSF

John Reif
EMT/Nano: Polymerase-Based Self-Activating and Reactivating DNA Systems
Sponsor: NSF
Faculty Awards: Jeff Chase, Shivnath Babu, IBM. This year, the Department received four promote innovative curricula strategic to Awards, intended to foster collaboration and universities. One of these is the IBM Faculty research lab. "important to be successful in an industrial Wang. "These two qualities are very background and hands-on skills, " says nice balance between a solid theoretical and jobs at IBM. "Duke graduates have a encourage students to apply for internships least once a year to talk with faculty and Department. Wang returns to campus at and manager of the Unified Data Analytics where she is now a research staff member there. "One of the major advantages of an internship at IBM," says Lungu, "is the opportunity to get a sense of what research work in industry is like." Lungu's sentiment is echoed across the department by students and faculty with industry partners like IBM. "Being in academia, you don't always get to see the problems actual customers are facing," says Shivnath Babu, who has published two joint papers with IBM researchers at Almaden Research Center in San Jose. He also maintains a collaboration in autonomic computing with IBM employees at Research Triangle Park. Working with an industry partner is a "hands-on collaboration" of the utmost value, says Babu. Appreciation of the partnership goes both ways. IBM relies on universities to recruit talent and form collaborative research relationships, says Andy Rindos, head of the RTP Center for Advanced Studies (CAS) at IBM, so the company has a vested interest in supporting quality education and encouraging innovative research. Min Wang, a '99 Duke PhD graduate, interned for three summers at IBM's Silicon Valley lab, then took a job with IBM's research division, where she is now a research staff member and manager of the Unified Data Analytics Department. Wang returns to campus at least once a year to talk with faculty and encourage students to apply for internships and jobs at IBM. "Duke graduates have a nice balance between a solid theoretical background and hands-on skills," says Wang. "These two qualities are very important to be successful in an industrial research lab." IBM hosts several formal programs for universities. One of these is the IBM Faculty Awards, intended to foster collaboration and promote innovative curricula strategic to IBM. This year, the Department received four Faculty Awards: Jeff Chase, Shivnath Babu, Landon Cox, and a joint award to Susan Rodger, Nancy Shaw and Richard Lucic. The internationally competitive grant is "very, very valuable," says Babu, who has received a Faculty Award each year for the past three years. "IBM's support is an important supplement to our research funding from the National Science Foundation," says Chase, whose awarded funds were used for advanced cloud computing systems based on resource leasing. Susan Rodger applied the funds to host teachers at Adventures in Alice Programming, a summer workshop to teach middle and high school teachers to use the Alice programming language in the classroom. In addition to Faculty Awards, four Duke graduate students have received prestigious IBM PhD Fellowships since 1998, including Wang. Lungu recently received an IBM scholarship award which, among other benefits, afforded her the chance to travel to Italy to present a research paper. Another funding mechanism is the IBM Shared University Research (SUR) awards program, a worldwide equipment donation program. "Through the SUR program IBM has donated some of its cutting-edge hardware to advance our research and our use of computing within the university," says Chase, co-recipient of a 2008 SUR grant which added new IBM BladeCenter servers for the Duke Shared Cluster Resource (DSCR), a shared computing cluster that hosts computational research across campus. "Thanks to the project, the BladeCenter core of the DSCR is enabled for virtual computing, allowing more flexible sharing of the computing resources." The Department has received a SUR award each year for the last six years. In addition to awards and collaborations, CAS sponsors IBM University Day in RTP twice a year, hosting 350+ faculty, students, and IBM employees to discuss the "latest and greatest" topics in research, says Rindos. "It's a real opportunity to develop contacts, network, and define collaborations," he adds. There's not enough to be said about the value of industry-academic collaborations, says Professor Richard Lucic, Director of inDuke, a joint program with the Department of Electrical and Computer Engineering that encourages value-based industry relationships. "Collaboration is a win-win for both sides."
KAMESH MUNAGALA wants nothing more than to simplify. At first glance, it seems like a strange goal for a mathematician/computer scientist who specializes in the design and analysis of algorithms for NP-hard combinatorial optimization problems. But while Munagala's research has one foot in the theoretical, the other is grounded in the practical—the application of models and algorithms to databases, computer and sensor networks, and e-commerce.

Many emerging applications, such as Internet advertising and wireless transmissions, present difficult decision problems, called stochastic control problems, in which solving for an exact solution would take exponential time or space. So much time and space, in fact, that the attempt is prohibitive. This is referred to as "the curse of intractability." Researchers in operations and control theory have tackled such problems, but Munagala is addressing them from a new direction: "We propose to look at the same problems, but from the lens of approximation algorithms," he says.

Approximation algorithms are computational methods that trade perfection for efficiency: A good solution that can be found in a day is better than an ideal solution that requires a month of processing. Such algorithms are valuable when efficiency takes precedence over exactness, as in many modern computing infrastructures. But simply designing algorithms to ease the strain of computing isn't enough, Munagala believes. There is a second step: proving that the performance of the designed algorithm will be close to optimal. The algorithm must prove its mettle. This is often the hard part, says Munagala, but it's vital to the process. "Both are tied together—the process of proving an algorithm is close to optimal gives more insights into what the correct algorithm itself should be."

With support from a NSF CAREER Award (see page 2), Munagala is currently focused on unraveling problems of allocating resources, such as time or money, when there is uncertainty, such as gaps in information. Using the time-honored 'multi-armed bandit' approach, a model for studying systems with inherent trade-offs, Munagala is currently investigating two applications: Internet bidding and wireless networks.

Advertisers on Google or Yahoo! bid on keywords so that when a user searches for the keyword, the advertisement pops up on the screen. Faced with a limited budget (the resource), advertisers must decide which keywords to pay for despite limited knowledge (the uncertainty) about whether likely users of that keyword will actually click the advertisement. For example, the keyword "mortgage" may result in twice the number of clicks than the keyword "home." How does an advertiser allocate its budget among several keywords? Working with PhD candidate Sayan Bhattacharya, Munagala hopes to simplify the problem and design a model to solve it. Munagala plans to confer with employees at Google and Yahoo! about the model design and what company policies might need to be incorporated.

Munagala is also collaborating with researchers in ecology and statistics, as well as Professors Jun Yang and Pankaj Agarwal, on a variety of wireless network decision problems. In general, a single wireless node has the option of a variety of channels that can be used for transmission, like exits on and off a freeway. But traffic among channels may vary widely and randomly change over time. To maximize its transmission rate, a node confronts the trade-off between sticking to a channel with a high rate and updating its information about the other channels in case the initial channel begins to slow. But to gather information on the other channels, it must stop transmitting on the currently high rate channel and transmit on the alternate channels. "This leads to a 'chicken-and-egg' issue," says Munagala. "The decision to transmit not only influences the current rate, but also what information is available to make decisions in the future." It's a classic decision problem, one for which a practical solution would be beneficial to a variety of network applications.

"The focus of approximation algorithms is to simplify," says Munagala. "Instead of looking at problems in their full complexity, you try to find the most simple structure in the problems. If you analyze that structure, it gives you insights into what is going on in the process."
THE GIFT OF EDUCATION

IN THE SMALL fishing village of Muhuru Bay, Kenya, only five percent of girls attending primary school move on to secondary education. Of those, not a single woman has gone on to a university in the last twenty years. But Andrew Cunningham, BA ’08, and a team at the Women’s Institute for Secondary Education and Research (WISER), working together with the Duke Department of Computer Science and the Information Science and Information Studies (ISIS) program, intend to change all that.

WISER, which began as a collaboration between Sherryl Braverman in the Duke Department of Biology and Rose Odhiambo of Egerton University in Kenya, will be the first all-girls secondary boarding school and community center in the region. Thanks to the CS Department’s recent donation of fifteen laptops, each loaded with a copy of Microsoft Office donated by Microsoft, WISER is currently implementing several development projects in the local community.

“The first is simple, but lifesaving,” writes Cunningham, executive director of WISER, in an email from Kenya. In conjunction with ISIS, locals are using the laptops to create and maintain a health services inventory for local clinic personnel. A second program uses the laptops at primary schools for individualized instruction and access to interactive media tools. “For example, most students have never seen snow, human anatomy, or even a court of law,” writes Cunningham.

The Department cycles through equipment on a regular basis, says Professor Richard Lucic—a necessity to stay on the cutting edge of research. Last year, the Department donated fourteen Dell Inspiron 600m laptops to the BMB Senior Secondary School, a rural school outside New Delhi, India. The recently reopened school was in desperate need of equipment to begin a computer science program, a behest of students and parents in the region.

“The marketplace in India is cruelly competitive, be it for jobs or admission to institutions of higher learning,” writes Sagar Jain, Professor Emeritus of Health Policy and Management at UNC and member of the team who reopened the school, in an email. One of the prerequisites for student success is a high degree of computer proficiency, he notes. The donated laptops formed a computer lab at the school, and computer education is now compulsory for grades 4 and above. “Our students love the laptops,” writes Jain. “Thanks Duke!”

NEW C-SURF FELLOWS

Sophia Cui
Visualization of Multi-scale Network Graphs
Advisor: Rachael Brady

Peng Shi
Computational Issues in Markets, Elections, and Game Theory
Advisor: Vincent Conitzer

Zexiao "Sean" Yu
Designing a Virtual Information Telescope Using Mobile Phones and Social Networking
Advisor: Romit Roy Choudhury

C-SURF PROJECTS

Research projects are solicited from Computer Science faculty and from faculty in other disciplines who have projects with computational or programming tasks. The current projects are listed below.

Computational Issues in Markets, Elections, and Game Theory
Advisor: Vincent Conitzer

Mining Performance Data from Large Systems
Advisor: Shivnath Babu

Designing a Virtual Information Telescope Using Mobile Phones and Social Networking
Advisor: Romit Roy Choudhury

Using Mobile Phones to Write and Draw on Air
Advisor: Romit Roy Choudhury

Machine Learning and Computational Systems Biology
Advisor: Alexander Hartemink

Visualization of Multi-scale Network Graphs
Advisor: Rachael Brady

Project descriptions and additional information on the C-SURF program can be found at www.cs.duke.edu/csutf.
A WEEKEND ON THE COAST: GRAD STUDENT RETREAT

ON A SUNNY Friday afternoon, faculty, students, and staff caravanned across the state to the first-ever Department of Computer Science graduate student retreat. Spearheaded by Jeff Phillips and organized by a committee of graduate students, the event was held September 19-21 at the Duke University Marine Laboratory in Beaufort, NC.

Designed to build departmental fellowship and encourage research discussions, the weekend kicked off with a Friday night poster session, complete with refreshments and a display of over thirty posters. “The best thing was getting to know the work of others in a relaxed environment,” says Pablo Gainza, a first-year PhD student.

Saturday began with two panels on surviving grad school, one led by students and the other by faculty. “Those were generally popular,” says Phillips. “People asked a lot of questions.” Following the panels, Professor Vince Conitzer gave a research presentation and Professor Richard Lucic delivered a talk on intellectual property management. An afternoon beach excursion topped off the day. “It was not only about getting people to know what others are working on,” says Bei Wang, a member of the organizing committee, “but getting faculty and students to interact outside of a traditional university setting.” On Sunday, Professor Kamesh Munagala gave a research presentation and Phillips led a how-to discussion on completing a thesis.

Over sixty people attended this year’s retreat, which Phillips hopes will become a tradition in the Department.

STUDENT PUBLICATIONS/PRESENTATIONS

Ionut Constandache
Secure Control of Portable Images in a Virtual Computing Utility,
VMSEC/ACM CCS Workshop

Nihshanka Debroy
Accelerating Non-Uniform FAST Fourier Transform via Reduction in Memory Access Latency, Society of Photo-Optical Instrumentation Engineers (SPIE 08)

Shashidhara Ganjugunte
Stabbing Convex Polygons with a Segment or a Polygon, 16th Annual European Symposium on Algorithms (ESA 2008)

Urmi Majumder

Jeff Phillips
An Efficient Algorithm for Euclidean 2-Center with Outliers, 16th Annual European Symposium on Algorithms (ESA 2008)

Vamsidhar Thummala and Risi Thonangi

KEEP IN TOUCH!

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

Kshipra Bhawalkar (BS, ’08)
Computer Science PhD Student at Stanford

Jimin Choi (BS, ’08)
Cisco Systems
San Jose, CA

Harish Srinivasan (BS, ’08)
Cisco Systems
Boston, MA

If you received a degree from the Department of Computer Science, please fill out our online alumni registration form (www.cs.duke.edu/people/alumni).
UNDERGRAD ALUM PROFILE:  
MATTHEW TERRITO  | A DREAM COME TRUE

WATCHING JURASSIC PARK in 1993, Matthew Territo had an epiphany. “I saw that movie, and I was like, ‘Holy cow! I have to do that,’” he recalls. Territo, BS ’06, was awed by the special effects and graphics, and he wanted to produce them himself someday. Problem was, he didn’t know how.

Territo entered Duke as an electrical engineering major, following in his father’s footsteps and hoping they would lead him to the movies. But on the first day of a CS class with Professor Owen Astrachan, he opened the textbook to read, “Computer science is the study of computer graphics and 3D imaging.” Shortly after, he switched his major to computer science and never looked back.

Today, Territo is the Surfacing Technical Director at DreamWorks Animation studio in Northern California. With one credited movie already under his belt, Madagascar: Escape 2 Africa, and experience with various other films and short animations, Territo is living his dream. But it wasn’t easy at first. Despite his experience at Duke, including a certificate in the Film/Video/Digital Program, Territo spent his senior year job-hunting with no success. “I couldn’t get many people to pay attention to me from the industry,” he says. But he continued to apply for studio positions.

Just a few months after graduation, Territo got a call from DreamWorks Animation. Two weeks, two interviews, and a cross-country flight later, Territo started as Technical Director in the Surfacing Department. As part of the surfacing team, Territo designs and maintains technical tools for the art team (“Tech support for artists,” he likes to say), which can vary and change with each new project. Territo occasionally takes part in the art itself; he helped design a grass system for Madagascar: Escape 2 Africa. “We actually grew and landscaped the grass as if it were real grass,” says Territo.

Territo’s CS training made all the difference at DreamWorks Animation. During two senior-year graphics courses with Rachael Brady and Robert Duvall, Territo was introduced to the computer graphics pipeline. Now he sees it in action everyday at the studio. In addition, his work involves a good amount of code and software writing.

Overall, Territo believes he was well prepared to enter the workforce after graduating. “The CS Department trains people correctly,” he says. “The focus is on understanding computer science and making sure what you do is extensible, accessible, and applicable. I think Duke students have the capability to really excel out here.”

Territo is currently working on a DreamWorks Animation project slated for a fall 2010 release, and he couldn’t be happier. “I’m making movies,” says Territo. “I never thought I’d be able to say that for real.”

ACM-W CHAPTER APPROVED AT DUKE

THANKS to the efforts of students and faculty, the first-ever chapter of ACM Committee on Women in Computing, ACM-W, was officially approved at Duke this fall. Now the official computer science women’s union for Duke University, the ACM-W chapter began last year after a group of graduate women attended the 2007 Grace Hopper Celebration of Women in Computing Conference (GHC).

“It was the first time we all really got to know each other,” says Urmi Majumder, a fifth year graduate student and president of the new chapter. After the conference, a group of 6-8 women began meeting weekly over informal lunches to discuss classes, projects, “everything under the sun,” laughs Majumder. With the help of Professor Susan Rodger, the students filed for official status in spring 2008, and it was granted in the fall.

In addition to regular lunches, the group coordinates attendance to lectures around campus and organizes exclusive talks with guest speakers, such as Susan Fischer from Pixar films who spoke last January on the technologies behind the movie Wall-E.

This past October, Majumder returned to the GHC along with second year graduate student Brittany Fasy, and Rodger, who spoke on a mentoring panel.
UNDERGRAD STUDENT PROFILES:
TIFFANY YAM | DAVE STECHER

Tiffany Yam found it through teaching. Dave Stecher discovered it through research. These two exemplary students uncovered their passions for computer science along different routes, but each has made a valuable contribution to the Department during their undergraduate years at Duke.

Tiffany Yam wasn’t sure what major to pursue when she began as a Duke freshman in 2005. But between drawing, economics, and biology classes, Yam took COMPSCI 6, Program Design & Analysis I, and loved the basic programming. The following semester, while still a freshman, Yam became a Teaching Assistant for the class, and continued to do so each subsequent year. Last year, as a junior, Yam was TA for COMPSCI 185, a seminar course for students in the Duke Emerging Scholars in Computer Science (DES-CS) program. Together with Professor Susan Rodger and TA Joanna Shih, Yam co-taught a seminar of twelve students. “That was my favorite one to TA,” says Yam. “It gave me the opportunity to actually teach and be creative in how I taught.” During the class, Yam was a good leader with strong mentoring skills, says Rodger. “She helped create a fun atmosphere.”

Next year, Yam will take a job at Citigroup in New York City, and knows her CS skills will be a valuable asset in the financial sector. But someday she may return to school to pursue the intersection of CS and art, her reigning passions. “I’ve always wanted to combine the two,” says Yam.

The DES-CS program also made an impact on Dave Stecher, a junior this year. After hearing about the program on a visitation weekend, Stecher enrolled as soon as he arrived at Duke. The program encourages students with little or no programming experience to learn more about CS by taking a series of two regular computer science courses with two half-credit seminar courses. The classes propelled Stecher into a CS major and into Jeff Forbes’ Program Design & Analysis II course during his sophomore year. “It was a lot of work,” recalls Stecher, but it appealed to him. Shortly after, Stecher successfully applied to be a fellow in C-SURF, the CS Undergraduate Research Fellows Program. Through the program, Stecher is working with Forbes on the analysis of social networks and is building a bibliographic recommender system within the Duke science and engineering departments. “It’s fun to be able to build something and have it work,” says Stecher. Stecher has done a great job gathering data for the project and working through difficult algorithms, says Forbes. “He works very well independently.” The project is currently moving into a user study phase, and Stecher hopes it will be up and running before he graduates next year.
GRAD STUDENT PROFILE: IVELIN GEORGEV

Ivelin Georgiev remembers the first time he was asked to program life—artificial life, that is. During his sophomore year at Eckerd College in St. Petersburg, Florida, Georgiev was assigned a project programming small organisms to compete in a virtual Darwinian battlefield. “It was amazing how we could use computers to show what nature does, to simulate it,” says Georgiev, a native of Bulgaria. Georgiev’s cyber-pet won the competition, and he continued to study artificial organism programs for his undergraduate thesis, but his interests began to shift toward a more applied field—computational protein and drug design.

After receiving his BS in computer science and math, Georgiev began his PhD at Dartmouth College with Professor Bruce Donald. “He gave me a project I’m still working on today,” says Georgiev. “I’ve been very fortunate.” The assignment was to develop an algorithm able to search through all hypothetical protein sequences and structures and emerge with a selected few most likely to have desired target properties. Once a protein’s basic structure is determined, scientists can begin to imagine redesigning it. Mutating a protein can alter such properties as stability, binding preference, and function. But there are countless possible mutations for any single protein, and it would be prohibitively expensive to test them all in a wet lab, says Georgiev. That’s where computer science can help. Based on a desired outcome, protein design algorithms search the combinatorial space of all possible protein sequences and produce a narrowed set of results most likely to produce that outcome. That subset can then be physically created and tested in the lab.

While working in Donald’s lab, which moved to Duke in 2006, Georgiev, in collaboration with peers, developed a number of algorithms, including K*, MinDEE, and BD, each of which identify protein mutations in unique ways. MinDEE and BD take into account flexible protein backbones and rotamers, factors traditionally left out because of increased complexity, while K* transcends standard single-conformation models by identifying an ensemble of conformations. “Ivelin has done a fantastic job,” says Donald. He not only attacked the bioinformatics and algorithmic problems of protein design, says Donald, but has already confirmed the feasibility of his approach. Georgiev’s algorithms were used to predict mutations of gramicidin synthetase A (GrsA), an enzyme involved in the synthesis of gramicidin, an antibiotic. Another graduate student in Donald’s lab, Cheng-Ju Chen, experimentally created the protein mutants. The resulting products worked as hoped, preferentially binding a different substrate than the natural GrsA. Since similar enzymes make a variety of other antibiotics, their redesign could be a step toward creating novel antibiotics. “It could be a new way to cope with antibiotic resistance,” says Georgiev. “What’s Georgiev up to now?” A few things, he laughs, including a new, more efficient algorithm and several collaborative projects. Winner of the 2007–2008 Outstanding PhD Proposal Award and Best Poster Award at the departmental retreat in September, Georgiev values the time he’s spent in the Department of Computer Science. “It’s a great place for me, very collaborative,” he says.

DISTINGUISHED DEPARTMENTAL SERVICE AWARD
Jeff Phillips

This special award was given to Jeff Phillips in recognition of his exceptional service to the Department and his valuable contributions to the graduate program during his five years in Duke CS.

GRADUATE AWARDS
2007–2008 ACADEMIC YEAR

OUTSTANDING PH.D. DISSERTATION AWARD
Dmitriy Morozov
Homological Illusions of Persistence and Stability
Advisor: Herbert Edelsbrunner

OUTSTANDING MASTER’S THESIS AWARD
Raluca Gordan
Incorporating Informative Priors into a Gibbs Sampler for de novo Motif Discovery
Advisor: Alexander Hartemink

OUTSTANDING PH.D. PROPOSAL AWARD
Ivelin Georgiev
Novel Algorithms for Computational Protein Design
Advisor: Bruce Donald

OUTSTANDING RESEARCH PROJECT AWARD
Mingyu Guo
Worst-Case Optimal Redistribution of VCG Payments in Multi-Unit Auctions
Advisor: Vincent Conitzer

OUTSTANDING TEACHING ASSISTANTSHIP AWARD
Mac Mason
COMPSCI 100E: Program Design and Analysis II
Instructor: Jeff Forbe

OUTSTANDING TEACHING ASSISTANTSHIP AWARD
Zhiqiang Gu
COMPSCI 111: Introduction to Computational Modeling
Instructor: Carlo Tomasi

OUTSTANDING DEPARTMENTAL SERVICE AWARD
Susanna Ricco

Prof. Jun Yang (left) presents the Distinguished Departmental Service Award to Jeff Phillips
DESPITE THE troubled economy, TechConnect 2008 was another great success. Over 375 students poured into the Fitzpatrick Center and Schiciano Auditorium on September 16 to participate in the industry panel discussion and the networking/recruiting event that followed. Six companies were invited to participate in the panel and there were a total of forty-three companies represented at TechConnect 2008.

The six panelists included engineers, VPs and directors from featured companies: Accenture, Boeing, Medtronic, Nortel, Rosetta Stone, and Skanska. The panel was moderated by ECE/ME Senior Willie Du. The networking/recruiting session following the panel discussion was extended an extra hour this year, at the request of several companies, to give more time to industry reps and students to engage and make valuable connections.

Several new companies joined TechConnect including Boeing, Northrop Grumman, Facebook, Agilent Technologies, NASA, Schlumberger, and AT&T. It is always exciting to add new companies to the program, and especially so this year due to the economic forecast. Returning industry partners were also well represented with Parsons, Microsoft, ExxonMobil, GE, and GM in attendance.

Another new feature at this year’s event was the addition of “info suites.” GE and Microsoft were featured on the 2nd and 3rd floors in glass enclosed student study areas with additional space for engaging students, answering questions and presenting mini-info sessions.

The feedback at the end of the evening from both students and industry partners was positive and, as usual, everyone could have used more time. We look forward to continuing our tradition of connecting Engineering and Computer Science students with industry. See you next year!

FRONTIERS 2008

The induke frontiers technology commercialization event was held Tuesday, November 18. This year Frontiers affiliated with the Office of Licensing and Ventures and the Fuqua School of Business to conduct Frontiers in partnership with Entrepreneurship Week: www.eweekatduke.com.

The eWeek activities had a strong emphasis on both research and technology transfer opportunities for industry and entrepreneurship guidance for students. The Frontiers portion of eWeek included two parallel sessions:

The Technology Showcase provided an opportunity for faculty and students to make presentations describing the value and impact of their technology.

The Poster Session gave students a venue to present their technology accomplishments.

Dinner and an opportunity to network followed the formal sessions. Over fifty individuals from industry participated and interacted with Duke researchers and total attendance reached over one hundred. This was by far the most successful Frontiers event to date.

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Scenes from TechConnect 2008.

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HOLIDAY PARTY 2008

DUKE PROGRAMMERS TAKE TOP HONORS

ON SATURDAY, October 25, over one hundred teams of undergraduates from New Jersey to North Carolina took part in the annual ACM Mid-Atlantic Regional Programming contest. Thirty-one local teams gathered in the LSRC to compete in the exciting but grueling all-day programming challenge.

The day began bright and early with three hours of preparation to familiarize students with the software and competition process. At the strike of noon, the numbers game began: Teams of three with one computer were given eight problems to solve over five hours. This year, five Duke teams competed, many of whom prepared for the competition in a half-credit class offered by Professor Owen Astrachan. In the class, students tackle previous competition problems and discuss team strategy.

This year’s problems ranged in difficulty, says Matthew Rognlie, a junior and member of last year’s team that advanced to the competition finals. Many of the problems were whimsical, such as trying to obscure an eyesore highway with strategically placed hedges, recalls Rognlie, but they still required intelligent insights under tight time constraints. One difficult problem challenged contestants to determine how Lawrence of Arabia could most effectively bomb a railroad line connecting 1,000 cities of varying importance so that it was least useful to the enemy.

All five Duke teams placed in the top eight in the on-site competition, co-directed by Professors Susan Rodger and Robert Duvall. Since Duke began hosting the event, a Duke team has advanced to the finals every year but one. This year was no exception: The “Duke A” team, composed of Matt Rognlie, Nadeem Kolia, and Siyang Chen, coached by Astrachan, will compete in the ACM World Finals in Stockholm, Sweden on April 18-22, 2009.

Matt Rognlie (standing), Alex Beutel, and Kosta Kostadinov in class COMPSCI 149S preparing for the ACM Programming Contest.

STAFF AWARDS

RICHARD BRAUN AND CELESTE HODGES

THE OUTSTANDING Staff Award for 2007-8 was given to Celeste Hodges and Richard Braun at the Fall 2008 departmental meeting in recognition of their outstanding efforts on the Department’s electronic communications.

Richard Braun Celeste Hodges
FALL 2008 DEPARTMENTAL MEETING

AT THE ANNUAL MEETING, hosted by the Chair and the Director of Graduate Studies, new faculty, staff, and students were introduced; plans for the academic year were announced; and grad student and staff achievement awards for 2007-8 were presented. Dinner, catered by Three Seasons, followed the program. Family and friends joined in, making for a very enjoyable evening.