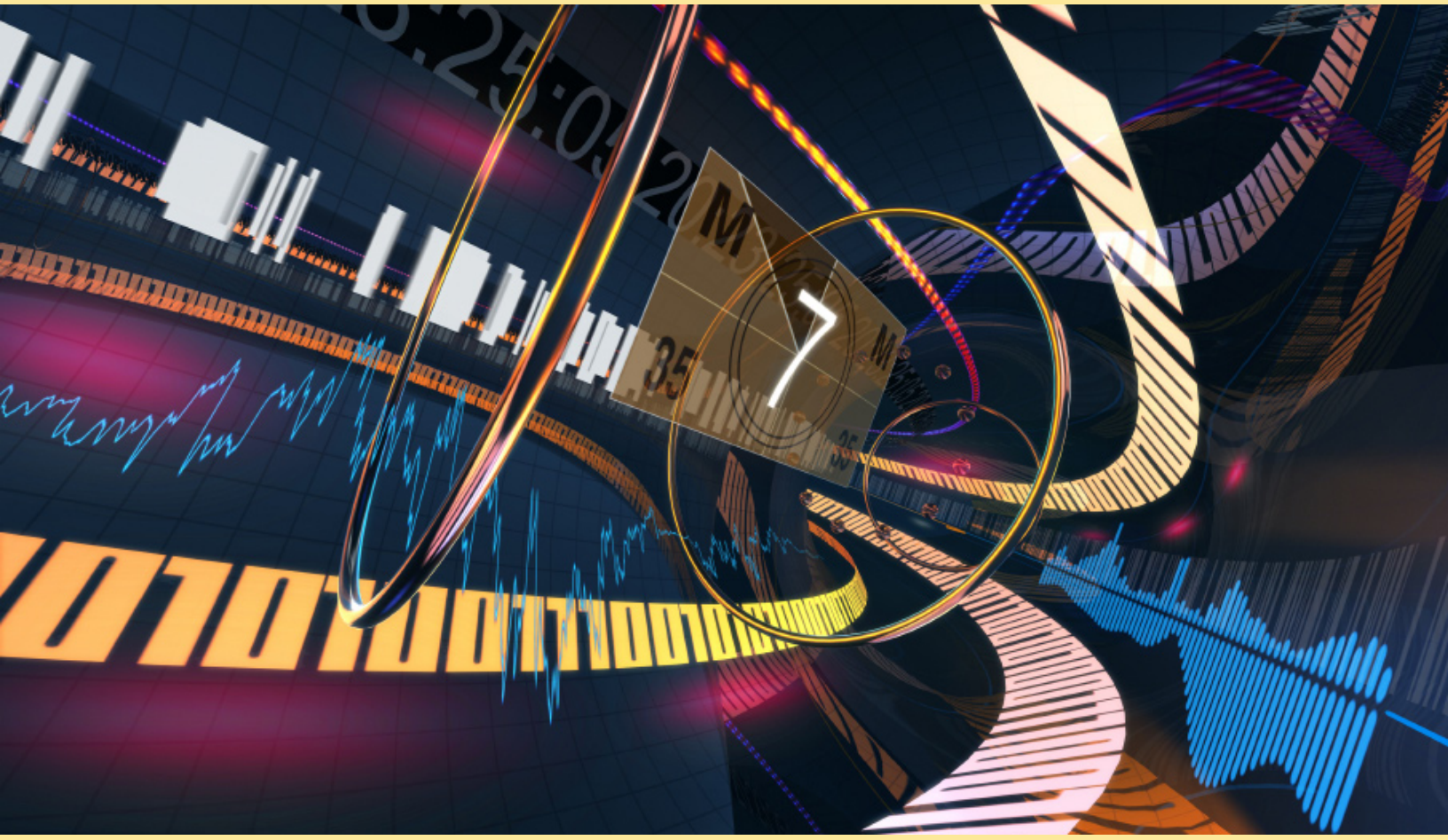
THE OHIO STATE UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2008-2009 Annual Report



GREETINGS FROM THE CHAIR'S OFFICE

Dear Colleagues, Alumni, Friends, and Parents,

Welcome to the 2008-2009 CSE Annual Report, in which you will read about our progress in the year. The global economic recession has affected many academic institutions in the U.S. Fortunately, in this critical time, the State of Ohio has protected the higher education by not cutting the budgets of Ohio's public universities. This munificence allowed CSE to continue hiring new faculty and maintain our standards in many other activities. Let me highlight several accomplishments to be presented in this report.

- The Ph.D. program in Computer Engineering was ranked in the top 20 by *US News and World Report 2010 Edition List of America's Best Graduate Schools*. This reflects CSE's continuous improvement of quality and reputation of experimental oriented research and education activities.
- Two more faculty members have been named *IEEE Fellows*, Anish Arora and Xiaodong Zhang. This increases the Fellow memberships in CSE to 8, plus two *ACM fellows* and one *AAAI Fellow*.
- The department established two Fellowships named for two retired professors Mile Liu and Balakrishnan Chandrasekaran. They were founding members of the department and have made significant contributions in their technical fields.
- We welcome to the Department two new assistant professors: Luis Rademacher and Christopher Stewart. Luis works in the area of theory and algorithms, and Chris's interests are in systems.
- We have expanded the Industrial Advisory Committee, adding another two well established CSE alums: Matt Desch (CIS BA'80), Chairman and CEO of Iridium Satellite LLC, and Michael Fortin (CSE Ph.D.'91), Distinguished Engineer, Microsoft.
- The Ph.D. production continues its high momentum with a total of 26 graduates last year.
- Finally I would like to give my congratulations to Prasun Sinha on his promotion to the rank of Associate Professor with tenure.

Increasingly we have more interactions with our alums via the Buckeye Blog newsletters, CSE's Facebook page, and many mutual visits. I hope you enjoy reading this annual report. We look forward to hearing more comments and suggestions from you. We will report more accomplishments of the CSE family in the next issue in 2010.

Cordially yours,

Xiaodong Zhang
Robert M. Critchfield Professor and Chair
Department of Computer Science and Engineering
The Ohio State University

Mission Statement

- *The Department of Computer Science and Engineering will impact the information age as a national leader in computing research and education.*
- *We will prepare computing graduates who are highly sought after, productive, and well-respected for their work, and who contribute to new developments in computing.*
- *We will give students in other disciplines an appropriate foundation in computing for their education, research, and experiences after graduation, consistent with computing's increasingly fundamental role in society.*
- *In our areas of research focus, we will contribute key ideas to the development of the computing basis of the information age, advancing the state of the art for the benefit of society, the State of Ohio, and The Ohio State University.*
- *We will work with key academic partners within and outside of OSU, and with key industrial partners, in pursuit of our research and educational endeavors.*

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Ohio State University
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Highlights & Achievements

Faculty Recognitions and Awards

Faculty Members Recognized for Innovation

It has long been known within the OSU-CSE community that Drs. **Tim Long** (left in picture) and **Bruce Weide** (right) bring more than just smarts to their classrooms. This year, the state of Ohio recognized the fact. The Ohio Board of Regents named them "Faculty Innovators," along with eight other Ohio educators, in this first recognition of faculty and teams who have introduced "digital course materials in the classroom that enrich learning and make college textbooks more affordable for their students."

"Making college more affordable, including leveraging technology to reduce out-of-pocket textbook costs for students, is a priority of the University System of Ohio," said Chancellor Fingerhut. "We commend the awardees for developing outstanding, affordable materials for their students and want to share their 21st century ideas and practices with others across the System."

The awardees used a variety of means to save their students money. In some instances, textbooks were replaced completely while others used online sources to share class notes, audio files, music recordings, and video clips. Some taught classes in the use of online technology.

In The Ohio State University's introductory Computer Science and Engineering courses (a three-quarter sequence taken by about 250 students per year), Long and Weide put all of the course materials online where students can access everything using a web browser. If they wish, students can still buy paper copies of the two textbooks (of which professors Weide and Long are the authors), but this purchase is optional because the books and all other course materials are also available online. There is no cost to students for course materials, and this innovation is made possible by using web-based technology.

This award is not the first recognition Drs. Long and Weide have received for their teaching skills. In 2000, they received the International Institute of Electrical and Electronics Engineers (IEEE) Computer Science & Engineering Undergraduate Teaching Award. Dr. Long received The Ohio State University Alumni Award for Distinguished Teaching. Bruce Weide has received the CSE Teaching Award several times.

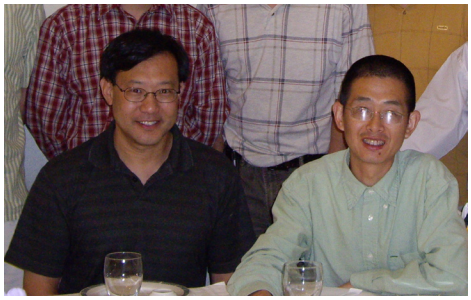
New Scholarship Fund Honors Retiring Professor

Dr. Liu posing wth the plaque commemorating the creation of his scholarship and the initial donors.

The Department of Computer Science and Engineering is pleased to announce the creation of a new graduate student scholarship fund named The Mike Liu Scholarship Fund. This fund was conceived to honor **Dr. Ming-Tsan (Mike) Liu** as he retires this year. The fund was formerly established with gifts from CSE alumni and Dr. Liu's colleagues within OSU and the research communities, as well relatives and long time friends and admirers. Dr. Lui and this scholarship were given special recognition at the 13th Annual CSE Awards Banquet on May 13th, 2009.

The purpose of the scholarship fund is to recognize, encourage, and assist outstanding graduate students in Computer Science and Engineering at The Ohio State University who demonstrate promise in contributing much to their technical field. The scholarship winners will be chosen for their academic merit and research achievements with no regard to their financial need. Recipients will be named annually, typically at the annual awards banquet in the spring.

Research of Zhang and Advisee Gains Real-World Prominence



The research of Song Jiang (pictured on right) and **Xiaodong Zhang** (pictured left) was adopted by MySQL, one of the foremost database systems, supporting numerous applications all over the world. The LIRS (Low Inter-Reference Recency Set) caching algorithm, originally published in the ACM Conference of SIGMETRICS in 2002, entitled "LIRS: an Efficient Low Inter-Reference Recency Set Replacement to Improve Buffer Cache Performance," is such an integral part MySQL's most recent version 5.1(released in November 2008), it is called "Jiang-Zhang LIRS Caching Algorithm" in the MySQL documentation.

MySQL is the world's most widely used open source database software, with over 100 million copies of its software downloaded or distributed throughout its history. This relational database management system has more than 11 million installations. The LIRS caching algorithm serves as a critical component in the buffer pool management in MySQL, which can maximize the hit ratio of data accesses in the DRAM memory to significantly improve the database performance.

Many of the world's largest and fastest-growing organizations use MySQL to save time and money powering their high-volume Web sites, critical business systems, and packaged software including industry leaders such as Yahoo!, Alcatel-Lucent, Google, Nokia, YouTube, Wikipedia, and Booking.com. Several high-traffic web sites (including Flickr, Facebook, Wikipedia, Google, Nokia and YouTube) use MySQL for its data storage and logging of user data.

"When our paper was published 7 years ago, we were very confident that the LIRS caching algorithm had fundamentally addressed the limits of the commonly used LRU caching algorithm. Since then, this work has continuously shown its transformational impact on memory management in major software systems on different types of computing platforms, first in operating systems, and then in database systems. For example, a system implementation based LIRS called Clock-Pro was first reported in a USENIX'05 paper, then was quickly adopted in the NetBSD operating system and patched in Linux kernels, and in other data-processing servers." said Professor Xiaodong Zhang who joined Ohio State in 2006 as the Robert M. Critchfield Professor in Engineering and Department Chair of Computer Science and Engineering. "We feel very happy and rewarding to see the influential contributions of our research work to MySQL that provides indispensible services to millions of important data transactions in the human society."

The original research and article were done while Song Jiang was Professor Zhang's Ph.D. student at the College of William and Mary. Dr. Jiang is now an Assistant Professor in the Department of Electrical and Computer Engineering at Wayne State University in Detroit, Michigan. He received a National Science Foundation CAREER Award this year.

Dr. Rountev Received IBM Award

Associate Professor **Atanas (Nasko) Rountev** has been awarded IBM Software Quality Innovation Faculty Award. According to IBM, proposals for this program are invited from a few, carefully selected leaders in the field. These proposals are judged on technical merit and potential collaboration opportunities between faculty members and researchers at IBM and elsewhere.

Rountev's project, titled "BIGFOOT: Searching for the Elusive Small Memory Footprint for Java Applications," was chosen under the research focus on static and dynamic program analysis for identifying software quality problems. His work considers the excessive memory usage which is common in real-world Java applications. Such memory bloat can create serious scalability and performance problems for large-scale Java software systems. The goal of the project is to allow programmers to explore multiple semantically-equivalent implementation choices for a particular software design, leading to smaller and healthier memory footprint.

Nasko, who joined CSE in 2002, was recently promoted to Associate Professor. He leads the Program Analyses and Software Tools (PRESTO) Research Group and his interests generally

encompass software engineering, programming languages, and compilers focusing on static and dynamic program analysis; component-based software; parallel and distributed software; high-performance computing; software understanding and evolution; software testing. He received his PhD from Rutgers University in 2002 under the mentorship of Prof. Barbara Ryder.

IBM is well known and well appreciated for its work with academia through their IBM University Research & Collaboration programs. Information may be found at their website.

Two CSE Professors Elected as IEEE Fellows

The Institute of Electrical and Electronics Engineers (IEEE) Board of Directors elected Professors **Anish Arora** and **Xiaodong Zhang** on November 12, 2008. The grade of IEEE Fellow is awarded to recognize extraordinary accomplishments to its members world-wide as one of the Institute's most prestigious honors. The total number of IEEE Fellows selected in any one year is limited to no more than 0.1% of the total IEEE memberships.

Dr. Anish Arora received this recognition for his contributions to scalability and stabilization of networks of sensors and computers. Dr. Arora joined CSE in 1992 and quickly became a strong member of the networking research group. Leading the Dependable Distributed and Networked System Group a description of his recent work in People-Centric Wireless Sensor Networking may be found in the CSE 2007-2008 Annual Report.

IEEE honored Dr. Xiaodong Zhang, CSE Chairperson and Robert M. Critchfield Professor in Engineering, for his contributions to computer memory systems. A member of both the Networking and System Groups, Dr. Zhang came to CSE from the College of William and Mary in 2006 and has made exceptional impact in the growth of the Department's research productivity and academic excellence. As Director of the High Performance Computing and Software Laboratory, his research covers a wide spectrum in the areas of high performance and distributed systems, a common thread being a focus on fast data accesses and resource sharing with cost- and energy-efficient management at different levels of the memory and storage hierarchies in computer, distributed, and Internet systems.

The CSE Department at Ohio State has a total of 8 IEEE Fellows, 2 ACM Fellows and one AAAI Fellow.

Dual Best Papers

CSE researchers gave the selection committee for the IEEE Cluster a very difficult task and they resorted to compromise; two papers tied for best paper! The papers are "Efficient One-Copy MPI Shared Memory Communication in Virtual Machines" by **Wei Huang** (CSE alum Ph.D., '08), **Matthew Koop** (CSE Grad Student), and **Dhabaleswar K. Panda** (CSE Faculty) and "Are Non-Blocking Networks Really Needed for High-End-Computing Workloads?" by **Pavan Balaji** (CSE alum PhD '04) and Narayan Desai (Argonne National Laboratory), **P. Sadayappan** (CSE Faculty), and **Mohammed Islam** (CSE Grad Student).

The IEEE Cluster conference is a forum for fellow cluster researchers to present and discuss new directions, opportunities and ideas that will shape Cluster Computing. The department also received a best paper award at Cluster 2007 entitled "High Performance Virtual Machine Migration with RDMA over Modern Interconnects" by Wei Huang, Qi Gao, Jiuxing Liu and Dhabaleswar K.Panda.

Four Faculty Receive 2009 Lumley Awards

Drs. **Anish Arora, Atanas Rountev**, **Prasun Sinha**, and **Dong Xuan** were awarded Ohio State College of Engineering Lumley Research Awards. The Lumley Research Award was established to promote and enhance research within the OSU - CoE and is given to a select group of outstanding researchers who have shown exceptional activity and success pursuing knowledge within their fields. A total of 27 Lumleys have been earned by CSE faculty members.

Professor Anish Arora, a new IEEE Fellow as previously mentioned, joined OSU-CSE in 1992 after receiving his Ph.D. in University of Texas at Austin. This is his second Lumley Award.

The College recognition for Atanas Rountev follows closely on the heels of achieving his NSF CAREER award. Atanas's research interests are in software engineering and programming languages. In particular, he is working in static and dynamic program analysis, software understanding and evolution, software testing, component-based software, distributed software, aspect-oriented software, and high-performance computing. Prior to his arrival in Columbus in 2002, he received his Ph.D. and Masters degrees from Rutgers University

Another Lumley and CAREER recipient is Dr. Prasun Sinha. Prior to joining CSE, Sinha took a detour from academia into industry, spending two years at Bell Labs in New Jersey. He received his PhD from the University of Illinois at Urbana-Champaign in 2001 and his MS degree in Computer Science from Michigan State University in 1997. His research focuses on the design of wireless network architectures and protocols, with emphasis on mesh networks, wireless LANs, and sensor networks.

Dong Xuan, is the fourth Lumley awardee. Dong received his B.S. and M.S. degrees in Electronic Engineering from Shanghai Jiao Tong University (SJTU), China, in 1990 and 1993, and Ph.D. degree in Computer Engineering from Texas A&M University in 2001. Xuan also won an NSF CAREER grant in 2006. His research interests include distributed computing, computer networks and cyberspace security.

Student Awards

LISA '09 Best Student Paper

PhD candidate **Xiaoning Ding** was awarded the Best Student Paper at the 22nd USENIX Annual Large Installation System Administration Conference (LISA 2008). The paper, entitled "Automatic Software Fault Diagnosis by Exploiting Application Signatures", is in collaboration with IBM T.J. Watson Research Center and his advisor, CSE Professor and Chair Xiaodong Zhang. The paper proposes an automatic approach to diagnose application faults. It represents a promising step toward automating application problem solving, and could lead to significant time and cost savings in enterprise IT environments.

Xiaoning's research includes operating, storage and distributed systems. He received his undergraduate degree in Computer Science from Northwestern Polytechnic Institute. He received the departmental graduate research award in 2008.

Undergrad Receives Recognition

Chad Sowald received a First Place in the Denman Undergraduate Research Forum for this work in "File Harvest: Targeted, Legal Crawling & Downloading of Online Media". The project aimed to combine the benefits of two disparate forms of online information gathering: crawling and downloading. While there are plenty of tools available today that do either one or the other quite well, combining the two into a single integrated application was novel.

Chad, from Centerville, Ohio, was mentored through his work by Dr. Paul Sivilotti. Dr. Sivilotti said, "Working with Chad was a real pleasure. He is self-motivated and energetic, so he was always coming up with new ideas for how to improve his project."

The Denman Undergraduate Research Forum was created to showcase outstanding student research and encourage all undergraduates to participate in research as a value-added element of their education. Originally conceived in 1996, it is a cooperative effort of The Ohio State University's Honors & Scholars Center, The Undergraduate Research Office, and The Office of Research.

Alumni Highlights

Alum Named IEEE Fellow

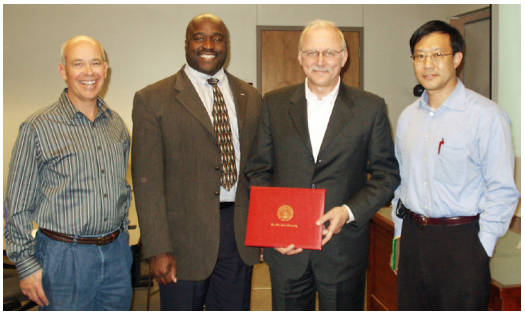
David Ebert

CSE is very pleased to learn one of its alumni, **Dr. David S. Ebert**, has been named an IEEE Fellow. IEEE bestowed this honor in for his for contributions to data visualization and its applications.

Dr. Ebert is a Buckeye through and through receiving not just his PhD. from OSU in 1991, but also his Masters ('87) and his BS ('86), graduating with the last Summa Cum Laude. Dr. Rick Parent mentored David through his studies. Currently, David is a Professor of Electrical and Computer Engineering at Purdue University. Purdue also recognizes him as a University Faculty Scholar, a program that "recognizes outstanding faculty members on accelerated path for academic distinction." Within the School of Electrical and Computer Engineering, he is Director of the PURVAC: Purdue University Regional Visualization and Analytics Center and PURPL : Purdue University Rendering and Perceptualization Lab. His research interests range over the topics of visual analytics, computer graphics, visualization, mobile graphics, modeling natural phenomena, photorealistic and non-photorealistic rendering. He was recently elected into the IEEE Board of Governors.

According to their website, IEEE honors accomplishments that have contributed importantly to the advancement or application of engineering, science and technology, bringing the realization of significant value to society. The IEEE Fellows are an elite group from around the globe, they are looked to for guidance and leadership as the world of electrical and electronic technology continues to evolve. Every year only 0.1% of the IEEE members are elected Fellows, the highest rank within the IEEE. Currently, about 2% of the membership holds the Fellow rank.

2008 COE Distinguished Alumnus



Left to irght: Bruce Weide, CSE Vice Chair and Tamer Özsu's advisor; Greg Washington, Interim Dean of the OSU College of Engineering; Dr. M. Tamer Özsu; Xiaodong Zhang, CSE Chair.

Dr. M. Tamer Özsu was named a Distinguished Alumnus by the Ohio State College of Engineering. This is one of the highest honors an alumnus may receive from the College. The "Distinguished Alumnus" Awards were established in 1954. Their purpose is to recognize distinguished achievement in one's profession by reason of significant inventions, important research or design, administrative leadership, or genius in production.

Dr. Özsu is currently a professor of Computer Science and Director of the David R. Cheriton School of Computer Science at the University of Waterloo, and holds a University Research Chair at Waterloo which he joined in 2000 as a Faculty Research Fellow. Prior to this position, he occupied a McCalla Research Professorship from 1993-1994 at the University of Alberta where he was a faculty member between 1984 and 2000. Tamer, as he is informally known, is a fellow of the Association for Computing Machinery (ACM), a senior member of the Institute of Electrical and Electronics Engineers (IEEE), and a member of Sigma Xi. He was awarded the ACM SIGMOD Contributions Award in 2006.

He earned a Master of Science degree from The Ohio State University in 1981 and his PhD in 1983 in Computer and Information Science and Bachelors and Master of Science degrees in Industrial Engineering (1974 and 1978) from the Middle East Technical University.

Özsu's current research focuses on Internet-scale data distribution that emphasizes stream data management, peer-to-peer databases and Web data management; multimedia data management, concentrating on similarity-based retrieval of time series and trajectory data; and the integration of database and information retrieval technologies, focusing on XML query processing and optimization.

Alumnus Named ACM Fellow

Dr. Ozsu was also elected as a Fellow of the Association for Computing Machinery (ACM). This is the ACM's most prestigious honor, reserved for its distinguished members who have made outstanding contributions in research and information technology. A candidate's accomplishments are expected to place him or her among the top 1% of ACM members.

Alum named Microsoft New Faculty Fellow

Susan Hohenberger (BS, 2000) (pictured right) is one of five young faculty members named as Microsoft Research New Faculty Fellows 2008. Susan was chosen from a pool of approximately 100 nominees. She achieved this recognition for her work in cryptography. This award gives her $200,000 as well as access to other Microsoft resources, such as software, invitations to conferences, and engagements with Microsoft Research. This award is intended, according to Microsoft's web site, to give "recipients considerable freedom in planning the focus of their academic research. The funds can be applied to a wide variety of uses to pursue novel research."

Dr. Hohenberger was recognized as a talented research prospect early in her academic career. Dr. Bruce Weide invited her to join the Europa Undergraduate Research Forum before the end of the introductory course sequence. She then worked on a number of projects, including a senior thesis that used genetic algorithms to help solve manufacturing plant layout problems for Dr. Shahrukh Irani in Industrial and Systems Engineering.

Hohenberger's research interests lie in the cryptographic challenges in verifying authenticity of incoming messages and encrypting outgoing ones in energy, data and time constrained applications, computer security, algorithms and complexity theory. After leaving OSU-CSE in 2000, pursued her graduate studies at Massachusetts Institute of Technology (MIT) under the mentorship of Dr. Ronald Rivest. She received her doctorate in 2006 and accepted a tenure track position as an Assistant Professor with John Hopkins University.

Microsoft began this program in 2005 and there are now 20 Microsoft Research Fellows pursuing their dreams and gaining recognition in their respective fields of endeavor. OSU-CSE is proud one of our students is included in this elite group.

> Jamie Colley with Clint Foulk. Dr. Foulk is Associate Professor Emeritus and a supporter for the ACM.

^ Dr. Bruce Flinchbaugh (Ph.D., '80; Texas Instruments) presents an award to undergraduate, Hoa Vu . CSE was fortunate to have two alumni guest presenters this year at the banquet.

< Chair's Service Award recipient, Laurie Maynell and her husband, Ed Hubbard.

< Wayne Clark (BS, '73; Cisco) with Parmeet Singh.

Annual CSE Department Awards

Scholarships

- *Central Ohio Chapter of Association of Computing Machinery (ACM)*
  Jamie Colley
- *Ernest William Leggett, Jr. Scholarship The Leggett Family Award*
  Cody Baith
  Zhangpeng (Jack) Cheng
  Eric George
  Justin Landers
- *Lockheed Martin*
  Andrew Stock
  Brandon Sorg
- *Northrop Grumman*
  Isaac Chan
- *The O'Connell Family Award*
  Adam Cotner
  Hyun Lee
- *Raytheon Corporation*
  Ross Amore
  Christina Deiters
  Luke MacAdam
- *The Department of Computer Science & Engineering*
  Conner Campassi
  Minh Pham
  Parmeet Singh
  Zhitu Chen
  Hoa Vu
- *The Department of Computer Science & Engineering Undergraduate Research Award*
  Jamie Colley

Luke MacAdam receives his award from Raytheon representative and friends of CSE, Dennis Frailey.

Faculty & Staff Awards

- *Chair's Service Recognition Award*
  Laurie Maynell
- *Eleanor Quinlan Memorial Awards Outstanding Graduate Student Teachng*
  David Chiu
  Matthew Lang
- *Outstanding Research Awards*
  Sitaram Asur
  Xiaole Bai
  Matthew Koop
- *Outstanding Service Award*
  Don Havard
- *Outstanding Teaching Award*
  Dr. Han-Wei Shen

Sharing the enjoyment of the evening are Dong Xuan and his student, Xiaole Bai.

DK Panda and his student, Matt Koop.

Passages

Dr. Ming -Tsan Liu Retires

After forty years of teaching, research, and service to the Department of Computer Science and Engineering and The Ohio State University, Professor **Ming-Tsan (Mike) Liu** retired.

Mike, as he prefers to be called, is one of the friendliest, kindest, and most humble gentlemen that can be found. He came to OSU-CSE (then named Computer and Information Science) in 1969. His research has been in the areas of Distributed Computing and Computer Networking. He has graduated 55 Ph.D. students during his time here. His students are playing leadership roles in industry and academia, in America, China and elsewhere around the world.

Mike has always been very active in service to the greater computing field. He has been honored with many awards over the years, most recently receiving the Institute of Electrical and Electronics Engineers (IEEE) Presidential Service Award (2007). In 2000, IEEE gave him their Millennium Award and named him a Life Fellow; he had been a Fellow since 1983. The IEEE Computer Society Technical Committee on Distributed Computing acknowledged his research contributions with their Distinguished Achievement Award in 2006.

Dr. Liu received his Ph.D. in Electrical Engineering from the University of Pennsylvania in 1964, as well as a Masters. He began his academic career at the National Cheng Kung University where he earned his Bachelors of Science in Electrical Engineering.

In his retirement, Mike will spend more time with his lovely wife Lily and, using his vast camera collection, fill many gigabytes of memory with photos of his grandchildren and parakeets.

Retirement is the Trend

Following the example set by Dr. Liu, **Dr. Stuart Zweben** decided to spend his more of his time away from campus and has retired as well.

Dr. Stuart H. Zweben joined the Ohio State Computer & Information Science Department (now named the Dept. of Computer Science and Engineering) in 1974 and became its chairperson twenty years later in October 1994. He remained the Chair until the Autumn of 2005 thus setting a record for length of occupancy in that role. He then moved up the Administration ladder becoming Associate Dean of Academic Affairs for the OSU College of Engineering.

Stuart Zweben (left) and Mike Liu pictured enjoying the 2009 CSE Awards Banquet.

He received his Masters (1971) and Ph.D. (1974) degrees from Purdue University in 1974 after having received his Bachelors of Science in Mathematics from City College of New York. He is a Fellow and former president of ACM (Association for Computing Machinery) and former president of the Computing Sciences Accreditation Board (CSAB). Currently he serves on the Board of Directors of the Computing Research Association (CRA) and on the editorial board of the Empirical Software Engineering Journal.

Stu has been an award winning chair. The Columbus Technology Council named him Top Contributor to the Advancement of Technology (Outstanding Educator Advancing Technology) in 2002. He previously had received the Columbus Technical Council's Technical Person of the Year Award (2000). He also received an Outstanding Service Award from the ACM in 1997.

His research interests are in software engineering and computer science education. He is co-director of the Reusable Software Research Group along with Bruce Weide and Tim Long. His special interests are in the testing of object-based software, and in doing empirical studies to assess the effectiveness of various software engineering principles and practices.

During his tenure as leader of CSE, Stu dealt with many issues including irate students slamming his door to the loss of a dear colleague to entertaining the dogs his secretary raised for Canine Companions for Independence. His In Box was labeled "Big Kauna" and a mug on his desk read "El Jefe." His name was misspelled and mispronounced. Throughout it all he kept his head, smiled and managed the chaos.

Even the death of friends will inspire us as much as their lives ... Their memories will be encrusted over with sublime and pleasing thoughts as monuments of other men are overgrown with moss; for our friends have no place in the graveyard. ~ Henry David Thoreau

The Department of Computer Science and Engineering family has experienced passings of a more permanent kind this year.

Eitan Gurari 1947 - 2009

Our department and the computer science community lost a scientist suddenly and unexpectedly. Dr. Eitan Gurari, Associate Professor, passed away Monday, June 22, 2009.

Dr. Gurari was born in Israel in March 1947. He attended Technion - Israel Institute of Technology where, in 1971, he received Bachelors of Science in Physics. He continued his studies there, but changed focus to Computer Science receiving a Masters degree in 1974. The University of Minnesota granted him a Ph.D. in 1978 (Computer Science) after which he taught at the University of Wisconsin - Milwaukee and the State University of New York at Buffalo. He joined the Ohio State University Department of Computer Science and Engineering in 1982.

Dr. Gurari started his career as a theoretician. He made fundamental contributions to automata and complexity theory. His textbook, An Introduction to the Theory of Computation, was highly praised and he published frequently in JACM, SIAM Computing, ACM STOC, and IEEE FOCS. After joining OSU, Gurari switched his research focus, starting to build software systems. His most recent Software Engineering research interests covered hypertext processing and Braille production. His creation, the TeX4ht system, has been widely used worldwide in the scientific community for publishing research papers on the Internet and is generally considered to be the best application to translate LaTeX into other formats. He often received emails from users praising and appreciating the various software systems he had single-handedly built.

Eitan left behind his wife, Shaula Gurari, two sons and three daughters.

Loss of a Former CSE Office Commander

This year, CSE learned one of its first staff members had passed. Commander **Ernest Staveley**, USN, Ret., of Upper Arlington, passed away July 6, 2009 at the age of 83. Ernest, commonly known as Ernie, joined CSE (then Computer and Information Science) in 1968 as our Chief of Staff. In this position, Ernie hired many of the office staff who built the Department and assisted with establishing its position in the College of Engineering. He was a tolerant task master; tolerating office chair racers through Caldwell hallway and leading the team as the Department successfully grew. He was also the pitcher of the less successful WYSIWYGS Softball Team. He retired effective July 1, 1991.

Before coming to OSU-CSE, Ernie Stavely was Commander Staveley of the United States Navy and held a Masters degree from Navy Postgraduate School.

Ernie is survived by his wife of 59 years, Dorothy. He had five children; Mary (Paul), David (Kathy), Helen (Tom), Joan (David), Ruth (John). Joan is an OSU alum and participated in the 1999 Animation Celebration.

Loss Far Too Soon

To work in academia means students will move in and out of your life, but when the loss is sudden and permanent, it affects the community. Jeremy Bryon George came into the world November 24, 1986, and left us March 4, 2009. By George, as he liked to be called, was a true bright light in this world. A favorite with his instructors, he was known for having a good mind, being an exceptional student, and was interested game design, poetry and music.

Industrial Advisory Board Expansion

The Department of Computer Science and Engineering continues to expand its Industrial Advisory Board. This year two new members have joined the board, **Matt Desch** and **Michael Fortin**.

Since the day he graduated from OSU, Matt Desch's career has been in ascension. He earned his BS in 1980 and began working for AT&T Western, now Alcatel Lucent. Moving within the company to Chicago, in 1986, he was able to gain his MBA taking night classes from the University of Chicago. Interested in greater challenges, he moved to Northern Telecom which has become Nortel Networks. He climbed the ladder there until he found himself living in London, England, and in charge of Nortel's international business. At this point, he decided to become involved with starting new companies and the venture capital front. In 2003, he became CEO of Telcordia Technologies which he then sold in 2005. He was then recruited to be the Chairman and CEO of Iridium Satellite, where he leads today. An avid pilot since getting his license as a high school student in Kettering, Ohio, Matt uses his small airplane to get his wife Ann and their Jack Russell terrier to and from Ohio State activities from their homes in Washington, Dallas, and Pinehurst, NC.

Michael Fortin is a Distinguished Engineer working in the Windows Core Operating Systems Division where he has management and architectural oversight responsibilities for disciplines such as performance, reliability, feedback, application compatibility, and diagnosis. He was employed by IBM before joining Microsoft, and worked primarily as a performance analyst and architect on a variety of operating systems. Fortin received a doctorate in computer science from The Ohio State University in 1991, and a Masters in 1987. It was at Ohio State where he developed a strong appreciation for the art of performance analysis and improvement. He also has an undergraduate computer science degree from Cincinnati's Xavier University. In his spare time, Fortin enjoys most competitive sports, skiing with his daughters, a good poker game, and spending time with his family.

The primary mission of the CSE Industrial Advisory Board is, as it has always been, to insure the world is aware of the quality research and teaching done in CSE. Additionally, through the members' prominent corporate positions or via interaction with their extensive network connections, they will watch for internships, jobs, and grant situations for CSE students and assist them in attaining those goals. Board members will also aid faculty members with collaboration opportunities as well as acquiring new funding sources. As leaders in their respective areas, they will inform the Department of changes and new trends within the computing field and suggest adjustments in strategic planning to meet these shifts. Their guidance will be a vital component in raising the Department of Computer Science and Engineering to a greater level of prominence and influence.

During these challenging economic times, the Board will give direction for organizing individual and major donation activities. They will watch for and develop relationships with substantive donors affecting large endowments for increased research funding and expansion of scholarship funds.

Besides **Matt Desch** and **Michael Fortin**, the current board includes: **James Cates** (MS '71, Altera, Corp.); **Wayne Clark** (BS '73, Cisco Systems); **David Cohen** (Ph.D '77, sente.com, Inc); **Bruce Flinchbaugh** (Ph.D '80, Texas Instruments); **Shivnandan (Shiv) Kaushik** (MS, '91, Ph.D. '95, Intel); **Doug Roble** (MS, '87, Ph.D., '92, Digital Domain); **Feng Zhao** (former CSE faculty member [1992-2000] Microsoft Research).

Wayne Clark (center in long sleeves and tie) of the Industrial Advisory Board talks with CSE Students about working in Industry.

Research

The faculty continually makes impact and contributions within CSE's five focus areas of research. The Department of Computer Science and Engineering strives with great determination to excel.

- The **Artificial Intelligence** Cluster has been a source of stable growth since Dr. **B. Chandrasekaran**'s (now Senior Research Scientist) established its first lab, LAIR (Laboratory for Artificial Intelligence Research) forty years ago. Chandra, along with **John Josephson**, Research Scientist, continues overseeing students in LAIR, but it is not the only busy lab. Five faculty members; Professor **DeLiang (Leon) Wang**, Associate Professors **Chris Brew** and **James Davis**, and Assistant Professors **Mikhail Belkin**, and **Eric Fosler-Lussier**, are all questioning ideas, searching for answers and mentoring students. They examine questions in the dimensions of Speech and Language Technologies, Perception and Neurodynamics, Computer Vision and Machine Learning research.
- The **Graphics Area** continues to expand and grow as much now as it did in the field's infancy. Professor **Rick Parent**, working in Computer Animation, gains greater worldwide recognition for his expertise. Professor **Tamal Dey**, Associate Professor **Raphael Wenger** and Assistant Professor **Yusu Wang** will soon be joined by **Luis Rademacher** in the area of Computational Geometry and Algorithms. Considering the questions and finding answers in Computer Graphics and Visualization are Associate Professors **Roger Crawfis**, **Raghu Machiraju** and **Han-Wei Shen**.
- The **Networking Group**, will miss its founder Professor **Ming-Tsan (Mike) Liu**, but its faculty is strong and has a breadth of research offering many opportunities for graduate students. Professor **Ness Shroff**, working within both CSE and ECE, oversees projects in wireless and wireline communication networks. Professor **David Lee** leads the work security research. Professor **Anish Arora** leads a large sensor network project along with his colleagues Professor **Ten-Huang (Steve) Lai**, Associate Professor **Dong Xuan**, and Assistant Professor **Prasun Sinha** who are working in other realms of sensor research. Professor **Xiaodong Zhang**'s research crosses into the Networking sphere through his work in Internet and Distributed Systems.
- The **Software Engineering** Group research is a product-oriented view of software which prioritizes process and management, but maintains vigilance to the details so the systems work correctly. A uniquely structured group, a common theme runs through the work: establishing behavioral properties of a software system by reasoning -- modularly -- about the source code of its components. The faculty includes Professors **Bruce W. Weide**, Associate Professors **Timothy J. Long**, **Atanas (Nasko) Rountev**, **Neelam Soundarajan, Paolo A.G. (Paul) Sivilotti**, and **Ken Supowit**. Also included are Senior Research Scientist **Jay Ramanthan** and Clinical Assistant Professor **Rajiv Ramnath** who oversee CETI, "CERCS for Enterprise Transformation and Innovation." CERCS is the National Science Foundation funded multi-institutional Center for Experimental Research in Computer Systems at Georgia Institute of Technology.
- The **Systems Group** grows forcefully and abundantly. Whether the questions are in Core Computer Systems and Architecture, High-End and Distributed Systems, or Datamining and Databases, these researchers will search for answers. Full Professors **Gagan Agrawal**, **D. K. Panda**, **P. Sadayappan** and **Xiaodong Zhang** serve as senior leaders striving to keep ahead of the Associate Professors **Hakan Ferhatosmanoglu** and **Srinivasan Parthasarathy** and Assistant Professors **Feng Qin** and **Radu Teodorescu**. Associate Professor **Atanas (Nasko) Routev** also collaborates with several system faculty on compiler and software reliability. New Assistant Professor **Christopher Stewart** will join the group October 2009.

Computational Modeling and Analysis of Shape Geometry

Many applications in science and engineering require modeling and analysis a geometric shape for scientific simulations, rapid prototyping, visualizations, and various other purposes. For example, if a car body is modeled digitally within a computer, several scientific analyses can be performed on this model to predict and improve its performance. Using sophisticated laser scanners available nowadays, one can scan the surface of the car to generate points from them. A computer program can then connect these points with triangles to reproduce the surface. Various geometric structures can then be computed for different physical simulations and/or visualizations.

The above example embodies a series of problems that need efficient and robust solutions. The conversion of a point data into a polygonal surface is the Surface Reconstruction problem. To improve the shape quality of the surface elements, one needs to mesh it further without destroying the geometry and topology of the shape. This leads to the problem of Mesh Generation. After generating a good mesh for the shape, post-processing applications may need to extract various geometric and topological structures which gives rise to the problem of Shape Analysis. **Tamal Dey** and his research group Jyamiti focused on the three problems in shape modeling mentioned above. The main emphasis of Prof. Dey's research is to design algorithms for the above problems with mathematical guarantees, that is, the output of the algorithms is quantifiable with provable geometric and topological properties. Almost all of these algorithms have been implemented into robust software some of which are routinely used in academia and industry.

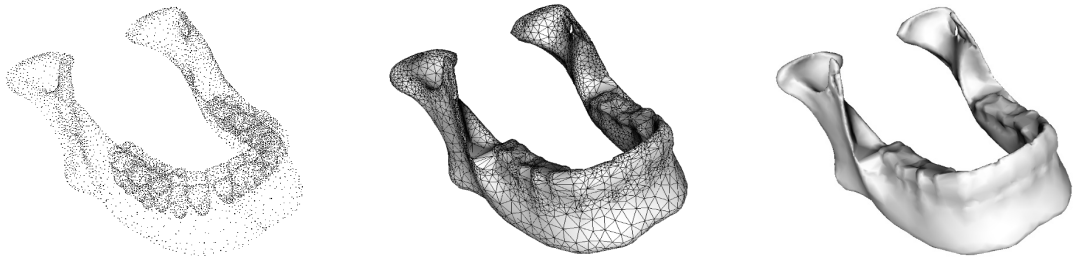


Figure 1: Modeling a jaw bone from a scanned point sample with Cocone software.

In Surface Reconstruction Dey and his group developed a well known suit of solutions called Cocone algorithms and software based on them (http://www.cse.ohio-state.edu/ tamaldey/cocone.html). Various issues such as noise, boundary effects, scales, and robustness are addressed in these developments. The Cocone software have gained a considerable popularity over the years which is evident from its several thousand downloads. See Figure 1 for an example reconstruction by Cocone. Prof. Dey summarized the recent developments in provable surface reconstruction algorithm designs in a book titled Curve and Surface Reconstruction: Algorithms with Mathematical Analysis published by Cambridge University Press in 2007.

In Mesh Generation the Jyamiti group focused on how to generate meshes from various kinds of input domains in three dimensions with provable guarantees. These domains include implicit and polygonal surfaces, and volumes enclosed by them. In a recent work the dif_cult problem of meshing piecewise smooth domains and non-manifolds has been addressed. In fact, Dey and his group provided the first viable solution for the problem which is both practical and is theoretically sound. A software application called DelPSC (http://www.cse.ohio-state.edu/ tamaldey/delpsc.html) has been released which is slowly gaining the popularity.

In Shape Analysis, Dey and his group developed new methods to extract and identify geometric features from point data and meshes. For example, a novel algorithm based on topological ideas was designed to identify the head, arms, legs, and torso of a human body automatically from a laser scanned point sample. This feature identification algorithm is used in retrieving shapes that are similar to a given shape from a pool of shapes. Figure 3 shows some examples of feature identifications and medial axis computations with our software. A software application, SegMatch

Computational Modeling and Analysis of Shape Geometry – cont'd.

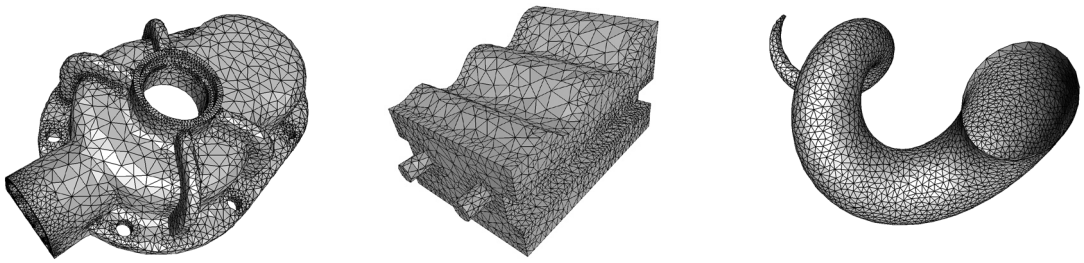


Figure 2: Mesh generation of piecewise smooth shapes with DelPSC software.

(http://www.cse.ohio-state.edu/ tamaldey/segment.html), has been built on this concept. In another development Dey and his students developed new techniques to identify special set of curves on a surface that have certain topological properties. These curves are useful in identifying shape features as well as in surface parameterization. A software application called HanTun has been built on this work which finds applications in computer graphics.

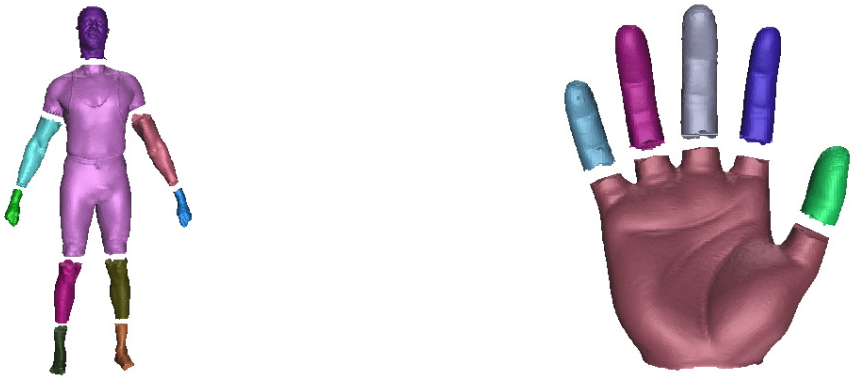


Figure 3: Segmentation of 3D models into so-called features with SegMatch software.

After working on algorithm/software design for shape representation and shape analysis mainly for three dimensional geometries, Prof. Dey wants to focus on the generalization of these problems in higher dimensions. In particular, he aims to apply his experience and expertise in computational geometry and topology to the problem of data analysis which deals with point data in high dimensions. In some of his recent works, he and his co-researchers have designed new algorithms for computing homology groups and their representatives from point data in high dimensions. These are important topological information that can aid in understanding the space from where the data are sampled. For high dimensional data, the main challenge is to extract information with as little as possible computations. The hope is that looking at the problem of data analysis from a geometric point of view would open up new opportunities.

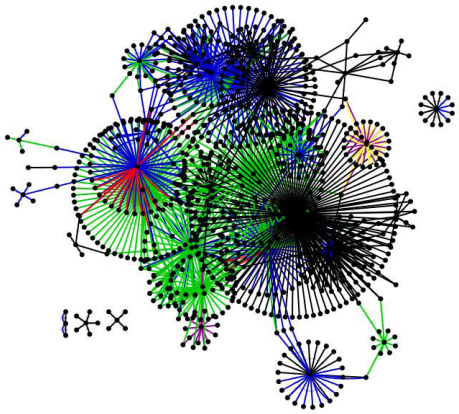
Managing and Analyzing Peta-Scale Data

Advances in technology have enabled us to collect large amounts of data in all walks of human endeavor. Examples include scientific observations (e.g. astronomical surveys), experimental studies (e.g. Gene expression arrays), simulation studies (e.g. molecular dynamics), clinical testing (e.g. MRIs), the World Wide Web and social network analysis (e.g. Facebook). Such data can be preprocessed and abstracted in many forms and modalities. Integrating, managing, and mining such data so that useful information can be gleaned efficiently from them is at the heart of Professor Parthasarathy's research agenda.

Over the last few years Associate Professor **Srinivasan Parthasarathy** and his group (the Data Mining Research Laboratory) have been targeting several important real world problems along these lines. Past work with local physicists has sought to understand the dynamics of defect evolution in materials through the analysis of molecular dynamics simulations. His group has also been working with local clinical vision scientists toward the development of a novel modeling and classification system for the early detection of Keratoconus, a corneal eye disease that is the second leading cause of blindness in the US. Another major direction of work has been the development of a toolkit (MotifMiner) for mining structural motifs in molecular datasets. Next, we highlight two recent high profile projects actively underway in the data mining research laboratory.

Architecture Conscious Data Mining and Management: Prof. Parthasarathy's work at the intersection of data mining and high performance computing, in the late nineties resulted in the development of several novel scalable algorithms for mining dynamic and distributed datasets. Several of these papers have been quite influential both in terms of their wide-spread adaptation and in terms of citations from peer researchers. A substantive recent effort along these lines has focused on algorithms and runtime support for architecture conscious data mining and management. With recent advances in computer architectures (e.g. multi-cores, GPGPUs), they have found that a large majority of data mining and management tasks heavily under-utilize the capabilities of such architectures. In an effort to redress this limitation they have made a number of fundamental algorithmic contributions over the last decade that demonstrate how several data mining and indexing algorithms can significantly benefit and effectively scale to tera- and peta-scale data by leveraging succinct data structures and cache-, memory-, disk- and network- aware designs. Based on some of the initial findings Prof. Parthasarathy and his group are currently designing a prototype runtime framework wherein different system services that can aid and abet in designing and prototyping such applications (e.g. scheduling, data placement, I/O, caching) can be interconnected using simple plug-and-play semantics. As part of future work they plan to investigate the use of energy-aware algorithm designs for architectures ranging from embedded systems to hybrid supercomputers. Their work in this project has appeared in many of the top conferences and journals in the field highlighted by a best paper award from the VLDB 2005 conference.

Extract, Analyze and Visualize: A Framework for Network Science: A second project currently underway aims to unravel common principles, events, algorithms, and tools that govern network behavior across different domains ranging from social networks to biological networks. Of particular interest here are not just scalable algorithms for module discovery, link discovery, anomaly detection and event detection but also usable systems infrastructure that can enable researchers to effectively query, visualize, and analyze such networks under various trust, probabilistic and provenance models. In addition to several novel systemic and algorithmic contributions, Prof. Parthasarathy and his group have also worked closely with domain scientists making important contributions to their particular discipline. For example, working together



with biologists, they have recently identified new methods to analyze and predict the functionality of protein-protein and protein-DNA interactions. Their work on this project has appeared in many of the top conferences and journals in the field highlighted by a best paper at SIGKDD 2007.

Professor Parthasarathy's group has been funded by the Department of Energy, the National Institutes of Health, the National Science Foundation, and the Department of Defense. Additionally support from Intel Corporation, Pfizer Inc., IBM and Microsoft Research is also gratefully acknowledged.

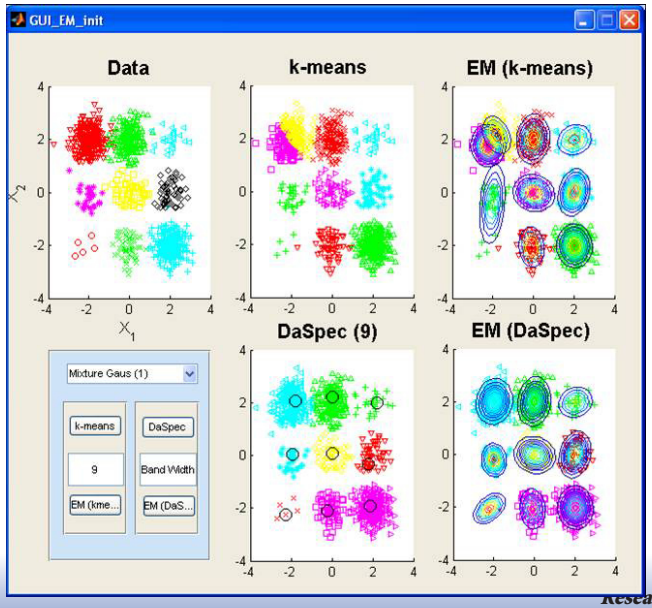
Searching for Understanding structures in natural data

Understanding structures in natural data is one of the fundamental issues facing researchers in machine learning and pattern analysis. The goal is to get a grip on these structures by creating some model or summary of the data. One of the oldest and most common data modeling tools is mixture of Gaussian distributions. The data is represented as a sum of several Gaussians and the centers of those Gaussians are often thought as representatives for clusters in the data. This model is used widely in areas ranging from speech recognition and synthesis (where it is ubiquitous) to computer vision to bioinformatics and many other fields. Even though the model is so useful, simple, and has a long history (going back to the 19th century!) many aspects of inference are not well understood.

The standard method for learning a mixture from data is Expectation Maximization (EM), which is usually initialized using the standard k-means clustering algorithm. However, as it turns out, the behavior of this algorithm can sometimes be surprisingly unpredictable and counterintuitive even in one or two dimensions. **Dr. Mikhail Belkin,** in his joint work with Tao Shi (Ohio State University, Department of Statistics) and Bin Yu (University of California, Berkeley, Department of Statistics), has proposed a new algorithm for learning Gaussian mixture distributions. The algorithms have theoretical guarantees when the mixture components are sufficiently separated and can be seen to outperform the standard methods for several datasets. The researchers are now in the process of applying it to real-world problems, such as speech recognition. A part of this work was published in the International conference on Machine Learning (ICML) 2009 and will soon appear in the Annals of Statistics.

The second important direction the team focuses on is the theoretical properties of learning Gaussian mixture distributions. Relatively little is currently known about this fundamental problem.

Interestingly, all existing theoretical results for learning these mixtures require large separation between the components. Together with graduate student Kaushik Sinha, Belkin's team has been able to produce the first algorithm for provable polynomial time learning of Gaussian mixture distributions in high dimensions with arbitrarily small separation between the mixture components.



New CSE Awards: 2008 - 2009

Legend

PRIMARY INVESTIGATOR (IN ALPHABETICAL ORDER ACCORDING TO THE NAME OF THE FIRST CSE MEMBER TO WHOM THE FUNDS ARE ASSIGNED)

- *Grant Title*
  Co-PIs (CSE members' names are in blue)
  (OSU Department name initials defined at the end of the section.)
  Sponsor
  Term - Amount

GAGAN AGRAWAL

- *A Language Independent Framework for Compiling Data-Intensive Applications on Highly Parallel Systems*
  National Science Foundation
  $502,000 9/1/08 – 08/31/11

ANISH ARORA

- *IRWIN Research in Wireless*
  Los Alamos National Labs
  $82,500 2/6/09 – 6/30/11
- *Technical Support – Decision Support for Persistent Layered Sensing*
  SAIC, Inc.
  $78,000 8/6/08 – 9/30/09
- *Genifying and Federating Autonomous Kansei Wireless Sensor Networks*
  Co-PI: Ramnath
  BBNT Solutions, LLC
  $500,000 9/1/08 – 8/31/11

JAMES W. DAVIS

- *IRWIN Research in Wireless*
  Los Alamos National Labs
  $55,500 2/6/09 – 6/30/09
- *Center for Automatic Target Recognition Research (Task 4)*
  Air Force Research Laboratory (AFRL)
  $480,000 6/1/09 – 5/24/10

TAMAL DEY

- *Inferring Topology and Geometry for Dynamic Shapes*
  National Science Foundation
  $220,000 9/1/08 – 8/31/11

HAKAN FERHATOSMANOGLU

- *Similarity-based indexing and integration of protein sequence and structure databases DBI*
  Co-PI: Yusu Wang
  National Science Foundation:
  $498,117 8/15/08 – 7/31/11

DAVID LEE

- *Internet Attack Traceback-Cross-Validation and Pebble-Trace*
  Air Force Office of Scientific Research (AFOSR)
  $450,000 4/1/09 – 11/30/12
- *AT&T Gift Award*
  $35,000
- *Google Gift Award*
  $60,000

D.K. PANDA

- *Performance Evaluation of Cluster Networking and I/O Technologies (PECNIT)*
  Advanced Virtual Engine Test Cell, Inc., (AVETEC)
  $30,000 10/1/08 – 3/31/09
- *Extending One-Oided Communication in MPI Programming Model for Next-Generation Ultra-Scale HEC*
  National Science Foundation
  $399,000 9/1/08 – 8/31/10
- *Research on High Performance and Scalable MPI over InfiniBand.*
  Mellanox Technologies, Inc
  $112,599 4/1/08-3/31/09
- *Creating Petascale File Systems Using Application-aware Network Offloading*
  RNET Technologies
  $33,000 6/30/08 - 3/29/09
- *QLogic Gift Award*
  $52,930
- *Sun Gift Award*
  $75,000

ANAND DESAI (JOHN GLENN SCHOOL OF PUBLIC AFFAIRS)

- *Pandemic Influenza Program Initiative B - project 7: Evaluating Feasibility of the Distribution and Dispensing of Antiviral Drugs to Self-Isolated or Self-Quarantined Persons as Part of a Community Containment Strategy in Ohio*
  Co-PI: RAJIV RAMNATH
  Cuyahoga County Board of Health
  $10,000 8/10/08 – 8/9/09

- *Pandemic Influenza Program Initiative B-Project 6 Program: Addressing Vulnerabilities in Populations*
  Co-PI: **Rajiv Ramnath**
  Summit County Health District
  $30,000 8/10/08 – 8/9/09
- *NW Ohio REMS Project*
  Co-PI: **Rajiv Ramnath**
  The Hospital Council of Northwest Ohio
  $20,00012/01/08 – 8/9/09

Rajiv Ramnath

- *Curriculum for Accelerated Services Engineering (CASE)*
  Co-PIs: **Jay Ramanathan**, **Neelam Soundarajan**, D'Agostino
  National Science Foundation
  $149,981 9/1/09 – 2/28/11

Atanas Rountev

- *IBM Gift Award*
  $20,000

P. Sadayappan

- *A Platform-Aware Compilation Environment*
  Co-PI: **Atanas Rountev**
  DARPA (Rice University Subaward)
  $630,438 4/1/09 – 3/31/10
- *Collaborative Research: CPA-CPL-T: An Effective Automatic Parallelization Framework for Multi-core Architectures*
  National Science Foundation:
  Co-PI: **Atanas Rountev**
  $500,000 8/1/08 – 7/31/11
- *Scalable Faulty Tolerant Runtime Technology for Petascale Computers*
  DOE
  PI: Sadayappan
  $375,820 8/1/08 - 7/31/11
- *I/O Forwarding Scalability Layer (IOFSL) Project*
  Argonne National Lab
  PI: Sadayappan
  $10,783 3/30/09 – 6/30/09

Ness Shroff

- *NeTS-NECO: A New Resource Management Paradigm for Sensor Networks with Energy Replenishment*
  National Science Foundation
  Co-PI: **Prasun Sinha** and Can Emre Koksal, OSU-ECE
  $500,000 9/1/08 – 8/31/12

Paul Sivilotti

- *Development and Integration of ODOT Geological Hazard Management System (GHMS): Subcontract for Remediation Cost-Estimation*
  Ohio Department of Transportation
  $33,523 9/15/08 – 6/30/09

DeLiang (Leon) Wang

- *Robust Speaker Recognition Using Auditory-Based Features and Computational Auditory Scene Analysis*
  RADC
  $300,000 2/20/09 – 2/19/11
- *Oticon: Integrating Monaural CASA and Binaural Localization for Robust Speech Separation*
  $180,000 7/1/08 – 6/30/11

Bruce Weide

- *CPA-SEL: Collaborative Research: Continuing progress toward verified software*
  Co-PI: Harvey Friedman, OSU-Dept. of Mathematics
  National Science Foundation:
  $248,590 9/1/08 – 8/31/10

Xiaodong Zhang

- *Collaborative Research: CSR-PSCE, TM: Effective Resource Sharing and Coordination Inside Multicore Processors for High Throughput Computing*
  National Science Foundation:
  $330,000 9/1/08 – 8/31/11

Awards in Good Standing Initiated Before July 1, 2008

Legend

PRIMARY INVESTIGATOR (IN ALPHABETICAL ORDER ACCORDING TO THE NAME OF THE FIRST CSE MEMBER TO WHOM THE FUNDS ARE ASSIGNED)

- *Grant Title*
  Co-PIs (CSE members' names are in blue)
  (OSU Department name initials defined at the end of the section.)
  Sponsor
  Term - Amount

GAGAN AGRAWAL

- *ST-CRTS: Enabling Processing of Large-Scale Scientific Data through Compilers Supported XML Abstractions*
  National Science Foundation (NSF)
  1/15/06-12/31/08 $299,997
- *REU: ST:CRTS: Enabling Processing of Large Scale Scientific Data Through Compiler Supported XML Abstractions*
  National Science Foundation Research Experiences for Undergraduates (NSF REU)
  1/15/08-12/31/08 $10,700
- *CEO: P--A Data-Intensive Cyberinfrastructure Component for Coastal Environmental Forecasting and Analysis*
  National Science Foundation (NSF)
  HAKAN FERHATOSMANOGLU
  10/1/06-9/30/09 $1,400,000

EMRE ERTIN (ECE)

- *Sectored Antenna-based MAC Protocol for WNSs - Year 2*
  Electronics and Telecommunications ResInst.
  ANISH ARORA, Umit Ozguner (OSU-ECE)
  1/1/08-12/31/08 $130,471

MIKHAIL BELKIN

- *CAREER: Geometry and High-Dimensional Inference*
  National Science Foundation (NSF)
  1/1/07 - 12/31/11 $498,972

CHRIS BREW

- *Third Workshop On Issues In Teaching Computational Linguistics*
  National Science Foundation (NSF)
  6/1/08 – 5/31/09 $13,160
- *CAREER: Hybrid methods for acquisition and tuning of lexical information*
  National Science Foundation (NSF)
  2/1/04 – 1/31/09 $500,000

B. CHANDRASEKARAN

- *Artificial Intelligence Techniques And Advanced Decision Architectures*
  Micro Analysis & Design
  David Woods (OSU-IWSE)
  06/01/01 - 09/30/08 $2,759,422

JAMES DAVIS

- *Wright Center of Innovation, Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST)*
  Ohio Department of Development
  Randy Moses (OSU-ECE), John Volakis (OSU-ECE)
  2/26/07 - 2/25/10 $190,000

TAMAL DEY

- *Collaborative Research: Non-Smoothness in Meshing and Reconstruction*
  National Science Foundation (NSF)
  10/1/06 - 9/30/09 $429,402

HAKAN FERHATOSMANOGLU

- *CAREER: Exploration of Dynamic Sequences in Scientific Databases*
  National Science Foundation (NSF)
  07/15/06-07/14/11 $455,000

ERIC FOSLER-LUSSIER

- *CAREER: Breaking the Phonetic Code: Novel Acoustic-Lexical Modeling Techniques for Robust Automatic Speech Recognition*
  National Science Foundation (NSF)
  12/15/06-11/30/11 $502,952
- *ITR: Automatic Speech Attribute Transcription (ASAT): A Collaborative Speech Research Paradigm and Cyberinfrastructure with Applications to Automatic Speech Recognition (ASR)*
  Georgia Institute of Technology (National Science Foundation (NSF) Subcontract)
  10/01/04-08/31/08 $461,000
- *Lexicon Building for Multi-Language Speech Recognition*
  Dayton Area Graduate Studies Institute
  06/19/06-9/30/08 $124,479

MARY BECKMAN (OSU - LINGUISTICS)

- *DHB/Collaborative Research: Using Machine Learning to Model the Interplay of Production Dynamics and Perception Dynamics in Phonological Acquisition*
  National Science Foundation (NSF)
  ERIC FOSLER-LUSSIER
  1/15/08-12/31/10 $273,284

Mark Pitt, (Linguistics)

- *Recognizing Phonological Variants of Spoken Words*
  National Institute for Deafness & Other Communication Disorders
  Eric Fosler-Lussier
  07/01/04-06/30/09 $702,746

David Lee

- *CPATH T: NEWPATH: Nurturing, Through Entrepreneurship, IT World Leaders*
  National Science Foundation (NSF)
  Stephen Camp (OSU-COB), Eylem Ekici (OSU-ECE), Walleed Muhanna (OSU-COB), **Rajiv Ramnath**, **Han-Wei Shen**, **Neelam Soundarajan**, **Bruce Weide**, **Dong Xuan**
  7/1/07-6/30/12 $606,822

Raghu Machiraju

- *ITR/NGS: A Framework for Discovery, Exploration, and Analysis of Evolutionary Simulation Data (DEAS)*
  National Science Foundation
  Srinivasan Parthasarathy, John Wilkins, (OSU-Physics)
  09/15/03-08/31/08 $616,600

D.K. Panda

- *Coordinated Fault Tolerance for High Performance Computing*
  Department of Energy (DoE)
  9/15/06-9/14/11 $1,000,000
- *Research on High Performance and Scalable MPI Over InfiniBand*
  Mellanox Technologies
  4/1/08-3/31/09 $ 112,599
- *High-end computing and networking research testbed for next generation data driven, interaction applications*
  National Science Foundation (NSF)
  Gagan Agrawal, **P. Sadayappan**, **Joel Saltz**, **Han-Wei Shen**
  09/15/04-08/31/09 $1,529,997
- *Performance Evaluation of Cluster Networking and I/O Technologies (PECNIT)*
  Avetec
  07/01/06-12/31/08 $749,996
- *CPA: Designing next Generation Communication and I/P Subsystems with Multi-Core Architecture*
  National Science Foundation (NSF)
  07/01/07-06/30/10 $375,000

DK Panda & P. Sadayappan

- *Programming Models for Scalable Parallel Computing*
  Department of Energy (DoE)
  9/15/06-9/14/11 $1,500,000

Srinivasan Parthasarathy

- *CAREER: A Scalable Framework for Mining Scientific and Biomedical Data*
  National Science Foundation (NSF)
  01/15/04-12/31/08 $288,082
- *SGER: An Event-Driven Approach for Analyzing Interaction Networks*
  National Science Foundation (NSF)
  8/1/07-7/31/08 $58,408
- *NGS: A Services-Oriented Framework for Next Generation Data Analysis Centers*
  National Science Foundation
  Tahsin Kurc, (OSU-BMI), Joel Saltz
  08/01/04-07/31/08 $300,000
- *Scalable Data Analysis: An Architecture Conscious Approach*
  National Science Foundation (NSF)
  06/01/07-05/31/10 $325,000

Jay Ramanathan

- *eGOV Server Migration/Hosting, Content Management, Security and BPM*
  City of Columbus
  Rajiv Ramnath
  12/6/07-4/30/09 $50,000
- *Center for Experimental Research in Computer Systems- Research Site*
  National Science Foundation (NSF)
  Rajiv Ramnath
  5/1/08-4/30/13 $150,000

Francis Holtzhauer (OSU-COPH)

- *Training of Public Health Personnel and Public Health Partners in the "Planning P Process" for a Type 3 Incident*
  Ohio Department of Health
  Anand Desai (OSU-PPM), Joann Pearsol (OSU-COPH), **Rajiv Ramnath**
  4/21/08-8/8/08 $110,206

Steven Gordon (OSC)

- *Improving American Competitiveness through Workforce Education in Cyberinfrastructure Applications*
  National Science Foundation (NSF)
  Cathleen Carey (OSU-OLN), Jose Castro (OSU-IWSE) Steven Gordon (OSC) Ashok Krrishnamurthy (OSC), **Rajiv Ramnath**
  4/1/08-3/31/11 $999,942

P. Sadayappan

- *Enhancements to Disk Resident Arrays Library*
  Pacific Northwest National Laboratory
  02/03/04-09/30/08 $327,014
- *SOFTWARE: Job Scheduling*
  National Science Foundation (NSF)
  Umit Catalyurek (OSU-BMI), Tahsin Kurc, (OSU-BMI), Pete Wyckoff (OSC), Joel Saltz
  09/15/04-08/31/08 $300,167

Han-Wei Shen

- *SciDAC Institute for Ultra scale Visualization*
  Department of Energy (DoE)
  8/15/06-9/14/11 $750,000
- *CAREER: Toward Effective Visualization of Large Scale Time-Varying Data*
  National Science Foundation (NSF)
  02/15/04-01/31/09 $428,178

Donald Stredney (OSC)

- *Validation/Dissemination Virtual Temporal Bone Dissection*
  Children's Research Institute Columbus
  Bradley Clymer, (OSU-ECE), Ashok Krishnamoorthy, (OSC), Petra Schmalbrock, (OSU-Radiology), **Han-Wei Shen**, Janet Weisenberger, (OSU-Speech & Hearing)
  07/01/06-06/30/07 $135,343

Ness Shroff

- *Collaborative research: Towards an Analytic Foundation for Network Architectures*
  National Science Foundation (NSF)
  11/1/07 – 9/30/08 $58,786.12
- *NESTS – NBD: A high performance control plane for mesh networks: Theory and implementation*
  National Science Foundation (NSF)
  10/1/07 – 8/31/09 $316,438
- *CT-T: Collaborative Research: Protecting TCP Congestion Control: Tools for Design, Analysis and Emulation*
  National Science Foundation (NSF)
  7/1/07 – 7/31/09 $91,875
- *NeTS-NOSS: Robust sensor network architecture through neighborhood monitoring and isolation*
  National Science Foundation (NSF)
  7/1/07 – 8/31/09 $132,4775
- *Design of Urban Sensor Networks (MURI)*
  Purdue University
  6/15/07 – 11/14/10 $400,000

Prasun Sinha

- *CAREER: On-The-Fly Protocols for Data Dissemination in Wireless Mesh Networks*
  National Science Foundation (NSF)
  0/15/06-12/31/11 $412,000
- *NeTS-NOSS: Collaborative research: Energy-Efficient Distributed Sensor Network Control: Theory to Implementation*
  National Science Foundation (NSF)
  Ness Shroff
  9/1/07-8/31/10 $204,017.00
- *Collaborative proposal: NOSS: Doing More with Less: Tracking Movements Using a Sparse Sensor Network*
  National Science Foundation (NSF)
  9/1/-81/10 $467,661.00

DeLiang Wang

- *Collaborative Research: Separating Speech from Noise to Improve Intelligibility*
  National Science Foundation (NSF)
  1/15/06- 12/31/08 $144,914
- *Study of Speech and NonSpeech Separation in Aging*
  Veterans Administration
  04/01/06-03/31/11 $500,00
- *Sequential Organization and Room Reverberation in Speech Segregation*
  Air Force Office of Scientific Research (AFOSR)
  2/1/08-11/30/13 $874,369.00

Rongxing Li (OSU-CEEGS)

- *Biologically-Inspired Target Recognition Methods for Multispectral/Hyperspectral and Multiplatform Image Analysis*
  National Geospatial Intelligence Agency
  DeLiang Wang
  8/15/07-5/14/09 $450,000.00

Yusu Wang

- *Feature Extraction, Characterization, and Visualization for Protein Interaction via Geometric and Topological Methods*
  Department of Energy Young Investigator Award (DoE)
  8/15/06-8/14/09 $300,000
- *CAREER: Geometric and Topological Methods in Shape Analysis, With Applications in Molecular Biology*
  National Science Foundation (NSF) CAREER
  2/1/08-1/31/13 $420,000

Bruce Weide

Collaborative Research: Logical Support for Formal Verification
National Science Foundation (NSF)
Harvey Friedman (OSU-Mathematics)
9/1/07-8/31/08 $75,000

Dong Xuan

- *Defending Against Physical Attacks in Sensor Networks*
  Army Research Office
  Anish Arora, Steve Lai
  03/15/07-03/14/10 $280,000
- *CAREER: Algorithm Design for Optimization Problems in Network Over-Provisioning*
  National Science Foundation (NSF)
  12/15/05-11/30/11 $400,060

Xiaodong Zhang

- *Algorithms Design and Systems Implementation to Improve Buffer Management for Fast I/O Data Accesses*
  National Science Foundation (NSF)
  06/01/07-05/31/10 $275,000
- *Collaborative Research: CSR-EHS: System Research on Media Streaming to Heterogeneous Mobile Devices*
  National Science Foundation (NSF)
  09/15/06-08/30/08 $119,314
- *Memory Caching And PreFetching to Improve I/O Performance in High-End Systems*
  National Science Foundation (NSF)
  10/1/06-9/30/08 $93,999
- *Collaborative Research: Next Generation Internet Proxy Systems*
  National Science Foundation (NSF)
  11/1/05-8/31/08 $130,000
- *Collaborative Research: LEAPNET: NOSS: Self-Adaptable All Terrain Sensor Networks*
  National Science Foundation (NSF)
  9/1/07-8/31/09 $141,139.00

Stuart Zweben

- *Wright Center of Innovation in Advanced Data Management and Analysis: Kansei*
  Wright State University (subcontract with Ohio Department of Development)
  Anish Arora
  10/01/03-06/30/08 $222,797
- *Wright Center of Innovation in Advanced Data Management and Analysis: Large-Scale Sensor Network Management and Analysis for Security and Monitory*
  Wright State University (subcontract with Ohio Department of Development)
  James Davis
  10/01/03-06/30/08 $7,000
- *Wright Center of Innovation in Advanced Data Management and Analysis: Audio-Based Analysis and Surveillance*
  Wright State University (subcontract with Ohio Department of Development)
  DeLiang Wang
  10/01/03-06/30/08 $18,000
- *Wright Center of Innovation in Advanced Data Management and Analysis: Large Format Stereoscopic Projection System*
  Wright State University (subcontract with Ohio Department of Development)
  Han-Wei Shen
  10/01/03-06/30/08 $122,600
- *Wright Center of Innovation in Advanced Data Management and Analysis: High Performance and Scalable Data-Centers with Multi-Core Architectures and Emerging Networking Technologies*
  Wright State University (subcontract with Ohio Department of Development)
  DK Panda
  10/01/03-06/30/08 $600,000

Faculty Service
Journal Editorial Boards & Major Conference Chair Positions

Gagan Agrawal
- *IEEE Transactions on Parallel and Distributed Systems*

Anish Arora
- *ACM Transactions on Sensor Networking*
- *Journal of Real Time Systems*
- *Journal of New Generation Computing*

Chris Brew
- *Journal of Artificial Intelligence Research*

James Davis
- *Journal of Machine Vision and Applications*

Tamal Dey
- *Journal of Discrete and Computational Geometry*
- *Executive Board of the Social Modeling Association*

Ten-Hwang (Steve) Lai
- *ACM/Springer Journal of Wireless Networks*
- *Journal of Information Science and Engineering*
- *International Journal of Ad Hoc and Ubiquitous Computing*
- *International Journal of Sensor Networks*
- *Encyclopedia of Computer Science and Engineering*

David Lee
- *IEEE Journal of Selected Areas in Communications (Senior Editor)*
- *I/S: A Journal of Law and Policy for the Information Society*
- *Chair of Executive Committee, International Conference of Network Protocols (ICNP)*
- *Chair of Steering Committee, International Conference of Network Protocols (ICNP)*

Ming T. Liu
- *International Journal of Communication Systems*
- *Chair of Steering Committee, International Conference on Distributed Computing Systems (ICDCS)*
- *Co-Chair, Steering Committee, International Conference on Parallel Computing (ICPP)*

Raghu Machiraju
- *Co-General Chair IEEE Visualization 2009*

D. K. Panda
- *Journal of Parallel and Distributed Computing*
- *Co-Chair of Program Committee, ACM/IEEE Annual Conference of Supercomputing (SC '08)*

Richard Parent
- *IEEE Transactions on Visualization on Visualization and Computer Graphics*
- *The Visual Computer*

Srinivasan Parthasarathy
- *IEEE Intelligent System*
- *Journal of Data Mining and Bioinformatics*
- *Encyclopedia on Geographical Information Sciences*
- *Data Mining and Knowledge Discovery, an International Journal*
- *Co-General Chair, 2009 SIAM International Conference on Datamining*

Atanas (Nasko) Rountev
- *International Journal of Information and Software Technology*

Han-Wei Shen
- *IEEE Transactions on Visualization and Computer Graphics*
- *Co-Chair of Program Committee, IEEE Visualization 2009*

Ness Shroff
- *Computer Networks*
- *IEEE/ACM Transactions and Networks*
- *Co-Chair of Program Committee, 8th ACM International Symposium on Mobile AdHoc Networking and Computing (MobiHoc '08)*

DeLiang (Leon) Wang
- *Journal Cognitive Neurodynamics*
- *EURASIP Journal on Audio, Speech, and Music Processing*
- *Journal of Neurocomputing*
- *Journal of Neural Computing Applications*
- *IEEE Transactions on Neural Networks*
- *Governing Board, International Neural Network Society*

Xiaodong Zhang
- *IEEE Transactions on Parallel and Distributed Systems (Associate Editor-in-Chief)*
- *IEEE Transactions on Computers*
- *IEEE Micro*
- *Journal of Parallel and Distributed Computing*
- *Journal of Computer and Science and Technology (Executive Editor-in-Chief)*
- *Chair of Program Committee 29th International Conference on Distributed Computing Systems (ICDCS 2009)*

Dr. Prasun Sinha (right), with grad student research assistants Xhixue Lu (left) and Zizhan Zheng (center), reviews data received during a test of his wide area assured data service research. Details may be found at www.cse.ohio-state.edu/~prasun. There is also an article in the Spring 2009 edition of the Buckeye Blog which may be found the Department's website.

Visiting Speakers

Distinguished Guest Lecturer

John Makhoul — BBN Technologies
A Model-Based Approach to Speech and Language Processing

M. Tamer Özsu — Cheriton School of Computer Science, University of Waterloo
Distributed XML Processing

Distinguished Guest Lecturer: Jointly Hosted with the OSU - Department of Statistics

John Lafferty — Carnegie Mellon University
Estimating High Dimensional Graphs

Guest Speaker

Shivani Agarwal — Massachusetts Institute of Technology
Learning to Rank

Sami Ayyorgun — Los Alamos National Laboratory
Is There a Communication Strategy Solving the "Rubik Cube" of Wireless Adhoc/Sensor Networks?

Pavan Balaji — Argonne National Laboratory
Message Passing for a Million Processes

Abhishek Chandra — University of Minnesota-Twin Cities
Achieving Predictability in Large-Scale Distributed Systems

Daniel Golovin — Carnegie Mellon University
Online Maximization of Submodular Functions

Du Li — Nokia Research Center
Building Collaboration Services on Cellular Phones

Luis Rademacher — Georgia Institute of Technology
Random Spanning Trees, Expanders, and Routing on Networks

Christopher Ré — University of Washington
Managing Large-scale Probabilistic Databases

Lawrence J. Rosenblum — National Science Foundation
NSF's New Initiatives and Proposal Evaluation

Cynthia Rudin — Columbia University
Supervised Ranking for Manhole Event Mitigation

Jagan Sankaranarayanan — University of Maryland
A Road Map to Understanding, Organizing, and Querying Spatial Information

Tao Shi — Dept. of Statistics, The Ohio State University
Data Spectroscopy: Eigenspace of Convolution Operators and Clustering

Christopher Stewart — University of Rochester
Foundations for the Cloud

Special Presentation
Hosted with Nationwide Insurance, OSU-CSE and OpenSource Student Organization

Damian Conway
Thoughtstream
Associate Professor, Monash University, Australia

Fun with Dead Languages

Focus on Faculty: CSE Faculty Presentations

Raghu Machiraju
Imaging the Body and Disease - A Perspective for the Computer Scientist

Ness Shroff
Cross-Layer Design for Multi-Hop Wireless Networks: A Loose Coupling Perspective

Yusu Wang
Computing Discrete Laplace Operator: From Point Clouds to Meshes and Back to Point Clouds

Radu Teodorescu
Variation Aware Application Scheduling and Power Management for Chip Multiprocessors

Atanas (Nasko) Rountev
Precise Memory Leak Detection for Java Software Using Container Profiling

Dhabaleswar K. (DK) Panda
High Performance Computing with Virtual Machines

Tamal Dey
Computing Handle and Tunnel Loops on Surfaces : A SIGGRAPH paper

Everyone catches Buckeye fever and ends helping to spell out Ohio, even folks from down under!
Special Guest, Damian Conway takes the position of 'H,' while Jim Dinan (CSE Grad Student) is the first 'O,' Heath Bair of Nationwide enthusiastically portrays the 'I' and Aarron Joseph (CSE Undergrad) rounds out the name in the final 'O' position.

TEACHING TEN YEAR STATISTICAL HISTORY

	AU 1998	AU 1999	AU 2000	AU 2001	AU 2002	AU 2003	AU 2004	AU 2005	AU 2006	AU 2007	AU 2008
Faculty	30	28.5	29	30	29	31	31	32	33	35	35
Course Enrollment/ Autumn Qtr.	4,124	3,693	3,977	4,103	4,076	3,650	3,125	3,187	3,238	3,386	3,702
	98-99	**99-00**	**00-01**	**01-02**	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
Students Taught	14,230	14,278	14,278	14,006	13,878	12,208	10,623	10,844	10,641.	11,185	12,209

GRADUATE PROGRAM

Every year through its graduate program, Computer Science and Engineering mentors and educates tomorrow's leaders in our field. Our former students lead in the areas research, education and industry. They can be found in corporate offices, research labs and university classrooms. Students have the options to obtain either a Master's degree or Doctorate or both. The program admits about sixty new students each year. Masters and Doctorate degrees are offered with an emphasis on specialized research areas, including a dual masters degree in CIS and Biomedical Communications.

Admission to the CSE Graduate Program continues to be highly competitive. During the 2008-2009 academic year, we received 677 applications for graduate admissions to the Autumn 2009 quarter.

	AU 1998	AU 1999	AU 2000	AU 2001	AU 2002	AU 2003	AU 2004	AU 2005	AU 2006	AU 2007	AU 2008
Graduate Students Enrolled	169	160	157	159	164	174	169	188	184	235	239
	98-99	**99-00**	**00-01**	**01-02**	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
Graduate Student Applications	703	857	940	1,542	1,508	712	589	694	619	705	677
Graduate Students Supported	119	111	130	175	156	149	158	163	135	135	132
M.S. Degrees Awarded	64	58	36	19	30	31	27	21	33	37	39
Ph.D. Degrees Awarded	10	10	8	4	7	7	11	18	17	32	26
Ph.D. Degrees (cumulative)	297	307	314	318	325	332	343	361	378	410	436

DOCTORATES BESTOWED 2008-2009

Legend

Graduate Name
Advisor — Home
Education History
Post Graduate Professional Destination (Careers in Academia highlighted wiht a ▸)
Dissertation Title

Tan Apaydin
Dr. Hakan Ferhatosmanoglu — Bucak, Burdur, Turkey
B.S., Bilkent Universitesi; M.S., The Ohio State University
Epic Systems, Madison, Wisconsin
Query Support for Multi-Dimensional and Dynamic Databases

Sitaram Asur
Dr. Srinivasan Parthasarathy — Bangalore, India
B.Engr., Visveswariah Technological University; M.S., The Ohio State University
CRA-CIFellow at Hewlett Packard Labs
A Framework for the Static and Dynamic Analysis of Interaction Graphs

Uday Kumar Reddy Bondhugula
Dr. P. Sadayappan — Hyderbad, India
B.Tech., Indian Institute of Technology, Madras, India; M.S., The Ohio State University
IBM T.J. Watson Research Center, Yorktown Heights, New York
Effective Automatic Parallelization and Locality Optimization using the Polyhedral Model

Guadalupe Canahuate
Dr. Hakan Ferhatosmanoglu — Columbus, Ohio, USA
Engineer, Ponticficia Universidad Católica Madre y Maestra, Dominican Republic; M.S., The Ohio State University
▸ University of Iowa
Enhanced Bitmap Indexes for Large Scale Data Management

Lei Chai
Dr. D.K. Panda — Qingdao, P.R.C.
B.Engr., Zhejian University; M.S., The Ohio State University
VMware, Palo Alto, California
High-Performance and Scalable MPI Intra-Node Communication Middleware for Multi-Core Clusters

Michael Gibas
Dr. Hakan Ferhatosmanoglu — Bellbrook, Ohio, USA
B.S.E.E., M.S., The Ohio State University
Teradata, Los Angeles, California
Improving Query Performance through Application-Driven Processing and Retrieval

Leonid Glimcher
Dr. Gagan Agrawal — Columbus, Ohio, USA
B.S., M.S., The Ohio State University
Cisco Systems, Raleigh, North Carolina
FREERIDE-G: A Middleware for Remote Data Analysis

Wei Huang
Dr. D.K. Panda — Hangzhou, P.R.C.
B.Engr., Zhejiang University; M.S., The Ohio State University
VMware, Palo Alto, California
High Performance Network I/O in Virtual Machines Over Modern Interconnects

Mohammad Kamrul Islam
Dr. P. Sadayappan — Westerville, Ohio, USA
B.S., Bangladesh University of Engineering and Technology; M.S., Wright State University; M.S., The Ohio State University
Yahoo!, Sunnyvale, California
QoS In Parallel Job Scheduling

Gaurav Khanna
Dr. P. Sadayappan — New Delhi, India
B.Engr., University of Delhi; M.S., The Ohio State University
Intel Corporation, Hillsboro, Oregon
A Data-Locality Aware Mapping and Scheduling Frameework for Data-Intensive Computing

Matthew Jon Koop
Dr. D.K. Panda — Grand Rapids, Michigan, USA
B.S., Calvin College
NASA Goddard Space Flight Center, Greenbetl, Maryland
High-Performance Multi-Transport MPI Design for Unltra-Scale Infiniband Clusters

Matthew A. Lang
Dr. Paul Sivilotti
Cleveland, Ohio, USA — B.S., Indiana University of Pennsylvania; M.S., The Ohio State University
▸ Moravian College
Maximality: Modular Verification and Implementability

Qingda Lu
Dr. P. Sadayappan — Hefei, P.R.C.
B.Engr., Beijing Institute of Technology; M.S., Peking University; M.S., The Ohio State University
Intel Corporation, Hillsboro, Oregon
Data Layout Optimization Techniques for Modern and Emerging Architectures

Amith Rajith Mamidala
Dr. D.K. Panda — Hyderbad, India
B.Tech., Indian Institute of Technology, Madras; M.S., The Ohio State University
IBM TJ Watson Research Center, NY
Scalable and High Performance Collective Communication for Next Generation Multicore Infiniband Clusters

Sivarmakrishnan Narayanan
Dr. Joel Saltz — Chennai, India
B.Engr., Birla Institute of Technology and Science, Pilani, India
Greenplum Inc, San Mateo, CA
Efficient Virtualization of Scientific Data

Sundeep Narravula
Dr. D.K. Panda — Hyderbad, India
B.Tech., Indian Institute of Technology, Madras, India; M.S., The Ohio State University
Yahoo!, Sunnyvale, California, USA
Designing High-Performance and Scalable Distributed Datacenter Services Ove rModern Interconnects

Ranjit Noronha
Dr. D.K. Panda — Newburgh, New York, USA
B.S., University of Mumbai, India; M.S., State University of New York at Binghamton; M.S., The Ohio State University
Isilon Systems, Seattle, Washington
Designing High-Performance and Scalable Clustered Network Attached Storage with Infiniband

Aleksandar Pantaleev
Dr. Atanas Rountev — Rousse, Bulgaria
B.A., American University of Bulgaria, Blagoevgrad, India; M.S., The Ohio State University
- State University of New York at Oswego

Dynamic Analyses for Understanding and Optimization of Enterprise Java Applications

Rajkiran Panuganti
Dr. P. Sadayappan — Columbus, Ohio, USA
B.Tech., Indian Institute of Technology, Bombay; M.S., The Ohio State University
Microsoft, Redmond, WA
A High Productivity Framework for Parallel Data Intensive Computing in MATLAB

Shansi Ren
Dr. Xiaodong Zhang — Jingzhou, P.R.C.
B.S., University of Science and Technology, Hefei, China; M.S., Bowling Green State University; M.S., The Ohio State University
Microsoft, Redmond, Washington
Analysis and Implementation of Topology-Aware Overlay Systems on The Internet

Gopalakrishnan Santhanaraman
Dr. D.K. Panda — Chennai, India
B.Tech., Banaras Hindu University, Varanasi, India; M.S., University of South Carolina at Columbia, South Carolina, USA
NCSA (National Center for Supercomputuing Applications), Urbrana-Champaign, Illinois, USA
Designing Scalable and High Performance One Sided Communication Middleware For Modern Interconnects

Ambrish Tyagi
Dr. James W. Davis — New Delhi, India
B.Engr., University of Delhi; M.S., The Ohio State University
Omron Scientific Technologies, Inc., Fremont, CA
Layered Tracker Switching for Visual Surveillance

Jonathan Woodring
Dr. Han-Wei Shen — Delta, Ohio, USA
B.S., M.S., The Ohio State University
Los Alamos National Laboratory, Los Alamos, NM
Visualization of Time-Varying Scientific Data Through Comparative Fusion and Temporal Behavior Analysis

Daqing Xue
Dr. Roger A. Crawfis — Wuhu, P.R.C.
B.Engr., Zhejiang University; M.S., Nankai University, Tianjin, P.R.C.
Intel VCG, Austin, Texas
Volume Visualization Using Advanced Graphics Hardware Shaders

Xuan Zhang
Dr. Gagan Agrawal — Beijing, P.R.C.
B.S., Tsinghua University, China; Tsinghua University, China
Supporting On-The-Fly Data Integration for Bioinformatics

Youding Zhu
Dr. Richard Parent — Ningbo, P.R.C.
B.Engr., M.S., Tongji University, Shanghai, P.R.C.
Honda Research
Model-Based Human Pose Estimation with Spatio-Temporal Inferencing

Spring 2009, Sitaram Asur, in his commencement robes, poses with his mentor, Srinivasan Parthasarathy.

At the Winter 2009 commencement (rrom left to right): Xiaodong Zhang (CSE Chair and Ren's advisor) and Gordon Gee (President of The Ohio State University), pose with new Doctor of Philosophy, Shansi Ren.

MASTER OF SCIENCE DEGREES 2008 - 2009

Legend

O **Name**
Advisor — Home
Previous Degrees

O **Bruce Morgan Adcock**
Dr. Bruce Weide — Latham, New York, USA
B.S., Lafayette College, USA; M.S. (Mathematics), The Ohio State University

O **Xiaole Bai**
Dr. Dong Xuan — Hilliard, OH, USA
B.Engr., Southeast University, P.R.C.; M.S., University of Helsinki

O **Karthik Beeraka**
Dr. Prasun Sinha — Rajahmundry, India
B.S., Birla Institute of Technology and Science, India

O **Yashwanth Venkatak Krish Chanamolu**
Dr. Prasun Sinha — Hyderbad, India
B.Engr., Osmania University, India

O **Prashant Chandrasekaran**
Dr. Rajiv Ramnath — Chennai, India
B.Engr., Anna University, India

O **Ai Chen**
Dr. Ten-Hwang (Steve) Lai — Zhejiang, P.R.C.
B.Engr., M.S., Tsinghua University, P.R.C.

O **Lei Ding**
Dr. Mikhail Belkin — Maanshan, P.R.C.
B.S.C.S.E., Zhejiang University, P.R.C.

O **Xiaoning Ding**
Dr. Xiaodong Zhang — Xian, China
B.Engr., Northwestern University Polytechnical University, P.R.C.

O **Tejus Abhimutt Gangadharappa**
Dr. D.K. Panda — Bangalore, India
B.Engr., Visveswariah Technological University, India

O **Sudhaa Gnanadesikan**
Dr. Atanas (Nasko) Rountev — Chennai, India
B.Engr., Anna University, India

O **Shilpa Huttanahalli Gopal**
Dr. Gagan Agrawal — Bangalore, India
B.Engr., Mangalore University, India

O **Vasudha Gupta**
Dr. Rajiv Ramnath — Noida, India
B.Tech., Guru Gobind Singh Indraprastha University, India

O **Zhaozhang Jin**
Dr. DeLiang (Leon) Wang — Shanghai, P.R.C.
B.E.E., Shanghai Jiao Tong University, P.R.C.

O **Nirmal Shravanth Kagolanu**
Dr. Paul Sivilotti
Vijayawada, India
B.S., Nagarjuna University, India

O **Nipun Kalra**
Dr. Prasun Sinha — Stamford, Connecticut, USA
B.Tech., Uttar Pradesh Technical University, India

O **Jason Kirschenbaum**
Dr. Bruce Weide — Shaker Heights, Ohio, USA
B.S., B.S., The Ohio State University, USA

O **Aman Kumar**
Dr. Rajiv Ramnath — Ambala, India
B.Tech., Maharshi Dayanand University, India

O **Rahul Kumar**
Dr. D.K. Panda — Madhubani, India
B.Tech., University of Roorkee, India

O **Darrell Brian Larkins**
Dr. P. Sadayappan — Columbus, Ohio, USA
B.S.C.I.S., The Ohio State University, USA

O **Hsing-Jung Lee**
Dr. Gagan Agrawal — Taipei City, Taiwan
B.B.A., National Central University, P.R.C.

O **Omkar Mukund Lele**
Dr. B. Chandrasekaran — Pune, India
B.Engr., University of Pune, India

O **Na Li**
Dr. David Lee — Nanchang, P.R.C.
B.S., Zhongshan University, P.R.C.; Masters, Chinese Academy of Science, P.R.C.; M.Appl.Stat., The Ohio State University

Prateeti Mohapatra
Dr. Eric Fosler-Lussier — West LaFayette, Indiana, USA
B.Engr., Birla Institute of Technology, Mesra, Ranchi, India; M.S., University of Massachusetts at Dartmouth, USA

O **Madhavi Marigold Muppala**
Dr. Richard Parent — Hyderbad, Andra Pradesh, India
B.S., Birla Institute of Technology and Science, India

O **Deepak Nagaraj**
Dr. Gagan Agrawal — Bangalore, India
B.Engr., Viseveswariah Technological University, India

O **Bhargavi Rajaraman**
Dr. D.K. Panda — Villupuram, India
B.Tech., Birla Institute of Technology and Science, India

O **Lifeng Sang**
Dr. Anish Arora — Hanzhou, P.R.C.
B.Engr., M.S., Zhejiang University, P.R.C.

O **Kaushik Sinha**
Dr. Mikhail Belkin — Burwan, India
B.Tech., Kakatiya University, India; M.Tech., Indian Institute of Technology, India

- **Timothy Sprague**
  Dr. DeLiang (Leon) Wang — Hamilton, Ohio, USA
  B.S.C.S.E., The Ohio State University, USA

- **Jaidev Krishna Sridhar,**
  Dr. D.K. Panda — Bangalore, India
  B.Eng., Visveswaraiah Technological University

- **Divya Sridharabalan**
  Dr. Prasun Sinha — Detroit, Michigan, USA
  B.Tech., SRM University, India

- **Kedamath Thangudu**
  Dr. Yusu Wang — Vizianagaram, India
  B.Tech., International Institute of Information Technology, India

- **Aye Thuzar**
  Dr. Han-Wei Shen & Dr. Dong Xuan — Yangon, Myanmar
  B.A., Smith College, USA

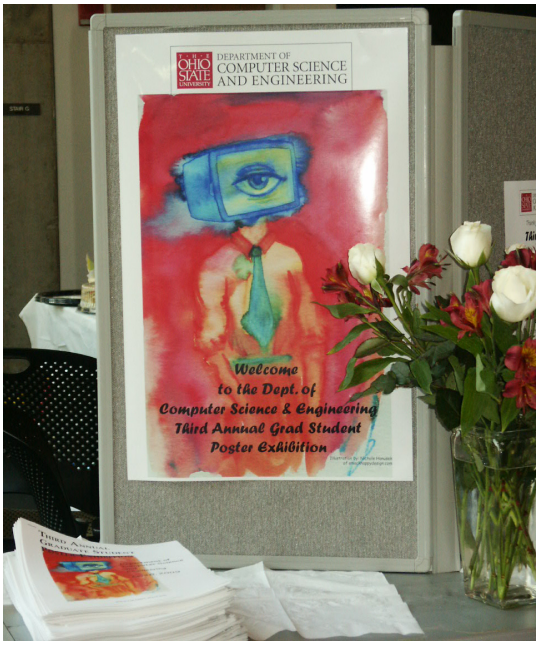
- **Aditya Raghavendra Torvi**
  Dr. Roger Crawfis — Pune, India
  B.Engr., Visveswariah Technological University, India

- **Jaswini Vijayakumar**
  Dr. Paul Sivilotti — Ciombatore, India
  B. Tech., Anna University, India

- **Pihui Wei**
  Dr. Anish Arora — Columbus, Ohio, USA
  B.S., Shandong University, P.R.C.; Master's, Chinese Academy of Sciences, P.R.C.

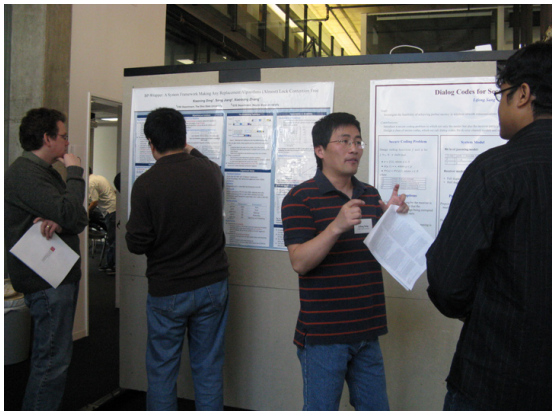
- **Srikar Yekollu**
  Dr. Mikhail Belkin — Columbus, Ohio, USA
  B.Engr., National Institute of Technology, India

- **Qian Zhu**
  Dr. Gagan Agarwal — Richmond Heights, Ohio, USA
  B.S., Beijing Institute of Technology, P.R.C.



Welcome to the 2009 Graduate Student Research Poster Exhibition.

Chair Xiaodong Zhang presents the "Best in Show" winner, Ben Schroeder with his certificate of achievement.



Guests and students discuss the research presented.

2009 GRADUATE STUDENT RESEARCH POSTER EXHIBIT

The 3rd Graduate Student Research Poster Exhibit was a third success. Below are the participants with their advisors names and poster titles.

Name	Advisor	*Title*
Bruce M. Adcock	Bruce Weide	*The End of Debugging as We Know It*
Michael Andereck	Rick Parent	*Interactive Smoothed Particle Hydrodynamics*
Xiaole Bai	Dong Xuan	*Authentication in Malicious Environments*
Muthu Manikandan Baskaran	P. Sadayappan	*Automatic Parallelization and Optimizations for Modern Multi-core Architectures*
Matt Boggus	Roger Crawfis	*Procedural Creation of Three Dimensional Caves*
Ai Chen	Ten-Hwang (Steve) Lai	*Measuring and Guaranteeing Quality of Barrier-Coverage in Wireless Sensor Networks*
Feng Chen	Xiaodong Zhang	*Hystor: A Hybrid Storage System Delivering SSD Performance at HDD Cost*
Xiaoning Ding	Xiaodong Zhang	*BP-Wrapper: A System Framework Making Any Replacement Algorithms (Almost) Lock Contention Free*
Lei Ding	Mikhail Belkin	*Object Segmentation and Recognition from Images*
Jonathan Eisenmann	Rick Parent with Matt Lewis of ACCAD.	*Interactive Evolutionary Design for Motion Variety*
Qi Gao	Feng Qin	*First-Aid: Surviving and Preventing Memory Management Bugs during Production Runs*
Mark Keck	James Davis	*On Finding Static Occluding Structures with Few Views*
Jason Kirschenbaum	Bruce Weide	*Investigations in Tuning Proof Assistants for Program Verification*
Matthew Koop	D.K. Panda	*Network-Aware Messaging for Ultrascale Supercomputers*
Matthew Lang	Paul Sivilotti	*Modular Verification of Maximality Properties*
Brian Larkins	P. Sadayappan	*Global Trees: A Framework for Linked Data Structures on Distributed Memory Parallel Systems*
Teng-Yok Lee	Han-Wei Shen	*Visualizing Time-Varying Features with TAC-based Distance Field*
Na Li	David Lee	*Malicious Node Conviction in Untrustworthy Distributed Network*
Ren-Shiou Liu	Prasun Sinha	*Distributed Routing and Rate Control in Perpetual Sensor Networks*
Timothy Miller	Radu Teordorescu	*Flexible Redundancy in Robust Processor Architecture*
Jeremy Morris	Eric Fosler-Lussier	*Automatic Speech Recognition using Conditional Random Fields*
Shansi Ren & Enhua Tan	Xiaodong Zhang	*Design, Implementation, and Evaluation of a Topology-Aware and Infrastructure-Independent BitTorrent Client*
Issam Safa & Chunajiang Luo	Yusu Wang	*Gradiant Estimation in Eigen Space*
Lifeng Sang	Anish Arora	*Dialog Codes for Secure Wireless Communications*
Gopalakrishnan Santhanaraman	D.K. Panda	*Designing High Performance and Scalable One-Sided Communication Middleware on Modern Interconnects*
Venu Satuluri	Srinivasan Parthasarathy	*Scalable Graph Clustering Using Flows*
Benjamin Schroeder	Rick Parent with Marc Ainger of the OSU School of Music	*Real-time Sounding Plates for Rigid Body Simulations*
Kaushik Sinha	Mikhail Belkin	*Semi-Supervised Learning with Sparse Eigenfunction Bases*
Mukundan Sridharan	Anish Arora	*Virtualization in Sensor Networks*
Kelly Yackovich	Jay Ramanathan	*Dynamic CitiScapes Architecture for Service Composition within Complex Systems*
Zhimin Yang	Dong Xuan	*E-SmallTalker: A System for Mobile Social Networking in Physical Proximity*
Zizhan Zheng	Prasun Sinha	*Alpha Coverage: Bounding the Interconnection Gap for Vehicular Internet Access*
Youding Zhu	Rick Parent	*Online Transfer of Human Motion to Humanoids*
Qian Zhu	Gagan Agrawal	*Support Time-Critical Event Handling in Distributed Environments*

Undergraduate Program

Overview

In these recessionary times, a college education can appear to be a luxury, but in today's job market, it is a necessity more than ever. The Bureau of Labor Statistics estimations continue showing computing graduates as the most in demand. More companies have begun to see the need for students with not just the technical skills but also the ability to adapt to new responsibilities and move in areas beyond the computer program requiring organizational, communication and interpersonal abilities. OSU-CSE diligently works to generate exceptional candidates who can fill these roles.

The Department strives to meet these needs with three multi-focused undergraduate degrees from either the College of Engineering or the College of Arts and Sciences. Each of these degrees programs is carefully tailored to provide the perspective on computing appropriate to the college in which it is offered. Students from any college may also earn a minor in Computer and Information Science (CIS).

	AU 1998	AU 1999	AU 2000	AU 2001	AU 2002	AU 2003	AU 2004	AU 2005	AU 2006	AU 2007	AU 2008
Undergrad Students Enrolled	1131	1250	1267	1401	1217	990	817	800	795	817	877
	98-99	**99-00**	**00-01**	**01-02**	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**07-08**	**08-09**
B.A., B.S. Degrees Awarded	259	296	297	277	335	274	192	124	140	142	138

These figures have been adjusted to reflect a change in reporting definitions.

Undergraduate Office for Academic Advising

The Undergraduate Office for Academic Advising is likely the busiest office in the Department. There is a seeminly unending queue of students seeking assistance with class schedules, career options, and many aspects of their academic careers.

The office is staffed by three highly professional team members.

Peg Steele, Coordinator of Academic Advisement. 2009 is another banner year for Ms. Steele. The National Academic Advising Association gave her the 2009 NACADA Service to Commission Award for her work on the Engineering & Science Advising Commission. In 2004, NACADA named Ms. Steele "Outstanding Advisor" and twice she received the same recognition from the local OSU chapter.

Nikki Strader, Academic Advisor & Staff Assistant. From 2006 through 2008, Nikki served as the President of the Academic Advising Association of Ohio State (ACADAOS), and in May 2007, was named one of two Outstanding Advisors at Ohio State by ACADAOS. She is the primary contact for all freshman pre-CSE students.

This year saw the departure of Graduate Administrative Assistant in Advising, **Jason Sawin.** Jason will continue in the academic field as an Assistant Professor at the University of Puget Sound in Tacoma, Washington. Filling his hard to fit shoes will be **Michael McGrath**, a graduate student working Dr. Rajiv Ramnath.

BACHELORS GRADUATES 2008-2009

College of Arts and Sciences

- **Katie Leigh Adams (BS)**
  Cincinnati, OH USA
- **Kenda Maretta Albertson (BA)**
  Magna cum Laude
  Sunbury, OH USA
- **Chris James Anderson (BS)**
  Powell, OH USA
- **Stephen Michael Arthur (BS)**
  Cincinnati, OH USA
- **Nicholas Perkins Brown (BA)**
  Columbus, OH USA
- **Chris N. Fabian (BS)**
  Hilliard, OH USA
- **Elise Faubel-Ravely (BS)**
  With Honors in the Arts & Sciences
  Columbus, OH USA
- **Warren James Francis (BS)**
  Summa cum Laude with Honors in the Arts & Sciences
  Marysville, OH USA
- **Jeffrey David Freeman (BS)**
  Statesville, OH USA
- **Jeremy Byron George* (BS)**
  Magna cum Laude with Honors in the Art & Sciences
  Waverly, OH USA
- **Charles Patrick Goins (BS)**
  Columbus, OH USA
- **David Hague (BS)**
  Columbus, OH USA
- **Hiroshi Hayashi (BS)**
  Pickerington, OH USA
- **Nicholas Fredrick Hickman (BS)**
  Elmore, OH USA
- **Keith Harrison Hill (BA)**
  Columbus, OH USA
- **Zachary John Howard (BS)**
  Cum Laude
  Medina, OH USA
- **Nathan Andrew Howes (BS)**
  Grove Port, OH USA
- **Christopher George James (BS)**
  Rochdale, England

**presented posthumously*

- **Joshua David James (BS)**
  Belle Center, OH USA
- **Brian Ellis Jones (BS)**
  Mentor, OH USA
- **Andrew James Allan Keller (BA)**
  Cum Laude
  Twinsburg, OH USA
- **Yoon-Ho Kim (BS)**
  Columbus, OH USA
- **Ryan Adam Klein (BS)**
  West Chester, OH USA
- **Joshua Edward Kossoff (BS)**
  Cum Laude
  Solon, OH USA
- **Stacey Ann Laugel (BS)**
  With Honors in the Arts & Sciences
  West Chester, OH USA
- **Daniel Marcel Mack (BS)**
  Akron, OH USA
- **Thomas Scott Mitro (BS)**
  Cum Laude with Honors in the Arts & Sciences
  Westlake, OH USA
- **Jessie James Morris (BS)**
  Amanda, OH USA
- **Aleksandra Obrazcova (BS)**
  Daugavpils, Latvia
- **Hyun Seuk Park (BS)**
  Columbus, OH USA
- **Lauren Elizabeth Reichenbacher (BS)**
  Columbus, OH USA
- **Benjamin Richard Rhine (BS)**
  Greenwich, OH USA
- **Derek G. Richardson (BS)**
  Columbus, NC USA
- **Anthony John Rickelman (BS)**
  Macedonia, OH USA
- **Shinta Salim (BS)**
  Magna Cum Laude
  Jakarta, Indonesia
- **Ajay Sampat (BS)**
  Columbus, OH USA
- **Ryan Edward Sanders (BS)**
  Fayetteville, OH USA

- **Young Sok Shin (BS)**
  Columbus, OH USA
- **Joshua Michael Taylor (BS)**
  Magna Cum Laude
  Lebannon, OH USA
- **Kyle Joseph Tolle (BS)**
  Summa Cum Laude with Honors in the Arts & Sciences
  Springfield, OH USA
- **Edward F. Van Loon (BS)**
  Ashley, OH USA
- **Kurt Richard Weimer (BA)**
  Centreville, VA USA
- **Michael James White (BS)**
  Dublin, OH USA
- **Michael Shawn White (BS)**
  Columbus, OH USA
- **Adam Jai Wiggins (BS)**
  Canton, OH USA
- **Jonathan David Yeagley (BA)**
  Ashtabula, OH USA
- **Chun-Min Yu (BS)**
  Taoyuan, Taiwan, R.O.C.

A very happy Prabhjyotsin Chawla waves to the crowd after receiving his diploma.

College of Engineering

- **Stephen Michael Arthur**
  Cincinnati,OH USA
- **John Atkinson**
  Whitehall, OH USA
- **Brian Wade Bain**
  Columbus, OH USA
- **Joseph Barkawi**
  Mason, OH USA
- **Ryan Edward Bauman**
  Cum laude
  Cleveland, OH USA
- **Richard Forest Bilderback**
  Pickerington, OH USA
- **Pete Terence Bohman**
  Summa cum laude
  Versailles, OH USA
- **Daniel Aaron Brooks**
  Findlay, OH USA
- **Jamall J, Brown**
  Summa Cum Laude
  North Olmsted, OH USA
- **Nicholas Perkins Brown**
  Columbus, OH USA
- **Sean Robert Carrick**
  Cum Laude
  Hanoverton, OH USA
- **Kevin Paul Casey**
  Elida, OH USA
- **Daniel William Charnigo**
  Medina, OH USA
- **Prabhjyotsin Ramindersing Chawla**
  Summa Cum Laude with Distinction in Computer and Science Engineering
  Chawla, Vadordara India
- **Eddy Cheung**
  Wickliffe, OH USA
- **Nicholas Eugene Chihil**
  Tipp City, OH USA
- **Ga Young Choi**
  Seoul, South Korea
- **Brad Nicholas Condo**
  Sardinia, OH USA

- **Andrew Lewis Coonce**
  West Chester, OH USA
- **Casey A. Dekker**
  Mansfield, OH USA
- **Matthew Stephen Dixon**
  Powell, OH USA
- **Peter Joseph Dohm**
  North Royalton, OH USA
- **Jorge E. Doig**
  Columbus, OH USA
- **Christopher Paul Domas**
  Cincinnati, Oh USA
- **Dominic Paul Garda**
  Columbus, OH USA
- **Kyle John Gillingham**
  Westerville, Oh USA
- **Matthew Daniel Gonzalez**
  Toledo, Oh USA
- **Nikhil Gudikandula**
  Dayton, Oh USA
- **Matthew Roger Haar**
  Bowling Green, Oh USA
- **David Hague**
  Columbus, OH USA
- **Ross Alan Hardy**
  Upper Arlington, OH USA
- **Kyle Aaron Hawk**
  Summa cum Laude
  Celina, OH USA
- **Andrew Paul Hertlein**
  Cum Laude
  Buford, Oh USA
- **Kevin Roy Hobson**
  Summa cum Laude with Honors in Engineering
  Cincinnati, Oh USA
- **Dennis William Horvath**
  Euclid, OH USA
- **Nathan Andrew Howes**
  Grove Port, OH USA
- **Clark A. Inada**
  Demarest, NJ USA
- **Matthew Patrick Jakob**
  Columbus, OH USA
- **Edgar Danshen Jin**
  Columbus, Oh USA
- **Yogesh Jindal**
  Glenford, OH USA
- **Hitesh Jagdish Kamdar**
  Panipat, India
- **Benjamin Alexander Kedo**
  Hilliard, OH USA
- **Irwin Kim**
  Mumbai, India
- **Yoon Ho Kim**
  Columbus, OH USA
- **Timothy Daniel Kormos**
  North Royalton, OH USA
- **Joseph Michael Laing**
  Lima, OH USA
- **Trent Matthew Lamphere**
  Glenford, OH USA
- **James Zachary Lauzau**
  Pickerington, OH USA
- **Wei-Chieh Liao**
  Taichung, Taiwan China
- **William Robert Lorenz**
  Cleveland, OH USA
- **Patrick J. Losco**
  Columbus, OH USA
- **Ho Yin Mak**
  Columbus, OH USA
- **Brandon Ley Martin**
  Oakwood, IL USA
- **Craig Jeffrey Mauer**
  Willowick, OH USA
- **Joseph Andrew Mazzon**
  Sunbury, OH USA
- **Samuel Kimama Mburu**
  Grove City, OH USA
- **Daniel R. McKee**
  Hamilton, OH USA
- **Ryan Francis McNeeley**
  Avon Lake, OH USA
- **Bradley James Mellen**
  Magna cum Laude
  Hilliard, OH USA
- **Brandon Owen Meyer**
  Macedonia, OH USA
- **Anthony Frederick Morris**
  Dover, OH USA
- **Andrew Daniel Muraski**
  Magna cum laude
  Mason, OH USA
- **David Frederick Neal**
  Cincinnati, OH USA

- **Matthew James Nedrich**
  Cum Laude
  North Royalton, OH USA
- **Jin Seuk Park**
  Cum Laude
  Incheon, South Korea
- **Jeffrey Kenneth Patterson**
  West Carrollton, OH USA
- **Robert Lee Quick**
  Cum Laude
  Canal Winchester, OH USA
- **Jennifer Rajadhyaksha**
  Columbus, OH USA
- **Praveenkumar Jothi Ramalingam**
  Columbus, OH USA
- **Timothy James Raptoulis**
  Pickerington, OH USA
- **Christopher William Reiner**
  Cum laude
  Richfield, OH USA
- **Jeffrey Harland Ridenbaugh**
  Pickerington, OH USA
- **Jason Kyle Rosser**
  Cincinnati, OH USA
- **Karl T. Salva**
  Cum Laude
  Fredericktown, OH USA
- **Tyler Jacob Scheerens**
  Westerville, OH USA
- **Janeen Carlee Simon**
  Beavercreek, OH USA
- **Christopher Charles Snodgrass**
  Pickerington, OH USA
- **Jonathan Chad Solove**
  Blacklick, OH USA
- **Chad David Sowald**
  Magna cum Laude with Distinction in Computer Science and Engineering
  Centerville, OH USA
- **Karl Staas, Jr.**
  Willoughby, OH USA
- **Kevin Alan Stock**
  Magna Cum Laude
  Upper Arlington, OH USA
- **Christopher Charles Suran**
  Cum Laude
  Concord, OH USA
- **Daniel B. Thomas**
  Vermilion, OH USA
- **Katherine Elizabeth Watson**
  Cum Laude
  Cincinnati, OH USA
- **Steve Carl Wohlwend**
  Columbus, OH USA
- **Edward J. Yee**
  Westerville, OH USA
- **Diego Sebastian Zaccai**
  Magna Cum Laude
  Buenos Aires, Argentina
- **Theresa Anne Zajkowski**
  Uniontown, OH USA
- **William Norbert Zeitler**
  Columbus, OH USA

Morrill Tower reflected in the Olentangy River.
Photo courtesy of CSE staffer, Kat Wenger

Faculty, Scientists & Staff

Tenure Track Faculty

Gagan Agrawal Full Professor

B.S., Computer Science & Engineering, Indian Institute of Technology, Kanpur, India, 1991; M.S., Computer Science, University of Maryland, College Park, Maryland, 1994; Ph.D., Computer Science, University of Maryland, College Park, Maryland, 1996

Department Research Area:
SYSTEMS

Interests: System Software for Parallel and Distributed Environments; Compiler and Runtime Support for Data Intensive Computing, Middleware for Grid and Cloud Environments, Data Integration and Deep web mining.

Anish Arora Full Professor

B. Tech., Computer Science and Engineering, Indian Institute of Technology, New Delhi, 1986; M.S., Computer Science, University of Texas, Austin, 1988; Ph.D., Computer Science University of Texas, Austin, 1992.

Department Research Area:
NETWORKING

Interests: Wireless Sensor Networks; Fault-tolerant, Secure And Timely Computing; Distributed Systems and Networks; Embedded Systems; Component-Based Design; Formal Methods; Concurrency Semantics.

Mikhail Belkin Assistant Professor

Hon.B.Sc. with High Distinction, Mathematics, University of Toronto, 1995; M.S., Mathematics, University of Chicago, 1997; Ph.D., Mathematics, University of Chicago, 2003. Department Research Area
ARTIFICIAL INTELLIGENCE

Interests: Machine Learning And Statistical Analysis Of Natural Data; Manifold And Spectral Methods For Machine Learning; Algorithms For Semi-Supervised Learning And Clustering; Understanding The Value Of Unlabeled Data In Pattern Recognition; Data Mining And Applications To Areas With Abundant Unlabeled Data

Christopher Brew Associate Professor
Associate Professor of Linguistics and Cognitive Science

B.Sc in Chemistry, University of Bristol, 1980; M.Sc in Experimental Psychology, University of Sussex, 1985; D.Phil, Computational Approaches to Parsing in Dialogue, University of Sussex, 1991.

Department Research Area:
ARTIFICIAL INTELLIGENCE

Interests: Statistical Natural Language Processing, particularly Corpus-based Methods for Lexical Acquisition; Data-driven Speech Synthesis and Spoken Language Generation; Infrastructure for Statistical NLP Corpus Creation, Annotation, Indexing and Processing.

Roger Crawfis Associate Professor

B.S., Computer Science and Applied Mathematics, Purdue University, 1984; M.S., Computer Science, University of California, Davis, 1989; Ph.D., Computer Science, University of California, Davis, 1995.

Department Research Area:
GRAPHICS

Interests: Computer Graphics; Video Game Technology; Scientific Visualizations; Medical Imaging; and Volume Rendering.

James W. Davis Associate Professor

B.S., Computer Science, University of Central Florida, 1994; M.S., Media Laboratory, Massachusetts Institute of Technology, 1996; Ph.D., Media Laboratory, Massachusetts Institute of Technology, 2000.

Department Research Area:
ARTIFICIAL INTELLIGENCE

Interests: Computer Vision; Automatic Visual Surveillance and Monitoring; Human Activity Recognition; Video Understanding; and Human-Computer Interaction.

Tamal K. Dey Full Professor

B.E., Electronics, Jadavpur University, 1985; M.Tech., Computer Science, Indian Institute of Science-Bangalore, 1987; Ph.D., Computer Science, Purdue University, 1991.

Department Research Area:
GRAPHICS

Interests: Computational Geometry, Computational Topology, Geometric Modeling, Meshing, Data Analysis..

Hakan Ferhatosmanoglu Associate Professor

B.S., Computer and Information Science, Bilkent University, Turkey, 1997; Ph.D., Computer Science, University of California, Santa Barbara, 2001.

Department Research Area:
SYSTEMS

Interests: Bioinformatics; Data Streams; High Performance Databases for Multi-dimensional and Scientific Applications, and Multimedia and Spatial Data.

Eric Fosler-Lussier Assistant Professor

B.A., Linguistics, University of Pennsylvania, 1993; B.A.S., Cognitive Science, University of Pennsylvania; 1993; Ph.D., Computer Science, University of California, Berkeley, 1999

Department Research Area:
ARTIFICIAL INTELLIGENCE

Interests: Automatic Speech Recognition, Corpus-based Computational Linguistics, Spoken Dialogue Systems, Semantics of Path Planning

Eitan M. Gurar Associate Professor

B.S., Physics, Technion-Israel Institute of Technology, Israel, 1971; M.S., Computer Science, Technion-Israel Institute of Technology, Israel, 1974; Ph.D., Computer Science, University of Minnesota, 1978.

Department Research Area:
SOFTWARE ENGINEERING

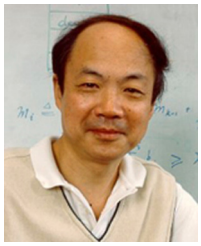
Interests: Hypertext Processing and Braille Production

Ten-Hwang (Steve) Lai Full Professor

B.S., Mathematics, Fu-Jen University, Taiwan, 1972; M.S., Mathematics, Fordham University, 1976; Ph.D., Computer Science, University of Minnesota, 1982.

Department Research Area:
NETWORKING

Interests: Wireless Networks; Mobile Computing; and Parallel and Distributed Computing.



David Lee Full Professor

M. A., Mathematics, Hunter College, City University of New York, 1982; M. S. and Ph. D., Computer Sciences, Columbia University, 1985

Department Research Area:
NETWORKING

Interests: Communications and network protocol security and reliability

Ming-Tsan (Mike) Liu Full Professor

B.S.E.E., Electrical Engineering, National Cheng Kung University, Taiwan, 1957; M.S.E.E., Electrical Engineering, University of Pennsylvania, 1961; Ph.D., Electrical Engineering, University of Pennsylvania, 1964.

Department Research Area:
NETWORKING

Interests: Computer Architecture and Networking; Parallel and Distributed Computing; Wireless and Mobile Computing; and Protocol Engineering and Design.

Timothy J. Long Associate Professor

B.S., Education, University of Cincinnati, 1972; B.A., Mathematics, Unviersity of Cincinnati, 1972; M.S., Computer & Information Science, The Ohio State University, 1974; Ph.D., Computer Science, Purdue University, 1978.

Department Research Area:
SOFTWARE ENGINEERING

Interests: Design, Implementation, Verification, Testing and Application of Reusable Software Components.

Raghu Machiraju Associate Professor

B.Sc., Electrical Engineering, Delhi University, 1982; M.S., Automation, Indian Institute of Science, Bangalore, 1984; Ph.D., Computer Science, The Ohio State University, 1996.

Department Research Area:
GRAPHICS

Interests: Scientific and Medical Visualization; Visualization; Image Analysis; Scientific Computing; Graphics

Dhabaleswar K. (DK) Panda Full Professor

B.S., Electrical Engineering, Indian Institute of Technology, Kanpur, India, 1984; M.S., Electrical and Computing Engineering, Indian Institute of Science, Bangalore, India, 1986; Ph.D., Computer Engineering, University of Southern California, Los Angeles, 1991.

Department Research Area:
SYSTEMS

Interests: Parallel Computer Architecture, High Performance Networking, Network-Based Computing, Cluster Computing, High Performance File/Storage Systems, Lan-Wan Interfacing and Communication, and Resource Management..

Richard E. Parent Full Professor

B.S., Computer Science and Mathematics, University of Dayton, 1972; M.S., Computer Science, The Ohio State University, 1973; Ph.D., Computer Science, The Ohio State University, 1977.

Department Research Area:
GRAPHICS

Interests: Computer Graphics; Computer Animation; Modeling and Animating Human Figure;Tracking Human Figures in Video; Perception of Synthetic Imagery.

Srinivasan Parthasarathy Associate Professor

B.E., Electrical Engineering, University of Roorkee, India, 1992; M.S., Electrical Engineering, University of Cincinnati, 1994; M.S., Computer Science, University of Rochester, 1996; Ph.D., Computer Science, University of Rochester, 2000.

Department Research Area:
SYSTEMS

Interests: Data Mining; Parallel and Distributed Computing and Systems; Bioinformatics.

Feng Qin Assistant Professor

B.E., University of Science and Technology of China, 1998; M.E., Chinese Academy of Sciences, 2001; Ph.D., the University of Illinois, Urbana-Champaign, 2006.

Department Research Area:
SYSTEMS

Interests: Operating Systems, Software Reliability, Security and Distributed Systems

Atanas (Nasko) Rountev Associate Professor

B.S., Computer Science & Engineering, Technical University, Sofia, Bulgaria, 1995; M.S., Computer Science, Rutgers University, 1999; Ph.D., Computer Science, Rutgers University, 2002.

Department Research Area:
SOFTWARE ENGINEERING

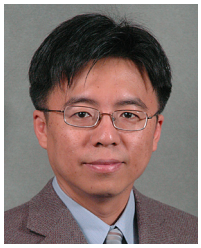
Interests: Static and Dynamic Program Analysis; Programming Languages and Compilers; Software Understanding and Evolution; Software Testing; High-Performance Computing

Ponnuswamy (Saday) Sadayappan Full Professor

B.S., Electrical Engineering, Indian Institute of Technology, Madras, India, 1977; M.S., Electrical Engineering, State of University of New York, Stony Brook, 1978; Ph.D., Electrical Engineering, State of University of New York, Stony Brook, 1983.

Department Research Area:
SYSTEMS

Interests: Compiler/runtime systems for high-performance computing; performance optimization; high-productivity, high-performance scientific computing.



Han-Wei Shen Associate Professor

B.S., Computer Science, National Taiwan University, 1988; M.S., Computer Science, State University of New York, Stony Brook, 1992; Ph.D., Computer Science, University of Utah, 1998.

Department Research Area:
GRAPHICS

Interests: Computer Graphics, Information Visualization, Parallel Visualization Scientific Visualization, Visual Analytics.

Ness B. Shroff Ohio Eminent Scholar
Full Professor

B.S., University of Southern California, 1988; M.S.E, University of Pennsylvania, 1990; M.Phil, Columbia University, 1993; Ph.D., Columbia University, 1994.

Department Research Area:
NETWORKING

Interests: Wireless and Wireline Communication Networks; Network Optimization; Network Design and Dimensioning; Network Security; Queueing Theory; Dynamic Control; Network Coding; Performance Limits; Distributed Algorithms; Complexity and Approximability; Pricing; Network Information Theory

Prasun Sinha Associate Professor

B. Tech., Computer Science and Engineering, Indian Institute of Technology, Delhi, India, 1995; MS, Computer Science, Michigan State University, 1997; PhD, Computer Science, University of Illinois, Urbana-Champaign, 2001.

Department Research Area:
NETWORKING

Interests: Sensor Networking; Ad-hoc Networking; Mobile Computing; Wireless Networking

Paul A.G. Sivilotti Associate Professor

B.Sc.H., Computing Science, Mathematics & Biochemistry, Queen's University, Ontario, Canada, 1991; M.S., Computer Science, California Institute of Technology, 1993; Ph.D., Computer Science, California Institute of Technology, 1998.

Department Research Area:
SOFTWARE ENGINEERING

Interests: Distributed Systems; Software Engineering; and Tool-based Support for Testing Component Implementations.

Neelam Soundarajan Associate Professor

B.S., Physics, Bombay Unviersity, India, 1970; M.S., Physics, Bombay University, India, 1972; Ph.D., Computer Science, Bombay University, India, 1978

Department Research Area:
SOFTWARE ENGINEERING

Interests: Software Engineering; Reasoning about Program Behavior; Specification; Verification; Testing; Issues in Engineering Education.

Kenneth J. Supowit Associate Professor

A.B., Linguistics, Cornell University, 1978; Ph.D., Computer Science, University of Illinois, 1981.

Department Research Area:
SOFTWARE ENGINEERING

Interests: Combinational Algorithms

Radu Teodorescu Assistant Professor

Dipl. Eng. in Computer Science, Technical University of Cluj-Napoca, Romania, 2002; M.S., Computer Science, University of Illinois at Urbana-Champaign, 2005; Ph.D., Computer Science, University of Illinois at Urbana-Champaign, 2008.

Department Research Area:
SYSTEMS

Interests: Computer Architecture, Multicore and Parallel Architectures, Support for Software Debugging, Nanoscale Technology, Scaling, Reliability, Variability and Power Management.

DeLiang (Leon) Wang Full Professor

B.S., Computer Science, Beijing University, 1983; M.S., Computer Science, Beijing University, 1986; Ph.D., Computer Science, Unviersity of Southern California, Los Angeles, 1991.

Department Research Area:
ARTIFICIAL INTELLIGENCE

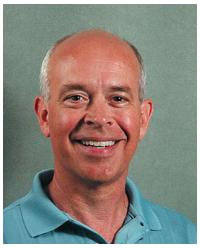
Interests: Machine Perception and Neurodynamics

Yusu Wang Assistant Professor

B.S., Computer Science, Tsinghua University (P. R. China), 1998; M.S., Computer Science, Duke University, 2000; Ph.D., Computer Science, Duke University, 2004.

Department Research Area:
GRAPHICS

Interests: Computational Geometry, Algorithms, Computational Biology, Computational Topology, Graphics, Modeling, And Visualization.



Bruce W. Weide Associate Chairperson
Full Professor

B.S.E.E., Electrical Engineering, University of Toledo, 1974; Ph.D., Carnegie Mellon University, 1978.

Department Research Area:
SOFTWARE ENGINEERING

Interests: Component-Based Software; Verified Software.

Rephael Wenger Associate Professor

B.S.E., Computer Science, Princeton University, 1984; Ph.D., Computer Science, McGill University, 1988.

Department Research Area:
COMPUTER GRAPHICS

Interests: Computational Geometry; Computer Visualization; Isosurface Reconstruction; and Image Processing.

Dong Xuan Associate Professor

B.S., Electronic Engineering, Shanghai Jiao Tong University, China, 1990; M.S., Electronic Engineering, Shanghai Jiao Tong University, 1993; Ph.D., Computer Engineering, Texas A&M University, 2001.

Department Research Area:
NETWORKING

Interests: Distributed Computing, Computer Networks and Cyber Space Security

Xiaodong Zhang Chairperson of Computer Science & Engineering
Robert M. Critchfield Professor

B.S., Electrical Engineering, Beijing University of Technology, 1982; M.S., Computer Science, University of Colorado at Boulder, 1985; Ph.D., Computer Science, University of Colorado at Boulder, 1989.

Department Research Area:
SYSTEMS

Interests: Distributed and High Performance Systems

Stuart H. Zweben Associate Dean - College of Engineering
Full Professor

B.S., Mathematics, City College of New York, 1968; M.S., Statistics and Computer Science, Purdue University, 1971; PhD., Computer Science, Purdue University, 1974.

Department Research Area:
SOFTWARE ENGINEERING

Interests: Reusable Software; Quality Evaluation; and Engineering Education.

Clinical Faculty

Rajiv Ramnath Assistant Professor of Practice
Director, Collaborative for Enterprise Transformation and Innovation (C.E.T.I.)

B.Tech., Indian Institute of Technology, New Delhi, India, 1981; M.S., Computer & Information Science, The Ohio State University, 1983; Ph.D., Computer & Information Science, The Ohio State University, 1988

Research Interests: Foundations of Adaptive Complex Enterprises, Enterprise Architecture and Engineering, Business-IT Alignment, Workflow and Work-Management Systems Enterprise Software Engineering and Computer Science Education, Wireless Sensor Network and Pervasive Computing Enterprise Applications, e-Government.

Adjunct faculty

Kikuo Fujimura

Courtesy Appointments

Wayne Carlson	Chair, Industrial Design
Harvey M. Friedman	Mathematics
Kun Huang	Biomedical Informatics
Furrukh Khan	Electrical and ComputerEngineering
Michael Knopp	Chair, Radiology
Albert M. Lai	Biomedical Informatics
Alan Saalfeld	Geodetic Science
Cathy Honghui Xia	Integrated Systems Engineering
Tao Shi	Statistics

Emeritus appointments

Professor Emeritus

Balakrishnan Chandrasekaran
Charles A. Csuri
Sandy Mamrak
Mervin E. Muller

Associate Professor Emeritus

Clinton R. Foulk
Douglas S. Kerr
William F. Ogden
Anthony E. Petrarca

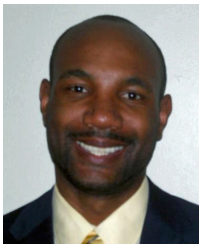
New Faculty Arriving Autumn 2009

Luis Rudemacher Assistant Professor

Bachelor in Engineering Sciences, Mathematics, Universidad de Chile. Santiago, Chile, 2002; Mathematical Engineering Title (Masters Equivalent) Universidad de Chile. Santiago, Chile, 2002; Ph.D., Applied Mathematics, Massachusetts Institute of Technology, 2007.

Department Research Area:
Graphics)

Interests: Algorithmic convex geometry, random structures, computational complexity theory, matrix approximation, game theory, mathematical economics, optimization.



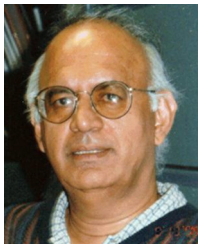
Christopher Stewart Assistant Professor

B.S., Computer Science, Morehouse College, 2003; M.S., Computer Science, University of Rochester, 2005; Ph.D., Computer Science, University of Rochester, 2008

Department Research Area:
Systems

Interests: Operating Systems, Distributed Systems, Performance Management, and Power Management
.

Research Scientists



Balakrishnan Chandrasekaran Professor Emeritus
Senior Research Scientist

B.E., Electrical Engineering, Madras University, India, 1963; Ph.D., Electrical Engineering, University of Pennsylvania, 1967

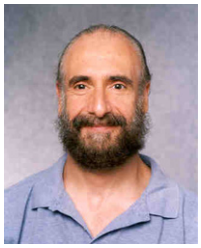
Research Interests:
Artificial Intelligence and Cognitive Science, specifically Knowledge Systems, Diagrammatic Reasoning, Cognitive Architecture, and Decision Support Systems.

Jay Ramanathan Senior Research Scientist
Director, Collaborative for Enterprise Transformation and Innovation (C.E.T.I.)

B.S. , Computer Science, Purdue University, 1970; M.S. in Computer Science, Purdue University, 1972; Ph.D. Computer Science, Rice University, 1977.

Research Interests:

Methods For Analysis and Engineering of Complex Adaptive Enterprise Architectures using Business-IT alignment Patterns, Ontologies, Complexity Theory, Autonomic Computing as well as Technologies Such as Middleware, Workflow, Mobile Computing, and Web Services..



John Josephson Research Scientist

B.S., Mathematics, The Ohio State University 1968; M.S., Mathematics, The Ohio State University, 1970; Ph.D., Philosophy, The Ohio State University, 1982

Research Interests:

Artificial Intelligence; Computational Epistemology, Abductive Inference, Causal Reasoning, Multiple Criteria Decision Making, Perception, Information Fusion, Diagnosis, Theory Formation, Logic of Investigation and Foundations of Science

William M. Leal Research Scientist

B.A. Mathematics, University of California, Berkeley, 1969; M.S. Computer Science, University of South Alabama, Mobile, 1994; M.S. Computer Science, The Ohio State University, 2001; Ph.D., Computer Science, The Ohio State University, 2001.

Research Interests:

Wireless Sensor Networks, Dynamic Resource Management, Compositional Stabilization

Senior Lecturers

Gojko Babic

B.S., Electric Engineering, University of Sarajevo, 1972; M.S., Computer Science, Florida Institute of Technology, 1975; Ph.D., Computer Science, The Ohio State University, 1978.

Research Interests: Computer Networking and Security.

Bettina Bair

B.S., Business Administration, University of Phoenix, 1987; M.B.A., University of Denver, 1992.

Research Interests: Women in Computing; Effects of Technology on Business and Culture; and Computer Education

Paolo Bucci

Laurea in Scienze Dell' Informazione, Universita' Degli Studi di Milano, Italy, 1986; M.S., Computer & Information Science, The Ohio State University, 1989; Ph.D., Computer & Information Science, The Ohio State University, 1997.

Research Interests: Software Engineering; Computer Science Education

Debby Gross

B.S., Chemical Engineering, Massachusetts Institute of Technology, 1977; M.B.A., University of Chicago, 1987.

Research Interests: Business Technology and Applications.

Wayne Heym

B.Phil., Miami University, 1978; M.S., Cornell University, 1980; M.S., Computer & Information Science, The Ohio State University, 1989; Ph.D., Computer & Information Science, The Ohio State University, 1995.

Research Interests: Software Engineering and Computing Education

H. David Mathias

B.S., Computer Science, University of Delaware, 1991; M.S., Computer Science, Washington University, 1993; D.Sc., Computer Science, Washington University, 1996.

Research Interests:

Computational Learning Theory.

Part-Time Lecturers

Moez Chaabouni
Michael Compton
Matt Curtin
Charles Giles
Steve Gomori
Robert Joseph
Perumal Krishnasamy
Igor Malkiman
Michelle Mallon
Robert Mathis
John David Pavkov
Doyt Perry
Steven Romig
Ron Salyers
Naeem Shareef
Al Stutz
Robert Weekley

Administrative Staff

Carrie Casto: Grants Administrator.
Catrena Collins: Human Resources Officer
Tamera Cramer: Public Relations Coordinator.
Tom Fletcher: Office Support Associate
Don Havard: Fiscal Officer
Z. Lynn Lyons: Graduate Admissions and Graduate Studies Coordinator.
Kitty Reeves: Academic Program Administrator

Computing Services Staff

Michael Compton -- Director, Computing Services
Chris Jackson -- Systems Administrator
Aaron Jenkins – Systems Manager
Bob Joseph-- Systems Developer/Engineer, DBA
Tami King -- Sr. Systems Developer/Engineer
Dave Kneisly -- Systems Administrator
Todd Lucall -- Systems Administrator
Shaun Rowland -- Manager, Software Support and Development
Ted Welch -- Systems Administrator
Kat Wenger -- Systems Manager

Select Faculty Publications

Artificial Intelligence

M. Belkin, P. Niyogi, "Towards a Theoretical Foundation for Laplacian-Based Manifold Methods." *Journal of Computer and System Sciences*, Special Issue on Learning Theory, invited, 2008 Volume 74, Issue 8 (December 2008), pp. 1289-1308.

L. Rosasco, **M. Belkin**, E. De Vito, "A Note on Learning with Integral Operators." *Proceedings of the 22nd Annual Conference on Learning Theory*, (COLT 2009).

T. Shi, **M. Belkin**, B. Yu, "Data Spectroscopy: Learning Mixture Models using Eigenspaces of Convolution Operators." *Proceedings of the 25th International Conference on Machine Learning 2008,* pp. 936-943.

V. Sharma and **J. Davis**, "A Feature-Selection Approach to Fusion of Electro-Optical and Infrared Imagery." *Electronic Image & Signal Processing*, February 2009.

K. Sankaranarayanan and **J. Davis**, "A Fast Linear Registration Framework for Multi-Camera GIS Coordination" , *Proceedings of the International Conference on Advanced Video and Signal Based Surveillance*, September 2008, 7 pages.

I. Heintz, **E. Fosler-Lussier**, and **C. Brew**, "Latent Phonetic Analysis: Use of Singular Value Decomposition to Determine Features for CRF Phone Recognition." *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing* (ICASSP 2008), Las Vegas, Nevada, 2008.

P. Mohapatra and **E. Fosler-Lussier**, "Investigations into Phonological Attribute Classifier Representations For Crf Phone Recognition." *Proceedings of Interspeech,* Brisbane, Australia, 2008. 4 pages.

G. Hu and **D. Wang**."Segregation of Unvoiced Speech From Nonspeech Interference." *Journal of the Acoustical Society of America,* vol. 124, pp. 1306-1319. (2008)

D. Wang, U. Kjems, M. Pedersen, J. Boldt, and T. Lunner "Speech Perception of Noise with Binary Gains." *Journal of the Acoustical Society of America*, vol. 124, pp. 2303-2307 (2008).

S. Srinivasan and **D. Wang**, "A Model for Multitalker Speech Perception." *Journal of the Acoustical Society of America,* vol. 124, pp 3213-3224 (2008)

D. Wang, "Time-Frequency Masking for Speech Separation and Its Potential for Hearing Aid Design." *Trends in Amplification,* vol.12, pp. 332-353. (2008)

Y. Li and **D. Wang**, "A Supervised Learning Approach to Monaural Segregation of Reverberant Speech." *IEEE Transactions on Audio, Speech, and Language Processing,* vol. 17, pp. 625-638 (2009)

D.Wang, U. Kjems, M. Pedersen, J.Boldt, and T. Lunner "Speech Intelligibility in Background Noise with Ideal Binary Time-Frequency Masking." *Journal of the Acoustical Society of America,* vol. 125, pp.2336-2347(2009)

Computer Graphics

Visualization and Graphics

F. Janoos, B. Nouanesengsey, **R. Machiraju**, **H-W. Shen**, I. Morocz, "Spatio-Temporal Visualization Of fMRI Data." Computers Graphics Forum (*Proceedings of EuroVis 2009*).

K. Mosaliganti, L. Cooper, R. Sharp, **R. Machiraju**, K. Huang, G. Leone, "Visualization of Cellular Biology Structures from Optical Microscopy Data." *IEEE Transactions in Visualization and Computer Graphics*, (14)4:863-76, 2008.

J. Eisenmann, **R. Parent**, "Stereoscopy in Cinematographic Synthetic Imagery." Electronic Imaging, IS&T/SPIE, San Jose, Calif., 18-22 January 2009. 8 pages.

T. Lee and **H. Shen**, "Visualization and Exploration of Temporal Trend Relationships in Multivariate Time-Varying Data." *IEEE Transactions on Visualization and Computer Graphics*, 2009 (special issue of IEEE Visualization 2009)

J. Woodring and **H. Shen**, "Multi-scale Time Activity Data Exploration via Temporal Clustering Visualization Spreadsheet." *IEEE Transactions on Visualization and Computer Graphics*, Vol. 15, No. 1, pp. 123-137, Jan 2009

Y. Tu and **H. Shen**, B. Filter, "A Seamless Multi Focus+Context Technique for Treemaps." *IEEE Transactions on Visualization and Computer Graphics,* Vol. 14, No. 6, pp 1157-1164, Nov. 2008 (special issue of IEEE Information Visualization 2008)

Computational Geometry

M. Belkin, J. Sun and **Y. Wang**, "Constructing Laplace Operator from Point Cloud Data in R^d." *Proceedings of SIAM/ACM Symposium on Discrete Algorithms* (SODA), 2009, 1031--1040.

S.-W. Cheng, **T. Dey**, E. Ramos. "Delaunay Refinement for Piecewise Smooth Complexes". *Discrete & Computational Geometry*, Published online, September 2008.

T. Dey and K. Li., "Persistence-Based Handle and Tunnel Loops Computation Revisited for Speed Up." *Computers & Graphics* (2009), vol. 33, 351—358.

K. Buchin, **T. Dey**, M. John, and J. Giesen. "Recursive Geometry of the Flow Complex and the Topology of the Flow Complex Filtration". *Computational Geometry Theory & Applications* (2008), vol. 40, 115-157.

T. Dey, K. Li, J. Sun, and D. Cohen-Steiner. "Computing Geometry-Aware Handle and Tunnel Loops in 3d Models." *Proceedings of SIGGRAPH 2008*, 45:1 –45:9.

T. Dey and K. Li. "Cut Locus and Topology from Point Data." *Proceedings of 25th Symposium on Computational Geometry* (SOCG09), 281—290.

C. Luo, J. Sun and **Y. Wang**, "Estimating Integrals from Point Clouds in R^d --- A Geometric View." *Proceedings of ACM Symposium on Computational Geometry* (SoCG) ,2009.

K. Buchin, M. Buchin and **Y. Wang**, "Exact Partial Curve Matching under the Frechet Distance, *Proceedings of SIAM/ACM Symposium on Discrete Algorithms* (SODA), 2009, 645--654.

Computer Networking

H. Zhang, **A. Arora** and **P. Sinha**, "Link Estimation and Routing in Sensor Network Backbones: Beacon-based or Data-driven." *IEEE Transactions on Mobile Computing*, Volume 8, Number 5, pp. 653-667, May 2009.

H. Zhang, **A. Arora**, and **P. Sinha**, "Link estimation and routing in sensor network backbones: Beacon-based or data-driven?." *IEEE Transactions on Mobile Computing*, 8(5), May 2009, pp. 653--667.

V. Kulathumani, **A. Arora**, M. Sridharan, and M. Demirbas, "Trail: A distance-sensitive sensor network service for distributed object tracking." *ACM Transactions on Sensor Networks*, 5(2), 2009.

S. Bapat, W. Leal, T. Kwon, P. Wei, and **A. Arora**, "Chowkidar: Reliable and scalable health monitoring for wireless sensor network testbeds." *ACM Transactions on Autonomous and Adaptive Systems*, 4(1), 2009.

H. Cao, E. Ertin, and **A. Arora**, "MiniMax equilibrium of networked differential games." *ACM Transactions on Autonomous and Adaptive Systems*, 3(4), 2008.

A. Arora and L. Sang, "Dialog codes for secure wireless communications." *Proceedings of the 4th ACM/IEEE Symposium on Information Processing in Sensor Networks* (IPSN), San Francisco, April 2009, pp. 13—24.

D. Zhou, L. Huang, **T. H. Lai**, "On the scalability of IEEE 802.11 ad hoc networks." *ACM/Springer Wireless Networks*, pp. 479-499, August 2008.

Y. Hsu, G. Shu and **D. Lee**, "A Model-based Approach to Security Flaw Detection of Network Protocol Implementations." *Proceedings of IEEE International Conference on Network Protocols (ICNP)*, Oct 2008.

S. Kwon and **N. B. Shroff**, "Analysis of Shortest Path Routing for Large Multi-Hop Wireless Networks." *IEEE/ACM Trans. on Networking*, June 2009, vol. 17, Issue 3, pp. 857-869.

G. R. Gupta, S. Sanghavi, and **N. B. Shroff**, "Node Weighted Scheduling." *Proceedings of ACM SIGMETRICS Conference*, Seattle, Washington, June 2009.

Sungoh Kwon and **N. B. Shroff**, "Energy-Efficient SINR-Based Routing for Multihop Wireless Networks." *IEEE Trans. on Mobile Computing*, vol. 8, Issue 5, May 2009, pp. 668-681.

G. R. Gupta and **N. B. Shroff**, "Delay Analysis for multi-hop Wireless Networks." *Proceedings of IEEE INFOCOM'09*, Rio de Janeiro, Brazil, Apr. 2009.

R. Li, L. Ying, A. Eryilmaz, and **N. B. Shroff** , "A Uni ed Approach to Optimizing Performance in Networks serving Heterogeneous Flows." *Proceedings of IEEE INFOCOM'09*, Rio de Janeiro, Brazil, Apr. 2009.

S. Sellke, C. -C. Wang, S. Bagchi, and **N. B. Shroff**, "Covert TCP/IP Timing Channels: Theory to Implementation." *Proceedings of IEEE INFOCOM'09*, Rio de Janeiro, Brazil, Apr. 2009.

J. Kim, X. Lin, and **N. B. Shroff**, "Optimal Anycast Technique for Delay-Sensitive Energy-Constrained Asynchronous Wireless Sensor Networks." *Proceedings of IEEE INFOCOM'09* , Rio de Janeiro, Brazil, Apr. 2009

R. Chertov, S. Fahmy, **N. B. Shroff**, "Fidelity of network simulation and emulation: A case study of TCP-targeted denial of service attacks." *ACM Transactions on Modeling and Computer Simulation,* Volume 19 , Issue 1, December 2008, pp. 4:1-4:29.

S. Murugesan, P. Schniter, and **N. B. Shroff** , "Multiuser Scheduling in a Markov-modeled Downlink Environment." *Proceedings of Forty-sixth Annual Allerton Conference on Communication, Control, and Computing,* Allerton House, Monticello, IL, Sept. 2008.

C. Joo and **N. B. Shroff** "On the Delay Performance of In-Network Aggregation in Lossy Wireless Sensor Networks." *Proceedings of The Forty-Sixth Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, Sept. 2008.

A. Chen, D. Lee, and **P. Sinha**, "Efficient Multicasting over Large-Scale WLANs through Controlled Association." *Elsevier Computer Networks,* Volume 53, Issue 1, pp 45-59, January 2009.

K. Fan, S. Liu, and **P. Sinha**, "Dynamic Forwarding over Tree-on-DAG for Scalable Data Aggregation in Sensor Networks." *IEEE Transactions on Mobile Computing*, Vol. 7, Number 10, pp 1271-1284, October 2008.

P. Balister, Z. Zheng, S.Kumar, and **P. Sinha**, "Trap Coverage: Allowing Coverage Holes of Bounded Diameter in Wireless Sensor Networks." *Proceedings of IEEE INFOCOM*, Rio de Janeiro, Brazil, 2009.

K. Fan, Z. Zheng, and **P. Sinha**, "Steady and Fair Rate Allocation for Rechargeable Sensors in Perpetual Sensor Networks." *Proceedings of ACM International Conference on Embedded Networked Sensor Systems* (SENSYS), Raleigh, NC, 14 pages, November 2008.

X. Bai, C. Zhang, **D. Xuan**, J. Teng and W. Jia, "Low-Connectivity and Full-Coverage Three Dimensional Networks." *Proceedings of ACM International Symposium on Mobile Ad Hoc Networking and Computing* (MobiHoc), May 2009.

X. Bai, C. Zhang, **D. Xuan** and W. Jia, "Full-Coverage and K-Connectivity (K=14, 6) Three Dimensional Networks." *Proceedings of IEEE International Conference on Computer Communications* (INFOCOM), April 2009.

W. Jia, F. Po Tso, Z. Ling, X. Fu, **D. Xuan** and W. Yu, "Blind Detection of Spread Spectrum Flow Watermarks." *Proceedings of IEEE International Conference on Computer Communications* (INFOCOM), April 2009.

X. Bai, W. Gu, S. Chellappan, X. Wang, **D. Xuan** and B. Ma, "PAS: Predicate-based Authentication Services Against Powerful Passive Adversaries." *Proceedings* of *Annual Computer Security Applications Conference* (ACSAC), Dec. 2008.

M. Lang and **P. Sivilotti**, "On the Impossibility of Maximal Scheduling for Strong Fairness with Interleaving." *Proceedings of the 29th International Conference on Distributed Computing Systems,* Montreal, Canada, June 22–26, 2009.

L. Guo, E. Tan, S. Chen, Z. Xiao, and **X. Zhang**, "The stretched exponential distribution of Internet media access patterns." *Proceedings of 27th ACM Symposium on Principles of Distributed Computing*, (PODC 2008), Toronto, Canada, August 18-21, 2008, pp. 283-294.

L. Guo, E. Tan, S. Chen, **X. Zhang**, and Y. E. Zhao, "Analyzing Patterns of User Content Generation in Online Social Networks." *Proceedings of 15th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (KDD-09), Paris, France, June 28-30, 2009.

Software Engineering

G. Xu and **A. Rountev**, "Merging Equivalent Contexts for Scalable Heap-Cloning-Based Context -Sensitive Points-to Analysis." *Proceedings of ACM SIGSOFT International Symposium on Software Testing and Analysis* (ISSTA), pages 225-236, July 2008.

B. Weide, M.Sitaraman, H.K. Harton, B. Adcock, P. Bucci, D. Bronish, W.D. Heym, J. Kirschenbaum, D. Frazier, "Inctremental Benchmarks for Software Verification Tools and Techniques." *Proceedings of VSTEE 2008*: *Verified Software: Theories, Tools and Experiments,* Springer-Verlag LNCS 5295, 2008, 84-98.

Systems

Data Mining and Data Bases

A. Sacan, I. Toroslu, and **H. Ferhatosmanoglu**, "Integrated Search and Alignment of Protein Structures". *Bioinformatics*, vol. 24, no. 14, December 2008, pp. 2872-9.

H. Sun, **H. Ferhatosmanoglu**, M. Ota, **Y. Wang**." An Enhanced Partial Order Curve Comparison Algorithm and its Application to Analyzing Protein Folding Trajectories". *BMC BioInformatics,* August 2008, vol. 9 : 344 (13 pages).

G. Canahuate, T. Apaydin, A. Sacan, **H. Ferhatosmanoglu**, "Secondary Bitmap Indexes with Vertical and Horizontal Partitioning." *Proceedings of EDBT*, March 2009, pp 600-611.

K. Mosaliganti, T. Pan, R. Ridgway, R. Sharp, L. Cooper, A. Gulacy, A. Sharma, O. Irfanoglu, **R. Machiraju**, T. Kurc, P. Wenzel, A. deBruin, G. Leone, **J. Saltz**, K. Huang. "An Imaging Workflow for Characterizing Phenotypical Change in Terabyte Sized Mouse Model Datasets". *Journal of Bioinformatics*, 41:863-73, 2008.

S. Asur and **S. Parthasarathy**, "A Viewpoint-based Approach for Interaction Graph Analysis." *Proceedings of ACM SIGKDD 2009*, June 2009.

V. Satuluri and **S. Parthasarathy**, "Scalable Graph Clustering Using Stochastic Flows: Applications to Community Discovery." *Proceedings of ACM SIGKDD 2009,* June 2009.

T. Tran, C.Y. Chan, **S. Parthasarathy**, "Query by Output." *Proceedings of ACM International Conference on Management of Data* (SIGMOD), June 2009.

X. Yang, S. Asur, **S. Parthasarathy** and S. Mehta, "A Visual Analytic Toolkit for Dynamic Interaction Graphics." *Proceedings of ACM International Conference on Knowledge Discovery and Data Mining* (SIGKDD), August, 2008.

High-end and Core Systems

Q. Zhu and **G. Agrawal**, "A Resource Allocation Approach for Supporting Time-Critical Applications in Grid Environments." *Proceedings of International Parallel and Distributed Processing Symposium* (IPDPS), May 2009.

W. Ma and **G. Agrawal**, "A Translation System for Code Generation of GPU's." *Proceedings of International Conference on Supercomputing* (ICS), June 2009, pp. 400-409.

M. Koop, J. Sridhar and **D.K. Panda**, "TupleQ: Fully-Asynchronous and Zero-Copy MPI over InfiniBand." *Proceedings of Int'l Parallel and Distributed Processing Symposium* (IPDPS), May 2009.

M. Koop, J. Sridhar and **D. K. Panda**, "Scalable MPI Design over InfiniBand using eXtended Reliable Connection." *Proceedings of IEEE Cluster 2008*, Sept. 2008.

W. Huang, M. Koop and **D. K. Panda**, "Efficient One-Copy MPI Shared memory Communication in Virtual Machines." *Proceedings of IEEE Cluster 2008*, Sept. 2008.

M. Koop, W. Huang, K. Gopalakrishnan and **D.K. Panda**, "Performance Analysis and Evaluation of PCIe 2.0 and Quad-Data Rate InfiniBand." *Int'l Symposium on Hot Interconnects* (HotI), Aug. 2008

D. Larkins, J. Dinan, S. Krishnamoorthy, **S. Parthasarathy**, **A. Rountev**, and **P. Sadayappan**, "Global Trees: A Framework for Linked Data Structures on Distributed Memory Parallel Systems." *Proceedings of International Conference for High Performance Computing, Networking, Storage and Analysis* (SC), November 2008.

Q. Gao, W. Zhang, Y. Tang, and **F. Qin**, "First-Aid: Surviving and Preventing Memory Management Bugs during Production Runs". *Proceedings of the 4th ACM SIGOPS/EuroSys European Conference on Computer Systems* (EuroSys'09), March 2009.

G. Xu, M. Arnold, N. Mitchell, **A. Rountev**, and G. Sevitsky, "Go with the Flow: Profiling Copies To Find Runtime Bloat." *Proceedings of ACM SIGPLAN Conference on Programming Language Design and Implementation* (PLDI), June 2009.

M. Baskaran, N. Vydyanathan, U. Bondhugula, J. Ramanujam, **A. Rountev**, and **P. Sadayappan**, "Compiler-Assisted Dynamic Scheduling for Effective Parallelization of Loop Nests on Multicore Processors." *Proceedings of ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming* (PPoPP), pages 219-228, February 2009.

V. Kumar, **P. Sadayappan**, G. Mehta, K. Vahi, E. Deelman, V. Ratnakar, J. Kim, Y. Gil, M. Hall, T. Kurç, **J. Saltz**: "An Integrated Framework for Performance-Based Optimization of Scientific Workflows". *Proceedings of HPDC 2009,* June 2009.

A. Hartono, M. Baskaran, C. Bastoul, A. Cohen, S.Krishnamoorthy, B.Norris, J. Ramanujam, **P. Sadayappan**: "Parametric Multi-Level Tiling of Imperfectly Nested Loops". *Proceedings of ICS 2009.*

A. Hartono, B. Norris, **P. Sadayappan**: "Annotation-Based Empirical Performance Tuning Using Orio". *Proceedings of IPDPS 2009.*

G. Khanna, Ü. Çatalyürek, T. Kurç, R. Kettimuthu, **P. Sadayappan**, I. Foster, **J. Saltz**: "Using Overlays for Efficient Data Transfer Over Shared Wide-Area Networks". *Proceedings of SC 2008.*

X. Ding, H. Huang, Y. Ruan, A. Shaikh, and **X. Zhang**, "Automatic Software Fault Diagnosis By Exploiting Application Signatures." *Proceedings of 22nd USENIX Conference on Large Installation System and System Administration* (LISA'08), San Diego, California, November 9-14, 2008.

X. Ding, S. Jiang,, and **X. Zhang**, "BP-Wrapper: A System Framework Making Any Replacement Algorithms (Almost) Lock Contention Free." *Proceedings of 25th International Conference on Data Engineering* (ICDE'09), Shanghai, China, March 29 – April 4, 2009, pp. 369-380.

F. Chen, D. A. Koufaty, and **X. Zhang**, "Understanding Intrinsic Characteristics and System Implications of Flash Memory Based Solid State Drives." *Proceedings of 2009 ACM SIGMETRICS Conference on Measurement and Modeling of Computer Systems* (SIGMETRICS/Performance 2009), Seattle, WA, June 15-19, 2009, pp. 181-192.

F. Chen and **X. Zhang**, "Caching For Bursts (C-Burst): Let Hard Disks Sleep Well and Work Energetically." *Proceedings of 13th ACM/IEEE International Symposium on Low Power Electronics and Design* (ISLPED'08), Bangalore, India, August 11-13, 2008.

2008 - 2009 Courses Offered

Number	Title	CrHrs
100	Introduction to Computing Technology	3
101	Computer-Assisted Problem Solving	4
105	Computer-Assisted Problem Solving for Construction Management	4
200	Computer Assisted Problem Solving for Business	5
201	Elementary Computer Programming	4
202	Introduction to Programming and Algorithms for Engineers and Scientists	4
203	Computational Thinking in Context: Interactive Animations and Games	4
204	Computational Thinking in Context: Digital Images and Sound	4
205/294P	Computational Thinking in Context: Science and Engineering	4
214	Data Structures for Information Systems	4
221	Software Development Using Components	4
222/H222	Development of Software Components	4
230	Introduction to C++ Programming	4
314	Business Programming with File Processing	4
321	Case Studies in Component-Based Software	4
360	Introduction to Computer Systems	4
421	Software Development in Java	3
459.11	The UNIX Programming Environment	1
459.21	Programming in C	1
459.22	Programming in C++	1
459.23	Programming in Java	1
459.24	Programming in C#	1
459.31	Programming in LISP	1
459.41	Programming in COBOL	1
459.51	Programming in Perl	1
489	Professional Practice in Industry	2
493	Individual Studies	1-5
502	Object-Oriented Programming for Engineers and Scientists	3
541	Elementary Numerical Methods	3
551	Introduction to Information Security	3
560	Systems Software Design, Development, and Documentation	5
581	Interactive Computer Graphics	4
601	Social and Ethical Issues in Computing	1
612	Introduction to Cognitive Science	3
616	Object-Oriented Systems Analysis	4
621	Introduction to High-Performance Computing	3
625/H625	Introduction to Automata and Formal Languages	3
630	Survey of Artificial Intelligence I: Basic Techniques	3
634	Computer Vision for Human-Computer Interaction	3
651	Network Security	3
652	Applied Information Security Project	4
655	Introduction to the Principles of Programming Languages	4
660	Introduction to Operating Systems	3
662	Operating Systems Laboratory	3
668	Applied Component-Based Programming for Engineers and Scientists	3
670	Introduction to Database Systems I	3
671	Introduction to Database Systems II	3
674	Introduction to Data Mining	3
675.01	Introduction to Computer Architecture	3
675.02	Introduction to Computer Architecture	4
676	Microcomputer Systems	3
677	Introduction to Computer Networking	3
678	Internetworking	3
679	Introduction to Multimedia Networking	3
680/H680	Introduction to Analysis of Algorithms and Data Structures	3
681	Introduction to Computer Graphics	4
682	Computer Animation	4
683	Computer Animation - Algorithms and Techniques	4
693	Individual Studies	1-5
694L	Introduction to Visualization	4
699	Undergraduate Research in Computer Science and Engineering	1-5
721	Introduction to Parallel Computing	4
725	Computability and Unsolvability	3
730	Survey of Artificial Intelligence II: Advanced Topics	3
731	Knowledge-Based Systems	4
732	Computational Linguistics	4
733	Foundations of Spoken Language Processing	3
735	Machine Learning and Statistical Pattern Recognition	3
737	Proseminar in Cognitive Science	2
741	Comparative Operating Systems	3
755	Programming Languages	3
756	Compiler Design and Implementation	4
757	Software Engineering	3
758	Software Engineering Project	4
760	Operating Systems	3
762	Web-Services-Based Distributed Systems Project	4
763	Introduction to Distributed Computing	3
767	Applied Use-Case-Driven Object-Oriented Analysis and Design for Engineers and Scientists	3
769	Applied Enterprise Distributed Computing for Engineers and Scientists	3
770	Database System Implementation	3
772	Information System Project	4
775	Computer Architecture	3
777	Telecommunication Networks	3
778	Computer-Aided Design and Analysis of VLSI Circuits	4
779	Introduction to Neural Networks	3
780	Analysis of Algorithms	3
781	Introduction to 3D Image Generation	4
782	Advanced 3D Image Generation	3
H783	Honors Research	1-5
784	Geometric Modeling	3
786	Game Design and Development Project	4
788.01	Computational Complexity	1-5
788.02	Information Systems and Database Systems	1-5
788.03	Symbolic Computation	1-5
788.04	Artificial Intelligence	1-5
788.06	Operating Systems and Systems Programming	1-5
788.07	Programming Languages	1-5
788.08	Computer Organization	1-5
788.09	Numerical Analysis	1-5
788.10	Human-Computer Interaction	1-5
788.11	Parallel and Distributed Computing	1-5
788.12	Software Engineering	1-5
788.14	Computer Graphics	1-5
793	Individual Studies	1-5
794A	Advanced Algorithms	3
794J	Applied Enterprise Services Architectures	3
794K	Applied Enterprise IT Architectures II	3
794Q	Introduction to Cryptography	3
861	Computer Communication Networks I	3
862	Computer Communication Networks II	3
875	Advanced Computer Architecture	3
885	Seminar on Research Topics in Computer Science and Engineering	1
888.01	Computational Complexity	1-5
888.02	Information Systems and Database Systems	1-5
888.03	Symbolic Computation	1-5
888.04	Artificial Intelligence	1-5
888.06	Operating Systems and Systems Programming	1-5
888.07	Programming Languages	1-5
888.08	Computer Organization	1-5
888.09	Numerical Analysis	1-5
888.10	Human-Computer Interaction	1-5
888.11	Parallel and Distributed Computing	1-5
888.12	Software Engineering	1-5
888.13	Biomedical Information Sys	1-5
888.14	Computer Graphics	1-5
891.01	Interdisciplinary Seminar on Biomedical Images	1-2
894	Group Studies	1-5
999	Research	1-18

DEPT. OF COMPUTER SCIENCE AND ENGINEERING

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