CHAIR’S MESSAGE
As we begin the new academic year, it is a good time to share with you some of the highlights of the last semester. I am delighted to announce the arrival of our two latest faculty members: Bruce Donald and Vincent Conitzer. Not only do they build upon our existing strengths, they also expand our areas of expertise and provide useful links to a number of other departments. A world-renowned leader in robotics and computational biology, Bruce Donald moved here from Dartmouth where he was a Foley Professor of Computer Science. Bruce holds a secondary appointment in Biochemistry, and he will strengthen our ties with Biochemistry, Biology, and the Institute for Genome Sciences & Policy. A recent graduate from CMU, Vincent Conitzer is a rising star in the area of artificial intelligence. His research interests lie in computational economics, and he holds a secondary appointment in the Department of Economics. I am pleased to announce that Julian Lombardi, Assistant VP, Information Technology, has joined the Department as an adjunct faculty member. We also welcome our incoming graduate students: twenty-two PhD and four MS students.

As Chair, I am always proud to share with you the accomplishments of the members of our department. Ron Parr received the prestigious NSF CAREER award for his research in robotics and planning. He was also one of twelve young computer scientists and engineers selected for a DARPA program aimed at introducing young researchers to the technical challenges that the military faces. Jeff Chase was promoted to Full Professor. Not only is Jeff an outstanding researcher and mentor, we are also grateful for his service to the Department as the Director of Graduate Studies. Owen Astrachan was reappointed as Professor of the Practice for ten years. This unusually long term is a testimony to how much Duke values him. Hao He, a fifth year graduate student, received a highly competitive IBM Fellowship.

Recognizing the growing importance of computational techniques in various scientific fields and striving toward our goal of providing interdisciplinary education at all levels, the Department is introducing two interdisciplinary minors: computational biology and computational economics. They will provide undergraduates exciting avenues to explore the topics that can arise by integrating ideas from multiple disciplines. We just concluded a vibrant summer internship program for undergraduates: twenty undergraduates worked on a range of projects.

We were busy hosting several events during the spring and summer. The graduate recruiting weekend, March 30 – April 1, was a smashing success, as 79% of the visitors accepted our offer and joined this fall. In collaboration with the Department of Electrical and Computer Engineering,
BRUCE DONALD
PROFESSOR

BRUCE DONALD’S interdisciplinary research includes several fields of computational science and engineering, spanning robotics, geometry, graphics, and algorithms. Currently he is concentrating his efforts on two areas, Computational Biology, and Microelectromechanical Systems (MEMS) and Microrobotics. For example, his group recently developed the smallest controllable untethered mobile microrobot, by using MEMS technologies. As a primary faculty member in Computer Science, Donald also is Professor of Biochemistry in the Duke University Medical Center.

Some of the most challenging and influential opportunities for Physical Geometric Algorithms (PGA) arise in developing and applying information technology to understand the molecular machinery of the cell. Donald’s recent work shows that many PGA techniques may be fruitfully applied to the challenges of computational molecular biology. PGA research should lead to computer systems and algorithms that are useful in structural molecular biology, proteomics, and rational drug design. Concomitantly, a wealth of interesting computational problems arise in proposed methods for discovering new pharmaceuticals. Some recent results from the Donald laboratory include: new algorithms for interpreting X-ray crystallography and NMR (nuclear magnetic resonance) data, disease classification using mass spectrometry of human serum, and protein redesign. His algorithms have recently been used, respectively, to reveal the enzymatic architecture of organisms high on the CDC bioterrorism watch-list, for probabilistic cancer classification from human peripheral blood, and to redesign an antibiotic-producing enzyme to bind a novel substrate.

Trained at MIT, Donald spent 11 years as a professor in the Cornell Computer Science Department. Before coming to Duke, he was the Foley Professor at Dartmouth.

“Duke is an ideal place for my research,” says Donald, “because of its tradition of interdisciplinary collaboration, together with Duke’s triple strengths in Computer Science, Engineering, and the Medical School.”

NEW GRANTS AWARDED

Pankej Agarwal
Algorithms
Collaborative Proposal: Motion–Models, Algorithms, and Complexity (REU Supplement)
Sponsor: National Science Foundation

Herbert Edelsbrunner
Algorithms, Philip Benfey (Biology)
TRRGR Genomic Approaches to Identify Genes for Root System Architecture Traits
Sponsor: National Science Foundation

Thom LaBean
Algorithms
Qubic: Novel DNA Nanostructures for Targeted Molecular Scale to Micron Scale Interconnects (REU Supplement)
Sponsor: National Science Foundation

Ron Parr
Artificial Intelligence
Computer Science Study Group (CS2G)
Sponsor: Department of Defense

Ron Parr
Artificial Intelligence
CAREER: Observing to Plan – Planning to Observe
Sponsor: National Science Foundation

John Reif
Algorithms
EMT: NSF Workshop on Emerging Technologies of Nano and Quantum Systems (Conference Supplement)
Sponsor: National Science Foundation

John Reif
Algorithms
FNANO: Conference Support
Sponsor: Department of Defense

Susan Rodger
Computer Science Education
Collaborative Research: Increasing the Representation of Undergraduate Women and Minorities in Computer Science (Conference Supplement)
Sponsor: National Science Foundation

Jun Yang
Systems & Architecture
CAREER: Techniques and Applications of Derived Data Maintenance (REU Supplement)
Sponsor: National Science Foundation
RON PARR RECEIVES NSF AWARD, PARTICIPATES IN DOD PROGRAM

DUKE UNIVERSITY Assistant Professor Ronald Parr has received the prestigious NSF CAREER award, which includes a $440,000 grant for his research project entitled “Observing to Plan, Planning to Observe.” The CAREER award is given in support of the early career-development activities of outstanding teacher-scholars who most effectively integrate research and education within the context of the mission of their organization.

Professor Parr was also one of twelve junior faculty from across the nation selected for the Department of Defense’s Computer Science Study Panel (CS2P). In this program, he visited military bases, ships and aircraft during the summer and attended briefings to learn first-hand of the military’s technological needs. Parr’s work at Duke has focused on robotics, which has obvious military applications.

JEFF CHASE PROMOTED TO FULL PROFESSOR

DUKE UNIVERSITY has recognized the contributions of Jeff Chase with a promotion to Full Professor. “Duke Computer Science has been a great place for me to teach and do research. I appreciate the recognition and I welcome the opportunity to find out what really happens in Executive Committee meetings,” says Chase.

Chase’s research focuses on sharing resources and information in computer networks ranging from computational clusters to the global Internet. His current research in the Network/Internet Computing Lab (NICL) is developing new principles and tools for “virtual” Internet computing, funded by the National Science Foundation.

“What makes the Internet so powerful is really the services that run on the computers attached to it. The Web is only the beginning,” Chase said. “We are working toward a world in which tapping into server power through the Internet is as easy as drawing electrical power from the power grid. The idea originated with the earliest Internet visionaries, and there are lots of moving parts to get right. It is a massive-scale shared infrastructure with many owners and users with different interests, and the systems that control and protect it must react to changes faster than humans can.”

Chase is known for contributions in several related areas. As a graduate student, he built one of the earliest systems for parallel cluster computing, a paradigm that is now the workhorse of computational science. In the late 1990s his team set records for communication speeds using Internet protocols. Chase and his students have also led in new techniques for large-scale network storage, cooperative Web caching, energy-efficient data centers, and grid computing systems.

Chase also serves as the department’s Director of Graduate Studies. “It has been a privilege to oversee the graduate program and serve our graduate students, who make all the good ideas happen.”

APPOINTMENTS

Reappointment

Owen Astrachan has received a ten-year reappointment to his position as Professor of the Practice of Computer Science and Co-Director of Undergraduate Studies. He focuses on developing techniques to simplify and communicate complex, cutting-edge computer science research to students without sacrificing technical rigor and accuracy. He also develops techniques and technologies for learning and mastering programming, particularly object-oriented programming and agile software methodologies. A recipient of the Richard K. Lublin Teaching Award, a Robert Cox Teaching Award, an NSF CAREER Award, and an IBM Faculty Development Award, Astrachan is one of the best computer science teachers in the country. He was a keynote speaker at the 2004 SIGCSE Symposium, which is the premier conference on computer science education and is attended by more than a thousand computer science educators. His book on C++, which is in the second edition, is highly innovative and has made a large impact.

Adjunct Appointment

Julian Lombardi, Duke’s Assistant Vice-President, Information Technology, has joined the Department of Computer Science as an adjunct faculty member. He is known for his work in designing computer systems that support collaboration among large numbers of users.
STREAM DATA PROCESSING: SCALING ON TINY SENSORS AND LARGE SYSTEMS

STREAMS HAVE EMERGED as a popular data model for a wide range of applications, including sensor networks, distributed system monitoring, publish/subscribe systems, etc. In these applications, data is not available in advance but instead arrives continuously in real time from multiple streams. In contrast to traditional computational models, in which one performs computation on given input data, algorithms on streams continue to generate new results (or changes to old results) as new data arrives. Thus, many aspects of computational models need to be reconsidered while dealing with data streams, thereby raising many challenging questions: issues of data and algorithmic issues—particularly the need for more flexible execution, evaluation, and optimization frameworks. Work in this area is being carried out jointly by members of the systems and algorithms groups in the Department, including Professors Pankaj Agarwal, Shivnath Babu, Jeff Chase, Carla Ellis, Kamesh Munagala, and Jun Yang.

Sensor data processing is one of the applications of streams under investigation by Duke computer scientists. In collaboration with ecologists, statisticians and engineers, the team is building a sensor network in Duke Forest for environmental monitoring. Wireless sensors collect high-resolution data that is key to enabling ecological modeling on an unprecedented scale. The main challenge is coping with limited energy, storage, and computational resources available on tiny, battery-powered sensors. A promising approach combines data-driven, model-based data processing both in-network and out-of-network to optimize sensing and communication. Probabilistic models of ecological processes, environmental variables, and network reliability work in synchrony to enable data compression and report suppression based on utility of information, and to provide interpretation of data in the presence of noise and failures.

Duke computer scientists are also investigating stream processing in several types of large, distributed systems. In the context of Web services, the challenges include sharing processing across multiple continuous queries to optimize performance, and adaptive plan migration at run-time via efficient performance estimation. In the context of publish/subscribe systems, the challenge is to support thousands to millions of continuous queries over event streams from subscribers across a large network. The solution requires novel index structures for matching incoming events with queries, scalable ways of disseminating notifications in the network, as well as adaptive techniques for exploiting input characteristics for performance. In the context of autonomic computing, challenges arise in instrumenting complex networked systems, supporting real-time querying and analysis on instrumentation data streams, and using models derived from instrumentation data for automated control of the systems. From the algorithmic point of view, the challenges lie in developing optimization techniques that can cope with uncertainty and dynamic algorithms that use very little space.
HIGH-DIMENSIONAL DATA ANALYSIS

A DECADE OR TWO AGO, it was predicted that datasets would grow dramatically in size and number and would outstrip our capabilities to analyze them. This prediction has become true and led to extensive research in statistics, machine learning, algorithms and other disciplines targeted at new ways to manage and analyze data. The project described in this article rests on the premise that much more still needs to be done. In particular,

(i) we believe in the need for global statistics to complement the currently prevalent but primarily local methods;
(ii) we postulate the data is finite but describes possibly high-dimensional continuous spaces;
(iii) we view the estimation of the gross topology of these spaces as the first step in a global analysis.

The larger the datasets, the more true (or shall we say, convenient) is the assumption that the data describes a continuous space. A major difficulty in this approach is what we refer to as the question of scale, which has to do with the ambiguity in the transition from finite data to continuous space as well as the desired resolution of the analysis, which is in the eye of the beholder.

The TDA project (short for topological data analysis) is funded by DARPA and has just cleared a major hurdle and is now entering Phase II. It is structured as a multi-institutional effort involving primarily mathematicians and computer scientists at the University of Minneapolis, Stanford and Duke Universities.

The methods employed and developed in this project are primarily from algebraic topology, algorithms, and statistics. Here we single out two.

1. Topological persistence is the idea that the scale level of features can be measured using homology groups of filtered spaces. Importantly, this algebraic idea has fast algorithms that are able to churn through massive datasets without spending much time. The roots of this method can be found in a collaboration with David Letscher and the doctoral work of Afra Zomorodian supervised by Herbert Edelsbrunner, first at Urbana-Champaign and later at Duke.

2. Witness complexes are designed to turn point data into concrete topological spaces. Originally conceived by Vin de Silva and Gunnar Carlsson, they generalize the topology-preserving networks of Martinetz and Schulten to higher dimensions. Similar to alpha shapes, witness complexes form parametrized families that are naturally amenable to persistence analysis.

An important part of the project is the implementation of these and other methods. We develop software as we use it to analyze datasets, which poses challenges. Much of this work rests on the shoulders of Yuriy Mileyko, who needs at once to be a mathematician, an algorithm designer, a programmer, and a data analyst.

At Duke, we are currently looking into the structure of three particular datasets:

(i) medical records of patients checked into intensive care units, which has been collected by the Cerner Corporation;
(ii) gene expression data in mouse embryos collected in the study of somite development as a periodic process by Olivier Pourquie at the Stowers Institute for Medical Research;
(iii) heart-rate data of healthy and sick people collected at the Harvard Medical School.

To give a glimpse of the gene expression data, Figure A shows the functions of eight genes ranked highest according to our mathematical measures of periodicity.

![Figure A](gene_expression.png)
Science helps lead the way in making working diligently to ensure that Computer traditional departmental boundaries, we’re to be involved in research and to cross expands initiatives for undergraduates with an interdisciplinary focus. As Duke core computer science areas and in areas majors working on research projects in (Computer Science Undergraduate computer science. Our new CSURF program are supported by, and overlap with, fields to explore how their major interests possible for students majoring in other minor in Computational Economics. fall, will be working with our proposed Prof. Vincent Conitzer, who starts this proposed minor in Computational Biology. three years that will be required for the Computational Genomics, over the past undergraduate course, Introduction to Alex Hartemink has been developing an the new interdisciplinary minors. Prof. Carlo Tomasi is developing a new Modeling, that will serve as a gateway to the new interdisciplinary minors. Prof. Alex Hartemink has been developing an undergraduate course, Introduction to Computational Genomics, over the past years that will be required for the proposed minor in Computational Biology. Prof. Vincent Conitzer, who starts this fall, will be working with our proposed minor in Computational Economics. These proposed minors will make it possible for students majoring in other fields to explore how their major interests are supported by, and overlap with, computer science. Our new CSURF program (Computer Science Undergraduate Research Fellows) program helps fund our majors working on research projects in core computer science areas and in areas with an interdisciplinary focus. As Duke expands initiatives for undergraduates to be involved in research and to cross traditional departmental boundaries, we’re working diligently to ensure that Computer Science helps lead the way in making opportunities available for our students.

INTERDISCIPLINARY MINORS FOR UNDERGRADUATES

THE DEPARTMENT has approved an interdisciplinary minor in Computational Biology as the first step in an ongoing effort to strengthen ties between departments at the undergraduate level. As we wait for approval of the minor from various university committees, we’re already working toward another interdisciplinary minor in Computational Economics.

These proposed minors are part of ongoing plans to increase opportunities for undergraduates—to offer them intellectually rich and exciting avenues to explore what can arise from combining interests in more than one area. We’re building on interdisciplinary collaboration and research forged by our faculty. It’s particularly exciting that faculty at all levels are involved in these initiatives. Prof. Carlo Tomasi is developing a new course, Introduction to Computational Modeling, that will serve as a gateway to the new interdisciplinary minors. Prof. Alex Hartemink has been developing an undergraduate course, Introduction to Computational Genomics, over the past three years that will be required for the proposed minor in Computational Biology.

Prof. Vincent Conitzer, who starts this fall, will be working with our proposed minor in Computational Economics. These proposed minors will make it possible for students majoring in other fields to explore how their major interests are supported by, and overlap with, computer science. Our new CSURF program (Computer Science Undergraduate Research Fellows) program helps fund our majors working on research projects in core computer science areas and in areas with an interdisciplinary focus. As Duke expands initiatives for undergraduates to be involved in research and to cross traditional departmental boundaries, we’re working diligently to ensure that Computer Science helps lead the way in making opportunities available for our students.

ACADEMIC PODCASTING

IN COLLABORATION with Apple Computer, Inc., Duke distributed 20GB Apple iPod devices to each first-year student in August 2004 to stimulate creative uses of digital technology in academic and campus life. Since then, Duke has continued to support the incorporation of portable digital listening and recording devices in the curriculum. Infrastructure resources and training are provided to faculty and students. This program has allowed for innovative instruction and learning beyond the boundaries of the classroom.

One of the most popular Duke iPod initiatives is podcasting, a term used to describe a group of technologies for distributing audio or video programs over the Internet using a publisher/subscriber model. Many faculty and instructors have now incorporated podcasting into their curriculums. Courses as diverse as music, foreign languages, engineering, introductory computer science, medical physics, and Indian cinema are participating in the educational phenomena. A complete list of courses incorporating podcasting for the Spring 2006 semester can be found at http://cit.duke.edu/about/ipod_faculty_projects_spring06.do.

Because of the popularity of this technology, Duke has even developed its own open source tool called DukeCast (http://dukecast.cit.duke.edu) to facilitate the podcast management process for faculty and TAs. One of the earliest adopters of podcasting at Duke is Richard Lucic, Associate Chair of the Department of Computer Science, and Curriculum Director of the Information Sciences and Information Studies Certificate Program. Professor Lucic began podcasting lectures in the Fall 2004 semester. He has also found podcasting to be a productive tool for getting students actively engaged in creating course content.

The groundbreaking nature of these podcasting initiatives at Duke has generated a high degree of media attention, and as an early adopter, Lucic has been interviewed by such organizations as the BBC, CNBC, and CNN. A record of these interviews is available at http://web.mac.com/ralucic/iWeb/iviews/Welcome.html. Lucic was also instrumental in organizing and conducting the first Podcasting Symposium that was held at Duke on September 27–28, 2005 (http://isis.duke.edu/events/podcasting/). The two-day event featured a hands-on podcasting workshop, as well as panel discussions of the economic/business, legal, political, journalistic, and cultural impacts of podcasting by bringing together prominent members of the podcasting community with policy makers, scholars, and media experts.

A “Podcast Academy” is now in the planning process for February 14–15, 2007 at Duke. The Podcast Academy is a collaboration between Duke, Monash University in Australia, and Doug Kaye’s Podcast Academy (http://pa.gigavox.com/). This event will focus on issues related to academic podcasting and is expected to draw an international audience with venues at both Duke and Monash.
STUDENT PROFILE: HAO HE

HAO HE joined the Department of Computer Science in Fall 2001, having completed his undergraduate and MS degrees at China’s premier Tsinghua University. He is pursuing his PhD in the area of database systems under the supervision of Jun Yang.

He is broadly interested in data management research, focusing on query processing and indexing techniques on graph-structured data. During the past several years, he has aimed to develop query processing algorithms and indexes for some specific graph-structured data and queries. During his second year, he began to work with Professor Yang on an indexing and labeling XML data, which is generally represented as tree-structured. Then he worked on supporting reachability queries on general graphs.

Recently, he began working on an indexing and query processing scheme for ranked keyword search on directed graphs. Keyword search on a node-labeled graph finds a set of answers, each of which is a substructure of the graph containing all query keywords. These answers can be ranked according to how strong the connections of nodes are in each answer. In this project, he proposed a new search strategy with provable performance bounds, while additionally exploiting a novel index for pruning and accelerating the search.

The new scheme turns out to offer orders of magnitude performance improvement over existing approaches.

He has a strong publication record, with numerous papers in top database conferences. His work on dynamic indexing schemes for XML data is outstanding, as evidenced by He being a recipient of an IBM PhD fellowship for the 2006-2007 academic year.

He spent the summers of 2004, 2005 and 2006 working with Philip Yu’s group at the IBM T.J. Watson Research Center in Hawthorne, NY. This ongoing collaboration gives testimony to He’s creativity, knowledge, and diligence in his research work.

MAY & AUGUST 2006 GRADUATES

PH.D. DEGREES

Justin Moore
Advisor: Jeffrey S. Chase
Automated Cost-Aware Data Center Management

Jaidiev Patwardhan
Advisor: Alvin Lebeck
Architectures for Nanoscale Devices

Shannon Pollard
Advisor: Ronald Smith (ECU)
Defining the Complexity of Natural Language Dialogue System Domains

Patrick Reynolds
Advisor: Amin Vahdat
Using Causal Paths to Improve Performance and Correctness in Distributed Systems

Rebecca Braynard Silberstein
Advisor: Carla Ellis
Wireless MAC Layer Flexibility for Extending Effective System Lifetime

Ke Yi
Co-Advisors: Pankaj Agarwal/Lars Arge
1/O Efficient Algorithms for Processing Massive Spatial Data

Hai Yu
Advisor: Pankaj Agarwal
Geometric Algorithms for Time-Varying Data

UNDERGRADUATE DEGREES

Robert Benson
James Golds
Paula Ivey
Stephen Jones
Ki-Hung Keith Lam
Charles Lever
Samuel Louis
Benjamin Mickle
Jadrian Miles
Ian Moulton
Benjamin Pollack
Alex Steinart
Matthew Territo

M.S. DEGREES

Avik Bhattacharya
Advisor: Terrence Furey
Exploration of Single Nucleotide Polymorphisms

Subhendu Chakraborty
Advisor: Pankaj Agarwal
Scalable Algorithms for a Forest Growth Model: Understory Gap Light Model and Temporal Dispersal Model

Constantin Pisol
Advisor: Alvin Lebeck
Nanoscale Device Integration on DNA Self-Assembled Structures

Shobana Ravi
Advisor: Daniel Reed
Batch Scheduling Policies with Power and Temperature Constraints

UNDERGRADUATE AWARDS

Alex Vasios Memorial Award
Paula Georgiana Ivey
Outstanding Undergraduate Teaching Assistant Award
Jinghui Lim
Undergraduate Senior Thesis Project – Graduation with Distinction
Jadrian Miles
Undergraduate Senior Thesis Project – Graduation with High Distinction
Adam Durity
GRADUATE RESEARCH DAY

ON APRIL 5, the Sixth Annual Graduate Student Research Day was held in the Bryan Center. GSRD affords students at all stages of their graduate career the opportunity to gain experience presenting posters and papers to an audience outside their department and to receive valuable feedback from professors, post-docs and university administrators who provide written evaluations of the student’s presentation. Such participation helps to better prepare students to present their research at professional conferences.

At this year’s event, Urmi Majumder and Erik Halvorson (2nd year PhD candidates) presented their research during the poster sessions. Both Urmi’s work on the “Design and Simulation of Self-Repairing DNA Lattices” and Erik’s on “Geometric Approaches to Adaptive Rejection Sampling” benefited from constructive comments that helped them polish their presentations for later industry and conference events which they did during the semester. Medical PhD student Stephen Dallab gave an oral presentation on “An XML Web Service Approach to Robotic Laparoscopic Surgery”.

Rebecca Braynard
European Workshop on Sensor Networks (EWSN), Zurich, Switzerland, Extending Network Lifetime Using an Automatically Tuned Energy-Aware MAC Protocol

Fred Bower
ACM SIGMETRICS/Performance 2006, Saint-Malo, France, Analyzing Architectural Vulnerability Analysis to Hard Faults in the Microprocessor

Badhir Chandramouli
Southeast Workshop on Data and Information Management (SNWIDIM 2006), Raleigh, NC, and International Conference on Database Systems for Advanced Applications (DASFAA 2006), Singapore, Distributed Network Querying with Rounded Approximate Caching

Andrew Danner
Symposium on Spatial Data Handling, Vienna, Austria, From Point Cloud to Grid DEM: A Scalable Approach and V/O-efficient Hierarchical Watershed Decomposition of Grid Terrain Models

David Irwin
USENIX Technical Conference, Boston, MA, Sharing Network Resources with Brokered Leases

Tingting Jiang
European Conference on Computer Vision (ECCV), Graz, Austria, Level-Set Curve Particles

Varun Marupadi

Albert Meixner
Workshop on Edge Computing Using New Commodity Architectures (EDGE), Chapel Hill, NC, Comprehensive Detection of Hardware Errors in Commodity Multithreaded Architectures

Dmitriy Morozov
Symposium on Computational Geometry (SoCG’06), Sedona, AZ, Persistence-Sensitive Simplification of Functions on 2-Manifolds and Vines and Vineyards by Updating Persistence in Linear Time

Leeovati Narlikar
Intelligent Systems in Molecular Biology (ISMB 2006), Fortaleza, Brazil, Informative Priors Based on Transcription Factor Structural Class Imprive de nvo Motif Discovery

Jaidev Patwardhan

Jeff Phillips

Urmi Majumder
International Conference on Knowledge Discovery and Data Mining (KDD2006), Philadelphia, PA

Canadian Conference on Computational Geometry (CCCG 2006), Kingston, Ontario, On Bipartite Matching Under the RMS Distance

Eurographics Symposium on Geometry Processing, Cagliari, Italy, Outlier Robust ICP for Minimizing Fractional RMSD

Adam Silverstein
International Conference on Data Engineering (ICDE 2006), Atlanta, GA, A Sampling-Based Approach to Optimizing Top-K Queries in Sensor Networks and Energy-Efficient Continuous Isoline Querying in Sensor Networks

Ke Yi
Symposium on Computational Geometry (SoCG ’06), Sedona, AZ, I/O-Efficient Batched Union-Find and Its Applications to Terrain Analysis

Hai Yu
ACM-SIAM Symposium on Discrete Algorithms (SODA ’06), Miami, Florida, Robust Shape Fitting Via Peeling and Grating Coresets
WELCOME NEW COMPUTER SCIENCE STUDENTS

PH.D.
Abrita Chakrabarty
Haldia Institute of Technology; Michigan State University
Visualization and Modeling in Computational Biology

Ionut Constandache
Polytechnic Institute of Bucharest
Distributed Systems

Eduardo Cuervo
I.T.E.S.M. — Mexico
Systems/Architecture

Azbayar Demberel
Mongolian Technical University
High-performance Computing

Linda Deng
University of Southern California
Algorithms

Rolando Estrada
Louisiana State University
AI, Vision, Image Recognition

Ivelin Georgiev
Eckerd College, Dartmouth College
Computational Molecular Biology

Peter Gilbert
Mississippi State University
Systems

Nikhil Gopalkrishnan
SASTRA University
DNA Self-Assembly, Theory

Meiqing Guo
Zhejiang University; University of Florida
Scientific Computing

Yang Liu
Peking University
AI, Machine Learning, Vision, Biometrics

Igor Paprotny
Dartmouth College
Undergraduate Fellows

Chittaranjan Tripathy
Orissa University, University of Oklahoma, Dartmouth College
Computational Molecular Biology, Algorithms

Todd Wasson
University of Southern Florida
Gene Regulatory Networks

Albert Siucheng Yu
Polytechnic University — Brooklyn
Computational Geometry

Jianyang Zeng
Zhejiang University, Dartmouth College
Computational Biology, Algorithms

LINDA DENG
University of Southern California
Algorithms

ROLANDO ESTRADA
Louisiana State University
AI, Vision, Image Recognition

IVELIN GEORGIEV
Eckerd College, Dartmouth College
Computational Molecular Biology

PETER GILBERT
Mississippi State University
Systems

Nikhil Gopalkrishnan
SASTRA University
DNA Self-Assembly, Theory

MEIQING GUO
Zhejiang University; University of Florida
Scientific Computing

YANG LII
Peking University
AI, Machine Learning, Vision, Biometrics

ICHITANJAN TRIPATHY
Orissa University, University of Oklahoma, Dartmouth College
Computational Molecular Biology, Algorithms

TODD WASSON
University of Southern Florida
Gene Regulatory Networks

ALBERT SIUCHENG YU
Polytechnic University — Brooklyn
Computational Geometry

JIANYANG ZENG
Zhejiang University, Dartmouth College
Computational Biology, Algorithms

YANG LIU
Peking University
AI, Machine Learning, Vision, Biometrics

MEIQING GUO
Zhejiang University; University of Florida
Scientific Computing

YANG LIU
Peking University
AI, Machine Learning, Vision, Biometrics

ICHITANJAN TRIPATHY
Orissa University, University of Oklahoma, Dartmouth College
Computational Molecular Biology, Algorithms

TODD WASSON
University of Southern Florida
Gene Regulatory Networks

ALBERT SIUCHENG YU
Polytechnic University — Brooklyn
Computational Geometry

IJANANG ZENG
Zhejiang University, Dartmouth College
Computational Biology, Algorithms

Nihal Gopalkrishnan, in addition to the JBD Fellowship, is a recipient of a Nanoscience Fellowship which is awarded through the certificate program from the Graduate School to promising researchers whose work will contribute to the visibility, vitality, and interdisciplinarity of the nanoscience certificate program.

In addition to her JBD Fellowship, Susanna Ricco is the recipient of a National Science Foundation (NSF) Graduate Research Fellowship. The NSF aims to ensure the vitality of the human resource base of science, mathematics, and engineering in the United States and to reinforce its diversity by offering approximately 900 graduate fellowships each year, including awards for women in engineering and computer and information science.

Hao He, advised by Professor Jun Yang, is an honored recipient of the highly competitive IBM PhD Fellowship for 2006-2007.

UNDERGRADUATE FELLOWSHIP AWARDS

SEVERAL OF the incoming PhD students have been awarded competitive fellowships from the Graduate School. Recipients of the prestigious James B. Duke Fellowship, a four-year award, are Peter Gilbert, Nikhil Gopalkrishnan, and Susanna Ricco.

Nikhil Gopalkrishnan, in addition to the JBD Fellowship, is a recipient of a Nanoscience Fellowship which is awarded through the certificate program from the Graduate School to promising researchers whose work will contribute to the visibility, vitality, and interdisciplinarity of the nanoscience certificate program.

In addition to her JBD Fellowship, Susanna Ricco is the recipient of a National Science Foundation (NSF) Graduate Research Fellowship. The NSF aims to ensure the vitality of the human resource base of science, mathematics, and engineering in the United States and to reinforce its diversity by offering approximately 900 graduate fellowships each year, including awards for women in engineering and computer and information science.

Hao He, advised by Professor Jun Yang, is an honored recipient of the highly competitive IBM PhD Fellowship for 2006-2007.
WHEN SUSAN RODGER helped plan an Alice Workshop for summer 2006, the interest was so overwhelming that the workshop became a symposium. The Alice Symposium was held at Duke on June 19–21 and was attended by over 100 high school and college teachers. Alice is a programming environment designed to enable novice programmers to create 3D virtual worlds, including interactive games and stories. In the process, Alice users are introduced to the concepts of programming. The symposium participants were divided into five smaller groups and got hands-on experience modifying and building several Alice worlds. One such world involved programming a dragon to flap its wings, fly over to a castle, rescue a princess, and fly off with her. The main presenters of the symposium were Susan Rodger of Duke University, Stephen Cooper of Saint Joseph's University, Wanda Dann of Ithaca College and Don Slater of Carnegie Mellon. Duke undergraduates helping out included Ben Spain, Dametrious Peyton, Jinghui Lim, Stephen Reading, Tiffany Chen and Joanna Shih. There were two invited speakers. Owen Astrachan of Duke University spoke about social networks and broadening participation, and Caitlin Kelleher of Carnegie Mellon spoke about using storytelling to make computer programming attractive to middle school girls. Rodger managed to expose the participants to Durham specialties including Brezels from the German bakery Guglhupf and gourmet Mexican popsicles from Locopops. The symposium web site is at www.cs.duke.edu/csed/aliceworkshop

The Alice Symposium was sponsored by NSF grant CCLI EMD 0339734.

A SECOND Faculty Adopter Workshop for institutions using JFLAP was run by Susan Rodger at Duke June 12–13, 2006. JFLAP is instructional software for visualizing and experimenting with theoretical concepts in computer science, including finite automata and Turing machines. JFLAP is used in over 160 countries. Rodger has been developing JFLAP with the help of students for over 15 years. Rodger received a National Science Foundation grant to assess the use of JFLAP in a two year study. Participant institutions in the study include Duke, UNC Chapel Hill, Emory University, University of California Davis, University of Richmond, Fayetteville State University, Norfolk State University, Rensselaer Polytechnic Institute, Virginia State University, University of Houston and San Jose State University. Seventeen participants attended this second JFLAP workshop to discuss the use of JFLAP in their courses. The JFLAP workshop was sponsored by NSF grant DUE-0442513.

THE HARAMBENET Workshop was conducted by Owen Astrachan, Jeff Forbes, Susan Rodger, Richard Lucic, and Robert Duvall on July 11–12, 2006 with support from the Duke Department of Computer Science and generous support from IBM and BellSouth. The HarambNet goal was to provide a background in networks, social networks, and visualization using examples from biology, economics, and other areas that go beyond traditional data-processing and traditional computer science examples. This team of professors is developing an alternative introduction to computer science and has chosen to use The Science of Networks as the overarching theme of materials and modules. They hope to leverage student interest in websites like Facebook and MySpace in developing an alternative introduction to computer science.
A VERY SUCCESSFUL inDuke Frontiers 2006 meeting was held at Duke University’s Fitzpatrick Center auditorium on May 16, 2006. Duke Frontiers is a free event designed to help spur research collaborations between Duke’s Electrical and Computer Engineering and Computer Science faculty and industry. Attendees included corporate and university researchers, students, corporate university relations staff, and others interested in cutting-edge research collaboration.

The meeting began with an informal BBQ dinner and evening keynote talk, “Academic Entrepreneurism: Supporting the Innovation Economy,” by Barry Myers, MD, PhD, MBA, Senior Associate Dean for Industrial Partnerships and Research Commercialization, Pratt School of Engineering, Anderson-Rupp Professor of Biomedical Engineering, Director of the Center for Entrepreneurship and Research Commercialization.

The following day’s focus was research talks by Duke CS and ECE faculty who are conducting research in various aspects of sensing systems. David Brady, Professor of Electrical and Computer Engineering, discussed sensor technology. Carla Ellis, Professor of Computer Science, described her research related to how human beings interface with sensor systems. Richard Fair, Professor of Electrical and Computer Engineering, explored research commercialization issues in his talk “Mining Research Nuggets from Duke - Tapping the Mother Lode.” Jeffrey S. Chase, Professor and Director of Graduate Studies in Computer Science, discussed network systems that perform the connectivity in sensor networks, and Qing H. Liu, Professor of Electrical and Computer Engineering, described his research project “NUFFT for Medical and Subsurface Image Reconstruction” for medical image sensing.

The day’s keynote address, “From the Tech World to Academia (and Hollywood),” was presented by Vivek Wadhwa, Entrepreneur in Residence, Pratt School of Engineering, with an introduction by Tod Laursen, Senior Associate Dean for Education, Pratt School of Engineering.

Following a networking luncheon, the graduate student poster session and lab tours proved to be very popular. Students presented posters representing the many areas of research taking place within the department and showcasing opportunities for collaboration with industry. The industry judging team was unanimous in choosing for first place the poster by Jaidev Patwardhan entitled “SSA: A Self-Organizing SIMD Architecture,” and second place to Adam Silberstein and Rebecca Braynard for their poster “Energy Efficient Continuous Isoline Queries in Sensor Networks.”

FRONTIERS 2006

TECHCONNECT 2006, hosted by the Duke University Career Center, Department of Computer Science, and Pratt School of Engineering, will be held September 19. At this annual event, designed to bring students and employers together, a panel of employers is selected to provide advice to students seeking internships and full-time jobs. Through this panel presentation, students get a good understanding of characteristics employers seek as well as a realistic view of the job market for engineering and technical careers. The panel discussion is followed by a vibrant networking event. Students from all classes are welcome to visit with employer representatives, many of whom are Duke alumni. This venue provides a less formal environment than the traditional Career Fair, which takes place the following day in the Bryan Center. We are using a slightly new format that will make it even easier for students and employers to connect by providing company specific “chat” areas. Thirty companies are registered to participate this year.
SCENES FROM GRAD STUDENT ORIENTATION