THE OHIO STATE UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

"Hello, World"

Reaching out to improve the world's technology.

2009-2010 Annual Report

MESSAGE FROM THE CHAIR'S OFFICE

Dear Colleagues, Alumni, Friends, and Parents,

Welcome to the 2009-2010 CSE Annual Report. As I finish my first term as CSE chair, I would like to summarize several team efforts we have made to move the department forward in the last four years. First, the faculty has strengthened their consensus to value the quality of education and impact of research, and we follow this principle in our daily operations. Second, even though the current economic times have pressed us, we have responded with dedication and fortitude. The Department continues to grow and flourish in what we hope are only temporary circumstances. Third, our connections to our alumni have been strengthened and are increasing. These connections have revealed the number of alumni in key leadership roles of academia and industry and these friends are now returning and supporting the Department through various means. Finally, we have effectively kept the world informed about the CSE progress and alumni achievements through a frequently updated web page, twice-a-year newsletters and the annual report. With a strong support from the faculty, I have agreed to chair another term of the CSE Department.

Here are several selected accomplishments presented in this annual report.

- *The US News and World Report rankings show the Ohio State Computer Science ranking moving up to 14th among public universities and 28th among more than 200 CS Ph.D. programs in the country.*

- *Assistant Professor Feng Qin received an NSF Career Award raising the total number of NSF Career Awardees in the department to 21. Coincidentally this is the same number of NSF Career awards received by Ohio State CSE graduates.*

- *We welcome Michael Bond to the department as an assistant professor starting early next year. His research area is in programming languages and software engineering.*

- *We have further expanded the Industrial Advisory Committee by adding two more distinguished CSE alums: Ray Harishankar (MS'90), IBM Fellow, and Julie Hartigan (MS'89, Ph.D.'94), CTO, Expert Systems Inc.*

- *I would like to give my congratulations: to Eric Fosler-Lussier for his promotion to the rank of Associate Professor with tenure; to Srinivasan Parthasarathy for being promoted to the rank of Full Professor; and to Rajiv Ramnath for his promotion to the rank of Associate Professor of Practice.*

I hope you enjoy reading the annual report. I look forward to many new developments and progress next year.

Sincerely,

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.*

TABLE OF CONTENTS

NEWS & ACHIEVEMENTS

CSE Faculty

OSU-CSE Reputation Marked by Peers and Reflected in Rankings

Computer Science Ranking at Ohio State Improves Again

According to the US News and World Report 2011 Edition of America's Best Graduate Schools released in April 2010, the ranking of Computer Science and Engineering at Ohio State continued moving upward to 28th among all PhD granting Computer Science Departments and 14th among public universities. The department was ranked 34th in 2006 and 31st in 2008.

Game Design Class

The Princeton Review is known for rating the best of the best. This year the video game courses of CSE's Graphics group, "Game Design and Development Project" to name one, placed on The Review's Top 50 Undergraduate Game Design Programs list. This puts CSE in the top 10% of all programs. The results were compiled from a comprehensive survey of more than 50 questions covering areas from academics and faculty credentials to graduates' employment and career achievements. Criteria included the quality of the curriculum, faculty, facilities and infrastructure. The Princeton Review also looked at data on scholarships, financial aid and career opportunities.

Members of CSE 786 present their final project to their classmates and other invited guests.

CSE's Graphics group has long enjoyed an eminent ranking and reputation. **Dr. Roger Crawfis**, the primary instructor for the game courses, said "we have always been known as a very strong computer graphics and animation department, with many successful students employed in Hollywood animation studios. Leveraging this with our recent success and focus on curriculum and research for computer games has paid big dividends."

On his commencement day, Dr. Xiaoning Ding poses with his advisor, Xiaodong Zhang with University Hall in the background.

Intel Puts OSU-CSE Inside

The ultimate goal of high-quality research is to solve important problems and impact the real world. Intel's Developer Relations Division has recently recognized the significant contributions of an OSU-CSE and Iowa State University research collaboration made to advance multicore technology with their algorithms and software. The Intel Software and Service Group (SSG) is using a software cache partitioning method developed by the collaborative team of Drs. Jiang Lin, Qingda Lu, Xiaoning Ding, Zhao Zhang, **Xiaodong Zhang,** and **P. Sadayappan**.

Performance degradation caused by access conflicts in shared caches has been a major concern for data intensive applications running on multi-core processors. This team's work makes a strong case for using a software solution implemented in the Linux kernel to effectively manage shared hardware caches in multi-core processors. In a letter of acknowledgement, Wolfgang Petersen, Director of Developer Relations, informed the coauthors their research contributions "helped our engineers implement a solution

that provided 1.5X latency reduction in a custom Linux stack running on multi-core Intel platforms."
According to Intel SSG, the software cache partitioning method "has been adopted by a major industrial automation vendor and facilitated the deployment on multi-core Intel platforms".

"I am very pleased to learn that another research work of ours has made a strong impact in the advancement of computer systems," states Xiaodong Zhang. "I believe the solution presented in this work is not only effective in Linux system for Intel processors, but also general-purpose, which will be widely used as a critical component in any operating system to manage shared caches in any multi-core processors." Several published research results on memory systems from his group have been widely adopted in both commercial processors, such as AMD, Intel, NVADIA, and Sun Microsystems, and major software systems, such as Linux, NetBSD, and MySQL.

The paper reporting the research results, "Gaining Insights Into Multi-core Cache Partitioning: Bridging the Gap Between Simulation and Real Systems," was presented and published at the 14th International Symposium and on High Performance Architecture (HPCA'08).

Systems Trio Win Best Paper

Ms. Ping Lai, Dr. Sayantan Sur, and Dr. DK Panda received the International Supercomputer Conference (ISC 2010) Award for the Best Paper at the 2010 ISC- HPC Event in Hamburg, Germany. In their work, "Design of Truly One-sided Intra-node Data Transfer using two Kernel-based Direct Copy Alternatives: Basic Kernel-assisted Approach and I/OAT-assisted Approach," the team addresses the problems with multi-core processors using the popular Message Passing Interface (MPI) which do not provide support for pure one-sided intra-node Remote Memory Access (RMA) communication. The recent development of MPI-2 RMA allows for efficient one-sided communication for MPI applications. This design eliminates the need for using two-sided operations and involvement from the remote side. The paper also proposes a "series of benchmarks" to evaluate various performance aspects of the new design over multi-core architectures (Intel Clovertown, Intel Nehalem and AMD Barcelona). The results show that the new design obtains up to 39% lower latency for small and medium messages and demonstrates 29% improvement in large message bandwidth. Moreover, it provides superior performance in terms of better scalability, reduced cache misses, higher resilience to process skew and increased computation and communication overlap. Finally, up to 10% performance benefit is demonstrated for a real scientific application AWM-Olsen (recently renamed to AWM-ODC)."

Santayan Sur (middle) and DK Panda receive their Best Paper award from Professor Michael M. Resch, Chair of ISC Awards Committee, at the International Supercomputer Conference (ISC 2010) in Hamburg, Germany. (Ping Lai was unable to attend.)

The ISC conference typically accepts a maximum of 24 papers for its technical program from the total number of submissions. This paper has been selected to receive the Best Paper Award from this competitively selected set of papers. The ISC Award is sponsored by Gauss Center for Supercomputing (GCS).

Ping Lai is a Ph.D. candidate whose primary research interests include high performance computing, communication protocols, and high performance data-centers. She has published (including coauthored) about 10 papers in journals and conferences related to these research areas. She is a member of the Network-Based Computing Laboratory.

Sayantan Sur is a CSE Research Scientist. His research interests include high speed interconnection networks, high performance computing, fault tolerance, and parallel computer architecture. He has published more than 18 papers in major conferences and journals related to

these research areas. He is a member of the Network-Based Computing Laboratory lead by Dr. DK Panda. He is currently collaborating with National Laboratories and leading InfiniBand and iWARP companies on designing various subsystems of next generation high performance computing platforms. He has contributed significantly to the MVAPICH/MVAPICH2 (High Performance MPI over InfiniBand and 10GigE/iWARP) open-source software packages. The software developed as a part of this effort is currently used by over 1135 organizations in 58 countries. In the past, he has held the position of post-doctoral researcher at IBM T. J. Watson Research Center, Hawthorne, and Member Technical Staff at Sun Microsystems. Dr. Sur received his Ph.D. degree from The Ohio State University in 2007.

Dr. Panda leads the Network-Based Computing Research Group. Students and staff members of this group are involved in multiple state-of-the-art research projects. The team has been doing extensive research on modern networking technologies including InfiniBand, 10GE/iWARP and RDMA over Enhanced Ethernet (RoCE). Currently the group is collaborating with National Laboratories and leading InfiniBand and 10GE/iWARP and RoCE companies on designing various subsystems of next generation high-end systems. The MVAPICH/MVAPICH2 (High Performance MPI over InfiniBand and iWARP) open-source software project, developed by his research group, is being used by more than 1,135 organizations worldwide in 58 countries. This software has enabled several InfiniBand clusters, including the 5th and 9th ranked ones, to get into the latest TOP500 ranking of the powerful computer systems and with few exceptions InfiniBand clusters have been included in each biannual list over the past five years. These software packages are also available with the Open Fabrics stack for network vendors (InfiniBand, iWARP and RoCE), server vendors and Linux distributors. Dr. Panda's research is supported by funding from US National Science Foundation, US Department of Energy, Ohio Board of Regents and several industry including Intel, Cisco, SUN, Mellanox, QLogic and NetApp. More details on this project are available at http://mvapich.cse.ohio-state.edu. DK obtained his Ph.D. in computer engineering from the University of Southern California. He has published over 270 papers in major journals and international conferences related to these research areas. Dr. Panda is a Fellow of IEEE and a member of ACM and has served on many conference committees and boards in various capacities.

Google Research Awards Parthasarathy

Google Research selected Dr. Srinivasan Parthasarathy to receive a Google Research Award to investigate hashing algorithms for semi-structured and structured data. Hashing algorithms, used for data storage and in encryption, take large amounts information which vary in length and transform them into a specific element, a hash value. This result can then be used to evaluate and/or organize a profusion of datum from various sources according a specific set of requirements. Dr. Parthasarathy's research team in the Data Mining Research Laboratory will investigate the theoretical significance of this work together with the practical application, which, is that the conversion enhances the ability to process and store masses of structured information ranging from XML documents to social network data efficiently and succinctly. This ties in with the lab's work to develop efficient and novel algorithms for managing and analyzing complex data.

Parthasarathy's primary research interests are in data mining/machine learning, high performance computing and database systems. Srini, as he is casually known, received the NSF CAREER award and Department of Energy Early Career awards in 2004. His work has received six best paper awards or similar honors from leading conferences in the field including the ACM SIGKDD Best Applications Paper award in 2007 and the VLBD Best Paper Award in 2005. He joined CSE in Autumn 2000. He has mentored ten PhD graduates, four in academia and the remainder in industrial research labs such as Microsoft, Yahoo, Google and IBM.

Google has long held that a prominent facet of its mission is to "organize the world's information

and make it universally accessible and useful." To that end they created the Google Research Awards. They are granted to the academic community so Google may assist all pursuits of relevant, innovative research wherever it may occur. Google is extremely selective and the gift is more than just monetary. From their website: "Participants in the awards program are expected to have a primary contact at Google through whom they can discuss research directions, provide progress updates, engage in knowledge transfer, etc. Google maintains an academic environment that we would like to share with our award recipients, so we invite them to visit our facilities, to give talks related to their work, and to engage in discussions with our research groups. By sharing new ideas and key insights, we hope that both Google and award recipients will find mutual benefits. After the research is completed, we sometimes invite award recipients for more visits to further discuss their work."

Feng Qin Receives NSF CAREER

The National Science Foundation awarded CSE Assistant Professor **Feng Qin** a Faculty Early Career Development Award (CAREER) for his research entitled, "Building Immunity to Memory Management Bugs during Production Runs." Qin's five-year project will explore novel ways to mitigate memory management bugs, a major category of common software defects. Studies show that memory management bugs may account for 43% of the reported software failures. Feng aims to employ a systemic approach for providing immunity to memory bugs during productions runs by performing online diagnosis once a memory bug or failure is detected, then generate and apply runtime immune patches to the running program for surviving and preventing memory bug occurrences or failures.
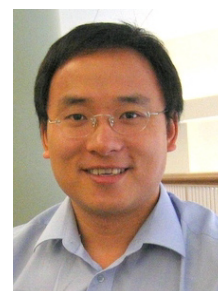
Before joining the department in 2006, Feng received his Ph.D. in computer science from the University of Illinois at Urbana-Champaign. He received his master's degree from the Institute of Software, Chinese Academy of Sciences and his bachelor's degree from the University of Science and Technology in China, both in computer science. Feng's research focuses on software dependability, operating systems and security.

The Department has a long history of fostering strong young faculty. Feng is the department's 25th CAREER or National Young Investigator award recipient from the National Science Foundation.

The Faculty Early Career Development (CAREER) Program offers the National Science Foundation's most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Such activities aim to build a firm foundation for a lifetime of leadership in integrating education and research.

Members of Top 10 Supercomputers Spin to MVAPICH Tune

Since 2003, the work of **DK Panda** and his team of students has been powering one or more of the top 10 computers as listed twice a year by the TOP500.org, which ranks supercomputers by their performance on the LINPACK Benchmark. Currently there are two versions of this MPI: MVAPICH with MPI-1 semantics and MVAPICH2 implementation with MPI-2 semantics, involves designing a high performance and scalable MPI (Message Passing Interface standard) for clusters with the emerging InfiniBand, 10GigE/iWARP and RDMA over Converged Ethernet (RoCE) networking technologies. This 'open-source' software was first demonstrated at Supercomputing (SC '02) and after that it has been steadily gaining acceptance in the HPC, Cluster, Networking, and InfiniBand communities.

More than 1,185 organizations, national labs, universities, and industry, in 59 countries have downloaded this software from OSU's web site directly together with voluntary registration. As of August 2010, more than 44,000 downloads have taken place from the OSU Web site alone. In addition, many server vendors, networking vendors (InfiniBand, 10GigE/iWARP and RoCE) and system integrators are incorporating MVAPICH/MVAPICH2 into their software stacks and distributing

it. Both MVAPICH and MVAPICH2 versions are also available with the OFED (http://openfabrics.org) stack for Linux and are being integrated into many Linux distributions (RedHat and SuSE).

Zweben Receives Honored for Service

Professor Emeritus Stuart Zweben was selected to receive the 2009 SIGSOFT Distinguished Service Award. SIGSOFT is the Special Interest Group on Software Engineering of the Association for Computing Machinery. He was honored for his work on accreditation, his service with the Association for Computing Machinery and his involvement with the Computing Research Association Taulbee Survey. Dr. Zweben takes a leadership role in conducting the survey, which is helpful both as a policy-making tool and in improving the conditions of employment of academic computing researchers, thus helping with recruitment and retention. The award was presented at the International Conference on Software Engineering.

Stu, as Dr. Zweben is generally known, officially retired last year after a 35 year career with The Ohio State University. However, for a short-term period, he serves as the Associate Dean for Academic Affairs and Administration for the Ohio State College of Engineering. Prior to moving to the College, he was CSE's chair for 10 years.

New Faculty for Software Engineering and an Alum Comes Home

In January 2011, the area of Programming Languages and Software Engineering will grow with the addition of Dr. Michael Bond. Dr. Bond is finishing a post-doc at the University of Texas, Austin where he also received his Ph.D. under the mentorship of Professor Kathryn S. McKinley. In 2009, Michael received the ACM SIGPLAN Outstanding Doctoral Dissertation Award and has had papers accepted at Programming Language Design and Implementation (PLDI '10) and Programming Languages and Analysis for Security (PLAS 2010).

Dr. Nicoleta Roman graduated from OSU-CSE with her Ph.D. in 2005, but did not wander far. For the past five years, she has been teaching at the Lima campus of The Ohio State University and has become much loved. Recently, however, she realized she was missing the research focus and collaboration available on the main campus. As Lima did not want to lose a prized teacher, arrangements were made and Nikki, as she is commonly called, has re-joined CSE as an Assistant Professor with one caveat. She will do research in Columbus and teach in Lima - a winning situation for all.

A Faculty Promotions Triad

Since it began, the career of Dr. Srinivasan Parthasarathy has been in continuous ascendancy. Effective October 2010, he will be granted the title "Full Professor." Dr. Parthasarathy has receives several awards since arriving at OSU-CSE in 2000 including the IBM Faculty Award, a Google Faculty Award, two OSU College of Engineering Lumley Research Awards and several Best Paper Awards. He is a member of the Systems Group.

With virtually no dispute, Dr. Eric Fosler-Lussier was awarded the position of Associate Professor. Dr. Fosler-Lussier is an active member of the Computational Linguistics and Language Technology (CLLT) Group at OSU, which spans the Linguistics, Psychology, and CSE departments, and oversees, with Dr. Chris Brew, Speech and Language Technologies Laboratory in CSE. He holds a courtesy appointment with OSU's Department of Linguistics and is a member the Ohio State Center for Cognitive Science. Eric joined CSE in Autumn 2003 after spending a year at Columbia University in New York City and two years with Bell Labs Research, Lucent Technologies. He received his Ph.D. from the University of California, Berkeley in 1999.

Dr. **Rajiv Ramnath** is the third promotion. Dr. Ramnath has been promoted from Assistant Professor of Practice to the level of Associate Professor of Practice. Rajiv, as codirector of the Collaborative for Enterprise Transformation and Innovation (C.E.T.I.), has been instrumental in building new collaborative relationships with local business. He has recieved exceptional student response to his Capstone courses being particularly cited for giving students real-world experience.

Another Award for an Accomplished Adviser

The National Academic Advising Association (NACADA) accorded **Margaret (Peg) Steele**, Coordinator of Academic Advisement, the 2009 Service to Commission Award for the Engineering and Science Advising Commission. This award was established to recognize individuals who have provided outstanding service, leadership and commitment to a particular commission within the association in support of its efforts to enhance advising services to students. The commission encourages advisors to become involved in research and share best practices in the area of engineering and science students.

Peg previously received the NACADA's Award for Outstanding Advisor in 2003 and twice received the same from the local University chapter. The CSE Department has also recognized her excellence with two Service Awards.

STUDENT NEWS

Two Students Named CI Fellows

Recent CSE PhD graduates, **Duygu Ucar** and **Sitaram Asur** were named 2009 Computing Innovation Fellows. The fellowship, sponsored by The Computing Community Consortium (CCC) and the Computing Research Association (CRA) with funding from the National Science Foundation, grants one-to-two year postdoctoral positions at host organizations including universities, industrial research laboratories, and other organizations that advance the field of computing and its positive impact on society. The goals of the CI Fellows project are to retain new Ph.D.s in research and teaching and to support intellectual renewal and diversity in the computing fields at U.S. organizations.

Duygu Ucar.

Duygu will conduct her fellowship at the University of Iowa where she will focus on the systems biology of gene regulation under the direction of Dr. Kai Tan. The research team had their first paper on epigenomics data analysis published in Bioinformatics.

Sitaram will carry out his fellowship in the Social Computing Lab at HP Labs in Palo Alto. Mentored by Dr. Bernardo Huberman, Sitaram will conduct social network analysis from the perspective of the web and mobile applications. Most recently this work has made media waves as their research into Twitter showed that analysis of 'tweets' could predict movie box office success and even the box office grosses with approximately 96% accuracy.

Duygu and Sitaram were both advised by Srinivasan Parthasarathy and were affiliated with the Data Mining Research Laboratory.

The proud graduate and his proud advisor, Dr. Sitaram Asur with Dr. Srini Parthasarathy.

CSE Students Awarded IBM Fellowships

Ph.D. candidates **Joe Bolinger** and **Guoqing Xu**, received IBM Fellowships.

Joe Bolinger is a true Buckeye having received his BS in Computer Science from Ohio State in 2005, graduating Magna Cum Laude. Striving towards his PhD under the tutelage of Jay Ramanathan and Rajiv Ramnath, his primary research interests are in design methodologies for collaborative tools that support service organizations. More generally, he is interested in human computer interaction, service and management science, software engineering, and anything that might help people work together and socialize more enjoyably online.

He is a member of the CETI NSF-IUCRC Program, whose mission is to uniquely integrate research, practice, and education to provide varied opportunities for students, professionals and industry collaborators. Joe has worked with local IT organizations to study the management and governance processes that these groups use to manage increasingly complex collections of computational resources, which enable critical business services. His research has lead to the development of new tools that can better support and monitor these kinds of highly unstable and ad-hoc work processes. Such tools can help prevent the costly errors that result from unplanned downtime or resource mismanagement, and can support broader organizational improvement and learning strategies.

Guoqing Xu, known to everyone as Harry, is a PhD candidate under the supervision of Dr. Atanas Rountev. His primary research interests are static and dynamic program analyses for compiler optimizations and software engineering tasks; more generally, he is interested in approaches to help programmers write and maintain reliable and reusable software. He has published several papers in top programming language and software engineering conferences including PLDI, ECOOP, FSE, and ICSE. In 2008, he received the Distinguished Paper Award in the International Conference on Software Engineering for his paper entitled "Precise Memory Leak Detection for Java Software Using Container Profiling."
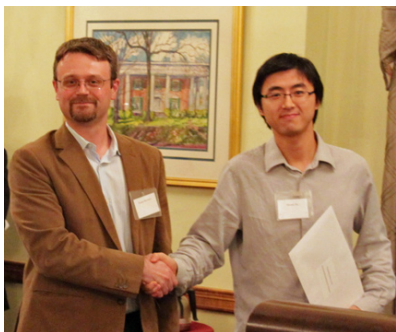
Dr. Rountev shakes hands with Guoqing Xu at the CSE awards banquet.

During the past two summers, Harry interned at the IBM TJ Watson Research Center. He has worked closely with IBM researchers on performance optimization for large-scale and long-running Java programs. For example, he has developed JVM-based tools that can detect inefficient operations by finding high-cost-low-benefit data structures and by profiling copy activities. Many performance problems in real-world applications have been revealed using these tools. Significant performance improvement can be seen after optimizing away these detected problems. Harry was honored this year by the CSE Department with a Departmental Graduate Research Award. Harry received both his MS and BS degrees with distinction in Computer Science from East China Normal University, Shanghai, China.

Marianna Russell Technology Grant

Renee Tischler, a CSE undergraduate, received a Marianna Russell Technology Grant to attend the 2009 Grace Hopper Celebration of Women in Computing in Tucson, Arizona. The grant is provided to facilitate professional development for women in the technology field. Ms. Tischler who minored in Studio Art, graduated Cum Laude at the Summer 2010 commencement. Originally from Parma, Ohio, she returns to Northern Ohio to begin her career with General Electric in Cleveland as a member of their Information Management Leadership Program (IMLP).
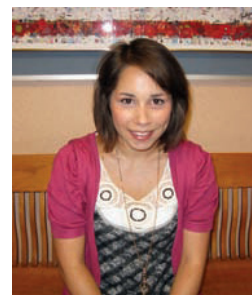
Alumni News

More IEEE Fellows from OSU-CSE Graduates
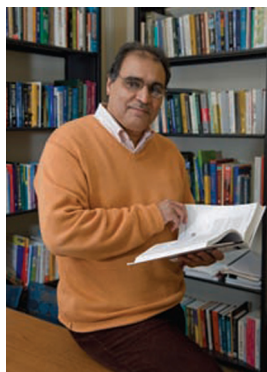
Ahmed El-Magarmid

The CSE department is proud to announce that our alumni **Ahmed El-Magarmid** (PhD '85) and **Shivkumar Kalyanaraman** (PhD '97) have been named members of the 2010 IEEE Fellow Class.

Ahmed received this honor for his contributions to transaction management and data integration and quality. Ahmed is a Professor of Computer Science at Purdue University and also serves as Director of the Indiana Center for Database Systems and the Cyber Center in Discovery Park. He received a Presidential Young Investigator award from the National Science Foundation, and distinguished alumni awards from Ohio State University and the University of Dayton in 1993 and 1995, respectively. Ahmed's research interests focus ranges on a large spectrum of foundational and application-oriented database research. He has done work in video databases, data quality and confidentiality, data integration, web service, bioinformatics and multidatabase systems. Ahmed has written six books and more than 150 papers. He has several active grants from state and federal government agencies and industry.

Shivkumar Kalyanaraman received his recognition for contributions to traffic management in computer communication networks. Shiv is a Senior Manager of the Next Gen Systems & Smarter Planet Solutions Department at IBM India Research Labs, Bangalore. He was previously a Manager of the Next Generation Telecom Research group and a Research Staff Member since 2008. He was a full Professor at the Department of Electrical, Computer and Systems Engineering at Rensselaer Polytechnic Institute. He also holds an Executive M.B.A. (EMBA) degree from Rensselaer Polytechnic Institute. Shiv's current research in IBM is at the intersection of emerging wireless technologies and IBM middleware and systems technologies with applications to large-scale smarter planet problems (grids, traffic, finance etc). He was selected by MIT's Technology Review Magazine in 1999 as one of the top 100 young innovators for the new millennium. He served as the TPC Co-chair of IEEE INFOCOM 2008, and will be the General co-chair of ACM SIGCOMM 2010 in New Delhi.

Shivkumar Kalyanaraman in a photo from his days with RPI.

IEEE established the grade of fellow in 1912 to recognize engineers who have demonstrated outstanding proficiency and have achieved distinction in their profession. The total fellows selected in any one year does not exceed one-tenth of one percent of the total IEEE membership.

IBM Distinguished Engineer

David Ogle, PhD '88 was named a 2009 IBM Distinguished Engineer in recognition of sustained technical leadership in Quality Software Engineering. With a history of achievement and innovation

in system testing and in autonomic computing, Dave has blazed new trails in software automation, Agile methods and logging. Dave has a long-held passion for improving software quality and resilience, to the benefit of IBM's customers. According to IBM, a Distinguished Engineer is a key technical consultant with a deep area of expertise or across multiple areas. He or she is a strategist, shaping business decisions and processes. They also provide leadership for technical disciplines, competencies and professions, and develop architectures, standards and tools. After graduating from Ohio State, Dave headed to North Carolina to work for IBM. He intended to stay there for 3-5 years, but liked it so

much that has been there for almost 20 years. He says IBM has given him the opportunity to grow his skills and respond to new challenges. He is currently the Chief Test Architect for the Lotus branded software. On a personal note, Dave very much enjoys North Carolina. There he met his beautiful wife and they are busily trying to raise their three second grade boys.

CAREER for 2005 Grad

Ruoming Jin, PhD '05, received a National Science Foundation CAREER award for his research entitled Novel Data Mining Technologies for Complex Network Analysis. The focus of this project is to develop novel data mining technologies to elucidate the structures and dynamics of complex but ubiquitous networks. A model complex network is a large system of elements that are joined by non-trivial relationships. Examples of such complex networks include the WWW, metabolic and protein networks, social networks, and economic and financial markets. The underlying principles and laws of these network systems can help construct more effective communication mechanisms, find cures for fatal diseases, and deal with economic crises. Ruoming is an Assistant Professor of Computer Science at Kent State University. His research focuses on mining complex networks and graph mining, graph databases, and biomedical informatics.

CoE Distinguished Alumnus

The Ohio State University College of Engineering gave **Matt Desch** (BS, '80) a Distinguished Alumnus Award. Established 56 years ago, the purpose of the "Distinguished Alumnus" Awards is "recognize distinguished achievement in one's profession by reason of significant inventions, important research or design, administrative leadership, or genius in production."

In 1980 when Matt Desch graduated and started working for AT&T Western, now Alcatel Lucent, it was merely the first and smallest step up the proverbial ladder of success. Six years after graduation, Mr. Desch, still with AT&T, moved to Chicago and gained his MBA taking night classes from the University of Chicago. Not a man who enjoys easy days, he moved to Northern Telecom, which has become Nortel Networks, continued moving upward until he found himself living in London, England, and in charge of Nortel's international business. He was then recruited to be the Chairman and CEO of Iridium Satellite, where he leads today.

Alums Continue Publishing Award Winning Papers

Summer 2007 graduate, **Amol Ghoting**, was awarded the IBM Research Pat Goldberg Best Paper Award for his work, "Serial and Parallel Methods for I/O Efficient Suffix Tree Construction," coauthored with Konstantin Makarychev. This work, presented at the 35th SIGMOD International conference on Management of Data, revisits "a fundamental data structure in string processing, namely the suffix tree. By doing a thorough review of past work, the authors highlight the main deficiencies of existing solutions and then introduce robust and scalable techniques to address these deficiencies." Amol joined the Data Mining Systems group at IBM Research in October, 2007. His advisor was Dr. Srinivasan Parthasarathy.

Scott Pike (PhD '04) received a Best Paper Award at the International Parallel and Distributed Processing Symposium (IPDPS) 2009 in Rome, Italy. The paper, "Crash Fault Detection in Celerating Environments," was a collaboration with his PhD student Srikanth Sastry and colleague Jennifer Welch at Texas A&M University. Dr. Paul Sivilotti mentored Scott through his PhD.
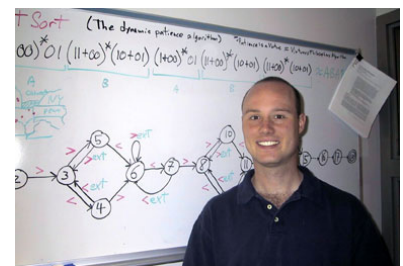
Jian Sun (PhD '07) received the Best Paper Award at the *Symposium on Geometry Processing* held in Berlin, Germany in July. The paper, "A Concise and Provably Informative Multi-scale Signature Based Heat Diffusion" was coauthored by Maks Ovsjanikov and Leonidas Guibas. Jian is a post-doctoral researcher at the Department of Computer Science at Stanford University focusing on developing geometric and topological methods for shape and data analysis. He received his PhD from Ohio State under the direction of Professor Tamal Day.

2010 Department Awards

Scholarships

Central Ohio Chapter of Association of Computing Machinery (ACM)
Benjamin Gilbert

Dedication Award
Brian Swaney

Crowe Horwath
Chirantan Ekbote

Ernest William Leggett, Jr. Scholarship
The Leggett Family Award
David Mason
Katherine Tornwall
Michael Diekema
Jacqueline Telljohann

Matt Desch Award
Laura Housley

Silicon Valley CIO Award
Angela Deady
Patrick Mulac

The O'Connell Family Award
Meghan Day
Eric Perry

Raytheon Corporation
Greg Loesch
Natalie O'Connell

CSE Undergraduate Scholarships
Brian Arand
Matthew Zachrich
Jamie Colley
Christopher Mayer
Maksim Pritsker
Marc Khoury
Jason Link
Dorian Rahamim
Jonathan Silliman

Faculty & Staff Awards

Eleanor Quinlan Memorial Awards
Bruce Adcock
Raffi Khatchadourian

Mike Liu Graduate Fellowship Award
Feng Chen

Outstanding Graduate Research Awards
Shirish Tatikonda
Guoqing (Harry) Xu

Outstanding Service Award
Shaun Rowland
Peg Steele

Outstanding Teaching Award
James W. Davis
Tim Long

Jim Cates presents the Silicon Valley CIO award to Angela Deady.

Explanation of Department Awards & Scholarships

Ernest William Leggett, Jr. Scholarship // The Leggett Family Award
The Leggett Family established this endowment in memory of Ernest William Leggett, Jr., who received his Ph.D. from the Department in 1977. Dr. Leggett passed away in 1994.

Eleanor Quinlan Memorial Award
This fund is an endowment established to honor the memory of Eleanor "Elley" Quinlan, who was both a staff member and graduate of the Department. From 1990 until her passing in January 2001, she was the Academic Program Assistant. The proceeds from this fund are used for the development and recognition of graduate teaching associates in the CSE Department.

Mike Liu Graduate Scholarship Fund
Established November 1, 2008, by the department, former Ph.D. graduates, friends, colleagues through The Foundation to celebrate Professor Mike Liu's 40 year service to CSE, and his contributions to Ohio State and to the fields of distributed and networking. Income is used to annually award one or more Ph.D. students for the excellence of academic and research activities.

The O'Connell Family Award
Alumni Conleth O'Connell (Ph.D. 1990) and Christina "Curby" (Morgan) O'Connell, his wife and former Department staffer, have created this endowment for undergraduate students. A portion of the funds have been designated for an incoming first year student. This money is given in two payments; half is distributed upon arrival to the University and the other half upon entering the major.

Outstanding Research Awards
Exclusively open to CSE graduate students, this award is given in recognition of their exceptional research efforts.

Outstanding Service Awards
All faculty, staff and students who contribute to the Department's success by working beyond the expected are eligible.

Outstanding Teaching Awards
This award is given to a member of the faculty, a lecturer or Teaching Assistant who demonstrates exemplary ability in the classroom and in her/his interaction with students.

Silicon Valley CIO Award
The funding source for this award came from a Scholarship Fund established by thirty Silicon Valley executives who used the monies from book profits. They annually bestow $50,000 to $70,000 in scholarships.

Left: Mike Fortin presents Meghan Day with her Scholarship certificate.

Below: Xiaodong Zhang opening remarks to the record breaking gathering.

Retirees Sow Seeds for Future Students' Growth

Many people retire from one 'job,' start another career and then retire again from that one. However there are few who retire from the same place twice. B. Chandrasekaran (Chandra) is one of those rare individuals. Even fewer leave a place making such an impact on the future as Drs. Chandrasekaran and Sandy Mamrak did for CSE this past year.

This past year Chandra, Sandy and many of their former students gave seed money for the B. Chandrasekaran & Sandra Mamrak Fellowship Fund. The annual income from this fund will award one or more fellowships for full-time graduate students. The fellowship winners will be chosen primarily for their academic merit and research achievements with no regard to their financial need. Recipients will be named annually but may be eligible to compete for renewed awards. Selection of each recipient will be done by the Chair of the Department of Computer Science and Engineering in consultation with the Department of Computer Science and Engineering's Awards Committee. This generosity will make a difference for many CSE students and hopefully allow a bright star to rise and impact the field as these two have done in their time.

Internationally renowned for his work in Artificial Intelligence, Dr. B. Chandrasekaran was one of the first faculty members of the then named Department of Computer and Information Science. Chandra originally retired from CSE as a professor in 1995, but returned almost immediately as a Senior Research Scientist continuing to work with students and investigating new questions and problems. During his entire tenure, he mentored forty some students. He established the very first computer science lab, the Laboratory for Artificial Intelligence Research (LAIR).

For thirty years, Dr. Sandra "Sandy" Mamrak served the Department and the University in several capacities: instructor, committee leader, and researcher. Dr. Stuart Zweben, current chairperson, and former chairperson, Dr. Merv Muller, concur that Sandy was the 'Go-To' person when an important committee spot needed to be filled. She finished her OSU career chairing the Computer and Graduate Admissions committees, two key positions, leaving her influence on the Department for years. Her recent research interests included Web-based Information Systems Architecture and Object-Oriented Frameworks Architecture. She was very active with The Ohio State University Medical Center thanks to her ACUITY project, which devoted innovative information-system technology to support cancer research. Dr. Mamrak relocated to New York City announcing that she may never return to Columbus, Ohio; going so far as to sacrifice her Ohio State football season tickets situated on the 50 yard line. She may enjoy the Big Apple too much to miss CSE, but CSE misses her.

Chandra addressing the banquet attendees about CSE, students, artificial intelligence, and his very real and lovely wife, Sandy Mamrak. Sandy could not be in attendance.

On a December evening, Computer Science and Engineering said "Fare thee well" to three of its most treasured members; Professor Tim Long, Research Scientist John (JJ) Josephson and Senior Lecturer David Mathias.

For over 25 years, **Dr. Tim Long** served as a pillar of the Software Engineering area of the Department, particularly making large contributions to the Resolve/Reusable Software Research Group. However, his greatest contributions to the field of Computer Science have been in his teaching as his mark was left on numerous students. With his colleague, Bruce Weide, Tim received one of the first ever bestowed IEEE Computer Society's Computer Science and Engineering Undergraduate Teaching Award, an international award given for outstanding contributions to undergraduate teaching. Tim's creativity in the classroom seemed boundless and gave birth to many fun activities which assisted students to visualize programming in real world concepts, most notable among these is the Mr. LeastCostPathMachine. In 2009, Dr. Long, again with Dr. Weide, received a Faculty Innovators recognition from the Ohio Board of Regents for their adapting online materials work and incorporating online materials into the classroom.

Dr. Tim Long (l.) with mentee, Paolo Bucci, Paolo's wife, Kristen, and Donna Long. As it was the Longs who introduced Kristen to Dr. Bucci, Paolo remarked that Dr. Long was a wonderful mentor going so way to improve Paolo's life even going so far as to find him a wife.

He also received The Ohio State University Alumni Award for Distinguished Teaching as well as the Boyer Award for Teaching from the OSU College of Engineering. With his wife, Dr. Donna Long (OSU Dept. of Spanish), Tim will retire to Ashville, North Carolina, where he may turn his passion for woodworking into his next career.

JJ Josephson, his daughter-in-law, Jennie, and grandchildren.

Dr. John (JJ) Josephson has long been a Buckeye. Before Dr. Josephson started his OSU academic career as a student, ultimately receiving his Ph.D. in Philosophy and Mathematics, his father was the Chair of the OSU Mathematics Department. JJ, as he fondly called, investigated computational epistemology, abductive inference, causal reasoning, perception and information fusion. With his wife, Susan, he wrote *Abductive Inference: Computation, Philosophy, Technology*. He worked as the Associate Director of the Laboratory for AI Research (LAIR), CSE's first established lab. JJ intends to spend his future free-time traveling, meditating and playing with his grandchildren.

Often one of the greatest compliments an educator can receive is to over-hear a student recommending him or her with the words, "He's really tough, but he's also very nice and helpful. You'll really learn a lot from him." **Dr. David Mathias** is one such instructor, receiving some of the highest Student Evaluations and twice getting the CSE Outstanding Teaching Award. David does not just leave Ohio State, but the United States as well. The Mathias family (Patty, Dylan and Zachary) is emigrating to Switzerland as Patty's career begins a new phase. David will be expanding his career as an author when his book, *Greene & Greene Furniture - Poems of Wood & Light*, about the furniture traditions of Charles and Henry Greene debuts in Autumn 2010.

The Mathias family.

Industrial Advisory Board

The CSE Industrial Advisory Board is a growing and active group of smart and energetic industry leaders who are also CSE alums. The primary mission of the Board is to insure the world is aware of the quality of research and teaching done in CSE. A three part action plan has been devised for accomplishing this aim.

1. 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 new funding sources.

2. 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 its greatest level of recognition.

3. 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 as well scholarship funds.

This last point was greatly in evidence at the CSE Annual Banquet with five scholarships coming directly from Board members' sources.

In 2010, two more members were asked and have agreed to serve on the Board.

Ray Harishankar - (MS '90)

Mr. Harishankar, an IBM Fellow, currently serves as CTO of Global Solutions and Asset Management within IBM Global Business Services in Dublin, OH. Ray defines and operationalizes strategies for GBS to have strong portfolio of Business Solutions and Service-Oriented Architecture (SOA) based assets. Ray is an information technology professional with substantive and versatile skills and experience in the design, delivery and support of complex solutions integrating many leading technology and process elements and in technical leadership. He was named the Asian American Engineer of the year in 2009 by the Chinese Institute of Engineers USA.

Julie Hartigan (MS '89, Ph.D '94)

Also a Chief Technology Officer, Dr. Hartigan oversees the Federal Programs at Expert Systems in Washington, DC. Expert Systems is a leading provider of semantic software, Cogito, that discovers, classifies and interprets text information. They provide linguistic technology leveraging semantics to deliver a host of high-value applications in areas of knowledge management. Prior to joining Expert Systems, Julie served as Chief Technology Officer over Government Systems at Teradata and as the Technology Evangelist for NetBase Solutions, Inc.

The other members of the Board are: James Cates (MS '71, Altera, Corp.); Wayne Clark (BS '73); David Cohen (Ph.D '77, sente.com, Inc); Matt Desch (BS '80, Iridium Satellite), Bruce Flinchbaugh (Ph.D '80, Texas Instruments); Michael Fortin (MS '87, Ph.D., '91, Microsoft), 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).

RESEARCH

Over the course of the past forty-two years, the Department of Computer Science and Engineering has evolved and developed into a research center where questions are asked and answers found. While, the Department researchers have broad, individual interests and collaborate with investigators in greatly diversified spheres, CSE research falls within five core areas.

Artificial Intelligence

With the retirements of Drs. B. Chandrasekaran's and John Josephson, the face of the Artificial Cluster is undergoing changes with extensions into new areas. Delving into the questions found in Speech and Language Technologies, Perception and Neurodynamics, Computer Vision and Machine Learning research are Professor DeLiang (Leon) Wang, Associate Professors Chris Brew, James Davis, and Eric Fosler-Lussier and Assistant Professor Mikhail Belkin.

Computer Graphics

Besides investigating the traditional and best known graphics issues in animation and computer art, our researches are substantially broader with investigations into Computational Geometry and Algorithms, Visualization, Topology and more. Professor Rick Parent, Professor Tamal Dey, Associate Professors Roger Crawfis, Raghu Machiraju, Han-Wei Shen and Raphael Wenger, and Assistant Professors Luis Rademacher and Yusu Wang make up this renown research group.

Networking

A busy area of research, Networking advances through multiple leading researchers working within both CSE and ECE. Dr. Ness Shroff leads projects in wireless and wireline communication networks. Work in Security is overseen by Professor David Lee. Sensors are tested and improved in the labs of Professor Anish Arora, Professor Ten-Huang (Steve) Lai, Associate Professor Dong Xuan, and Associate Professor Prasun Sinha. Professor Xiaodong Zhang's research crosses into the Networking sphere through his work in Internet and Distributed Systems.

Software Engineering

Professor Bruce W. Weide, Associate Professors Atanas (Nasko) Rountev, Neelam Soundarajan, Paolo A.G. (Paul) Sivilotti, and Ken Supowit comprise the 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. Joining the group in Autumn 2010, is Dr. Michael Bond who will be an Assistant Professor. Included with Software Engineering is the work being done in CETI (CERCS for Enterprise Transformation and Innovation) as led by Senior Research Scientist Jay Ramanthan and Clinical Assistant Professor Rajiv Ramnath.

Systems

Currently the largest group of researchers, the group examines Core Computer Systems and Architecture, High-End and Distributed Systems, or Datamining and Databases. Senior members are Professors Gagan Agrawal, D. K. Panda, Srinivasan Parthasarathy, P. Sadayappan and Xiaodong Zhang. Associate Professor Hakan Ferhatosmanoglu and Assistant Professors Feng Qin, Christopher Stewart, and Radu Teodorescu complete this highly recognized set of researchers. Associate Professor Atanas (Nasko) Routev also collaborates with several system faculty on compiler and software reliability.

Scientific Foundations for Multi-Hop Wireless Network Design

Over the last two decades, computer and communication networks have managed to completely revolutionize the workplace, entertainment, the media, and even social human interactions. These networks are inescapably intertwined with the very fabric of society and their continued growth and well-being is critical to the success and health of the US and the global economy. What is remarkable, however, is that these systems are still very much in their infancy. The advent of new technological breakthroughs in hardware, software, and communications, development of renewable energy devices, and the huge demand for most sophisticated services, holds significant promise for the future. For example, these future networks could: (i) support such high-resolution holographic communication that it would render geography and travel virtually irrelevant; (ii) monitor and control one's environment for entertainment, safety, health care, and early warnings from disasters (natural and human made); (iii) provide capabilities for better coordination in military and disaster relief operations that could save countless lives, and the list goes on and on.
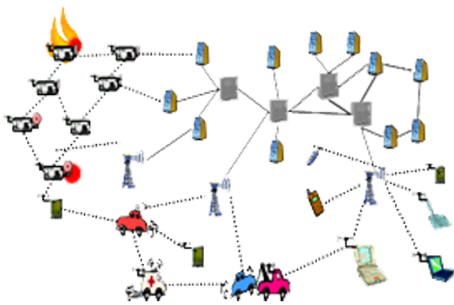
Figure 1: A heterogeneous multi-hop wireless network that senses the environment for disasters, alerts authorities, and provides communication between devices and users, resulting in interplay between sensing, communication, and computing.
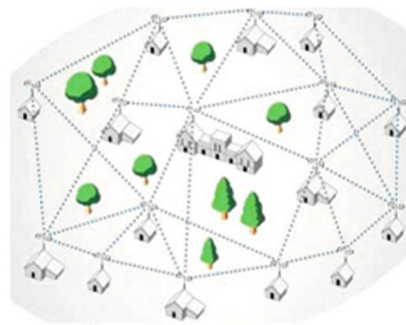

Figure 2: A community or mesh network, where antennas on rooftops connect to each other forming a very high bandwidth network all the way to each home. These networks are expected to solve the decades-*long last mile problem*

Many of these exciting new applications and services will demand huge amounts of resources, and if not properly managed, will bring existing networks to their knees. Already, the (relatively speaking) rudimentary applications and services generated by the success of devices like the i-Phone have put an enormous strain on the communication infrastructure resulting in very poor services in various metropolitan environments. The major challenges as we move forward will be to design and control the complex communication networks to achieve the often conflicting goals of high performance, simple and distributed implementations, robustness to failure, and security. This will mean a significant paradigm shift from current networks that are designed using ad hoc rules that have been honed through simulations, heuristics, "good practices" and trial and error.

To overcome these challenges, **Professor Ness Shroff's** group is leading collaborative efforts to develop a mathematical foundation for the modeling, analysis, and control of future "multi-hop" wireless networks taking into account: (i) the heterogeneity of the devices and network infrastructure; (ii) dynamic, mobile, and stochastic nature of wireless systems; and (iii) interplay between sensing, communications, and computation. This analytical foundation is expected to be conceptually unifying and mathematically rigorous, and lead to new design and control architectures. It will answer

fundamental questions about the role that time-scales, network dynamics, and correlations play in the performance of wireless networks, as well as develop provably efficient and practical (distributed) control mechanisms to achieve high performance, robustness, and scalability.
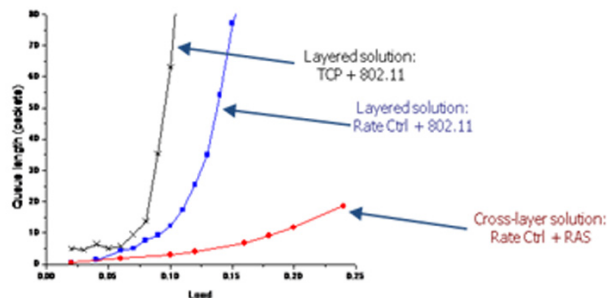
Figure 3: Shows an example of the enormous success that the development of such an analytical foundation has had. The delay (measured in terms of queue lengths) using a simple cross-layer protocol solution based on our rigorous analytical foundation is an order of magnitude less than using traditional (layered) protocols.

Figure 4: Examples of renewable energy devices. A sensor mote and cell phone mounted with solar panels. These devices demand new solutions for managing resources efficiently

COMPILER/RUNTIME SYSTEMS FOR HIGH-PERFORMANCE COMPUTING

We have entered an era where parallel computing has become mainstream. Unlike previous decades when parallel computing was a niche technology of primary interest to a small cadre of users of high-end systems, today all servers, desktops and laptops contain multi-core processors with many CPUs. Thus programming parallel computers is becoming a widespread need. But parallel programming is much more difficult than standard sequential programming. Commenting on this issue in an interview with ACM Queue, Prof. John Hennessey, a pioneer in our field and President of Stanford University, said: "when we start talking about parallelism and ease of use of truly parallel computers, we're talking about a problem that's as hard as any that computer science has faced... I would be panicked if I were in industry."

Professor Sadayappan's research group in the High-Performance Computing Laboratory focuses on advances in compiler and runtime systems to ease the development of high-performance software for parallel computers. The research directions include automatic parallelization and optimized code generation for multi-core processors and GPUs (Graphical Processing Units), high-level domain-specific languages for high-performance computing, and parallel programming models for PGAS (Partitioned Global Address Space) computing.

Automatic Parallelization: A very challenging but attractive approach to developing parallel software is to automatically transform sequential code to a parallel form. Although automatic parallelization has been a topic of research from the early seventies, progress has been relatively modest. However, recent advances at Ohio State using a polyhedral model of compiler optimization

have resulted in the first robust and effective approach for automatic parallelization and tiling of affine imperfectly nested loops. The publicly released Pluto system for automatic parallelization can transform input sequential C programs into tiled parallel OpenMP code for multi-core processors or CUDA code for GPUs. The approach to automatic parallelization is being incorporated into commercial compilers as well as advanced research compilers such as that being developed by the DARPA sponsored PACE (Platform Aware Compilation Environment) project led by Rice University, where Ohio State is a partner institution.

Domain-Specific Languages for High-Performance Computing: High-level DSL's (Domain Specific Languages) enable enhanced productivity in developing applications because of the high-level domain-specific abstractions they provide the programmer. DSL's can also offer greater opportunities for optimized high-performance parallel implementations since the compiler can utilize domain-specific properties that cannot be exploited if the same computation were expressed in a general-purpose language like C/C++. Two domain-specific efforts include the Tensor Contraction Engine (TCE) and a domain-specific language extension for stencil computations. The TCE project has brought together a multi-disciplinary team of computer scientists and computational chemists and developed very powerful code generation and optimization capability, enabling automatic transformation of high-level mathematical expression of models in many body quantum chemistry into optimized parallel programs tailored to the characteristics of the target computer.

Parallel Programming with PGAS Models: Although message passing has been the dominant parallel programming model for large-scale parallel machines, it has limitations with emerging multi-level parallel systems with significant degrees of shared-memory parallelism. PGAS models offer advantages but also challenges to efficient and scalable implementations. Research in collaboration with Pacific Northwest National Laboratory has resulted in advances in a number of areas, including a highly scalable work-stealing implementation for load balancing of tasks (Scioto), a framework for scalable PGAS programming with tree data structures called Global Trees (GT), and a new approach to fault resilience of parallel computations using task collections in a PGAS setting.

REVEALING THE SHAPES FROM DISCRETE SAMPLE

Shapes, in their myriad of forms, come naturally across a broad spectrum of applications; from computer graphics, visualization, and computer vision, to sensor networks and computational biology. With the rapidly increasing role of computational methods in science and engineering, effectively handling shapes computationally and algorithmically is one of the key challenges for many research fields. While mathematics provides beautiful theory to describe various aspects of smooth shapes, in practice, the underlying shape is only accessible through a discrete approximation, such as a mesh, or simply as a point cloud. The important question becomes: How do we accurately and efficiently approximate certain geometric or topological quantities / measures / structures of the hidden shape from its discrete approximations?

One specific object **Dr. Yusu Wang** has focused on is the Laplace-Beltrami Operator of manifold. The Laplace-Beltrami Operator of a given manifold (e.g, a surface) is a fundamental object encoding the intrinsic geometry of the underlying manifold. It has many properties useful for practical applications and has been widely used in areas such as graphics, geometric optimization, data analysis and machine learning. However, in practice, the underlying manifold is available only through some discrete approximation, a mesh being most common. Thus, it is important to approximate the Laplace operator faithfully in this discrete setting. Specifically, as the mesh becomes finer we want the discrete Laplace operator to converge to the true Laplacian on the manifold. Although several

discretizations of the Laplace operator had been previously proposed and widely used in the fields of graphics, none of them could provide convergence guarantees for general meshes or point clouds data.

Together with Drs. Belkin and Sun, Dr. Wang proposed the first Laplace operator for an arbitrary triangular mesh approximating an underlying surface with a theoretical convergence guarantees. The convergence of the spectrum of this operator is also established in a later joint work with Dr. Dey and their student, Ranjan. Further investigation into the framework led the investigators to an important follow-up work, where they presented the first discrete Laplace operation for arbitrary point cloud data sampled from an m-dimensional manifold embedded in Rd, which we call the PCD-Laplace operator.

Since the Laplace-Beltrami operator encodes all intrinsic geometry information of the underlying manifold, once the team approximates it accurately from a point cloud data, another interesting question arises: how to estimate and retrieve other geometric information of the hidden manifold from the PCD-Laplacian? Dr. Wang and her collaborators call this a spectral point-cloud-data (PCD) processing framework. Indeed, in two follow-up works with Dr. Sun, Dr. Wang and her students, Luo and Safa, used such a framework to estimate the integral as well as the gradients of a scalar function on the hidden manifold by its values at sampled points. In a recent work with Dey et. al., a shape descriptor function (the Heat-Kernel Signature) computed from the Laplacian eigenfunctions was employed to develop an effective shape retrieval algorithm that can query partial and incomplete models in a database.

An Autumn evening photo of the newly restored Thompson Library and the statue of Ohio State fifth president, William Oxley Thompson, who served from 1899 to 1925. This photo was taken by Scott Sanders, an Alumnus, and was part of the OSU "Photo of the Day" on the website.
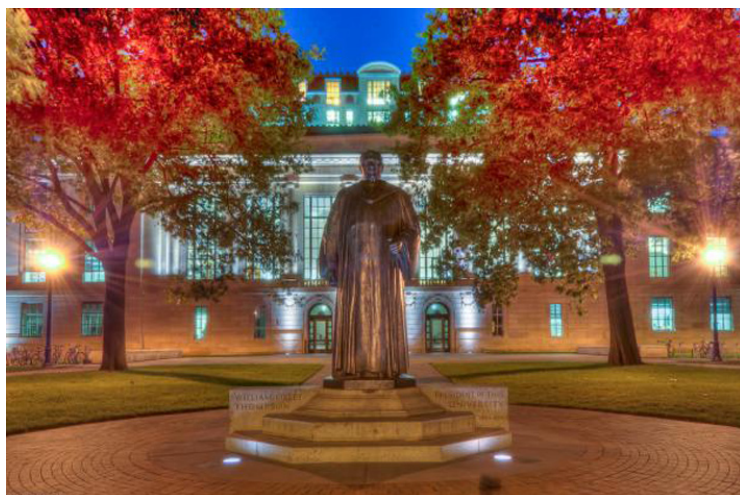
Research Funding

New Awards Received
07/01/2009 - 06/30/2010

Gagan Agrawal

¤ National Science Foundation
Data Intensive Computing Solutions for
Neuroimage Analysis
Co-PI: Raghu Machiraju
$480,000   9/15/09 – 8/31/12

Anish Arora

¤ National Science Foundation
Localization and System Services for
Spatiotemporal Actions in Cyber-Physical Systems
143,686.78   9/15/09 – 8/31/12

Mikhail Belkin

¤ National Science Foundation (NSF):
Travel Grant for 2009 Chicago Summer School/
Workshop on Computational Learning
$20,000   7/1/09 – 6/30/10

  ¤ PI: Simon Dennis (OSU-Dept. of Psychology)
Co-PI: Mikhail Belkin
Air Force Office of Scientific Research (AFOSR)
Network of Memories
$478,426   4/1/09 – 3/31/12

James W. Davis

¤ Air Force Research Laboratory (AFRL)
Center for Automatic Target Recognition Research
(task 4)
$53,000   1/1/10 – 9/30/10

¤ Los Alamos National Labs
IRWIN Research in Wireless
$57,339   10/1/09 – 9/30/10

Tamal Dey

¤ National Science Foundation (NSF)
MCS: Reconstructing and Inferring Topology and
Geometry From Point to Point Cloud Data
Co-PI: Dan Burghelea (OSU-Dept. of Mathematics)
$462,000   9/1/09 – 8/31/12

Eric Fosler-Lussier

¤ National Science Foundation (NSF)
Explicit Articulatory Models of Spoken Language,
with Application to Automatic Speech Recognition
$334,469   7/1/09 – 6/30/12

¤ Xerox Corporation
Customization and Individualization of Reading
Materials for an Individual or Group
$30,000   1/1/10 – 7/30/10

Raghu Machiraju

¤ Lawrence Livermore National Lab
Modeling and Rendering of Urban Environments
$43,050   01/04/10 - 9/30/10

  ¤ PI: Tim Huang (OSU- Dept. of Molecular Virology,
Immunology & Medical Genetics – Human Cancer
Genetics)
Co-PIs: Kun Huang (OSU- Dept. of Biomedical
Informatics), Raghu Machiraju, Lin, Wang, Yan
National Cancer Institute
Interrogating Epigenetic Changes in Cancer
Genomes
$1,596,781   5/1/10 – 2/28/11

DK Panda

¤ Dept. of Energy Small Business Technology
Transfer (DoE: STTR) Phase II (with RNET
Technologies)
Creating Petascale File Systems Using Application-
Aware Network Offloading
$275,000   9/15/09 – 05/15/11

¤ Mellanox Technologies, Inc.
Research on High Performance and Scalable MPI
over Infiniband
$117,812   4/1/09 – 3/31/10

¤ National Science Foundation (NSF)
Applicability of Object-based Storage Devices in
Parallel File Systems
$520,000   09/01/06 – 08/31/10

¤ National Science Foundation (NSF)
Designing QoS-Aware MPI and File Systems
Protocols for InfiniBand Clusters
$491,570   09/01/09 – 08/31/12

¤ National Science Foundation (NSF):
Collaborative Research: Dynamic Staging
Architecture for Accelerating I/O Pipelines
$90,000   5/1/10 – 4/30/13

¤ National Science Foundation (NSF)
Topology-Aware MPI Collectives and Scheduling for
Petascale Systems with InfiniBand
$920,000   09/15/06 – 08/14/11

¤ Srinivasan Parthasarathy
National Science Foundation (NSF)
Global Graphs: A Middleware for Data Intensive
Computing
Co-PI: P. Sadayappan
$499,997   9/1/09 – 8/31/12

- ¤ RNET Technologies
  NIC-based Intrusion Detection
  $33,000   9/15/09 – 4/19/10

Feng Qin

- ¤ National Science Foundation (NSF):
  CAREER: Building Immunity to Memory
  Management Bugs During Production Runs
  $420,000   3/1/10 – 2/28/15

P. Sadayappan

- ¤ National Science Foundation (NSF):
  Collaborative Research: An Environment for High-
  Productivity High-Performancy Computing using
  GPUs/accelerators
  $468,492   9/15/09 – 8/31/12

- ¤ National Science Foundation (NSF):
  Customizable Domain-specific Computing
  $749,998   9/1/09 – 8/31/10

- ¤ National Science Foundation (NSF):
  Collaborative Research: Petascale Simulations of
  Quantum Systems by Stochastic Methods
  $639,952   9/1/09 – 8/31/12

- ¤ RNET Technologies
  Optimizing of the PETSc Library for Clusters of
  Multicore Processors
  $33,000   9/15/09 – 4/19/10

Han-Wei Shen

- ¤ Los Alamos National Lab
  Hardware-accelerated User-programmable Volume
  Rendering
  $13,340   6/24/09 – 12/31/09

Ness Shroff

- ¤ National Science Foundation (NSF):
  NeTS-Medium: Collaborative Research: Unifying
  Network Coding and Cross-Layer Optimization
  for Wireless Mesh Networks: From Theory to
  Distributed Algorithms to Implementation
  $350,000   09/01/09 – 08/31/13

Bruce Weide

- ¤ National Science Foundation (NSF):
  Automated Support for Developing Logical
  Reasoning Skills in Discrete Mathematics Courses
  Co-PIs: Harvey Friedman (OSU- Dept. of
  Mathematics), Pearl
  $199,775   3/1/10 – 2/29/12

- ¤ PI: Ümit Özgüner (OSU- Dept. of Electrical &
  Computer Engineering)
  Co-PI: Bruce Weide, Paul Sivilotti, Ashok
  Krishnamurthy (OSU- Dept. of Electrical &
  Computer Engineering), Füsun Özgüner (OSU-
  Dept. of Electrical & Computer Engineering)
  National Science Foundation (NSF):
  CPS: Medium: Autonomous Driving in Mixed-
  traffic Urban Environments
  $1,296,683   9/1/09 – 8/31/12

Dong Xuan

- ¤ National Science Foundation (NSF):
  NeTS: Small: Connected Coverage of Wireless
  Sensor Networks in Theoretical and Practical
  Settings
  Co-PI: Ten-Hwang (Steve) Lai
  $400,000   9/1/09 – 8/31/12

Xiaodong Zhang

- ¤ National Science Foundation (NSF):
  Basic Research for Developing SSD-Based Caching
  and Hybrid Storage Systems
  $400,000   8/1/09 – 7/31/12

- ¤ National Science Foundation (NSF):
  Travel Support for the 29th IEEE International
  Conference on Distributed Computing Systems
  $10,000   9/1/09 – 8/31/10

- ¤ National Science Foundation (NSF):
  Travel Support for the 30th IEEE International
  Conference on Distributed Computing Systems
  $10,000   6/1/10 – 5/31/11

Awards in Good Standing initiated before July 1, 2009

Gagan Agrawal

¤ National Science Foundation (NSF)
A Language Independent Framework for Compiling Data-Intensive Applications on Highly Parallel Systems
$510,000   9/1/08 – 08/31/11

¤ National Science Foundation (NSF)
CEO: P--A Data-Intensive Cyberinfrastructure Component for Coastal Environmental Forecasting and Analysis
Co-PI: Hakan Ferhatosmanoglu, Keith Bedford (OSU - Civil and Environmental Engineering and Geodetic Science), Ron Li (OSU - Civil and Environmental Engineering and Geodetic Science)
$1,400,000   9/1/06 – 3/31/10

¤ National Science Foundation (NSF): ST-CRTS: Enabling Processing of Large-Scale Scientific Data Through Compiler Supported XML Abstractions
$299,997   1/15/06 – 12/31/2009

Anish Arora

¤ BBNT Solutions, LLC
Genifying and Federating Autonomous Kansei Wireless Sensor Networks
Co-PI: Rajiv Ramnath
$500,000   9/1/08 – 8/31/11

¤ Los Alamos National Labs
IRWIN Research in Wireless
$203,151   2/6/09 – 6/30/11

¤ SAIC, Inc.
Technical Support – Decision Support for Persistent Layered Sensing
$78,000   8/6/08 – 9/30/09

Mikhail Belkin

¤ National Science Foundation (NSF):
CAREER: Geometry and high-dimensional inference
$498,972   10/01/07 – 12/31/12

James W. Davis

¤ Air Force Research Laboratory (AFRL)
Center for Automatic Target Recognition Research (task 4)
$930,070   5/1/08 – 9/30/10

¤ Los Alamos National Labs
IRWIN Research in Wireless
$170,392   2/6/09 – 6/30/11

¤ Randolph Moses (OSU- Dept. of Electrical & Computer Engineering)
Co-PI: James W. Davis, John Volakis
Ohio Department of Development
(University of Dayton sub-award)
Wright Center of Innovation, Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST)
$190,000   2/26/07 – 2/25/11

Tamal Dey

¤ National Science Foundation (NSF)
Inferring Topology and Geometry for Dynamic Shapes
$220,000   9/1/08 – 8/31/11

¤ National Science Foundation (NSF)
Nonsmoothness in Meshing and Reconstruction
$429,402   10/01/06 – 09/30/10

¤ National Science Foundation (NSF)
Collaborative research: Nonsmoothness in Meshing and Reconstruction
PI: Edgar Ramos
Co-PI: Tamal Dey
$156,069   12/1/07 – 09/30/09

Hakan Ferhatosmanoglu

¤ National Science Foundation (NSF):
CAREER: Exploration of Dynamic Sequences in Scientific Databases
$455,000   8/1/06 – 8/31/11

¤ National Science Foundation (NSF)
Similarity-Based Indexing and Integration of Protein Sequence and Structure Databases DBI
Co-PI: Yusu Wang, Li
$498,117   8/15/08 – 7/31/11

Eric Fosler-Lussier

¤ National Science Foundation Human-Robot Interaction (HRI)
(Northeastern University sub-award)
Establishing and Breaking Conceptual Pacts with Dialog Partners
$149,084   1/28/08 – 9/30/10

¤ National Science Foundation (NSF)
CAREER: Breaking the Phonetic Code: Novel Acoustic-Lexical Modeling Techniques for Robust Automatic Speech Recognition
$502,952   12/15/06 – 11/30/11

¤ National Science Foundation (NSF)
(Georgia Institute of Technology sub-award)
ITR: Automatic Speech Attribute Transcription (ASAT): A Collaborative Speech Research Paradigm and Cyberinfrastructure with Applications to Automatic Speech Recognition (ASR)
$461,000   10/1/04 – 8/31/09

¤ PI: Mary Beckman (OSU-Dept. of Linguistics)
Co-PI: Eric Fosler-Lussier
National Science Foundation (NSF)
Sing Machine Learning to Model the Interplay of Production Dynamics And Perception Dynamics in Phonological Acquisition
$273,284   1/15/08 – 12/31/10

David Lee

¤ Air Force Office of Scientific Research (AFOSR)
Internet Attack Traceback-Cross-Validation and Pebble-Trace
$500,000   4/1/09 – 11/30/12

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

Raghu Machiraju

¤ Kitware, Inc.
A Framework for Analyzing Unsteady Large-Scale Computational Fluid Dynamics Simulation Area
$29,904   11/1/08 – 7/31/09

DK Panda

¤ Dept. of Energy (DoE)
Coordinated Fault Tolerance for High Performance Computing
$1,000,000   9/15/06 – 9/15/11

¤ Dept. of Energy (DoE)
Programming Models for Scalable Parallel Computing
$1,000,000   9/15/06 – 09/15/11

¤ Mellanox Technologies, Inc.
Research on High Performance and Scalable MPI over InfiniBand.
$529,420   4/4/04 – 3/31/09

¤ National Science Foundation (NSF)
Extending One-Sided Communication in MPI Programming Model for Next-Generation Ultra-Scale HEC
$399,000   9/1/08 – 8/31/10

¤ National Science Foundation (NSF)
High-end Computing and Networking Research Testbed for Next Generation Data Driven, Interactive Applications
Co-PIs: Gagan Agrawal, P. Sadayappan, Joel H. Saltz (Emory University), Han-Wei Shen
$1,529,997   9/15/04 – 8/31/10

¤ National Science Foundation (NSF)
CPA: Designing Next Generation Communication and I/P Subsystems with Multi-Core Architecture
$375,000   7/1/07 – 6/30/10

Srinivasan Parthasarathy

¤ National Science Foundation (NSF)
CAREER: A Scalable Framework for Mining Scientific and Biomedical Data.
$497,775   1/15/04 – 12/31/09

¤ National Science Foundation (NSF)
Scalable Data Analysis: An Architecture Conscious Approach
$325,000   6/1/07 – 5/31/10

Rajiv Ramnath

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

¤ Anand Desai (OSU-John Glenn School of Public Affairs)
Co-PI: Rajiv Ramnath
Cuyahoga County Board of Health:
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
$10,000   8/10/08 – 8/9/09

¤ Anand Desai (OSU-John Glenn School of Public Affairs)
Co-PI: Rajiv Ramnath
The Hospital Council of Northwest Ohio
NW Ohio REMS Project
$20,000   12/01/08 – 8/9/09

¤ Anand Desai (OSU-John Glenn School of Public Affairs)
Co-PI: Rajiv Ramnath
Summit County Health District
Pandemic Influenza Program Initiative B-project 6 program: Addressing Vulnerabilities in Populations
$30,000   8/10/08 – 8/9/09

¤ Steven Gordon (Ohio Supercomputer Center)
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 Krishnamurthy (OSC), Rajiv Ramnath
$999,942   4/1/08 – 3/31/11

Jay Ramanathan

- National Science Foundation (NSF)
  Center for Experimental Research in Computer Systems- Research Site
  Co-PI: Rajiv Ramnath
  $140,000   5/1/08 – 4/30/11

- City of Columbus:
  eGOV Server Migration/Hosting, Content Management, Security and BMP
  Co-PI: – Rajiv Ramnath
  $80,000   12/06/07 – 4/30/11

- CETI IUCRC Memberships
  Co-PI: – Rajiv Ramnath
  $281,904.31   10/1/06 – 4/30/11

Atanas Rountev

- National Science Foundation (NSF):
  CAREER: Dataflow Analysis for Modern Software Systems
  $407,000   9/15/06 – 8/14/11

P. Sadayappan

- Defense Advanced Research Projects Agency (DARPA)
  (Rice University Sub-award)
  A Platform-Aware Compilation Environment
  Co-PI: Atanas Rountev
  $630,438   4/1/09 – 3/31/11

- Dept. of Energy (DoE)
  Programming Models for Scalable Parallel Computing
  $500,000   9/15/06 – 8/31/11

- Dept. of Energy (DoE)
  Scalable fault tolerant runtime technology for Petascale computers
  $375,820   8/1/08 – 7/31/11

- National Science Foundation (NSF)
  An Integrated Framework for Compile-Time/Run-Time Support for Multi-Scale Applications on High-End Systems
  Co-PI: Atanas Rountev
  $348,000   9/1/05 – 8/31/09

- National Science Foundation (NSF)
  Collaborative Research: CPA-CPL-T: An Effective Automatic Parallelization Framework for Multi-Core Architectures
  Co-PI: Atanas Rountev
  $500,000   8/1/08 – 7/31/11

- Pacific Northwest National Lab
  Enhancements to Disk Resident Arrays Library
  $427,014   2/3/04 – 9/30/10

- UT-Battelle
  An Octave Implementation of a Multi-Resolution Simulation System
  $50,000   6/20/08 – 9/18/09

Han-Wei Shen

- Dept. of Energy (DoE)
  SciDAC Institute for Ultrascale Visualization
  $750,000   9/26/07-8/31/11

- National Science Foundation
  CAREER: Toward Effective Visualization of Large Scale Time-Varying Data.
  $440,178   2/15/04-1/31/10

- PI: Don Stredney (Ohio Supercomputer Center)
  Research Institute at Nationwide Children's Hospital
  Validation/Dissemination Virtual Temporal Bone Dissection
  Co-PIs: Han-Wei Shen, Bradley Clymer (OSU- Dept. of Electrical & Computer Engineering), Ashok Krishnamurthy (Ohio Supercomputer Center), Petra Schmalbrock (OSU – College of Medicine - Dept. of Radiology), Janet Weisenberger (OSU - Dept. of Speech and Hearing Science)
  $1,496,987   7/1/04 - 6/30/11

Ness Shroff

- Army Research Office
  Stochastic Control of Multi-Scale Networks: Modeling, Analysis and Algorithms
  $6,456,625   5/1/08 – 5/28/11

- National Science Foundation (NSF)
  FIND: Collaborative Research: Towards an Analytical Foundation for Network Architectures
  $200,000   9/1/07 – 8/31/11

- National Science Foundation (NSF):
  CT-ISG: Collaborative Research: Router Models and Downscaling Tools for Scalable Security Experiments
  $125,000   10/1/08 – 9/30/11

- National Science Foundation (NSF):
  Nets-NBD: A High-Performance Control Plane for Mesh Networks: Theory and Implementation
  $553,417   9/1/06 – 8/31/10

- National Science Foundation (NSF)
  NeTS-NECO: A New Resource Management Paradigm for Sensor Networks with Energy Replenishment
  Co-PIs: Prasun Sinha and Can Emre Koksal (OSU-Dept. of Electrical & Computer Engineering)
  $346,426   9/1/08 – 8/31/12

- National Science Foundation (NSF)
  Nets-NOSS: Robust Sensor Network Architecture Through Neighborhood Monitoring and Isolation
  $350,000   07/01/07 – 08/31/10
- National Science Foundation (NSF)
  Workshop on Future Wireless Communication Networks
  $145,000   10/01/09 – 9/30/10
- Multidisciplinary University Research Initiative (MURI - DoD)
  (Pennsylvania State University Sub-award)
  Design Of Urban Sensor Networks
  $300,000   6/15/07 – 11/14/10

Prasun Sinha

- National Science Foundation (NSF):
  CAREER: On-the-fly Protocols for Data Dissemination in Wireless Mesh Networks
  $412,000   1/15/06 – 12/31/11
- National Science Foundation (NSF):
  OSS: Doing More with Less: Tracking Movements Using a Sparse Sensor Network
  $216,017   9/1/07 – 8/31/11
- National Science Foundation (NSF):
  NeTS-NOSS: Collaborative Research: Energy-Efficient Distributed Sensor Network Control: Theory to Implementation
  Co-PI: Ness Shroff
  $491,661   9/1/07 – 8/31/10

Paul Sivilotti

- Ohio Department of Transportation (ODOT)
  Development and Integration of ODOT Geological Hazard Management System (GHMS): Subcontract For Remediation Cost-Estimation
  $33,523   9/15/08 – 6/30/10

DeLiang Wang

- Air Force Office of Scientific Research (AFOSR)
  Sequential Organization and Room Reverberation in Speech Segregation
  $874,369   2/1/08 – 11/30/11
- National Science Foundation (NSF)
  Collaborative Research: Separating Speech from Speech Noise to Improve Intelligibility
  $750,000   1/15/06-12/31/09
- Oticon
  Integrating monaural CASA and binaural localization for robust speech separation
  $180,000   7/1/08 – 6/30/11

- Research Associates for Defense Conversion Inc. (RADC)
  Robust Speaker Recognition Using Auditory-Based Features And Computational Auditory Scene Analysis
  $300,000   2/20/09 – 2/19/11
- Veteran's Affairs
  Study of Speech and Nonspeech Separation in Aging
  $600,000   7/1/06 – 09/31/10
  - PI: Rongxin Li (OSU- Dept. of Civil and Environmental Engineering and Geodetic Science)
    Co-PI: DeLiang Wang
    National Geospatial Intelligence Agency
    Biologically-Inspired Target Recognition Methods for Multispectral/Hyperspectral and Multiplatform Image Analysis
    $450,000   8/15/07 – 8/14/10

Yusu Wang

- Dept. of Energy (DoE) Young Investigator
  Feature Extraction, Characterization, and Visualization for Protein Interaction Via Geometric and Topological Methods
  $295,073   8/29/06 – 8/14/09
- National Science Foundation (NSF)
  CAREER: Geometric and Topological Methods in Shape Analysis, with Applications in Molecular Biology
  $420,000   2/1/08 – 1/31/13

Bruce Weide

- National Science Foundation (NSF)
  CPA-SEL: Collaborative Research: Continuing Progress Toward Verified Software
  Co-PI: Harvey Friedman (OSU - Dept. of Mathematics)
  $232,591   9/1/08 – 8/31/10
- National Science Foundation (NSF)
  Collaborative Research: Logical Support for Formal Verification
  Co-PI: Harvey Friedman (OSU - Dept. of Mathematics
  $75,000   9/1/07 – 8/31/10

Dong Xuan

- Army Research Office
  Defending Against Physical Attacks in Sensor Networks Defending Against Physical Attacks in Sensor Networks
  Co-PI: Anish Arora and Ten-Hwang Lai
  $280,000   3/15/07-12/31/10

- ¤ National Science Foundation (NSF)
  CAREER: Algorithm Design for Optimization
  Problems in Network Over-Provisioning
  $400,060   12/15/05 – 11/30/10

Xiaodong Zhang

- ¤ National Science Foundation (NSF)
  Algorithms Design and Systems Implementation
  to Improve Buffer Management for Fast I/O Data
  Accesses
  $275,000   7/1/07 – 5/31/11
- ¤ National Science Foundation (NSF)
  System Research On Media Streaming to
  Heterogeneous Mobile Devices
  $119314   10/4/06 – 8/31/09
- ¤ National Science Foundation (NSF)
  Effective Resource Sharing and Coordination
  Inside Multicore Processors for High Throughput
  Computing
  $330,000   9/1/08 – 8/31/11
- ¤ National Science Foundation (NSF)
  Next Generation Internet Proxy Systems
  $130,000   11/1/05 – 8/31/09

- ¤ National Science Foundation (NSF)
  EAPNET: NOSS: Self-Adaptable All Terrain Sensor
  Networks
  $330,000   9/1/07 – 8/31/11

GIFT AWARDS

David Lee

- ¤ AT&T Gift Award
  $25,000
- ¤ AT&T Gift Award
  $35,000
- ¤ Google Gift Award
  $60,000

Atanas Rountev

- ¤ IBM Gift Award
  $20,000

FACULTY SERVICE
JOURNAL EDITORIAL BOARDS
& MAJOR CONFERENCE CHAIR POSITIONS

Gagan Agrawal
- ▶ IEEE Transactions on Parallel and Distributed Systems
- ▶ International Journal of New Generation Computing

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

Chris Brew
- ▶ Journal of Artificial Intelligence Research
- ▷ Executive Member – North American Association for Computational Linguistics

Roger Crawfis
- ▷ Associate Editor, Proceedings of the International Symposium on Visual Computing

James Davis
- ▶ Journal of Machine Vision and Applications

Tamal Dey
- ▶ Journal of Discrete and Computational Geometry
- ▶ Journal of Computational Geometry
- ▷ Acting Chair, Social Modeling Association Executive Board

Hakan Ferhatosmanoglu
- ▶ Turkish Journal of Electrical Engineering & Computer Sciences

Eric Fosler-Lussier
- ▶ Journal of Experimental Linguistics

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
- ▷ Co-Chair & International Liaison of the International Conference on Distributed

Computing Systems (ICDCS 2009)

David Lee
- IEEE Journal of Selected Areas in Communications (Senior Editor)
- I/S: A Journal of Law and Policy for the Information Society

Raghu Machiraju
- Guest Editor, IEEE Transactions on Visualization and Graphics

D. K. Panda
- IEEE Transactions on Computers

Srinivasan Parthasarathy
- Data Mining and Knowledge Discovery Journal
- Distributed and Parallel Databases: An International Journal
- Encyclopedia on Geographical Information Sciences
- IEEE Intelligent System
- IEEE Transactions on Knowledge and Data Engineering
- Journal of Data Mining and Bioinformatics
- ▷ Conference/General Chair, SIAM Data Mining 2010
- ▷ Student Award Chair, ACM Conference on Bioinformatics and Computational Biology 2010 (ACM-BCB '10)

Rajiv Ramnath
- I/S: A Journal of Law and Policy for the Information Society
- ▷ Co-Chair, Symposium for Applied Computing 2010 (SAC '10), Cloud Computing Track
- ▷ Co-Chair, 3rd India Software Engineering Conference, 2010 (ISEC '10)

Atanas (Nasko) Rountev
- International Journal of Information and Software Technology
- ▷ Editor, Proceedings of the 9th ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering (PASTE 2010)

P. Sadayappan
- ▷ Board Member, External Advisory Board for Fundamental and Computational Sciences Directorate, Pacific Northwest National Laboratory
- ▷ Committee Chair, External Advisory Board for Extreme Scale Computing Initiative, Pacific Northwest National Laboratory

- ▷ Scientific Advisory Committee for PetaQCD Project

Han-Wei Shen
- IEEE Computer Graphics and Applications (Special Issue on UltraScale Visualization)
- IEEE Transactions on Visualization and Computer Graphics
- Journal of Computer Science and Technology
- Journal of Visualization

Ness Shroff
- Computer Networks
- IEEE/ACM Transactions on Networking
- Co-chair NSF Workshop on Future Wireless Communication Networks

Prasun Sinha
- IEEE Transactions on Mobile Computing
- IEEE Transactions on Wireless Communications

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

Yusu Wang
- Journal of Computational Geometry

Dong Xuan
- IEEE Transactions on Distributed and Parallel Systems
- Journal of Ad Hoc & Sensor Wireless Networks

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)
- ▷ Co-General Chair, the 30th International Conference on Distributed Computing Systems (ICDCS '10)

Invited Speakers

Distinguished Guest Lecturer

Pankaj Kumar Agarwal
Dept. Chair & RJR Nabisco Professor of Computer Science, Duke University
STREAM: Scalable Techniques for High-Resolution Elevation Analysis and Modeling

Mike Fortin
Microsoft Distinguished Engineer, Windows Core Operating Systems Division, Microsoft
An Insider's Perspective on Designing, Developing and Advancing Windows
(Also part of the CSE homecoming Series)

A Joint Presentation of the Departments of
Computer Science & Engineering, Electrical & Computer Engineering and the Institute
for Sensing Systems

Mischa Schwartz
Charles Batchelor Professor Emeritus of Electrical Engineering and Computer Science, Columbia University
A Personalized History of Computer Communications

Guest Speaker

Yanif Ahmad
Cornell University
DBToaster: Aggressive Query Compilation for Incremental Processing in Update-Intensive Applications

Jeff Bigham
University of Rochester
Teaching the Web to Speak and Be Understood

Michael Bond
University of Texas at Austin
Achieving Robust Software Systems After Deployment

Albert Cohen
Alchemy Group, INRIA Saclay
Supercomputing Research vs. Volkscomputing Research: a Language and Compilation Perspective to Performance Portability

Danny Dig
Microsoft/Intel funded Universal Parallel Computing Research Center,
University of Illinois at Urbana-Champaign
Retrofitting Parallelism into Sequential Programs

Alon Efrat
University of Arizona
Occam's Razor, Localization And Clustering Among Static and Mobile Nodes

Virginia A. Folcik Nivar
Dept. of Internal Medicine, Div. of Pulmonary, Allergy, Critical Care and Sleep Medicine
The Ohio State University Medical Center
Using Agent - based Modeling to Study Complex Systems

Bart Goethals
Dept. of Mathematics & Computer Science, University of Antwerp, Belgium
Cartification: from Similarities to Itemset Frequencies

Y. Charlie Hu
Purdue University
Optimizing Cost and Performance in Online Service Provider Networks

Spyridon Papadimitriou
Thomas J. Watson Research Center, IBM
Scalable Mining of Multi-aspect Networks

Vibhor Rastogi
University of Washington
Accurate Analysis of Large Private Datasets

Jagan Sankaranarayanan
University of Maryland, College Park
Oracles for Road Networks

Saurabh Srivastava
University of Maryland, College Park
Satisfiability-based Program Reasoning and Synthesis

Suresh Venkatasubramanian
University of Utah
A Unified Algorithmic Framework for Multidimensional Scaling

Guest Speaker: A Joint Presentation of the Departments of
Computer Science & Engineering and Mathematics

Jeff Erikson
University of Illinois at Urbana-Champaign
Homology Flows, Cohomology Cuts

Focus on Faculty

Jay Ramanathan
Stakeholder-driven Enterprise Modeling for Complex Services Adaptation

Nicoleta Roman
Binaural Sound Segregation in Multisource and Reverberant Environments

CSE Homecoming Series

David Ebert
University Faculty Scholar, School of Electrical and Computer Engineering, Purdue University
Visual Analytics: Powering Discovery, Decisions, and Actions from Floods of Data

Chung-Ming Huang
Distinguished Professor, Dept. of Computer Science and Information Engineering, National Cheng Kung University, Taiwan, R.O.C.
Multimedia Proxy Handoff for Wireless/Mobile Networks

Scott Pike
Texas A&M University
Crash Fault Detection in Celerating Environments

SELECTED PUBLICATIONS

ARTIFICIAL INTELLIGENCE

▫ T. Shi, **M. Belkin**, and B. Yu. "Data Spectroscopy: Eigenspaces Of Convolution Operators and Clustering." *The Annals of Statistics*. Vol. 37, no. 6B. December 2009. pp. 3960-3984

▫ L. Rosasco, **M. Belkin**, and E. DeVito. "On Learning with Integral Operators." *Journal of Machine Learning Research*. No. 11. February 2010. pp. 905-934

▫ K. Sinha and **M. Belkin**. "Semi-Supervised Learning Using Sparse Eigenfunction Bases." In the proceedings of the *Advances in Neural Information Processing Systems* (NIPS 22), Vancouver, B.C., Canada. December 7-9, 2009. pp. 1687-1695

▫ **M. Belkin** and K. Sinha. "Toward Learning Gaussian Mixtures with Arbitrary Separation." In the proceedings of the *23rd Annual Conference on Learning Theory* (COLT 2010), Haifa, Israel. June 27-29, 2010. pp. 407-419

▫ S. Boxwell, D. Mehay, and **C. Brew**. "A Semantic Role Labeling System Incorporating CCG, CFG, and Dependency Features." In the proceedings of the *Joint conference of the 47th Annual Meeting of the Association for Computational Linguistics and the 4th International Joint Conference on Natural Language Processing of the Asian Federation of Natural Language Processing*, Suntec, Singapore. August 6-7, 2009

▫ A. Morison, D. Woods, and **J. Davis**. "How Panoramic Visualization can Support Human Supervision of Intelligent Surveillance." In the proceedings of the *53rd Annual Meeting of the Human Factors and Ergonomics Society*, San Antonio, TX, USA. October 19-23, 2009. pp. 1136-1140

▫ C. A. Rytting, **J. E. Fosler-Lussier**, and **C. Brew**. "Segmenting Words from Natural Speech: Subsegmental Variation in Segmental Cues." *Journal of Child Language*. Vol. 37, no. 3. March 2010. pp. 513-543

▫ I. Heintz, **J. E. Fosler-Lussier**, and **C. Brew**. "Discriminative Input Stream Combination for Conditional Random Field Phone Recognition." *IEEE Transactions on Acoustics, Speech, and Language Processing*. Vol. 17, no. 8. November 2009. pp. 1533-1546

▫ Y. Shao, S. Srinivasan, Z. Jin, and **D. Wang.** "A Computational Auditory Scene Analysis System for Speech Segregation and Robust Speech Recognition." *Computer Speech and Language*. Vol. 24, no. 1. January 2010. pp. 77-93

▫ Z. Jin and **D. Wang**. "A Multipitch Tracking Algorithm for Noisy and Reverberant Speech." In the proceedings of *35th International Conference on Acoustics, Speech, and Signal Processing* (ICASSP), Dallas, TX, USA. March 14–19, 2010. pp. 4218-4221

▫ J. Woodruff and **D. Wang.** "Integrating Monaural and Binaural Analysis for Localization of Multiple Sound Sources in Noisy and Reverberant Conditions," In the proceedings of *35th International Conference on Acoustics, Speech, and Signal Processing* (ICASSP), Dallas, TX, USA. March 14–19, 2010. pp. 2706-2709

▫ Y. Li, J. Woodruff, and **D. Wang**. "Monaural Musical Sound Separation Based on Pitch and Common Amplitude Modulation." *IEEE Transactions on Audio, Speech, and Language Processing*, Vol. 17. pp. 1361-1371

▫ D. S. Brungart, P. S. Chang, B. D. Simpson, and **D. Wang** "Multitalker Speech Perception with Ideal Time-Frequency Segregation: Effects of Voice Characteristics and Speaker Number." *Journal of the Acoustical Society of America*, Vol. 125, no. 6. June 2009. pp. 4006-4022

▫ Y. Shao and **D. Wang.** "Sequential Organization of Speech in Computational Auditory Scene Analysis." *Speech Communication*, Vol. 51, issue 8. August 2009. Pages 657-712

▫ U. Kjems, J.B. Boldt, M.S. Pedersen, T. Lunner, and **D. Wang**. "Role of Mask Pattern in Intelligibility of Ideal Binary-Masked Noisy Speech." *Journal of the Acoustical Society of America*, Vol. 126, no. 3. September 2009. pp. 1415-1426

▫ S. Srinivasan and **D. Wang**. "Robust Speech Recognition By Integrating Speech Separation and Hypothesis Testing." *Speech Communication,* Vol. 52, Issue 1. January 2010. pp. 72-81

GRAPHICS PAPERS

Computer Graphics

▫ J. Eisenmann and **R. Parent**. "Matte Painting in Stereoscopic Synthetic Imagery." In the proceedings of the *2010 IS&T/SPIE Electronic Imaging Science and Technology*, San Jose, CA, USA. January 17-21, 2010. Vol. 7524-12

◦ C. Zhang and **R. Parent**. "Several Approaches to Solve the Rotation Illusion with Wheel Effect." In the proceedings of the *2010 IS&T/SPIE Electronic Imaging Science and Technology*, San Jose, CA USA. January 17-21, 2010. Vol. 7533-OZ

◦ T. Peterka, D. Goodwell, R. Ross, **H.-W. Shen**, and R. Takur. "A Configurable Algorithm for Parallel Image Compositing Applications." In the proceedings of the *ACM/IEEE Supercomputing 2009* (SC'09), Portland, OR, USA. November 14-20, 2009. Article 4

◦ A. Chaudhuri and **H.-W. Shen**. "A Self-adaptive Treemap-based Technique for Visualizing Hierarchical Data in 3D." In the proceedings of the *IEEE Pacific Visualization 2009*, Beijing, China. April 20-23, 2009. pp. 105-112.

◦ T. Kerwin, **H.-W. Shen**, and D. Stredney. "Enhancing Realism of Wet Surfaces in Temporal Bone Surgical Simulation." *IEEE Transactions on Visualization and Computer Graphics*. Vol. 15, no. 5. August 2009. pp.747-759

◦ S. Martin, **H.-W. Shen**, and P. McCormick. "Load-Balanced Isosurfacing on Multi-GPU Clusters." In the proceedings of the *10th Eurographics Symposium on Parallel Graphics and Visualization* (EGPGV), Norrköping, Sweden. May 2-3, 2010. pp. 91-100

◦ B. Nouanesengsy, S.-C. Seok, **H.-W. Shen**, and V. Vieland. "Using Projection and 2D Plots to Visually Reveal Genetic Mechanisms of Complex Human Disorders." In the proceedings of the *IEEE Symposium on Visual Analytics Science and Technology* (VAST), Atlantic City, NJ, USA. October 11-16, 2010. pp. 171-178

Computational Geometry

◦ **T. K. Dey,** J. Sun, and **Y. Wang**. "Approximating Loops in a Shortest Homology Basis from Point Data." In the proceedings of the *26th Annual Symposium on Computational Geometry* (SoCG), at Snowbird, UT, USA. June 13th-16th, 2010. pp. 166-175

◦ **T. K. Dey**, P. Ranjan, and **Y. Wang**. "Convergence, Stability, and Discrete Approximation of Laplace Spectra." In the proceedings of the *21st Annual ACM-SIAM Symposium on Discrete Algorithms* (SODA10), Dallas, TX, USA. January 17-19, 2010. pp. 650-663

◦ **T. K. Dey** and J. Levine. "Delauney Meshing of Piecewise Smooth Complexes without Expensive Predicates." *Algorithms*. Vol. 2, no. 4. November 2009. pp. 1327-1349

◦ **T. K. Dey**, K. Li, E. Ramos, and **R. Wenger**. "Isotopic Reconstruction of Surfaces with Boundaries." *Computer Graphics Forum.* Vol. 28, July 2009. pp. 1371-1382

◦ **T. K. Dey**, A. Hirani, and B. Krishnamoorthy. "Optimal Homologous Cycles, Total Unimodularity, and Linear Programming." In the proceedings of *ACM Symposium on Theory of Computing* (STOC), Cambridge, MA, USA. June 6-8, 2010. pp. 221-230

◦ O. Busaryev, **T. K. Dey**, and J. A. Levine. "Repairing and Meshing Imperfect Shapes with Delaunay Refinement." In the proceedings of the *2009 ACM Symposium on Solid and Physical Modeling,* San Francisco, CA, USA. October 5-8, 2009. pp. 25-33

◦ R. Kannan, and **L. Rademacher**. "Optimization Of A Convex Program With A Polynomial Perturbation." *Operations Research Letters.* Vol. 37, no. 6. 2009. pp. 384-386

◦ Wm. Harvey, **Y. Wang**, and **R. Wenger**. "A Randomized O(m\Log m) Time Algorithm For Computing Reeb Graphs Of Arbitrary Simplicial Complexes." In the proceedings of the *26th Annual Symposium on Computational Geometry* (SoCG), at Snowbird, UT, USA. June 13th-16th, 2010. pp. 267-276

◦ C. Luo, I. Safa, and **Y. Wang**. "Approximating Gradients for Meshes and Point Clouds via Diffusion Metric." *Computer Graphics Forum*. Vol. 28, no. 5. pp. 1497-1508

NETWORKING

◦ L. Sang and **A. Arora**. "A Wireless Security Framework Without Shared Secrets." In the proceedings of the *11th International Symposium on Stabilization, Safety, and Security of Distributed Systems* (SSS '09), Lyon, France. November 3-6, 2009. pp. 609-623

◦ S. Bapat and **A. Arora**. "Stabilizing Reconfiguration in Wireless Sensor Networks." *Security in Ad Hoc and Sensor Networks.* Edited by R. Beyah, J. McNair, C. Corbett. Taichung, Taiwan. World Scientific Press. Vol. 3, Ch. 12. September 2009. pp. 385-419

◦ A. Chen, **T.-H. Lai**, and **D. Xuan**. "Measuring and Guaranteeing Quality of Barrier-Coverage for General Belts with Wireless Sensors." *ACM Transactions on Sensor Networks* (TOSN). Vol. 6, No. 1, Article 2. December 2009

▫ G. R. Gupta and **N. B. Shroff**. "Delay Analysis for Wireless Networks with Single Hop Traffic and General Interference Constraints," *IEEE/ACM Transactions on Networking*. Vol. 18, no. 2. April 2010. pp. 393-405.

▫ C. Joo, X. Lin, and **N. B. Shroff**. "Greedy Maximal Matching: Performance Limits for Arbitrary Network Graphs Under the Node-exclusive Interference Model." *IEEE Transactions on Automatic Control*. Vol. 54, no. 12. December 2009. pp. 2734-2744.

▫ O. Gungor, J. Tan, C. E. Koksal, H. El Gamal, and **N. B. Shroff**. "Joint Power and Secret Key Buffer Management to Achieve Delay Limited Secrecy." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19, 2010. 10.1109/INFCOM.2010.5462158

▫ J. Kim, X. Lin, **N. B. Shroff**, and **P. Sinha**. "Minimizing Delay and Maximizing Lifetime for Wireless Sensor Networks With Anycast " *IEEE/ACM Transactions on Networking.* Volume 8 , Issue 2. March 2010. pp. 148-164.

▫ Y. Wu, S. Fahmy, and **N. B. Shroff**. "Optimal Sleep/Wake Scheduling for Time- Synchronized Sensor Networks with QoS Guarantees." *IEEE/ACM Transactions on Networking.* Vol. 17, issue 5. October 2009. pp. 1508-1521.

▫ C. Joo and **N. B. Shroff**. "Performance of Random Access Scheduling Schemes in Multi-hop Wireless Networks." *IEEE/ACM Transactions on Networking*. Vol. 17, issue 5. October 2009. pp. 1481-1493.

▫ B. T. Swapna, A. Eryilmaz, and **N. B. Shroff** "Throughput-Delay Analysis of Random Linear Network Coding for Wireless Broadcasting, *"The 2010 IEEE International Symposium on Network Coding*. June 2010.

▫ J. Tan and **N. B. Shroff**. "Transition from Heavy to Light Tails in Retransmission Durations." *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. Mar. 15-19, 2010. 10.1109/ INFCOM.2010.5461910

▫ S. Liu, K.-W. Fan and **P. Sinha**. "CMAC: Energy Efficient MAC Layer Protocol Using Convergent Packet Forwarding for Wireless Sensor Networks." *ACM Transactions on Sensor Networks* (TOSN). Vol. 5, no. 4

▫ R.-S. Liu, **P. Sinha**, and E. C. Koksal. "Joint Energy Management and Resource Allocation in Rechargeable Sensor Networks." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19, 2010

▫ Z. Zheng, Z. Lu, **P. Sinha**, and S. Kumar. "Maximizing the Contact Opportunity for Vehicular Internet Access." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19, 2010

▫ Z. Ling, J. Luo, W. Yu, X. Fu, **D. Xuan**, and W. Jia. "A New Cell Counter Based Attack Against Tor." In the proceedings of the *16th ACM conference on Computer and Communications Security,* Chicago, IL, USA. November 9-13, 2009. pp. 578-589

▫ W. Yu, X. Wang, X. Fu, **D. Xuan**, and W. Zhao. "An Invisible Localization Attack to Internet Threat Monitors." *IEEE Transactions on Distributed and Parallel Systems* (TPDS). Vol. 20, no. 11. November 2009. pp. 1611-1625

▫ Z. Yang, B. Zhang, J. Dai, A. Champion, **D. Xuan**, and D. Li. "E-SmallTalker: A Distributed Mobile System for Social Networking in Physical Proximity." In proceedings of the *IEEE International Conference on Distributed Computing Systems* (ICDCS), Genoa, Italy. June 2010. pp. 468-477

▫ B. Gu, X. Bai, Z. Yang, A. Champion, and **D. Xuan**. "Malicious Shellcode Detection with a Virtual Memory Snapshot." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19. 2010

▫ X. Bai, Z. Yun, **D. Xuan**, **T.-H. Lai**, and W. Jia. "Optimal Deployment Patterns for Four-Connectivity and Full-Coverage Wireless Sensor Networks." *IEEE Transactions on Mobile Computing* (TMC). Vol. 9, no. 3. March 2010. pp. 435-448

▫ X. Bai, Z. Yun, **D. Xuan**, W. Jia, W. Zhao. "Pattern Mutation in Wireless Sensor Deployment." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19, 2010

▫ E. Tan, L. Guo, S. Chen, and **X. Zhang.** "CUBS: Coordinated Upload Bandwidth Sharing in Residential Networks." In proceedings of the *17th International Conference on Network Protocols* (ICNP 2009), Princeton, NJ, USA. October 13-16, 2009

▫ S. Ren, E. Tan, T. Luo, S. Chen, L. Guo, and **X. Zhang**. "TopBT: A Topology-Aware and Infrastructure-Independent BitTorrent Client." In the proceedings of the *IEEE International Conference on Computer Communications* (INFOCOM), San Diego, CA, USA. March 15-19, 2010

Software Engineering

- G. Xu and **A. Rountev**. "Detecting Inefficiently-Used Containers to Avoid Bloat." In the proceedings of the *ACM SIGPLAN Conference on Programming Language Design and Implementation* (PLDI'10), Toronto, Canada. June 5-10, 2010. pp. 160-173

- G. Xu, N. Mitchell, M. Arnold, A. Rountev, E. Schonberg, and G. Sevitsky. "Finding Low-Utility Data Structures", ACM SIGPLAN Conference on Programming Language Design and Implementation, Toronto, Canada. June 5 - 10, 2010 pp. 174-186

- G. Xu, **A. Rountev,** and M. Sridharan. "Scaling CFL-Reachability-Based Points-to Analysis Using Context-Sensitive Must-Not-Alias Analysis." In the proceedings of the *23rd European Conference on Object-Oriented Programming* (ECOOP'09), Genova, Italy. July 6-10, 2009. pp. 98-122

- J. Hallstrom and **N. Soundarajan**. "Reusing Patterns Through Design Refinement." In the proceedings of the *11th International Conference on Software Reuse* (ICSR '09), Falls Church, VA, USA. September 27-30, 2009. pp. 225-235

Systems

Databases and Datamining

- W. Ma and **G. Agrawal**. "AUTO-GC: Automatic Translation of Data Mining Applications to GPU Clusters." In proceedings of *Workshop on High-level Parallel Programming Models and Supportive Environments held in conjunction with International Parallel and Distributed Processing Symposium* (IPDPS 2010), Atlanta, GA, USA. April 19-23, 2010.

- M. Demirbas, C. Akcora, M. Bayir, Y. Yilmaz, and **H. Ferhatosmanoglu**. "Crowd-sourced Sensing and Collaboration Using Twitter." In proceedings of the *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks* (WoWMoM 2010), Montreal, Canada, June 14-17, 2010

- A. Sacan, N. Ferhatosmanoglu, and **H. Ferhatosmanoglu**. "Microarray Designer: An Online Search Tool and Repository for Near-Optimal Microarray Experimental Designs." *BMC Bioinformatics* Vol. 10:304. September 2009

- S. Tatikonda and **S. Parthasarathy**. "Hashing Tree Structured Data: Methods and Applications." In proceedings of the *IEEE International Conference on Data Engineering* (ICDE), Long Beach, CA, USA. March 1-6, 2010. pp. 429-440

- S. Tatikonda and **S. Parthasarathy**. "Mining Tree Structured Data on Multicore Systems." In proceedings of the *35th International Conference on Very Large Data Bases* (VLDB 2009), Lyon, France. August 24-28, 2009. pp. 694-705

- Z. Zhang, B. Ooi, **S. Parthasarathy**, and A. Tung. "Similarity Search on Bregman Divergence: Towards Non-Metric Indexing." In proceedings of the *35th International Conference on Very Large Databases* (VLDB 2009), Lyon, France. August 24-28, 2009. pp. 13-24

Highend and Core Systems

- V. T. Ravi, W. Ma, D. Chiu, and **G. Agrawal**, "Compiler and Runtime Support for Enabling Generalized Reduction Computations on Heterogeneous Parallel Configurations." In proceedings of *International Conference on Supercomputing* (ICS), Epochal, Tsukuba, Japan. June 1-4, 2010. pp. 137-146

- Q. Zhu and **G. Agrawal**, "Resource Provisioning with Budget Constraints for Adaptive Applications in Cloud Environments." In proceedings of *19th ACM International Symposium on High Performance Distributed Computing* (HPDC), Chicago, IL, USA. June 20-25, 2010

- Q. Zhu and **G. Agrawal**. "Supporting Fault-Tolerance for Time-Critical Events in Distributed Environments." In proceedings of the *22nd ACM/IEEE Annual Conference on Supercomputing* (SC09). Portland, OR, USA. November 14-20, 2009

- T. Bicer, W. Jiang, and **G. Agrawal**. "Supporting Fault Tolerance in a Data-Intensive Computing Middleware." In proceedings of the *International Parallel and Distributed Processing Symposium* (IPDPS), Atlanta, GA, USA. April 19-23, 2010

- R. Gupta, P. Beckman, H. Park, E. Lusk, P. Hargrove, A. Geist, **D. K. Panda**, A. Lumsdaine, and J. Dongarra. "CIFTS: A Coordinated Infrastructure for Fault-Tolerant Systems." In proceedings of the *International Conference on Parallel Processing* (ICPP '09), Vienna, Austria. September 22-25, 2009. pp. 237-245

▫ Q. Lu, C. Alias, U. Bondhugula, T. Henretty, S. Krishnamoorthy, J. Ramanujam, **A. Rountev**, and **P. Sadayappan**, Y. Chen, H. Lin, and T.-F. Ngai. "Data Layout Transformation for Enhancing Data Locality on NUCA Chip Multiprocessors." In the proceedings of the *International Conference on Parallel Architectures and Compilation Techniques* (PACT'09), Raleigh, NC, USA. September 12-16, 2009. pp. 348-357

▫ G. Santhanaraman, T. Gangadharappa, S. Narravula, A. Mamidala, and **D. K. Panda.** "Design Alternatives for Implementing Fence Synchronization in MPI-2One-sided Communication on InfiniBand Clusters." In proceedings of the *International Conference on Cluster Computing* (Cluster '09), New Orleans, LA, USA. August 31-September 4, 2009

▫ X. Ouyang, K. Gopalakrishnan, T. Gangadharappa, and **D. K. Panda**. "Fast Checkpointing by Write Aggregation with Dynamic Buffer and Interleaving on Multicore Architecture." In proceedings of the *16th annual IEEE International Conference on High Performance Computing* (HiPC 2009), Kochi, India. December 16-19, 2009. pp. 99-108

▫ S. Potluri, P. Lai, K. Tomko, S. Sur, Y. Cui, M. Tatineni,K. Schulz, W. Barth, A. Majumdar, and **D. K. Panda**. "Quantifying Performance Benefits of Overlap using MPI-2 in a Seismic Modeling Application." In proceedings of the *24th International Conference on Supercomputing* (ICS), Epochal, Tsukuba, Japan. June 1-4, 2010. pp. 17-25

▫ N. Vydyanathan, S. Krishnamoorthy, G. M. Sabin, U. V. Catalyurek, T. Kurc, J. H. Saltz, and **P. Sadayappan**. "An Integrated Approach to Locality-conscious Processor Allocation and Scheduling of Mixed-parallel Applications." *IEEE Transactions on Parallel and Distributed Systems.* Vol. 20, No. 8. pp. 1158-1172

▫ G. S. Murthy, M. Ravishankar, M. M. Baskaran, and **P. Sadayappan**. "Optimal Loop Unrolling for GPGPU Programs." In proceedings of the *IEEE International Parallel & Distributed Processing Symposium* (IPDPS 2010), Atlanta, GA, USA. April 19-23, 2010

▫ M. M. Baskaran, A. Hartono, S. Tabarageri, T. Henretty, J. Ramanujam, and **P. Sadayappan**. "Parameterized Tiling Revisited." In proceedings of the *8th International Symposium on Code Generation and Optimization* (CGO 2010), Toronto, Ontario, Canada. April 24–28, 2010. pp. 200-209

▫ A. Hartono, M. Barskaran, J. Ramanujam, and **P. Sadayappan**. "Parametric Tiled Loop Generation for Effective Parallel Execution on Multicore Processor." In proceedings of the *IEEE International Parallel & Distributed Processing Symposium* (IPDPS 2010), Atlanta, GA, USA. April 19-23, 2010

▫ J. Dinan, D. B. Larkins, **P. Sadayappan**, S. Krishnamoorthy, and J. Nieplocha. "Scalable Work Stealing." In proceedings of the *ACM/IEEE Conference on High Performance of Computing* (SC 2009),

▫ R. Lee, X. Ding, F. Chen, Q. Lu, and **X. Zhang**. "MCC-DB: Minimizing Cache Conflicts in Multi-core Processors for Databases", In proceedings of the *35th International Conference on Very Large Data Bases* (VLDB 2009), Lyon, France. August 24-28, 2009. pp. 373-384

▫ J. Lin, Q. Lu, X. Ding, Z. Zhang, **X. Zhang**, and **P. Sadayappan**. "Enabling Software Management for Multi-core Caches with a Lightweight Hardware Support." Proceedings of *22nd ACM/IEEE Annual Conference on Supercomputing* (SC09). Portland, OR, USA. November 14-20, 2009

▫ Q. Lu, J. Lin, X. Ding, Z. Zhang, **X. Zhang**, and **P. Sadayappan**. "Soft-OLP: Improving Hardware Cache Performance Through Software-Controlled Object-Level Partitioning." Proceedings of *18th International Conference on Parallel Architectures and Compilation Techniques* (PACT 2009), Raleigh, NC, USA. September 12-16, 2009. pp. 283-295

▫ X. Ding, H. Huang, Y. Ruan, A. Shaikh, B. Peterson, and **X. Zhang**, "Splitter: A Proxy-Based Approach for Post-Migration Testing of Web Applications." In the proceedings of the *ACM European Conference on Computer Systems* (EuroSys 2010), Paris, France. April 13-16, 2010. pp. 97-110

CSE STUDENTS & TEACHING

Graduate Program

The Ohio State University is one of the leading doctoral degree granting institutions in the United States. OSU-CSE's Computer Science and Engineering graduate program strives to maintain and surpass the excellence which comes from being part of an esteemed organization. Each graduate school application season comes with a seemingly endless number of students looking for admittance as either a Doctoral candidate or for the two year Masters option. The new economic future has contributed to a change in the faces of the students. The Department has long enjoyed a diverse, international community and now we find ourselves becoming multi-generational as well.

As you may noticed in the table below, CSE had a significant jump in the number of Master degree graduates this past year. In answer to the demand for two year Master degrees, CSE expanded its acceptance of unsupported students looking to broaden their career options.

	AU 1999	AU 2000	AU 2001	AU 2002	AU 2003	AU 2004	AU 2005	AU 2006	AU 2007	AU 2008	AU 2009
Graduate Students Enrolled	160	157	159	164	174	169	188	184	235	239	303
	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10
Graduate Student Applications	857	940	1,542	1,508	712	589	694	619	705	677	817
Graduate Students Supported	111	130	175	156	149	158	163	135	135	132	182
M.S. Degrees Awarded	58	36	19	30	31	27	21	33	37	39	64
Ph.D. Degrees Awarded	10	8	4	7	7	11	18	17	32	26	19
Ph.D. Degrees (cumulative)	307	314	318	325	332	343	361	378	410	436	455

2009 – 2010 Doctorates

🌐 **Nawab Ali**   Pacific Northwest National Laboratory, Richland, WA
Rethinking I/O In High-Performance Computing Environments
P. Sadayappan   Jameshedpur, India
M.Tech., Birla Institute of Technology & Science; M.S., University of Cincinnati

🌐 **Xiaole Bai**   University of Massachusetts at Dartmouth, Dartmouth, MA, USA
Optimal Connected Coverage for Wireless Sensor-networks
Dong Xuan   Jiangsu, China
B.Eng., Southeast University; M.S., University of Helsinki; M.S., The Ohio State University

🌐 **Muthu Manikandan Baskaran**   Reservoir Labs Inc., New York City, NY, USA
Compile-Time and Run-time Optimization for Enhancing Locality and Parallelism on Multi-Core and Many-Cores Systems
P. Sadayappan   Madurai, India
B.Eng., Bharathidasan University; M.S., The Ohio State University

🌐 **Ai Chen**   Shenzhen Institutes of Advanced Technology, Chinese Academic of Science, China
Sealing Borders with Wireless Sensors
Ten-Hwang Lai   Tianjin, China
B.Eng., Tsinghua University; M.S., The Ohio State University

🌐 **David Chiu**   Washington State University at Vancouver, Vancouver, WA, USA
Auspice: Automatic Service Planning in Cloud/Grid Environments
Gagan Agrawal   Stow, OH, USA
B.S., M.S., Kent State University

🌐 **James Dinan**   Argonne Labs, Chicago, IL, USA
Scalable Task Parallel Programming in the Partitioned Global Address Space
P. Sadayappan   Columbus, OH, USA
B.S.Cptr.Sci.Eng., University of Massachusetts, Amherst; M.S., The Ohio State University

🌐 **Qi Gao**   Facebook, Inc.
Runtime Support for Improving Reliability in System Software
Feng Qin   China
B.Engr., Zhejiang University; M.S., The Ohio State University

🌐 **Albert Hartono**   Reservoir Labs, New York City, NY, USA
Tools for Performance Optimizations and Tuning of Affine Loop Nests
P. Sadayappan   Solo, Indonesia
Sarjana, Trisakti University; M.S., Indiana University, Bloomington, IN, USA

🌐 **Mark A. Keck**   BAE Systems, Boston, MA, USA
Occlusion Recovery and Reasoning for 3D Surveillance
James Davis   Wichita Falls, TX, USA
B.S., Tulane University of Louisiana

🌐 **JOSHUA LEVINE**   Scientific Computing and Imaging Institute,
                                                              Salt Lake City, UT, USA

Dalaunay Methods for Approximating Geometric Domains
Tamal Dey   Downers Grove, IL, USA
B.S., M.S., Case Western Reserve

🌐 **REN-SHIOU LIU**   Epic Systems, Madison, WI, USA
Towards Perpetual Operation in Renewable Energy Based Sensor Networks
Prasun Sinha   Hualien, Taiwan, PRC
B.S.Cptr.Sci.Eng., M.S., National Chao Tung University

🌐 **JEREMY MORRIS**   The Ohio State University
A Study on the Uses of Conditional Rendon Fields for Automatic Speech Recognition
Eric Fosler-Lussier   Columbus, OH, USA
B.S., Bowling Green State University; M.A., Linguistics, The Ohio State University; M.S., The Ohio
State University

🌐 **LIFENG SANG**   Yahoo Inc., Sunnyvale, CA, USA
Designing Physical Primitives for Secure Communication in Wireless Sensor Networks
Anish Arora   Columbus, OH, USA
B.Engr., M.S., Zhejiang University; M.S., The Ohio State University

🌐 **JASON E. SAWIN**   University of Puget Sound, Tacoma, WA, USA
Improving the Static Resolution of Dynamic Java Features
Atanas Rountev   Joseph, OR, USA
B.A., Lewis and Clark College; M.S., The Ohio State University

🌐 **SHIRISH TATIKONDA**   IBM Almaden Research Center, San Jose, CA, USA
Towards Efficient Data Analysis and Management of Semi-Structured Data
Srinivasan Parthasarathy   Hyderbad, Andhra Pradesh, India
B.Engr., M.S., Birla Institute of Technology and Science, India

🌐 **DUYGU UCAR**   NSF Computing Innovation Fellow,
                        Dept. of Internal Medicine and Biomedical Engineering, University of Iowa, Iowa City, IA
Constructing and Analyzing Biological Interaction Networks for Knowledge Discovery
Srinivasan Parthasarathy   Corum, Turkey
B.S., Bilkent University

🌐 **ZHIMIN YANG**   Microsoft, Redmond, WA, USA
Opportunistic Computing in Wireless Networks
Dong Xuan   Harbin, China
B.Engr., M.S., Harbin Institute of Harbin; M.S., The Ohio State University

🌐 **ZIZHAN ZHENG**   The Ohio State University
Sparse Deployment of Large Scale Wireless Networks for Mobile Targets
Prasun Sinha   Suzhou, China
B.Engr., Sichuan University, China; M.S., Peking University, China

🌐 **QIAN ZHU**   Laboratory of Advanced Numerical Simulation Group
                                                              Argonne National Laboratory, Chicago, IL, USA
Supporting Time-Critical Event Processing in Grids and Clouds
Gagan Agrawal   Sichuan, China
B.S., Beijing Institute of Technology; M.S., The Ohio State University

Masters

Legend

- **Graduate Name**
  Advisor
  Home
  Vita

- **Tekin Bicer**
  Gagan Agarwal
  Giresun, Turkey
  B.S. Honors, Ismir Institute of Technology

- **Saba Bokhari**
  P. Sadayappan
  Lahore, Pakistan
  B.S.Cptr.Sci.Eng., The Ohio State University

- **Tarali Bora**
  Ness Shroff
  Bancho, Orissa, India
  B.Engr., National Institutes of Technology, India

- **Derek Bronish**
  Bruce Weide
  Westlake, OH, USA
  B.S.Cptr.Sci.Eng., The Ohio State University

- **Feng Chen**
  Xiaodong Zhang
  Yangzhou, Jiangsu, China
  BEng., Master Deg.,

- **Ralston Da Silva**
  Rajiv Ramnath
  Margao, Goa, India
  B.Eng., Goa University, India

- **Mahashweta Das**
  Rajiv Ramnath
  Kolkata, India
  B.Engr., Jadavpur University

- **Debraj De**
  Anish Arora
  Kolkata, India
  B.Engr., Jadavpur University

- **Youri Dimitrov**
  Yusu Wang
  Rousse, Bulgaria
  M.S., Michigan Technological University
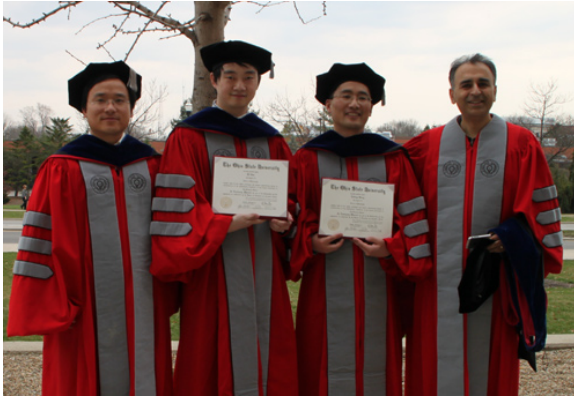
Professora Feng Qin and Anish Arora flank their newly minted doctorate students Dr. Qi Gao and Dr. Lifeng Sang.

In the Garden of Constants, newly 'commenced' Dr. James Dinan poses with the program tile representing his status as an official student.

- **James Dinan**
  P. Sadayappan
  Columbus, OH, USA
  B.S.Comp.Sci.Eng., University of
  Massachusetts, Amherst

- **Nehal Gandhi**
  P. Sadayappan
  Vadodara, Gujarat, India
  B.Engr., Maharaja Sayajirao University of
  Baroda

- **Qi Gao**
  Feng Qin
  Zhengzhou, China
  B.Eng., Zhejiang University

- **Karthik Gopalakrishnan**
  DK Panda
  Columbus, OH, USA
  B.Engr., Visveswaraiah Technological
  University

- **Vineet Harbhajanka**
  Rajiv Ramnath
  Kolkata, India
  B.Engr., Manipal University

- **Gregory Horvath**
  Rajiv Ramnath
  North Olmstead, OH, USA
  B.S., The Ohio State University

- **Keith Aaron Johansen**
  Gagan Agrawal
  Westerville, OH, USA
  B.S., The Ohio State University

- **Manikantan Kalaiya**
  P. Sadayappan
  Kolar Gold Fields, India
  B.Engr., Gulbarga University

- **Santhosh Kumar Kalimuthu**
  Xiaodong Zhang
  Coimbatore, India
  B.Tech., Anna University

- **Srija Reddy Kallu**
  Ten-Hwang Lai
  Hyderabad, India
  B.Tech., Jawaharlal Nehru Technological
  University

- **Gunjan Kathuria**
  Hakan Ferhatosmanoglu
  Bhiwani, Haryana
  B.Tech., Kurukshetra University

- **Raffi Khatchadourian**
  Neelam Soundarajan
  Edison, NJ, USA
  B.S.Cptr.Sci.Eng., Monmouth College

- **Ketaki Krishna Koppal**
  Rajiv Ramnath
  Pune, Maharashtra, India
  B.Eng., University of Pune

- **Vijay Kumar**
  P. Sadayappan
  Bangalore, India
  B.Eng., Birla Institute of Technology and
  Science; M.S., Birla Institute of Technology and
  Science

- **Ping Lai**
  DK Panda
  Columbus, OH, USA
  B.Engr., Master's, Zheijiang University

- **Kuiyu Li**
  Tamal Dey
  Columbus, OH, USA
  B.Engr., Shandong University; M.S., Chinese
  Academy of Sciences

- **Shuang Liang**
  Xiaodong Zhang
  Wuhuan, China
  B.Engr., Masters', Huazhong University of
  Science and Technology

- **Thomas Loffing**
  Rajiv Ramnath
  Urbana, OH, USA
  B.S.Cptr.Sci.Eng., The Ohio State University

- **John Loy**
  Richard Parent
  Bucyrus, OH, USA
  B.A., The Ohio State University

- **Wenjing Ma**
  Gagan Agrawal
  Tianjin, China
  B.Eng., Nankai University

- **Gregory Marsh**
  Dhabaleswar Panda
  Columbus, OH, USA
  B.S., University of Idaho; M.S., Northern Illinois University

- **Rahul Mukhedkar**
  Rajiv Ramnath
  New Delhi, Inida
  B.Tech., Guru Gobind Singh Indraprastha University

- **Praveen Nagarajan**
  Rajiv Ramnath
  Chennai, India
  B.Tech., Anna University

- **Jaspreet Oberoi**
  Rajiv Ramnath
  Patiala, India
  B.Engr., Thapar Institute of Engineering and Technology

- **David Ogirala**
  Richard Parent
  Visakhapatnam, Andhra Pradesh, India
  B.Tech., Jawaharlal Nehru Technological University

- **Sudhir Jayram Patel**
  Atanas Rountev
  Eastlake, OH, USA
  B.S.Comp.Sci.Eng., The Ohio State University

- **Yogesh Pendharkar**
  Gagan Agrawal
  Karad, Maharashtra, India
  B.Engr., University of Pune

- **Preethi Raghavan**
  Rajiv Ramnath
  Mumbai, India

- **Bhargavi Rajaraman**
  DK Panda
  Canandaigua, NY, USA
  B.Tech., Birla Institute of Technology and Science

- **Venkatram Ramanathan**
  Gagan Agrawal
  Chennai, India
  B.Engr., P.S.G. College of Technology, Bharathiar University

- **Neha Sahay**
  Feng Qin
  Dhanbad, Jharkhand, India
  B.Tech., Vellore Institute of Technology

- **Avijeet Sahoo**
  Bruce Weide
  Bhubhaneswar, India
  B.Engr., Sambalpur University

- **Ashwin Shiv Kumar**
  Umit Catalyurek
  Bangalore, Karataka, India
  B.Engr., Visveswaraiah Technological University

- **Darla Magdalene Shockley**
  Hui Fang
  Jamestown, SC, USA
  B.A., State University of New York at Stony Brook

- **Nisheet Singh**
  Rajiv Ramnath
  Kanpur, India
  B.S., Jaypee Institute of Information Technology University

- **Shantanu Singh**
  Raghu Machiraju & Rick Parent
  Bangalore, India
  Visveswaraiah Technological University

- **Arjun Singri**
  P. Sadayappan
  Bangalore, India
  B.Engr., Visveswaraiah Technological University

- **Giridhar Sreenivasa Murthy**
  P. Sadayappan
  Bangalore, India
  B.Engr., Visveswaraiah Technological University

- **Bharath Sriram**
  Hakan Ferhatosmanoglu
  Bangalore, Karnataka, India
  B.Engr., Visveswaraiah Technological University

- **Ravishankar Subramaniyan**
  David Lee
  Chennai, India
  B.Engr., Anna University

- **Akshay Suresh**
  Rajiv Ramnath
  Mumbai, India
  B.Engr., University of Mumbai

- **Ying Tu**
  Han-Wei Shen
  Yichuan, China
  B.Engr., Zhejiang University

- **Praneeth Uppalapati**
  Kun Huang
  Hyderabad, India
  B.Engr., Osmania University

- **Kevin J. Van Valakenburgh**
  Atanas Rountev
  North Royalton, OH, USA
  B.S., Case Western Reserve University

- **Manjunath Venugopala Reddy**
  Prasun Sinha
  Bangalore, India
  B B.Engr., Visveswaraiah Technological University

- **Smita Vijayakumar**
  Gagan Agrawal
  Mysore, India
  B.Tech., Guru Gobind Singh Indraprastha University

- **Varun Vijayvargiya**
  Hakan Ferhatosmanoglu
  Mumbai, India
  B.Tech., National Institutes of Technology

- **Fan Wang**
  Gagan Agrawal
  Beijing, China
  B.Engr., Beijing University of Technology

- **Timothy Weale**
  Eric Fosler-Lussier
  Columbus, OH, USA
  B.S., University of Dayton

- **Guoqing (Harry) Xu**
  Atanas Rountev
  Shanghai, China
  B.Engr., M.S., East China Normal University

- **Wei Xu**
  Richard Parent
  China
  B.Engr., Tsinghua University

- **Zhe Xu**
  Rajiv Ramnath
  Longhai, Fujian, China
  B.Engr., Xiamen University

- **Kelly Yackovich – Corwin**
  Bruce Weide
  North Braddock, PA, USA
  B.S., Clarion University of Pennsylvania

- **Erdem Yalcin**
  Hakan Ferhastosmanoglu
  Istanbul, Turkey
  B.S., Bahcesehir University

- **Jiangye Yuan**
  DeLiang Wang
  Columbus, OH, USA
  B.Engr., North China Electric Power University

Masters grad, David Ogirala stands in front of Ohio Stadium after the Spring Commencement.

GRADUATE STUDENT RESEARCH POSTER EXHIBIT

GRADUATE STUDENT RESEARCH	ADVISER	POSTER TITLE
Bruce M. Adcock	Bruce Weide	THE END OF DEBUGGING AS WE KNOW IT
Matt Boggus	Roger Crawfis	DISTANCE BASED ILLUMINATION AS A NAVIGATIONAL AID
Joe Bolinger	Jay Ramanathan	BLACKTIE: INJECTING ELEMENTS OF FORMALITY INTO ENTERPRISE SOCIAL SOFTWARE
Derek Bronish	Bruce Weide	ISSUES IN MODULAR VERIFICATION FOR A COMPONENT-BASED FUNCTIONAL PROGRAMMING LANGUAGE
Feng Chen	Xiaodong Zhang	EXPLOITING INTERNAL PARALLELISM OF FLASH MEMORY BASED SOLID STATE DRIVES
David Chiu	Gagan Agrawal	ENABLING AD HOC QUERIES OVER LOW-LEVEL SCIENTIFIC DATA SETS
Lei Ding	Mikhail Belkin	GRAPH BASED EVENT DETECTION FROM REALISTIC VIDEOS USING WEAK FEATURE CORRESPONDENCE
Xiaoning Ding	Xiaodong Zhang	A SHARED CACHE AWARE SCHEDULING FRAMEWORK FOR MULTI-CORE PROCESSORS BASED ON WORKING SET MODEL
David Ely	Christopher Stewart	LARGE VOLUME DATA PROCESSING SOLUTIONS IN REAL TIME
David Fuhry, Bharath Sriram, and Engin Demir	Hakan Ferhatosmanoglu	SHORT TEXT CLASSIFICATION IN TWITTER TO IMPROVE INFORMATION FILTERING
Boxuan Gu	Dong Xuan	MALICIOUS SHELLCODE DETECTION WITH VIRTUAL MEMORY SNAPSHOTS
William Harvey	Yusu Wang	GENERATING AND EXPLORING A COLLECTION OF TOPOLOGICAL LANDSCAPES FOR VISUALIZATION OF SCALAR-VALUED FUNCTIONS
Zhaozhang Jin	DeLiang Wang	A MULTIPITCH TRACKING ALGORITHM FOR NOISY AND REVERBERANT SPEECH
Thomas Kerwin, Brad Hittle, Han-Wei Shen, Don Stredney, Gregory Wiet	Han-Wei Shen	WEIGHTED DISTANCE TRANSFORM IN ANATOMICAL STRUCTURE VISUALIZATION
Raffi Khatchadourian	Neelam Soundarajan	POINTCUT REJUVENATION: RECOVERING POINTCUT EXPRESSIONS IN EVOLVING ASPECT-ORIENTED SOFTWARE
Jason Kirschenbaum	Bruce Weide	INVESTIGATIONS IN AUTOMATING PROGRAM VERIFICATION
Brian D. Larkins	P. Sadayappn	EFFICIENT SUPPORT FOR GLOBAL VIEW PROGRAMMING OF DISTRIBUTED LINKED DATA STRUCTURES
Kuiyu Li	Tamal Dey	PERSISTENT HEAT SIGNATURE FOR POSE-OBLIVIOUS MATCHING OF INCOMPLETE MODELS
Rubao Li	Xiaodong Zhang	SCAMAR: SQL-CORRELATION-AWARE MAPREDUCE
Ren-Shiou Liu	Prasun Sinha	PERPETUAL AND FAIR DATA COLLECTION FOR ENVIRONMENTAL ENERGY HARVESTING SENSOR NETWORKS
Tian Luo	Xiaodong Zhang	TOPBT - TOPOLOGY-AWARE BITTORRENT CLIENT
Thomas Lynch	Rajiv Ramnath	IBRUTUS
Timothy Normand Miller	Radu Teodorescu	PARICHUTE: GENERALIZED TURBOCODE-BASED ERROR CORRECTION FOR NEAR-THRESHOLD CACHES
Benjamin Schroeder	Rick Parent	A SPATIAL WORKBENCH FOR PHYSICALLY-BASED SOUND
Kevin Streib, Matt Nedrich and Karthik Sankaranarayanan	James Davis	INTERACTIVE VISUALIZATION AND BEHAVIOR ANALYSIS FOR VIDEO SURVEILLANCE
Enhua Tan	Xiaodong Zhang	ANALYSIS AND DETECTION OF SPAMMING BEHAVIOR IN BLOG NETWORKS

Graduate Student Research	Adviser	Poster Title
Ying Tu	Han-Wei Shen	*Multi-Con: Exploring Graphs by Fast Switching among Multiple Contexts*
Fan Wang	Gagan Agrawal	*SEEDEEP: A System for Exploring and Querying Deep Web Data Sources*
Guoqing (Harry) Xu	Atanas Rountev	*Analyzing Large-Scale Object-Oriented Applications to Detect and Remove Runtime Bloat*
Xintian Yang	Srinivasan Parthasrathy	*Efficient Visual Analytics On Large Graphs*
Fang Yu	David Lee	*Nemor: A Protocol for Anonymous Peer-based Content Distribution*
Cheng Zhang	Rick Parent	*Several Approaches To Solve The Rotation Illusion With Wheel Effect*
Wenbin Zhang and Nehal Gandhi	Feng Qin	*Efficient Manifestation of Concurrency Bugs via Symbolic Execution*
Zizhan Zheng	Prasun Sinha	*Maximizing the Contact Opportunity for Vehicular Internet Access*
Qian Zhu	Gagan Agrawal	*Power-aware Consolidation for Scientific Workflows in Clouds*

Guoqing (Harry) Xu's winning poster from the Grad Student Poster Exhibition.

Undergraduate Program

Post the dot.com collapse, computer science programs across the board suffered a brief reduction in students entering the major. That was a brief moment. Today the number of incoming pre-computer science students is rising and the major is healthier from the influx of such enthusiasm and bright minds.

Undergraduate students joining the Department of Computer Science and Engineering have three options for their education: a Bachelors of Science from the College of Engineering and a Bachelors of Science or a Bachelors of Arts from the College of Natural & Mathematical Sciences. Each gives the student flexibility in how they wish to work with computers and opens up options for post graduation careers.

The Department is also responsible for many service courses for students of multiple majors across the University. We offer CSE 101 which is accepted for all OSU majors as a General Education Credit. For the Construction Systems Management majors from the Department of Food, Agriculture and Biological Engineering, we teach Computer-Assisted Problem Solving for Construction Management (#105) where students learn how to use productivity software, especially spreadsheets and databases, to solve problems for construction management; relative/absolute cell referencing, logic, functions, relational databases, querying, project integration. Meanwhile, future Systems Administrators in the Fisher College of Business attend OSU-CSE's Computer Assisted Problem Solving for Business (#200), Data Structures for Information Systems (#214), and Business Programming with File Processing (#314).

Two relatively new courses are numbers 203, Computational Thinking in Context: Interactive Animations and Games, and 204, Computational Thinking in Context: Digital Images and Sound. These two courses can be used by majors as a prerequisite to the CSE 221 course, but are just as easily accessible by students who have an interest in learning a little about programming, but do not want to major in the subject.

CSE Students have multiple language options. CSE teaches C, C++, LISP, PERL, and Java.

For more information on individual classes please see the CSE website.

Undergraduate Office for Academic Advising

All undergraduate majors eventually realize they cannot complete their degree without finding the Undergraduate Office Academic Advising. This is especially true as The Ohio State University moves its academic calendar from quarters to semesters in Autumn 2012 and the pivotal position of Undergraduate Academic Advisor becomes essential for every undergraduate student. The Advisors will be working with numerous committees as CSE restructures its programs for the new calendar.

Two very knowledgeable women annually brave the Autumn onslaught and gently lead the students toward attaining their goals.

PEG STEELE, Coordinator of Academic Advisement. Ms. Steele is active at the local and national levels of academic advising. 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. She will be serving on the Board of Directors for the next three years for the National Academic Advising Association.

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.

BACHELOR DEGREES AWARDED
College of Arts & Sciences

* **Student Name**
Award
Home

* **Abdirahim M. Abdi (BS)**
Columbus, Ohio, USA

* **Sadeem Mohammed Aleissa (BA)**
Riyadh, Saudi Arabia

* **Ashley Elizabeth Amato (BA)**
Brunswick, Ohio, USA

* **Amir Bainazarov (BA)**
Columbus, Ohio, USA

* **Michael Joseph Banaski (BS)**
Blacklick, Ohio, USA

* **Bubakar Barrie (BS)**
Columbus, Ohio, USA

* **Robert Earl Carroll (BS)**
Cincinnati, Ohio, USA

* **Craig A. Confer (BS)**
Ashland, Ohio, USA

* **Peter Matthew Brendan Maximillian Dietz (BS)**
North Royalton, Ohio, USA

* **Stephen John Edwards (BS)**
Cum Laude
Pickerington, Ohio, USA

* **David Lloyd Fagan (BS)**
Magna Cum Laude
Dimsbury, Connecticut, USA

* **Nima Falaki (BS)**
Columbus, Ohio, USA

* **Douglas Steven Funk (BS)**
Lancaster, Ohio, USA

* **John C. Gray (BS)**
Magna Cum Laude
Vikery, Ohio, USA

* **Evan Collier Prince (BA)**
Pickerington, Ohio, USA

* **Andrew J. Pyles (BS)**
Corvallis, Oregon, USA

* **Mateusz Maciej Rakowski (BA)**
Worthington, Ohio, USA

* **David Michael Rattine (BS)**
Barnesville, Ohio, USA

* **Seth Thomas Ruscak (BS)**
With Honors in the Arts and Sciences
Newark, Ohio, USA

* **Sewon Shin (BS)**
Torrance, California, USA

* **Stephen Patrick Sizemore (BA**
Akron, Ohio, USA

* **Spencer Thomas Smith (BS)**
Mason, Ohio, USA

* **Geoffrey Daniel Smith (BS)**
South Euclid, Ohio, USA

* **Brandon Jacob Sorg (BS)**
Magna Cum Laude
with Honors in the Arts and Sciences
with Research Distinction in Computer and Information Science
Springboro, Ohio, USA

* **Daniel Lewis Stottlemire (BA)**
Warren, Ohio, USA

* **Benjamin Tarney (BS)**
Westerville, Ohio, USA

* **Carmichael Villarroel Venci (BS)**
Powell, Ohio, USA

* **Corry Ray Watson (BS)**
Grove City, Ohio, USA

* **Jarrod Keith Williams (BA)**
South Bloomfield, Ohio, USA

* **Matthew Joseph Wolfzorn (BS)**
Cincinnati, Ohio, USA

* **Xueyang Xu (BS)**
Summa Cum Laude
Wuhan, China

* **Benjamin Yurkovich (BS)**
Columbus, Ohio, USA

College of Engineering

* **Mohmad Firas Alnemer**
Clarksburg, Ohio, USA

* **Mark Daniel Arnold**
Dayton, Ohio, USA

* **Anderson Nixon Bell**
Worthington, Ohio, USA

* **Christopher James Birie**
Fredericktown, Ohio, USA

* **Joseph Leonard Blumenthal**
Beachwood, Ohio, USA

* **Saba Shahid Bokhari**
Magna Cum Laude
Lahore, Pakistan

* **Saniyah Shahid Bokhari**
Lahore, Pakistan

* **Conner Hudson Campassi**
Magna Cum Laude
Columbus, Ohio, USA

* **Lewis Paul Carter**
Columbus, Ohio, USA

* **Isaac Chan**
Magna Cum Laude
Perrysburg, Ohio, USA

* **Matthew Allen Cherry**
Toledo, Ohio, USA

* **Keith Swift Chima**
Strongsville, Ohio, USA

* **Patrick Nolen Collins**
East Greewich, Rhode Island, USA

* **John R Colvin**
Oregon, Ohio, USA

* **Adam Christopher Cotner**
Cum Laude
Grove City, Ohio, USA

* **John Paul Danford**
Fairfield, Ohio, USA

* **Christina Marie Deiters**
Magna Cum Laude
Cincinnati, Ohio, USA

* **Anushree Dwivedi**
New Delhi, India

* **Hamid Reza Ettefagh**
Sugar Land, Texas, USA

* **Philip Wade Evers**
Delaware, Ohio, USA

* **Kevin David Farst**
Arcanum, Ohio, USA

* **Keith William Finney**
Westerville, OH, USA

* **Adam J Gall**
Cleveland, Ohio, USA

* **Elie Daoud Gerges**
Magna Cum Laude
Lebanon, Ohio, USA

* **Fabian Gomez**
Bay Shore, New York, USA

* **Jason Michael Goodman**
Cincinnati, Ohio, USA

* **Geoffrey Philip Griffith**
Beavercreek, Ohio, USA

* **Muktar Guled**
Columbus, Ohio, USA

* **Joseph M Hasel**
Amherst, Ohio, USA

* **Charles Edward Hellstrom**
Magna Cum Laude
Reynoldsburg, Ohio, USA

* **Maximilian Herkender**
Dublin, Ohio, USA

* **Kyle G. Hiltner**
Lyons, Ohio, USA

* **Shawn Anthony Holzworth**
Bexley, Ohio, USA

* **Holly Marie Hughes**
Newark, Ohio, USA

* **Andrew Michael Kane**
Summa Cum Laude
Lewis Center, Ohio, USA

* **David Sunil Kitchener**
Dayton, Ohio, USA

* **Brett Thomas Kizer**
Cum Laude
Urbana, Ohio, USA

* **Kevin M Klopfenstein**
New Albany, Ohio, USA

* **Justin Thomas Landers**
Magna Cum Laude
Liberty Township, Ohio, USA

* **Justin Michael Lastrapes**
Powell, Ohio, USA

* **Joung-Hyun Lee**
Seoul, Korea

* **Terence Lee**
West Chester, Ohio, USA

* **Hyun Lee**
Magna Cum Laude
Gwacheon, South Korea

* **Bryan J Linthicum**
Columbus, Ohio, USA

* **Luke Andrew MacAdam**
Cum Laude
New Philadelphia, Ohio, USA

* **Domenic M. Matestic**
Palisades Park, New Jersey, USA

* **Jonathan Michael Mazala**
Orange Village, Ohio, USA

* **Jenna Rose McCarthy**
Oakwood, Ohio, USA

* **Paul Anthony McPhee**
San Clemente, California, USA

* **Daniel Elliott Miller**
Magna Cum Laude
Eden Prairie, New Jersey, USA

* **Eric Mychal Morgan**
Westerville, Ohio, USA

* **Suresh Murali**
Bangalore, India

* **Michael S Paktinat**
Chardon, Ohio, USA

* **Bina D Patel**
Celina, Ohio, USA

* **Michael R Payne**
Pickerington, Ohio, USA

* **Akhil Anil Pillai**
Cochin, India

* **Rian Carl Rainey**
Van Wert, Ohio, USA

* **Gaurav C. Rajan**
North Olmstead, Ohio, USA

* **Candace Madison Remaly**
Columbus, Ohio, USA

* **Markus Rogosinsky**
Magna Cum Laude
Halberstadt, Germany

* **Michael P Rojas**
Monroe, New York, USA

* **Michael Bradley Roth**
Fairfield, Ohio, USA

* **Matthew C. Saalfeld**
Upper Arlington, Ohio, USA

* **Shengying Shen**
Ashland, Ohio, USA

* **Christopher Thomas Sherman**
Canfield, Ohio, USA

* **Kevin Michael Simmons**
Miamisburg, Ohio, USA

* **Matthew Eric Smith**
Cheshire, Ohio, USA

* **Clayton Matthew Snyder**
Richmond, Ohio, USA

* **Simonas Stankevicius**
Eastlake, Ohio, USA

* **Jason Stenftenagel**
Magna Cum Laude
Loveland, Ohio, USA

* **Adam Michael Sternfeld**
Cum Laude
Beachwood, Ohio, USA

* **Brian Stricklin**
Delaware, Ohio, USA

* **Philip M. Vallera**
Marietta, Ohio, USA

* **Georgii Sergeeych Viznyuk**
Lewis Center, Ohio, USA

* **Daniel K Wagers**
Cincinnati, Ohio, USA

* **Gregory J. Walsh**
Cum Laude
Painesville, Ohio, USA

* **Ross Wang**
Magna Cum Laude
Liberty Township, Ohio, USA

* **Steven Anthony Wenzke**
Magna Cum Laude
Dayton, Ohio, USA

* **Jijo Wilson**
Cum Laude
Kollam, India

* **Eric Nathaniel Witte**
Rockton, Illinois, USA

* **Jeffrey Andrew Wolcott**
Austin, Texas, USA

* **Tyler J Wymer**
Cum Laude
Canton, Ohio, USA

* **Christopher Douglas Yunker**
Columbus, Ohio, USA

* **Brittany Ann Zwiebel**
Cum Laude
Wapakoneta, Ohio, USA

Charles Hellstrom receives congratulations from President Gee during Commencement Autumn 2009.

In the Classroom

Teaching over the Past Ten Years

	AU 1999	AU 2000	AU 2001	AU 2002	AU 2003	AU 2004	AU 2005	AU 2006	AU 2007	AU 2008	AU 2009
Faculty	28.5	29	30	29	31	31	32	33	35	35	35
Course Enrollment/ Autumn Qtr.	3,693	3,977	4,103	4,076	3,650	3,125	3,187	3,238	3,386	3,702	3,943
	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10
Students Taught	14,278	14,278	14,006	13,878	12,208	10,623	10,844	10,641.	11,185	12,209	12,689

Department of Computer Science and Engineering Course Listing for Academic Year 2009- 2010

# & Name of Course	Credit Hours
101 Computer-Assisted Problem Solving	4
102 Introduction to the Internet and the World-Wide Web	3
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 Computational Thinking in Context: Science and Engineering	4
214 Data Structures for Information Systems	4
221 Software Development Using Components	4
222 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 Programming Languages for Programmers: The UNIX Programming Environment	1
459.21 Programming Languages for Programmers: Programming in C	1
459.22 Programming Languages for Programmers: Programming in C++	1
459.23 Programming Languages for Programmers: Programming in JAVA	1
459.24 Programming Languages for Programmers: Programming in C#	1
459.31 Programming Languages for Programmers: Programming in LISP	1
459.51 Programming Languages for Programmers: Programming in Perl	1
489 Professional Practice in Industry	2
493 Individual Studies	1

# & Name of Course	Credit Hours
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 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 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
699 Undergraduate Research in Computer Science and Engineering	

Knowlton Hall Columns. This photo was taken by a local web designer, Kevin Miller.

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; Theoretical analysis of algorithms, particularly in high dimension; Connections to Human Cognition

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 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 *Associate Professor*

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

Department Research Area: ARTIFICIAL INTELLIGENCE

Interests: Automatic Speech Recognition; Computational Linguistics; Machine Learning
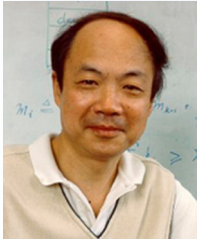
Ten-Hwang (Steve) Lai *Full Professor*

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

Timothy J. Long *Associate Professor*

B.S., Education, University of Cincinnati, 1972; B.A., Mathematics, University 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 *Full 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; Database Systems; Bioinformatics; Parallel and Distributed Computing and Systems.

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

LUIS RADEMACHER *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: THEORETICAL COMPUTER SCIENCE

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

NICOLETA ROMAN *Assistant Professor, Lima Campus*

B.S., Computer Science, University of Bucharest, Romania, 1996; M.S., Computer Science, University of Bucharest, Romania,1997; Ph.D., Computer Science and Engineering, The Ohio State University, Columbus, Ohio, 2005.

Department Research Area: ARTIFICIAL INTELLIGENCE

Research interests: Computational Auditory Scene Analysis; Binaural sound localization and separation; Automatic Speech Recognition; Machine Learning.

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.
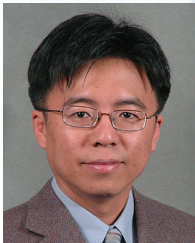
HAN-WEI SHEN *Associate Professor*

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 of Networking and Communications Endowed Chaired 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; Scaling Laws; 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 University, 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.

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.

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, University 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

Clinical Faculty

Jay Ramanathan *Research Associate Professor*
Director of Research of Center for Experimental Research in Computer Systems

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

Research Interests: Analysis and Engineering of the Complex Adaptive Enterprise to achieve overall objectives, performance and Business-IT alignment. Related applications include Serious Gaming and CyberInfrastructure. Methodologies include knowledge mining, Complexity Theory, Autonomic Computing; technologies such as OWL, Middleware, Workflow, Mobile Computing, and Web Services.

Rajiv Ramnath *Associate 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.

New Faculty Arriving Winter 2011
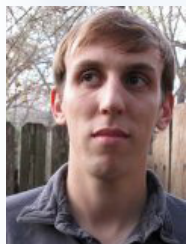
Michael Bond *Assistant Professor*

B.S., Computer Science, University of Illinois at Urbana-Champaign, 2002; M.C.S., Computer Science, University of Illinois at Urbana-Champaign, 2003; Ph.D., Computer Sciences, The University of Texas at Austin, 2008

Research Interests: Developing Analyses and systems that make complex, concurrent software reliable, scalable, and secure. Programming Languages, Runtime Systems, Compilers, Security.
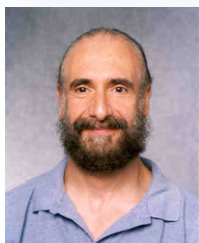
Research Scientists

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.

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

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
Virginia Nivar	Davis Heart & Lung Research Institute
Alan Saalfeld	Geodetic Science
Cathy Honghui Xia	Integrated Systems Engineering
Tao Shi	Statistics

Emeritus appointments

Professor Emeritus

Balakrishnan Chandrasekaran

Charles A. Csuri

Ming-Tsan (Mike) Liu

Sandy Mamrak

Mervin E. Muller

Stuart Zweben

Associate Professor Emeritus

Clinton R. Foulk

Douglas S. Kerr

William F. Ogden

Anthony E. Petrarca

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, 1979.

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

Thomas Bihari

Moez Chaabouni

Doreen Close

Michael Compton

Matt Curtin

Charles Giles

Steve Gomori

Robert Joseph

Perumal Krishnasamy

Igor Malkiman

Michelle Mallon

Robert Mathis

Judita Preissova

Steven Romig

Naeem Shareef

Al Stutz

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

Tim Welsh: Director of Development

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

Milan Kopper -- Systems Administrator

Dave Kneisly -- Systems Administrator

Todd Lucall -- Systems Administrator

Shaun Rowland -- Manager, Software Support and Development

Ted Welch -- Systems Administrator

Kat Wenger -- Systems Manager

During a visit to his home school Dr. Hari Srihari (middle) poses with (from left) Srini Parthasarathy, Jim Davis, Hari Srihari, Chris Brew and Mikhail Belkin. Dr. Srihari is a SUNY Distinguished Professor in the Department of Computer Science and Engineering at the University of Buffalo.

From left, new grads Dr. Muthu Baskaran, Dr. Albert Hartono, and Dr. Josh Levine bask in warmth from the smiles of their advisors Professor Tamal Dey and Professor P. Sadayappan after the Autumn 2009 commencement.

A rainbow ends in Ohio Stadium, hopefully brining the team some of its luck!
~ Corey Cottrell Eletrical Engineering; from an Ohio State Photo of the Day.

Mirror Lake on the South Oval of The Ohio State University campus. The photo followed one of those unpredictable Columbus storms, as evident by the sunshine immediately thereafter. ~ Alex Suttmiller - CSE; Graduate;

Kim and Dnan pose as O and H with new grad, Joshua Levine, closing with the ending O. I is respresented by the Brutus Buckeye statue in the new Student Union. ~ photo courtesy of Dinans

Autumn 2009 Graduation in the Schottenstein Arena. ~photo courtesy of University Photographic Services.

Page left blank.

DEPARTMENT OF
COMPUTER SCIENCE
AND ENGINEERING

395 Dreese Labs
2015 Neil Avenue
Columbus, Ohio 43210

614-292-5813

www.cse.ohio-state.edu