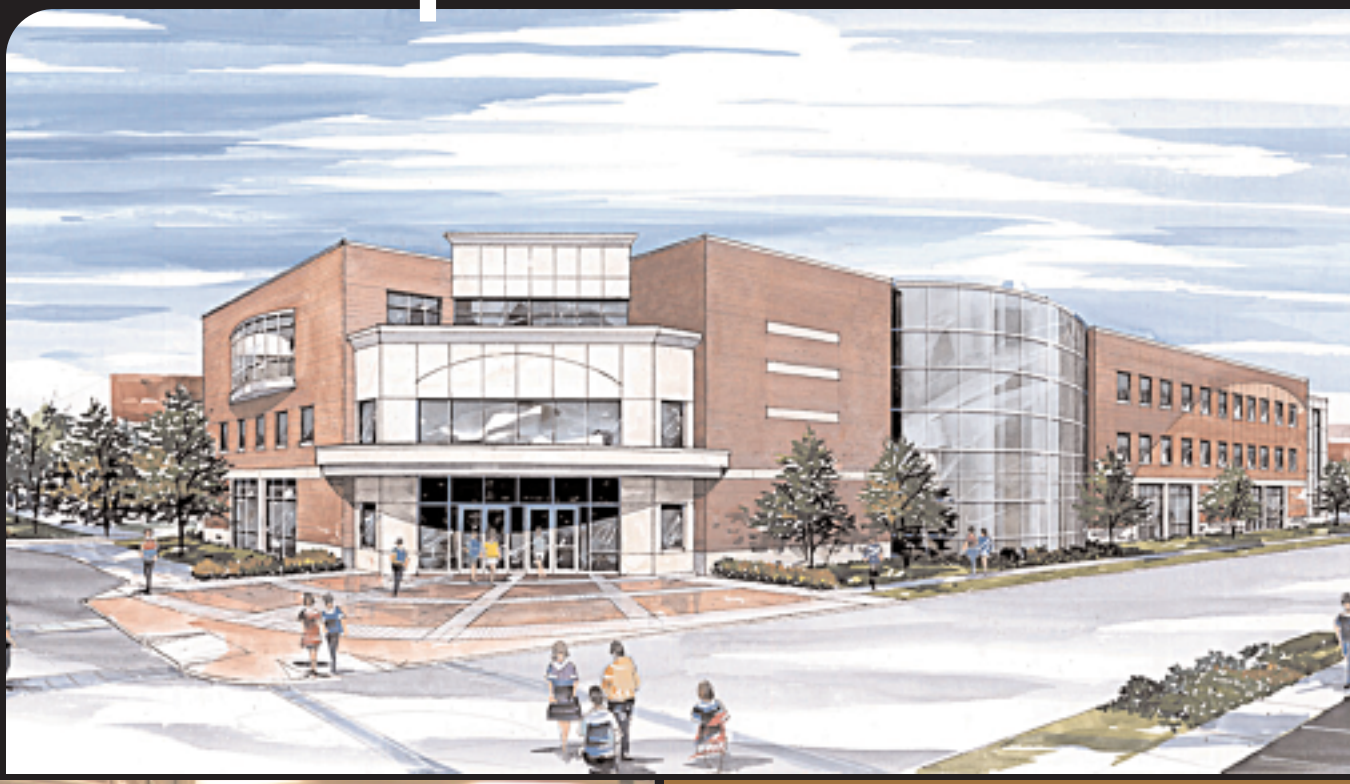
Department of Computer Science



2003-04 Annual Report

PURDUE
UNIVERSITY

Message from the Head

Department Head, Professor Susanne Hambrusch

For Purdue Computer Science, 2003-04 was a year of special milestones!

On October 1, 2003, the department celebrated the end of its successful Capital Campaign for a new facility. Almost exactly a year later, on Monday, October 4, 2004, we broke ground. A few weeks later, on October 16, the building was named for our lead donors Richard and Patricia (Pat) Lawson in a special Homecoming Celebration. We invite you to monitor the building progress by viewing our live webcam at http://buildingcam.cs.purdue.edu/popup.html. The building is to be completed in time for the fall 2006 semester.

Collaboration with internal and external partners has always been a hallmark of our department. In this spirit, the Computer Science Department plays an active role in the School of Science COALESCE initiative (see http://www.science.purdue.edu/COALESCE for more information). COALESCE is part of a Purdue-wide initiative to target compelling national research priorities that require insights and contributions from multiple disciplines. Solving societal problems through multi-disciplinary research is quickly becoming an integral component of progressive science programs, and we are proud to be one of the pioneers in changing the shape of science.

Multi-disciplinary research and hiring was the focus of the first Departmental Advisory Board meeting held in March 2004. The mission of this newly created board includes actively advising the department in achieving the departmental vision as defined in the strategic plan. Last year's board members were: Jeanne Ferrante (UC San Diego), Gene Golub (Stanford), Clinton Kelly (SAIC), Kevin Kahn (Intel), and Robert Tarjan (Princeton and HP).

This year we welcomed two outstanding new senior faculty members, Elisa Bertino and Robert Skeel to the department. With their arrival, the size of our department has grown to 41 tenured and tenure-track faculty members. I am proud to report that our faculty continue to earn praise and reward for their achievements. Recent highlights include:

- Professors Mikhail Atallah and Doug Comer were made Distinguished Professors
- Professor Walid Aref received a University Faculty Scholar Award
- Professor Mikhail Atallah was selected as a Fellow of the Purdue Teaching Academy
- Professor Greg Frederickson received the Pólya Award from the MAA
- Professor Elisa Bertino was named a Fellow of the ACM
- Professor Gene Spafford received the ACM SIGCAS Making a Difference Award and the IEEE Taylor L. Booth Education Award
- Professor Susanne Hambrusch won the TechPoint Educator MIRA Award
- Professor Aditya Mathur accepted a position as Associate Dean of Graduate Education in the School of Science
- Professor Sunil Prabhakar was promoted to Associate Professor with tenure
- Professor Chris Clifton received tenure in the rank of Associate Professor
- Professors Mikhail Atallah, Greg Frederickson, and Dr. Gustavo Rodriguez-Rivera were selected as three of the Top Ten Outstanding Teachers in the School of Science
- Professor Mikhail Atallah was selected as the Outstanding Teacher of the Year in the School of Science

As has occurred nationally, our undergraduate enrollment declined slightly in the last year. We are pleased that the resulting smaller classes have allowed us to improve the quality of the education we can provide. In fall 2004, we had 196 freshmen and 609 total undergraduate majors. Among our 160 graduate students we currently have 93 students who passed the qualifying exams, a record number of PhD students. The department awarded 198 BS, 58 MS, and 11 PhD degrees in 2003-04.

Our research expenditures for 2003-04 totaled $8,748,359, an increase of nearly 20% from the previous year. Financial support from individuals and corporate partners continues to grow. For this we are thankful—external support is essential for us to bridge the gap between departmental needs and available funds. Funding resources, however, remain tenuous in some cases and contributions will continue to play an integral role in the success of the department. You will find a complete list of 2003-04 donors beginning on page 6. The department presented $166,904 in merit scholarships to new and continuing students at the April 2004 awards banquet.

As you look through this annual report, I think you will agree that Purdue Computer Science had many reasons to celebrate during the past year. I am honored to lead this extraordinary department.

Susanne Hambrusch
Professor and Department Head

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Editor's Note: As of November 19, 2004, the School of Science has been renamed the College of Science.

Pictured on cover (top): An artist's rendering shows Phase I of the Richard and Patricia Lawson Computer Science Building.

Pictured on cover (bottom): The newly renovated computer lab serves as a collaborative environment for computer science students.

Aerial view of Purdue University's West Lafayette campus.

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 69,000 students system-wide. Purdue is one of the nation's leading research institutions with a reputation for excellence and affordable education.

Recently ranked among the top 25 public universities nationally by *U.S. News & World Report* magazine, the University offers more than 7400 courses in over 500 fields of study. 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 myriad fields.

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

A coffee house in the Greater Lafayette downtown district.

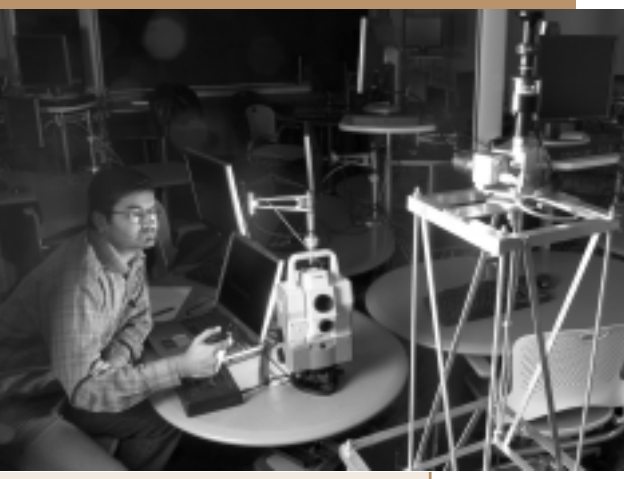
Greater Lafayette

The home of Purdue, Greater Lafayette is a welcoming and progressive community 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

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, one network engineer, one hardware engineer, six system administrators, and several student assistants.



An Autonomous Image Capture pioneer robot with a laser positioning system, often used by construction engineers, collects raw images of a building and uses them to build a 3D colored model.

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 5 TB of disk storage. All faculty and many graduate students have a Sun, Intel, or Apple (Mac) workstation on their desk.

Educational Facilities

Computing systems used by students enrolled in both undergraduate and graduate computer science courses include over 100 Intel PCs running either Sun Solaris x86 or Windows XP. CS also offers over 60 Sun workstations for courses running Solaris Sparc OS. Four rooms in the Computer Science Building, two rooms in the Physics Building, and a room in the Recitation Building are dedicated to laboratory-based instruction using these facilities. A later section lists equipment owned and maintained by Information Technology at Purdue 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, video projectors, digital video editing capabilities, 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 network users at 100 Mbps and 1,000 Mbps to department computing facilities. Experimental wireless networks and production wireless networks also are used 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 SPARCservers 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

An artist's rendering shows Phase I of the future Richard and Patricia Lawson Computer Science Building.

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 our 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 our friends, alumni, and benefactors by our side, we will continue to lead the way in computer science in the upcoming year.

Update on the Building Campaign

October 2004 brought the groundbreaking and naming ceremony for the Richard and Patricia Lawson Computer Science Building, which will serve as the new home for the Department of Computer Science at Purdue.

This project is being made possible by the generous giving of over $7 million from alumni and corporate and foundation friends, plus an allocation of $13 million from the State of Indiana.

The impact of the new building in Purdue's quest to become a top ten program in computer science will be immediate.

- In its new home, CS will be a magnet for the world's brilliant minds in the field and achieve a competitive advantage in growing the faculty.
- Outstanding students will follow great faculty to Purdue. The exterior of the new building will be stunning, and the thoughtful, people-friendly interior design that, among other features, includes break-out rooms, comfortable conversation areas, and upscale food service, will help attract the best and brightest students.
- Working in teams, students in the new building will be taught more often by faculty and less often by teaching assistants. There will be space and equipment for additional research projects for undergraduates as well as graduate students.
- Students will take coursework in smaller classrooms with the most technologically advanced equipment.
- The new building will include a well-designed and fully equipped room intended to host university gatherings, corporate meetings, and academic conferences, one of the features that will help Purdue attain the preeminent, multi-disciplinary environment it is striving to achieve.

K-12 Outreach

Our corporate partners and other friends vigorously support our engagement in the community. Working with these associates has enabled the department to be an active partner in the School of Science K-12 outreach program, as we work with students and teachers to increase interest and achievement in science and mathematics at the pre-college level. Outreach coordinators act as resources and/or facilitators, establishing collaborative relationships with elementary and secondary schools to bring about changes in the quality of science education. Our programs serve as a vital catalyst linking the expertise of science faculty with students, teachers, parents and the community-at-large.

Computer Science K-12 Outreach Advanced Camp

Mission:

The mission of the Department of Computer Science is to advance the frontiers of computer science, to expand the pool of qualified individuals working in the discipline, and to reach out both within and beyond the university to apply computational principles to technical and societal problems.

Vision:

The faculty will be preeminent in creating and disseminating new knowledge on computing and communication. The department will prepare students to be leaders in computer science and its applications. Multidisciplinary activities that strengthen the impact of computation in other disciplines will play an essential role.

Corporate Partners

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 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.

Premier Corporate Partners

Cisco Systems — Kara Adams
Eli Lilly and Company — Bill Matthews
Guidant Corporation — Jim Mapel
Hewlett-Packard — Janice Zdankus
IBM — Ko-Yang Wang
Intel Corporation — Steve Tolopka
Lockheed Martin — Richard Schubert
Microsoft Corporation — John Spencer
Motorola — Ken Crisler

Partners

The Boeing Company — Bob Broeder
Harris Corporation — Jim Clamons
Lucent Technologies — Jack Kozik
Northrop Grumman — Dave Capka
Raytheon Technical Services Company — Jerry Slater
TechPoint — Cameron Carter
Tektronix, Inc. — Steve Sutton

Friends

Beckman Coulter — Carl Murray
Crowe Chizek — Mark Strawmyer
ExxonMobil — Dan Post
Goodyear Tire and Rubber Company — Paul Pinkie
Kimberly-Clark Corporation — Rick Grosskopf
Procter & Gamble — Tom Hylton
State Farm Insurance Companies — Luke Wellman

Corporate partners take a guided tour of the Envision Center.

Donor Honor Roll

Purdue President Martin Jischke presents Richard and Patricia Lawson with a Purdue Pinnacle Award.

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 2003-04 academic year.

Donor Honor Roll — Individuals

$1,000,000 and up

Mrs. Hedwig H. Kurz

$25,000 - $99,999

Dr. Eric R. Dittert
Dr. Kevin and Mrs. Suzanne Kahn
Dr. Stephen and Mrs. Janet Tolopka

$10,000 - $24,999

Mr. Jack and Mrs. Ruth Chappell
Mr. David Spellmeyer
Mr. Donald and Mrs. Barbara Swanson
Mr. R. Curtis and Mrs. Caroline Worsey

$1,000 - $9,999

Dr. Endre Balazs and Dr. Janet Denlinger
Ms. Helen Bauer
Mr. James and Mrs. Judy Bonnet
Dr. Richard and Mrs. Bonnie Buten
Dr. David and Dr. Janice Fairchild
Mr. Timothy and Mrs. Mary Anne Fath
Mrs. Marilyn I. Forsythe
Dr. Greg Frederickson and Dr. Susanne Hambrusch
Dr. Frank and Mrs. Martha Friedman
Dr. Alan and Mrs. Cynthia Hevner
Mr. Michael K. Jones
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Ms. Michelle P. Leung
Mr. William and Mrs. Deborah Nigh
Dr. William and Mrs. Libbie Nylin
Mr. Malcolm and Mrs. Cheryl Railey
Mr. Charles and Ms. Dion Richter
Mr. Stephen and Mrs. Laura Salisbury
Dr. Ahmed H. Sameh
Mr. Stephen and Mrs. Brenda Susemichel
Dr. Kwei and Mrs. Kuei-Hsiang Tang
Mr. Michael and Mrs. Martha Thurk
Mr. Bill Weaver and Ms. Elileen Gorrell
Mr. Faris Y. Yau
Mr. Stephen and Mrs. Virginia Zimmerly

Under $1000

Mr. Richard E. Amick
Mr. Richard and Mrs. Margaret Anderson
Mr. Donald H. Andres
Mr. Thomas J. Anthony
Ms. Mary Jo Bartolacci and Mr. Timothy Palmer
Mr. Stephen and Ms. Deborah Belter
Mr. Frank C. Belz
Mr. Bryan E. Bentley
Mr. Clifton W. Bingham
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Mr. Ryan E. Hudson
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Mrs. Sandra R. Pakaski
Mr. John and Mrs. Darlene Tucker
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Dr. Ko-Yang Wang and Dr. G. Yuh-Jiun Lin
Mrs. Karen L. Weedman and
Mr. Mike Culbertson
Mr. Robert and Caryl Wolf
Mr. Gary and Mrs. Leah Wood
Ms. Leslie A. Wortman
Mr. Patrick D. Yates
Ms. Hongdi Zhang
Dr. Stuart and Mrs. Rochelle Zweben

Donor Honor Roll — Corporate

$100,000 and up

Agere Systems
Intel Corporation
International Business Machines
Microsoft Corporation
Tektronix Incorporated
Tellabs Incorporated

$10,000 - $99,999

Boeing Company
Caterpillar Incorporated
Cisco Systems Incorporated
Eli Lilly and Company
Guidant Corporation
Harris Corporation
Hewlett-Packard Company
Lockheed Martin Corporation
Lucent Technologies
Motorola Incorporated
NEC Corporation
Northrop Grumman Corporation
Raytheon Company
Tektronix, Inc.

$1,000 - $9,999

Accenture Ltd.
Baker Hill Corporation
Baxter International Inc.
Beckman Coulter Inc.
Crowe Chizek
D & S Computer Texts, Inc.
Exxon Mobil Corporation
Goodyear Tire and Rubber Company
Honeywell International
Kimberly-Clark Corporation
Mesquite Software, Inc.
Procter & Gamble Company
State Farm Insurance Companies
United Technologies Corporation
Verizon

Under $1,000

Argonne National Laboratory
DaimlerChrysler Corporation
Ford Motor Company
Northern Trust Company
SBC Communications Inc.
Science Applications International Corp
S.C. Johnson & Son Inc.
Shell Oil Company
Southern Company Services Inc.
Starent Networks Corp.
Superior Essex
3M Corporation
Vectren Corporation
Whirlpool Corporation
Xerox Corporation

CS 2003-2004 Faculty Information

Shreeram S. Abhyankar

Education:
B.Sc., Mathematics, Bombay University, *1951*
AM, Mathematics, Harvard University, *1952*
PhD, Mathematics, Harvard University, *1955*

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

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 included 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

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*

Position:
Assistant Professor of Computer Science

Bio-sketch:
Dr. Aliaga joined the department in Fall 2003. His 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. Dr. Aliaga's work into this general problem overlaps with several fields, including:

- computer graphics
- computer vision
- data compression
- robotics
- system building

Over the years, Dr. 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.

Dr. 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 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:

Daniel G. Aliaga, Thomas Funkhouser, Dimah Yanovsky, and Ingrid Carlbom, "Sea of Images: A Dense Sampling Approach for Rendering Large Indoor Environments," *Computer Graphics & Applications, Special Issue on 3D Reconstruction and Visualization*, pp. 22-30, November/December 2003.

Daniel G. Aliaga and Ingrid Carlbom, "Plenoptic Stitching: A Scalable Method for Reconstructing 3D Interactive Walkthroughs," *Proceedings of the ACM SIGGRAPH*, pp. 443-450, 2001.

Daniel G. Aliaga and Anselmo Lastra, "Automatic Image Placement to Provide a Guaranteed Frame Rate," *Proceedings of the ACM SIGGRAPH*, pp. 307-316, 1999.

David C. Anderson

Education:

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

Positions:

Professor of Mechanical Engineering
Professor of Computer Science (Courtesy)

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*.

Dr. Anderson is a Fellow of the ASME.

Alberto Apostolico

Education:

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

Position:

Professor of Computer Science

Bio-sketch:

Professor Apostolico's research interests are in the areas of algorithmic analysis and 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 J. of Bioinformatics Research and Applications*, *Springer-Verlag Lecture Notes on Bioinformatics*, and as guest editor for a special issues of *Algorithmica*, *Information Sciences*, *Journal of Discrete Algorithms*, *PPL,* and*TCS*.

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:

A. Apostolico, M.E. Bock, and S. Lonardi, "Monotony of Surprise and Large Scale Quest for Unusual Words," *Journal of Computational Biology*, Volume 10, No. 3-4, pp. 283-311, 2003.

A. Apostolico, "Pattern Discovery and the Algorithmics of Surprise (Invited Paper)," *Artificial Intelligence and Heuristic Methods for Bioinformatics*, (P. Frasconi and R. Shamir, Editors.) IOS Press, pp. 111-127, 2003.

A. Apostolico and M. Crochemore, "String Pattern Matching for a Deluge Survival Kit (Invited Paper)," *Handbook of Massive Data Sets*, (J. Abello et al, eds.) Kluver Acad. Publishers, 151—194 (2002).

Walid G. Aref

Education:

B.Sc., Computer Science, Alexandria University, Egypt, *1983*
M.Sc., Computer Science, Alexandria University, Egypt, *1986*
PhD, Computer Science, University of Maryland at College Park, *1993*

Position:

Associate Professor of Computer Science

Bio-sketch:

Walid G. Aref is an associate professor of computer science at Purdue. His 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 NSF, 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 on the editorial board of the VLDB Journal and is a member of the ACM and the IEEE.

Selected Publications:

M. A. Hammad, M. J. Franklin, W. G. Aref, and A. K. Elmagarmid, "Scheduling For Shared Window Joins Over Data Streams," *Proceedings of the 29th International Conference on Very Large Data Bases (VLDB 2003)*, pp. 297-308, 2003.

M. F. Mokbel, T. M. Ghanem, and W. G. Aref, "Spatio-temporal Access Methods," *IEEE Data Engineering Bulletin*, Volume 26, No. 2, pp. 40-49, Jun., 2003.

W. G. Aref and I. F. Ilyas, "SP-GiST: An Extensible Database Index for Supporting Space Partitioning Trees," *Journal of Intelligent Information Systems: Special Issue on Scientific and Statistical Database Management*, Volume 17, No. 2/3, pp. 215-240, November 2001.

Mikhail Atallah

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*

Positions:

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

Bio-sketch:

Professor Atallah's current research interests are in information security (in particular, software security, secure protocols, 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 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 was keynote and invited speaker at many national and international meetings. In June 2001, he co-founded Arxan Technologies Inc., a startup in the software security products space, that in 2002 secured funding from a top-tier venture capital firm.

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:

Mikhail J. Atallah and Marina Bykova, "Portable and Flexible Document Access Control Mechanisms," *Proceedings of the 9th European Symposium on Research in Computer Security (ESORICS)*, pp. 193-208, Sophia Antipolis, France, September 2004.

Radu Sion, Mikhail J. Atallah, and Sunil K. Prabhakar, "Resilient Rights Protection for Sensor Streams," *Proceedings of the 30th International Conference on Very Large Data Bases (VLDB 2004)*, pp. 732-743, Toronto, September 2004.

Keith B. Frikken and Mikhail J. Atallah, "Privacy-Preserving Route Planning," *Proceedings of the 3rd. ACM Workshop on Privacy in the Electronic Society (WPES)*, Washington, DC, October 2004.

Saurabh Bagchi

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*

Positions:

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

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. For details of the research projects, take a 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 Performance and Dependability Symposium (IPDS) since 2002. 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 organized a panel on Open Source Software at the International Symposium on Software Reliability Engineering and is the co-organizer of a workshop titled "Dependability Issues in Wireless Ad hoc Networks and Sensor Networks (DIWANS)" at the International Conference on Dependable Systems and Networks (DSN), 2004. 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:

Saurabh Bagchi, Yu-Sung Wu (Purdue U., USA); Sachin Garg, Navjot Singh (Avaya Labs), and Tim Tsai (Sun Microsystems), "SCIDIVE: A Stateful and Cross Protocol Intrusion Detection Architecture for Voice-over-IP Environments," *Proceedings of the IEEE Dependable Systems and Networks Conference (DSN 2004)*, pp. 401-410, Florence, Italy, June 28-July 1, 2004.

Gunjan Khanna, Padma Varadharajan, and Saurabh Bagchi, "Self Checking Network Protocols: A Monitor Based Approach," *Proceedings of the 23rd IEEE Symposium on Reliable Distributed Systems (SRDS 2004)*, pp. 18-30, Florianopolis, Brazil, October 18-20, 2004.

Chris Bailey-Kellogg

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*

Position:

Adjunct Professor of Computer Science

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:

C. Bailey-Kellogg and F. Zhao, "Influence-based Model Decomposition," *Artificial Intelligence*, Volume 130, No. 2, pp. 125-166, 2001.

C. Bailey-Kellogg, J.J. Kelley, III, C. Stein, and B.R. Donald, "Reducing Mass Degeneracy in SAR by MS (Structure-activity Relation by Mass Spectrometry) by Stable Isotopic Labeling," *Journal of Computational Biology*, Volume 8, No. 1, pp. 19-36, 2001.

F. Zhao, C. Bailey-Kellogg, and M. Fromherz, "Physics-based encapsulation in embedded software for distributed sensing and control applications," *Proceedings of the IEEE*, Volume 91, No. 1, pp. 40-63, 2003.

Elisa Bertino

Education:

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

Positions:

Professor of Computer Science
Professor of Electrical and Computer Engineering
Director of Research, CERIAS

Bio-sketch:

Professor Elisa Bertino joined Purdue in January 2004 as professor in Computer Science and research director at CERIAS. Her research interests cover many areas in the fields of information security and database systems. Her research combines both theoretical and practical aspects, addressing applications on 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:

E. Bertino, J.Fan, E.Ferrari, MSHacid, A.Elmagarmid, and X.Zhou, "A Hierarchical Access Control Model for Video Database Systems," *ACM Transactions on Information Systems*, Volume 21, No. 2, pp.155-191, April 2003.

E. Bertino, B.Catania, E. Ferrari, and P. Perlasca, "A Logical Framework for Reasoning About Access Control Models," *ACM Transactions on Information and System Security (TISSEC)*, Volume 6, No.1, pp. 71-127, February 2003.

E.Bertino, E.Ferrari, and A.Squicciarini, "A Peer-to-Peer Framework for Trust Establishment A Peer-to-Peer Framework for Trust Establishment," *IEEE Transactions on Knowledge and Data Engineering*, Volume 16, No. 7, pp. 827-842, July 2004.

Bharat Bhargava

Education:

BS, Mathematics (Honors), Punjab University, *1966*
BE, Electrical and Computer Engineering, Indian Institute of Science, *1969*
PhD, Electrical Engineering, Purdue University, *1974*

Positions:

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

Bio-sketch:

Bharat Bhargava is a professor of the Department of Computer Science with a courtesy appointment in the School of Electrical & Computer Engineering at Purdue University. 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, bio-security, 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.

In 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 in the Purdue's Book of Great Teachers.

He serves on five editorial boards of 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:

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

B. Bhargava, X. Wu, Y. Lu, and W. Wang, "Integrating Heterogeneous Wireless Technologies: A Cellular-assisted mobile ad hoc network," *Mobile Networks and Applications: Special Issue on Integration of Heterogeneous Wireless Technologies*, No. 9, pp. 393-408, 2004.

A. Habib, M. Khan, and B. Bhargava, "Edge-to-Edge Measurement-based Distributed Network Monitoring," *Computer Networks*, Volume 44, Issue 2, pp. 211-233, Feb 2004.

Alok R. Chaturvedi

Education:

B.Sc., 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*

Positions:

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

William S. Cleveland

Education:

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

Positions:

Professor of Statistics
Professor of Computer Science (Courtesy)

Bio-sketch:

William S. Cleveland is a professor of Statistics and courtesy professor of Computer Science at Purdue University. Previously he was a distinguished member of Technical Staff in the Statistics Research Department at Bell Labs, Murray Hill; for 12 of his years at Bell Labs, he was a Department Head.

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 over 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 Probability and Statistics 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:

J. Cao, W. S. Cleveland, Y. Gao, K. Jeffay, F. D. Smith, and M. Weigle, "Stochastic Models for Generating Synthetic HTTP Source Traffic," *IEEE Infocom, 2004.*

J. Cao, W. S. Cleveland, and D. X. Sun, "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*, Volume 12, pp. 865-892, 2003.

J. Cao, W. S. Cleveland, D. Lin, and D. X. Sun, "On the Nonstationarity of Internet Traffic," *ACM SIGMETRICS*, Volume 29, pp. 102-112, 2001.

Christopher W. Clifton

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*

Position:

Associate Professor of Computer Science

Bio-sketch:

Dr. 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, Dr. 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:

Christopher W. Clifton, "Using Sample Size to Limit Exposure to Data Mining," *Journal of Computer Security,* Volume 8, No. 4, IOS Press, November 2000.

Christopher W. Clifton and Wen-Syan Li, "SEMINT: A Tool for Identifying Attribute Correspondences in Heterogeneous Databases Using Neural Networks," *Data and Knowledge Engineering,* Volume 33, No. 1, Elsevier Science, Amsterdam, April 2000.

Murat Kantarcioglu and Chris Clifton, "Privacy Preserving Data Mining of Association Rules on Horizontally Partitioned Data," *Transactions on Knowledge and Data Engineering*, Volume 16, No. 9, pp. 1026-1037, IEEE Computer Society Press, Los Alamitos, CA, September 2004.

Douglas E. Comer

Education:

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

Positions:

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

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 networking 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 ground breaking textbooks on computer networks, the Internet, and computer operating systems. His books have been translated into sixteen 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 fifteen of the top sixteen Computer Science Departments listed in the *U.S. News and 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 over fifteen 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.

H. E. Dunsmore

Education:

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

Position:

Associate Professor of Computer Science

Bio-sketch:

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

Dr. 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.

Dr. 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. Dr. 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, Dr. Dunsmore was selected as one of three Outstanding Indiana Information Technology Educators by the Indiana Information Technology Association (INITA).

Dr. Dunsmore has extensive legal and industrial consulting experience. He has written over 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

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*

Positions:

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

Ahmed K. Elmagarmid

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*

Position:

Professor of Computer Science

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 over 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:

M. A. Hammad, M. J. Franklin, W. G. Aref, and A. K. Elmagarmid, "Scheduling for Shared Window Joins Over Data Streams," *Proceedings of the 29th International Conference on Very Large Data Bases (VLDB 2003)*, pp. 297-308, 2003.

I. F. Ilyas, W. G. Aref, and A. K. Elmagarmid, "Supporting Top-k Join Quereis in Relational Databases," *Proceedings of the 29th International Conference on Very Large Databases (VLDB 2003)*, pp. 754-765, Berlin, Germany.

E. Bertino, T. Catarci, A. K. Elmagarmid, and M-S, "Hacid: Quality of Service Specification in Video Databases," *IEEE Multimedia*, Volume 10, No. 4, pp. 71-81, October/December 2003.

Sonia Fahmy

Education:

B.Sc., 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*

Position:

Assistant Professor of Computer Science

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 over 50 papers, including publications in *IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, Computer Networks, IEEE INFOCOM, IEEE ICNP, IEEE IWQoS, 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 has served on the organizing or technical program committees of IEEE INFOCOM, ICNP, ICDCS, ICC, GLOBECOM, ICPP, Hot Interconnects, and IPCCC, and co-chaired the first SPIE conference on scalability and traffic control in IP networks in 2001. She is a member of the ACM, IEEE, Phi Kappa Phi, Sigma Xi, and Upsilon Pi Epsilon.

Selected Publications:

S. Fahmy and M. Kwon, "Characterizing Overlay Multicast Networks," *Proceedings of the IEEE International Conference on Network Protocols (ICNP)*, pp. 61-70, November 2003.

S. Kalyanaraman, R. Jain, S. Fahmy, R. Goyal and B. Vandalore, "The ERICA Switch Algorithm for ABR Traffic Management in ATM Networks," *IEEE/ACM Transactions on Networking*, Volume 8, No. 1, pp. 87-98, February 2000.

O. Younis and S. Fahmy, "Distributed Clustering in Ad-hoc Sensor Networks: A Hybrid, Energy-Efficient Approach," *Proceedings of the IEEE INFOCOM*, March 2004.

Greg N. Frederickson

Education:

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

Position:

Professor of Computer Science

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.

Selected Publications:

Greg N. Frederickson, "Ambivalent data structures for dynamic 2-edge-connectivity and k smallest spanning trees," *SIAM Journal on Computing*, Volume 26, pp. 484-538, 1997.

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

Greg N. Frederickson and Roberto Solis-Oba, "Increasing the weight of minimum spanning trees," *Journal of Algorithms*, Volume 33, pp. 244-266, 1999.

Walter Gautschi

Education:
PhD, Computer Science, University of Basel, *1953*

Positions:
Professor Emeritus of Computer Science
Professor Emeritus of Mathematics

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:
W. Gautschi, "Orthogonal Polynomials: Applications and Computations," *Acta Numerica*, (A. Iserles, Editor) Cambridge University Press, Cambridge, pp. 45-119, 1996.

W. Gautschi, "The Incomplete Gamma Functions Since Tricomi," *Tricomi's Ideas and Contemporary Applied Mathematics*, pp. 203-237, Atti dei Convegni Lincei, No. 147, Accademia Nazionale dei Lincei, Roma, 1998.

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

Ananth Grama

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

Position:
Associate Professor of Computer Science

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 clus-

tered 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 a text book *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.

Selected Publications:

Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, "Introduction to Parallel Computing," *Addison Wesley*, 2003.

Sreekanth Sambavaram, Vivek Sarin, Ahmed Sameh, and Ananth Grama, "Multipole-Based Preconditioners for Large Sparse Linear Systems," *Parallel Computing*, Volume 29, No. 9, pp. 1261-1273, September 2003.

Mehmet Koyuturk and Ananth Grama, "Proximus: A Framework for Analyzing Very High Dimensional Discrete-Attributed Datasets," *ACM SIGKDD*, 2003.

Michael Gribskov

Education:

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

Positions:

Professor of Biological Sciences
Professor of Computer Science (Courtesy)

Bio-sketch:

Dr. 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, Dr. 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, Dr. 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., Harper, J.F., and Gribskov, M., "Systematic trans-genomic comparison of protein kinases between Arabidopsis thaliana and Saccharomyces cerevisiae," *Plant Physiology* Volume 132, pp. 2152-2165, 2003.

Nair, T.M., Zheng, C.L., Fink, J.L, Stuart, R.O., and Gribskov, M., "Rival penalized competitive learning (RPCL): a topology determining algorithm for analyzing gene-expression data," *Computational Biology and Chemistry*, 27, pp. 563-574, 2003.

Zheng,s C.L., de Sa, V.R., Gribskov, M., and Nair, T.M., "On selecting features from splice junctions: An analysis using information theoretic and machine learning approaches," *Genome Informatics*, Volume 14, pp. 73-83, 2003.

Susanne E. Hambrusch

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

Positions:
Department Head
Professor of Computer Science

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 serves as the head of the Department of Computer Science (since July 2002).

Selected Publications:
Mohamed Mokbel, Xiaopeng Xiong, Walid Aref, Susanne Hambrusch, Sunil Prabhakar, and Moustafa Hammad, "PLACE: A Query Processor for Handling Real-time Spatio-temporal Data Streams," *Proceedings of the 13th International Conference on Very Large Data Bases (VLDB)*, pp. 1377-1380, 2004.

Ashfaq A. Khokhar, Susanne Hambrusch, and Erturk Kocalar, "Termination Detection in Data-Driven Parallel Computations/Applications," *Journal of Parallel and Distributed Computing*, Volume 63, No. 3, pp. 312-326, 2003.

S.E. Hambrusch and C.-M. Liu, "Data Replication for Static Tree Structures," *Information Processing Letters*, Volume 86, No. 4, pp. 197-202, 2003.

Christoph M. Hoffmann

Education:
PhD, University of Wisconsin, *1974*

Positions:
Professor of Computer Science
Codirector, Computing Research Institute
Codirector, PLM Center of Excellence

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:

C. M. Hoffmann and W. Yang, "Compliant Motion Constraints," *Proceedings of the 6th Asian Symposium on Computer Mathematics (ASCM 2003)*, Beijing 2003.

X.-S. Gao, C. M. Hoffmann, and W. Yang, "Solving Spatial Basic Geometric Constraint Configurations with Locus Intersection," *Computer-Aided Design* 2003.

Jun Wu, Sherry L Voytik-Harbin, David L. Filmer, Christoph M. Hoffman, Bo Yuan, Ching-Shoei Chiang, Jennis Sturgis, and Joseph P. Robinson, "Modeling ECM Fibre Formation: Structure Information Extracted by Analysis of 2D and 3D Image Sets," *Proceedings of the Society of Photo-Optical Instrumentation Engineers (SPIE)*, Volume 4621, pp. 52-56, San Diego, CA, Spring 2002.

Antony Hosking

Education:

B.Sc., Mathematical Sciences, University of Adelaide, *1985*
M.Sc., Computer Science, University of Waikato, *1987*
PhD, Computer Science, University of Massachusetts, *1995*

Position:

Associate Professor of Computer Science

Bio-sketch:

Dr. 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:

M. Hirzel, A. Diwan, and A. Hosking, "On the Usefulness of Liveness for Garbage Collection and Leak Detection," *Proceedings of the 15th European Conference on Object Oriented Programming*, Budapest, Hungary, pp. 181-206, June 2001.

D. Whitlock and A. Hosking, "A Framework for Persistence-Enabled Optimization of Java Object Stores," *Proceedings of the Ninth International Workshop on Persistent Object Systems* G.N.C. Kirby (editor), Lillehammer, Norway, pp. 4-18, September 2000. Lecture Notes in Computer Science 2135, Springer-Verlag, 2001.

A. Hosking, N. Nystrom, D. Whitlock, Q. Cutts, and A. Diwan, "Partial Redundancy Elimination for Access Expressions," *Software - Practice and Experience*, Volume 31, 6, pp. 577-600, May 2001.

Elias N. Houstis

Education:

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

Position:

Professor of Computer Science

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 environment, and recommender system for mathematical software. He has published several books and over 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

Education:

BS, Computer Science, University of Science and Technology of China, *1989*
MS, Computer Science, Yale University, *1992*
M. Phil., Computer Science, Yale University, *1992*
PhD, Computer Science, Harvard University, *1997*

Positions:

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

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 over 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 is a vice chair for the 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:

Chris Gniady, Y. Charlie Hu, and Yung-Hsiang Lu, "Program Counter Based Techniques for Dynamic Power Management," *Proceedings of the 10th International Symposium on High-Performance Computer Architecture (HPCA-10)*, Madrid, Spain, February 14-18, 2004.

Y. Charlie Hu, Saumitra M. Das, and Himabindu Pucha, "Exploiting the Synergy between Peer-to-Peer and Mobile Ad Hoc Networks," *Proceedings of the HotOS-IX: Ninth Workshop on Hot Topics in Operating Systems*, Lihue, Kauai, Hawaii, May 18-21, 2003.

Y. Charlie Hu, Weimin Yu, Alan Cox, Dan Wallach, and Willy Zwaenepoel, "Runtime Support for Distributed Sharing in Safe Languages," *ACM Transactions on Computer Systems*, Volume 21, No. 1, pp. 1-35, February 2003.

Suresh Jagannathan

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*

Positions:

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

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.

His 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:

Adam Welc, Suresh Jagannathan, and Antony Hosking, "Transactional Monitors for Concurrent Objects," *European Conference on Object-Oriented Programming* (2004).

Jan Vitek, Suresh Jagannathan, Adam Welc, and Antony Hosking, "A Semantic Framework for Designer Transactions," *European Symposium on Programming* (2004).

Suresh Jagannathan, "Continuation-Based Transformations for Coordination Languages," *Theoretical Computer Science* (2000).

Daisuke Kihara

Education:

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

Positions:

Assistant Professor of Computer Science
Assistant Professor of Biological Sciences

Bio-sketch:

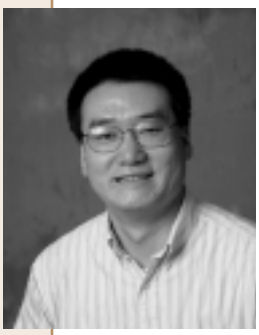
Dr. Kihara's research interest is in the area of bioinformatics. In the last decade, a large amount of biological data, such as genome/protein sequences, protein 3D structures, and pathway data have become available. This data now enables us to employ comprehensive analysis of relationship between protein sequence, structure and function, evolution of protein families, pathways, and organisms. Especially, 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. He has worked recently on protein structure prediction and comparison, development of prediction method of transmembrane proteins, and its application to genome sequences.

Selected Publications:

Daisuke Kihara and Jeffrey Skolnick, "The PDB is a covering set of small protein structures," *Journal of Molecular Biology*, Volume 334 pp. 793-802, 2003.

Daisuke Kihara, Yang Zhang, Hui Lu, Andrzej Kolinski, and Jeffrey Skolnick, "Ab initio Protein Structure Prediction on a Genomic Scale: Application to the Mycoplasma genitalium Genome," *Proceedings of the National Academy of Sciences of the United States of America*, Volume 99: pp. 5993-5998, 2002.

Daisuke Kihara, Hui Lu, Andrzej Kolinski, and Jeffrey Skolnick, "TOUCHSTONE: An ab initio Protein Structure Prediction Method that Uses Threading-based Tertiary Restraints," *Proceedings of the National Academy of Sciences of the United States of America*, Volume 98: pp. 10125-10130, 2001.



Ninghui Li

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*

Position:

Assistant Professor of Computer Science

Bio-sketch:

Professor Ninghui Li joined Purdue in August 2003 as an assistant professor in Computer Sciences. His 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. One focus of Professor Li's work is on trust management, which is an approach to access control in decentralized, open, and distributed systems. He has 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 is co-PI of a recently-funded mid-size NSF ITR project titled "Automated Trust Negotiation in Open Systems" (2003-2008). Automated Trust Negotiation (ATN) is an approach to regulate the exchange of sensitive credentials by using access-control policies. He has been working with Professors Will Winsborough and Kent Seamons on ATN, using the RT family of trust-management languages.

Together with Professors Dan Boneh and Wenliang Du, Professor Li introduced a cryptographic primitive called oblivious signature-based envelope (OSBE) and developed an efficient and provably secure OSBE protocol for credentials signed using RSA signatures. OSBE enables the sender to send an encrypted message to the receiver such that the receiver can decrypt if and only if it possesses the signature on a predetermined message, yet the sender does not learn whether the receiver has the signature or not.

Before joining Purdue, Professor Li was a research associate for the Computer Science Department at Stanford University. He has served on the program Committees for the ACM Conference on Computer and Communications Security, IEEE Computer Security Foundations Workshop, and International Conference on Trust Management, and has reviewed papers for a number of international journals and conferences.

Selected Publications:

Ninghui Li, William H. Winsborough, and John C. Mitchell, "Beyond Proof-of-compliance: Safety and Availability Analysis in Trust Management," *Proceedings of the 2003 IEEE Symposium on Security and Privacy*.

Ninghui Li, Wenliang Du, and Dan Boneh, "Oblivious Signature-Based Envelope," *Proceedings of the 22nd ACM Symposium on Principles of Distributed Computing (PODC 2003)*.

Ninghui Li, Benjamin N. Grosof, and Joan Feigenbaum, "Delegation Logic: A Logic-based Approach to Distributed Authorization," *ACM Transactions on Information and System Security (TISSEC)*, Volume 6, No. 1, February 2003.

Zhiyuan Li

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*

Positions:

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

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:

Junjie Gu and Zhiyuan Li, "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*, Volume 26, No. 3, pp. 244-26, March 2000.

Cheng Wang and Zhiyuan Li, "Parametric Analysis For Adaptive Computation Offloading," *Proceedings of the ACM SIGPLAN 2004 Conference on Programming Language Design and Implementation (PLDI)*, pp. 119-130, Washington, DC, June 9-11, 2004.

Cheng Wang and Zhiyuan Li, "A Compiler Scheme For Computation Offloading on Wireless-Networked Handheld Devices," *Journal of Parallel and Distributed Computing*, Volume 64, No. 6, pp. 740-746, June, 2004.

Yung-Hsiang Lu

Education:

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

Positions:

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

Bio-sketch:

Dr. Lu's research is developing energy-efficient computing systems. His work focuses on architecture and operating system techniques for power management. The applications include distributed sensor networks, autonomous robots, wireless communication, and real-time systems. He received the Career Award from National Science Foundation in 2004 for developing advanced energy management in operating systems.

Selected Publications:

Nathaniel Pettis, Le Cai, and Yung-Hsiang Lu, "Dynamic Power Management for Streaming Video," *International Symposium on Low Power Electronics and Design 2004*, pp. 62-65.

Yung-Hsiang Lu, Luca Benini, and Giovanni De Micheli, "Dynamic Frequency Scaling with Buffer Insertion for Mixed Workloads," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, Volume 21, No. 11, pp. 1284-1305, November 2002.

Yung-Hsiang Lu, Luca Benini, and Giovanni De Micheli, "Power-Aware Operating Systems for Interactive Systems," *IEEE Transactions on Very Large Scale Integration Systems*, Volume 10, No. 2, pp. 119-134, April 2002.

CS 2003-2004 Faculty Information

Bradley J. Lucier

Education:

B.Sc., Mathematics, University of Windsor, *1976*
SM, Applied Mathematics, University of Chicago, *1978*
PhD, Applied Mathematics, University of Chicago, *1981*

Position:

Professor of Mathematics and Computer Science

Bio-sketch:

Professor Lucier has worked for over ten 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:

Antonin Chambolle, Ronald A. DeVore, Namyong Lee, and Bradley J. Lucier, "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*, Volume 7, pp. 319-335, 1998.

Antonin Chambolle and Bradley J. Lucier, "Interpreting Translation-Invariant Wavelet Shrinkage as a New Image Smoothing Scale Space," *Transactions on Image Processing*, Volume 10, pp. 993-1000, 2001.

Namyong Lee and Bradley J. Lucier, "Wavelet Methods for Inverting the Radon Transform with Noisy Data," *IEEE Transactions on Image Processing*, Volume 10, pp. 79-94, 2001.

Robert E. Lynch

Education:

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

Position:

Professor Emeritus of Computer Science and Mathematics

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

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*

Positions:

Professor of Computer Science
Associate Dean, Graduate Education, School of Science

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:

Joao Cangussu, Raymond DeCarlo, and Aditya P. Mathur, "A Formal Model of the Software Test Process," *IEEE Transactions on Software Engineering*, Volume 28, No. 8, pp. 782-796, August 2002.

Aditya P. Mathur, Baskar Sridharan, and Steven G. Unger, "Digital Device Manuals for the Management of Connected Spaces," *IEEE Communications Magazine*, Volume 40, No. 8, pp. 78-85, August 2002.

Joao Cangussu, Raymond DeCarlo, and Aditya P. Mathur, "Using Sensitivity Analysis to validate a State Variable Model of the Software Test Process," *IEEE Transactions on Software Engineering*, Volume 29, No. 5, pp. 430-443, 2003.

Cristina Nita-Rotaru

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*

Position:

Assistant Professor of Computer Science

Bio-sketch:

Cristina Nita-Rotaru joined Purdue in 2003, where she conducts her research within the Dependable and Secure Distributed Systems Laboratory (DS^2).

Cristina Nita-Rotaru's 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
• 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), by the Defense Advanced Research Projects Agency (DARPA), and by the National Science Foundation (NSF).

Selected Publications:

Y. Amir, Y. Kim, C. Nita-Rotaru, and G. Tsudik, "On the Performance of Group Key Agreement Protocols," *ACM Transactions on Information and System Security (TISSEC)*, Volume 7, No. 3, August 2004.

B. Awerbuch, D. Holmer, C. Nita-Rotaru, and H. Rubens, "An On-Demand Secure Routing Protocol Resilient to Byzantine Failures," *Proceedings of the ACM workshop on Wireless security (WiSe)*, Atlanta, Georgia, September 28, 2002.

Y. Amir, Y. Kim, C. Nita-Rotaru, J. Schultz, J. Stanton, and G.Tsudik, "Secure Group Communication Using Robust Contributory Key Agreement," *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, Volume 15, No. 5, pp. 468-480, May 2004.

Jens Palsberg

Education:

M.Sc., Computer Science and mathematics, University of Aarhus, Denmark, *1988*
PhD, Computer Science, University of Aarhus, Denmark, *1992*

Position:

Adjunct Professor of Computer Science

Bio-sketch:

Jens Palsberg is a Professor of Computer Science at UCLA and an Adjunct Professor of Computer Science at Purdue University. From 1992-1996 he was a visiting scientist at various institutions, including MIT. He was an Associate Professor of Computer Science at Purdue University from 1996-2002 and, from 2002-2003, Professor and Associate Head of Computer Science at Purdue University. His research interests span the areas of compilers, embedded systems, programming languages, software engineering, and information security. He has authored over 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. Dr. Palsberg's research has also been supported by DARPA, IBM, Intel, and British Telecom. Dr. Palsberg 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 is serving as the general chair of the ACM Symposium on Principles of Programming Languages in 2005, he 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, and he has been a member of more than 40 other conference program committees.

Selected Publications:

Jens Palsberg and Christina Pavlopoulou, "From Polyvariant Flow Information to Intersection and Union Types," *Journal of Functional Programming*, Volume 11, No. 3, pp. 263-317, May 2001Preliminary Version in *Proceedings of POPL'98 25th Annual SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, San Diego, California, pages 197-208, January 1998.

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

Dennis Brylow, Niels Damgaard, and Jens Palsberg, "Static Checking of Interrupt-driven Software," *Proceedings of the ICSE 2001, 23rd International Conference on Software Engineering*, pp. 47-56, Toronto, May 2001.

Gopal Pandurangan

Education:

B.Tech., 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*

Position:

Assistant Professor of Computer Science

Bio-sketch:

Professor Pandurangan's research interests are broadly in design and analysis of algorithms (both theoretical and experimental). He is especially interested in stochastic analysis of dynamic computer phenomena and associated algorithmic problems, randomized algorithms, and probabilistic analysis of algorithms.

Professor Pandurangan is currently working on algorithmic and modeling problems that arise in the following application areas: Peer-to-Peer (P2P) Computing, Communication Networks (especially wireless ad hoc networks), Web Measurement and Modeling, Computational Biology, and Bioinformatics.

Selected Publications:

S. Chainraj, C. Bailey-Kellogg, and G. Pandurangan, "A Random Graph Approach to NMR Sequential Assignment," *Proceedings of the 8th Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, 2004.

G. Pandurangan, P. Raghavan, and E. Upfal, "Building Low-Diameter Peer-to-Peer Networks," *IEEE Journal on Selected Areas in Communications (JSAC)*, Volume 21, No. 6, pp. 995-1002, August 2003.

G. Pandurangan and H. Ramesh, "The Restriction Mapping Problem Revisited," *Journal of Computer and System Sciences: Special Issue on Computational Biology* (invited paper), Volume 65, pp. 526-544, 2002.

CS 2003-2004 Faculty Information

Kihong Park

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

Position:
Associate Professor of Computer Science

Bio-sketch:
Professor Park's research centers on design and control issues in high-speed multimedia networks, including quality of service provisioning architectures, congestion control, distributed scheduling, and the facilitation of adaptive, fault-tolerant computing on large-scale distributed systems.

He has over 40 technical publications, and has edited a book *Self-Similar Network Traffic and Performance Evaluation* (co-editor: Dr. Walter Willinger) published by Wiley-Interscience, 2000. His thesis, entitled "Ergodicity and Mixing Rate of One-Dimensional Cellular Automata" (advisor: Dr. Peter Gacs), was on a problem in theoretical probability going back to von Neumann, with applications to fault-tolerance and reliability in large scale systems such as the Internet.

Dr. Park was a Presidential University Fellow at Boston University; is a recipient of the NSF CAREER Award; is a Fellow-at-Large of the Santa Fe Institute, has served on several international program committees, NSF panels, and is a member of ACM and IEEE. He serves on the editorial boards of *IEEE Communications Letters* and *Computer Networks* as associate editor.

In 2001, he organized an SFI/NSF Workshop titled "The Internet as a Large-Scale Complex System" (co-chair: Dr. Walter Willinger), March 29-31, held at the Santa Fe Institute, and a SPIE Conference titled "Scalability and Traffic Control in IP Networks" (co-chair: Dr. Sonia Fahmy), August 20-24, at the Colorado Convention Center in Denver.

Selected Publications:
K. Park and H. Lee, "On the Effectiveness of Route-based Packet Filtering for Distributed DoS Attack Prevention in Power-law Internets," *Proceedings of the ACM SIGCOMM 2001*, pp. 15-26, 2001.

K. Park and T. Tuan, "Performance Evaluation of Multiple Time Scale TCP Under Self-Similar Traffic Conditions," *ACM Transactions on Modeling and Computer Simulation*, Volume 24, pp. 152-177, 2000.

K. Park and W. Willinger (eds.), "Self-Similar Network Traffic and Performance Evaluation," *Wiley-Interscience*, 2000.

Voicu S. Popescu

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*

Position:
Assistant Professor of Computer Science

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, hand-held 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:

Voicu Popescu and Anselmo Lastra, "The Vacuum Buffer," *Proceedings of the 2001 ACM Symposium on Interactive 3D Graphics (Chapel Hill, NC)*, 2001.

Voicu Popescu, John Eyles, Anselmo Lastra, Joshua Steinhurst, Nick England, and Lars Nyland, "The WarpEngine: An Architecture for the Post-Polygonal Age," *Proceedings of the SIGGRAPH 2000 (New Orleans, La)*, pp. 433-442, July 23-28, 2000.

Voicu S. Popescu, Anselmo A. Lastra, Daniel G. Aliaga, and Manuel de Oliveira Neto, "Efficient Warping for Architectural Walkthroughs using Layered Depth Images," *Proceedings of the IEEE Visualization 1998*, pp. 211-215, Oct 18-23, 1998.

Sunil Prabhakar

Education:

B.Tech., Electrical Engineering, Indian Institute of Technology, *1990*
MS, Computer Science, University of California, *1998*
PhD, Computer Science, University of California, *1998*

Position:

Associate Professor of Computer Science

Bio-sketch:

Dr. 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. Dr. Prabhakar's interest also lies 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, Dr. Prabhakar held a position with Tata Unisys Ltd. from 1990 to 1994.

Selected Publications:

R. Cheng, D. Kalashnikov, and Sunil Prabhakar, "Evaluating Probabilistic Queries over Imprecise Data," *Proceedings of the ACM International Conference on Management of Data (SIGMOD 2003)* pp. 551-562, San Diego, California, June 2003.

R. Sion, M. J. Atallah, and Sunil Prabhakar, "Rights Protection for Relational Data," *Proceedings of the ACM International Conference on Management of Data (SIGMOD 2003)* pp. 98-109, San Diego, California, June 2003.

Sunil Prabhakar, Y. Xia, D. Kalashnikov, W. Aref, and S. E. Hambrusch, "Query Indexing and Velocity Constrained Indexing: Scalable Techniques for Continuous Queries on Moving Objects," *IEEE Transactions on Computers*, Volume 51, No. 10, pp. 1124-1140, October 2002.

Vernon J. Rego

Education:

M.Sc., Mathematics, Birla Institute of Technology and Science, *1979*
MS, Computer Science, Michigan State University, *1982*
PhD, Computer Science, Michigan State University, *1985*

Position:

Professor of Computer Science

Bio-sketch:

Vernon Rego directs research in the Parallel Computation and Simulation Laboratory (PacsLab) in Purdue's computer sciences department. 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

Education:

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

Positions:

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

Bio-sketch:

Professor Rice is founder of the 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), *Enabling Technologies for Computational Science* (Kluwer,

2000). He also has published about 300 scientific articles. The most recent twenty-five 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.

In addition to the projects appearing in the Research Funding section, 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

Education:

BS, Mathematics and Computer Science, Carnegie-Mellou University, *1982*
S.M., Computer Science, Massachusetts Institute of Technology, *1985*
PhD, Computer Science, Massachusetts Institute of Technology, *1988*

Position:

Professor of Computer Science

Bio-sketch:

Dr. 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 for a while. He is also 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. Dr. Sacks is also the director of the Visualization Center.

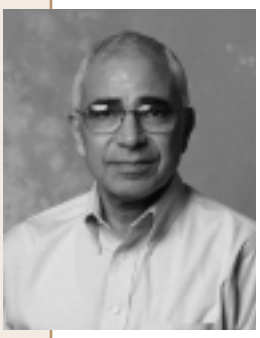
Selected Publications:

Min-Ho Kyung and Elisha Sacks, "Parameter Synthesis of Higher Kinematic Pairs," *Computer-Aided Design*, Volume 35, No. 1, 2003.

Elisha Sacks, "Path Planning for Planar Articulated Robots using Configuration Spaces and Compliant Motion," *IEEE Transactions on Robotics and Automation*, Volume 19, No. 3, 2003.

Voicu Popescu, Elisha Sacks, and Gleb Bahmutov, "The ModelCamera: A Hand-Held Device for Interactive Modeling," *Proceedings of the Fourth International Conference on Digital Imaging and Modeling*, Banff, 2003.

CS 2003-2004 Faculty Information



Ahmed Sameh

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

Position:
Samuel D. Conte Professor of Computer Science

Bio-sketch:
Ahmed Sameh is the Samuel D. Conte Professor of Computer Science. His 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 for the Department of Computer Science at the University of Illinois at Urbana-Champaign, from 1968 to 1991, and 1992-93. 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:
S. Kilic, F. Saied, and A. Sameh, "Efficient iterative solvers for structural dynamics problems," *Computers & Structures*, Volume 82, No. 28, pp. 2363-2375, 2004.

A. Baggag and A. Sameh, "A nested iterative scheme for indefinite linear systems in particulate flows," *Computer Methods in Applied Mechanics and Engineering*, Vol 193, pp. 1923-1957, 2004.

S. Sambavaram, V. Sarin, A. Sameh, and A. Grama, "Multipole-Based Preconditioners for Large Sparse Linear Systems," *Parallel Computing*, Volume 29, No. 9, pp. 1261-1273, September 2003.

Ness B. Shroff

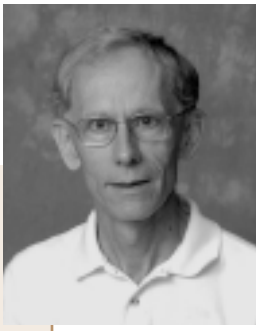
Education:
BSEE, Univeersity of Southern California, *1988*
MSEE, University of Pennsylvania, *1990*
MPhil, Columbia University, *1993*
PhD, Columbia University, *1994*

Positions:
Professor of Computer Science (Courtesy)
Professor of Electrical and Computer Engineering

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 various 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.

Dr. 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, CA), the panel co-chair for ACM Mobicom'02 (Atlanta, GA), program co-chair for the symposium on high-speed networks, Globecom 2001 (San Francisco, CA), and conference chair for the 14th Annual IEEE Computer Communications Workshop (Estes Park, CO). 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 Network* journal's best paper award for the year 2003.



Robert D. Skeel

Education:

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

Positions:

Professor of Computer Science
Professor of Mathematics (Courtesy)

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. Current research of Professor Skeel 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. Professor Skeel has previously 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 a textbook *Elementary Numerical Computing with Mathematica*.

Selected Publications:

G. Zou and R.D. Skeel, "Robust biased Brownian dynamics for rate constant calculation," *Biophysical Journal* Volume 85, pp. 2147-2157, 2003.

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

R.D. Skeel and K. Srinivas, "Nonlinear stability analysis of area-preserving integrators," *SIAM. J. Numer. Anal.*, Volume 38, 2000, 129-148.

CS 2003-2004 Faculty Information

Eugene H. Spafford

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*

Positions:

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

Bio-sketch:

Dr. 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 of 2000, Dr. 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 medal for "Meritorious Civilian Service" 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 Outstanding Undergraduate Teaching Award in Memory of Charles B. Murphy, a Fellow of the Purdue Teaching Academy, and 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 infosec education.

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

Selected Publications:

B. D. Joshi, Walid G. Aref, Arif Ghafoor, and Eugene H. Spafford, "Security Models of Web-Based Applications," *Communications of the ACM*, Volume 44, No. 2, pp. 38-44, 2001.

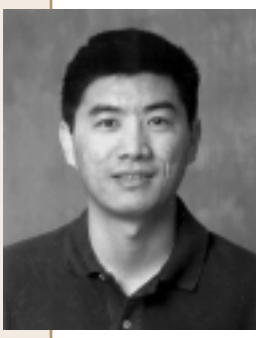
Florian Kirschbaum, Eugene H. Spafford, and Diego Zamboni, "Embedded Sensors and Detectors for Intrusion Detection," *Journal of Computer Security*, Volume 10, No. 1/2, pp. 23-70, 2002.

Brian Carrier and Eugene H. Spafford, "Getting Physical with the Digital Investigation Process," *International Journal of Digital Evidence*, Volume 2, No. 2, 2003.

John M. Steele

Position:
Associate Professor Emeritus of Computer Science

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



Yinlong Sun

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

Position:
Assistant Professor of Computer Science

Bio-sketch:
Dr. Sun is an assistant professor in areas of computer graphics, scientific visualization, and computational imaging. His current researches include spectrally-based realistic image synthesis, physical modeling of complex illumination, realistic volume rendering, and interactive 3D flow visualization. In addition, he is actively conducting cross-disciplinary researches in biomedical imaging and computational neuroscience. At Purdue, he has set up a Photometric Imaging Lab to measure real spectra of lights and materials as well as spectral BRDFs. He has developed software to manage and design spectral data for applications in computer graphics and color engineering. He is a member of ACM, IEEE and IS&T.

Selected Publications:
Yinlong Sun, Bartek Rajwa, and J. Paul Robinson, "Adaptive Image-Processing Technique and Effective Visualization of Confocal Microscopy Images," *Microscopy Research and Techniques*, Volume 64, pp. 156-163, 2004.

Yinlong Sun, "Self Shadowing and Local Illumination of Randomly Rough Surfaces," *Proceedings of the Computer Vision and Pattern Recognition (CVPR)*, pp. 158-165, 2004.

Yinlong Sun, F. David Fracchia, Mark S. Drew, and Thomas W. Calvert, "A Spectrally Based Framework for Realistic Image Synthesis," *The Visual Computer* Volume 17, No. 7, pp. 429-444, 2001.

Wojciech Szpankowski

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

Positions:
Professor of Computer Science
Professor of Electrical and Computer Engineering (Courtesy)

Bio-sketch:

Before coming to Purdue, Wojciech Szpankowski was assistant professor at the Technical University of Gdansk, and in 1984 he was assistant professor at the 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 & 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:

P. Jacquet and W. Szpankowski, "A Combinatorial Problem Arising in Information Theory: Precise Minimax Redundancy for Markov Sources," *Proceedings of the 2nd Colloquium on Mathematics and Computer Science: Algorithms, Trees, Combinatorics and Probabilities*, pp. 311-328, Birkhauser, 2002.

P. Flajolet and W. Szpankowski, "Analytic Variations on Redundancy Rates of Renewal Processes," *IEEE Transactions on Information Theory*, Volume 48, pp. 2911-2921, 2002.

C. Knessl and W. Szpankowski, "Height of a Binary Search Tree: The Limiting Distribution Perspective," *Theoretical Computer Science*, volume 289, pp. 649-703, 2002.

T. N. Vijaykumar

Education:

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

Positions:

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

Jan Vitek

Education:

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

Position:

Assistant Professor of Computer Science

Bio-sketch:

Professor Vitek is working in foundations and implementation of computer programming languages and 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.

Dr. Vitek was born in Czechoslovakia and educated in Switzerland. He has authored over 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. Dr. Vitek is a member of CERIAS.

Selected Publications:

P. Sewell and J. Vitek, "Secure Composition of Untrusted Code: Wrappers and Causality Types," *Proceedings of the 13th IEEE Computer Security Foundations Workshop (CSFW-13)*, Cambridge, U.K., July 2000.

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

C. Bryce, M. Orial, and J. Vitek, "A Coordination Model for Agents Based on Secure Spaces," *Proceedings of the 3rd International Conference on Coordination Models and Languages (COORDINATION 99)*, LNCS 1594, Amsterdam, Netherlands, Springer-Verlag, Berlin, April 1999.

Jeffrey S. Vitter

Education:

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

Positions:

Frederick L. Hovde Dean of the School of Science
Professor of Computer Science

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 current-

ly working on compressed indexes for long sequences of symbols, such as text. A recent theoretical breakthrough he worked on shows how to fully compress text and make it self-indexing at the same time. Experiments have proven the technique to be quite practical.

Honors & 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:

L. Lim, M. Wang, and J. S. Vitter, "SASH: A Self-Adaptive Histogram Set for Dynamically Changing Workloads," *Proceedings of the 29th International Conference on Very Large Data Bases (VLDB 2003)*, Berlin, Germany, September 2003.

D. T. Hoang and J. S. Vitter, "Efficient Algorithms for MPEG Video Compression," *John Wiley & Sons*, New York, NY, 2002.

R. Grossi, A. Gupta, and J. S. Vitter, "High-Order Entropy-Compressed Text Indexes," *Proceedings of the 14th Annual SIAM/ACM Symposium on Discrete Algorithms (SODA 2003)*, Baltimore, MD, January 2003.

Samuel S. Wagstaff, Jr.

Education:

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

Position:

Professor of Computer Science

Bio-sketch:

Before coming to Purdue, Professor Wagstaff taught at the Universities of Rochester, Illinois, and 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, 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) (See http://www.ams.org/online_bks/conm22) and *Cryptanalysis of Number Theoretic Ciphers,* CRC Press, 2002.

Selected Publications:

Samuel S. Wagstaff, "Prime numbers with a fixed number of one bits or zero bits in their binary representation," *Experimental Mathematics*, Volume 10 (2001), pp. 267-273.

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

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

Dongyan Xu

Education:

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

Positions:

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

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.

Especially, his group has been investigating runtime environment virtualization models and technologies for shared distributed infrastructures. The goal is to protect a shared infrastructure from un-trusted 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 Year 2000 recipient of 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:

X. Jiang and D. Xu, "SODA: a Service-On-Demand Architecture for Application Service Hosting Utility Platforms," *Proceedings of the 12th IEEE International Symposium on High Performance Distributed Computing (HPDC-12)*, Seattle, Washington, June 2003.

X. Jiang and D. Xu, "Collapsar: A VM-Based Architecture for Network Attack Detention Center," *Proceedings of the 13th USENIX Security Symposium (Security 2004)*, San Diego, CA, August 2004.

D. Xu and X. Jiang, "Towards an Integrated Multimedia Service Hosting Overlay," *Proceedings of the ACM Multimedia 2004*, New York, NY, October 2004.

CS 2003-2004 Faculty Information

David K. Y. Yau

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*

Positions:

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

Bio-sketch:

David Yau is Associate Professor of Computer Science and Electrical and Computer Engineering (by courtesy). His research interests are in network and operating system quality of service, network security, value-added services routers, and mobile wireless networks. A major goal is to improve the robustness and predictability of complex large-scale networks for heterogeneous applications.

Dr. Yau has been invited to serve as a 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 and has served on the program committee of many leading ACM and IEEE conferences in networking.

David currently holds 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. As a graduating senior, he represented the graduating class to meet with the governor of Hong Kong. Prior to academia, he was employed as management associate and then assistant manager at Citibank, NA.

Selected Publications:

Siu F. Yeung, John C. S. Lui, and David K. Y. Yau, "A Case for a Multi-key Secure Video Proxy: Theory, Design, and Implementation," *Proceedings of the ACM Multimedia*, Juan Les Pins, France, December 2002.

David K. Y. Yau, John C. S. Lui, and Feng Liang, "Defending Against Distributed Denial-of-service Attacks with Max-min Fair Server-centric Router Throttles," *Proceedings of the IEEE International Workshop on Quality of Service (IWQoS)*, Miami Beach, FL, May 2002.

David K. Y. Yau and Xiangjing Chen, "Resource Management in Software Programmable Router Operating Systems," *IEEE Journal on Selected Areas in Communications (JSAC)*, Volume 19, No. 3, March 2001.

Research funding

The funding shown on these pages is only for grants that were administered by the CS Department Business Office and were active during the period covered by this report. Grants with no end date are included only in the year in which they were awarded. Faculty may have additional funding through other sources described on their homepages.

Daniel G. Aliaga

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

Daniel Aliaga and Dongyan Xu, "2004 Microsoft Research Learning Science," *Microsoft Corporation*, 12/1/2003, $40,000

Walid G. Aref

Walid Aref, Ahmed K. Elmagarmid, and Aref Ghafoor, "A Test-bed Facility for Research in Video Database Benchmarking," *National Science Foundation*, 8/15/2002 - 8/31/2005, $135,856

Walid Aref, "Technical Services for High Performance Knowledge Base, Data Mining and Non-Traditional Data Interfaces," *EG&G Services (CRANE)*, 10/18/2002 - 9/30/2003, $270,844

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

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 and Ahmed K. Elmagarmid, "Integrated Detection of Energetic & Hazardous Materials (IDEHM)," *NAVSEA/NSWC CRANE*, 7/11/2001 - 9/30/2003, $3,799,000

Mikhail Atallah

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

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

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

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

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

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

Chris Bailey-Kellogg, "Multimodal Discrimination of Protein Fold," *Purdue Research Foundation*, 8/18/2003 - 8/17/2004, $12,908

Chris Bailey-Kellogg and Michael Laskowski, "Distribution Functions of Standard Free Energies of Protein-Protein Assoc.," *The Showalter Trust*, 7/1/2003 - 6/30/2004, $74,800

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 - 6/30/2005, $149,081

Bharat Bhargava, "Adaptable Communication Software for Differential QoS," *IBM*, 7/1/1999 - 8/15/2004, $35,000

Bharat Bhargava, "Formalizing Evidence & Trust for User Authorization," *National Science Foundation*, 8/15/2002 - 7/31/2005, $332,179

Bharat Bhargava, "ITR: Scalable Edge Router for Differentiated Services Networks," *National Science Foundation*, 10/1/2002 - 9/30/2005, $308,296

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

Bharat Bhargava, "Time-Based Coordination of Networked Embedded Nodes," *Defense Advanced Research Projects Agency*, 8/1/2001 - 5/23/2004, $90,000

Bharat Bhargava, "Secure Mobile Systems," *National Science Foundation*, 9/1/2000 - 8/31/2005, $279,172

Research funding

Christopher W. Clifton

Christopher Clifton, "Privacy Preserving Distributed Data Mining," *Purdue Research Foundation*, 8/12/2002 - 8/11/2004, $26,403

Christopher Clifton, "Text Mining for Telemaintence," *EG&G Services (CRANE)*, 9/29/2003 - 2/29/2004, $71,900

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

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 - 6/30/2005, $149,081

Christopher Clifton, "I3P Executive Committee," *The Institute for Information Infrastructure Protection (I3P) Research Fellowship*, 5/1/2004 - 4/30/2005, $6,750

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

Christopher Clifton, "Technical Services for High Performance Knowledge Base, Data Mining and Non-Traditional Data Interfaces," *EG&G Services (CRANE)*, 10/18/2002 - 9/30/2003, $187,708

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

Douglas E. Comer

Douglas E. Comer, "Software Practice & Experience," *John Wiley & Sons*, 11/1/1987 - 12/31/2004, $635,765

Douglas E. Comer, "Faculty Award," *Intel*, 4/13/2004, $30,000

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

Ahmed K. Elmagarmid

Walid Aref and Ahmed K. Elmagarmid, "Integrated Detection of Energetic & Hazardous Materials (IDEHM)," *NAVSEA/NSWC CRANE*, 7/11/2001 - 9/30/2003, $3,799,000

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

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

Ahmed K. Elmagarmid, "Digital Government: Database Middleware for Distributed Ontologies in State and Federal Family and Social Services," *National Science Foundation*, 6/1/2000 - 5/31/2004, $499,998

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

Walid Aref, Ahmed K. Elmagarmid, and Aref Ghafoor, "A Test-bed Facility for Research in Video Database Benchmarking," *National Science Foundation*, 8/15/2002 - 8/31/2005, $135,856

Sonia Fahmy

Sonia Fahmy, Catherine Rosenberg, Eugene Spafford, and Ness Shroff, "Collaborative Research: Testing and Benchmarking Methodologies for Future networking Security Mechanisms," *National Science Foundation*, 9/1/2003 - 8/31/2006, $819,000

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

Greg N. Frederickson

Greg N. Frederickson, "Router Validation System and Training Instruction," *Purdue Research Foundation*, 8/1/2004 - 7/31/2005, $12,939

In collaboration with the schools of engineering, graphics researchers visualize optimal designs of the High-Altitude Aerial Vehicle (HAAV), an autonomous airship continuously aloft for months at high altitudes. The HAAV will have applications in commerce, environmental research, and in homeland security.

Ananth Grama

Ananth Y. Grama, "Algorithms for Network Routers," *Purdue Research Foundation*, 8/1/2002 - 7/31/2004, $25,792

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

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

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

Ananth Y. Grama, "Krell Institute/DOE Fellowship for Paul Ruth," *The Krell Institute*, 1/15/2001 - 1/14/2004, $4,966

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

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

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

Bruce Alexander and Ananth Y. Grama, "Calibrating the Two Antimicrobial Susceptibility Tests," *National Institute of Health*, 7/1/2001 - 6/30/2004, $161,197

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

Susanne E. Hambrusch

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

Susanne E. Hambrusch, "Microsoft Wireless and Mobile Computing," *Microsoft Corporation*, 9/9/2003, $2,500

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

Christoph M. Hoffmann

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

Christoph M. Hoffmann, "Volume-Filling Image Display Equipment," *Army Research Office*, 5/3/2002 - 2/2/2004, $150,000

Christoph M. Hoffmann, "Center for Security of Large Scale Systems/Task 8," *Air Force Office of Scientific Research*, 3/25/2004 - 3/24/2005, $1,027,984

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 - 2/15/2005, $1,654,197

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

Mileta Tomovic, Karthik Ramani, and Christoph M. Hoffmann, "Short Run Tooling Advisor," *Ad Tech Inst*, 12/14/2001 - 6/15/2004, $450,000

Christoph M. Hoffmann, "Topological Accuracy for Boundary Representation Models," *National Science Foundation*, 5/1/2002 - 4/30/2005, $230,600

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, "Faculty Award," *IBM*, 9/25/2003, $40,000

Karthik Ramani, Linda Katehi, Christoph M. Hoffmann, and Sunil K. Prabhakar, "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 - 12/31/2004, $600,000

Research funding

Antony Hosking

Antony Hosking, "Transactional Threads for Reliable Persistent Application Systems," *National Science Foundation*, 9/1/2000 - 8/31/2004, $215,000

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

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

Elias N. Houstis

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 10/1/2002 - 9/30/2005, $467,499

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, and Elias N. Houstis, "ICER: The Indiana Consortium for E-Commerce Research," *State of Indiana*, 3/5/2001 - 3/4/2004, $1,000,000

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

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

John R. Rice and Elias N. Houstis, "Collaborative Research: Performance-Driven Adaptive Software Design and Control," *National Science Foundation*, 9/15/2001 - 8/31/2004, $356,239

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, Shailendra Mehta, Herbert Moskowitz, Edward Coyle, Suresh Mittal, Melissa Dark, Dennis Engi, Elias Houstis, Robert Bartlett, and Richard Cosier; "Center for Computational Homeland Security (CHHS): A Center of Excellence Proposal; State of Indiana, 3/16/04-3/16/06, $2,199,070

Alok Chaturvedi, Shailendra Mehta, Suresh Mittal, David Moffett, Elias Houstis, Dionysios Aliprantis, Robert Bartlett, and Michael Ward; "Synthetic Environment for Computational Experimentation (SECE): Base Protection Application," 7/21/04-9/30/05, $450,000

Suresh Jagannathan

Suresh Jagannathan, "Program Analysis for Adaptive Resource-Aware Compilation," *Purdue Research Foundation*, 8/16/2004 - 8/15/2005, $14,715

Suresh Jagannathan, "Distributed Storage System Research," *NEC Laboratories America*, 11/7/2002 - 1/31/2005, $139,000

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

Ninghui Li

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

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 - 6/30/2005, $257,078

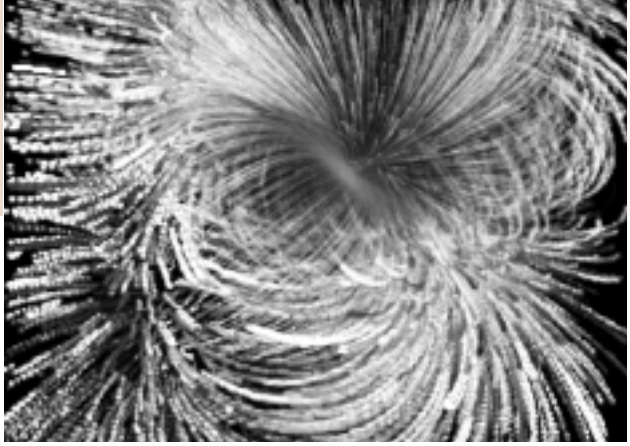
Aditya P. Mathur

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, "Software Engineering Research Center - (North Grumman for Ball State Subcontract)," *Software Engineering Research Center*, 8/20/2003 - 8/19/2004, $25,000

Aditya P. Mathur, "Industry/University Collaborative: Monitoring & Control of Next Generation Systems," *National Science Foundation*, 9/15/2002 - 8/31/2004, $25,000

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 - 12/31/2004, $30,000



An image of a 3D electric field generated by one positive charge and two negative charges is rendered using a new vector visualization technique called streamline splatting developed by Professor Sun's research group. This new technique has applications in assisting teaching of vector fields and analyzing complex flows in scientific research.

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

Jens Palsberg

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

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

Jens Palsberg, "ITR: Static Timing of Interrupt-Driven Software," *National Science Foundation*, 9/1/2001 - 8/31/2004, $432,900

Jens Palsberg, "ITR: Static Timing of Interrupt-Driven Software," *National Science Foundation*, 9/1/2001 - 8/31/2004, $447,900

Kihong Park

Kihong Park, "Network Security Managament Framework Research," *Electronics and Telecommunications Research Institute*, 11/15/2002 - 12/31/2004, $143,201

Kihong Park, "Toward a QoS Provision Architecture in Noncooperative Networks: Theory and Implementation (Career Award)," *National Science Foundation*, 5/1/1999 - 4/30/2004, $348,401

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

Kihong Park, "ITR: Multiple Time Scale Traffic Control for Next Generation Internets," *National Science Foundation*, 9/1/2000 - 8/31/2004, $460,371

Voicu S. Popescu

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

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

Sunil Prabhakar

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

Karthik Ramani, Linda Katehi, Christoph M. Hoffmann, and Sunil K. Prabhakar, "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 - 12/31/2004, $600,000

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, "Technical Services for High Performance Knowledge Base, Data Mining and Non-Traditional Data Interfaces," *EG&G Services (CRANE)*, 10/18/2002 - 9/30/2003, $136,633

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

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, "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 - 12/31/2004, $56,490

Research funding

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

John R. Rice and Elias N. Houstis, "Collaborative Research: Performance-Driven Adaptive Software Design and Control," *National Science Foundation*, 9/15/2001 - 8/31/2004, $356,239

Elias N. Houstis, John R. Rice, and Terrance Weisshaar, "ITR: A Data Driven Environment for Multiphysics Applications," *National Science Foundation*, 10/1/2002 - 9/30/2005, $467,499

Elisha Sacks

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, $240,000

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

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

Ahmed Sameh, "Efficient Algorithms for Large-Scale Dynamical Systems," *National Science Foundation*, 9/1/2000 - 8/31/2004, $158,023

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

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

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

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

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

Eugene H. Spafford

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

Aref Ghafoor and Eugene Spafford, "Access Control Management and Security in a Heterogeneous Multidomain Environment," *National Science Foundation*, 8/15/2002 - 7/31/2004, $225,000

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

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

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

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

Melissa Dark and Eugene Spafford, "A Summer Workshop for Beginning Infosec Educators," *National Science Foundation*, 1/1/2002 - 12/31/2004, $237,848

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

Eugene Spafford, "Forensic Evidence Capture and Analysis," *MITRE Corp*, 1/1/2001 - 12/31/2003, $30,308

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

Sonia Fahmy, Catherine Rosenberg, Eugene Spafford, and Ness Shroff, "Collaborative Research: Testing and Benchmarking Methodologies for Future Networking Security Mechanisms," *National Science Foundation,* 9/1/2003 - 8/31/2006, $819,000

Yinlong Sun

Yinlong Sun, "Spectral Framework for Photorealistic Graphics," *Purdue Research Foundation*, 1/1/2004 - 12/31/2004, $13,263

Wojciech Szpankowski

Wojciech Szpankowski, "Information Theory and Computer Science Interface," *National Science Foundation*, 6/15/2003 - 8/31/2004, $40,000

Wojciech Szpankowski, "Analytic Information Theory, Combinatorics, and Algorithmics: The Precise Redundancy & Related Problems," *National Science Foundation*, 8/1/2002 - 7/31/2005, $215,000

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

Jan Vitek

Jan Vitek, "High Productivity Computing Systems (HPCS)," *IBM*, 9/1/2003 - 7/7/2006, $309,218

Jan Vitek, "High Productivity Computing Systems (HPCS)," *IBM*, 9/1/2003 - 7/7/2006, $309,218

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

Jan Vitek, "High Productivity Computing Systems (HPCS)," *IBM*, 9/1/2003 - 7/7/2006, $149,986

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

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

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

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

Jeffrey S. Vitter

Jeffrey Vitter, "External Memory Algorithms: Dealing with Massive Data," *Army Research Office*, 9/15/2003 - 1/14/2005, $88,567

Carl Cowen and Jeffrey Vitter, "Mathematical Modeling of the Nervous System of the Leech," *National Science Foundation*, 9/1/2003 - 8/31/2004, $99,999

Dongyan Xu

Daniel Aliaga and Dongyan Xu, "2004 Microsoft Research Learning Science," *Microsoft Corporation*, 12/1/2003, $40,000

Dongyan Xu, "Purdue Discovery Park-E-Courier: An Enhanced Service for Enterprise Data Distribution & Backup," *CERIAS*, 7/1/2003 - 8/31/2004, $30,000

Catherine Rosenberg and Dongyan Xu, "e-Courier: A Service for Enterprise Data Delivery," *CERIAS*, 8/1/2002 - 2/29/2004, $30,000

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

David K. Y. Yau

David Yau, "Ensemble: Cooperative Resource Management for Cluster Web Servers," *Purdue Research Foundation*, 1/1/2001 - 4/15/2004, $26,210

David Yau, "QoS Architecture for General Purpose Network Computing (Career Award)," *National Science Foundation*, 3/15/1999 - 12/31/2004, $210,697

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 - 3/31/2005, $187,000

Graduate Students, Curriculum, and Learning

Graduate Teaching Assistants

Saumya Agarwal
Hasan Metin Aktulga
Dan I. Ardelean
Mehmet Derya Arikkan
Asad Khan Awan
Gleb Evgeny Bahmutov
Ethan Lee Blanton
Florian Buchholz
Brian David Bue
Marina Valeryevna Bykova
Ji-Won Byun
Ahmet Burak Can
Bogdan Carbunar
Sarah Ann Caruthers
James Edward Cernak
Chi-bun Chan
Chun-Kong Cheng
Roman Chertov
Tomasz Czajka
Slobodanka Dimova
Yonghua Ding
Yu Dong
James Patrick Early
Knic Martin Ebel
Ziad Zouheir El Bizri
Hicham Galal Elmongui
Ferit Erin
Mohamed Raouf Fouad
Keith Byron Frikken
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Robert Gwadera
Mohamed Mosaad Hefeeda
Matthew Craig Henkler
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Ioannis Ioannidis
Sundararaman Jeyaraman
Chun Jia
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Xuxian Jiang
Brian Robert Johnson
Hetunandan Munisharan Kamichetty
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Md-Abdul Maleq Khan
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Ali Yilmaz Kumcu
Benjamin Asher Kuperman
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Yasin Nilton Laura Silva
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Wenchang Liu
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Russell Kenneth Meyers
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Ian Michael Molloy
Tamara Lonette Morris
Faith Edna Moulton
Mihai Mudure
Mummoorthy Murugesan
Ramkumar Natarajan
Armand Navabi
Mehmet Ercan Nergiz
Daniel Aaron Noland
Terry Daniel Ott
Krzysztof Palacz
Jayesh Pandey
GaHyun Park
Muralikrishna Ramanathan
Jorge R. Ramos
Shrish Ranjan
Ryan Denver Riley
Paul Michael Ruth
Rupak Sanjel
Anna Saputera
Andrew Walter Scharlott
Amit Jayant Shirsat
William Robert Speirs
David John Spigarelli
Sriram Srinivasan
Tiberiu Vasile Stef-Praun
Hongmei Sun
Nikolai Alexeevich Svakhine
Evans Adolfo Tapia
Christopher Taylor
Yuldi Tirta
Mercan Karahan Topkara
Umut Topkara
Mahesh Veeraragh Tripunitara
Fijoy George Vadakkumpadan
Otoniel Venezuela
David Thomas Vos
Qiqi Wang
Weichao Wang
Yang Wang
Jeffrey David Wassil
Adam Welc
Barry Joseph Wittman
John Bradford Woodfin
Yan Wu
Huiying Xu
Rong Xu
Yi Xu
Hiroshi Yamauchi
Yu Yang
Jing Ye
Scott Yost
Ossama Mohamed Younis
David John Zage
Haiping Zhang
Haiya Zou

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Maksim Rakhmil Averbukh
Asad Khan Awan
Gleb Evgeny Bahmutov
Jason Baker
Daniel Ryan Bekins
Bhagyalaxmi Bethala
Abhilasha Bhargav
Ethan Lee Blanton
Deepak Rao Bobbarjung
Birgitte Mariaelisabeth Brydso
Florian Buchholz
Marina Valeryevna Bykova
Ji-Won Byun
Bogdan Carbunar
Brian David Carrier
Sheetal Kumar Lalwani Chainraj
Chi-bun Chan
Jen-Yeu Chen
Chun-Kong Cheng
Chen Yong Cher
Roman Chertov
Gang Ding
Yonghua Ding
Yu Dong
James Patrick Early
Ziad Zouheir El Bizri
Mohamed Ahmed Yassin El Tabakh
Mohamed Galal Elfeky
Hazem Diaa Eldin Elmeleegy
Hicham Galal Elmongui
Ronaldo Alves Ferreira
John Chapman Flack
Mohamed Raouf Fouad
Keith Byron Frikken
Thanaa Mohamed Ghanem
Bryon Christopher Gloden
Alberto Pablo Gonzalez
Rajeev Gopalakrishna
Christian Grothoff
Robert Gwadera
Moustafa Mohamed Hammad
Mohamed Mosaad Hefeeda
Thomas Heinis
Joon Woo Hong
Ihab Francis Ilyas
Ioannis Ioannidis
Sundararaman Jeyaraman
Chun Jia
Wei Jiang
Xuxian Jiang
Hetunandan Munisharan Kamichetty
Ashih Kamra
Murat Kantarcioglu
Humayun Mukhtar Khan
Md-Abdul Maleq Khan
HyoJeong Kim
Yunhua Koglin
Mehmet Koyuturk
Benjamin Asher Kuperman
Minseok Kwon
Shan Lei
Jiangtao Li
Jiangtian Li
Kuiyang Lou
Yi Lu
Di Ma
Andrey A. Madan
Murat Manguoglu
Maxim S. Martynov
Philip McGachey
Carl Christian Kjelgaard Mikkelsen
Scott David Miller
Mohamed Fathalla Mokbel
Mihai Mudure
Frank Mueller
Maxim Naumov
Mehmet Ercan Nergiz
Natalia Maria Nogiec
Krzysztof Palacz
Jayesh Pandey
GaHyun Park
Filip Jerzy Pizlo
Shobha Chowdary Potluri
Xiaopeng Qi
Muralikrishna Ramanathan
Jorge R. Ramos
Wenhui Ren
Paul Andrew Rosen
Paul Michael Ruth
Rupak Sanjel
Rajesh Selvamani
Amit Jayant Shirsat
Javed Siddique
Sarvjeet Singh
Radu Sion
Tiberiu Vasile Stef-Praun
Hongmei Sun
Christopher Taylor
Jacques Daniel Thomas
Mercan Karahan Topkara
Umut Topkara
Mahesh Veeraragh Tripunitara
Yi-Cheng Tu
Fijoy George Vadakkumpadan
Navaneetha K. S. Vaidhyanathan
Jaideep Shrikant Vaidya
Thomas John VanDrunen
Olga Vitek
David Thomas Vos
Cheng Wang
Qihua Wang
Qiqi Wang
Weichao Wang
Adam Welc
Yan Wu
Yuni Xia
Changjiu Xian
Bin Xin
Xiaopeng Xiong
Huiying Xu
Rong Xu
Hiroshi Yamauchi
Weiqiang Yang
Yu Yang
Xiaoduan Ye
Scott Yost
Ossama Mohamed Younis
David John Zage
Haiping Zhang
Mingwu Zhang
Yuhui Zhong
Lukasz Ziarek

Fellows

Jason Baker
David William Bettis
Megan Carney
Hong Chen
Marga Chiri
Brian Joseph Denny

Joseph-Patrick Roger Dib
Jing Dong
James Patrick Early
Hicham Galal Elmongui
Ferit Erin
Lucas Jon Fisher
John Chapman Flack
Keith Byron Frikken
Hwan Jo Heo
Win Mar Htay
Abhinav Jain
Ardalan Kangarlou-Haghighi
Jessica Catherine Kerper
Paul Michael Kuliniewicz
Tamara Lonette Morris
Faith Edna Moulton
Maxim Naumov
Ryan N. Nicoletti
April Wilhelmina Savoy
Otoniel Venezuela
David Thomas Vos
Jeffrey David Wassil
Scott Yost
Lukasz Ziarek

Members of the Graduate Student Board (GSB) serve as a link between graduate students and faculty.

PhD Graduates

August 2004

Moustafa Mohamed Hammad
Query Processing in Stream Database Systems
Advisors: A. K. Elmagarmid and W. G. Aref

Mohamed Mosaad Hefeeda
A Framework for Cost-Effective Peer-to-Peer Content Distribution
Advisor: B. Bhargava

Ihab Francis Ilyas
Rank-aware Query Processing and Optimization
Advisors: A. K. Elmagarmid and W. G. Aref

Benjamin Asher Kuperman
A Categorization of Computer Security Monitoring Systems and the Impact on the Design of Audit Sources
Advisor: E. H. Spafford

Minseok Kwon
Designing and Characterizing Overlay Networks
Advisor: S. Fahmy

Yi Lu
Adaptive and Heterogeneous Mobile Wireless Networks
Advisor: B. Bhargava

Di Ma
Bounding the Stack Size of Interrupt-driven Programs
Advisor: J. Palsberg

Radu Sion
Rights Assessment for Discrete Digital Data
Advisors: M. J. Atallah and S. K. Prabhakar

Jaideep Shrikant Vaidya
Privacy Preserving Data Mining over Vertically Partitioned Data
Advisor: C. W. Clifton

Thomas John VanDrunen
Partial Redundancy Elimination for Global Value Numbering
Advisor: A. L. Hosking

Cheng Wang
Program Analysis and Scheduling for Distributed Computing on Handheld Devices
Advisor: Z. Li

Courses

110 Introduction to Computers
149 Web Programming
152 FORTRAN Programming for Engineers
154 FORTRAN Programming
156 C Programming for Engineers
158 C Programming
178 Programming with Multimedia Objects
180 Programming I
182 Foundations of Computer Science
192 Freshman Resources Seminar
197 Freshman Honors Seminar
235 Introduction to Organizational Computing
240 Programming in C
250 Computer Architecture
251 Data Structures
290B Web Database Programming
290E Freshman and Sophomore EPICS Projects
314 Numerical Methods
348 Information Systems
352 Compilers: Principles and Practice
354 Operating Systems
381 Introduction to the Analysis of Algorithms
390S Secure Programming
406 Software Engineering I
422 Computer Networks
426 Computer Security
434 Advanced Computer Graphics
448 Introduction to Relational Database Systems
456 Programming Languages
490B Introduction to Bioinformatics
490D Introduction to Data Mining
490E Junior and Senior EPICS Projects
490T Advanced Tablet Platform Applications
491 Senior Resources Seminar
501 Introduction to Computational Science
502 Compiling and Programming Systems
503 Operating Systems
514 Numerical Analysis
515 Numerical Linear Algebra
520 Computational Methods in Analysis
525 Parallel Computing
526 Information Security
530 Introduction to Scientific Visualization
535 Interactive Computer Graphics
541 Database Systems
542 Distributed Database Systems
543 Introduction to Simulation and Modeling of Computer Systems
555 Cryptography
565 Programming Languages
574 Advanced Computer Graphics Applications
580 Algorithm Design, Analysis, and Implementation
590A Topics in Overlay Networks
590B Topics in Computational Molecular Biology
590D Security Topics in Networking and Distributed Systems
590E Topical Lectures in Information Security
590G Capturing, Modeling, Rendering 3D Structures
590M Geometric Modeling and Applications
590N Embedded Systems Design
590R Randomized Algorithms and Probabilistic Techniques in Computer Science
590U Access Control: Theory and Practice
603 Advanced Topics in Distributed Systems
614 Numerical Solution of Ordinary Differential Equations
626 Advanced Information Assurance
636 Internetworking
638 Multimedia Networking and Operating Systems
662 Pattern Recognition and Decision-Making Processes
690G Capturing and Rendering Real-World Scenes
690M Advanced Dynamic Memory Management

Guest Speakers

Date	Name	Association	Talk Title
FALL 2003			
Sep. 5	Professor Gene Golub	Stanford University	Adaptive Methods for Updating/Downdating Page Ranks
Sep. 11	Professor Barbara Ryder	Rutgers University	Dimensions of Precision in Reference Flow Analysis of Object-oriented Programming Languages
Sep. 15	Dr. Burton Smith	Cray Research	Communication-Intensive Computing
Sep. 17	Mr. David F. Ferraiolo	National Institute of Standards and Technology	The Policy Machine: Towards Universal Attribute-based Access Control Policy Specification and Enforcement
Sep. 24	Professor Marianne Winslett	University of Illinois at Urbana-Champaign	Automated Trust Negotiation: An Approach to Access Control
Oct. 8	Professor William H. Winsbrough	George Mason University	Specification and Management of Attribute-based Authorization Policy
Oct. 15	Professor Michael J. Franklin	UC Berkeley	Sensor Networks and Other Strange Places for Database Query Processing
Oct. 21	Professor Kevin Chang	University of Illinois, Urbana-Champaign	Shallow Integration over the Deep Web: Observations, Implications, and Evidences
Oct. 22	Professor Umakishore Ramachandran	Georgia Tech	DFuse and MediaBroker: System Support for Sensor-Based Distributed Computing
Oct. 27	Professor Pat Hanrahan	Stanford University	Digital Lights, Cameras, Materials...
Oct. 29	Mr. Peter Stephenson	International Institute for Digital Forensic Studies	An End-To-End Approach to Digital Investigation
Oct. 31	Professor Hwanjo Yu	University of Illinois, Urbana-Champaign	Data mining via Support Vector Machines (SVMs)
Nov. 5	Professor Cole Smith	University of Arizona	Optimizing the Design of SONET-Based Ring Networks
Nov. 11	Dr. Rakesh Agrawal	IBM Alamaden Research Center	Privacy Cognizant Information Systems
Nov. 12	Ms. Carrie Gates	Carnegie Mellon University	Port Scans: Real Numbers, Real Networks
Nov. 17	Dr. William Levy	Virginia Medical School	At the Limits of Computation: How Nature Deals With Physical Constraints on Computation
Nov. 24	Professor Eli Upfal	Brown University	Performance Analysis of Dynamic Network Processes
Dec. 3	Professor Susan Brenner	University of Dayton School of Law	Using Criminal Law to Encourage the Prevention of Cybercrime
Dec. 8	Professor Andrea Califano	Columbia University	Global Search for Genetic Associations by Pattern Discovery
Dec. 9	Professor Leonard McMillan	University of North Carolina at Chapel Hill	Data-Driven Modeling in Computer Graphics
SPRING 2004			
Jan.5	Dr. Anil Vullikanti	Los Alamos National Labs	End-to-End Packet-Scheduling in Wireless Ad-hoc Networks
Jan. 26	Mr. William Norton	Equinix	The Evolution of the U.S. Internet Peering Ecosystem
Feb. 2	Professor Gary T. Leavens	Iowa State University	A Simple and Practical Approach to Unit Testing: The JML and JUnit Way
Feb. 12	Dr. Hui Lei	IBM T. J. Watson Research Center	Towards Context Awareness in Pervasive Computing
Feb. 16	Professor Ranjit Jhala	University of California, Berkeley	Scalable Program Verification by Lazy Abstraction
Feb. 23	Professor Haiyun Luo	University of California, Los Angeles	Providing Two-tier Service through Distributed Packet Scheduling in Multihop Wireless Networks
Feb. 23	Professor Dominic Duggan	Stevens Institute of Technology	Type-Based Distributed Access Control
Feb. 24	Dr. Yongguang Zhang	HRL Laboratories	An Experimental Platform for Studying Secure Mobile Ad-hoc Networks
Mar. 1	Dr. Bob Horgan	Telcordia	Application Level Security for Softswitches and Other NGN Software Components
Mar. 8	Mr. Martin Hirzel	University of Colorado at Boulder	Connectivity-Based Garbage Collection
Mar. 11	Mr. Hwanjo Yu	University of Illinois, Urbana-Champaign	Massive Data Mining via Support Vector Machines
Mar. 22	Dr. Godmar Back	Stanford University	Processes in KaffeOS: Isolation, Resource Management, and Sharing for Java
Mar. 25	Dr. Alessandro Orso	Georgia Institute of Technology	Analysis and Testing of Deployed Software
Mar. 29	Dr. Lili Qiu	Microsoft Research	On Selfish Routing in Internet-like Environments
Mar. 30	Professor Michael Goodrich	University of California, Irvine	Confluent Drawings: Visualizing Non-planar Diagrams in a Planar Way
Mar. 31	Professor Roberto Tamassia	Brown University	Efficient Authentication of Data Structures and Streams
Apr. 1	Professor Panagiotis G. Ipeirotis	Columbia University	QProber: Classifying and Searching Hidden-Web Databases
Apr. 6	Dr. Douglas C. Schmidt	Vanderbilt University	Adaptive and Reflective Middleware for Distributed, Real-time, and Embedded Systems
Apr. 8	Dr. Mihai Budiu	Carnegie Mellon University	Spatial Computation — Computing without General-Purpose Processors
Apr. 12	Mr. Scott M. Pike	The Ohio State University	Fault-Localization in Distributed Resource Allocation
Apr. 13	Dr. Shaz Qadeer	Microsoft Research	Atomicity: A New Technique for Specifying and Verifying Concurrent Software
Apr. 15	Dr. David K Schrader	Teradata	Adventures in Computer Science: How the Rubber Hits the Road
Apr. 19	Professor Jeff Chase	Duke University	Controlled Resource Sharing for an On-Demand Utility
Apr. 30	Professor Klemens Böhm	Otto-von-Guericke-Universität Magdeburg, Germany	Enforcing Cooperation in Peer-to-Peer Information Systems

Computer Science Staff

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

Business Office
Mary Bell, Business Manager
Linda Byfield, Account Clerk
Margaret Floyd, Account Clerk
Penny King, Account Clerk
Tammy Muthig, Account Clerk
Amber Vibbert, Account Clerk

Office of Development
Mary Jo Bartolacci, Director of Development
(until March 2004)
Anthony (Tony) J. Vidmar, Director of Development
(October 2004 - present)
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
Eric Polizzi, Senior Research Scientist

Support Staff
Dennis Brylow, Instructor
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
Rajesh Subramanyan, Instructor
K. C. VanZandt, Instructor
Bill White, Instructor
Connie Wilson, Department Secretary

Undergraduate Office
Patricia Giordano, Advisor
Criselda Marquez, Advisor
Mary-Ann Neel, Advisor
Carol Paczolt, Advisor
Janice Thomaz, Advisor