Department of Computer Science

Annual Report

2004-05

PURDUE
UNIVERSITY

Message from the Head

Department Head,
Professor Susanne Hambrusch

For Purdue Computer Science, 2004–05 was a year of celebrating the many accomplishments of the people associated with the department!

The students, faculty, staff, alumni, and friends of the department comprise a community that is dedicated to the understanding and application of computational principles to all aspects of the world. We like to think of the accomplishments of the department in terms of the accomplishments of the individuals associated with the department — both internally and externally.

In fall 2004, Professor Robert Skeel joined our faculty as a professor with a courtesy appointment in Mathematics. Later in fall 2005, Patrick Eugster joined the faculty as an assistant professor. Their biographies and research interests are described in this report. In July 2005, Sonia Fahmy and Jan Vitek received tenure and were promoted to associate professor. Both are currently enjoying a year-long sabbatical.

We are very proud of Professor Ninghui Li, who was given an NSF CAREER Award for his research on "Access Control Policy Verification Through Security Analysis and Insider Threat Assessment." Our faculty have been exceptionally successful in receiving funding in the NSF Cyber Trust and ITR programs. The research projects of eleven Computer Science faculty members were presented at the 2005 NSF Cyber Trust Principal Investigators Meeting. Our department presented more posters than any other institution.

Other faculty recognitions we are proud of include: Professor Elisa Bertino was awarded the 2005 IEEE Kanai Award — awarded annually for major contributions to state-of-the-art distributed computing systems; Professor Greg Frederickson received the Polya Award from the Mathematical Association of America; Professor Gene Spafford received an honorary doctor of science from the State University of New York; Ann Christine Catlin and the Knowledge Projection Project under the direction of Professor Chris Clifton won the 2005 Indiana Mira Award for Education; Professor Zhiyuan Li was named a Purdue Faculty Scholar; Professor Buster Dunsmore and Gustavo Rodriguez-Rivera were named as Top Ten College of Science teachers; Professor Mikhail Atallah was inducted into the Purdue Teaching Academy; and the College of Science voted Professor Buster Dunsmore as the favorite science professor for the Department of Computer Science.

Our students also received a number of prestigious awards and recognitions during the year. PhD candidate Tomek Czajka won first prize at the TopCoder Open, Ethan Blanton received an Intel Foundation PhD Fellowship, and Yu Dong received an IBM fellowship. Computer Science undergraduates Chris Kanich, Stan Luban, and Liz Saftalov received Honorable Mentions in the 2005 Outstanding Undergraduate Research Award Program of the Computing Research Association. Michael Armbrust received the 2005 Bruce Helfert Award for outstanding academic achievement and an understanding of the impact of science and technology on humanity.

Professor Ahmed Elmagarmid is serving as the interim director for the newly established Purdue Cyber Center in Discovery Park. The center will serve as a place where scientists from a variety of disciplines will work together to address new areas of science and technology that will answer some of the grand challenges facing society today. The center will also unite computer resources, enhance research and education, and set the stage for boosting the Indiana economy.

Construction of the new Richard and Patricia Lawson Computer Science Building is proceeding on schedule. We expect to move in during the summer of 2006 and be open in time for fall classes. We're looking forward to the many new educational, research, and interaction opportunities that will be made possible by this wonderful new facility.

Enrollment starting in the fall 2005 semester is at 522 undergraduates and 152 graduate students. Between December 2004 and August 2005, the department awarded 17 PhD degrees. These outstanding students accepted a variety of prestigious academic or industrial research positions. We also awarded 29 MS degrees and 134 BS degrees.

I think that you will agree it was quite a year for Purdue Computer Science! The department made significant strides in many arenas — all geared towards our mission to advance the frontiers of computer science and apply computational principles to technical and societal problems. It is my personal pleasure and honor to lead this extraordinary department and also to interact with our world-class alumni and friends!

Susanne Hambrusch
Professor and Head

Table of Contents

Purdue University

Founded in 1869 as Indiana's land-grant university, Purdue University is a public, doctoral-granting research university with nearly 39,000 students on its West Lafayette (main) campus, and serves over 68,000 students system-wide. Purdue is one of the nation's leading research institutions with a reputation for excellence and affordable education.

Recently ranked 22nd in the nation in the latest *USNews & World Report* top 50 public universities survey, the University offers more than 7,400 courses in over 500 fields of study. Ranked 59th in the world, 22nd among U.S. universities, and ninth among American public universities in a survey by *The Times of London*, Purdue students hail from all 50 states and 126 countries. Purdue enjoys the distinction of having more international students than any public university in the United States.

Purdue's research and learning environment is an incubator of great ideas and stellar accomplishments; where faculty and students discover together, push the boundaries of knowledge, and make significant contributions to virtually every aspect of contemporary life. Extensive library, computing, and laboratory resources support a robust research and learning setting providing multiple opportunities to explore interests and develop skills. More than 325,000 living alumni are graduates of one of the University's highly regarded 10 colleges and schools — Science, Engineering, Management, Pharmacy, Nursing, Consumer and Family Sciences, Liberal Arts, Agriculture, Veterinary Medicine, and Technology — and are making a difference each day in a myriad of fields.

For more information, visit: www.purdue.edu.

Aerial view of Purdue University's West Lafayette campus.

Greater Lafayette downtown district.

Greater Lafayette

The home of Purdue, Greater Lafayette is a welcoming and progressive community conveniently located on Interstate 65, approximately 150 miles southeast of Chicago and 65 miles northwest of Indianapolis. West Lafayette and Lafayette, situated along the scenic Wabash River in Tippecanoe County, are home to a total population of nearly 150,000 people who enjoy a strong and diverse economic base, historic architecture, excellent schools, well-maintained parks, biking, and hiking trails, and several outlets for fine dining. The local arts scene, including performances by international artists presented throughout the year at Purdue, is thriving and vibrant. Residents enjoy an average mean temperature in January of 23 degrees and 73 degrees in July.

For more information, visit: www.lafayette-in.com.

Computer Science Department Facilities

CS Facilities — General Overview

The department is dedicated to providing high-quality computing facilities for use by computer science faculty, students, and administrative personnel. The facilities are operated by a technical staff who are not only responsible for the installation and maintenance of the systems, but who also assist faculty and students in the development of software systems for research projects. The staff includes a director, facilities manager, administrative assistant, network engineer, hardware engineer, six system administrators, and several student assistants.

General Facilities

General computing facilities are available for both administrative activities (such as the preparation of research reports and technical publications) and research needs that are not supported by other dedicated equipment. The main systems each have 512 MB to 8 GB of main memory and a total of over 10 TB of disk storage. All faculty and many graduate students have a Sun, Intel, or Apple (Mac) workstation on their desks.

Educational Facilities

Computing systems used by students enrolled in both undergraduate and graduate computer science courses include over 60 Sun workstations and 100 Intel PCs running Windows XP, Linux, Solaris x86, or Solaris Sparc OS. Two labs in the Computer Science Building feature Intel machines running Windows XP. CS also has one lab with Intel machines running Linux. Another lab in the CS building and two labs in the Physics building feature Sun hardware running Solaris. The CS lab in the Recitation building features Intel workstations also running Solaris. CS facilities are dedicated to laboratory-based instruction. A later section lists equipment owned and maintained by ITaP but used by computer science students.

I/O Equipment

The department operates both special-purpose output devices as well as general output equipment, including more than 75 laser printers, color printers, color scanners, copiers, video projectors, digital video editing capabilities, and phone and video conferencing equipment.

Networking Services

The department is strongly committed to state-of-the-art networking technology to provide access to and communication among its systems, as well as to those elsewhere on campus and throughout the world. The building includes more than 65 ethernet switches that connect the 1 GB departmental network infrastructure to department computing facilities at 100 and 1,000 Mbps. Experimental wireless networks and production wireless networks are also active in the building. A dual gigabit link connects departmental systems to other systems on campus, as well as to the Internet community via both "commodity" and Internet2/I-Light connections. ADSL, cable, and cellular data services are widely used for remote access.

Information Technology at Purdue (ITaP)

In addition to the facilities described above, students and faculty have access to computing systems owned and operated by ITaP. General instructional facilities operated by ITaP include large Sun SPARC servers and several Sun and Intel workstation laboratories. In addition, ITaP provides systems for use in courses taught by the CS department. These systems include UNIX-based Sun SPARC stations for undergraduate computer science courses and Microsoft Windows-based Intel personal computers for use in an introductory course for non-majors (CS 110). Departmental research projects make use of other facilities provided by ITaP. These include a large IBM SP cluster and the Envision Center for Data Perceptualization.

Development

Highlights

We are proud that our department continues to grow. Our faculty, staff, and students are actively engaged in the discovery and application of information technology at many levels. The generous help of friends, alumni, and benefactors continues to allow us to pursue excellence by enabling us to secure the best equipment, facilities, and people. Consistent with our mission and vision, and with this help, we will continue to lead the way in computer science in the upcoming year.

New Building, New Opportunities

The completion of the Richard and Patricia Lawson Computer Science Building in the summer of 2006 will usher in a new and exciting era in the department. The 100,000-square-foot, 22-million-dollar project will have a commons area, two team project instructional computer labs to support student collaboration, and a geometric modeling and graphics visualization lab that includes space for a large virtual reality theatre. Additional state-of-the art components of this facility will greatly enhance the opportunities to teach, conduct research, and learn.

The purpose of the Development Office is to support the comprehensive mission of the department by obtaining the necessary financial resources. A major strategic initiative of the Development Office this year is to secure additional operational funding that will enable the department to fully capture *all* of the opportunities this great facility offers.

We are actively pursuing gifts from alumni, friends, and the corporate sector to provide the best physical and programmatic infrastructure in the new building. Historic naming opportunities still exist for gifts that range from $10,000 to $300,000. Please contact Tony Vidmar (tvidmar@purdue.edu), director of development, if you desire further information on naming opportunities in the Richard and Patricia Lawson Computer Science Building.

K-12 Outreach

The main purpose of the Department of Computer Science K–12 Outreach Program is to promote scientific literacy and stimulate interest in computer science among students in the K–12 school systems. Visits to K–12 schools include presentations, workshops, and teacher consultations. Students participate in hands-on learning experiences, for example, by disassembling and reassembling a computer. Some visits are done solely by the Computer Science Department, while others are part of college-level events held at schools and other venues and include all the College of Science outreach coordinators.

A mainstay of the Computer Science Outreach Program are the annual summer camps for middle school students. There are beginner and advanced level camps. Additionally, former campers are invited to participate in a junior counselor program. Another expansion of the K–12 Outreach Program is a summer workshop for mathematics teachers. The goal of the workshop, called "Linking Mathematics and Computer Science," is to show teachers how topics in the mathematics curriculum relate naturally to many concepts in computer science. During the 2004–05 school year, more than 1,500 students and 600 teachers participated in departmental K–12 outreach events.

A group of middle school girls construct a robot during the CS Summer Camp.

Intel Distinguished Speaker Ralph Kling spoke to faculty, students, and staff about 'Intel Motes and Sensor Networks' at a CS-sponsored lecture.

Corporate Partners Program

The Corporate Partners Program (CPP) was launched to foster close communication between the Department of Computer Science and private industry in the context of a mutually beneficial relationship. The Department of Computer Science enjoys the benefit of financial contributions, nurturing experiences for our students, and collaboration with industry leaders. At the same time, members in our CPP reap the benefit of increased visibility, priority access to top students who may become future employees, as well as priority access to faculty who are experts in relevant technical fields. True to any real partnership, both sides benefit significantly.

Companies participate through strategic, unrestricted donations at tier levels and are involved in many core activities of the department. Company representatives take advantage of opportunities to speak in classes, sponsor student projects, and make significant contact with CS students and faculty. Members of the CPP include giants of the information technology industry, as well as smaller, specialized companies. Partner members represent Indiana-based companies and other outstanding firms nationwide. This diverse and dynamic membership provides CS students with exposure to a myriad of career opportunities across the United States.

The corporate partners meet twice each year to provide input and feedback to departmental and college leadership. Recent contributions of the council include assistance in revising the undergraduate and graduate curricula, suggestions regarding recruiting, retention, and enrollment issues, collaborative efforts with faculty and student research, as well as alerting the department to industry areas of concern, such as global outsourcing.

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United Technologies

Donor Honor Roll

Development of Private Support

With support from its alumni and friends, Purdue Computer Science competes for the best faculty, recruits top students, provides scholarships, supports research, and funds new program initiatives. The department is deeply grateful to these donors who made contributions and pledges in the 2004–05 academic year.

Donor Honor Roll — Individuals

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2005 CS Distinguished Alumnus, Curt Worsey (center) talks with CS Assistant Department Head, Tim Korb (right) and a student before his talk.

Kurz Lobby namesake Heddy Kurz takes a tour of the Lawson building. Pictured left to right: Suzy Hutson, Heddy Kurz, Cheryl Cunningham-Parsons, Chet Parsons, and Jane Milton.

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Microsoft Corporation
Tellabs Incorporated

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Cisco Systems Incorporated
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Northrop Grumman Corporation
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Lead building donors Patricia and Richard Lawson tour the soon to be completed Lawson Computer Science Building.

Faculty

Shreeram S. Abhyankar

Professor of Computer Science (Courtesy) (1988)
Marshall Distinguished Professor of Mathematics
Professor of Industrial Engineering (Courtesy)

Education:
BSc, Mathematics, Bombay University, *1951*
AM, Mathematics, Harvard University, *1952*
PhD, Mathematics, Harvard University, *1955*

Bio-sketch:
Professor Abhyankar is a fellow of the Indian Academy of Science and an editorial board member of the *Indian Journal of Pure and Applied Mathematics*. He has won numerous awards and honors. Before coming to Purdue, he was an associate professor of mathematics at Johns Hopkins University and came to Purdue as a full professor. In 1967, he was appointed the Marshall Distinguished Professor of Mathematics.

His research areas of interest include algebraic geometry, commutative algebra, local algebra, theory of functions of several complex variables, quantum electrodynamics, circuit theory, invariant theory, combinatorics, computer-aided design, and robotics. His current research is in the area of computational geometry and algorithmic algebraic geometry.

Daniel G. Aliaga

Assistant Professor of Computer Science (2003)

Education:
BS, Computer Science, Brown University, *1991*
MS, Computer Science, University of North Carolina at Chapel Hill, *1993*
PhD, Computer Science, University of North Carolina at Chapel Hill, *1999*

Bio-sketch:
Professor Aliaga's research activities are in the area of computer graphics, in particular capturing and rendering large complex environments. Applications for his research include telepresence, computer-aided design, and education. Aliaga's work into this general problem overlaps with several fields, including computer graphics, computer vision, robotics, data compression, and system building.

Over the years, Aliaga has developed and published several new algorithms for interactively rendering massive geometrical models, recreating complex 3D environments, visibility culling, reconstructing images, estimating camera pose, calibrating cameras, and compressing images. In addition, he has designed several complete experimental research systems, in collaboration with researchers at University of North Carolina at Chapel Hill, Princeton University, Johns Hopkins University, and Bell Laboratories.

Professor Aliaga has been a department coordinator for two Bell Labs scholarship programs, an organizer for a NSF-sponsored Science and Technology Student Collaboration Conference, a Brown University Faculty-Student Liaison, and an invited speaker and guest lecturer at several institutions. Furthermore, he is a frequent reviewer of numerous ACM, IEEE, Eurographics, and NSF conferences and panels.

Selected Publications:
Bekins, D., and Daniel G. Aliaga. 2005. Build-by-number: Rearranging the real world to visualize novel architectural spaces. *IEEE Visualization* (October).

Aliaga, Daniel G., and Ingrid Carlbom. 2004. Build-by-number: Finding yourself: Fiducial planning for error-bounded pose estimation of a panoramic camera in large environments. Special Issue of *IEEE Robotics and Automation Magazine*: *Panoramic Robotics* (December).

Aliaga, Daniel G., and Ingrid Carlbom. 2001. Plenoptic stitching: A scalable method for reconstructing 3D interactive walkthroughs. In *Proceedings of the ACM SIGGRAPH*, 443–450.

David C. Anderson

Professor of Computer Science (Courtesy) (1975)
Professor of Mechanical Engineering

Education:
BS, Purdue University, *1970*
MS, Purdue University, *1971*
PhD, Purdue University, *1974*

Bio-sketch:
Professor Anderson conducts research and teaches in the areas of computer-aided design, computer graphics, and mechanical engineering design. His research focuses on problems in intelligent manufacturing systems, computer-aided engineering, design environments, high-level shape representation, geometric modeling, and geometric reasoning.

He is currently deputy director and co-principal investigator of the National Science Foundation Engineering Research Center (ERC) for Collaborative Manufacturing, and chairman of the Mechanical Engineering Design Area. He is a member of the editorial boards of the *Journal of Research in Engineering Design* and the *Journal of Design and Manufacturing*.

Professor Anderson is a Fellow of the ASME.

Alberto Apostolico

Professor of Computer Science (1984)

Education:
DR, Electronic Engineering, University of Naples, *1973*
Dipl. Perf., Computer Science, University of Salerno, *1976*

Bio-sketch:
Professor Apostolico's research interests are in the areas of algorithmic analysis, design, and applications. His recent work deals with algorithms and data structures for combinatorial pattern matching and discovery problems as arising in text editing, data compression, picture processing, biomolecular sequence analysis, etc. He is a co-editor (with Z. Galil) of the books *Combinatorial Algorithms on Words* (Springer-Verlag) and *Pattern Matching Algorithms* (Oxford Univ. Press), serves on the editorial boards of *Parallel Processing Letters*, *Theoretical Computer Science*, *Journal of Computational Biology*, *Chaos Theory and Applications*, *International Journal of Bioinformatics Research and Applications*, *Springer-Verlag Lecture Notes on Bioinformatics*, and serves as guest editor for a special issues of *Algorithmica*, *Information Sciences*, *Journal of Discrete Algorithms*, *PPL*, and *TCS*.

Faculty

He also serves on the steering committee of the *International Symposia on Combinatorial Pattern Matching*, the proceedings of which he co-edited in 1993, 1994, 1997, and 2002, and of the *International Conferences on Discovery Science*, and was on the executive committees of the *Fibonacci Institute for the Foundations of Computer Science* and of the *MSE Program in Software Engineering*. He has served on the program committees of many international conferences, most recently, *Research in Computational Biology (RECOMB)*, *Workshop on Algorithms in Bioinformatics (WABI)*, *IEEE Data Compression Conference*, *String Processing and Information Retrieval (SPIRE)*, *Combinatorial Pattern Matching (CPM)*, among others, and as an invited speaker at numerous international conferences and advanced research schools.

In his career, Professor Apostolico also held appointments at Italian Universities and spent extended stages at several other institutions, including CMU, UIUC, Rensselaer Poly, U. of London, U. of Paris, IBM T.J. Watson, Renyi Institute, and ZiF-Bielefeld. He has been the (co-)recipient of US (Air Force, NIH, NSF, IBM), British, French, Italian, collaborative (Israel, Korea, Japan), and international (Fulbright, NATO, ESPRIT) research grants.

Selected Publications:

Apostolico, A., M. E. Bock, and S. Lonardi. 2003. Monotony of surprise and large scale quest for unusual words. *Journal of Computational Biology* 10 (3-4): 283–311.

Apostolico, A. 2003. Pattern discovery and the algorithmics of surprise (invited paper). *Artificial Intelligence and Heuristic Methods for Bioinformatics*. IOS Press, 111–127.

Apostolico, A., and M. Crochemore. 2002. String pattern matching for a deluge survival kit. *Handbook of Massive Data Sets*. Edited by J. Abello et al. Kluver Acad. Publishers, 151–194.

Walid G. Aref

Associate Professor of Computer Science (1999)

Education:

BSc, Computer Science, Alexandria University, Egypt, *1983*
MSc, Computer Science, Alexandria University, Egypt, *1986*
PhD, Computer Science, University of Maryland at College Park, *1993*

Bio-sketch:

Aref's research interests are in developing database technologies for emerging applications, e.g., spatial, spatio-temporal, multimedia, genomics, and sensor databases. He is also interested in indexing, data mining, and geographic information systems (GIS). Professor Aref's research has been supported by the National Science Foundation, Purdue Research Foundation, CERIAS, Panasonic, and Microsoft Corp. In 2001, he received the CAREER Award from the National Science Foundation, and in 2004, he received a Purdue University Faculty Scholar award. Professor Aref is a member of Purdue's Discovery Park Bindley Bioscience Center. He is on the editorial board of the *VLDB* journal, a senior member of the IEEE, and a member of the ACM.

Selected Publications:

Hammad, M. A., M. J. Franklin, W. G. Aref, and A. K. Elmagarmid. 2003. Scheduling for shared window joins more than data streams. In *Proceedings of the 29th International Conference on Very Large Data Bases (VLDB 2003)*, 297–308.

Mokbel, M. F., T. M. Ghanem, and W. G. Aref. 2003. Spatio-temporal access methods. *IEEE Data Engineering Bulletin* 26 (2): 40–49.

Aref, W. G., and I. F. Ilyas. 2001. SP-GiST: An extensible database index for supporting space partitioning trees. *Journal of Intelligent Information Systems: Special Issue on Scientific and Statistical Database Management* 17 (2/3): 215–240.

Mikhail Atallah

Distinguished Professor of Computer Science (1982)
Professor of Electrical and Computer Engineering (Courtesy)

Education:

BE, Electrical Engineering and Computer Science, American University in Beirut, *1975*
MS, Electrical Engineering and Computer Science, The Johns Hopkins University, *1980*
PhD, Electrical Engineering and Computer Science, The Johns Hopkins University, *1982*

Bio-sketch:

Professor Atallah's current research interests are in information security (in particular, secure protocols, software security, and watermarking). He received a Presidential Young Investigator Award from the National Science Foundation in 1985. A fellow of the IEEE, he has served on the editorial boards of *SIAM Journal on Computing*, *IEEE Transactions on Computers*, *Journal of Parallel and Distributed Computing*, *Information Processing Letters*, *Computational Geometry: Theory & Applications*, *International Journal of Computational Geometry & Applications*, *Parallel Processing Letters*, and *Methods of Logic in Computer Science*. He was guest editor for a special issue of *Algorithmica* on computational geometry, has served as editor of the *Handbook of Parallel and Distributed Computing* (McGraw-Hill), as editorial advisor for the *Handbook of Computer Science and Engineering*, (CRC Press), and as editor-in-chief for *Handbook of Algorithms and Theory of Computation* (CRC Press). He was selected to serve on the program committees of various conferences and workshops (including ACM Symposium on Principles of Database Systems, Workshop on Privacy Enhancing Technologies, International World Wide Web Conference, ACM Symposium on Access Control Models and Technologies, ACM Workshop on Digital Rights Management, Australasian Information Security Workshop, ACM Symposium on Computational Geometry, SIAM Symposium on Discrete Algorithms, Workshop on Algorithms and Data Structures, IEEE Symposium on Parallel and Distributed Processing, IEEE International Parallel Processing Symposium, International Symposium on Algorithms and Computation, and many others). He has been the keynote and invited speaker at many national and international meetings. In June 2001, he co-founded the software startup Arxan Technologies Inc., a company that has secured funding from top-tier venture capital firms.

In addition to the projects appearing in the research funding section, Professor Atallah has received funding for these external projects: "Effectiveness of Software Projection Methods" (with John Rice and Buster Dunsmore), Wright-Patterson Air Force Base, 11/1/02-11/1/03, $950,000; "Automatically Protecting Software Against 'diff' Attacks" (with John Rice and David M'Raihi), SBIR Department of Defense, 8/12/03 - 1/31/04, $250,000; and "Tools for Quantifying Software Vulnerabilities and Protection" (with John Rice), Indiana 21st Century Fund, 4/1/04 - 4/1/05, $1,178,256.

Selected Publications:

Atallah, Mikhail J., Keith B. Frikken, and Marina Blanton. 2005. Dynamic and efficient key management for access hierarchies. In *Proceedings of the 12th ACM Conference on Computer and Communications Security (CCS 05)*, Alexandria, Va.

Goodrich, Michael T., Mikhail J. Atallah, and Roberto Tamassia. 2005. Indexing information for data forensics. In *Proceedings of the 3rd Conference on Applied Cryptography and Network Security (ACNS 05)*, New York, N.Y., 206–221.

Faculty

Blanton, Marina, and Mikhail J. Atallah. 2005. Provable bounds for portable and flexible privacy-preserving access rights. In *Proceedings of the 10th ACM Symposium on Access Control Models and Technologies (SACMAT 05)* Stockholm, Sweden, 95–101.

Saurabh Bagchi

Assistant Professor of Computer Science (Courtesy) (2004)
Assistant Professor of Electrical and Computer Engineering

Education:
BS, Computer Science & Engineering, Indian Institute of Technology, Kharagpur, *1996*
MS, Computer Science, University of Illinois at Urbana–Champaign, *1998*
PhD, Computer Science, University of Illinois at Urbana–Champaign, *2001*

Bio-sketch:
Professor Bagchi's research interests are in the areas of large-scale distributed systems, reliable and secure systems, system modeling and evaluation, and computer networks and protocols. He is interested in the question of how to build heterogeneous large-scale distributed systems that are reliable. Since many business and life critical functions are being performed by distributed systems, they need to be reliable while meeting their performance goals. Thus, there is need for smart error detection, diagnosis, and recovery protocols. More importantly, there is need for architectures that can combine fault tolerance aspects with performance aspects in an adaptive manner, adapting to different user requirements and different runtime environments. He considers intrusions to be an increasingly important class of faults and is therefore looking at the design of intrusion tolerant systems. He also is researching how to build dependable wireless networks of sensor nodes.

There are four current projects in Professor Bagchi's lab — the Dependable Computing Systems Lab (DCSL). The first project is building systems to provide detection and diagnosis of failures in distributed applications that are black-box or gray-box. The second project is building an intrusion tolerant system, with the current application testbed being a distributed e-commerce system and the current focus being automated containment for multi-stage attacks. The third project is building dependable practical sensor networks, through protocols for reliable data dissemination, detection and isolation of nodes involved in control and data attacks, and reliable reprogramming of the network. The fourth project is looking at reliable execution of tasks in a fine-grained cycle sharing system. For details of the research projects, look at the home page of the Dependable Computing Systems Research Group at http://shay.ecn.purdue.edu/~dcsl.

Professor Bagchi has been a program committee member for the International Symposium on Dependable Systems and Networks (DSN) since 2002 and was a member of its organizing committee in 2005. He has been an invited member to the meetings of the IFIP Working Group 10.4 on Dependable and Fault Tolerant Computing, which is a select group of researchers in the field. He leads an NSF research project on reliable real-time sensor networks using directional antennas, is a co-PI on a project aimed at detection and diagnosis in embedded networks, and involved in a project with the University of Notre Dame and the State of Indiana on remedying the combined sewage overflow (CSO) problem in cities of Indiana through the use of smart sensors and actuators. He is a member of CERIAS (Center for Education and Research in Information Assurance and Security) and CWSA (Center for Wireless Systems and Applications) at Purdue University.

Selected Publications:
Malhotra, Nipoon, Shrish Ranjan, and Saurabh Bagchi. 2005. LRRM: A randomized reliable multicast protocol for optimizing recovery latency and buffer utilization. *24th IEEE Symposium on Reliable Distributed Systems (SRDS)*.

Foo, Bingrui, Yu-Sung Wu, Yu-Chun Mao, Saurabh Bagchi, and Eugene Spafford. 2005. Adepts: Adaptive intrusion response using attack graphs in an e-commerce environment. *International Conference on Dependable Systems and Networks (DSN)* 508–517.

Malhotra, Nipoon, Mark Krasniewski, Chin-lung Yang, Saurabh Bagchi, and William Chappell. 2005. Location estimation in ad-hoc networks with directional antennas. *25th IEEE International Conference on Distributed Computing Systems (ICDCS)* 633–642.

Chris Bailey-Kellogg

Adjunct Professor of Computer Science (2001)

Education:

BS, Electrical Engineering and Computer Science, Massachusetts Institute of Technology, *1993*
MS, Electrical Engineering and Computer Science, Massachusetts Institute of Technology, *1993*
PhD, Computer and Information Science, The Ohio State University, *1999*

Bio-sketch:

Chris Bailey-Kellogg's research focuses on intelligent systems in computational science and engineering. In the area of computational biology, he is pursuing a mixed computational-experimental approach to the structural and functional understanding of and control over the molecular machinery of the cell. He is developing algorithms and systems to automatically plan experiments, predict outcomes, interpret data, revise models, and so forth. In the area of qualitative reasoning about physical systems, he is focusing on analysis of spatially distributed data, for example, in phase portrait representations and for decentralized control design. He is developing and applying a general framework that navigates a hierarchy from input data to abstract description and back using a mixture of numeric, symbolic, and geometric reasoning.

Selected Publications:

Bailey-Kellogg, C., and F. Zhao. 2001. Influence-based model decomposition. *Artificial Intelligence* 130 (2): 125–166.

Bailey-Kellogg, C., J. J. Kelley III, C. Stein, and B. R. Donald. 2001. Reducing mass degeneracy in SAR by MS (Structure-activity Relation by Mass Spectrometry) by stable isotopic labeling. *Journal of Computational Biology* 8 (1): 19–36.

Zhao, F., C. Bailey-Kellogg, and M. Fromherz. Physics-based encapsulation in embedded software for distributed sensing and control applications. In *Proceedings of the IEEE* 91 (1): 40–63.

Elisa Bertino

Professor of Computer Science (2004)
Professor of Electrical and Computer Engineering
Research Director of CERIAS

Education:

PhD, Computer Science, University of Pisa, *1980*

Bio-sketch:

Professor Elisa Bertino joined Purdue in January 2004 as a professor in Computer Science and research director at CERIAS. Her research interests cover many areas in the fields of information security and database systems, combining both theoretical and practical aspects and addressing applications in a number of domains, such as medicine and humanities. Current research includes: access control systems, secure publishing techniques and secure

broadcast for XML data; advanced RBAC models and foundations of access control models; trust negotiation languages and privacy; data mining and security; multi-strategy filtering systems for Web pages and sites; security for grid computing systems; integration of virtual reality techniques and databases; and geographical information systems and spatial databases.

Professor Bertino is a co-editor-in-chief of the *VLDB Journal* and serves on the editorial boards of several journals, many of which are related to security, such as the *ACM Transactions on Information and System Security,* the *IEEE Security & Privacy* Magazine, and the *International Journal of Information Security.* She served as program chair of the 7th ACM Symposium on Access Control Models and Technologies (SACMAT02), and is currently serving as program chair of the 9th International Conference on Extending Database Technology Conference (EDBT 2004). Professor Bertino is a Fellow of the Institute of Electrical and Electronics Engineers and has been recently elected ACM Fellow. She also received the IEEE Computer Society Technical Achievement award in 2002 for outstanding contributions to database systems and database security and advanced data management systems.

Selected Publications:

Bertino, E., J. Fan, E. Ferrari, M.S. Hacid, A. Elmagarmid, and X. Zhou. 2003. A hierarchical access control model for video database systems. *ACM Transactions on Information Systems* 21 (2): 155–191.

Bertino, E., B. Catania, E. Ferrari, and P. Perlasca. 2003. A logical framework for reasoning about access control models. *ACM Transactions on Information and System Security (TISSEC)*. 6 (1): 71–127.

Bertino, E., E. Ferrari, and A. Squicciarini. 2004. A peer-to-peer framework for trust establishment. *IEEE Transactions on Knowledge and Data Engineering* 16 (7): 827–842.

Bharat Bhargava

Professor of Computer Science (1984)
Professor of Electrical and Computer Engineering (Courtesy)

Education:

BS, Mathematics (Honors), Punjab University, *1966*
BE, Electrical and Computer Engineering, Indian Institute of Science, *1969*
PhD, Electrical Engineering, Purdue University, *1984*

Bio-sketch:

Professor Bhargava is conducting research in security and privacy issues in distributed systems. This involves host authentication and key management, secure routing and dealing with malicious hosts, adaptability to attacks, and experimental studies. Related research is in formalizing evidence, trust, and fraud. Applications in e-commerce and transportation security are being tested in a prototype system. Based on his research in reliability, he is studying vulnerabilities in systems to assess threats to large organizations. He has developed techniques to avoid threats that can lead to operational failures. The research has direct impact on nuclear waste transport, biosecurity, disaster management, and homeland security. These ideas and scientific principles are being applied to the building of peer-to-peer systems, cellular assisted mobile ad hoc networks, and to the monitoring of QoS-enabled network domains.

At the 1988 IEEE Data Engineering Conference, he and John Riedl received the best paper award for their work on "A Model for Adaptable Systems for Transaction Processing." Professor Bhargava is a fellow of the Institute of Electrical and Electronics Engineers and of the Institute of Electronics and Telecommunication Engineers. He has been awarded the charter Gold Core Member distinction by the IEEE Computer Society for his distinguished

service. He received Outstanding Instructor Awards from the Purdue chapter of the ACM in 1996 and 1998. In 1999, he received the IEEE Technical Achievement Award for a major impact of his decade long contributions to foundations of adaptability in communication and distributed systems. In 2003, he was inducted into Purdue's Book of Great Teachers.

He serves on the editorial boards of five international journals. He also serves the IEEE Computer Society on Technical Achievement award and Fellow committees. Professor Bhargava is the founder of the IEEE Symposium on Reliable and Distributed Systems, IEEE conference on Digital Library, and the ACM Conference on Information and Knowledge Management.

His research group consists of nine PhD and four postdoctoral students. He has several NSF funded projects. In addition, DARPA, IBM, Motorola, and CISCO are providing contracts and gift funds.

Selected Publications:

Hefeeda, M., B. Bhargava, and D. Yau. 2004. A hybrid architecture for cost-effective on-demand media streaming. *Computer Networks Journal* 44:353–382.

Bhargava, B., X. Wu, Y. Lu, and W. Wang. 2004. Integrating heterogeneous wireless technologies: A cellular-assisted mobile ad-hoc network. *Mobile Networks and Applications: Special Issue on Integration of Heterogeneous Wireless Technologies* 9:393–408.

Habib, A., M. Khan, and B. Bhargava. 2004. Edge-to-edge measurement-based distributed network monitoring. *Computer Networks* 44 (2): 211–233.

Alok R. Chaturvedi

Associate Professor of Computer Science (Courtesy) (2004)
Associate Professor of Management Information Systems
Director of the SEAS Laboratory

Education:

BSc, Mechanical Engineering, Birla Institute of Technology, Ranchi, India, *1980*
MS, MIS/Computer Science, University of Wisconsin, *1985*
PhD, MIS/Computer Science, University of Wisconsin, *1989*

William S. Cleveland

Professor of Computer Science (Courtesy) (2003)
Professor of Statistics

Education:

PhD, Statistics, Yale University
AB, Mathematics, Princeton University

Bio-sketch:

Before coming to Purdue, Cleveland was a Distinguished Member of Technical Staff in the Statistics Research Department at Bell Labs, Murray Hill, where he was also department head for 12 years.

Faculty

His areas of research have included data visualization, computer networking, machine learning, data mining, time series, statistical modeling, visual perception, environmental science, and seasonal adjustment.

Cleveland has been involved in many projects requiring the mining, statistical analysis, and modeling of data from several fields, including environmental science, customer opinion polling, visual perception, and computer networking. In the course of this work, he has developed many new statistical models and methods, including visualization methods that are widely used in engineering, science, medicine, and business.

He has participated in the design and implementation of software for the trellis display framework for visualization that he and colleagues developed, and for the loess approach to nonparametric function estimation that he introduced into statistics and machine learning. The software is now a part of many commercial systems.

Cleveland has published more than 120 papers on his research in a wide range of scientific journals, refereed proceedings, and books. In the area of data visualization, he has written three books and one user's manual, edited two books, and edited a special issue of the *Journal of the American Statistical Association.* He was the editor-in-chief of the seven volumes of *The Collected Works of John W. Tukey,* and for ten years was an editor of the Wadsworth Statistics/Probability Series. His two books *The Elements of Graphing Data* and *Visualizing Data* have been reviewed in dozens of journals, and *Elements* was selected for the Library of Science.

He is a principal investigator in the Network Modeling and Simulation Program of DARPA where he works on statistical modeling for generating background packet-level traffic and source-level traffic in simulators, on bandwidth allocation, on validation of network simulator models, and on packet sampling.

Cleveland has twice won the Wilcoxon Prize and once won the Youden Prize from the statistics journal *Technometrics.* He is a fellow of the American Statistical Association, the Institute of Mathematical Statistics, and the American Association of the Advancement of Science, and is an elected member of the International Statistical Institute. In 1996, he was chosen Statistician of the Year by the Chicago Chapter of the American Statistical Association. In 2002, he was selected as a Highly Cited Researcher by the American Society for Information Science & Technology in the newly-formed mathematics category.

He was the founding chair of the Graphics Section of the American Statistical Association, and has served on the Council of the Institute of Mathematical Statistics, the Committee on Applied and Theoretical Statistics of the National Research Council, and the Council of the Statistics Section of the American Association of the Advancement of Science.

Selected Publications:

Cao, J., W. S. Cleveland, Y. Gao, K. Jeffay, F. D. Smith, and M. Weigle. 2004. Stochastic models for generating synthetic HTTP source traffic. *IEEE Infocom*.

Cao, J., W. S. Cleveland, and D. X. Sun. 2003. The S-Net system for Internet packet streams: Strategies for stream analysis and system architecture. *Journal of Computational and Statistical Graphics: Special Issue on Streaming Data* 12:865–892.

Cao, J., W. S. Cleveland, D. Lin, and D. X. Sun. 2001. On the nonstationarity of Internet traffic. *ACM SIGMETRICS* 29:102–112.

Christopher W. Clifton

Associate Professor of Computer Science (2001)

Education:
BS, Computer Science and Engineering, Massachusetts Institute of Technology, *1986*
MS, Electrical Engineering and Computer Science, Massachusetts Institute of Technology, *1986*
MA, Computer Science, Princeton University, *1988*
PhD, Computer Science, Princeton University, *1991*

Bio-sketch:
Professor Clifton works on challenges posed by novel uses of data mining technology, including privacy-preserving data mining, data mining of text, and data mining techniques applied to interoperation of heterogeneous information sources. Fundamental data mining challenges posed by these applications include extracting knowledge from noisy data, identifying knowledge in highly skewed data (few examples of "interesting" behavior), and limits on learning. He also works on database support for widely distributed and autonomously controlled information, particularly information administration issues such as supporting fine-grained access control.

Prior to joining Purdue, Professor Clifton was a principal scientist in the Information Technology Division at the MITRE Corporation. Before joining MITRE in 1995, he was an assistant professor of computer science at Northwestern University.

Selected Publications:
Vaidya, Jaideep, and Chris Clifton. 2005. Secure set intersection cardinality with application to association rule mining. *Journal of Computer Security* 13 (4).

Li, Wen-Syan, and Christopher W. Clifton. 2000. SEMINT: A tool for identifying attribute correspondences in heterogeneous databases using neural networks. *Data and Knowledge Engineering* 33 (1).

Kantarcioglu, Murat, and Chris Clifton. 2004. Privacy preserving data mining of association rules on horizontally partitioned data. *Transactions on Knowledge and Data Engineering* 16 (9): 1026–1037.

Douglas E. Comer

Distinguished Professor of Computer Science (1976)
Professor of Electrical and Computer Engineering (Courtesy)

Education:
BS, Mathematics and Physics, Houghton College, *1971*
PhD, Computer Science, The Pennsylvania State University, *1976*

Bio-sketch:
Professor Comer is an internationally recognized expert on computer networking and the TCP/IP protocols. He has been working with TCP/IP and the Internet since the late 1970s. Comer established his reputation as a principal investigator on several early Internet research projects. He served as chairman of the CSNET technical committee, chairman of the DARPA Distributed Systems Architecture Board, and was a member of the Internet Activities Board (the group of researchers who built the Internet).

Comer has created courses on TCP/IP and networking technologies for a variety of audiences, including in-depth courses for engineers and less technical courses for others; he continues to teach at various industries and net-

working conferences around the world. In addition, Comer consults for private industry on the design of corporate networks.

Professor Comer is well known for his series of groundbreaking textbooks on computer networks, the Internet, and computer operating systems. His books have been translated into 16 languages, and are widely used in both industry and academia. Comer's three-volume series *Internetworking With TCP/IP* is often cited as an authoritative reference for the Internet protocols. More significantly, Comer's texts have been used by 15 of the top 16 computer science departments listed in the *USNews & World Report* ranking.

Comer's research is experimental. He and his students design and implement working prototypes of large, complex systems. The performance of the resulting prototypes are then measured. The operating system and protocol software that has resulted from Comer's research has been used by industry in a variety of products.

For more than 15 years, Professor Comer has served as North American editor of the research journal *Software-Practice and Experience*, which is published by John Wiley & Sons. Comer is a fellow of the ACM and the recipient of numerous teaching awards.

Selected Publications:

Comer, D. 2005. *Internetworking with TCP/IP Volume 1: Principles, Protocols, and Architecture*. Fifth edition. Upper Saddle River, NJ: Prentice-Hall.

Comer, D. 2005. *Essentials Of Computer Architecture*. Upper Saddle River, NJ: Prentice-Hall.

Comer, D. 2004. Consequences of IPv6 addressing. *Journal of Internet Technology* 5 (4): 305–309.

Melissa Dark

Associate Professor of Computer Science (Courtesy) (2005)
Assistant Dean of Computer and Information Technology
Associate Professor of Computer and Information Technology

Education:

BA, Foreign Language Education and Communications, Purdue University, *1983*
MS, Instructional Research and Development, Purdue University, *1993*
PhD, Curriculum and Instruction, Purdue University, *1993*

Bio-sketch

Melissa Dark is an associate professor of Computer Technology and assistant dean in the College of Technology. She has extensive experience in post-secondary science, technology, engineering, and mathematics (STEM) education. Melissa completed her PhD work at Purdue University and throughout her career has worked on several STEM curriculum and instruction projects with business and industry, government, and higher education. She has led faculty development projects in technology education and information security education aimed at increasing the knowledge and skills of secondary and post-secondary educators throughout the United States. She has been active in helping define the information assurance discipline and is currently leading a group that is developing the common body of knowledge in information security education. She has extensive experience in needs assessment, instructional design, development, and evaluation of continuing education in science, math, engineering, and technology related disciplines including traditional face-to-face training and education, as well video, CDROM, and Internet-delivered courseware. Melissa has specialized in educational measurement and evaluation. She has designed, developed, and taught educational measurement and evaluation. She also has consulting

experience in the evaluation of operator error in heat treatment operations, industrial radiography, industrial infant security alarm systems, cost of quality measurement systems, and the evaluation of personal digital assistants for a company standard.

H. E. Dunsmore

Associate Professor of Computer Science (1978)

Education:
BS, Mathematics and Physics, University of Tennessee, *1968*
PhD, University of Maryland, *1978*

Bio-sketch:
Professor Dunsmore's research areas include the Internet, the World Wide Web, Web browsers, Web site design and implementation, software engineering, Java, C++, C, JavaScript, and Perl programming, cgi software, object-oriented design and programming, and information systems.

Professor Dunsmore is the information systems convenor for the Global Studies Program in the Office of International Programs. He coordinates research concerning international issues related to the development and the use of information systems.

Professor Dunsmore is a 1996 recipient of the Charles B. Murphy Outstanding Undergraduate Teacher Award for Purdue University. He was selected in 1998 as a member of the Purdue University chapter of Mortar Board (national honor society that recognizes college students and faculty for their achievements in scholarship, leadership, and service). He was nominated in 1998 by Purdue University for the Carnegie Foundation U.S. Professor of the Year program. He was chosen as a founding fellow of the Purdue University Teaching Academy in 1997. He was selected Outstanding Teacher in the School of Science at Purdue University in 1980. Professor Dunsmore was selected one of the Top Ten Teachers in the School of Science in 1994, 1995, and 2000. He is a member of the Phi Beta Kappa and Upsilon Pi Epsilon (honor society for the computing sciences). On May 18, 2001, Professor Dunsmore was selected as one of three Outstanding Indiana Information Technology Educators by the Indiana Information Technology Association (INITA).

Professor Dunsmore has extensive legal and industrial consulting experience. He has written more than 60 technical articles. He is coauthor of the books *Software Engineering Metrics and Models* (with Sam Conte and Vincent Shen) and *Internet Resources for Tourism and Leisure* (with William Theobald).

David S. Ebert

Associate Professor of Computer Science (Courtesy) (2003)
Associate Professor of Electrical and Computer Engineering

Education:
BS, Computer and Information Science, The Ohio State University, *1986*
MS, Computer and Information Science, The Ohio State University, *1988*
PhD, Computer and Information Science, The Ohio State University, *1991*

Bio-sketch:
David Ebert is an associate professor in the School of Electrical and Computer Engineering at Purdue University. His research interests are scientific, medical, and information visualization, computer graphics, animation, and procedural techniques. Professor Ebert performs research in volume rendering, illustrative visualization, realistic

rendering, procedural texturing, modeling, and animation, and modeling natural phenomena. Ebert has been very active in the graphics community, teaching courses, presenting papers, serving on and co-chairing many conference program committees, serving on the ACM SIGGRAPH Executive Committee and serving as editor-in-chief for *IEEE Transactions on Visualization and Computer Graphics*. Ebert is also editor and co-author of the seminal text on procedural techniques in computer graphics, *Texturing and Modeling: A Procedural Approach*, whose third edition was published in December 2003.

Selected Publications:

Svakhine, N., Y. Jang, D. S. Ebert, and K. Gaither. 2005. Illustration and photography-inspired visualization of flows and volumes. *IEEE Visualization*.

Mora, B. and D. S. Ebert. 2005. Low complexity maximum intensity projection. *ACM Transactions on Graphics* 24 (4).

Svakhine, N., D.S. Ebert, D. Stredney. 2005. Illustration motifs for effective medical volume illustration. *IEEE Computer Graphics and Applications* 25 (3): 31–39.

Ahmed K. Elmagarmid

Professor of Computer Science (1988)

Education:

BS, Computer Science, University of Dayton, *1977*
MS, Computer and Information Science, The Ohio State University, *1981*
PhD, Computer and Information Science, The Ohio State University, *1985*

Bio-sketch:

Professor Elmagarmid is the director of the Indiana Center for Database Systems and the Indiana Telemedicine Incubator. He received a Presidential Young Investigator award from the National Science Foundation, and distinguished alumni awards from Ohio State University and the University of Dayton in 1993 and 1995, respectively. Professor Elmagarmid is the editor-in-chief of *Distributed and Parallel Databases: An International Journal*, editor of *IEEE Transactions on Knowledge and Data Engineering*, *Information Sciences Journal*, *Journal of Communication Systems*, and editor of the book series on *Advances in Database Systems*. He has chaired and served on several program committees and served on several editorial boards.

Professor Elmagarmid's research interests focus on applications of database technology to telemedicine, digital government, and electric power management. He has done work in video databases, data quality and confidentiality, and multidatabase systems. He has more than 10 active grants from state and federal government agencies as well as several grants from industry.

Professor Elmagarmid serves as an industry consultant in the areas of database systems. He has consulted with Telcordia Technology, Bellcore, IBM, CSC, Harris, D. H. Brown and Associates, MCC, Bell Northern Research, Molecular Design Labs, and UniSql to name a few. He is the owner of a recent patent on workflow database technology.

Selected Publications:

Hammad, M. A., M. J. Franklin, W. G. Aref, and A. K. Elmagarmid. 2003. Scheduling for shared window joins more than data streams. In *Proceedings of the 29th International Conference on Very Large Data Bases* 297–308.

Ilyas, I. F., W. G. Aref, and A. K. Elmagarmid. 2003. Supporting top-k join queries in relational databases. In *Proceedings of the 29th International Conference on Very Large Data Bases*, Berlin, Germany, 754–765.

Bertino, E., T. Catarci, A. K. Elmagarmid, and M. Hacid. 2003. Quality of service specification in video databases. *IEEE Multimedia* 10 (4): 71–81.

Patrick Eugster

Assistant Professor of Computer Science (2005)

Education:
BS, Computer Science, Swiss Federal Institute of Technology in Lausanne, *1998*
PhD, Computer Science, Swiss Federal Institute of Technology in Lausanne, *2001*

Bio-sketch:
Professor Eugster's research aims to proposing adequate support for distributed programming. Particular topics of interest include (fault-tolerant) algorithms, (object-oriented) programming languages and abstractions, middleware, and software engineering - all specifically in the context of distributed settings.

Professor Eugster was educated in Switzerland, and has worked for both Swiss Federal Institutes of Technology in Lausanne (EPFL) and in Zurich (ETHZ), as well as for Sun Microsystems. He has authored more than 30 articles.

Selected Publications:
Eugster, P., R. Guerraoui, A. M. Kermarrec, and L. Massoulie. 2004. From Epidemics to Distributed Computing. IEEE Computer, 37(5): 60-67.

Eugster, P., and R. Guerraoui. 2004. Distributed Programming with Typed Events. IEEE Software 21(2): 56-64.

Eugster, P., R. Guerraoui, S. B. Handurukande, A. M. Kermarrec, and P. Kouznetsov. 2003. Lightweight Probabilistic Broadcast. ACM Transactions on Computer Systems 21(4): 341-374.

Sonia Fahmy

Associate Professor of Computer Science (1999)

Education:
BSc, Computer Science, The American University in Cairo, Egypt, *1992*
MS, Computer and Information Science, The Ohio State University, *1996*
PhD, Computer and Information Science, The Ohio State University, *1999*

Bio-sketch:
Sonia Fahmy's research interests are in the design and evaluation of network architectures and protocols. She is currently investigating Internet tomography, overlay networks, network security, and wireless sensor networks. Her work is published in more than 50 papers, including publications in *IEEE/ACM Transactions on Networking, Computer Networks, IEEE INFOCOM, IEEE ICNP,* and *ACM NOSSDAV*. She received the National Science Foundation CAREER award in 2003, the Schlumberger foundation technical merit award in 2000 and 2001, and the OSU presidential fellowship for dissertation research in 1998. She has been very active in the Traffic Management working group of the ATM Forum, and has participated in several IRTF and IETF working groups. Some of the results of her work were incorporated in the ATM Forum traffic management specifications 4.0 and

4.1, and a patent has been awarded for her work on the ERICA algorithm for network congestion control. She is currently serving on the editorial boards of the *Journal of High Speed Networks* (IOS Press), and *Computer Communications* (Elsevier). She has served on the organizing or technical program committees of *IEEE INFOCOM, ICNP, ICDCS, ICC, GLOBECOM, Hot Interconnects, ICPP,* and *IPCCC*. She chaired the first *Workshop on Secure Network Protocols (NPSec)* in 2005, and co-chaired the first SPIE conference on scalability and traffic control in IP networks in 2001. She is a member of the ACM, Phi Kappa Phi, Sigma Xi, and Upsilon Pi Epsilon, and a senior member of the IEEE.

Selected Publications:

Fahmy, S., and M. Kwon. 2003. Characterizing overlay multicast networks. In *Proceedings of the IEEE International Conference on Network Protocols (ICNP)* 61–70.

Younis, O., and S. Fahmy. 2005. FlowMate: Scalable on-line flow clustering. *IEEE/ACM Transactions on Networking* 13 (2): 288-301.

Younis, O., and S. Fahmy. 2004. Distributed clustering in ad-hoc sensor networks: A hybrid, energy-efficient approach. *Proceedings of the IEEE INFOCOM* 1 (March): 629-640.

Greg N. Frederickson

Professor of Computer Science (1982)

Education:

AB, Economics, Harvard University, *1969*
MS, Computer Science, University of Maryland, *1976*
PhD, Computer Science, University of Maryland, *1977*

Bio-sketch:

Professor Frederickson's areas of interest include the analysis of algorithms, with special emphasis on data structures, and graph and network algorithms. His recent work has focused on designing data structures to dynamically maintain information about graphs, on designing optimal algorithms for parametric search problems on trees, and on discovering graph decompositions that facilitate fast algorithms for shortest path problems. Professor Frederickson has served on the editorial boards of *SIAM Journal on Computing*, *SIAM Journal on Discrete Mathematics*, and *IEEE Transactions on Computers*, and he currently serves on the editorial board of *Algorithmica*. He has published two books, *Dissections Plane & Fancy*, Cambridge University Press, 1997, and *Hinged Dissections: Swinging & Twisting*, Cambridge University Press, 2002. Professor Frederickson was recognized in 2003-04 as a Top Ten Outstanding Teacher in Science at Purdue, and won the 2004 George Pólya Award from the Mathematical Association of America.

Selected Publications:

Frederickson, Greg N. 1997. Ambivalent data structures for dynamic 2-edge-connectivity and k smallest spanning tree. *SIAM Journal on Computing* 26:484–538.

Frederickson, Greg N. 1997. A data structure for dynamically maintaining rooted trees. *Journal of Algorithms* Volume 24:37–65.

Frederickson, Greg N., and Roberto Solis-Oba. Increasing the weight of minimum spanning trees. *Journal of Algorithms* 33:244–266.

Walter Gautschi

Professor Emeritus of Computer Science (1963)
Professor Emeritus of Mathematics

Education:
PhD, Mathematics, University of Basel, *1953*

Bio-sketch:
Before coming to Purdue, Professor Gautschi did postdoctoral work as a Janggen-Pöhn Research Fellow at the National Institute of Applied Mathematics in Rome and at the Harvard Computation Laboratory. He also held positions at the National Bureau of Standards, the American University, the Oak Ridge National Laboratory, and the University of Tennessee. Since coming to Purdue, he has been a Fulbright Scholar at the Technical University of Munich and has held visiting appointments at the University of Wisconsin, Argonne National Laboratory, the Wright-Patterson Air Force Base, ETH Zurich, the University of Padova, and the University of Basel. He has been a Fulbright Lecturer, an ACM National Lecturer, and a SIAM Visiting Lecturer. He is, or has been, on the editorial boards of *SIAM Journal on Mathematical Analysis*, *Numerische Mathematik*, *Calcolo*, and *Mathematics of Computation*, and has served as a special editor for *Linear Algebra and Its Applications*. From 1984 to 1995, he was the managing editor of *Mathematics of Computation* and, since 1991, an honorary editor of *Numerische Mathematik*. In 2001, Professor Gautschi was elected a corresponding member of the Bavarian Academy of Sciences and Humanities and, in the same year, a foreign member of the Academy of Sciences of Turin.

Selected Publications:
Gautschi, W. 1996. Orthogonal polynomials: Applications and computations. *Acta Numerica,* 45–119. Edited by A. Iserles. Cambridge: Cambridge University Press.

Gautschi, W. 1998. The incomplete gamma functions since Tricomi. *Tricomi's Ideas and Contemporary Applied Mathematics*, 147:203–237, Atti dei Convegni Lincei:Accademia Nazionale dei Lincei, Roma.

Gautschi W. 2004. *Orthogonal Polynomials: Computation and Approximation.* New York: Oxford University Press, 2004.

Ananth Grama

Associate Professor of Computer Science (1996)

Education:
BE, Computer Science and Technology, University of Roorkee, *1989*
MS, Computer Engineering, Wayne State University, *1990*
PhD, Computer Science, University of Minnesota, *1996*

Bio-sketch:
Professor Grama's research interests span the areas of parallel and distributed computing architectures, algorithms, and applications. His work on distributed infrastructure deals with development of software support for dynamic clustered and multiclustered environments. More recent work has focused on resource location and allocation mechanisms in peer-to-peer networks. His research on applications has focused on particle dynamics methods, their applications to dense linear system solvers, and fast algorithms for data compression and analysis.

Professor Grama has authored several papers and co-authored the textbook *Introduction to Parallel Computing: Design and Analysis of Algorithms* with Vipin Kumar, Anshul Gupta, and George Karypis. He is a member of American Association for Advancement of Sciences and Sigma Xi.

Faculty

Selected Publications:
Grama, A., Anshul Gupta, George Karypis, and Vipin Kumar. 2003. *Introduction to Parallel Computing*. New York: Addison-Wesley, 2003.

Sambavaram, S., Vivek Sarin, Ahmed Sameh, and Ananth Grama. 2003. Multipole-based preconditioners for large sparse linear systems. *Parallel Computing* 29 (9): 1261–1273.

Koyutürk, M., and Ananth Grama. 2003. PROXIMUS: A framework for analyzing very high dimensional discrete-attributed datasets. In *Proceedings of the ninth ACM SIGKDD international conference on knowledge discovery and data mining* 147–156.

Michael Gribskov

Professor of Computer Science (Courtesy) (2004)
Professor of Biological Sciences

Education:
BS, Biochemistry and Biophysics, Oregon State University, *1979*
PhD, Molecular Biology, University of Wisconsin, *1985*

Bio-sketch:
Professor Gribskov has wide ranging interests in computational molecular biology. These interests fall into several main categories. One area of interest is the application of pattern recognition and machine learning techniques to biomolecules. These approaches are often used in the functional annotation of molecules based on their sequences. A second area is the design and implementation of biological databases, and the development of interactive data laboratories that integrate analytical tools and databases. Finally, Professor Gribskov is interested in the development of interoperable resources to support genomics and systems biology using approaches such as database federation, data mediation, and Web services.

Since 2003, Professor Gribskov has been the president of the International Society for Computational Biology, the largest professional society devoted to bioinformatics and computational biology.

Selected Publications:
Wang, D., J. F. Harper, and M. Gribskov. 2003. Systematic trans-genomic comparison of protein kinases between *Arabidopsis thaliana* and *Saccharomyces cerevisiae*. *Plant Physiology* 132:2152–2165.

Nair, T. M., C. L. Zheng, J. L. Fink, R. O. Stuart, and M. Gribskov. Rival penalized competitive learning (RPCL): a topology determining algorithm for analyzing gene-expression data. *Computational Biology and Chemistry* 27:563–574.

Zheng, C. L., V. R. de Sa, M. Gribskov, and T. M. Nair. On selecting features from splice junctions: An analysis using information theoretic and machine learning approaches. *Genome Informatics* 14:73–83.

Susanne E. Hambrusch

Professor of Computer Science (1982)
Department Head

Education:
MS, Computer Science, Technical University of Vienna, *1977*
PhD, Computer Science, The Pennsylvania State University, *1982*

Bio-sketch:
Professor Hambrusch's research interests are in the area of parallel and distributed computation, data management and data dissemination in wireless environments, and analysis of algorithms. Her research contributions include communication and data dissemination routines for distributed applications, data management techniques for query processing in wireless, mobile environments, and parallel algorithms for image processing and graph problems. Professor Hambrusch's research has been supported by NSF, ONR, DARPA, DoE, and Microsoft Corp.

Professor Hambrusch is a member of the editorial board for *Parallel Computing and Information Processing Letters*, and she also serves on the IEEE Technical Committee on Parallel Processing. Her recognitions include inaugural membership in the Purdue University Book of Great Teachers, a 2003 Outstanding Engineering Alumni Award from Pennsylvania State University, and 2004 TechPoint Mira Education Award Winner. She has served as the head of the Department of Computer Science since July 2002.

Selected Publications:
Mokbel, M., Xiaopeng Xiong, Walid Aref, Susanne Hambrusch, Sunil Prabhakar, and Moustafa Hammad. 2004. PLACE: A query processor for handling real-time spatio-temporal data streams. In *Proceedings of the 13th International Conference on Very Large Data Bases (VLDB)*, 1377–1380.

Khokhar, A. A., Susanne Hambrusch, and Erturk Kocalar. 2003. Termination detection in data-driven parallel computations/applications. *Journal of Parallel and Distributed Computing* 63 (3): 312–326.

Hambrusch, S.E., and C.-M. Liu. 2003. Data replication for static tree structures. *Information Processing Letters* 86 (4): 197–202.

Christoph M. Hoffmann

Professor of Computer Science (1976)
Co-director, Computing Research Institute
Co-director, PLM Center of Excellence

Education:
PhD, University of Wisconsin, *1974*

Bio-sketch:
Before joining the Purdue faculty, Professor Hoffmann taught at the University of Waterloo, Canada. He has also been a visiting professor at the Christian-Albrechts University in Kiel, West Germany (1980), and at Cornell University (1984–1986). His research focuses on geometric and solid modeling, its applications to manufacturing and science, and the simulation of physical systems. The research includes, in particular, research on geometric constraint solving and the semantics of generative, feature-based design. Professor Hoffmann is the author of *Group-Theoretic Algorithms and Graph Isomorphism*, *Lecture Notes in Computer Science*, 136, Springer-Verlag and of *Geometric and Solid Modeling: An Introduction*, published by Morgan Kaufmann, Inc. Professor Hoffmann has received national media attention for his work simulating the 9/11 Pentagon attack.

Selected Publications:
Hoffmann, C. 2004. Solid modeling. In *Handbook of Discrete and Computational Geometry*, ed. J. Goodman and J. O'Rourke, CRC Press.

Hoffmann, C., and V. Popescu. 2005. Fidelity in large-scale simulations. *CAD* 37:99–107.

Hoffmann, C., and N. Stewart. 2004. Accuracy and robustness in shape interrogation applications. Keynote address, *Solid Modeling.* Given by N. Stewart in my place, joint paper to appear in *Geometric Models*.

Faculty

Antony Hosking

Associate Professor of Computer Science (1995)

Education:
BSc, Mathematical Sciences, University of Adelaide, *1985*
MSc, Computer Science, University of Waikato, *1987*
PhD, Computer Science, University of Massachusetts, *1995*

Bio-sketch:
Professor Hosking's research lies at the intersection between programming languages and database systems, focusing on the integration of language and database functionality for efficient data management. Particular topics of interest include interpretation, compilation, and optimization of object-oriented persistent/database programming languages, and empirical performance evaluation of experimental prototype systems. His current research explores language and compiler support for run-time object management (e.g., garbage collection, persistence, resilience, distribution, and security) in the context of the Smalltalk, Modula-3, and Java programming languages.

Selected Publications:
Blackburn, S., and Antony Hosking. 2004. Barriers: Friend or foe? *Proceedings of the Third International Symposium on Memory Management* 143–151.

Cher, Chen-Yong, Antony Hosking, and T. N. Vijaykumar. 2004. Software prefetching for mark-sweep garbage collection: Hardware analysis and software redesign. In *Proceedings of the Eleventh International Conference on Architectural Support for Programming Languages and Operating Systems* Oslo, Norway, 199–210.

Welc, A., Suresh Jagannathan, and Antony Hosking. 2004. Transactional monitors for concurrent objects. *Proceedings of the European Conference on Object-Oriented Programming* 519–542.

Elias N. Houstis

Professor of Computer Science (1984)

Education:
BS, Mathematics, University of Athens, *1969*
PhD, Mathematics, Purdue University, *1974*

Bio-sketch:
Elias Houstis has served as acting and associate head of the Department of Computer Science. He is on the editorial board of *Neural, Parallel and Scientific Computational*; *Computational Engineering Science*; and *HPC Users Web-Based* journals and a member of the IFIP WG 2.5 Working Group in Numerical Software. Houstis's current research interests are in the areas of problem solving environments (PSEs), parallel computation, performance evaluation and modeling, computational intelligence, computational finance, and on-line learning. He is one of the principal designers of several domain specific PSEs (i.e., Parallel ELLPACK, PDELab), and numerous performance evaluation studies of PDE software and parallel architectures. He is leading the Parallel ELLPACK group, which is developing infrastructure and implementing methodologies for reusing "legacy" PDE software on a variety of physical and virtual parallel machines, and designing a Web Parallel ELLPACK server. Houstis has been involved in the designing of a knowledge-based framework (known as PYTHIA) to support the selection of algorithm and machine pairs for a given class of PDE problems based on performance knowledge. This framework has been applied to a simulation system for designing HPC systems (POEMS project), a virtual laboratory envi-

ronment, and a recommender system for mathematical software. Houstis has published several books and more than 120 technical articles. He has supervised 14 PhD students and several MS students. His research has been supported by the Air Force Office of Scientific Research, the Army Research Office, DARPA, DOE, ESPRIT, INTEL, IBM, AT&T, Kozo-Japan, Purdue University, National Science Foundation, and the Greek Research Foundation.

Y. Charlie Hu

Assistant Professor of Computer Science (Courtesy) (2003)
Assistant Professor of Electrical and Computer Engineering

Education:
BS, Computer Science, University of Science and Technology of China, *1989*
MS, Computer Science, Yale University, *1992*
MPhil, Computer Science, Yale University, *1992*
PhD, Computer Science, Harvard University, *1997*

Bio-sketch:
Y. Charlie Hu's research interests are in distributed systems, operating systems, wireless ad hoc networking, and high performance computing. He is currently investigating program-counter-based techniques for the I/O management in operating systems, peer-to-peer overlay networking infrastructures, the synergy between peer-to-peer and grid computing, and the synergy between peer-to-peer mobile ad hoc networking to address key technical challenges in these areas. His work is published in more than 40 papers, including publications in *ACM Transactions on Computer Systems*, *ACM Transactions on Mathematical Software*, *Journal of Parallel and Distributed Computing*, *USENIX OSDI*, *USENIX HotOS*, *ACM NOSSDAV*, *IEEE INFOCOM*, *International Symposium on High-Performance Computer Architecture*, and *IEEE/ACM SC Conference*. He received the National Science Foundation CAREER award in 2003, and the Honda Initiation Grant in 2002. He was a vice chair for the 2004 International Conference on Parallel Processing (ICPP-04), and a co-founder and co-chair for the first and the second International Workshop on Mobile Peer-to-Peer Computing (MP2P). He is a member of the ACM.

Selected Publications:
Gniady, C., Y. Charlie Hu, and Yung-Hsiang Lu. 2004. Program counter based techniques for dynamic power management. In *Proceedings of the 10th International Symposium on High-Performance Computer Architecture (HPCA-10)*, Madrid, Spain, February 14–18.

Hu, Y. C., Saumitra M. Das, and Himabindu Pucha. 2003. Exploiting the synergy between peer-to-peer and mobile ad-hoc networks. In *Proceedings of the HotOS-IX: Ninth Workshop on Hot Topics in Operating Systems*, Lihue, Kauai, Hawaii, May 18–21.

Hu, Y. C., Weimin Yu, Alan Cox, Dan Wallach, and Willy Zwaenepoel. 2003. Runtime support for distributed sharing in safe languages. *ACM Transactions on Computer Systems* 21 (1): 1–35.

Suresh Jagannathan

Associate Professor of Computer Science (2002)
Associate Professor of Electrical and Computer Engineering (Courtesy)

Education:
BS, Computer Science, State University of New York at Stony Brook, *1982*
MS, Electrical Engineering and Computer Science, Massachusetts Institute of Technology, *1985*
PhD, Electrical Engineering and Computer Science, Massachusetts Institute of Technology, *1989*

Faculty

Bio-sketch:
Professor Jagannathan is interested in the semantics and implementation of high-level programming languages like SML, Scheme, or Java. More specifically, his interests lie in formal methods for describing and implementing such languages, e.g., type theory, program analysis, abstract interpretation, etc. He also has an active interest in coordinated and distributed languages. One aspect of this research studies the semantics and implementation of lightweight transactions as an alternative to lock-based synchronization for expressing concurrency. The results of this work are used to devise scalable coordination and distributed systems. Jagannathan's research also explores issues in the design and implementation of next-generation storage infrastructures. This work applies formal methods and software engineering principles to develop highly-available scalable storage applications for wide-area deployment.

Selected Publications:
Welc, A., Suresh Jagannathan, and Antony Hosking. 2004. Transactional monitors for concurrent objects. *European Conference on Object-Oriented Programming*.

Vitek, J., Suresh Jagannathan, Adam Welc, and Antony Hosking. 2004. A semantic framework for designer transactions. *European Symposium on Programming*.

Jagannathan, S. 2000. Continuation-based transformations for coordination languages. *Theoretical Computer Science*.

Sabre Kais

Professor of Computer Science (Courtesy) (2005)
Professor of Chemical Physics

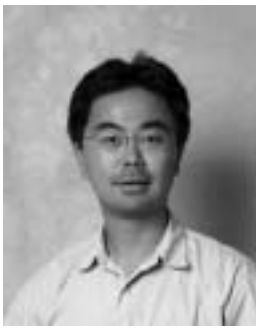
Education:
BS, Hebrew University, *1983*
MS, Hebrew University, *1984*
PhD, Hebrew University, *1989*

Bio-sketch:
Professor Kais's research is in the field of quantum information and computation, and quantum phase transitions. In particular, his research focuses on quantifying entanglement, quantum algorithms, teleportation using quantum dots, decoherence in spin systems and solid state implementations of qubits.

Selected Publications:
Huang, Z., and Sabre Kais. 2005. Entanglement as measure of electron-electron correlation in quantum chemistry calculations. *Chem. Phys. Letters* 413 (1).

Huang, Z., and Sabre Kais. 2005. Dynamics of entanglement for one-dimensional spin systems in an external time-dependent magnetic field. *J. Quant. Information* 3 (483).

Shi, Qicun, and Sabre Kais. 2004. Finite size scaling for the atomic Shannon-information entropy. *J. Chem. Phys.* 121: 5611–5617.



Daisuke Kihara

Assistant Professor of Computer Science (2003)
Assistant Professor of Biological Sciences

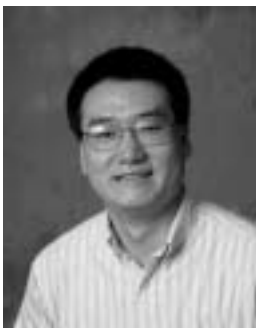
Education:
BS, Biochemistry, University of Tokyo, *1994*
MS, Bioinformatics, Kyoto University, *1996*
PhD, Bioinformatics, Kyoto University, *1999*

Bio-sketch:
Professor Kihara's research interest is in the area of bioinformatics. In the last decade, a large amount of biological data, such as genome/protein sequences, protein 3D structures, and pathway data have become available. This data now enables us to employ comprehensive analysis of relationship between protein sequence, structure and function, evolution of protein families, pathways, and organisms. He is focusing on developing computational methods to predict and analyze protein structure/function, pathway structure, and their applications in genome-scale or pathway/network scale. Recently, he worked on protein structure prediction and comparison, development of prediction method of transmembrane proteins, and its application to genome sequences.

Selected Publications:
Hu, J., Bin Li, and Daisuke Kihara. 2005. Potentials and limitations of current motif discovery algorithms. *Nucleic Acid Research*, In Press.

Kihara, D. 2005. The effect of long-range interactions on the secondary structure formation of proteins. *Protein Science* 14:1955–1963.

Kihara, D., and Jeffrey Skolnick. 2004. Microbial genomes have more than 72% structure assignment by the threading algorithm PROSPECTOR_Q. *Proteins: Structure, Funct. Bioinformatics* 55:466–473.



Ninghui Li

Assistant Professor of Computer Science (2003)

Education:
BS, Computer Science, University of Science and Technology of China, *1993*
MS, Computer Science, New York University, *1998*
PhD, Computer Science, New York University, *2000*

Bio-sketch:
Professor Li's research interests are in computer security and applied cryptography, e.g., security and privacy in distributed systems, networks, databases, and electronic commerce, with a focus on access control. Li has worked extensively on trust management and automated trust negotiation, which are approaches to access control in decentralized, open, and distributed systems. In his PhD thesis work, he designed and implemented delegation logic, a logic-based language for distributed authorization. While at Stanford, he designed, together with Professors John Mitchell and Will Winsborough, the RT role-based trust-management framework, efficient goal-directed algorithms to do distributed credential chain discovery, logic-based semantic foundations for security policy languages, and algorithms and computational complexity characterization for analyzing properties of security policies such as safety and availability.

Professor Li's recent research focuses on role-based access control and online privacy protection. In 2005, he was awarded the NSF CAREER award for proposed work on "Access Control Policy Verification Through Security Analysis And Insider Threat Assessment."

Faculty

Before joining Purdue, Li was a research associate in the Computer Science Department, at Stanford University. He has served on the program committees of more than a dozen conferences and workshops in information security, including the ACM Conference on Computer and Communications Security (CCS), the ISOC Network and Distributed System Security Symposium (NDSS), the International Conference on Security and Privacy for Emerging Areas in Communication Networks (SecureComm), ACM Symposium on Access Control Models and Technologies (SACMAT), and IEEE Computer Security Foundations Workshop (CSFW).

Selected Publications:

Li, N., Ziad Bizri, and Mahesh V. Tripunitara. 2004. On mutually-exclusive roles and separation of duty. In *Proceedings of the ACM Conference on Computer and Communications Security (CCS)*, (October).

Li, N., John C. Mitchell, and William H. Winsborough. 2005. Beyond proof-of-compliance: Security analysis in trust management. *Journal of the ACM* 52 (3): 474–514.

Li, N., John C. Mitchell, and William H. Winsborough. 2002. Design of a role-based trust-management framework. In *Proceedings of the 2002 IEEE Symposium on Security and Privacy* (May).

Zhiyuan Li

Associate Professor of Computer Science (1997)
Associate Professor of Electrical and Computer Engineering (Courtesy)

Education:

BS, Mathematics, Xiamen University, *1982*
MS, Computer Sciences, University of Illinois at Urbana-Champaign, *1985*
PhD, Computer Sciences, University of Illinois at Urbana-Champaign, *1989*

Bio-sketch:

Zhiyuan Li has led a group to design and implement an interprocedural parallelizing Fortran compiler, called Panorama, which performs highly efficient array data flow analysis to enable aggressive loop parallelization and locality-enhancement program transformations. His group also designs and implements compiler-based programming environments and run-time systems for mobile computing on handheld devices.

Li received a National Science Foundation Research Initiation Award and a National Science Foundation Career Award in 1992 and 1995, respectively. In 1998, he co-edited with P. C. Yew a special issue on compilers and languages for parallel and distributed computers for *IEEE Transaction on Parallel and Distributed Systems* and two special issues on compilers and languages for parallel computing for the *International Journal on Parallel Programming*. Li, with Professor P. C. Yew, co-chaired the *10th International Workshop on Languages and Compilers for Parallel Computing* in 1997. He has served as a program committee member for several international conferences, including *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, *ACM International Conference on Supercomputing*, *International Conference on Parallel Processing*, and *ACM SIGPLAN Symposium on Languages*, *Compilers and Tools for Embedded Systems (LCTES)*.

Selected Publications:

Gu, J., and Zhiyuan Li. 2000. Efficient interprocedural array data-flow analysis for automatic program parallelization. *IEEE Transactions on Software Engineering, Special Issue on Architecture-Independent Languages and Software Tools for Parallel Processing* 26 (3): 244–26.

Wang, C., and Zhiyuan Li. 2004. Parametric analysis for adaptive computation offloading. In *Proceedings of the ACM SIGPLAN 2004 Conference on Programming Language Design and Implementation (PLDI),* 119–130, Washington, DC, June 9–11.

Wang, C., and Zhiyuan Li. 2004. A compiler scheme for computation offloading on wireless-networked handheld devices. *Journal of Parallel and Distributed Computing* 64 (6): 740–746.

Yung-Hsiang Lu

Assistant Professor of Computer Science (Courtesy) (2004)
Assistant Professor of Electrical and Computer Engineering

Education:
BSEE, Electrical Engineering, Taiwan University, *1992*
MSEE, Electrical Engineering, Stanford University, *1996*
PhD, Electrical Engineering, Stanford University, *2002*

Bio-sketch:
Professor Lu's research is developing energy-efficient computing systems using system-level power management. The applications include distributed sensor networks, autonomous robots, wireless communication, and real-time systems. He received a CAREER Award from National Science Foundation in 2004 for developing advanced energy management in operating systems.

Selected Publications:
Pettis, N., Le Cai, and Yung-Hsiang Lu. 2004. Dynamic power management for streaming video. *International Symposium on Low Power Electronics and Design 2004*, 62–65.

Cai, L., and Yung-Hsiang Lu. 2005. Energy management using buffer memory for streaming data. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* February:141–152.

Cai, L., and Yung-Hsiang Lu. 2005. Joint power management of memory and disk. *Design Automation and Test in Europe 2005*, 86–91.

Bradley J. Lucier

Professor of Computer Science (1981)
Professor of Mathematics (1981)

Education:
BSc, Mathematics, University of Windsor, *1976*
SM, Applied Mathematics, University of Chicago, *1978*
PhD, Applied Mathematics, University of Chicago, *1981*

Bio-sketch:
Professor Lucier has worked for more than 10 years on wavelet and multiresolution methods for image processing and other applications. He has a particular interest in applications in medical imaging (image compression for telemedicine, tomographic and MRI reconstruction, etc.). The selected publications below indicate some of these interests. The first paper relates variational problems to wavelet shrinkage, as introduced by David Donoho and Iain Johnstone. The second paper gives an interpretation of translation-invariant wavelet shrinkage, introduced by Donoho and Ronald Coifman, as gradient descent along a convex functional; Gaussian smoothing can be interpreted in the same way (with a different functional). Finally, the third paper introduces several results about

wavelet methods for medical tomography, especially for Positron Emission Tomography (PET) imaging. Basically, it again puts into a variational framework the wavelet-vaguelette method of Donoho; it shows that wide classes of computationally efficient wavelet transforms can be used for tomography; and it gives examples that show that wavelet techniques are much more effective than the usual filtered back-projection method for PET imaging. This work has been supported continuously by the Office of Naval Research since 1990.

Selected Publications:

Chambolle, A., Ronald A. DeVore, Namyong Lee, and Bradley J. Lucier. 1998. Nonlinear wavelet image processing: Variational problems, compression, and noise removal through wavelet shrinkage. *IEEE Transactions on Image Processing: Special Issue on Partial Differential Equations and Geometry-Driven Diffusion in Image Processing and Analysis* 7:319–335.

Chambolle, A., and Bradley J. Lucier. 2001. Interpreting translation-invariant wavelet shrinkage as a new image smoothing scale space. *Transactions on Image Processing* 10:993–1000.

Lee, N., and Bradley J. Lucier. 2001. Wavelet methods for inverting the radon transform with noisy data. *IEEE Transactions on Image Processing* 10:79–94.

Robert E. Lynch

Professor Emeritus of Computer Science and Mathematics (1967)

Education:

BS, Engineering Physics, Cornell University, *1954*
MA, Mathematics, Harvard University, *1961*
PhD, Applied Mathematics, Harvard University, *1963*

Bio-sketch:

Professor Lynch has held positions at Brookhaven National Laboratory, Los Alamos Laboratories, Wright-Patterson Air Force Base, the University of Texas, and General Motors Research Laboratories. Areas of his research include differential equations, linear algebra, software for solving elliptic partial differential equations, and computational biology. He and G. Birkhoff have written the monograph *Numerical Solutions of Elliptic Problems*, SIAM Publications, 1985.

Aditya P. Mathur

Professor of Computer Science (1987)
Associate Dean, Graduate Education, College of Science

Education:

BE, Electrical Engineering, Birla Institute of Technology and Science, *1970*
MS, Electrical Engineering, Birla Institute of Technology and Science, *1972*
PhD, Computer Science, Birla Institute of Technology and Science, *1977*

Bio-sketch:

Aditya Mathur conducts research in the areas of software testing, reliability, and formal approaches for software process control. Mathur has been a crusader for the use of code coverage criteria in the estimation of software reliability or as an orthogonal metric to assess confidence in the reliability estimates. He has proposed the "saturation effect" as a motivating device for quantitative test assessment using an increasingly powerful suite of

criteria. This device is often used by vendors to enhance marketing of their test tools. Mathur, in collaboration with Raymond DeCarlo, has pioneered research into the use of feedback control in software development.

Selected Publications:

Cangussu, J., Raymond DeCarlo, and Aditya P. Mathur. 2002. A formal model of the software test process. *IEEE Transactions on Software Engineering* 28 (8): 782–796.

Mathur, A. P., Baskar Sridharan, and Steven G. Unger. 2002. Digital device manuals for the management of connected spaces. *IEEE Communications Magazine* 40 (8): 78–85.

Cangussu, J., Raymond DeCarlo, and Aditya P. Mathur. 2003. Using sensitivity analysis to validate a state variable model of the software test process. *IEEE Transactions on Software Engineering*, 29 (5): 430–443.

Cristina Nita-Rotaru

Assistant Professor of Computer Science (2003)

Education:

BS, Computer Science, Politehnica University of Bucharest, *1995*
MS, Computer Science, Politehnica University of Bucharest, *1996*
MSE, Computer Science, The Johns Hopkins University, *2000*
PhD, Computer Science, The Johns Hopkins University, *2003*

Bio-sketch:

Cristina Nita-Rotaru joined Purdue in 2003, where she conducts her research within the Dependable and Secure Distributed Systems Laboratory $(DS)^2$. Her research interests lie in designing distributed systems and network protocols and applications that are dependable and secure, while maintaining acceptable levels of performance. Her current research focuses on designing intrusion-tolerant architectures for distributed services that scale to wide-area networks, investigating survivable routing in wireless ad hoc networks, and providing access control mechanisms for secure group communication. Her work is funded by the Center for Education and Research in Information Security and Assurance (CERIAS), Defense Advanced Research Projects Agency (DARPA), and the National Science Foundation (NSF).

Selected Publications:

Amir, Y., Yongdae Kim, Cristina Nita-Rotaru, John Schultz, Jonathan Stanton, and Gene Tsudik. 2004. Secure group communication using robust contributory key agreement. *IEEE Transactions on Parallel and Distributed Systems (TPDS)* 15 (5): 468–480.

Amir, Y., Yongdae Kim, Cristina Nita-Rotaru, and Gene Tsudik. 2004. On the performance of group key agreement protocols. *ACM Transactions on Information Systems Security (TISSEC)* 7 (3).

Amir, Y., Cristina Nita-Rotaru, Jonathan Stanton and Gene Tzudik. 2005. Secure spread: An integrated architecture for secure group communication. *IEEE Transactions on Dependable and Secure Computing (TDSC)* 2 (3).

Jens Palsberg

Adjunct Professor of Computer Science (1996)

Education:

MSc, Computer Science, University of Aarhus, Denmark, *1988*
PhD, Computer Science, University of Aarhus, Denmark, *1992*

Faculty

Bio-sketch:
Jens Palsberg is a professor of computer science at UCLA and an adjunct professor of computer science at Purdue University. From 1992 to 1996 he was a visiting scientist at various institutions, including MIT. From 1996 to 2002, he was an associate professor of computer science at Purdue University, from 2002 to 2003, professor and associate head of computer science at Purdue. His research interests span the areas of compilers, embedded systems, programming languages, software engineering, and information security. He has authored more than 70 technical papers, co-authored the book *Object-Oriented Type Systems*, and co-authored the 2002 revision of Appel's textbook on modern compiler implementation in Java. He is the recipient of the National Science Foundation CAREER and ITR awards, a Purdue University Faculty Scholar award, and an Okawa Foundation research award. Professor Palsberg's research has also been supported by DARPA, IBM, Intel, and British Telecom. He is an associate editor of *ACM Transactions of Programming Languages and Systems*, a member of the editorial board of *Information and Computation*, and a former member of the editorial board of *IEEE Transactions on Software Engineering*. He served as the general chair of the ACM Symposium on Principles of Programming Languages in 2005, and has served as a program chair for the Static Analysis Symposium, the Symposium on Requirements Engineering for Information Security, and the ACM Workshop on Program Analysis for Software Tools and Engineering. He has been a member of more than 40 other conference program committees.

Selected Publications:
Palsberg, J., and Christina Pavlopoulou. 2001. From Polyvariant Flow Information to Intersection and Union Types. *Journal of Functional Programming*, 11(3): 263–317. Preliminary Version in *Proceedings of POPL'98 25th Annual SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, San Diego, Calif., 197–208, January 1998.

Palsberg, J., and Tian Zhao. 2001. Efficient and Flexible Matching of Recursive Types," *Information and Computation* 171:364–387. Preliminary version in *Proceedings of LICS'00, Fifteenth Annual IEEE Symposium on Logic in Computer Science*, Santa Barbara, Calif., 388–398, June 2000.

Brylow, D., Niels Damgaard, and Jens Palsberg. 2001. Static checking of interrupt-driven software. *Proceedings of the ICSE 2001: 23rd International Conference on Software Engineering*, 47–56, Toronto.

Gopal Pandurangan

Assistant Professor of Computer Science (2002)

Education:
BTech, Computer Science, Indian Institute of Technology at Madras, *1994*
MS, Computer Science, State University of New York at Albany, *1997*
PhD, Computer Science, Brown University, *2002*

Bio-sketch:
Professor Pandurangan's research interests are in theoretical computer science and design and analysis of algorithms. In particular, he is interested in randomized algorithms, probabilistic analysis of algorithms, dynamic computer processes, and theory and algorithms for real-world networks. Professor Pandurangan is especially interested in algorithmic and modeling problems that arise in the following application areas: communication networks (especially ad hoc and sensor networks), computational biology and bioinformatics, Web and Internet algorithms.

Selected Publications:
Bailey-Kellogg, C., S. Chainraj, and G. Pandurangan. 2005. A random graph approach to NMR sequential assignment. *Journal of Computational Biology*, 12 (6–7): 569–583.

Muthukrishnan, S., and G. Pandurangan. 2005. The bin-covering technique for thresholding random geometric graph properties. *Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA)*.

Pandurangan, G., P. Raghavan, and E. Upfal. 2003. Building low-diameter peer-to-peer networks. *IEEE Journal on Selected Areas in Communications (JSAC)* 21 (6): 995–1002.

Kihong Park

Associate Professor of Computer Science (1996)

Education:

BA, Management, Seoul National University, *1988*
MS, Computer Science, University of South Carolina, *1990*
PhD, Computer Science, Boston University, *1996*

Bio-sketch:

Professor Park's research centers on design and control issues in high-speed multimedia networks including deployable IP QoS, scalable network security, and robust distributed systems. He has published in major networking venues including *ACM SIGCOMM*, *ACM SIGMETRICS*, *IEEE ICNP*, and *IEEE INFOCOM*, and has edited two books, *Self-Similar Network Traffic and Performance Evaluation* (Wiley-Interscience 2000) and *The Internet as a Large-Scale Complex System* (Oxford University Press 2005) with Walter Willinger at AT&T Research. His doctoral thesis, "Ergodicity and mixing rate of one-dimensional cellular automata" (advisor: Peter Gacs), was on a problem in probability theory going back to von Neumann, with applications to fault-tolerance in large-scale systems.

Professor Park was a Presidential University Fellow at Boston University, a recipient of the NSF CAREER Award, a Fellow-at-Large of the Santa Fe Institute, and served on several international program committees and government panels. He was chair of the NSF/SFI Workshop on The Internet as a Large-Scale Complex System, held at the Santa Fe Institute in March 2001. He served on the editorial boards of *IEEE Communications Letters* and *Computer Networks*. His research has been supported by grants from government and industry including the Army, DARPA, ETRI, Intel, NSF, SFI, Sprint, and Xerox.

Selected Publications:

Choi, S., K. Park and C. Kim. 2005. On the performance characteristics of WLANs: revisited. *Proceedings of the ACM SIGMETRICS 2005*, 97–108.

Lomonosov, A., M. Sitharam and K. Park. 2004. Network QoS games: Stability vs. optimality tradeoff. *Journal of Computer and System Sciences* 69:281–302.

Park, K., and W. Willinger, eds. 2005. The Internet as a large-scale complex system. *SFI Studies in the Sciences of Complexity*, Oxford University Press.

Voicu S. Popescu

Assistant Professor of Computer Science (2001)

Education:

BS, Computer Science, University of Cluj-Napoca, Romania, *1995*
MS, Computer Science, University of North Carolina, *1999*
PhD, Computer Science, University of North Carolina, *2001*

Faculty

Bio-sketch:
Professor Popescu's research field is computer graphics, focusing on image-based modeling and rendering and on graphics architectures. He and his collaborators have built a low-cost, handheld device for creating 3D models of complex real-world scenes. The device consists of a video camera and 16 laser pointers that provide reference markings for the scene being scanned. The model is created dynamically during scanning, allowing the operator to control the model creation for greater accuracy and completeness.

Another project uses "reflection morphing" to render 3D reflectors, such as spheres and cylinders, in real-time. The technique uses a pre-processing phase that ray-traces the reflectors from a sparse set of views, then interpolates the datastructure at runtime to generate intermediate views.

Selected Publications:
Popescu, V., and Anselmo Lastra. 2001. The vacuum buffer. In *Proceedings of the 2001 ACM Symposium on Interactive 3D Graphics,* Chapel Hill, N.C.

Popescu, V., John Eyles, Anselmo Lastra, Joshua Steinhurst, Nick England, and Lars Nyland. 2000. The WarpEngine: An architecture for the post-polygonal age. In *Proceedings of the SIGGRAPH 2000,* New Orleans, La. 433–442, July 23–28.

Popescu, V. S., Anselmo A. Lastra, Daniel G. Aliaga, and Manuel de Oliveira Neto. 1998. Efficient warping for architectural walkthroughs using layered depth images. In *Proceedings of the IEEE Visualization 1998*, 211–215, Oct 18–23.

Sunil Prabhakar

Associate Professor of Computer Science (1998)

Education:
BTech, Electrical Engineering, Indian Institute of Technology, *1990*
MS, Computer Science, University of California, *1998*
PhD, Computer Science, University of California, *1998*

Bio-sketch:
Professor Prabhakar's research focuses on performance and privacy issues in large-scale, modern database applications such as multimedia, moving-object, and sensor databases. The efficient execution of I/O is a critical problem for these applications. The scope of this research ranges from main memory to disks and tertiary storage devices. Sensor and moving object applications are also faced with the need to process large volumes of data in an online manner. The current research effort addresses efficient continuous query evaluation and novel techniques for managing the inherent lack of accuracy for these applications. Professor Prabhakar's interests also lie in the design and development of private databases and digital watermarking techniques for structured (e.g. relational databases) and semi-structured (e.g., XML) data. He is also working on developing advanced databases for biological data. His current focus is on developing a transparent and reliable protein function database. Prior to joining Purdue, Professor Prabhakar held a position with Tata Unisys Ltd. from 1990 to 1994.

Selected Publications:
Cheng, R., D. Kalashnikov, and Sunil Prabhakar. 2003. Evaluating probabilistic queries more than imprecise data. In *Proceedings of the ACM International Conference on Management of Data (SIGMOD 2003)* 551–562, San Diego, California.

Sion, R., M. J. Atallah, and Sunil Prabhakar. 2003. Rights protection for relational data. In *Proceedings of the ACM International Conference on Management of Data (SIGMOD 2003)* 98–109, San Diego, California.

Prabhakar, S., Y. Xia, D. Kalashnikov, W. Aref, and S. E. Hambrusch. 2002. Query indexing and velocity constrained indexing: Scalable techniques for continuous queries on moving objects. *IEEE Transactions on Computers* 51 (10): 1124–1140.

Vernon J. Rego

Professor of Computer Science (1985)

Education:
MSc, Mathematics, Birla Institute of Technology and Science, *1979*
MS, Computer Science, Michigan State University, *1982*
PhD, Computer Science, Michigan State University, *1985*

Bio-sketch:
Vernon Rego directs research in the Parallel Computation and Simulation Laboratory (PacsLab) in Purdue's Department of Computer Science. His research interests include software systems for high-performance distributed computation, network protocols, threads systems, parallel stochastic simulation, computational probability and performance, and software engineering. His current projects include the ACES software architecture for multi-threaded distributed computing and parallel simulation, including the EcliPSe replicated simulation system (for which he was awarded an IEEE/Gordon Bell Prize), the ParaSol process-oriented distributed simulation system, the Ariadne threads system, and the CLAM protocol suite. He was also awarded a German Research Council Award for Computer Networking Research. He has been an invited researcher at the Oak Ridge National Laboratories and an ACM National Lecturer. He is an editor of the *IEEE Transactions on Computers* and an advisory board member of The DoD Advanced Distributed Simulation Research Consortium.

John R. Rice

W. Brooks Fortune Distinguished Professor of Computer Science (1964)
Professor of Mathematics (Courtesy)

Education:
BS, Mathematics, Oklahoma State University, *1954*
MS, Mathematics, Oklahoma State University, *1956*
PhD, Mathematics, California Institute of Technology, *1959*

Bio-sketch:
Professor Rice is a founder of *ACM Transactions on Mathematical Software* and is on several other editorial boards. He is the past chair of the Computing Research Association, a fellow of the AAAS, and the ACM, and a member of the National Academy of Engineering. For the past 25 years, Professor Rice has been analyzing numerical methods and problem-solving environments for scientific computing. He has created a general methodology for performance evaluation of mathematical software and developed the ELLPACK system for elliptic problems. It is now being extended to Parallel ELLPACK and PDELab. Professor Rice has published 21 books. Among recent ones are *Solving Elliptic Problems with ELLPACK* (Springer-Verlag, 1985), *Mathematical Aspects of Scientific Software* (Springer-Verlag, 1988), *Expert Systems for Scientific Computing* (North Holland, 1992), and *Enabling Technologies for Computational Science* (Kluwer, 2000). He has also published about 300 scientific articles. The most recent 25 or so articles were in the areas of agent-based computing, computational science, computer security, mathematical software, problem-solving environments, recommender systems, simulating gas turbines, and Web-based computing.

Faculty

In addition to the projects appearing in the Research Funding section of this publication, Professor Rice has received funding for these external projects: "Effectiveness of Software Projection Methods" (with Mike Atallah and Buster Dunsmore), Wright-Patterson Air Force Base, 11/1/02–11/1/03, $950,000; "Automatically Protecting Software Against 'diff' Attacks" (with Mike Atallah and David M'Raihi), SBIR Department of Defense, 8/12/03–1/31/04, $250,000; and "Tools for Quantifying Software Vulnerabilities and Protection" (with Mike Atallah), Indiana 21st Century Fund, 4/1/04–4/1/05, $1,178,256.

Elisha Sacks

Professor of Computer Science (1994)

Education:

BS, Computer Science, Carnegie-Mellon University, *1982*
SM, Computer Science, Massachusetts Institute of Technology, *1985*
PhD, Computer Science, Massachusetts Institute of Technology, *1988*

Bio-sketch:

Professor Sacks's research area is geometric reasoning in science and engineering. He is a problem solver who couples domain knowledge, mathematics, and computer science to solve real-world problems. He worked on qualitative analysis of nonlinear dynamical systems for his PhD and for the next few years. He has worked on mechanical design since then and plans to continue in this area. He is working with Matt Mason of Carnegie Mellon University on robot path planning with obstacles and steering constraints, and with Victor Milenkovic of University of Miami on robust computational geometry. His unique skill is in combining (often esoteric) mathematics with (often inarticulated) domain knowledge with (often idealized) computational methods to solve real-world problems.

The mechanical design research addresses kinematic analysis and the related tasks of simulation, tolerancing, and parametric design. Kinematic analysis means computing the ways that mechanical parts interact: how gears mesh, how linkages transform motion, how robots grasp. Kinematic analysis is central to mechanical design because part contacts largely determine mechanical function and because other forms of analysis (dynamical simulation, stress, tolerance) presuppose it. Prior to his research, a general, practical kinematic analysis algorithm was deemed impossible. He has developed and implemented such an algorithm based on configuration space computation. He is working with academic and industrial collaborators to develop practical mechanical design software based on his research, notably with Ford Motors on transmission design and with Sandia National Laboratory on micro-mechanism design. Professor Sacks is also the director of the Visualization Center.

Selected Publications:

Kyung, Min-Ho, and Elisha Sacks. 2003. Parameter synthesis of higher kinematic pairs. *Computer-Aided Design* 35 (1).

Sacks, E. 2003. Path planning for planar articulated robots using configuration spaces and compliant motion *IEEE Transactions on Robotics and Automation* 19 (3).

Popescu, V., Elisha Sacks, and Gleb Bahmutov. 2003. The ModelCamera: A hand-held device for interactive modeling. In *Proceedings of the Fourth International Conference on Digital Imaging and Modeling*, Banff, Alberta.

Ahmed Sameh

Samuel D. Conte Professor of Computer Science (1997)

Education:
PhD, University of Illinois at Urbana-Champaign, *1968*

Bio-sketch:
Ahmed Sameh's current research interests include numerical linear algebra, and the design and performance analysis of parallel numerical algorithms needed in various science and engineering applications. He has served on the editorial boards of *IEEE Transactions on Computers*, *Computing*, *SIAM Journal on Scientific and Statistical Computing*, *Parallel Computing*, *Journal of Parallel and Distributed Computing*, *Computer Physics Communications*, *International Journal of High Speed Computing*, *Numerical Linear Algebra with Applications*, *IEEE Computing in Science and Engineering*, and *International Journal of Parallel Programming*.

He joined Purdue in 1997 as head of Computer Science, after being head of computer science at the University of Minnesota, Minneapolis, and the holder of the William Norris Chair for Large-Scale Computing. He was also a faculty member in the Department of Computer Science at the University of Illinois at Urbana-Champaign, from 1968 to 1991, and from 1992 to 93. During his tenure at Illinois, he served as an associate director, and director of the Center for Supercomputing Research and Development (CSRD).

He is a fellow of ACM, IEEE, and AAAS, and a member of SIAM. He has also received the IEEE's 1999 Harry Goode Award for "seminal and influential work in parallel numerical algorithms."

Selected Publications:
Kilic, S., F. Saied, and A. Sameh. 2004. Efficient iterative solvers for structural dynamics problems. *Computers and Structures* 82 (28): 2363–2375.

Baggag. A., and A. Sameh. A nested iterative scheme for indefinite linear systems in particulate flows. *Computer Methods in Applied Mechanics and Engineering* 193:1923–1957.

Sambavaram, S., V. Sarin, A. Sameh, and A. Grama. 2003. Multipole-based preconditioners for large sparse linear systems. *Parallel Computing* 29 (9): 1261–1273.

Ness B. Shroff

Professor of Computer Science (Courtesy) (2003)
Professor of Electrical and Computer Engineering

Education:
BSEE, University of Southern California, *1988*
MSEE, University of Pennsylvania, *1990*
MPhil, Columbia University, *1993*
PhD, Columbia University, *1994*

Bio-sketch:
Ness B. Shroff's research interests span the areas of wireless and wireline communication networks. He is especially interested in fundamental problems in the design, performance, control, security, and pricing of these networks. His research has been funded by companies such as Intel, Hewlett Packard, Nortel, AT&T, BAE systems, and L.G. Electronics; and government agencies such as the National Science Foundation, DARPA, Indiana Department of Transportation, and the Indiana 21st Century Fund.

Faculty

Professor Shroff is an editor for the *IEEE/ACM Trans. on Networking and the Computer Networks Journal*, and past editor of *IEEE Communications Letters*. He was the technical program co-chair for IEEE INFOCOM '03 (San Francisco, Calif.), the panel co-chair for ACM Mobicom'02 (Atlanta, Ga.), program co-chair for the symposium on high-speed networks, Globecom 2001 (San Francisco, Calif.), and conference chair for the 14th Annual IEEE Computer Communications Workshop (Estes Park, Colo.). He was the co-organizer of the NSF Workshop on "Fundamental Research in Networking," in April 2003. He received the NSF CAREER award in 1996 and also the *Computer Networks* journal's best paper award for 2003.

Robert D. Skeel

Professor of Computer Science (2004)
Professor of Mathematics (Courtesy)

Education:

BSc, (Honours) Applied Mathematics, University of Alberta, *1969*
MS, Mathematics, University of Toronto, *1970*
PhD, Computing Science, University of Alberta, *1974*

Bio-sketch:

Professor Skeel's research interest is in computational methods for biomolecular simulation, which seeks to aid in the discovery of the structures and mechanisms that make life possible. Such simulations are very demanding computationally, running for days, weeks, and even months on parallel computers. Skeel's current research embraces three challenges: (1) the N-body problem for calculating nonbonded interactions as well as dense matrix "inversion" for dipole moments, (2) the problem of doing dynamics simulations on biological time scales, and (3) the problem of sampling very high dimensional configuration space. Before coming to Purdue, Skeel taught full time at the University of Illinois where he initiated the development of a scalable parallel molecular dynamics program NAMD as a joint effort with computer scientist L. V. Kale and biophysicist K. Schulten. NAMD is a winner of a 2002 Gordon Bell Prize for parallel performance.

Professor Skeel has, with Jerry Keiper, co-authored the textbook *Elementary Numerical Computing with Mathematica*.

Selected Publications:

Zou, G., and R. D. Skeel. 2003. Robust biased Brownian dynamics for rate constant calculation. *Biophysical Journal* 85:2147–2157.

Skeel, R. D., I. Tezcan, and D. J. Hardy. 2002. Multiple grid methods for classical molecular dynamics. *Journal of Computational Chemistry* 23:673–684.

Skeel, R. D., and K. Srinivas. 2000. Nonlinear stability analysis of area-preserving integrators. *SIAM, Journal of Numerical Analsis* 38:129–148.

Eugene H. Spafford

Professor of Computer Science (1987)
Professor of Electrical and Computer Engineering
Professor of Communication (Courtesy)
Professor of Philosophy (Courtesy)
Professor of Technology (Courtesy)
Executive Director, Purdue CERIAS

Education:

BA, Mathematics and Computer Science, State University of New York at Brockport, *1979*
MS, Information and Computer Science, Georgia Institute of Technology, *1981*
PhD, Information and Computer Science, Georgia Institute of Technology, *1986*
DSc (honorary), State University of NY (SUNY), *2005*

Bio-sketch:

Professor Spafford's current research interests are focused on issues of computer and network security, cybercrime and ethics, and the social impact of computing. He is currently the executive director of the Center for Education and Research in Information Assurance and Security (CERIAS). This university-wide institute addresses the broader issues of information security and information assurance, and draws on expertise and research across all of the academic disciplines at Purdue.

Spafford has received recognition and many honors for his research, including being named as a fellow of the ACM, as a fellow of the AAAS, and as a fellow of the IEEE. He has been awarded status as a CISSP (Certified Information Systems Security Professional), *honoris causa*, by the board of directors of (ISC)2 and named as a member of the *ISSA's Hall of Fame*. In October 2000, Professor Spafford received the field's most prestigious award — the NIST/ NCSC National Computer Systems Security Award.

Recent awards to Professor Spafford for service have included the ACM SIGCAS *Making a Difference Award* in 2004 and a U.S. Air Force "Meritorious Civilian Service" medal for his work with the USAF Scientific Advisory Board from 1999–2003.

Professor Spafford has also been honored for his teaching, including receiving all three of Purdue's highest honors for education: the Charles B. Murphy Outstanding Undergraduate Teaching Award, a fellow of the Purdue Teaching Academy, and a listing in Purdue's Book of Great Teachers. In 2001, he was awarded the Murray Founder's Medal by the NCISSE, and in 2003, he received the IEEE Computer Society's Taylor L. Booth Medal for his accomplishments in information securityeducation.

Among many professional activities, Professor Spafford is a member of the Computing Research Association's Board of Directors and was a member of the President's Information Technology Advisory Committee (PITAC) in 2003–2005. He is chair of ACM's U.S. Public Policy Committee. Professor Spafford is the academic editor of the journal *Computers and Security*.

Selected Publications:

Carrier, B., and Eugene H. Spafford. 2003. Getting physical with the digital investigation process. *International Journal of Digital Evidence* 2 (2).

Gopalakrishna, R., Eugene H. Spafford, and Jan Vitek. 2005. Efficient intrusion detection using automation inlining. In *Proceedings of the IEEE Symposium on Security and Privacy*, Oakland, Calif., 18–31.

Faculty

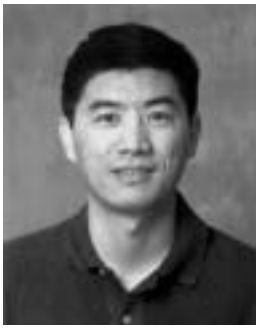
Williams, P. D., and Eugene H. Spafford. 2005. CuPIDS enhances StUPIDS: Exploring a coprocessing paradigm shift in information system security. In *Proceedings of the IEEE Workshop on Information Assurance and Security*, West Point, N.Y.

John M. Steele

Associate Professor Emeritus of Computer Science (1963)

Bio-sketch:

John Steele's research interests are in the areas of computer data communications and computer circuits and systems.



Yinlong Sun

Assistant Professor of Computer Science (2001)

Education:

BS, Physics, Beijing University, *1985*
PhD, Physics, Simon Fraser University, *1996*
PhD, Computer Science, Simon Fraser University, *2000*

Bio-sketch:

Professor Yinlong Sun's research interests lie in computer graphics, scientific visualization, biomedical imaging, computational neuroscience, and cross-disciplinary topics. The research projects include spectral modeling, simulation of iridescences, physical-based illumination, BRDF representation, vector visualization, cellular visualization, cortical surface analysis, and neuroimaging. A particular focus is on combining analytical, numerical, and experimental techniques to solve complex, cross-disciplinary problems. He has established a Computational Imaging Research Lab (CIRL) with principal missions to bridge computational sciences and physical sciences and engineering and to develop effective imaging and visualization tools to assist scientific research and discoveries. He is also associated with the Computer Graphics and Visualization Lab. Yinlong has received two PhD degrees — in physics and in computer science — from Simon Fraser University. He is a member of ACM, IEEE, and IS&T.

Selected Publications:

Sun, Y., Bartek Rajwa, and J. Paul Robinson. 2004. Adaptive image-processing technique and effective visualization of confocal microscopy images. *Microscopy Research and Techniques* 64:156–163.

Sun, Y. 2004. Self-shadowing and local illumination of randomly rough surfaces. In *Proceedings of the Computer Vision and Pattern Recognition (CVPR),* 158–165.

Sun, Y., F. David Fracchia, Mark S. Drew, and Thomas W. Calvert. 2001. A spectrally based framework for realistic image synthesis. *The Visual Computer* 17 (7): 429–444.

Wojciech Szpankowski

Professor of Computer Science (1985)
Professor of Electrical and Computer Engineering (Courtesy)

Education:
MS, Electrical Engineering and Computer Science, Technical University of Gdansk, *1970*
PhD, Electrical Engineering and Computer Science, Technical University of Gdansk, *1980*

Bio-sketch:
Before coming to Purdue, Wojciech Szpankowski was an assistant professor at the Technical University of Gdansk, and in 1984 he was an assistant professor at McGill University, Montreal. During 1992–93, he was professeur invité at INRIA, Rocquencourt, France. His research interests cover analysis of algorithms, data compression, information theory, analytic combinatorics, random structures, networking, stability problems in distributed systems, modeling of computer systems and computer communication networks, queueing theory, and operations research. His recent work is devoted to the probabilistic analysis of algorithms on words, analytic information theory, and designing efficient multimedia data compression schemes based on approximate pattern matching.

He is a recipient of the Humboldt Fellowship. He has been a guest editor for special issues in *IEEE Transactions on Automatic Control*, *Theoretical Computer Science*, *Random Structures and Algorithms*, and *Algorithmica*. Currently, he is editing a special issue on "Analysis of Algorithms" in *Algorithmica*. He serves on the editorial boards of *Theoretical Computer Science*, *Discrete Mathematics and Theoretical Computer Science*, and the book series *Advances in the Theory of Computation and Computational Mathematics*.

Selected Publications:
Jacquet, P., and W. Szpankowski. 2002. A combinatorial problem arising in information theory: Precise minimax redundancy for Markov sources. In *Proceedings of the 2nd Colloquium on Mathematics and Computer Science: Algorithms, Trees, Combinatorics and Probabilities*, 311–328, Birkhauser.

Flajolet, P., and W. Szpankowski. 2002. Analytic variations on redundancy rates of renewal processes. *IEEE Transactions on Information Theory* 48:2911–2921.

Knessl, C., and W. Szpankowski. 2002. Height of a binary search tree: The limiting distribution perspective. *Theoretical Computer Science* 289:649–703.

T. N. Vijaykumar

Assistant Professor of Computer Science (Courtesy) (2003)
Assistant Professor of Electrical and Computer Engineering

Education:
BE (Hons), Electrical and Electronics Engineering, Birla Institute of Technology and Science, *1990*
MSc (Tech), Computer Science, Birla Institute of Technology and Science, *1992*
MS, Computer Science, University of Wisconsin, *1997*
PhD, Computer Science, University of Wisconsin, *1997*

Faculty

Jan Vitek

Associate Professor of Computer Science (1999)

Education:
BS, Computer Science, University of Geneva, *1989*
MS, Computer Science, University of Victoria, *1995*
PhD, Computer Science, University of Geneva, *1999*

Bio-sketch:
Professor Vitek is working in foundations and implementation of computer programming languages. He has an interest in program analysis, real time languages, object-oriented software engineering, and information security. He is leading the Open Virtual Machines project to develop a framework for configurable and secure virtual machines for object-oriented languages. This research is being conducted in the Secure Software Systems (S3) Lab founded in early 2000 by Professors Vitek, Hosking, and Palsberg.

Professor Vitek was born in Czechoslovakia and educated in Switzerland. He has authored more than 30 papers and has edited two books on mobile objects and secure Internet programming. He has served on program committees for international conferences such as PLDI, OOPSLA, ECOOP, POPL, ESOP, ICALP, and SACMAT. Professor Vitek is a member of CERIAS.

Selected Publications:
Sewell, P., and J. Vitek. 2000. Secure composition of untrusted code: Wrappers and causality types. In *Proceedings of the 13th IEEE Computer Security Foundations Workshop (CSFW-13)*, Cambridge, U.K.

Bokowski, B., and J. Vitek. 1999. Confined cypes. In *Proceedings of the 14th Annual ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA 99)*, Denver, Colorado.

Bryce, C., M. Orial, and J. Vitek. 1999. A coordination model for agents based on secure spaces. In *Proceedings of the 3rd International Conference on Coordination Models and Languages (COORDINATION 99)*, LNCS 1594, Amsterdam, Netherlands.

Jeffrey S. Vitter

Professor of Computer Science (2002)
Frederick L. Hovde Dean of the College of Science

Education:
BS with highest honors, Mathematics, University of Notre Dame, *1977*
PhD, Computer Science, Stanford University, *1980*
MBA, Duke University, *2002*

Bio-sketch:
In his research, Professor Jeff Vitter investigates how to manage and process very large amounts of data. He helped pioneer the field of external memory algorithms, where the goal is to develop I/O-efficient algorithms that alleviate the bottleneck between small but fast internal memory and large but slow external storage. His work melds theory and practice to span a number of application areas, including geographic information systems (GIS), databases, computational geometry, data mining, and text indexing. For example, Professor Vitter and colleagues designed an I/O-efficient algorithm to help researchers in the Nicholas School of Environment at Duke compute how water flows and accumulates, based on satellite elevation data. The computation time for processing data from the Appalachian Mountain region was reduced from several days to just a few hours.

Another aspect of Vitter's work involves novel prediction mechanisms based upon principles of data compression and locality; examples include algorithms for caching, prefetching, data streaming, database query optimization, data mining, and resource management in mobile computers. His interest in prediction comes from ongoing work in data compression (in which data can be represented succinctly when the patterns in the data are predictable) and machine learning (in which predictions can be made when prior data can be represented succinctly). Professor Vitter is currently working on compressed indexes for long sequences of symbols, such as text. A recent theoretical breakthrough he worked on showed how to fully compress text and make it self-indexing at the same time. Experiments have shown the technique to be quite practical.

Honors and Awards: Fellow, John Simon Guggenheim Foundation, 1986; Fellow, Institute of Electrical and Electronics Engineers (IEEE), 1993; Fellow, Association for Computing Machinery (ACM), 1996; National Science Foundation Presidential Young Investigator Award 1985; Fulbright Scholar, 1998; Recognition of Service Award, ACM, 1998 and 2001.

Selected Publications:

Lim, L., M. Wang, and J. S. Vitter. 2003. SASH: A self-adaptive histogram set for dynamically changing workloads. In *Proceedings of the 29th International Conference on Very Large Data Bases (VLDB 2003)*, Berlin, Germany.

Hoang, D. T., and J. S. Vitter. 2002. Efficient algorithms for MPEG video compression. John Wiley & Sons, New York, N.Y.

Grossi, R., A. Gupta, and J. S. Vitter. 2003. High-order entropy-compressed text indexes. In *Proceedings of the 14th Annual SIAM/ACM Symposium on Discrete Algorithms (SODA 2003)*, Baltimore, Md.

Samuel S. Wagstaff Jr

Professor of Computer Science (1983)

Education:

BS, Massachusetts Institute of Technology, *1966*
PhD, Cornell University, *1970*

Bio-sketch:

Before coming to Purdue, Professor Wagstaff taught at the University of Rochester, the University of Illinois, and the University of Georgia. He spent a year at the Institute for Advanced Study in Princeton. His research interests are in the areas of cryptography, parallel computation, and analysis of algorithms, especially number theoretic algorithms. He and J. W. Smith of the University of Georgia have built a special processor with parallel capability for factoring large integers. He is the author of *Factorizations of bn 1 1, b = 2, 3, 5, 6, 7, 10, 11, 12 up to high powers*, Contemporary Mathematics series, v. 22, third edition, *American Mathematical Society*, 2002 (with John Brillhart, D. H. Lehmer, J. L. Selfridge, and Bryant Tuckerman) and *Cryptanalysis of Number Theoretic Ciphers*, CRC Press, 2002.

Selected Publications:

Wagstaff, S. S. 2001. Prime numbers with a fixed number of one bits or zero bits in their binary representation. *Experimental Mathematics* 10:267–273.

Wagstaff, S. S. 2000. Prime divisors of the Bernoulli and Euler numbers. In *Proceedings of the Millennial Conference on Number Theory*, Urbana, Illinois, May 21–26. M. A. Bennett, B. C. Berndt, N. Boston, H. G. Diamond, A. J. Hildebrand, W. Philipp, eds.

Faculty

Dodson, B., A. K. Lenstra, P. Leyland, A. Muffett, and Samuel S. Wagstaff. 2002. MPQS with three large primes. In *Proceedings of the Algorithmic Number Theory Symposium 2002* Volume 2369 of Springer-Verlag Lecture Notes in Computer Science, 448–462.

Dongyan Xu

Assistant Professor of Computer Science (2001)
Assistant Professor of Electrical and Computer Engineering (Courtesy)

Education:
BS, Computer Science, Zhongshan University, *1994*
PhD, Computer Science, University of Illinois at Urbana-Champaign, *2001*

Bio-sketch:
Professor Xu's research is on protection, management, and quality of service of next-generation distributed systems. He leads the Lab for Research in Emerging Network and Distributed Services (FRIENDS). He has conducted projects in overlay and peer-to-peer networks, autonomic grid computing middleware, and mobile pervasive applications and services. His group has been investigating runtime environment virtualization models and technologies for shared distributed infrastructures. The goal is to protect a shared infrastructure from untrusted applications running on top of it and vice versa. Their research results have also been effectively applied to the containment, emulation, and analysis of network attacks launched by human or malware.

Dongyan Xu is the 2000 recipient of the C. L. and Jane W-S. Liu Award in the Department of Computer Science at UIUC. He is a member of ACM, USENIX, IEEE, and IEEE Communications Society. He is affiliated with the Center for Education and Research in Information Assurance and Security (CERIAS) and e-Enterprise Center. His research is supported by the National Science Foundation (NSF), Microsoft Research, and Purdue Research Foundation.

Selected Publications:

Jiang, X., and D. Xu. 2003. SODA: a Service-On-Demand Architecture for application service hosting utility platforms. In *Proceedings of the 12th IEEE International Symposium on High Performance Distributed Computing (HPDC-12)*, Seattle, Wash.

Jiang, X., and D. Xu. 2004. Collapsar: A VM-based architecture for network attack detention center. In *Proceedings of the 13th USENIX Security Symposium (Security 2004)*, San Diego, Calif.

Xu, D., and X. Jiang. 2004. Towards an integrated multimedia service hosting overlay. In *Proceedings of the ACM Multimedia 2004*, New York, N.Y.

David K. Y. Yau

Associate Professor of Computer Science (1997)
Associate Professor of Electrical and Computer Engineering (Courtesy)

Education:
BS, Computer Science, Chinese University of Hong Kong, *1989*
MS, Computer Science, University of Texas at Austin, *1992*
PhD, Computer Science, University of Texas at Austin, *1997*

Bio-sketch:
David Yau's research interests are in network and operating system quality of service, network security, incentive protocols, value-added services routers, and mobile wireless networks. A major goal is to improve the performance and robustness of complex large-scale networks for heterogeneous applications.

Professor Yau has been invited to serve as panelist and reviewer by the National Science Foundation (NSF), the Research Grants Council of Hong Kong, and the Research Council of Norway. His research has been funded by various government and industrial organizations, including the NSF. He is a member of the ACM and IEEE. He serves on the editorial board of the *IEEE/ACM Transactions on Networking* and has served on the organizing and technical program committees of many ACM and IEEE conferences.

Yau received a CAREER award from the NSF. He was the recipient of a Hong Kong Government Scholarship, a Swire Scholarship, a microelectronics and computer development fellowship (UT Austin), and an IBM Fellowship. Prior to academia, he was employed as management associate and then assistant manager at Citibank, NA.

Selected Publications:
Yau, David K. Y., John C. S. Lui, Feng Liang, and Yeung Yam. 2005. Defending against distributed denial-of-service attacks with max-min fair server-centric router throttles. *IEEE/ACM Transactions on Networking* 13(1).

Ma, Richard T. B., Sam C. M. Lee, John C. S. Lui, and David K. Y. Yau. 2004. A aame theoretic approach to provide incentive and service differentiation in P2P networks. In *Proceedings ACM SIGMETRICS*, New York, N.Y.

Lam, S. S., Simon Chow, and David K. Y. Yau. 1996. A lossless smoothing algorithm for compressed video. *IEEE/ACM Transactions on Networking* 4(5).

Research Funding

Daniel G. Aliaga

Daniel Aliaga and Dongyan Xu, "2004 Microsoft Research Learning Science — 2004–05," *Microsoft Corporation*, 12/1/2003, $90,000.

Daniel Aliaga, Mireille Boutin, and Carl Cowen, "MSPA-MCS: 3D Scene Digitization:A Novel Invariant Approach for Large-Scale Environment Capture," *National Science Foundation*, 8/15/2004–7/31/2007, $500,000.

Walid G. Aref

Susanne E. Hambrusch, Sunil K. Prabhakar, and Walid Aref, "Query Processing in Pervasive Location Aware Computing Environments," *National Science Foundation*, 9/1/2001–8/31/2005, $226,000.

Walid Aref, Ahmed K. Elmagarmid, and Aref Ghafoor, "A Test-bed Facility for Research in Video Database Benchmarking," *National Science Foundation*, 8/15/2002–7/31/2006, $135,856.

Walid Aref, "Research and Development of Database Technologies for Modern Applications (CAREER Award)," *National Science Foundation*, 9/15/2001–9/30/2006, $300,000.

Mikhail Atallah

Mikhail J. Atallah, "General Paradigms for Watermarking and Tamperproofing Multi-Type/Media Documents," *Office of Naval Research*, 3/1/2002–2/28/2005, $417,751.

Christopher Clifton and Mikhail J. Atallah, "Collaborative Research: ITR Distributed Data Mining to Protect Information Privacy," *National Science Foundation*, 8/15/2003–7/31/2006, $282,274.

Mikhail J. Atallah, "Secure Supply Chain Protocols," *National Science Foundation*, 8/15/2003–7/31/2007, $800,000.

Sunil K. Prabhakar and Mikhail J. Atallah, "Watermaking Relational Databases," *National Science Foundation*, 6/1/2003–5/31/2006, $149,993.

Mikhail J. Atallah, "Motorola, Inc.," *Motorola*, 3/1/2004–2/28/2034, $9,360.

Mikhail J. Atallah, "Private Prediction Using Selective Models," *National Science Foundation*, 9/1/2002–8/31/2005, $28,729.

Chris Bailey-Kellogg

Chris Bailey-Kellogg, "CAREER: Sparse Spatial Reasoning for High-Throughput Protein Structure Determination," *National Science Foundation*, 4/1/2003–3/31/2008, $488,063.

Elisa Bertino

Elisa Bertino, Ninghui Li, Melissa Dark, Robert W. Proctor, and Victor Raskin, "Collaborative Research: A Comprehensive Policy–Drive Framework For Online Privacy Protection: Integrating IT, Human, Legal and Economic Perspectives," *National Science Foundation*, 9/15/2004–8/31/2005, $653,431.

Elisa Bertino, Eugene Spafford, Melissa Dark, Howard Sypher, Marc Rogers, Victor Raskin, and Juline Mills, "ITR-The Design & Use of Digital Identies," *National Science Foundation*, 9/15/2004–8/31/2007, $900,000.

Bharat Bhargava

Bharat Bhargava and Christopher Clifton, "Secure Private Communication in Mobile Ad Hoc Networks," *The Institute for Information Infrastructure Protection (I3P) Research Fellowship*, 7/1/2004–12/31/2005, $149,081.

Bharat Bhargava, "Applying the Principles of Engr & Mgmt for the improvement of Healthcare/Seed Grant Activity-Group 6: Evaluations and Recommendations for the Third Authentication 'Token' for the IHIE Provider Network," *Purdue University – Regenstrief Ctr. for Health Engr. – Disc. Park*, 4/1/2005–8/31/2006, $25,000.

Bharat Bhargava, "Formalizing Evidence & Trust for User Authorization," *National Science Foundation*, 8/15/2002–7/31/2006, $332,179.

Bharat Bhargava, "ITR: Scalable Edge Router for Differentiated Services Networks," *National Science Foundation*, 10/1/2002–9/30/2006, $308,296.

Bharat Bhargava, "Secure Mobile Systems," *National Science Foundation*, 9/1/2000–8/31/2006, $334,188.

Bharat Bhargava and Leszek Lilien, "Vulnerability Analysis and Threat Assessment Avoidance," *National Science Foundation*, 6/1/2003–5/31/2006, $212,472.

Christopher W. Clifton

Christopher Clifton, "I3P Consortium Payments," *The Institute for Information Infrastructure Protection (I3P) Research Fellowship*, 5/1/2004–4/30/2006, $13,500.

Christopher Clifton and Ahmed K. Elmagarmid, "ITR-(ASE+NHS)-(dmc+int): Privacy-Preserving Data Integration and Sharing," *National Science Foundation*, 9/15/2004–8/31/2007, $1,012,000.

Bharat Bhargava and Christopher Clifton, "Secure Private Communication in Mobile Ad Hoc Networks," *The Institute for Information Infrastructure Protection (I3P) Research Fellowship*, 7/1/2004–12/31/2005, $149,081.

Christopher Clifton, "A Center of Excellence in Medical Informatics to Create a Rich Clinical Resource Infrastructure for Human Research: Rocket Fuel for Indiana Medical Research," *State of Indiana*, 8/16/2004–8/20/2006, $50,000.

William Cleveland and Christopher Clifton, "A Multi-Site Study of How Medical Surgical Nurses Spend their Time: A Baseline Study in Preparation for an Electronic Health Record and an Evidenced-Based Nursing Unit Design," *Ascension Health*, 4/1/2005–4/30/2006, $191,780.

Christopher Clifton and Ahmed K. Elmagarmid, "Transportation, Distribution and Logistics: a Strategic Opportunity for Indiana and Purdue," *Central Indiana Corporate Partnership*, 7/7/2003–8/1/2005, $285,000.

Christopher Clifton, Ahmed K. Elmagarmid, Sunil K. Prabhakar, and Aref Ghafoor, "Knowledge Projection for TeleMaintenance," *NAVSEA/NSWC CRANE*, 12/19/2003–9/30/2005, $1,074,913.

Christopher Clifton and Mikhail J. Atallah, "Collaborative Research: ITR Distributed Data Mining to Protect Information Privacy," *National Science Foundation*, 8/15/2003–7/31/2006, $282,274.

Douglas E. Comer

Douglas E. Comer, "Software Practice & Experience," *John Wiley & Sons*, 11/1/1987–12/31/2005, $685,111.

Douglas E. Comer, "Proposal to Develop a Network Systems Engineering Course and Instructional Materials," *Intel Corporation*, 8/1/2001, $305,000.

James Bottum, Eugene Spafford, Douglas E. Comer, Ahmed Sameh, Christoph M. Hoffmann, Mark Lundstrom, Catherine Rosenberg, and Rudolf Eigenmann, "Indiana-Purdue Grid Proposal (IP-GRID)," *National Science Foundation*, 10/1/2003–9/30/2005, $1,467,769.

Douglas E. Comer, "Research on Network Processors Focused on High-Level Programming," *Agere Systems*, 7/31/2003, $107,900.

H. E. Dunsmore

Buster Dunsmore, "Collaborative Research: Increasing the Representation of Undergraduate Women and Minorities in Computer Science," *National Science Foundation*, 9/1/2004–8/31/2008, $60,000.

Ahmed K. Elmagarmid

Christopher Clifton and Ahmed K. Elmagarmid, "ITR-(ASE+NHS)-(dmc+int): Privacy-Preserving Data Integration and Sharing," *National Science Foundation*, 9/15/2004–8/31/2007, $1,012,000.

Ahmed K. Elmagarmid, Eugene Spafford, Kihong Park, John T. Korb, and Aref Ghafoor, "MSI: A Research Infrastructure for Integrated Quality of Service Management of Multimedia Computing Environments," *National Science Foundation*, 9/15/1999–8/31/2005, $1,394,111.

Walid Aref, Ahmed K. Elmagarmid, and Aref Ghafoor, "A Test-bed Facility for Research in Video Database Benchmarking," *National Science Foundation*, 8/15/2002–7/31/2006, $135,856.

Christopher Clifton, Ahmed K. Elmagarmid, Sunil K. Prabhakar, and Aref Ghafoor, "Knowledge Projection for TeleMaintenance," *NAVSEA/NSWC CRANE*, 12/19/2003–9/30/2005, $1,074,913.

Ahmed K. Elmagarmid, "A Test-Bed Facility for Research in Video Database Benchmarking," *Purdue Research Foundation*, 7/1/2005–6/30/2006, $14,912.

Graduate students Jiangtao Li, Keith Frikken, and Marina Blanton meet with Professor Mikhail Atallah in the CERIAS library.

Christopher Clifton and Ahmed K. Elmagarmid, "Transportation, Distribution and Logistics: a Strategic Opportunity for Indiana and Purdue," *Central Indiana Corporate Partnership*, 7/7/2003–8/1/2005, $285,000.

Sonia Fahmy

Sonia Fahmy, "Benchmarks for DDoS Defense Evaluation," *University of Delaware*, 4/29/2005–4/28/2006, $84,055.

Sonia Fahmy, "CAREER: Exploiting Tomography in Network-Aware Protocols: Theory and Practice," *National Science Foundation*, 9/1/2003–8/31/2008, $437,085.

Sonia Fahmy, Ness Shroff, and Eugene Spafford, "Collaborative Research: Testing and Benchmarking Methodologies for Future Networking Security Mechanisms," *National Science Foundation*, 9/1/2003–8/31/2006, $523,000.

Sonia Fahmy and Ness Shroff, "CT-T: Collaborative Research: Protecting TCP Congestion Control: Tools for Design, Analysis, & Emulation," *National Science Foundation*, 8/15/2005–7/31/2008, $325,000.

Ananth Grama

Ananth Y. Grama, "ITR-ASE-SIM:Collaborative Research: DeNovo Hierarchical Simulations of Stress Corrosion Cracking in Materials," *National Science Foundation*, 9/1/2004–8/31/2009, $361,140.

Zhiyuan Li, Ananth Y. Grama, and Ahmed Sameh, "AAD: Software Tools for Asynchronous-Algorithm Development," *National Science Foundation*, 1/1/2005–12/31/2007, $650,000.

Wojciech Szpankowski and Ananth Y. Grama, "Algebraic, Combinatorial and Probabilistic Methods for Biological Sequences," *National Institute of Health*, 5/15/2003–4/30/2007, $924,865.

Zhiyuan Li and Ananth Y. Grama, "ITR/SW+ACS: Dynamic Code Enhancement and Scheduling Techniques for Complex Simulations," *National Science Foundation*, 9/1/2000–2/28/2005, $294,994.

Ananth Y. Grama, "Academic Allowance for Paul Ruth," *The Krell Institute*, 8/1/2000–12/31/2005, $3,000.

Mete Sozen, George Chiu, Ananth Y. Grama, Ahmed Sameh, and Christoph M. Hoffmann, "Towards Real-Time Sensing and Control of Active Structures," *National Science Foundation*, 8/1/2004–7/31/2006, $200,000.

Ahmed Sameh, Ananth Y. Grama, and Christoph M. Hoffmann, "ITR/AP: Collaborative Research on Model Reduction of Dynamical Systems for Real-time Control," *National Science Foundation*, 9/1/2003–8/31/2007, $958,502.

Mark Lundstrom, James Bottum, Joseph Pekny, Supriyo Datta, Ahmed Sameh, Ananth Y. Grama, and Jayathi Murthy, "Network for Computational Nanotechnology," *National Science Foundation*, 9/15/2002–8/31/2007, $10,500,000.

Suresh Jagannathan and Ananth Y. Grama, "Plethora: A Wide-Area Read-Write Object Repository for the Internet," *National Science Foundation*, 9/15/2003–8/31/2006, $549,635.

Christoph M. Hoffmann, Ahmed Sameh, Ananth Y. Grama, Voicu Popescu, James Bottum, David Ebert, and J. Paul Robinson, "MRI: Acquisition of Equipment for Purdue Envision Center for Data Perceptualization," *National Science Foundation*, 9/1/2002–8/31/2005, $862,011.

Research Funding

Susanne E. Hambrusch

Dwight Lewis and Susanne E. Hambrusch, "Faculty for the Future-Engineering and Science–GE Fund," *General Electric*, 9/1/1997–12/31/2005, $20,134.

Susanne E. Hambrusch, Sunil K. Prabhakar, and Walid Aref, "Query Processing in Pervasive Location Aware Computing Environments," *National Science Foundation*, 9/1/2001–8/31/2005, $226,000.

Christoph M. Hoffmann

Christoph M. Hoffmann, "Center for Security of Large Scale Systems/Task 8," *Air Force Office of Scientific Research*, 4/1/2005–5/30/2006, $74,997.

Christoph M. Hoffmann, "Topological Accuracy for Boundary Representation Models," *National Science Foundation*, 5/1/2002–4/30/2006, $230,600.

Ahmed Sameh, Ananth Y. Grama, and Christoph M. Hoffmann, "ITR/AP: Collaborative Research on Model Reduction of Dynamical Systems for Real-time Control," *National Science Foundation*, 9/1/2003–8/31/2007, $958,502.

James Bottum, Eugene Spafford, Douglas E. Comer, Ahmed Sameh, Christoph M. Hoffmann, Mark Lundstrom, Catherine Rosenberg, and Rudolf Eigenmann, "Indiana-Purdue Grid Proposal (IP-GRID)," *National Science Foundation*, 10/1/2003–9/30/2005, $1,467,769.

Christoph M. Hoffmann, "2003 Faculty Award," *IBM*, 8/22/2003, $80,000.

Karthik Ramani, Sunil K. Prabhakar, Christoph M. Hoffmann, and Linda Katehi, "Toolingnet: A Partnership for Enhancing the Tooling Industry in Indiana through the use of Information Technology in the Advanced Manufacturing Sector," *National Science Foundation*, 1/1/2003–12/31/2005, $600,000.

Karthik Ramani, Christoph M. Hoffmann, and Mileta Tomovic, "Tooling Net: Foundations for Multi-Client Platform for Industrial Tooling Customer-Supplier Resource Management," *State of Indiana*, 2/15/2003–2/16/2006, $1,654,197.

Christoph M. Hoffmann, "Center for Security of Large Scale Systems/Task 8," *Air Force Office of Scientific Research*, 3/25/2004–4/30/2006, $1,027,984.

Mete Sozen, George Chiu, Ananth Y. Grama, Ahmed Sameh, and Christoph M. Hoffmann, "Towards Real-Time Sensing and Control of Active Structures," *National Science Foundation*, 8/1/2004–7/31/2006, $200,000.

Christoph M. Hoffmann, Ahmed Sameh, Ananth Y. Grama, Voicu Popescu, James Bottum, David Ebert, and J. Paul Robinson, "MRI: Acquisition of Equipment for Purdue Envision Center for Data Perceptualization," *National Science Foundation*, 9/1/2002–8/31/2005, $862,011.

Antony Hosking

Antony Hosking, "ITR/SW: Dynamic Cooperative Performance Optimization," *National Science Foundation*, 9/1/2000–8/31/2005, $263,912.

Jan Vitek, Jens Palsberg, and Antony Hosking, "DCMF/NES: Dynamic Compositional Middleware Frameworks for Networked Embedded," *Defense Advanced Research Projects Agency*, 5/30/2001–5/29/2005, $2,902,229.

Elias N. Houstis

Alok Chaturvedi, Elias N. Houstis, Charalambos Aliprantis, Shailendra Mehta, Suresh Mittal, David Moffett, Robert Bartlett, and James Ward, "Synthetic Environment for Computational Experimentation (SECE): Base Protection Application," *Department of Defense*, 7/21/2004–9/30/2005, $450,000.

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 8/1/2004–12/31/2005, $300,922.

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 10/1/2002–9/30/2004, $467,499.

Elias N. Houstis, "Agent Based Scalable Enterprise System for Enterprise Co-Design," *National Science Foundation*, 10/1/2001–9/30/2004, $498,354.

Alok Chaturvedi and Elias N. Houstis, "ITR: Synthetic Environment for Continuous Experimentation," *National Science Foundation*, 9/1/2003–8/31/2006, $1,178,446.

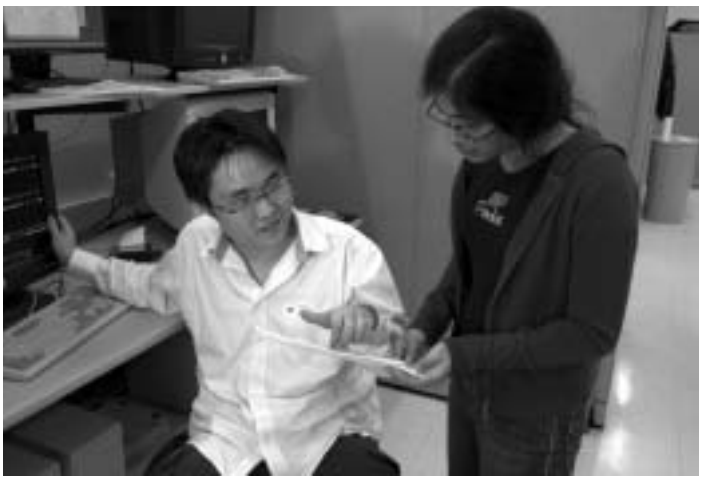
Alok Chaturvedi, Shailendra Mehta, Ed Coyle, Melissa Dark, Dennis Engi, Elias N. Houstis, Herbert Moskowitz, Suresh Mittal, Robert Bartlett, and Richard Cosier, "Center for Computational Homeland Security (CHHS): A Center of Excellence Proposal," *State of Indiana*, 3/16/2004–3/31/2006, $2,199,070.

Elias N. Houstis, "Travel Support for Young Scientists to attend the EUROSCO 2003 Conference on Advanced Environments and Tools for High Performance Computing," *National Science Foundation*, 6/15/2003–11/30/2005, $32,000.

Elias N. Houstis, "Agent Oriented Approaches to a Ubiquitous Grid," *National Science Foundation*, 9/15/2002–8/31/2005, $117,013.

Suresh Jagannathan

Suresh Jagannathan, "Distributed Storage System Research," *NEC Laboratories America*, 11/7/2002, $139,000.



Hwanjo Heo and Bhagya Bethala go over research results.

Suresh Jagannathan, "Program Analysis for Adaptive Resource-Aware Compilation," *Purdue Research Foundation*, 8/16/2004–8/15/2006, $29,627.

Suresh Jagannathan and Ananth Y. Grama, "Plethora: A Wide-Area Read-Write Object Repository for the Internet," *National Science Foundation*, 9/15/2003–8/31/2006, $549,635.

Suresh Jagannathan, "Caterpillar Inc. Unrestricted Gift," 8/5/2002–12/31/2006, $6,703.

Ninghui Li

Ninghui Li, "CAREER: Access Control Poilcy Verification Through Security Analysis and Insider Threat Assessment," *National Science Foundation*, 6/1/2005–5/31/2010, $400,000.

Ninghui Li, "ITR: Automated Trust Negotiation in Open Systems," *National Science Foundation*, 9/1/2003–8/31/2008, $206,878.

Elisa Bertino, Ninghui Li, Melissa Dark, Robert W Proctor, and Victor Raskin, "Collaborative Research: A Comprehensive Policy–Drive Framework For Online Privacy Protection: Integrating IT, Human, Legal and Economic Perspectives," *National Science Foundation*, 9/15/2004–8/31/2005, $653,431.

Zhiyuan Li

Zhiyuan Li and Ananth Y. Grama, "ITR/SW+ACS: Dynamic Code Enhancement and Scheduling Techniques for Complex Simulations," *National Science Foundation*, 9/1/2000–2/28/2005, $294,994.

Zhiyuan Li, "Compiler Schemes for Server-assisted Energy-efficient Mobile Computing on Handheld Devices," *National Science Foundation*, 7/1/2002–6/30/2006, $257,078.

Zhiyuan Li, Saurabh Bagchi, and Yung-Hsiang Lu, "CSR—EHS: Resource-efficient Monitoring, Diagnosis, and Programming Support for Reliable Networked Embedded Systems," *National Science Foundation*, 7/15/2005–8/31/2009, $480,000.

Zhiyuan Li, "17th Workshop on Languages and Compilers for Parallel Processing," *National Science Foundation*, 9/1/2004–8/31/2005, $15,000.

Zhiyuan Li, Ananth Y. Grama, and Ahmed Sameh, "AAD: Software Tools for Asynchronous-Algorithm Development," *National Science Foundation*, 1/1/2005–12/31/2007, $650,000.

Aditya P. Mathur

V. Venkatasubramanian, Stephen Byrn, Aditya P. Mathur, Kenneth Morris, Joseph Pekny, G.V. Reklaitis, Carl Wassgren, Sangtae Kim, Teresa Carvajal, and Lynne Taylor, "Center of Excellence: Institute for Advanced Pharmaceutical Technology," *State of Indiana*, 3/16/2004–3/16/2006, $1,948,866.

Aditya P. Mathur and Raymond DeCarlo, "Modeling the Software System Test Phase as a Feedback Control System under an Incremental Development Model," *State of Indiana*, 7/1/2003–3/31/2005, $30,000.

Aditya P. Mathur, "Computional Models for the Study of Hearing and Language Impairment in Children," *National Science Foundation*, 7/15/2005–12/31/2006, $119,702.

Aditya P. Mathur, "Tools for Quantifying Software Vulnerability and Protection:"A Science and Technology Commercialization Proposal," *State of Indiana*, 3/16/2004–3/16/2006, $141,962.

Cristina Nita-Rotaru

Cristina Nita-Rotaru, "Supplement: Scalability, Accountability and Instant Information Access for Network-Centric Warfare," *Defense Advanced Research Projects Agency*, 6/10/2004–6/9/2005, $20,072.

Cristina Nita-Rotaru, "Cristina Nita-Rotaru Voluntary Support," *Spread Concepts LLC*, 9/22/2004, $10,000.

Voicu Popescu, Cristina Nita-Rotaru, Gary Bertoline, Melissa Dark, Laua Arns, and Carols Morales, "Effective Distance Learning Through Sustained Interactivity and Video Realism," *National Science Foundation*, 9/15/2004–8/31/2007, $540,000.

Cristina Nita-Rotaru, "Scalability, Accountability, and Instant Information Access for Network-Centric Warfare," *Defense Advanced Research Projects Agency*, 6/10/2004–12/9/2005, $294,852.

Cristina Nita-Rotaru, "Collaborative Research: A Survivable Information Infrastructure for National Civilian BioDefense," *National Science Foundation*, 9/15/2004–8/31/2007, $404,000.

Jens Palsberg

Jens Palsberg, "Foundations of ILP-based Static Analysis," *National Science Foundation*, 9/1/2003–8/31/2006, $270,000.

Jan Vitek, Jens Palsberg, and Antony Hosking, "DCMF/NES: Dynamic Compositional Middleware Frameworks for Networked Embedded," *Defense Advanced Research Projects Agency*, 5/30/2001–5/29/2005, $2,902,229.

Gopal Pandurangan

Gopal Pandurangan, "A Random Graph Approach to Protein Structure Determination," *Purdue Research Foundation*, 7/1/2005–6/30/2006, $14,912.

Kihong Park

Kihong Park, "Network Security Managament Framework Research," *Electronics and Telecommunications Research Institute*, 11/15/2002–12/15/2005, $143,201.

Kihong Park, "Research on Worm Attack Prevention Using Content-Based Distributed Packet Filtering, It's Implementation and Benchmarking," *Electronics and Telecommunications Research Institute*, 1/1/2005–12/15/2005, $64,064.

Kihong Park, "Predictable, Scalable Qos Routing for Ad Hoc Wireless Networks based on Heavy-Tailed Statistics," *Department of Defense*, 8/15/2005–2/11/2006, $35,000.

Ahmed K. Elmagarmid, Eugene Spafford, Kihong Park, John T. Korb, and Aref Ghafoor, "MSI: A Research Infrastructure for Integrated Quality of Service Management of Multimedia Computing Environments," *National Science Foundation*, 9/15/1999–8/31/2005, $1,394,111.

Voicu S. Popescu

Christoph M. Hoffmann, Ahmed Sameh, Ananth Y. Grama, Voicu Popescu, James Bottum, David Ebert, and J. Paul Robinson, "MRI: Acquisition of Equipment for Purdue Envision Center for Data Perceptualization," *National Science Foundation*, 9/1/2002–8/31/2005, $862,011.

Research Funding

Voicu Popescu, Cristina Nita-Rotaru, Gary Bertoline, Melissa Dark, Laua Arns, and Carols Morales, "Effective Distance Learning Through Sustained Interactivity and Video Realism," *National Science Foundation*, 9/15/2004–8/31/2007, $540,000.

Voicu Popescu, "The ModelCamera: A System For Interactive Modeling," *Purdue Research Foundation*, 1/1/2004–12/31/2004, $66,280.

Sunil Prabhakar

Susanne E. Hambrusch, Sunil K. Prabhakar, and Walid Aref, "Query Processing in Pervasive Location Aware Computing Environments," *National Science Foundation*, 9/1/2001–8/31/2005, $226,000.

Sunil K. Prabhakar, "Efficient I/O for Modern Database Applications (Career Award)," *National Science Foundation*, 10/1/2000–9/30/2005, $240,000.

Sunil K. Prabhakar and Mikhail J. Atallah, "Watermaking Relational Databases," *National Science Foundation*, 6/1/2003–5/31/2006, $149,993.

Christopher Clifton, Ahmed K. Elmagarmid, Sunil K. Prabhakar, and Aref Ghafoor, "Knowledge Projection for TeleMaintenance," *NAVSEA/NSWC CRANE*, 12/19/2003–9/30/2005, $1,074,913.

Karthik Ramani, Sunil K. Prabhakar, Christoph M. Hoffmann, and Linda Katehi, "Toolingnet: A Partnership for Enhancing the Tooling Industry in Indiana through the use of Information Technology in the Advanced Manufacturing Sector," *National Science Foundation*, 1/1/2003–12/31/2005, $600,000.

Vernon J. Rego

Vernon Rego, "Recovery Issues in Wireless Group Transport Protocols," *Purdue Research Foundation*, 6/16/2003–6/15/2005, $27,978.

John R. Rice

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 8/1/2004–12/31/2005, $300,922.

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 10/1/2002–9/30/2004, $467,499.

Elisha Sacks

Elisha P. Sacks, "REU Supplement – Collaborative Research: A Formal Theory of Robust Numberical Computational Geometry and It's Validation on Confirmation Space Construction," *National Science Foundation*, 5/15/2005–5/14/2006, $5,000.

Voicu Popescu, "The ModelCamera: A System For Interactive Modeling," *Purdue Research Foundation*, 1/1/2004–12/31/2004, $66,280.

Elisha P. Sacks, "Collaborative Research: A Formal Theory of Robust Numerical Computational Geometry and Its Validation on Configuration Space Construction," *National Science Foundation*, 8/15/2003–7/31/2006, $242,424.

Elisha P. Sacks, "ITR/HCI: Practical Robot Path Planning with Contact and Velocity Constraints," *National Science Foundation*, 10/1/2000–9/30/2004, $185,173

Ahmed Sameh

Christoph M. Hoffmann, Ahmed Sameh, Ananth Y. Grama, Voicu Popescu, James Bottum, David Ebert, and J. Paul Robinson, "MRI: Acquisition of Equipment for Purdue Envision Center for Data Perceptualization," *National Science Foundation*, 9/1/2002–8/31/2005, $862,011.

Mark Lundstrom, James Bottum, Joseph Pekny, Supriyo Datta, Ahmed Sameh, Ananth Y. Grama, and Jayathi Murthy, "Network for Computational Nanotechnology," *National Science Foundation*, 9/15/2002–8/31/2007, $10,500,000.

Zhiyuan Li, Ananth Y. Grama, and Ahmed Sameh, "AAD: Software Tools for Asynchronous-Algorithm Development," *National Science Foundation*, 1/1/2005–12/31/2007, $650,000.

Mete Sozen, George Chiu, Ananth Y. Grama, Ahmed Sameh, and Christoph M. Hoffmann, "Towards Real-Time Sensing and Control of Active Structures," *National Science Foundation*, 8/1/2004–7/31/2006, $200,000.

Ahmed Sameh, "Voluntary Support/Intel," *Intel Corporation*, 9/16/2004, $30,000.

Ahmed Sameh, Ananth Y. Grama, and Christoph M. Hoffmann, "ITR/AP: Collaborative Research on Model Reduction of Dynamical Systems for Real-time Control," *National Science Foundation*, 9/1/2003–8/31/2007, $958,502.

James Bottum, Eugene Spafford, Douglas E. Comer, Ahmed Sameh, Christoph M. Hoffmann, Mark Lundstrom, Catherine Rosenberg, and Rudolf Eigenmann, "Indiana-Purdue Grid Proposal (IP-GRID)," *National Science Foundation*, 10/1/2003–9/30/2005, $1,467,769.

Ahmed Sameh, "Purdue Doctoral Program–Ardalan Kangarlou-Haghighi," *Purdue University*, 8/1/2004–7/31/2005, $14,749.

Eugene H. Spafford

Eugene Spafford, "IPA Assignment," *National Science Foundation*, 9/22/2003–9/21/2004, $63,222.

Eugene Spafford, "Center for the Development of Faculty in Information Assurance," *National Security Agency*, 9/19/2002–9/18/2005, $2,767,253.

Melissa Dark, Pascal Meunier, Eugene Spafford, "A Summer Workshop for Beginning Infosec Educators," *National Science Foundation*, 1/1/2002–12/31/2004, $91,287.

Elisa Bertino, Eugene Spafford, Melissa Dark, Howard Sypher, Marc Rogers, Victor Raskin, and Juline Mills, "ITR-The Design & Use of Digital Identies," *National Science Foundation*, 9/15/2004–8/31/2007, $900,000.

Melissa Dark and Eugene Spafford, "A Summer Workshop for Beginning Infosec Educators," *National Science Foundation*, 1/1/2002–12/31/2004, $106,920.

Melissa Dark and Eugene Spafford, "A Summer Workshop for Beginning Infosec Educators," *National Science Foundation*, 1/1/2002–12/31/2005, $237,848.

Aref Ghafoor and Eugene Spafford, "Content-Based, Context-Aware Role Based Access Control for Secure Distributed XML Applications," *National Science Foundation*, 7/1/2003–12/31/2005, $299,990.

Sonia Fahmy, Ness Shroff, and Eugene Spafford, "Collaborative Research: Testing and Benchmarking Methodologies for Future Networking Security Mechanisms," *National Science Foundation*, 9/1/2003–8/31/2006, $523,000.

Eugene Spafford, "CT-ISG: Designing Next-Generation Reliable Internet Servers," *National Science Foundation*, 8/1/2005–7/31/2008, $450,000.

Eugene Spafford, "A Dual-Track Masters Degree Program for Infosec Specialists," *National Science Foundation*, 6/1/2001–5/31/2005, $3,320,314.

Ahmed K. Elmagarmid, Eugene Spafford, Kihong Park, John T. Korb, and Aref Ghafoor, "MSI: A Research Infrastructure for Integrated Quality of Service Management of Multimedia Computing Environments," *National Science Foundation*, 9/15/1999–8/31/2005, $1,394,111.

James Bottum, Eugene Spafford, Douglas E. Comer, Ahmed Sameh, Christoph M. Hoffmann, Mark Lundstrom, Catherine Rosenberg, and Rudolf Eigenmann, "Indiana-Purdue Grid Proposal (IP-GRID)," *National Science Foundation*, 10/1/2003–9/30/2005, $1,467,769.

Yinlong Sun

Yinlong Sun, "Spectral Framework for Photorealistic Graphics," *Purdue Research Foundation*, 1/1/2004–12/31/2005, $27,978.

Wojciech Szpankowski

Wojciech Szpankowski, "Crossroads of Information Theory and Computer Science: Analytic Algorithmics, Combinatorics, and Information Theory," *National Science Foundation*, 7/1/2005–6/30/2008, $243,862.

Wojciech Szpankowski and Ananth Y. Grama, "Algebraic, Combinatorial and Probabilistic Methods for Biological Sequences," *National Institute of Health*, 5/15/2003–4/30/2007, $924,865.

Wojciech Szpankowski, "Analytic Information Theory, Combinatorics, and Algorithmics: The Precise Redundancy & Related Problems," *National Science Foundation*, 8/1/2002–7/31/2006, $215,000.

Jan Vitek

Jan Vitek, Jens Palsberg, and Antony Hosking, "DCMF/NES: Dynamic Compositional Middleware Frameworks for Networked Embedded," *Defense Advanced Research Projects Agency*, 5/30/2001–5/29/2005, $2,902,229.

Assistant Professor Daniel Aliaga and graduate student Yi Xu work on a research project focusing on computer rendering of moving objects.

Yu Hu and Jan Vitek, "Partage: An Open Peer-to-Peer Infrastructure for Cycle-Sharing," *National Science Foundation*, 8/15/2003–7/31/2006, $498,945.

Jan Vitek, "Assured Software Composition For Real-Time Systems," *National Science Foundation*, 9/15/2003–8/31/2007, $500,000.

Jan Vitek, "CAREER: Foundations and Implementation of Mobile Object Systems," *National Science Foundation*, 6/1/2001–5/31/2006, $325,936.

Jan Vitek, "High Productivity Computing Systems (HPCS)," *IBM*, 9/1/2003–7/7/2006, $361,986.

Jan Vitek, "Collaborative Research: Secure Distributed Programming," *National Science Foundation*, 9/1/2002–8/31/2006, $240,000.

Pascal Meunier and Jan Vitek, "Development of a Safe, Virtual Imaging Instrument for Logically Destructive Experiments," *National Science Foundation*, 9/1/2004–8/31/2009, $800,000.

Jan Vitek, "Resilient Mobile Agent Architure," *Motorola*, 9/1/2000–8/31/2005, $62,543.

Jeffrey S. Vitter

Jeffrey Vitter, "External Memory Algorithms: Dealing with Massive Data," *Army Research Office*, 9/15/2003–6/14/2005, $107,529.

Jeffrey Vitter, "Entropy-Compressed Data Structures," *National Science Foundation*, 9/1/2004–8/31/2005, $80,000.

Dongyan Xu

Dongyan Xu, "Microsoft Gift," *Microsoft Corporation*, 5/11/2005, $5,000.

Dongyan Xu, "Collaborative Research: NMI Development (CISE) Self-Management of Distributed Virtual Environments," *National Science Foundation*, 1/1/2005–12/31/2005, $45,000.

Daniel Aliaga and Dongyan Xu, "2004 Microsoft Research Learning Science—2004–05," *Microsoft Corporation*, 12/1/2003, $90,000.

Dongyan Xu, "MARIA: A Middleware Architecture for Reliable Information Access in Mobile Ad Hoc Applications," *Purdue Research Foundation*, 8/18/2003–8/17/2005, $27,978.

Sebastien Goasguen, Dongyan Xu, and Gerhard Klimeck, "NMI Deployment (ENG): Nanohub," *National Science Foundation*, 10/1/2004–9/30/2007, $970,368.

David K. Y. Yau

David Yau, "QoS Architecture for General Purpose Network Computing (Career Award)," *National Science Foundation*, 3/15/1999–6/30/2005, $205,698.

David Yau, "IBM PhD Fellowship–Yu Dong," *IBM*, 8/1/2005–4/30/2006, $38,263.

David Yau, "Collaborative: A Component-based Software Environment for Simulation, Emulation, and Synthesis of Network Protocols in Next Generation Networks," *National Science Foundation*, 4/1/2004–3/31/2006, $187,000.

David Yau, "QoS Architecture for General Purpose Network Computing (CAREER Award)," *National Science Foundation*, 3/15/1999–6/30/2005, $4,999.

Education

Graduate Instructors, Graduate Assistants, and Fellows

Graduate Teaching Assistants

Hasan Metin Aktulga
Ethan Lee Blanton
Deepak Rao Bobbarjung
Brian David Bue
Ahmet Burak Can
Bogdan Carbunar
Edith C. Cassell
Hong Chen
Yong Wook Choi
Tomasz Czajka
Ziad Zouheir El Bizri
Hicham Galal Elmongui
Ferit Erin
John Chapman Flack
Mohamed Raouf Fouad
Bryon Christopher Gloden
Matthew Charlton Greig
Robert Gwadera
Jahangir Hasan
Matthew Craig Henkler
Michael Elijah Huffman
Sundararaman Jeyaraman
Brian Robert Johnson
Hetunandan Munisharan Kamichetty
Md-Abdul Maleq Khan
Yunhua Koglin
Mark Krasniewski
Pankaj Kumar
Ashish Kundu
Yasin Nilton Laura Silva
Wenchang Liu
Jennifer Lynn Lynch
Murat Manguoglu
Russell Kenneth Meyers
Scott David Miller
Ian Michael Molloy
Tamara Lonette Morris
Faith Edna Moulton
Mummoorthy Murugesan
Maxim Naumov
Armand Navabi
Jayesh Pandey
GaHyun Park
Jorge R. Ramos
Ryan Denver Riley
Paul Michael Ruth
Andrew Walter Scharlott
Amit Jayant Shirsat
Chetak Shantilal Sirsat
William Robert Speirs
Tiberiu Vasile Stef-Praun
Hongmei Sun
Nikolai Alexeevich Svakhine
Evans Adolfo Tapia
Jacques Daniel Thomas
Yuldi Tirta
Mercan Karahan Topkara
Umut Topkara
Fijoy George Vadakkumpadan
Otoniel Venezuela
Qiqi Wang
Weichao Wang
Yang Wang
Jeffrey David Wassil
Barry Joseph Wittman
Yuni Xia
Huiying Xu
Yi Xu
Jingfeng Yan
Jing Ye
David John Zage

Graduate Research Assistants

Hasan Metin Aktulga
Mohamed Hassan Ali
Dan I. Ardelean
Oscar Alfredo Ardila-Giraldo
Maksim Rakhmil Averbukh
Asad Khan Awan
Gleb Evgeny Bahmutov
Jason Baker
Daniel Ryan Bekins
Bhagyalaxmi Bethala
Abhilasha Bhargav
Rafae A. Bhatti
Ethan Lee Blanton
Marina Valeryevna Blanton
Deepak Rao Bobbarjung
Birgitte Mariaelisabeth Brydso
Florian Buchholz
Ji-Won Byun
Bogdan Carbunar
Brian David Carrier
Chi-bun Chan
Jen-Yeu Chen
Chun-Kong Cheng
Roman Chertov
Gang Ding
Radu-Mihai Dondera
Yu Dong
James Patrick Early
Mohamed Ahmed Yassin El Tabakh
Hoda Mohamed Eldardiry
Mohamed Galal Elfeky
Hazem Diaa Eldin Elmeleegy
Hicham Galal Elmongui
Ronaldo Alves Ferreira
Ilya Figotin
John Chapman Flack
Mohamed Raouf Fouad
Keith Byron Frikken
David James Gerberry
Thanaa Mohamed Ghanem
Bryon Christopher Gloden
Rajeev Gopalakrishna
Christian Grothoff
Robert Gwadera
Win Mar Htay
Ioannis Ioannidis
Chun Jia
Wei Jiang
Xuxian Jiang
Jayaram Kallapalayam Radha
Hetunandan Munisharan Kamichetty
Ashish Kamra
Murat Kantarcioglu
Humayun Mukhtar Khan
Md-Abdul Maleq Khan
HyoJeong Kim
Yunhua Koglin
Mehmet Koyuturk
Bin Li
Jiangtao Li
Murat Manguoglu
Maxim S. Martynov
Philip McGachey
Carl Christian Kjelgaard Mikkelsen
Scott David Miller
Mohamed Fathalla Mokbel
Mihai Mudure
Mummoorthy Murugesan
Maxim Naumov
Mehmet Ercan Nergiz
Krzysztof Palacz
GaHyun Park
Filip Jerzy Pizlo
Muralikrishna Ramanathan
Jorge R. Ramos
Paul Andrew Rosen
Paul Michael Ruth
Rupak Sanjel
Rajesh Selvamani
Javed Siddique
Sarvjeet Singh
Jacques Daniel Thomas
Umut Topkara
Mahesh Veeraragh Tripunitara
Yi-Cheng Tu
Fijoy George Vadakkumpadan
Navaneetha K. S. Vaidhyanathan
David Thomas Vos
Aaron Richard Walters
Qihua Wang
Qiqi Wang
Weichao Wang
Yang Wang
Adam Welc
Yan Wu
Yuni Xia
Bin Xin
Xiaopeng Xiong
Huiying Xu
Rong Xu
Yi Xu
Hiroshi Yamauchi
Jingfeng Yan
Weiqiang Yang
Yu Yang
Ossama Mohamed Younis
David John Zage
Haiping Zhang
Ji Zhang
Mingwu Zhang
Yu Zhang
Yuhui Zhong

Fellows

Jason Baker
David William Bettis
Hong Chen
Marga Chiri
Tomasz Czajka
Jing Dong
Hicham Galal Elmongui
Keith Byron Frikken
Hwan Jo Heo
Win Mar Htay
Abhinav Jain
Ardalan Kangarlou-Haghighi
Jessica Catherine Kerper
Paul Michael Kuliniewicz
Ryan N. Nicoletti
Lukasz Ziarek

PhD Graduates

December 2004

Ding, Yonghua
Compiler-Based Computation Reuse Schemes for Handheld Devices
Advisor: Z. Li

Palacz, Krzysztof
Crusoe — Towards a Multicomputer Execution Environment for Java
Advisor: J. Vitek

May 2005

Carbunar, Bogdan
Coverage Problems in Wireless Sensor and RFID Systems
Advisors: A. Grama, C. Nita-Rotaru, J. Vitek

Cheng, Chun-Kong
Managing Uncertainty in Constantly-Evolving environments
Advisor: S. Prabhakar

Elfeky, Mohamed Galal
Online Periodicy Mining
Advisors: A. Elmagarmid and W. Aref

Ioannidis, Ioannis
Algorithms and Data Structures for IP Lookup
Advisor: A. Grama

Zhong, Yuhui
Formalization of Dynamic Trust and Uncertain Evidence for User Authorization
Advisor: B. Bhargava

August 2005

Buchholz, Florian
Pervasive Binding of Labels to System Processes
Advisor: E. Spafford

Early, James Patrick
Behavioral Feature Extraction for Network Anomaly Detection
Advisors: C. Brodley and E. Spafford

Frikken, Keith Byron
Secure and Private Online Collaboration
Advisor: M. Atallah

Kantarcioglu, Murat
Privacy Preserving Distributed Data Mining on Horizontally Partitioned Data
Advisor: C. Clifton

Mokbel, Mohamed Fathalla
Scalable Continuous Query Processing in Location-Aware Database Servers
Advisor: W. Aref

Wang, Weichao
Securing Wireless Network Topology and Routing
Advisor: B. Bhargava

Williams, Paul David
CuPIDS: Increasing Information System Security through the Use of Dedicated Co-processing
Advisor: E. Spafford

Xia, Yuni
Efficient Indexing Techniques for the Update-Intensive Environment
Advisor: S. Prabhakar

Xu, Rong
Improving Cache Performance by Smart Page Mapping in Application Programs
Advisor: Z. Li

Younis, Ossama Mohamed
An Energy-Efficient Architecture for Wireless Sensor Networks
Advisor: S. Fahmy

Courses Offered

110 Introduction to Computers
156 C Programming for Engineers
158 C Programming
177 Programming with Multimedia Objects
180 Programming I
182 Foundations of Computer Science
190E Introduction to Programming with Applications to Engineering and Physical Science Problems
192 Freshman Resources Seminar
197 Freshman Honors Seminar
235 Introduction to Organizational Computing
240 Programming in C
250 Computer Architecture
251 Data Structures
290E Freshman and Sophomore EPICS Projects
314 Numerical Methods
334 Fundamentals of Computer Graphics
348 Information Systems
352 Compilers: Principles and Practice
354 Operating Systems
381 Introduction to the Analysis of Algorithms
390S Secure Programming
390W The Wireless Revolution
397 Honors Seminar
422 Computer Networks
426 Computer Security
448 Introduction to Relational Database Systems
483 Introduction to the Theory of Computation
490B Introduction to Bioinformatics
490D Senior EPICS Design Project
490E Junior and Senior EPICS Projects
490G Advanced Tablet Platform Applications
490T Advanced Tablet Platform Applications
491 Senior Resources Seminar
497 Honors Research Project
501 Introduction to Computational Science
502 Compiling and Programming Systems
503 Operating Systems
510 Software Engineering
514 Numerical Analysis
515 Numerical Linear Algebra
525 Parallel Computing
526 Information Security
530 Introduction to Scientific Visualization
536 Data Communication and Computer Networks
541 Database Systems
542 Distributed Database Systems
543 Introduction to Simulation and Modeling of Computer Systems
555 Cryptography
565 Programming Languages
569 Introduction to Robotic Systems
580 Algorithm Design, Analysis, and Implementation
584 Theory of Computation and Computational Complexity
590C Virtual Networked Computing
590D Data Mining
590E Topical Lectures in Information Security
590G Capturing, Modeling, Rendering 3D Structures
590S Database Security
590S Randomized and Probabilistic Algorithms
590T Insider Threats to Information Systems
590U Access Control: Theory and Practice
590V Biomolecular Simulation
590Y Computational Imaging
615 Numerical Methods for Partial Differential Equations I
638 Multimedia Networking and Operating Systems
641 Multimedia Database Systems
655 Advanced Cryptology
661 Formal Compiling Methods
690B Pervasive Systems

Guest Speakers

Date	Speaker	Affiliation	Title
FALL 2004			
Sep. 13	Raj Jain, PhD	Nayna Networks, Inc.	Computer Networking: Recent Developments, Trends, and Issues
Sep. 16	Prof. Petros Drineas	Rensselaer Polytechnic Institute	Fast Monte Carlo Algorithms for Common Matrix Operations
Sep. 22	Prof. John Mitchell	Stanford University	Security analysis of network protocols
Sep. 29	Jeannette Wing, PhD	Carnegie Mellon University	Automatic Generation and Analysis of Attack Graphs
Oct. 4	Prof. Sanjay Kumar Madria	University of Missouri	Dynamic Data Replication Schemes for Mobile Ad-hoc Network Based on Aperiodic Updates
Oct. 14	Prof. Christian Collberg	University of Arizona	Software Watermarking: State of the Art and Future Directions
Oct. 15	Prof. Tiziana Catarci	Università di Roma "La Sapienza" – Roma, Italy	Searching for good quality data? Trust us
Oct. 18	Prof. Patrick McDaniel	Pennsylvania State University	Origin Authentication in Interdomain Routing
Oct. 21	Prof. Alan R. Hevner	University of South Florida	Health Care Data Warehousing: Research Applications
Oct. 22	Prof. James Won-Ki Hong	POSTECH	Internet Traffic Monitoring and Analysis using NG-MON
Oct. 25	Prof. Thomas Hughes	University of Texas at Austin	Isogeometric Analysis: Computer Aided Design, Finite Elements, and Adaptivity in Solid and Fluid Mechanics
Oct. 26	Dileep Bhandarkar, PhD	Intel	Multi-Core Microprocessor Chips: Motivation & Challenges
Nov. 4	Mr. Martin Schray	Microsoft	Developing for multiple devices (facts and fiction)
Nov. 5	H. Usami, S. Kawata and S. Hwang	National inst. for Informatics, Fujitsu Co. and Utsunomiya Univ.	NAREGI: The National Research Grid Initiative in Japan
Nov. 8	Ingrid Carlbom, PhD	Bell Laboratories	Telepresence – the Next Communications Paradigm
Nov. 15	Prof. Carl Gunter	University of Illinois Urbana–Champaign	A Formal Privacy System and its Application to Location Based Services
Nov. 15	Leszek Lyznik, PhD	Pioneer	Biological diversity generated by differential processing of DNA
Nov. 22	Wolfgang Lindner, PhD	MIT Computer Science and Artificial Intelligence Laboratory	An Integration Framework for Sensor Networks and Data Stream Management Systems
Dec. 6	Philip J. Davis, Professor Emeritus	Brown University	When is a Problem Solved?
Dec. 7	Bob Filman, PhD	Research Institute for Advanced Computer Science NASA Ames Research Center	Event-based Aspect-Oriented Programming
SPRING 2005			
Jan. 24	Ted Wilson, PhD	Hewlett-Packard	The HP Consumer Digital Entertainment Program
Jan. 26	David Cohn, PhD & Jakka Sairamesh, PhD	IBM T. J. Watson Research Center	IBM's Global Technology Outlook (2004–2005)
Feb. 7	Saurabh Sinha, PhD	University of Illinois Urbana-Champaign	Hidden Markov models and mutant fruitflies — A case study in Computational Biology
Feb. 15	Michael Brudno, PhD	EECS Department University of California, Berkeley	Alignment of Whole Genomes: Algorithms and Tools
Feb. 21	Mukesh Mohania, PhD	I.B.M. India Research Lab	Automatic Obligation Enforcement for Privacy Policy Compliance
Feb. 22	Mr. Tao Xie	University of Washington, Seattle	Improving Effectiveness of Automated Software Testing
Feb. 24	Mr. Westley Weimer	University of California, Berkeley	Run-Time Error Handling and Program Reliability
Feb. 24	Prof. Fevzi Belli	University of Paderborn, Germany	Event-Based Modeling and Testing of System Vulnerabilities
Feb. 25	Manuel Oriol, PhD	University of Maryland	Disconnected service architecture for unanticipated run-time evolution of code
Feb. 28	Mr. Sumit Gulwani	University of California at Berkeley	Random Interpretation
Mar. 2	Ramesh Raskar, PhD	Mitsubishi Electric Research Laboratories (MERL)	Active Imaging and Display at MERL: A Selective Overview
Mar. 2	Mr. Jayant Madhavan	University of Washington	Schemas, Heterogeneity, and Matching
Mar. 7	Aleksey Nogin, PhD	California Institute of Technology	From Computer-Aided Theorem Proving to Formal Software Construction
Mar. 9	Prof. Yale Patt	University of Texas, Austin	Are there any questions?
Mar. 14	Mario Sudholt, PhD	INRIA	Expressive aspect languages: motivation, definition and application

Mar. 21	Mr. Sorin Lerner	University of Washington	Automatically Checking the Correctness of Program Analyses and Transformations
Mar. 23	Dean Hermann Maurer	Graz University of Technology	Can we avoid catastrophic failures of computer networks?
Mar. 24	Prof. Xindong Wu	University of Vermont	Data Mining: Artificial Intelligence in Data Analysis
Mar. 24	Mr. Dejan Kostic	Duke University	Mesh-based Data Dissemination
Mar. 28	Mr. George Candea	Stanford University	A Reboot-based Approach to High Availability
Mar. 28	Prof. Lee White	Case Western University	Testing GUI Systems: A Difficult Problem
Mar. 30	Quaid Morris, PhD	University of Toronto	Statistical machine learning for large-scale biology
Mar. 31	Mr. Michalis Petropoulos	University of California, San Diego	Exporting and Utilizing Database Interfaces on the Web
Apr. 7	Okan Arikan, PhD	University of California, Berkeley	Realistic Approximations in Animation and Rendering
Apr. 7	Prof. Holly Rushmeier	Yale University	3D Scanning for "Eternal Egypt"
Apr. 8	Prof. Dan Marinsecu	University of Central Florida	Quantum Information and Quantum Computing. Why the Excitement?
Apr. 12	Ms. Jessica Lin	University of California, Riverside	Discovering Unusual and Non-Trivial Patterns in Time Series Databases
Apr. 14	Ms. Yanlei Diao	University of California, Berkeley	Query Processing for Large-Scale XML Message Brokering
Apr. 15	Mr. Curtis Worsey	Independent Consultant and Former Partner with Accenture	From Coding to Entrepreneurship: The Consulting Life of a CS Graduate
Apr. 18	Mr. Jieping Ye	University of Minnesota	Multiple protein structure alignment
Apr. 21	Mr. Spiros Papadimitriou	Carnegie Mellon University	Parameter-Free Spatial and Stream Mining
Apr. 25	Ms. Xue Yang	University of Illinois Urbana-Champaign	Improving Channel Utilization in Wireless Networks
Apr. 28	Patrick Eugster, PhD	Swiss Federal Institute of Technology in Zuerich (ETHZ)	Abstractions and Algorithms for Pervasive Programming
May 2	Prof. Jonathan Cohen	The Johns Hopkins University	Leveraging Modern Graphics Hardware for Interactive Visualization
May 11	Prof. Peter Chen	University of Michigan	Virtual machines: the ultimate tool for computer forensics
Jun. 2	Michael Sperber, PhD	DeinProgramm	Object-Oriented Programming Considered Harmful
Jun. 23	Prof. Peter Varman	Rice University and National Science Foundation	QoS Scheduling in Parallel Storage Systems

Staff

Department

Susanne Hambrusch, Department Head
John T. (Tim) Korb, Assistant Head
Karla Cotter, Administrative Assistant

Business Office

Mary Bell, Business Manager
Renda Bryant, Account Clerk
Linda Byfield, Account Clerk
Jessica Gretencord, Account Clerk
Tammy Muthig, Account Clerk

Office of Development

Anthony (Tony) J. Vidmar, Director of Development
Jean Jackson, Corporate Relations
Pat Morgan, Secretary

Facilities

Brian Board, Hardware
Ron Castongia, Facilities Manager
Charles Fultz, UNIX Software
Kip Granson, Windows Software
Nathan Heck, Windows Software
Nick Hirschberg, Webmaster and DBA
Mike Motuliak, Hardware
Steve Plite, UNIX Software
Dan Trinkle, Tech. System Administrator
Candace Walters, Assistant Director, Facilities

Graduate Office

William J. Gorman, Assistant to the Head
Amy Ingram, Graduate Secretary
Renate Mallus, Graduate Office Coordinator

Research Staff

Ann Christine Catlin, Systems Programmer
Sherri Neibert, Administrative Assistant

Support Staff

William Crum, Instructor
Mindy Hart, Outreach Coordinator
Eric King, Instructor
Patti Minniear, Copy Center Operator
Paula Perkins, Department Secretary
Nicole Piegza, Secretary
Gustavo Rodriguez-Rivera, Instructor
Connie Selleck-Moore, Secretary
K. C. VanZandt, Instructor
Bill White, Instructor
Connie Wilson, Department Secretary

Undergraduate Office

Patricia Giordano, Advisor
Carol Paczolt, Advisor
Janice Thomaz, Advisor

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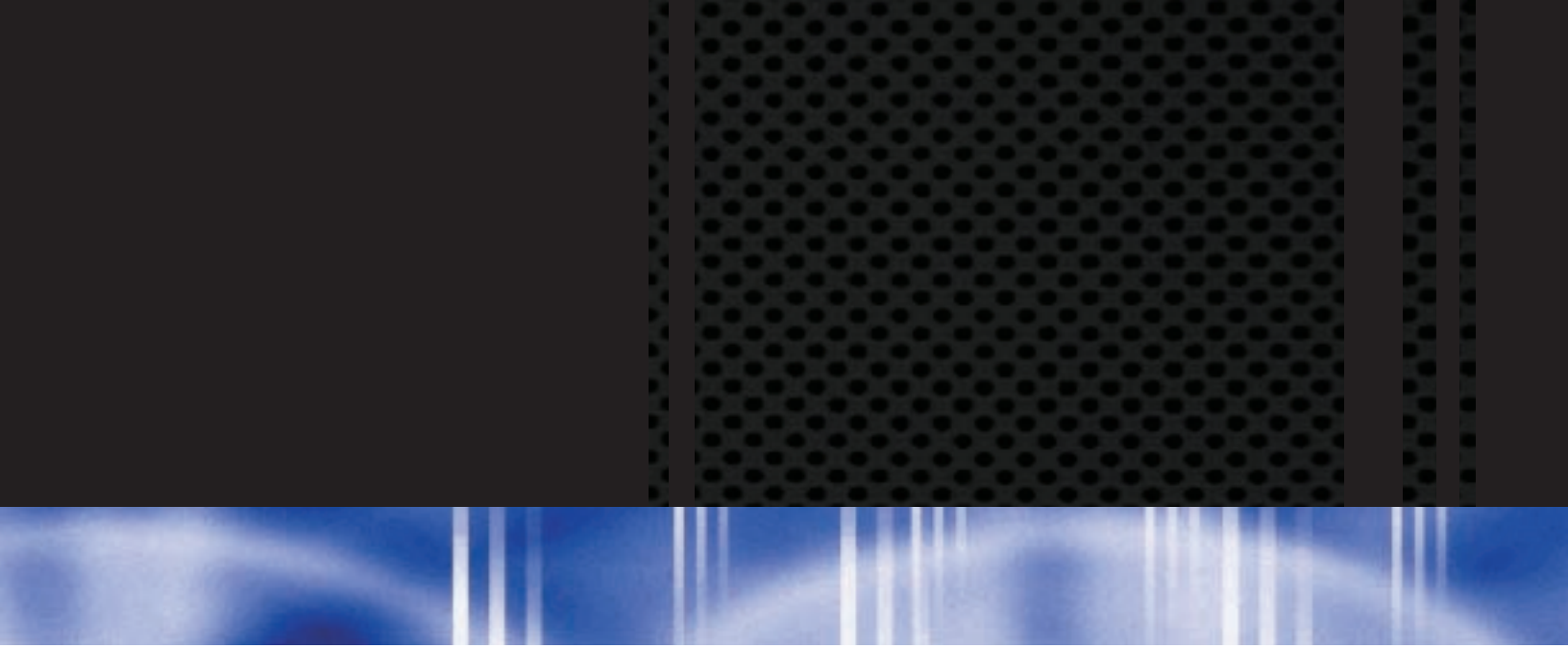

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