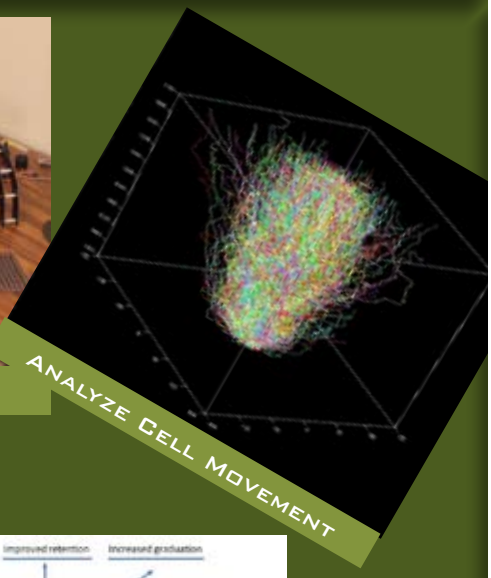
Missouri University of Science and Technology

SPRING 2013
NEWSLETTER

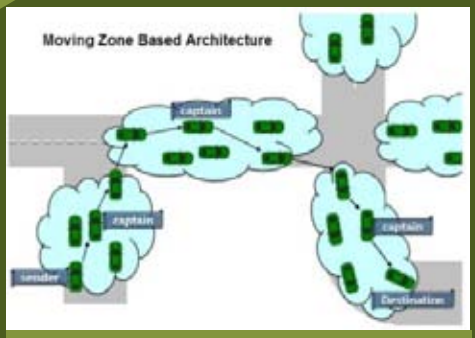
Computer Science Department

Stem Cell Lineage Trees

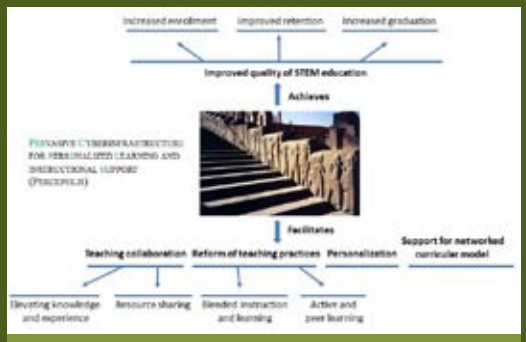
Quadcopter



Analyze Cell Movement



Vehicular Ad-hoc Networks



Personalized Education

In This Issue

CHAIR'S MESSAGE

Dear friends of the CS department,

Greetings from Missouri S&T's Department of Computer Science and welcome to the spring 2013 edition of the CS Newsletter. This letter is my fifth formal interaction with you as I am finishing my fifth year of service at Missouri S&T. The 2012 calendar year has been another exciting period and another successful milestone for the CS department.

This year was marked by another state revenue shortfall. Though the department survived and the budget cut did not derail our progress, we are very concerned since the department cannot sustain its progress in the face of year after year of budget cuts.

Five years ago, in our quest for excellence, we set the bar high; on ourselves, our students, and our alumni. I am extremely pleased to report that all performance indicators such as productivity, research expenditures, and students' satisfaction, are indicating strong improvement relative to the past.

Over the last five years, the department has experienced its largest enrollment growth ever in the number of undergraduate and PhD students, as well as the size of the faculty and the number of supporting staff. More specifically, we witnessed drastic changes and growth, including:

- Increasing undergraduate enrollment (50%), while improving the quality of the curriculum.
- Increasing PhD enrollment (400%), again while improving the quality of the graduate curriculum and raising admission requirements.
- Retooling the undergraduate and graduate curricula, and introducing more than twenty new courses.
- Improving the quality of teaching and student satisfaction in terms of teaching evaluations.
- Hiring five outstanding junior faculty members.
- Significantly increasing annual research expenditures.
- Doubling the annual number of refereed publications by the faculty and students.
- Adding three new research laboratories.
- Establishing strategic partnerships with industry and national laboratories to promote internships, job opportunities, and collaborative research.
- Attaining full ABET accreditation in 2009.
- Expanding the department's distance program and establishing international partnerships with universities in China, Kuwait, Oman, Tunisia, and Malaysia.
- Significantly renovating the physical facilities, including administrative offices, classrooms, and research infrastructure and laboratories.

We reached and surpassed every milestone set despite continual budget cuts.

Two outstanding alumni joined our computer science academy: Kent Lynn and Charles Marsh were inducted into the Missouri S&T Academy of Computer Science (ACS). I would like to welcome them and I am looking forward to their active contributions to the department. The 2012 CS Academy meeting was held on

October 12, 2012, the CS student award banquet was held on April 9, 2012, the CS Advisory Board meeting was held on April 6, 2012, and the 2012 CS Picnic was held on September 22, 2012.

We are eager to hear from you and your reflections on the program. As part of our accreditation process (both ABET and the Higher Learning Commission) you, as stakeholders, provide vital input in assessing how well we are delivering education.

To the 2007 Alumni, as 5 year alumni you will be receiving an alumni survey in the mail. Please fill this out and send it back – the information requested measures our departmental objectives, including technical background, communication, life-long learning, and societal appreciation. Tell us how we did, now that you have been out for awhile. Or you may fill it out online at http://cs.mst.edu (navigate to "Alumni, Corporations & Partners - Alumni Survey").

To our employers, your feedback is vital – we need to continue to produce the students you want to hire. Take a moment to fill out our employer survey at http://cs.mst.edu (navigate to "Alumni, Corporations & Partners - Employer Survey"). Alternately, if you are on campus, fill out a survey when you are in the Career Opportunities Center. Your input tells us how our fresh graduates stack up against your expectations.

The computer science department is humbled by, and deeply grateful for, the financial support of its alumni and corporate partners.

As a final note, I will be stepping down as the chair of the CS department on January 1st 2013. Consequently, this is the last time that I will be addressing you in this capacity. Serving our students, getting to know you, learning from you, and working with you has been a great pleasure and honor.

Ali Hurson
Department Chair, Professor

Welcome to the Department

Christina Barton joins the department in the newly created position of Sr. Secretary for undergraduate studies. Before joining the department, she was an Administrative Assistant in Cuba, MO. Christina is from Jacksonville, Florida; however, she was raised in Cuba, MO where she currently resides with her husband. When not working here on campus she enjoys reading, and spending time with her family. Christina will be assisting in keeping the Undergraduate Brochure and website up to date, as well as assisting faculty and undergraduate students however she can. She is enjoying her position thus far and looks forward to spending many years on campus.

KEEPING IN TOUCH

Dr. Sriram Chellappan is busy conducting research on various aspects of networking and security of Internet, Sensor Networks and Vehicular Networks. His research is funded by Army Research Office, Missouri Research Board and University Transportation Center. He is also busy advising his new Ph.D. and Masters students on various research topics. He enjoys teaching courses in Automata, Operating Systems, Computer Networking and Advanced Network Security.

Dr. Maggie Cheng was appointed a summer research fellow in Army Research. She worked on algorithm foundations for cyber security and information-theoretic security of computer networks. She will teach Network Information Analysis in Spring 2013 to bring interesting topics of the emerging research area into classroom.

She still serves on the technical program committees of several major conferences in computer networks and communications, including INFOCOM, ICC and Globecom.

Dr. Fikret Ercal is on the editorial board of an international journal and also serving on the program committees of several international conferences. He continues to teach undergraduate and graduate classes in Parallel Processing, Operating Systems, Algorithms, and Numerical Methods.

Dr. Ali Hurson had another busy yet productive year. As always, international trips to Switzerland, China, and Tunisia with domestic trips to Hawaii, Las Vegas, Palo Alto, San Jose, Washington D.C. and Baltimore; coupled with editorship of the advances in computers, actively involved with several international conferences including IPDPS, PerCom, IGCC, CCNC; endless administrative duties; teaching, publishing, writing proposals, and finally research were the highlights of his activities.

He had several international trips to Beijing and Shenyang (China) and Tunisia to develop outreach and international programs with Beijing Institute of Technology, Northeast University (Shenyang), and Central University (Tunisia). At Missouri S&T, currently, he is working with four PhD students, and on a grant funded by the Department of Education.

Dr. Wei Jiang came to Missouri S&T in 2008. Currently, he has four Ph.D. students and four M.S. thesis students. He usually teaches distributed systems and information security related courses. His research has been funded by the University of Missouri Research Board, the National Science Foundation and the Office of Naval Research in areas of secure data analysis and text sanitization.

Dr. Marouane Kessentini joined the department in Spring 2012; he is enjoying teaching software engineering courses: CS 401-Search based software engineering and CS-206 Software engineering I. His research group, search-based software engineering (SBSE) is composed by two PhD students, one MSC student, two exchange PhD students and one BSC student (undergraduate research experience). He is doing research with his group on solving software engineering problems using artificial intelligence techniques such as software quality, software testing and model-driven engineering.

Dr. Jennifer Leopold is teaching the Automata Theory and Programming Languages & Translators courses in 2012-2013. Her current research interests are ontologies and automated spatial reasoning in 3D. She will be serving as the interim graduate coordinator for the Computer Science department as of January 1, 2013.

Dr. Dan Lin has been at Missouri S&T for four years. Her current research interest includes security and privacy issues in cloud computing and VANETs (vehicular ad-hoc networks). She is currently advising three PhD students and one of them will graduate very soon. She is the chair of the departmental diversity committee and will continue her efforts on organizing various events for under-represented groups. She holds workshops for the Expanding Your Horizon program for 7th-8th grade girls every year. She also serves as faculty advisor of two student associations: IEEE Computer Society Student Branch and ACM-W (women in computing).

Dr. Frank Liu served as the graduate coordinator for the department for the past year. He continues to develop a web-based argumentation and collaborative decision support system, which is ranked as one of the top sites in Google search in this area. It may find applications in many domains, such as decision rationale capturing, collaborative decision making, conflict resolution, and policy development. He was invited to give a keynote speech on on-line argumentation in the 2012 international conference on social computing and its applications in China in October 2012. In addition to conducting research, he teaches software testing and quality assurance, software requirements engineering, and advanced software engineering classes, which attract many distant learning graduate students. He currently serves as the interim chair of the computer science department as of January 1, 2013.

Dr. Sanjay Madria has started a new NSF Industry/University Collaborative Research Center along with several new research projects/grants and is also directing the W2C (Web and Wireless Computing) Lab. He is currently supervising 7 PhD and 5 MS thesis students in the area of mobile, cloud and secure sensor networks. He is busier than ever before with his research, teaching and service. Currently he is on sabbatical and he is looking forward to offering Cloud Computing and XML Data Management classes in Fall 2013.

Dr. Bruce McMillin leads the FREEDM system center's (see related article) distributed grid intelligence thrust for the next generation smart grid. He and his students continue to work on advanced models of computer security and privacy for cyber physical systems such as the smart grid, specifically how to make the systems transparent to insiders and opaque to outsiders.

He looks forward to working with the alumni next year on "Vision 20/20" or "where do we want to see S&T and Computer Science by the year 2020?"

Dave Mentis is still teaching C++ and Fortran, and is also planning on teaching the Discrete Math course soon.

Dave's still living on the farm with his wife Doyla, his daughter Dava, and his grandson Layton. Replacing fence remains a lifelong project.

Dr. Ricardo Morales joined the Computer Science department this year.

He is currently teaching Introduction to Programming (CS53) along Clayton Price, and Data Structures (CS153).

Besides teaching, he has started a new ACM interest group "SIG-Comp", which will prepare students for programming competitions, like the ACM International Collegiate Programming Contest.

Clayton Price is excited and anxious about the coming academic year. The addition of new faculty last year has capped an exciting time of stimulus to the productivity of the department as a whole. He reports that his new colleagues are a joy to work with. "Our new, young faculty are very productive and caring of the welfare of their students, undergraduate and graduate alike." He hopes to be able to continue teaching his very popular yet demanding Object-Oriented Numerical Modeling I class in the future as it has been a driving force behind the great relationship our department has had with companies such as Tradebot.

Price has had to give up much of his personal life because of the demands of the job, but he hopes to rectify that in the future.

Dr. Chaman Sabharwal continues to teach Graphics (CS358), Robotics (CS 345), and Java GUI & Visualization (CS342). In fall 2012 he taught Robotics (CS345), Numerical Methods (CS228), and Java GUI & Visualization (CS342). In the spring of 2013, he will teach Discrete Mathematics for Computer Science (CS128), and Interactive Computer Graphics (CS358). He also collaborated in research, research grant from UMRB, and has published several research papers including a Journal article this year. Dr. Sabharwal still commutes back and forth from St. Louis.

Dr. Jagannathan (Jag) Sarangapani, the Rutledge-Emerson Distinguished Professor of Electrical and Computer Engineering, holds a joint appointment with CS. Dr. Sarangapani's students have been working on the development of indoor localization algorithms, routing protocols for regular and cognitive networks, and networked control systems with applications to cyber physical systems. He directs the Embedded Systems and Networking Laboratory where the students gain hands-on experience with networking protocols and Missouri S&T Mote hardware for wireless ad hoc and sensor networks. These Motes have been successfully deployed and evaluated on a number of industrial applications. He is also Director of NSF Industry/University Cooperative Research Center Site at Missouri S&T, where the Mote hardware and smart algorithms are used to detect and predict component and system failures. There are several company members in the Center Site. His team of faculty has received funding from the Army Research Laboratory to work on localization and tracking of threats and network security as well as more recently from Boeing, Dept of Education, Army Research Office and others. His overall funding for the past 10 years has exceeded $13 Million. He has co-authored 102 juried articles (mostly IEEE Transactions with his students), over 200 IEEE Conference publications, several book chapters, 3 text books, and holds 20 patents with two recently awarded. He has advised 28 M.S and 17 doctoral students with several in the pipeline.

Dr. Sahra Sedigh is an associate professor in Electrical and Computer Engineering, with joint appointment in Computer Science. The goal of her research is to understand how complex systems fail, and to use this information to make these systems more reliable. Critical infrastructure systems such as smart (power) grids and intelligent water distribution networks are among the complex systems studied by her group. She also designs and deploys wireless systems that monitor bridges and alert authorities of inclement weather conditions or structural hazards. Her most recent research investigates methods for using technology to make better use of class time and personalize and improve the learning experience for students. The Army Research Lab, Samsung, and the US Department of Transportation are among the sponsors of her research. All of the classes Dr. Sedigh currently teaches are focused on computer networks – introducing them (CpE 319, available through distance education), making them more secure (CpE 349, also available through distance education), and modeling them (CpE/CS 417). In her free time, she enjoys painting, reading books that have nothing to do with engineering, and catching up on lost sleep. She will be very happy if she finds a way to do all three concurrently.

Dr. Daniel Tauritz, or just Dr. T as the students call him, is very honored to have been appointed Guest Scientist at Los Alamos National Laboratory effective April 6th 2012 where he is collaborating with their Advanced Computing Solutions organization on applying Computational Intelligence techniques such as Evolutionary Algorithms in the Cyber Security domain. As founding director of the Natural Computation Laboratory (NC-LAB), he continues to lead research projects on developing novel Evolutionary Algorithms and applying them to real-world problems for a diverse set of domains including Cyber Security, Critical Infrastructure Protection, Automated Software Engineering, and Social Computing, funded via Sandia National Laboratories, Los Alamos National Laboratory, and various other agencies and organizations. He is particularly happy to announce that the department's newest Assistant Professor, Marouane Kessentini, has joined the NC-LAB as leader of the Search-Based Software Engineering group (see NC-LAB article for more lab information).

On 11/29/2011, Dr. Tauritz was granted, together with his co-inventor Ray Luechtefeld, US patent 8,069,131 for the system at the heart of their NSF funded virtual facilitation research project, namely an artificially intelligent rule-based system to assist teams or groups in becoming more effective by improving the communication process between members of the team or group. The system helps members share information, negotiate more effectively and make better group decisions. The system is designed to allow users to generate dialog interventions and rule sets which are then vetted by all users of the system.

Dr. Tauritz continues to enthusiastically teach his two-course sequences on Evolutionary Computing and Artificial Intelligence, and a section of the freshman course on Discrete Mathematics of which he is the coordinator. He ran the 12th S&T Artificial Intelligence Tournament in spring 2012 (see article) and is already in the planning stages for the 13th S&T Artificial Intelligence Tour-

nament in spring 2013. He is enjoying his 11th year as the Missouri S&T ACM Student Chapter SIG Security advisor (see article). Since December 2004 he has been the Missouri S&T coordinator for Sandia National Laboratories' Center for Cyber Defenders (CCD); during summer 2005 he brought a team of outstanding students (three from CS, one from CpE) to the CCD as summer interns, and has sent new teams every summer since. Now he has expanded his recruiting coordination activities, supporting both Sandia National Laboratories and Los Alamos National Laboratory in recruiting summer interns, co-op students, and regular hires.

Dr. Donald Wunsch continues to serve as the International Neural Networks Society Senior Fellow, Chair of the INNS College of Fellows. He has two new books: Neural Networks and Micromechanics, with Ernst Kussul and Tatiana Maidyk, Springer; and Unified Computational Intelligence for Complex Systems: Adaptation, Learning and Optimization, with John Seiffertt, Springer. He is co-PI (with Ganesh Venayagamoorthy) on a $2 million NSF grant entitled: EFRI-COPN: Neuroscience and Neural Networks for Engineering the Future Intelligent Electric Power Grid. He is PI, with Ganesh Venayagamoorthy and Daniel Tauritz, of the Army Research Office Grant entitled: DURIP: A GPU-based High Performance Computing Cluster for Multiple Military Modeling Capabilities. He is also PI of the NSF grant: Computer Go -- A Proxy for Key Open Challenges and Opportunities in Computational Intelligence. He gave several plenary talks, a tutorial on Clustering at the IEEE World Congress on Computational Intelligence and, with Rui Xu and Jie Xu, won "Overall Best Paper" at the IEEE Conference on Evolutionary Computation.

Dr. Zhaozheng Yin just finished his first year at Missouri S&T Computer Science Department. He teaches courses on Discrete Math and Computer Vision. His research interests span the fields of Computer Vision, Pattern Recognition and Biomedical Imaging. Currently, he works with two Ph.D. students and one master student. Dr. Yin and his student just won the Young Scientist Award in the premium Biomedical Imaging conference (MICCAI) in Oct 2012. They were in the Young Scientist Award finalist in MICCAI2010 and the related paper is ranked in top 10 of the most downloaded article in the high impact journal - Medical Image Analysis. Dr. Yin's research has been supported by University of Missouri Research Board, Lockheed Martin, Mid-American Transportation Center, Intelligent System Center, U.S. Department of Education and National Science Foundation.

Dawn Davis is ending her 5th year with the Computer Science Department. She is now in charge of graduate studies for the department, departmental brochures, departmental website, and other duties to keep her very busy. She still enjoys the challenges that come each day, and says that she really enjoys working with the faculty, staff, students, and everyone on the Missouri S&T campus. Dawn's summer was filled with family, camping, fishing, gardening, going to auctions, and just being outside. Dawn and her husband Rick hope to do something more exciting next summer. She hopes next year is as good or better than this year was and is looking forward to all the challenges in 2013.

Rhonda Grayson will be celebrating some milestones in 2013. First, in February she will celebrate ten years with the Computer Science Department. Over those ten years Rhonda has learned, and grown, a great deal. Every year has brought with it new and exciting challenges but she has enjoyed all of it and hopes to stay a few more years. The next milestone will be in June when Rhonda and her husband, William, celebrate their 25th wedding anniversary. It is still hard for her to believe that twenty five years have gone by already, but they have been wonderful years. The coming year promises to be filled with family, friends, watching her boys at rodeos, meeting new people at auctions, and new challenges at work. Rhonda is excited to continue assisting the students and working with the faculty over the next year.

Computer Science Faculty to Receive Awards at S&T

One faculty member of Missouri University of Science and Technology Computer Science Department received the Research Award for 2011, including a $1,000 stipend funded by industry and alumni contributions. An awards ceremony was held on Tuesday, Feb. 7, 2012.

Receiving the 2011 Research Award was:
Dr. Sanjay Madria, Professor, Computer Science

Departmental Research Laboratories & Highlights

Critical Infrastructure Protection Laboratory

http://filpower.mst.edu/

Mission: Is an organization dedicated to research in advanced methods of security applied within the realm of critical cyber and cyber-physical infrastructures. The focus is on the use of rigorous mathematics through formal methods to create and analyzer fault-tolerant and secure real-time distributed computing systems applied to critical infrastructure protection. The laboratory supports undergraduate, graduate, and faculty researchers. Students in the laboratory participate in the campus Center for Academic Excellence in Information Assurance and Research, the Intelligent Systems Center, and the Energy Research and Development Center.

Current Lab Faculty Researchers: Bruce McMillin (Lab Director), Wei Jiang and Sriram Chellappan, Sahra Sedigh and Jonathan Kimball (ECE)

Current Lab Student Researchers: Ravi Akella, Gerry Howser, Li Feng, Mike Gosnell, Stephen Jackson, Tom Roth, Tom Catanzaro

Current Projects:

- Information flow security for critical infrastructure systems
- Next generation smart grid

Research Highlight:

Current work in the lab centers around the model provided by the Future Renewable Electric Energy Delivery and Management (FREEDM) system. FREEDM is the next generation energy internet. The lab is responsible for the Distributed Grid Intelligence (DGI) thrust that provides distributed coordination of energy resources. Security and privacy are significant concerns within the smart grid and the lab researchers address and mitigate these concerns through the information flow techniques of nondeducibility. More recent attacks such as Stuxnet show the vulnerability of critical infrastructure systems. Modal logic plays a role in defining multi-partition nondeducibility of actions and bisimulation automates its verification process.

Current Funding Sources:

- National Science Foundation (NSF)
- Department of Defense/National Security Agency (NSA)

Web and Wireless Computing Laboratory
Net-Centric IUCRC

http://web.mst.edu/~cswebdb/about.html

Mission: The W2C lab is designed to carry out cutting edge research in different aspects of data management (security, compression, replication, caching, query processing, aggregation, fusion) in wireless networks and cloud computing environment. Our focus is on scientific research to advance the state of art in these areas. The current projects are supported by NSF, DOE, ARL, AFRL, NIST, UM System, etc. The current researchers in the lab are pursuing their PhD/MS degree in different areas of interest to the W2C lab. The lab is well-equipped with over 50 3.2 Ghz PCs, 5 Dell Server, linux machines, laptops etc. The lab also has sensor network test-beds consists of Crossbow sensor motes like Telosb, Mica2 and Missouri S & T motes. The lab has graduated 5 PhD and 22 MS thesis students, with 7 PhD and 5 MS thesis in progress.

Current Lab Faculty Researchers: Sanjay K Madria (Lab Director) and Sriram Chellappan

Current Lab Student Researchers: Vimal Kumar, Thomas Mark Daniel Szalapski, Venkata Krishna Suhas Nerella, Roy A. Cabaniss, Brijesh Kashyap Chejerla, Arej A. Muhammed, Amartya Sen, Raghul Mukundan, Shashank Kumar, Kiran Kumar Puram, Rashmi G. Dalvi, Siva Naga Venkata Chaitanya Vemulapalli, Neelanjana Dutta, Muhammad Al Mutaz, Ravindranath Kandlagunta, Churchil Garg, Doyal Mukherjee and Agastya Mahi

Current Projects:

1. Data Compression and Management in Wireless Sensor Networks
2. Secure Data Aggregation and Trust Management in Wireless Sensor Networks
3. Secure Sensor Cloud
4. Information Fusion in Networked Controlled Systems
5. Social Network based Routing and Security in Delay Tolerant Networks
6. Exploring Query Optimization and Caching in Programming Codes
7. Mobile Cloud Computing
8. Data Management in Mobile Networks
9. Secure and Privacy Preserving Smart-grids
10. Secure Intelligent Transportation
11. Resilient Sensor Networks
12. Assessing Human behavior from Internet Usage

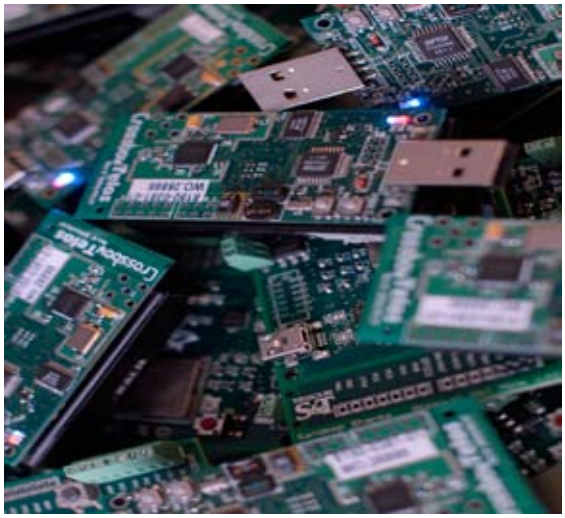
Current Funding Sources:

- National Science Foundation (NSF)
- Air Force Research Laboratory (AFRL)
- Army Research Laboratory (ARL)
- National Institute of Standards and Technology (NIST)
- Unique*Soft
- Department of Energy (DOE)
- Missouri Research Board (MRB)
- Missouri S&T Intelligent Systems Center (ISC)

Research Highlights:

Data Compression in Wireless Sensor Networks

Sanjay Madria



Wireless sensor networks possess significant limitations in storage, bandwidth, processing, and energy. Additionally, real-time sensor network applications such as monitoring poisonous gas leaks cannot tolerate high latency. While some good data compression algorithms exist specific to sensor networks, in this project we have developed TinyPack, a suite of energy-efficient methods with high- compression ratios that reduce latency, storage, and bandwidth usage further in comparison with some other recently proposed algorithms. Our Huffman style compression schemes exploit temporal locality and delta compression to provide better bandwidth utilization important in the wireless sensor network, thus reducing latency for real time sensor-based monitoring applications. We have shown performance evaluations over many different real data sets (over 10) using a simulation platform as well as a hardware implementation show comparable compression ratios and energy savings with a significant decrease in latency compared to some other existing approaches. We have also discussed robust error correction and recovery methods to address packet loss and corruption common in sensor network environments. This paper has won the best paper award in 12th IEEE International Conference on Mobile Data Management (MDM2011) in Sweden and an extended version has now appeared in Distributed and Parallel Database Journal. The algorithm has also been implemented in AFRL application during one of the summer to suite their data sets.

1. Tommy Szalapski and Sanjay K Madria, "On Compressing Data in Wireless Sensor Networks For Energy Efficiency and Real Time Delivery", to appear in Distributed and Parallel Databases, 2012.
2. Tommy Szalapski and Sanjay K Madria, Energy-efficient Real-Time Data Compression in Wireless Sensor Networks, in proceedings of 12th IEEE International Conference on Mobile Data Management, MDM 2011, Sweden (Best Paper Award).
3. Tommy Szalapski, Sanjay K Madria and Mark Linderman, TinyPack XML: Real Time XML Compression for Wireless Sensor Networks, in proceedings of IEEE Wireless Communications and Networking Conference (WCNC), 2012, France.

Resilient Sensor Networks
Sriram Chellappan

We are currently designing protocols for tiny embedded wireless sensors to communicate securely in environments of national security like military deployments. The fundamental challenges are large scale operations, low power operation, wireless propagation, ease of physical capture. Our schemes rely on light weight cryptography, exploiting network topology and leveraging collaboration among sensors against adversaries [1, 2, 3, 4].

Assessing Human behavior from Internet Usage: We are currently implementing techniques to assess human behavior from Internet usage. We have identified patterns of Internet usage associated with increasing depressive symptoms among college students. We believe our study is the first to use real Internet data collected continuously, unobtrusively and preserving privacy to assess human behavior [5]. Applications of this study lie in the realm of pervasive detection of mental disorders, online cognitive behavior therapy, and also improved understanding of cyber psychology.

1. S. Chellappan, W. Gu, X. Bai and H. Wang, Scaling Laws of Key Pre-distribution Protocols in Wireless Sensor Networks, IEEE Transactions on Information Forensics and Security, December 2011.
2. S. Chellappan, W. Gu, N. Dutta and X. Bai, Providing End-To-End Secure Communications in Wireless Sensor Networks, IEEE Transactions on Network and Service Management, September 2011.
3. S. Chellappan, C. Xu, X. Bai, L. Ding, J. Teng and D. Xuan, Directed-Coverage in Wireless Sensor Networks: Concept and Quality, Ad Hoc & Sensor Wireless Networks (AHSWN), Vol. 11, No. 3-4, 2011, pp. 173 – 197.
4. S. Chellappan, N. Dutta and A. Saxena, Defending Wireless Sensor Networks Against Adversarial Localization, Invited Paper in International Workshop on Mobile P2P Data Management, Security and Trust (MP-DMST) in conjunction with Proc. of International Conference on Mobile Data Management (MDM), May 2010.
5. S. Chellappan, R. Kotikalapudi, F. Montgomery, D. Wunsch and K. Lutzen, Associating Depressive Symptoms in College Students with Internet Usage Using Real Internet Data, To appear in IEEE Technology & Society Magazine.

Pervasive and Mobile Computing Laboratory

Mission: Pervasive computing explores the task of integrating technology into an environment, such that a multitude of computing devices are available to proactively perform services for users, thereby lightening the users' workload. The emergence of pervasive systems has been characterized as the third wave in computing, after the mainframe era (one computer, many users) and the personal computer era (one computer, one user). Pervasive computing is the next natural step, as a single user is in control of numerous computing elements.

The terms "ubiquitous computing" and "pervasive computing" have been used somewhat interchangeably in the literature. We draw a distinction between the two: "pervasiveness" refers to invisibility and proactiveness - where the computer dissolves into the fabric of the surroundings and requires minimal stimulus from the user, while "ubiquity" characterizes availability. In other words, ubiquitous computing facilitates pervasive computing. Advances in mobile computing have been pivotal to pervasive computing, as mo-

bile devices provide users with continual access to computing resources. To be truly pervasive, computing should be seamlessly and invisibly integrated into the lives of its users, necessitating computational intelligence that predicts the needs and desires of the user and can independently carry out services for the user, based on surrounding context. Pervasive computing also leverages distributed computing, to delegate computational tasks to remote and/or heterogeneous computing resources.

Not withstanding the availability of the required technology, truly pervasive computing environments have not yet been realized; only prototypes and theoretical designs have been developed by the research community. A major open field is related a delicate issue faced by pervasive computing: which choices can be delegated to the system (in the form of local clients, neighboring peers, or a central server) and which must be performed by the user. It is evident that the goal of pervasive computing is to maximize the former and minimize the latter. This often demands more intelligent algorithms, architectures and technologies than are presently available. In order to create a system that proactively carries out tasks, yet remains mostly transparent to the user, the following challenges should be addressed:

- The computing agents need to be able to predict the user's intent based on history and context-awareness.
- A reliable method for integrating all the computing agents into a seamless entity needs to be designed. The scope of these challenges is very broad.
-

In the Pervasive and Mobile Computing laboratory, our focus is on two specific areas that are crucial to the design of a proactive yet transparent system:

- Techniques for resource management in a pervasive environment, considering the practical constraint that proactive issue of tasks may exhaust available resources and/or distract the user.
- Security and privacy in discovery and authentication of users and services, again focusing on solutions that minimize human-machine interaction, yet provide the required level of security.

Current Lab Faculty Researchers: Ali Hurson (Lab Director), Dan Lin, Sanjay Madria, Sahra Sedigh, and Zhaozheng Yin.

Current Lab Student Researchers: Roy Cabaniss, Brijesh Chejerla, Sima Das, Sashi Gurung, Lasanthi Heendaliya, Nathan Kamrath, Vimal Kumar, Mingzhong Li, Yunxiang Mao, Arej Muhammed, Chris Seto, Tommy Szalapski, Shaun Wagner, Mike Wisel, Mark Woodard, and Huawei Yang.

Current Projects:

- Privacy-preserving location information publishing
- Constraint-based indexing and querying of moving objects
- Active sensor networks and interoperability of sensor networks
- Mobile agent security
- Data broadcasting in traffic control
- Pervasive cyberinfrastructure for personalized learning and instructional support (PERCEPOLIS)
- Model-driven Microscopy Image Analysis for Stem Cell Discovery
- Accurate Object Segmentation and Detection for Wide-Area Persistent Surveillance
- A Quadcopter with Heterogeneous Sensors for Autonomous Bridge
- Brokerage Services for the Next Generation Cloud

- An Infrastructure-free Vehicle Management Architecture to Support Secure Service Provisioning in VANETs
- Data Compression in Wireless Sensor Networks
- Secure Data Aggregation in Wireless Sensor Networks
- Information Fusion in Networked Controlled System

Current Funding Sources:

- National Science Foundation (NSF)
- Department of Education (DOE)
- Air Force Research Lab (AFRL)
- Army Research Lab (ARL)
- National Institute of Standards and Technology (NIST)
- Missouri University of Science and Technology (Intelligent System Center)
- University of Missouri Research Board
- Lockheed Martin
- Mid-America Transportation Center

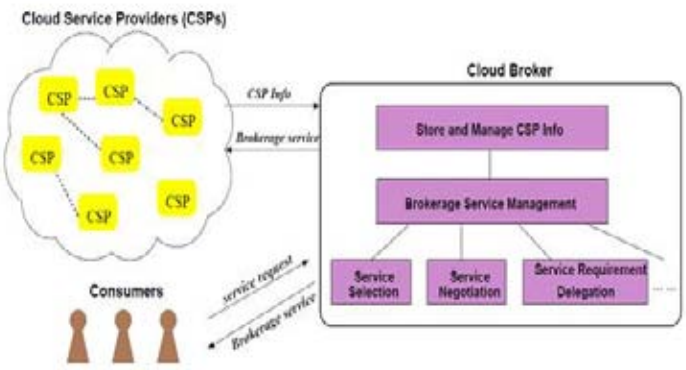
Research Highlights:

Brokerage Services for the Next Generation Cloud

Dan Lin

Cloud computing is a means by which highly scalable, technology-enabled services can be easily consumed over the Internet on an as-needed basis. Commercial and individual cloud computing services are already available from Amazon, Google, Microsoft, etc. We speculate that future cloud services will increasingly involve multiple clouds, and will utilize and synthesize capabilities from multiple clouds. Applications from different organizations will establish collaborative relationships and share information dynamically in cloud computing. In this increasingly complex scenario, both consumers and service providers are facing new challenges that cannot be easily conquered by themselves. Specifically, consumers will need to be able to identify the best service providers from a potentially huge pool, which could be computationally demanding. Service providers will need to be able to ensure the security and privacy of data shared among the loosely connected collaborators and subcontractors. It is not trivial for each single service provider to manage and monitor security and privacy issues throughout the cloud service provisioning that involves multiple parties.

The objective of this project is to design a novel brokerage-based architecture to serve as a middle-man between the consumers and cloud service providers to promote the cloud provisioning by: (i) providing consumers with automated service selection mechanisms that help obtain cost-effective cloud services tailored for the specific consumers needs; and (ii) reducing the security and privacy management burden on service providers caused by the existing relationships among providers and their subcontractors.



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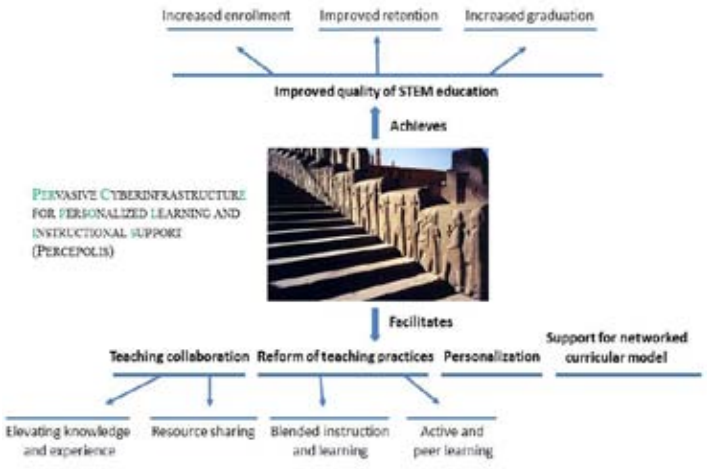
Personalized Education with the PERCEPOLIS Platform

Ali Hurson

Stimulating transformative changes in STEM education has been identified as the focus of numerous federal initiatives. Most specifically, President Obama's "Educate to Innovate" campaign aims at increasing STEM literacy, improving the standing of the United States in STEM achievement and preparing the next generation of American scientists, and expanding STEM education opportunities for underrepresented groups.

Dire and unprecedented economic constraints have severely impeded the ability of both public and private institutions of higher learning to respond to this urgent need. Constraints on physical capacity, teaching resources (exacerbated by widespread hiring freezes), and laboratory facilities seriously threaten the ability of universities and community colleges to keep abreast of advances in science and technology.

Advances in databases, computational intelligence, and pervasive computing, which allow "any-time, anywhere" transparent access to information, provide fertile ground for radical changes in pedagogy. Recent studies of undergraduate education have identified "linearity" and "static trajectory" of the dominant curricular as contradictory model to the body of knowledge on how students learn. A networked model and personalization of trajectory have been proposed as potential solutions. Cyberinfrastructure leveraging aforementioned technological advances can yield improvements in both instruction and learning, through personalization and support of networked curricula. This research is an attempt in that direction. It offers an innovative, practical, and comprehensive alternative to the traditional linear curriculum and lecture-based static pedagogy. The cornerstone and pillar of the proposed activities is Pervasive Cyberinfrastructure for Personalized Learning and Instructional Support (PERCEPOLIS), which leverages a collection of enabling technologies to facilitate transformative changes to higher education, by enabling the effective use of learning technology and the personalization of courses and curricula.



Fundamental to PERCEPOLIS is the modular approach to course development. Modules in different courses can be linked to each other, facili-

tating implementation of a networked curricular model. Furthermore, blended instruction, where students are responsible for perusing certain learning objects outside of class, allows the focus of face-to-face meetings to shift from lecture to active learning, interactive problem-solving, and reflective instructional tasks, i.e. flip classroom. The novelty of PERCEPOLIS lies in its ability to consider a student's academic profile, interests, and learning style, to customize the trajectory through a course or curriculum. Finally, PERCEPOLIS facilitates the collection of data on student performance and learning at a resolution that far exceeds what is currently available. Knowledge discovery from this rich data set can yield invaluable insights, such as the efficacy of particular instructional techniques.

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- Hurson A.R. and Sedigh S., "PERCEPOLIS: Pervasive cyber-infrastructure for personalized learning and instructional support". Intelligent Information Management, Vol. 2, No. 10, pp. 583-593, 2010.
- Hurson, A.R. and Sedigh, S., "Transforming the Instruction of Introductory Computing to Engineering Students". Transforming Engineering Education conference, Dublin, Ireland, 2010.

McDonnell Douglas Foundation Software Engineering Laboratory

http://web.mst.edu/~fliu/selab.html

Mission: Is to perform research on challenging issues of software engineering technology that are critical to support the development, operation and maintenance of modern software-centric systems. Our lab will enhance the competitiveness of member organizations by conducting collaborative research programs, developing joint R&D proposals to compete for state, national, and international funding, and delivering high-quality educational and training programs both on-campus and off-campus.

Current Lab Faculty Researchers: Frank Liu (Lab Director), Marouane Kessentini, Bruce McMillin

Current lab student researchers: Ming Dong (Post-doc), Ravi Santosh Arvapally, Kenneth Kofi Fletcher, Eric Christopher Barnes, Ali Alhajhouj, Mohamed Wiem Mkaouer, Lokesh Krishna Ravichandran, Ali Ouni (Exchange student with University of Montreal-Canada), Adnane Ghannem (Exchange student with Ecole de Technologie Superieur-Canada), Rim Mahouachi (Exchange student with University of Tunis-Tunisia), Ameni Ben Fadhel (Exchange student with University of Tunis-Tunisia), Akshay Harwande, Wafa Werda (Exchange student with University of Tunis-Tunisia), Nathan Barron

Current Projects:

- Web-based Computer Supported Intelligent argumentation and collaborative Decision Support System.
- Development of a Portable Turn-Key Motion Capture System for Shop-Floor Use
- Automated Assembly Simulation using Motion Capture with Wiimotes
- Eye tracking for Model Maintenance and evolution
- Automation of code and model maintenance artificial intelligence-based techniques: transformation, testing and evolution
- Empirical studies for software refactoring

Current Funding Sources:

- Spirit Aerospace Co.
- National University Transportation Center, Missouri University of Science and Technology
- Qatar National Research Fund
- UniqueSoft
- Benchmark Consulting

Research Highlights:

Web-based Computer Supported Intelligent Argumentation and Collaborative Decision Support System

Frank Liu

Web-based argumentation and collaborative decision making is a process of reaching consensus in a decision making group of stakeholders through web-based argumentation by evaluation of different possible alternative solutions of an issue. The web-based intelligent argumentation system allows stakeholders to post their arguments and evidences on different alternatives of an issue, assign weights and priorities to the arguments and reach the most favorable alternative using a fuzzy inference engine.

1. Ravi Santosh Arvapally and Xiaoqing (Frank) Liu, "Analyzing credibility of arguments in a Web-based intelligent argumentation system for collective decision support based on K-means clustering algorithm", Accepted for publication in the journal of Knowledge Management Research & Practice, June, 2012.
2. Ravi Santosh Arvapally, Xiaoqing (Frank) Liu and Wei Jiang, "Identification of Faction Groups and Leaders in Web-based Intelligent Argumentation System for Collaborative Decision Support", the 2012 International Conference on Collaboration Technologies and Systems (CTS 2012), Denver, Colorado, USA, May 21-25, 2012.
3. Xiaoqing (Frank) Liu, Eric Christopher Barnes, and Juha Erik Savolainen, "Conflict Detection and Resolution for Product Line Design in a Collaborative Decision Making Environment, Proc. of the 2012 ACM Conference on Computer Supported Cooperative Work (CSCW'12), Seattle, Feb., 2012.
4. Xiaoqing (Frank) Liu, Rubal Wanchoo, Ravi Santosh Arvapally, "Empirical Study of an Intelligent Argumentation System in Multi-Criteria Decision Making," Proc. of the 2011 International Conference on Collaboration Technologies and Systems (CTS'2011), Philadelphia, Pennsylvania, USA, May, 2011.
5. Xiaoqing (Frank) Liu, Hojong Baik, Ravi Santosh Arvapally, Rubal Wanchoo, Web-based Intelligent Computational Argumentation based Conflict Resolution in Air Traffic Management, Proc. of 2010 Annual International Symposium on Applications and the Internet, Seoul, South

Korea, July, 2010.

Model and Code Transformation by Example
Marouane Kessentini

The objective of this research is to design, build and evaluate new automated software maintenance tools which will enable computer engineers charged with the task of evolving existing software systems to do so more efficiently and accurately than ever before. Improving the capability to evolve existing software will drastically improve productivity and competitiveness of our software industry. In order to benefit from new hardware innovations that provide higher performance and better functionality, existing software systems must also evolve. However, the evolution of languages and software architectures provides a strong motivation to migrate/transform existing software systems. In fact, this transformation allows taking advantage of the latest technologies while preserving system functionality. One can replace existing designs with new, functionally equivalent ones manually. However, as argued in, developing new systems from scratch implies high costs and risks whereas redesigning or revalidating the same functionalities, although common and expected, has become an intense time-consuming task due to years of extensive maintenance where changes were not properly documented and design practices became outdated.

In this project, we intend to improve developer productivity by automating different evolution/transformation activities for software accuracy in evolving large software systems. We plan to investigate and evaluate ways to make model and code transformations easy to manipulate, reusable, fully automatable, and verifiable. The ultimate goal of this project is to provide automated software maintenance tools that developers can use to transform, test and evolve models or codes easily. The new automation technology will create a collaborative environment where information can be retained and shared with future ease of handling set as a goal that will always be at the forefront of maintenance development.

1. Kessentini, M., and Mkaouer, M., Multi-objective model transformation, Software of Systems and Software, Accepted, Elsevier (to appear), 2012.
2. Kessentini, M., Sahraoui, H., Boukadoum, M. and Omar ben Omar, Search-Based Model Transformation by Example, Software and System Modeling Journal, Vol 20, pp. 209-226, Springer, 2012.
3. Kessentini, M., Sahraoui, H., and Boukadoum, M. Example-based Model Transformation Testing, Automated Software Engineering Journal, Vol 18, pp 199-224, Springer, 2012.
4. Ben Fadhel, A., Kessentini, M., Langler, P., and Wimmer, M., Search-based Detection of High-level Model Change, Published, 28th IEEE International Conference on Software Maintenance (ICSM 2012), IEEE computer society (acceptance rate 21%), 2012.
5. Ouni, A., Kessentini, M., Sahraoui, H., and Mohamed Salah Hamdi, Search-based Refactoring: Towards Semantics Preservation, Published, 28th IEEE International Conference on Software Maintenance (ICSM 2012), IEEE computer society (acceptance rate 21%), 2012.

Natural Computation Laboratory (NC-LAB)

http://web.mst.edu/~tauritzd/nc-lab/

Mission: The mission of the NC-LAB is to develop novel types of computational problem solving methods inspired by nature which are both more powerful and user-friendlier than the current state-of-the-art, and to apply them to real-world problem solving. Since the lab's founding in 2002, its computational problem solving method of choice has been Evolutionary Computing.

Current Faculty Researchers: Dr. Daniel Tauritz (Lab Director), Dr. Marouane Kessentini (Search-Based Software Engineering Group Leader), Dr. Bruce McMillin, Dr. Mariesa Crow (Department of Electrical & Computer Engineering), and Dr. Matt Insall (Department of Mathematics & Statistics).

Current Student Researchers: Matthew Nuckolls, Jeffery Shelburg, Jasenko Hosic, Ryan Birmingham, Thomas Reese, Alex Bertels, Matthew Martin, Justin Smith, Justin O'Brien, Ian Lehmann, George Mausshardt, Jeremy Daugherty, Alex Smith, Mohamed Wiem Mkaouer, Lokesh Krishna Ravichandran, Ali Ouni, Adnane Ghannem, Rim Mahouachi, Ameni Ben Fadhel, Akshay Harwande, Wafa Werda, and Nathan Barron.

Current Projects:

- Computational Intelligence Techniques for Situational Awareness in Computing Networks
- Distributed Computational Intelligence Techniques for Complex Event Correlation in Real-World Cyber Security Datastreams
- Coevolutionary Automated Software Correction
- Fitness-Guided Fault Localization
- Self-Configuring Evolutionary Algorithms
- Automated Partial Credit Grader
- Automated Search Algorithm Selection
- Model Transformation by Example
- Search-Based Model Evolution and Testing
- Search-Based Refactoring, Empirical Studies for Software Refactoring
- Multi-Objective Optimization Framework for Model Maintenance.

Current Funding Sources:

- Sandia National Laboratories (SNL)
- S&T Intelligent Systems Center (ISC)
- Qatar National Research Fund
- UniqueSoft
- Benchmark Consulting.

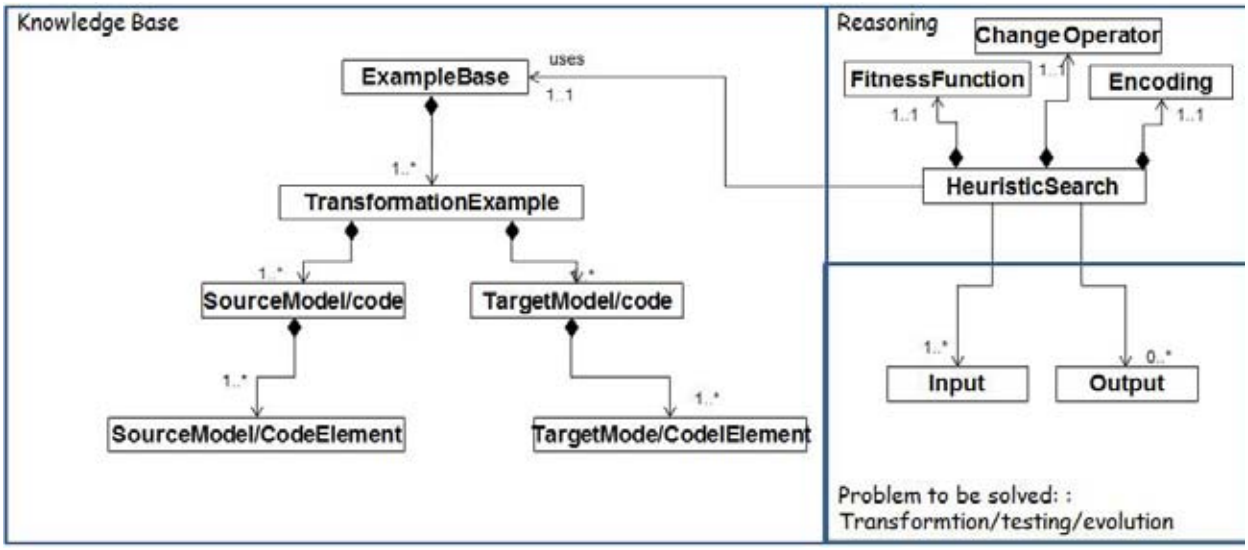
Research Highlight:

Automated Software Maintenance
Marouane Kessentini

Attention is paid to the evolution aspects in Model-Driven Engineering (MDE) along with the growing importance of modeling in software development. In fact, software models, defined as code abstractions, are iteratively refined, restructured and evolved due to many reasons such as correcting errors in design, modifying a design to accommodate changes in requirements, and modifying a design to enhance existing features. One of the foci of the SBSE research group is the definition, design and implementation of a new framework that will improve the way software systems are evolved and implemented today. The proposed framework is based on the use of optimization techniques, such as heuristic search, to detect, classify, and test changes between different software versions.

The ultimate goal of this project is to provide automated software maintenance tools that developers can use to easily transform, test and evolve their code and models. The project proposes the use of examples, found in industrial organizations (recorded software changes, manually transformed code/model fragments, etc.) as input to automate the transformation/evolution and testing activities. In the proposed project, devel-

opers no longer define rules manually to automate model and code transformation or constraints to detect transformation errors and model/code changes. Instead, developers provide the old and new version of the model/code as transformation examples, and then the "by-example" framework, based on the use of different heuristic search algorithms, will generalize a reusable context-aware transformation, testing and evolution from these examples. Thus, using this historical data (examples), model transformation rules and refactoring suggestions can be generated automatically and transformation errors and model/code changes can be identified, classified and fixed. We are planning to evaluate the applicability of all the proposed contributions in an industrial setting (large-scale validation) in collaboration with an industrial partner and on different large-scale open source systems.



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1. Ali Ouni, Marouane Kessentini, Houari Sahraoui, and Mounir Boukadoum, Maintainability defects detection and correction: a multi-objective approach. Automated Software Engineering, Springer, Vol. 19, pp. 1-33, 2012.
2. Marouane Kessentini, Rim Mahouachi, and Khaled Ghédira, What you like in design use to correct bad-smells. Software Quality Journal, Springer, Vol. 20, Number 4, pp. 51-82, 2012.
3. Rim Mahouachi, Marouane Kessentini, and Khaled Ghédira, A New Design Defects Classification: Marrying Detection and Correction. In the Proceedings of the 15th IEEE International Conference on Fundamental Approaches to Software Engineering (FASE 2012), Springer, LNCS 7212, pp. 455-470 (acceptance rate 24%), 2012.
4. Ameni Ben Fadhel, Marouane Kessentini, Philip Langler, and Manuel Wimmer, Search-based Detection of High-level Model Changes, In the Proceedings of the 28th IEEE International Conference on Software Maintenance (ICSM 2012), IEEE Computer Society (acceptance rate 21%), 2012.
5. Ali Ouni, Marouane Kessentini, Houari Sahraoui, and Mohamed Salah Hamdi, Search-based Refactoring : Towards Semantics Preservation, In the Proceedings of the 28th IEEE International Conference on Software Maintenance (ICSM 2012), IEEE Computer Society (acceptance rate 21%), 2012.

Selected Graduate Certificate Programs In Computer Science

What is a Graduate Certificate Program?
Graduate Certificate programs give students the opportunity to increase their knowledge in specific areas of interest. These courses provide students with the latest knowledge and skills in strategic areas of computing and are presented by Missouri University of Science and Technology instructors that are experts in their fields. Most of the courses will be offered through distance education over the internet. Where there is sufficient interest, some courses may be taught by traditional instruction methods at Missouri S&T off site locations such as Ft. Leonard Wood, St. Louis, and Springfield, MO.

ADMISSION REQUIREMENTS:
Graduate Certificate Program, Entrance Requirements & Course Descriptions:

The only entrance requirements for students entering a graduate certificate program is that they satisfy the prerequisites for any course they take in the program. Partial course descriptions are provided in this brochure (Graduate Certificate Program Brochure). Complete course descriptions are provided online at http://registrar.mst.edu/cataloginfo/cataloginfo.html.

The Software Design and Development Certificate provides an attractive option for the working professional to expand their experience in Software Engineering. The core of four classes gives a treatment of software project management in its many roles, from overall project management and process improvement to the management of individual lifecycle components, including software deployment and evolution. Specialized coursework gives depth in advanced object-oriented design, software quality and testing theory and practice, and an advanced treatment of software metrics.

Software Testing and Quality Assurance (CS 307): It covers unit testing, subsystem testing, system testing, object-oriented testing, testing specification, test case management, software quality factors and criteria, software quality requirement analysis and specification, software process improvement, and software total quality management.
Object Oriented Analysis and Design (CS 308): This course will explore principles, mechanisms, and methodologies in object-oriented analysis and design. An object-oriented programming language will be used as the vehicle for the exploration.
Software Engineering II (CS 406): A quantitative approach to measuring costs/productivity in software projects. The material covered will be software metrics used in the life cycle and the student will present topical material.
Software Requirements Engineering (CS 409): This course will cover advanced methods, processes, and technique for discovering, analyzing, specifying and managing software requirements of a software system from multiple perspectives. It will discuss both functional and non-functional requirements analysis.

The Wireless Networks and Mobile Systems Certificate is designed to provide the working professional with an intensive treatment in wireless systems and applications.

Program coverage includes network architecture and protocols, computer communication and networking basics, principles of network security, and techniques for preventing, detecting and recovering from attacks, as well as advanced topics that address the specific issues and challenges in the wireless and mobile environment, including wireless network provisioning and deployment, location and mobility management, security and privacy, attacks and countermeasures, mobile computing applications, and data management in networked sensor systems.

Graduate students will receive this certificate by completing four 3-credit courses from the following list:

Computer Communications and Networks (CS 365): Network architecture model including physical protocols for data transmission and error detection/correction, data link concepts, LAN protocols, internet working, reliable end to end service, security, and application services. Students will implement course concepts on an actual computer network.
Computer Security (CS 463): The course presents various vulnerabilities and threats to information in cyberspace and the principles and techniques for preventing and detecting threats, and recovering from attacks. The course deals with various aspects and layers of security: data-level, network-level, system-level, and application-level security.
Mobile and Sensor Data Management (CS 467): Architectures of mobile computing systems; Mobile-IP support in mobile computing systems; location data management, Broadcasting and indexing, replication control; caching, fault tolerance and reliability of mobile systems; adhoc and sensor routing schemes, key management.
Advanced Network Security (468): Network security issues such as authentication, anonymity, traceback, denial of service, confidentiality, forensics, etc. in wired and wireless networks

Heterogeneous and Mobile Databases (CS 438): Extensively discusses multidatabase systems (MDBS) and mobile data access systems (MDAS), moreover it will study traditional distributed database issues within the framework of MDBSs and MDASs.
Privacy Preserving Data Integration and Analysis (CS 461): Covers basic tools, in statistics and cryptography, commonly used to design privacy-preserving and secure protocols in a distributed environment as well as recent advances in the field of privacy-preserving data analysis, data sanitization and information retrieval. Students are expected to complete a course project on a relevant topic of their choosing.

Information Assurance & Security Officer Essentials Certificate protecting information systems is key to protecting the nation's critical infrastructures. Only through diligence and a well-trained workforce will we be able to adequately defend the nation's vital information resources.

Graduate students will receive this certificate by completing four 3-credit courses from the following list:

Intellectual Property for Computer Scientists (CS 317): A presentation of the relationship between the law of intellectual property and computer science. Topics include the application of copyright principles to computer programs, protection of computer programs through patents and trade secret law, and the effect of various agreements which are frequently encountered by the computer scientist.
Security Operations & Program Management (CS 362): An overview of information security operations, access control, risk management, systems and application life cycle management, physical security, business continuity planning, telecommunications security, disaster recovery, software piracy, investigations, ethics and more. There will be extensive reporting, planning and policy writing. Prerequisite: Writing emphasized course AND Operating System course AND Computer Networking course.
Trustworthy, Survivable Computer Networks (CpE 349): Basic issues in network management, testing, and security.
Network-Centric Systems Reliability & Security (CpE 449/ SE 449): Network-centric systems comprise a diverse category of large and complex systems whose primary purpose is to provide distributed, network-type services.
Advanced Network Security (CS 468): network security issues such as authentication, anonymity, traceback, denial of service, confidentiality, forensics, etc. in wired and wireless networks.

Computational Intelligence Certificate This graduate certificate program provides practicing engineers the opportunity to develop the necessary skills in the use and development of computational intelligence algorithms based on evolutionary computation, neural networks, fuzzy logic, and complex systems theory. Engineers can also learn how to integrate common sense reasoning with computational intelligence elective courses such as data mining and knowledge discovery.

Core Courses
Computational Intelligence (CpE 358/ EE367/ SysEng 367): Introduction to Computational Intelligence (CI), Biological and Artificial Neuron, Neural Networks, Evolutionary Computing, Swarm Intelligence, Artificial Immune Systems, Fuzzy Systems, & Hybrid Systems. CI application case studies covered include digital systems, control, power systems, forecasting and time-series predictions. Prerequisite: Stat 217. (Co-listed with EE 367)

And select one of the following:

Introduction to Artificial Intelligence (CS 347): A modern introduction to AI, covering important topics of current interest such as search algorithms, heuristics, game trees, knowledge representation, reasoning, computational intelligence, and machine learning. Students will implement course concepts covering selected AI topics. Prerequisite: CS 253
Evolutionary Computing (CS 348): Introduces evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory (e.g., genetic algorithms), capable of solving complex problems for which other techniques fail. Students will implement course concepts, tackling science, engineering and/or business problems. Prerequisites: CS 253 and a statistics course
Introduction to Neural networks and Applications (SysEng 378/ EE 368): Introduction to artificial neural network architectures, adaline, madaline, back propagation, BAM, and Hopfield memory, counter-propagation networks, self organizing maps, adaptive resonance theory, are the topics covered. Students experiment with the use of artificial neural networks in engineering through semester projects. Prerequisite: Math 204 or 229.

Elective Courses (Select two courses not taken as a core course):

Evolvable Hardware (EE/CpE/Sys Eng 301): This course deals with adaptive evolvable systems operating in a changing envi-

ronment. Components/building blocks approach for the design of evolvable systems and the mathematical theory of evolvable machines and the idea of virtual reconfigurable circuits for the design of more adaptive, competitive and innovative engineering products will be taught. Prerequisites: CpE 358/ EE 367/SysEng 367

Introduction to Artificial Intelligence (CS 347): A modern introduction to AI, covering important topics of current interest such as search algorithms, heuristics, game trees, knowledge representation, reasoning, computational intelligence, and machine learning. Students will implement course concepts covering selected AI topics. Prerequisite: CS 253

Evolutionary Computing (CS 348): Introduces evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory (e.g., genetic algorithms), capable of solving complex problems for which other techniques fail. Students will implement course concepts, tackling science, engineering and/or business problems. Prerequisites: CS 253 and a statistics course

Advanced Topics in Artificial Intelligence (CS 447): Advanced topics of current interest in the field of artificial intelligence. This course involves reading seminal and state-of-the-art papers as well as conducting topical research projects including design, implementation, experimentation, analysis, and written and oral reporting components. Prerequisite: CS 347 or CS 348 or CpE 358.

Advanced Evolutionary Computing (CS 448): Advanced topics in evolutionary algorithms, a class of stochastic, population-based algorithms inspired by natural evolution theory, capable of solving complex problems for which other techniques fail. Students will conduct challenging research projects involving advanced concept implementation, empirical studies, statistical analysis, and paper writing. Prerequisite: CS 348

Adaptive Critic Designs (SysEng/CpE/EE 458): Review of Neurocontrol and Optimization, introduction to Approximate Dynamic Programming (ADP), Reinforcement Learning (RL), combined concepts of ADP and RL, Heuristic Dynamic Programming (HDP), Duel Heuristic Programming (DHP), Global Dual Heuristic Programming(GDHP) and case studies. Prerequisites: SysEng/CpEng/EE 368

Data Mining and Knowledge Discovery (SysEng 404/ CpE 404/ CS 444): Data mining and knowledge discovery utilizes both classical and new algorithms, such as machine learning and neural networks, to discover previously unknown relationships in data. Key data mining issues to be addressed include knowledge representation and knowledge acquisition (automated learning). Prerequisites: CS 304 or 347, Stat 215

Neural Networks for Control (EE 337): Introduction to artificial neural networks and various supervised and unsupervised learning techniques. Types of neural nets architecture used in control. Identification and adaptive control using neural networks. Case studies and laboratory projects. Prerequisite: EE 231

Introduction to Neural networks and Applications (SysEng 378/ EE 368): Introduction to artificial neural network architectures, adaline, madaline, back propagation, BAM, and Hopfield memory, counter-propagation networks, self organizing maps, adaptive resonance theory, are the topics covered. Students experiment with the use of artificial neural networks in engineering through semester projects. Prerequisite: Math 204 or 229.

Markov Decision Processes (CpE/SysEng/EE 457): Introduction to Markov Decision Processes & Dynamic Programming. Application to Inventory Control & other optimization & control topics.

Advanced Neural Networks (SysEng 478): Advanced artificial neural network architectures, namely; Radial-Basis Function Networks, Support Vector Machines, Committee Machines, Principal Components Analysis, Information-Theoretic Models, Stochastic Machines, Neurodynamic Programming, and Temporal Processing are the topics covered. Prerequisite: SysEng 378 or equivalent neural network course.

Systems and Software Architecture Certificate The systems and software architect fills a critical role in today's development process, transforming market inputs into the requirements and architecture specification of a product that independent (often remote) development teams can implement. Requests from industrial partners have led to a focused graduate certificate training program on Systems and Software Architecture containing coursework as follows:

Software Intensive Systems Architecting (SysEng 470, LEC 3.0): Provides the basic tools and concepts of architecting complex software intensive systems. The following topics are covered under four main sections: Architecting Process, Architecting Heuristics, Architecting Patterns and Frameworks, and Architecture Assessment. Offered via distance and on-campus.

Software Requirements Engineering (CmpSci 409, LEC 3.0): Software Requirements Engineering covers all the activities involved in discovering, analyzing, specifying and managing software requirements for a software system from multiple perspectives. Students will study how to elicit, analyze, specify, validate, and manage software requirements using advanced software requirements engineering methods. Offered via distance and on-campus.

Object-Oriented Analysis and Design (CmpSci 308, LEC 3.0): This course will explore principles, mechanisms, and methodologies in object-oriented analysis and design. An object-oriented programming language will be used as the vehicle for the exploration. Offered via distance and on-campus.

Model Based Systems Engineering (SysEng 435/CmpSci 405, LEC 3.0): Provides the student with an understanding of the

use of models to represent systems and the underlying system elements, components, etc. The student will gain proficiency in using a systems modeling language and how it can be used to shift systems engineering from a document centric paradigm to one that is model centric. Offered via distance and on-campus.

Information Systems & Cloud Computing Certificate is tailored to the working professional who wants to expand their knowledge of advanced data management technologies. Object-oriented database structure, data mining, web database, bioinformatics, and multimedia storage and retrieval techniques form the core of the study.

Introduction to Data Mining (CS 301): This course provides an introduction to classical data mining methods which can be used to predict unknown or future values of variables, or to find human-interpretable patterns that describe data. Topics will include classification, clustering, association rule discovery, sequential pattern discovery, regression, and deviation/anomaly detection.

Cloud Computing (CS 401): Cloud computing architecture, data management and indexing in cloud computing, security and privacy issues in cloud computing, scheduling and cost analysis, sensor and mobile cloud, Ajax/mapreduce and EC3 cloud.

Heterogeneous and Mobile Databases (CS 438): This course extensively discusses multidatabase systems (MDBS) and mobile data access systems (MDAS), moreover it will study traditional distributed database issues within the framework of MDBSs and MDASs.

Students choose one of the following three courses:

Database Systems (CS 338): This course introduces the advanced database concepts of normalization and functional dependencies, transaction models, concurrency and locking, timestamping, serializability, recovery techniques, and query planning and optimization. Students will participate in programming projects. This course assumes students have an introductory course in database systems.

Data Mining & Knowledge Discovery (SysEng 404/ CpE 404/ CS 444): Data mining and knowledge discovery utilizes both classical and new algorithms, such as machine learning and neural networks, to discover previously unknown relationships in data. Key data mining issues to be addressed include knowledge representation and knowledge acquisition (automated learning).

Privacy Preserving Data Integration and Analysis (CS 461): This course covers basic tools, in statistics and cryptography, commonly used to design privacy-preserving and secure protocols in a distributed environment as well as recent advances in the field of privacy-preserving data analysis, data sanitization and information retrieval. Students are expected to complete a course project on a relevant topic of their choosing.

Master's Degree Program in Computer Science:

A student who completes a graduate certificate program in computer science with grades of B or better will be admitted into the master's degree program in computer science at the Missouri University of Science and Technology.[1]

[1] The student may be accepted as a "conditional" graduate student. Such students will need to complete additional prerequisite requirements before they are classified as "regular" graduate students. For more information go online at http://cs.mst.edu/graduatedegreeprograms/mscomputerscience.html.

Missouri S&T is Certified by the National Security Agency (NSA) Committee on National Security Systems (CNSS) for National Standards 4011 (National Training Standard for Information Systems Security (INFOSEC) Professionals) and 4014E (Information Assurance Training Standard for Information Systems Security Officers (ISSO)).

Contact Information

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Computer Science Department 2012
Colloquium Series

Dr. Yiyu Shi
Missouri S&T
February 14, 2012
Title: Compressed Sensing Based Through-Silicon-Via Modeling (Balancing the Seesaw of Flexibility and Accuracy)

Abstract - Through-Silicon-Vias (TSVs) are the critical enabling technique for three-dimensional integrated architectures. Many works exist in literature to model their electrical performance. However, those methods either lack flexibility (only work for fixed geometry) or accuracy. In this talk, a novel approach will be discussed to model the electrical performance of TSV pairs accurately yet flexibly. It is based on compressed sensing, a recent breakthrough in the signal processing society. Experimental results indicate that with an exceptionally small number of samples from full-wave simulation, the proposed model has a maximum relative error of 3.94% over a wide range of geometry parameters and frequencies. To the best of the speaker's knowledge, this is the first effort in literature to apply compressed sensing technique in the CAD modeling society.

Brief Bio - Yiyu Shi is currently an assistant professor in the Electrical and Computer Engineering Department at Missouri University of Science and Technology (formerly University of Missouri, Rolla). His research interests include advanced design and test technologies for 3D ICs, and renewable energy applications. In recognition of his research, five of his papers have been nominated for the Best Paper Award in top conferences (DAC'05, ICCAD'07, ICCD'08, ASPDAC'09, DAC'09). He was also the recipient of the IBM Invention Achievement Award in 2009, and the second placer winner of the TAU power grid analysis contest (sponsored by IBM) in 2011.

Dr. Nayot Poolsappasit
Missouri S&T
February 28, 2012
Title: Risk Assessment Using Bayes Graphs

Abstract - Security risk assessment and mitigation are two vital processes that need to be executed to maintain a productive IT infrastructure. On one hand, models such as attack graphs and attack trees have been proposed to helps ITs identify flaws in the design such as 'fail to place authentication where/when it is needed' -- the flaw which traditional security best practices such as standard compliance and patch management cannot manage. On the other hand, different decision problems have been explored to identify the minimum-cost hardening measures. However, these risk models do not help reason about the causal dependencies between network states. Further, the optimization formulations ignore the issue of resource availability while analyzing a risk model. In this paper, we propose a risk management framework using Bayesian networks that enable a system administrator to quantify the chances of network compromise at various levels. We show how to use this information to develop a security mitigation and management plan. In contrast to other similar models, this risk model lends itself to dynamic analysis during the deployed phase of the network. A multi-objective optimization platform provides the administrator with all trade-off information required to make decisions in a resource constrained environment.

Brief Bio - Nayot Poolsappasit received his Ph.D. from Colorado State University in 2010. He is currently a post-doctoral research fellow at the Missouri University of Science and Technology. He performs scientific research in security risk assessment and trusted computing in sensor networks. His current research interests include sensor-cloud services, trusted data aggregation, and identity and access management in virtual sensor networks. He is a member of the IEEE.

Chris Jonson
Garmin
March 1, 2012
Title: Debugging on Embedded Systems

Abstract - The challenges presented by debugging an embedded system require different approaches from those encountered in desktop software. Some of the methods for debugging embedded systems will be discussed, along with some amusing anecdotes surrounding the bugs which prompted their development.

Brief Bio - Chris Johnson, B.S. in Applied Mathematics, Magna Cum Laude, Missouri S&T (UMR) 2008 Chris has worked on embedded systems for Garmin, Boeing and the US Navy. Embedded applications appealed to him early in his professional career because of the challenges they present due to resource constraints and debugging difficulty.

Brian Mize
FBI
April 1, 2012
Title: Computer Crime Trends and Practices

Abstract - Electronic devices have evolved to become an integral part of day to day life for a large portion of the world's population. With this evolution, the data contained on these devices and subsequently the demand on law enforcement to preserve and extract evidence relevant to criminal cases has grown exponentially. The general discussion will include standard forensic practices and in depth looks at the goals and capabilities of a modern forensic examiner. Some emphasis will be placed on trends in computer crime activity including anti-forensic techniques and tools used by perpetrators to obfuscate data and elude law enforcement.

Brief Bio - SFO Brian Mize has been employed by the Chesterfield Missouri Police Department since October 1996. He is a graduate of St. Louis University and Lindenwood University. He is currently assigned to the Federal Bureau of Investigation, St. Louis Cyber Squad, as a Special Federal Officer where he conducts investigations related to computer crime and child exploitation on the Internet. He is also a Forensic Examiner with the Regional Computer Crime Education and Enforcement Group where he conducts forensic examinations of electronic evidence.

Dr. Marouane Kessentini
Missouri S&T
September 4, 2012
Title: Search-based Transformation by Example

Abstract - Model and code transformation (M&CT) is an important component of the Model Driven Engineering paradigm. Despite the many advances in research, writing M&CT mechanisms is still a technical and economic challenge. In this talk, I will present three of my contributions to resolving this challenge. The first contribution aims to automate model transformations by considering M&CT as an optimization problem. In this setting, different transformation possibilities are evaluated and, for each possibility, a quality is associated depending on its conformity with a reference set of examples. The second contribution targets the identification of code parts (design defects) that need to be transformed in order to improve the global quality of a program. To this end, I will present two techniques. The first one exploits a genetic programming algorithm that automatically finds defect-detection rules by combining metrics and thresholds according to a set of known instances of design defects (defect examples). Taking inspiration from artificial immune systems, the second technique is based on the notion that the more a code deviates from examples of good practices, the more likely it is risky. The third contribution addresses the problem of M&CT testing. We propose a testing oracle function that compares target test cases with a base of examples containing good quality transformation traces, and assigns a risk level based on the dissimilarity between the two. The three contributions were evaluated successfully with industrial and widely-used open-source projects.

Brief Bio - Marouane Kessentini is an assistant professor in Computer Science at Missouri University of Science and Tech. He holds a Ph.D. in Computer Science, University of Montreal (Canada), 2011. His research interests include the application of artificial intelligence techniques to software engineering (search-based software engineering), software testing, model-driven engineering, software quality, and engineering. He has published around 40 papers in conferences, workshops, books, and journals including four best paper awards. His thesis was selected for the best thesis award. He has served as program committee member in several conferences and journals, and as organization member of many conferences and workshops.

Alex Kent
Los Alamos National Laboratory
September 11, 2012
Title: Early Adopters: A Model for Correlating Internet Web Browsing with Compromise Events

Abstract - Downloading information content from the Internet is a primary activity for most networked computers and it provides a basis for behavior characterization and association to malicious activity. Using web traffic (HTTP) logs, aggregated antivirus detection logs, and information security incident response tickets from Los Alamos National Laboratory's network over a six month period involving over 24,000 computers and almost 4 million unique Internet content locations, this talk will present an analysis of Internet web surfing behavior in combination with detected malicious activity. The talk will then present a model of risk behavior based on the concept of early and independent adopters of content from the Internet showing a useful and novel correlation between potential computer compromise and Internet access behavior.

Brief Bio - Alex Kent is a research scientist at Los Alamos National Laboratory (LANL); his work is primarily focused on applied cyber security research, including distributed intrusion detection systems, dynamic trust models, authentication systems, and ethology-inspired cyber defense models. Alex was previously the program director responsible for LANL's non-Department of Energy (DOE) cyber security work and the director of LANL's Advanced Computing Solutions (ACS) organization, centered on solving current and forward-looking cyber security problems with a cross-disciplinary and applied R&D emphasis. Prior to ACS, as deputy division leader over LANL's computing, telecommunications, and networking organization, Alex was responsible for overseeing the Laboratory's site-wide classified and unclassified IT environments, services, and security, including LANL's computer incident response capability. Alex has led and developed a number of high-impact, successful LANL cyber security projects, including an integrated physical-cyber security protection system, a USB-port protection system, a heterogeneous network host quarantine system, and a scalable two-factor authentication system. Alex has been a member of the technical staff at LANL since 1997, working in areas relating to cyber security and IT management. He is also an adjunct staff researcher with the Institute for Defense Analysis at the Center for Computing Sciences. Alex has been presented with three Distinguished Performance Awards for his various technical contributions and has also received a patent for work in network authentication. He is currently a PhD Candidate at New Mexico Tech.

Dr. Valeriy Vyatkin
University of Auckland
October 2, 2012
Title: Function Block Architecture for Bringing Intelligent Automation into Industry

Abstract - There has been impressive research effort towards making industrial automation more intelligent. Examples include multi-agent systems with reasoning capabilities and semantic knowledge driven, self-organizing systems in such areas, such as manufacturing, energy and transportation. However, penetration of these results to industrial world is not great. Practitioners oppose that all technical systems need to implement concrete requirements respecting various constraints, and it is hard to ensure those with "intelligent" automation. Another obstacle is the lack of engineering methods which convert requirements to the intelligent automation solutions. All these trends are observed in power systems automation and SmartGrid, as well as in other industrial sectors. In this talk we will present the concept of Cyber-Physical Component architecture that is being developed in the speaker's group in Auckland. This architecture addresses several design software and system engineering challenges: right equilibrium between abstract representation and "executability", round-trip engineering and ability to exhibit emergent behavior. It offers ability of self-verification thanks to employing the concept of multi-closed-loop modelling. CPC exhibit such properties as portability, interoperability and configurability thanks to the reliance on open standards. The use of synchronous execution paradigm adds determinism and predictability at the run-time. The CPC architecture has been successfully applied in modelling and implementation of systems in such domains as manufacturing, logistics, power systems and building automation. It is being used as "underlying canvas" for generative programming.

Brief Bio - Valeriy Vyatkin is Associate Professor at the Department of Electrical and Computer Engineering, University of Auckland, New Zealand. Research interests of are in the area of dependable distributed automation and industrial informatics, including software engineering for industrial informatics systems, distributed architectures and multi-agent systems applied in various industry sectors: SmartGrid, logistics and transportation, material handling, building management systems, reconfigurable manufacturing, etc. Prof Vyatkin and his group are involved in joint research projects with companies in the U.S., Canada, Austria, New Zealand and Germany. He has been a Principal Investigator of research projects in the FREEDM program, funded by the National Science Foundation (USA). He is New Zealand delegate to the standardization committees

of the International Electrotechnical Commission (IEC) on standards 61131 and 61499. Prof Vyatkin held visiting professor positions at University of Cambridge (UK), University of New Brunswick (Canada), University of Paris-Sud (France), Tampere University of Technology (Finland) and Martin-Luther University of Halle-Wittenberg (Germany).

James Peery
Sandia National Laboratories
October 11, 2012
Title: Some Thoughts on Cyber Security Threats and Future Cyber Technologies

Abstract - To tip the balance in favor of cyber defenders, approaches and technologies must be developed and deployed that decrease benefits and impose costs (or risk) to attackers. Attackers are able to leverage the complexity of modern hardware and software systems at the component level to find and exploit a seemingly endless stream of vulnerabilities. These attacks scale globally to provide disproportionate benefit to attackers as a result of the relatively homogenous computing base that exists in most enterprise environments throughout the world. This talk will first describe Sandia National Laboratories and its history and mission space in cyber security. Next, the evolving cyber threat will be discussed. Finally, a few emerging cyber defense technologies will be highlighted.

Brief Bio - Dr. James Peery is the Director of the Information Systems Analysis Center, at Sandia National Laboratories (SNL) in Albuquerque, New Mexico. From 2007 to March 2010, James was the Director of the Computation, Computers, Information and Mathematics (CCIM) Center. CCIM is the foundation of SNL's research and development activities in high performance computing. CCIM contains the Computer Science Research Institute (CSRI), the joint Institute for Advanced Architectures and Algorithms (IAA) with ORNL and the Alliance for Computing at Extreme Scales (ACES) with LANL. During this period, James was the Program Director of the NNSA's Advanced Simulation and Computing Program (ASC - $120M/y) at SNL. Prior to returning to Sandia, James worked at Los Alamos National Laboratory (LANL) from 2002 to 2007 in the positions of Hydrodynamic Experiments Division Leader, Principal Deputy Associate Director of the LANL's $1.2B Nuclear Weapons program and Program Director of the NNSA's Advanced Simulation and Computing Program (ASC - $180M/y). James' major research areas are in Arbitrary Lagrangian Eulerian (ALE) algorithms and parallel algorithms where he has published greater than 50 papers. As part of the SALINAS team, James was awarded the 2002 Gordon Bell Award and NNSA Award for Excellence. James earned his Ph.D. degree in nuclear engineering from Texas A&M University and joined Sandia National Laboratories as a Member of the Technical Staff in 1990.

Mazin Yousif
T-System International
November 13, 2012
Title: Cloud Computing – a Paradigm IT Changer

Abstract – Cloud Computing is an emerging computing paradigm envisioned to change all IT landscape facets including technology, business, services and human resources. It is a consumer/delivery model that offers IT capabilities as services billed based on usage. Many such cloud services can be envisioned, but the main ones are IaaS (Infrastructure-as-a-Service), PaaS (Platform-as-a-Service), and SaaS (Software-as-a-Service). The underlying cloud architecture includes a pool of virtualized compute, storage and networking resources that can be aggregated and launched as platforms to run workloads and satisfy their Service-Level

Agreement (SLA). Cloud architectures also include provisions to best guarantee service delivery for clients and at the same time optimize efficiency of resources of providers. Examples of provisions include, but not limited to, elasticity through scaling resources up/down to track workload behavior, extensive monitoring, failure mitigation, and energy optimizations. The two main technologies enabling clouds are: (i) Virtualization, the foundation of clouds; and (ii) manageability (autonomics), the command & control of clouds. This talk is intended to provide an overview of cloud computing, its enabling technologies and current challenges. It will also look at clouds' IT/business ramifications as well as required future research.

Brief Bio - Dr. Yousif graduated in 1979 from the University of Baghdad, Iraq, with a B.Sc (Honors) in Electrical Engineering. He worked for several years in industry before leaving Iraq to pursue his graduate studies in the United States. Mazin received his Masters in Electrical Engineering and PhD in Computer Engineering from the Pennsylvania State University in 1987 and 1992, respectively. Dr. Yousif is currently the Chief Technology Officer, Cloud Comuting, in IBM Canada. Before that, he was chief systems architect for Phase Change Memory at Numonyxc Corporarion. He was also a Principal Engineer and Director of the Scale-out Virtualization and Autonomics project – first cloud infrastrcuture built in 2003 - in the Corporate Technology Group at Intel Corporation in Hillsboro, Oregon. He was also a member of many research committees. Prior to that, he was one of the principal architects defining the InfiniBand Architecture. From 1995-2000, he was a senior architect with the xSeries Division of IBM Corporation, RTP, NC. From 1993-1995, Dr. Yousif was an Assistant Professor at Louisiana Tech University. Dr. Yousif held adjunct Professors positions at a number of universities including Duke, NCSU and OGI. His current focus is on enabling cloud technologies and setting the R&D directions for cloud computing.

CS Technology Space Renamed John F. Carney III CS Technology Space

On May 4, 2012, CS Technology Space was renamed as John F. Carney III CS Technology Space and dedicated to former Chancellor Carney for his support of the CS department.

2013 PHONATHON DATES:

January 22, 23, 24, 27, 28, 29, 30, 31 & February 4

Two Inducted into Missouri S&T's Academy of Computer Science

Two Missouri University of Science and Technology alumni were inducted as members into the Missouri S&T Academy of Computer Science in 2012.

The academy honors outstanding computer scientists for their contributions to the profession and their involvement with Missouri S&T students and faculty. The academy also serves as an advisory group to the computer science department. The web site for the Missouri S&T academy is: https://sites.google.com/a/mst.edu/csacademy/.

New members are:

Kent Lynn of Charlottesville, Va., client executive for IBM Corp. in Washington, D.C., earned a bachelor of science degree in civil engineering from Missouri S&T in 1985. He also holds an MBA from the University of Nebraska. Lynn began his career with IBM after graduating from S&T as a systems engineer working with U.S. Department of Defense clients but moved into business development roles with increasing responsibility. During his 27-year career in information technology, Lynn has become an expert in the telecommunications and service-provider industries. In his current position, he is responsible for managing relationships with some of the company's largest commercial clients. He has traveled extensively and recently established a scholarship at Missouri S&T to support international service learning. Lynn is a member of the Missouri S&T Order of the Golden Shillelagh and was honored with a professional degree in computer science from Missouri S&T in 2009.

Charles L. Marsh of Chapin, S.C., senior vice president and chief operating officer of ESCADA of the Americas in New York, earned a bachelor of science degree in computer science from Missouri S&T in 1976. Marsh has more than 36 years of experience in IT operations, 28 of which are in retail and wholesale. In his current position, Marsh is responsible for supporting the wholesale and retail channels of the business with IT, logistics, loss prevention, legal, store construction and acquisition, and facilities both in the United States and Canada. In 1998, he was named to Retail Technology Magazine's Top 10 CIOs. He and his retail team won the 1998 Retail Innovative Technology Award from Chain Store Executive and the National Retail Federation for their success with customer relationship management (CRM) and replenishment when he was chief information officer at Camelot Music. Past positions include vice president of information technology for Hugo Boss U.S./Japan, vice president of information technology for Edison Brothers, CIO for Arter and Hadden LLP, senior vice president of operations for eCampus.com and vice president and CIO for Camelot Music.

Computer Science Awards Banquet

The Eleventh Annual Missouri S&T Computer Science Department Awards Banquet was held on April 9, 2012 bringing students, faculty, staff, alumni, and friends together for an evening of food, fun, and awards. A short reception preceded the banquet. Following a delicious meal, Dr. Cheryl B. Schrader, Missouri S&T Chancellor, presented a talk entitled "Game Changer". The evening concluded with fun-filled games and distribution of fabulous door prizes donated by several of the banquet sponsors. In addition to door prizes, banquet sponsors also sponsored tables for the event. The money from table sponsors made it possible for all Computer Science majors to attend the banquet free of charge. The 2013 Computer Science Awards Banquet is tentatively scheduled for April 4, 2013 but that date is subject to change. If you are in the area, we would be delighted to have you join us. If you and/or your company would like to participate in the 2013 banquet, please contact Rhonda Grayson at rhondag@mst.edu or Dawn Davis at dawnd@mst.edu. Additional information about the banquet can be found at: http://cs.mst.edu/department/csbanquet/CSawardsBanquet.html.

Sponsors for the 2012 event included:

Shoney's
Panera
Cupcakes & Cartwheels
Sonic
Blossom Basket
Lee's Chicken
Missouri S&T Bookstore
Maid Rite
Miller's Grill
Colton's Steakhouse
Slice of Pie
South Central Creamery
Dairy Queen
Alex's Pizza
Randy's Road Kill
Imo's Pizza
Domino's Pizza
Ray J's
Sirloin Stockade
Gordoz
Accenture
Sunsations Tanning
El Maguey
Garmin
Coachlite Lanes
Family Video
Cerner
Matt's Steakhouse
Key Sport
Boeing
Pizza Inn
Spoon Me
Tradebot
Tan Oasis
Mobil On the Run

Students, faculty, staff, and guests playing Hollywood Squares Bingo and winning door prizes

Dr. Ali Hurson & Dr. Cheryl B. Schrader, Missouri S&T Chancellor

Students receiving awards

Scholarships and Special Awards

CS Department Special Awards

Distinguished Speaker Award
Chancellor Cheryl B. Schrader

CS Mentor Award
Matt Nuckolls

Outstanding Computer Science Graduate Teaching Assistant Award
Nathan Eloe

CS Leadership Award
Brian Goldman

CS Ambassador Award
Margret Steele

Outstanding Service Award
Doug McGeehan

Accenture Scholarship
Nicholas Trojanowski, Tell Johnson, Ian Clark, Patrick Bremehr

John W. Hamblen Computer Science Scholarship
Gerard Busch, Joshua Hertlein

Ellen M. Hodges Memorial Scholarship
Holly Busken, Kelsey Maricic

Rex Widmer - RWS - Software Archaeology Computer Science Scholar
William Munshaw

Daniel C. St. Clair Scholars & Fellows
Justin O'Brien, Hannah Goring

Mark X. Stratman Scholarship
Nathanial Owen, Aaron Pope, Matt Lindsay

Howard L. and Lois M. Cook Endowed Scholarship
Wayne Viers III

Union Pacific
Megan Perry

CS Alumni Scholarships
Matthew Garlock, Chrsitopher Garlock, Jacob Andrews-Ohlman, Zachary Sarver, Jonathon Smith, Ethan Wells, Michael Catanzaro, Kathleen Vehnaus, Nathan Barron, Andrew Rhoads, Tanner Burge-Beckley, Christian Storer, Joshua Wyss, James Kellerman, Dale Mathews, Shen Yang, Mark Elders, Seth Green, Kathryn Isbell

CS Academic Achievement Awards – 4.0

Freshman
Justin Denk, James Kellerman, Arch Kelley, Dale Matthews, Christian Storer, Nick Trampe

Sophomore
Luke Allen, Joshua Hertlein, Kelsey Maricic, Kyle Reece, Patrick Sullivan, Trevor Wilson

Junior
Jordan Denny, Justin O'Brien, Zachary Sarver, Alex Wright

Senior
Mark Elders, Hiren Patel, Jacob Pennington, William Reynolds

Masters
Brian Goldman, Yaxi Liu, Raghul Mukundan, Jeffery Shelburg, Wenquan Wang

Ph.D.
Amir Bahmani, Stephen Jackson, Thomas Roth, Thomas Szalapski, Wenyong Lu

Computer Science Advisory Board

This year, the annual Advisory Board meeting was held on April 6, 2012.

The Board meeting had a full agenda ranging from the state of the department, research activities in the department, and expanding the distance program. The discussion topics included: (i) research in software engineering, (ii) research in secure distributed platforms to identify and share information, (iii) eLearning and Blended learning practices, and (iv) remodeling and strategic planning. The board members made many practical suggestions and unanimously endorsed our quest for excellence.

We appreciate the time and dedication of the Board members in contributing to our continuous efforts to improve the quality of education in the Department. Their perspectives provide valuable insights to the Department as we develop and revise our academic and research programs. If you are interested in serving on the CS Advisory Board, please send us an e-mail at csdept@mst.edu, along with a short bio.

CS Advisory Board Members (2012-13): Amanda Mechlin (Cerner), Robert (Bob) Perry (MasterCard), Craig Walters (Monsanto), Curt Schroeder (AT&T), Jeff Herzog (Maryville), Jim Lahm (Reliv International), Jim Leonard, (Boeing), John Brown (Purina), John Stone (University of Illinois), Ken Brenneke (Boeing), Kent Lynn (Verizon), Matt Dissinger (Garmin), Robert Byrne (Boeing), Krister Ungerboeck (Ungerboeck Software) and David Hammon (Accenture).

The Advisory Board website is: https://sites.google.com/a/mst.edu/csadvisory/.

Left to right Jason Northern, Development officer, Jeff Herzog, Ali Hurson, Krister Ungerboeck, David Hammon, John Stone, Matt Dissinger, Ken Brenneke, Jim Leonard

The Fifth Annual Computer Science Department "Friends and Family Picnic"

A great time was had by all that attended this year's CS Friends and Family Picnic! The weather was perfect for a fun day of soccer tournaments, treasure hunts, and great food at Schuman Park. Congratulations to the winners of both the soccer tournament and the treasure hunt. A big thank you goes out to the students who helped organize the day's activities and to the faculty that participated in the Dr. Who skit. Also, thank you to Rhonda Grayson and Dawn Davis who, once again, did a wonderful job of organizing the event so that everyone could relax and enjoy the day. We would also like to thank all the students, as well as their friends and family, who joined us for the day. It was good to see familiar faces and to meet new people. Be sure to check out the CS website at http://cs.mst.edu/department/picnic/cspicnic/index.html for photos and video of the day's activities.

We hope to see all of you there next year!

SMART AND SECURE

In a new twist on cyber-security, S&T computer scientists work to protect the future power grid.

Researchers working on a future power grid for the United States envision a network similar to the Internet. On this future smart grid, users and utility companies interact to share and swap energy from distributed systems, much like computer users tap into the web to transfer files.

But just as malicious Internet users can spread harmful viruses through computer networks, this future power network could be vulnerable to outages and other disruptions caused by terrorists or other attackers.

A small group of computer science researchers at Missouri S&T is trying to prevent such a scenario.

The S&T computer science department is one of only a few in the nation working on cyber-security issues for the smart grid. And the university, as a member of the National Science Foundation's FREEDM Systems Center, is among the nation's leaders in the field. Ultimately, the computer scientists' research could result in technology that stands between a major disruption and a secure source of electricity for businesses and homeowners.

It's a new twist on cyber-security, says Tom Roth, CSci'11, a Ph.D. student working on the project.

"We're usually concerned about who can access our data," Roth says. "But on the smart grid, we're not actually dealing with mainstream cyber-security. We're looking at what an attacker could do to the physical side of the system to compromise security. For instance, a malicious resident on a smart grid could affect the stability of the power network in such a way that it could cause a blackout.

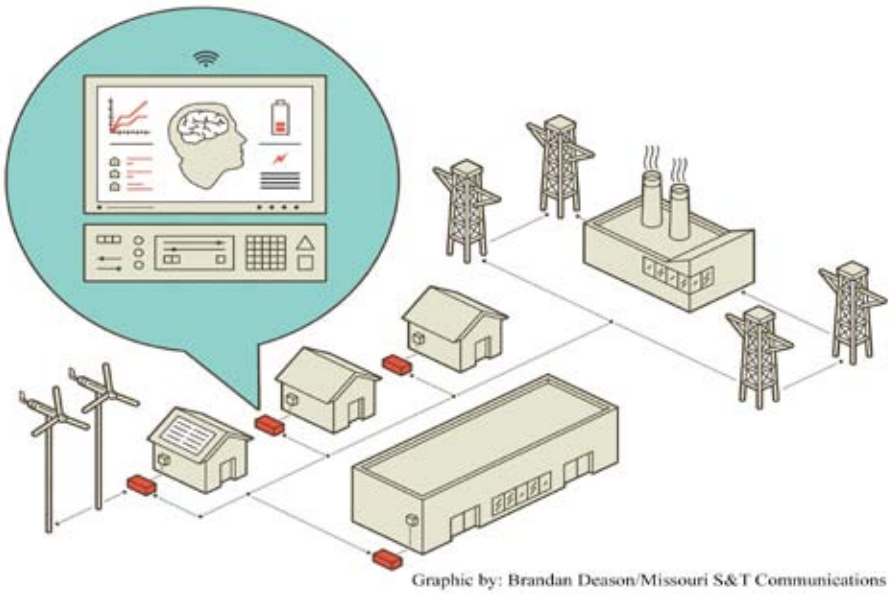
"We're asking, 'Can an attacker figure out, from the information being released on the grid, what part of the network might be most stressed and most vulnerable to attack?" Roth says.

Missouri S&T is one of seven universities involved in the NSF's FREEDM Systems Center, a nationwide effort established in 2008 to begin building the smart grid. The FREEDM (Future Renewable Electric Energy Delivery and Management) Systems Center is based at North Carolina State University.

The project's significant computer science component has to do with something called distributed grid intelligence, or DGI. The effort is led from Missouri S&T by Bruce McMillin, professor of computer science. DGI is a crucial component for making the smart grid work. It is essentially the "brains" of the operation — the command and control center.

Working with McMillin are five graduates and Ph.D. students, one undergraduate student and one post-doctoral researcher, all from Missouri S&T. Faculty and their graduate students at institutions in Florida and Auckland, New Zealand, are also involved with this project.

Roth is funded through the FREEDM System Center Graduate Fellowship and fellow researcher Michael Catanzaro, a senior in computer science, is funded through the FREEDM Undergraduate Research Scholars Program.



Graphic by: Brandan Deason/Missouri S&T Communications

Researchers envision a future smart grid where homeowners, businesses and utility companies share power across an "Internet for energy" network. Distributed grid intelligence, or DGI, will allow homeowners and businesses to monitor their energy use and buy and sell power. Taken together, the monitoring systems of all homes and businesses in a particular area make up the DGI.

S&T Students Win Awards for 'Smart' Grid Research

Two computer science students at Missouri University of Science and Technology have received National Science Foundation funding to support their research to create a future "smart" electric power grid.

Tom Roth of St. Louis, a Ph.D. student in computer science, received the NSF's FREEDM Systems Energy Research Consortium Graduate Fellowship for the 2012-2013 academic year. The fellowship provides $5,000 in funding for Roth's studies.

Michael Catanzaro of St. Louis, a junior in computer science, received a $4,000 award from the FREEDM Undergraduate Research Scholars Program to support his research.
FREEDM stands for Future Renewable Electric Energy Delivery and Management. The FREEDM center, established in 2008, involves seven U.S. and European universities working together to transform the nation's power grid into a distributed system - an Internet for energy - that will speed renewable electric-energy technologies into homes and businesses across the U.S. Missouri S&T is part of the effort, which is led by the FREEDM Systems Center at North Carolina State University.

Both Roth and Catanzaro are involved in developing methods that would allow homes connected to the future smart grid to schedule energy usage to conserve power or run appliances during off-peak hours. For example, a home connected to the smart grid could decide that the refrigerator compressor turns on only after the washer has completed its spin cycle, says Dr. Bruce McMillin, a professor of computer science at Missouri S&T.

Under McMillin's direction, Roth and Catanzaro are developing the sophisticated scheduling algorithms that would make the smart grid work. Roth is also focusing on security issues associated with the system, and Catanzaro is looking at "plug-and-play" implementation that would allow the grid to recognize appliances plugged in to the network the same way a computer recognizes a USB device when it is plugged in.

The FREEDM Systems ERC Graduate Fellowship is designed to help increase the number of outstanding and underrepresented Ph.D. students in the FREEDM Systems ERC. The Undergraduate Research Scholars Program is designed to immerse undergraduate student researchers in the culture and programs of the center.

As part of the FREEDM Systems ERC, Missouri S&T's computer science department plays a major role in the development of distributed grid intelligence.

Missouri S&T's participation in the FREEDM effort is led by Dr. Mariesa Crow, the Fred W. Finley Distinguished Professor of Electrical and Computer Engineering at Missouri S&T and director of the university's Energy Research and Development Center.

Tom Roth and Michael Catanzaro

Computer Science Student Organizations

Association for Computing Machinery (ACM)

The Missouri S&T Student Chapter of the Association for Computing Machinery (ACM) is the largest and most active computing organization on campus. With Margret Steele (President) leading the organization to success are her fellow officers: Matt Lindsay (Vice President), TJ Dolan (Secretary), Joseph Kurtz (Treasurer), Doug McGeehan (System Admin), Kyle Jamison (Assistant System Admin), Andrew Brown (Assistant System Admin), and Dr. Wei Jiang (Faculty Advisor). This semester has been a great success. With over 90 members, Missouri S&T ACM has grown tremendously this last Fall Semester.

ACM hosts various events during the school year. These events are geared towards students who would like to learn more about and have fun in their college career. During the Fall 2012 Semester, ACM hosted a variety of events: ACM Career Fair Dinner, MegaMinerAI (our very own AI competition), and a large variety of company given technical talks. ACM also works on several projects that may be featured in the Computer Science building. We are still working on the ACM Soda Machine where you can vend a soda from anywhere, as long as you are on the school network. Our Arcade Machine is still entertaining many students with the likes of Metal Slug, Sonic, and Street Fighter.

Next semester will feature over 12 meetings, more projects for students to get involved with, and more fun! However, none of this would be possible without our sponsors, Sandia National Laboratories, IDC, Garmin, and Tradebot. We would like to thank everyone for helping support our organization.

2012 ACM Fall Semester Career Fair Dinner

For the fifth year in a row, ACM successfully organized the Fall instance of the Career Fair dinner. The evening of the Fall Semester Career Fair, following a day-long progression of formal discussions, business attire, and resume swapping, students of Computer Science were provided with a delicious meal and a casual conversation with representatives from three industries: the Interdisciplinary Design Collaborative (IDC), Sandia National Laboratories, and National Instruments. These three companies generously sponsored the event and provided students with valuable insight as to what problems their organizations solve, and what type of work environment one would work in. This represented a great opportunity for students to expand upon questions that were unable to be answered due to the fast-paced nature of the Career Fair, and provided employers with some one-on-one conversations with their potential new employees.

If you missed out, do not fret! ACM is already planning for the Spring semester's Career Fair dinner. It is never too late to come join us for some delicious pizza.

Association for Computing Machinery SIG-Game (ACM SIG-Game)

SIG-Game is a student interest group focused on the design and creation of Artificial Intelligence programming competitions, with the main focus being MegaMinerAI. MegaMinerAI is a team based competition with a focus on strategy heuristics. For 24 hours, teams develop an AI for a unique game API designed by the SIGGame Dev team. The development time is concluded by a tournament among the competitors, with prizes for the top three teams. MegaMinerAI is open to anyone to compete, but only students are eligible for prizes.

This semester's competition was named MegaMinerAI 10: Galápagos. Teams of 2 to 3 students designed and implemented a variety of strategies to evolve their creatures to best dominate their world, either by fighting a war of annihilation with their opponent, or simply starving them out.

MegaMinerAI 10 continued the tradition of each competition being larger than the last: 33 paying teams totaling 88 competitors, with 4 of those teams traveling from Southeast Missouri State University. In addition to the prize fighters, there were also 11 teams competing 'just for fun', ineligible for prizes, staffed by a combination of 18 sponsors, game developers, and faculty members.

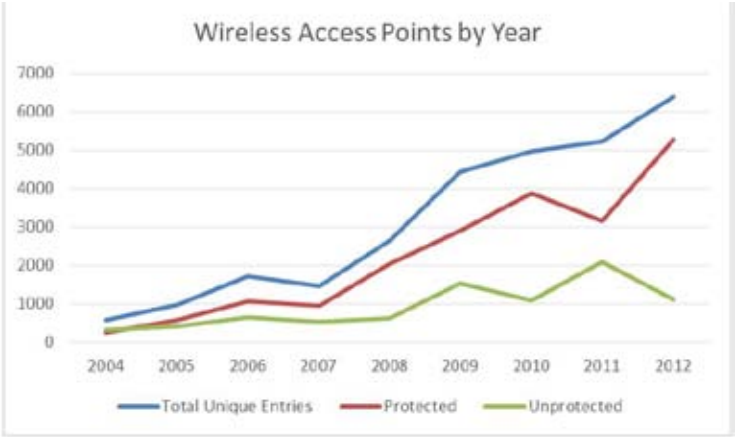
We would like to thank our corporate sponsors Garmin, Tradebot, IDC, and alumni sponsors Steven Wallace and Jacob Gardner, for their support. The next MegaMinerAI is scheduled for late April 2013. If you are interested in competing, or just looking for more information, feel free to visit our website at http://megaminerai.com or email us at siggame@mst.edu.

Association for Computing Machinery SIG-Security (ACM SIG-Sec)

The Missouri S&T Association for Computing Machinery (ACM) student branch Special Interest Group: Security (SIG Sec) is a student group focused on computer & network security. Founded ten years ago, in academic year 2012-2013 the organization is chaired by Jacob Magdziarz with Caitlin Derr as vice-chair during fall semester 2012 and Christopher Rawlings as vice-chair during spring semester 2013; for the 10th straight year Dr. Daniel Tauritz is the faculty advisor. SIG Sec meetings are typically bi-weekly, featuring a wide variety of speakers on topics ranging from software vulnerabilities and real-world tools to security projects and research. The group also works on its own security projects, such as building cantennas (directional antennas made from soup, coffee or Pringles cans that increase the gain of wireless cards), wireless auditing (mapping open wireless access points so we can inform the owners), and the SIG Sec "Capture the Flag" computer security challenge (controlled environment competition where participants compete to be the first to penetrate a protected computer system).

Highlights of the 2012-2013 academic year so far:

- 9th Annual Rolla Wireless Security Audit
  - Part 1: Cantenna Building Party led by the SIG Sec Officers
  - Part 2: Wireless Security Audit Competition



We gratefully acknowledge Sandia National Laboratory's sponsorship of the prizes for the Wireless Security Audit Competition in the form of very cool Raspberry Pi's (credit-card-sized single-board computers) with memory stick and power supply as accessories.

- A smorgasbord of mini-presentations by S&T students who interned over the summer at the Center for Cyber Defenders, Sandia National Laboratories, Albuquerque, NM.
- A security challenge workshop and competition led by Yaxi Liu and Jasenko Hosic with support from Michael Wisely.
- he Missouri S&T cyber defense team led by SIG Sec's very own chair Jacob is preparing for the annual collegiate cyber defense competition.
- Presentation by William Atkins, member of technical staff at Sandia National Laboratories and an alum of our department, on state-of-the-art red teaming strategies interspersed with war stories based on his personal experience.

For more information see S&T's ACM SIG Security website at: http://acm.device.mst.edu/security/

Association for Computing Machinery-Women (ACM-W)

ACM-W has had an exciting semester this year. This semester ACM-W has acquired brand new leadership for almost every position. Our current President is Jamie McNeely and our new Vice-President is Steven Kipp. ACM-W was lucky enough to keep our Treasurer, Tiffany Weckerman until December, when she will be graduating. She will be sorely missed. During the semester, ACM-W also held Peer Advising during the month of October to help both undergraduate and graduate students alike. The event brought in over 25 students and peer advisors who all ate free pizza and enjoyed a lunch of discussing different classes and the different teaching styles of courses offered in the department.

Next semester also holds to be a very busy and exciting semester for the organization. In the spring semester, ACM-W will be holding their annual Undergraduate Research Fair. During this event, professors will come and talk to the students about the type of research they are currently conducting and opportunities students have to get involved. There will also be presentations by current undergraduate researchers, who will explain how they got involved and the type of research they are doing. Last year the event drew in over 70 students and the hope is to have even more this year! ACM-W is also in talks with Microsoft to hopefully have a speaker come and talk about women in the workforce. There is also the possibility of having a speaker from the University of North Carolina Wilmington come and give a technical talk about Cryptography. ACM-W is also looking for ways to expand the organization's influence to more students within the Computer Science major. Some possibilities being considered are having a resume service for current members, a mentorship program and providing information about scholarships available to female students. Hopefully, ACM-W will continue to expand and have many more students in the coming semester.

Missouri S&T IEEE Computer Society Student Branch

Moving into its fourth year and its most exciting year yet, the Missouri University of Science and Technology IEEE – Computer Society (MS&T IEEE-CS) is one of the fastest growing computer organizations on campus. This year saw the society hold its old hands on deck while enlisting new ones.

The start of the new term was marked by several general meetings between officers and members, to discuss about the various events. This year gave rise to various event and programming workshop. The largest of them drew in a crowd of 80 strong.

This year's biggest event the Resume Drive saw students from various departments be a part of this event. This event proved to be a good opportunity to expand the IEEE-CS base of members and to spread awareness about the activities of the society.

The Android workshops conducted by the IEEE- CS also turned out to be a huge success pulling in students from non – computer science backgrounds. A marked enthusiasm was registered among members and there has been a steady stream of requests for such events.

Humungous arrays of events are in store for the coming days and the officers of MS&T IEEE – CS aim to

make it one of the most successful years for the organization. Lokesh Krishna Ravichandran(President), Bharath Kumar Samanthula (Vice President), Naveen Reddy (Secretary), Kiran Puran (Treasurer), Mitchell Miller (Web Administrator) and Dr. Dan Lin (Faculty advisor) have pledged allegiance to this cause.

The officers would like to thank the patrons of S&T IEEE-CS and would like to request their continued support fot the future ventures.

Missouri S&T 2012 AI Tournament

Winter Semester 2003 gave birth to a new S&T tradition: the Artificial Intelligence Tournament Series, created and organized by Dr. Daniel Tauritz and hosted by S&T's Department of Computer Science. This series follows a tradition of in-class tournaments in Computer Science course CS347 – Introduction to Artificial Intelligence, but aims to broaden that scope by inviting campus-wide participation in public tournaments and having formal awards ceremonies. This tournament gives students, faculty and staff a chance to test their skills in designing & implementing Artificial Intelligence by having their creations compete against each other and with human beings. Each academic year a challenge in the form of a board game is chosen to be solved during that year's tournament(s). Three winners are chosen each tournament and presented with trophies & prizes. The name of the first place winner is engraved on a perpetual plaque and displayed in the glass trophy case on the second floor of the Computer Science Building.

Previous years have featured the board games Abalone, Chess, Othello, Backgammon, and Mancala. In spring 2012 the 13th tournament in the series was held, featuring the board game Chess, a classic challenge in the field of Artificial Intelligence and a perennial favorite among contestants. The winners were:

- First place – Evan Wright for his computer player; Evan received in 2008 a BS in Applied Mathematics and a BS in Computer Science from S&T; he is currently pursuing a Ph.D. in Mathematics at the State University of New York – Stony Brook
- Second place – Neil Patel for his computer player; Neil is currently a senior at S&T, majoring in Computer Science and Computer Engineering
- Third place – Mark Elders as human player; Mark is currently a senior at S&T, majoring in Applied Mathematics, Computer Science, and Economics

We gratefully acknowledge the generous sponsorship of this tournament by Sandia National Laboratories which paid for everything from prizes & trophies to food & drink to computer time on Amazon's EC2 cloud!

The next tournament is scheduled for Saturday May 4th 2013 and tentatively the challenge will again be Chess. Additional information on the AI Tournament Series can be found at http://web.mst.edu/~tauritzd/AI-Tournament/.

NOTE: Dr. Tauritz is always looking for (corporate) sponsors for the Artificial Intelligence Tournament Series (great publicity!). For more information, E-mail him at: tauritzd@mst.edu

Congratulations to S&T's 2012 Computer Science Degree Recipients

May 2012

Minor in Computer Science

Benjamin Booth
Ben Bubenik
Shawn Cross
Shaun Hall
Daniel Peters
Brian Phagan
Antonio Sabatini
Peter Shilliday

Bachelor of Science

James Bridges
Michael Busby
Paul Eggler
Jacob Gardner
Gregory Harmon
Steven Heitzman
Daniel Hellwig
Dwight Jones
Parker Kessler
Robyn Littleton
Justin Peabody
Jacob Pennington
Timothy Pund
William Reynolds
Arturo Rosas
Chelsea Sanders
Jack Scholting
Benjamin Tullis
Cody Williams
Michael Wilson
Michael Wisely

Certificate Program

Ross Blanton
Stephen Duepner
Thomas Guenther
Samuel Lanza
Aaron Powers
Kyle Roach

Master of Science

Stephen Duepner
Brian Goldman
Matthew Harp
Gerry Howser

July 2012

Bachelor of Science

Ryan Birmingham
Max Eisenbraun
Steven Foust
Vincent Hall

Master of Science

Michael Hall

Doctor of Philosophy

Joshua Wilkerson

December 2012

Bachelor of Science (anticipated)

Benjamin Campbell-Bradley
Aaron Easter
Phillip Endsley
Jonathan Fauser
Jacob Feldmann
Jacob Fischer
Seth Green
Andrew Heien
Dennis Holt II
Ian Kottman
Kevin Mahoney
Adaleigh Martin
Neil Patel
Robert Ryterski
Hunter Scheib
Andrew Schrader
Justin Smith
Nathan Stechschulte
Sean Thoma
Tiffany Werckmann
Steven Williams

Master of Science

Kirthi Teja Bobba
Michael Howard
Pankaj Jogaikar
Christopher Jones
Prakash Kumar
Yaxi Liu
Swathi Sambaraj

Alumni News

John Emerson, CS '69 & MS '77, As of July 1, 2011 I have retired. I worked for McDonnell Dougles for about 25 years and then moved to Denver and worked 14 years for a small company in the field of speech recognition applications. During these jobs I lived and worked 3 years in Canbridge England and 1 year in Sydney Australia. Working overseas was very interesting for me and my two daughters. Retirement is full of travel for pleasure, volunteer work and even doing some part-time work for my previous company. I enjoy spending time with my wife, kids and my 8 grandkids.

John Wegman, CS '75, I retired from IBM on March 1st, 2011 after a career spanning 33 1/2 years. I was fortunate to spend my entire career in the Jefferson City, MO location primarily supporting and covering Missouri state government.

Adam Nichols, CS '07 & MS '09, married Liana Wages on May 28, 2011 at The Stone Church in Independence, MO where they live.

Matt Buechler, CS '03 & MS '05 and his wife Nikki had a boy, Leaf, on July 25, 2012.

MEMORIALS

Sharon M. (Shaver) Rickman, CS '73, (July 13, 2011).

Richard S. Rahubka, CS '82, (October 13, 2011).

Michael Alan Smith, CS '89, (December 16, 2011).

Sarah Ferguson Hock, wife of John R. Hock, CS '82, (September 12, 2011).

2013 Computer Science Phonathon

Last year's Computer Science Department phonathon was held in January and, thanks to all the alumni, it was a great success. The Missouri S&T Computer Science Department received pledges totaling $44,995. Thank you to all those who made this possible, and thank you for supporting the students!

This year's phonathon will be held **January 22, 23, 24, 27, 28, 29, 30, 31 & February 4, 2013.** With the economy as it is, please answer your phone and say "Yes," when asked to make a pledge. Taxpayer support accounts for only a minor portion of the university's revenue, making your contribution a vital ingredient in the revenue pie. Any amount you give will be greatly appreciated.

Phonathon Donations From Alumni and Friends

Under $100

Adams, Steven Richard 1982
Allwein, Erin Lee 1999
Allwein, Shawn Raymond 1999
Anderson, Glenn R 1973
Armbruster, Sara Beth 2000
Ashabranner, David B 1983
Ashwell, Scott Wayne 1995
Ashwell, Tracey Dawn 1995
Autry, Prentice Crandall 2008
Baber, Jeffrey Lester 1990
Bain, Patrick T 1987
Balestra, Chester Lee 2002
Bardsley, David Scott 1984
Baron, Timothy J 1979
Becker, Kathryn A 1976
Beckerle, Kelly Marie 1988
Beckerle, Timothy Gerard 1990
Beckmeyer, Margy R. 1973
Beckmeyer, Russell R 1971
Bennett, Carol Ann 1992
Bevans, Stanley Wayne 1985
Bier, Patrick K 1975
Biggers, Bradley Brian 1991
Birdsell, Clifford J 1982
Blum, Anthony Franco 2005
Bogener, Shawn Robert 1996
Bohn, Ellen B 1974
Bollinger, Terry B 1977
Booth, Brian David 1997
Bowman, Charles S 1986
Boyle, Stanley Clyde 1983
Brown, Daniel J 1974
Brunts, Barbara E 1981
Brunts, Randall T 1981
Buckley, Jared Roger 1996
Buehler, Douglas P 1979
Buehler, Elizabeth Renee 2003
Bumpus, Gary W 1971
Burgdorf, David Paul 1986
Butler, Ralph M 1981
Butler, Tracye Denton 1985
Byrd, Alicia Kathleen 1998
Byrd, Samuel Martin 1998
Clifton, Arlene K 1972
Cochran, Stephen 1992
Coffman, Terry R 1976
Colter, Kim D. 1973
Compton, Laura Lynne 1990
Cordes, Glenn E 1960
Court, Michael R 1973
Danz, Steven William 1987
Daum, Marilyn S 1980
Debner, David E 1968
Denney, Stephen Kent 1994
Denton, Samuel T. 1978
Derryberry, Darrell W 1985
Doerer, Daniel Michael 1988
Drake, Michael Edward 1994
Drewes, Mark Kenneth 1985
Duffey, Daniel James 1988
Duncan, Junetta Alisa 1999
Duncan, Thomas Shearer 1990
Dunford, Randall B 1974
Eaton, Daryl Ann 1970
Edwards, Harry K 1964
Elliott, Susan S.
Endsley, Mike
Ensign, Kyle Andrew 2011
Erickson, Alan G 1975
Erickson, Christina K 1975
Farley, Mary Ann 1984
Fieseler, Wayne G 1981
Foehrweiser, Roger Keith 1987
Follett, Matthew Anthony 2007
Folta, Joseph E. 1976
Frager, Alan R 1974
Galli, Donald H 1974
Gavin, Darla Spencer 1986
Gebhardt, Thomas V 1978
Geiger, Christopher M 1986
Geiger, Mary Elizabeth 1989
Giana, Fiorella 2005
Goetz, Carl Evan 1984
Gordon, Kevin Michael 1983
Grotefendt, Judith R 1974
Grotefendt, Rande H 1973
Hardy, Kenneth B. 1981
Harrington, Daniel L 1983
Harrington, Laura Ellen 1983
Hartman, Todd Warren 1997
Hawkes-Cates, Joseph 2011
Hayden, Bruce Jeffrey 1983
Herold, Lawrence W 1974
Hickman, Lewis Lee 1996
Hickman, Lisa Erika 1996
Hiebert, Gregory Lee 1982
Hiebert, Yoelit Hannah 1981
Hilleary, Cynthia S 1976
Hillhouse, Michael D 1975
Hilliard, Anthony Wayne 2000
Hilliard, Nieccole Marie 1997
Hughes, Jason Michael 1995
Huhman, Jacob Wilson 2009
Johnson, Andrew J 1974
Junk, Pamela Ann 1995
Kammer, Darren R 1991
Keep, Andrew William 1999
Khan, Aatif Jawed 2001
Kleikamp, David John 1986
Krasner, Herbert C 1973
Krupa, Andrea L
Kuebler, Kenneth L 1970
Lang, Stephen A 1979
Langer, Richard B 1983
Laufman, Anne E 1983
Leitterman, Pamela A 1975
Lenz, Sandra M 1974
Li, Li-Jen 1989
Lindsay, Elaine C.
Livaudais, Joan Marie 1986
Loesch, Janet L 1980
MacCormack, Michael W 1988
Marburger, Karla L 1984
Martin, Bennie F 1986
Maurseth, Jerome A 1974
Maurseth, Vicky J 1974
Mausshardt, Charles 1983
Mausshardt, Denise Ann 1983
McBride, Gregory C 1975
McCleary, Ronnie Neil 1973
McCormick, C. Craig 1968
Meng, Chun-Ping J 1982
Merenghi, Francine
Mersinger, Rozann P 1981
Miller, Clarence M. 1973
Miller, Gretchen Rose 2002
Mills, Andy Ray 1989
Mitchell, John W. 1983
Moore, Joseph R 1972
Moynihan, James 2006
Muo, James Nnamezie 2005
Nelson, Gary W 1987
Nierengarten, John A 1970
Oldroyd, Juanice E 1983
Omohundro, Warren C 1975
Ortbals, Robert J 1978
Ott, Mary A 1977
Pankey, Tina Marie 2006
Parrett, Alan V 1984
Parrett, Minh T 1979
Parsons, Clyde T 1972
Patience, Greg Allen 1995
Perry, Corinne Norine 1985
Pile, Thomas N 1979
Post, Mark K 1978
Queern, John Kneedler 1981
Rafferty, Patrick V 1975
Randall, Adonica D 1975
Reed, Danny A 1978
Reunert, Philip Peter 1984
Robertson, Kevin Dale 1997

Rodgers, Sondra K	1978
Ruesing, Anthony Aloyes	2006
Sanders, Roger D	1979
Santos, Carmela Rosario	1996
Schafale, Richard G	1973
Schaper, Gary E	1993
Schuehler, David Vincent	1993
Schuessler, Dawn E	1974
Schuessler, Richard B	1972
Schuster, Christopher	1999
Settle, Benjamin A	1983
Shi, Yuning	2000
Simon, Dennis M	1976
Simon, Kimberly M	1976
Simpson, John Lawrence	1997
Sinn, Elizabeth A	1976
Sinn, Larry F	1975
Sisko, Bruce Peter	1987
Slane, Jeffrey Robert	2006
Smith, Paul Thomas	1984
Snow, Bruce Floyd	1977
Spors, Richard E	1968
Stager, Scott P	1970
Steffan, Michael Roy	1969
Strong, William P	1970
Subramaniam, Annapurni	1995
Swisher, Dean O	1970
Taylor, Charles Ray	1973
Thill, Daniel Gerard	2003
Thorsell, Carl W	1969
Tippin, Kim Elizabeth	1992
Tippin, Martin Allen	1991
Underwood, Diane E	1981
Van Praag, Jeffrey R	1976
Veden, Leonard S	1973
Vora, Chetan Bharat	1997
Webster, Jacquelyne L	1969
Wegman, John L	1975
Welty, Daniel Jesse	2009
Wieberg, Peggy A	1986
Wilkins, Arthur T	1978
Wolters, David J	1970
Work, Paul R	1990
Workman, J. Douglas	1971
Woytus, John Martin	1987
Wurtzler, Pamela H	1981
Yek, Hong-Seng	1985
Yelton, Ken Stuart	1986
York, Larry Brian	1974
Yu, An-Chi	1988
Zenor, John J	1963
Zheng, Man	2007

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Abernathie, Dale Allen	1991
Abshier, John C	1983
Adelsberger, Mark	1999
Ahmad, Fawad	1995
Alexander, Mary C	1971
Altheide, Phyllis	1985
Armbruster, Austin E	2000
Atkins, William	
Bailey, Wayne P	1976
Baker, Gregory Dean	1984
Bardsley, Jeannine M	1983
Beckmeyer, Margy R.	1973
Beckmeyer, Russell R	1971
Bevans, Judy Kay	1985
Biggs, Roger Earl	1987
Bischel, Pat Oscar	1987
Boecker, Mark S	1974
Bousman, W. Thomas	1968
Brandon, Dwight W	1983
Bremehr, Dan	1983
Brenneke, Kenneth J	1978
Brewer, David W	1969
Brewer, Larry C	1968
Bruhn, Kurtis Matthew	1987
Brune, William K.	1973
Buehler, Robert Allen	2005
Burgdorf, Erik D	1980
Canis, Walter	1972
Chen, Emy A-Mei	1974
Chrisman, George F.	1969
Cobb, Berton Douglas	2006
Codespoti, Daniel J	1974
Coffman, Mary B	1978
Cothern, Douglas K	1978
Cox, David Duane	1983
Cox, Steven George	1998
Crane, Lynn Anne	1984
Crume, James L	1981
Dagestad, Pamela S	1978
Danner, Mary B	1973
DePauw, Thomas J	1973
Demieville, Cory Alan	2006
Doerr, Jerry W	1967
Drake, Sandra Jo	1993
Drewes, Laurie Ann	1985
Dupont, Steven J	1974
Dvorak, Anthony Scott	2008
Eaton, William A	1970
Evans, William David	1984
Fellows, William Joseph	1998
Fieseler, Catherine N	1980
Finfrock, Don C	1968
Fischer, Thomas W	1976
Folta, Joseph E.	1976
Ford, Raymond F	1970
Freiberger, Keith	1984
Gaitros, Donald L	1966
Ganofsky, John R	1978
Gavin, James Douglas	1987
Geigel, Christopher	2000
Gentry, Timothy W	1977
George, John Scott	1972
Goertzen, Patrick H	1982
Gordon, John Harrison	1988
Gower, Marcia Sue	1989
Graves, Kyle Eugene	1991
Grose, Daniel W	1977
Hagedorn, Gerald Lynn	1996
Haines, Benjamin John	1985
Hall, Allyson Taylor	1997
Hall, Charles Ray	1983
Hammond, Patrick Lewis	2005
Haring, James Donald	1989
Harrison, Robert M	1974
Harrison, Warren A	1981
Heerboth, Peter Nicholas	2003
Herbison, Robert G	1970
Hicks, Richard Jay	1989
Hilleary, Alexander L	1976
Hock, John R	1982
Horstmann, Paul W	1973
Howard, Steven R	1981
Huff, Donald Leroy	1993
James, David Loren	1985
James, Gwendolyn Powell	1988
Jeffries, Matthew S	1985
Jones, Roger M	1971
Kammer, Sally A	1991
Kennedy, Kelly Ann	1986
Kerns, Randy G	1974
Kester, Paul Allen	1999
King, Janet Rimmey	1980
King, Jefferey Robert	2009
Klemmer, Susan H	1966
Lang, Elizabeth A	1981
Leitterman, Dennis W	1976
Lenz, Richard G	1974
Livaudais, Ron Mark	1983
Loesch, Terry L	1980
Lorenzen, Stanley D	1975
McClanahan, Ronald D	1977
McClenning, John C.	1991
McMahon, Thomas	1995
McNally, John Michael	1983
Meier, Curtis P	1983
Menke, Elaine A	1973
Messmer, Kevin Michael	1988
Mike, Robar Thomas	1999
Miller, Joseph Earl	2003
Miller, Ryan James	2009
Montague, Michael W	1973
Morey, Michael Garvin	1989
Moynihan, Kristen Louise	2007
Muldoon, Mary Ellen	1991
Musial, Christopher	1982
Nau, Steven N	1970
Nayar, Sanjay	1993
Neary, Brian Lewis	1991

Newcomer, John	1989
Nichols, Byron K	1973
Nolde, Keith A	1974
Ott, James W	1975
Owensby, Roger Wayne	1986
Pace, Gary Glen	1984
Peetz, Bryan Dale	1983
Phipps, Neil Alan	2001
Porter, David Bryan	1988
Potzmann, Kim J	1970
Pratt, Michael L	1978
Randall, Harvey G	1974
Randazzo, Vincent A	1989
Reed, Danny A	1978
Rehkop, Thomas G.	1974
Rider, Adam Clinton	1993
Rodgers, Michael A	1978
Roth, Michael G	1972
Rothschild, Susan H	1974
Sage, Barry E	1980
Savells, Kenneth C	1974
Scheer, John Albert	1988
Scherer, Keith W	1982
Scherer, Kenneth Paul	1982
Schmidt, Lonnie D	1969
Schneider, Susan	1982
Schumacher, John James	1988
Serban, Cristina	1993
Shaver, Brian Joseph	2005
Shu, Min-Chun Jenny	1982
Siever, William Michael	2000
Sigman, Scott Lee	1999
Sirbu, Mihai G	1993
Smith, Brian Lynn	1987
Smith, Houstin G	1981
Smith, Johanna Marie	1985
Smith, Todd Walker	1985
Sowers, James R	1969
Spradlin, Charles	1983
Squires Foelsch, Karen	1989
St. Clair, Mrs. Daniel C.	1975
Stahl, Joseph W	1969
Stanek, Craig Steven	2004
Stanley, Denise W.	1984
Stark, John Evan	1989
Steele, Anthony A	1975
Steffan, Cheryl A	1969
Stocking, Terry Lee	1989
Stone, John Edward	1994
Stratman, Mark X	1973
Sullivan, Kevin Dennis	1995
Szygenda, Ralph James	1970
Taylor, Robert P	1987
Taylor, Timothy Topper	1987
Thornton, Jeffrey A	1980
Toombs, Howard L	1976
Trampe, Michael Ronald	1993
Treptow, Eric B	1981
Vahle, Michael O	1971
Veach, Alva Lester	1992
Wang, Le	2004
Washburn, Ricky Lee	1979
Wasleski, Steven Francis	1987
Watson, Lowell R	1979
Watson-Hajjar, Susan	1983
Watts, Charles A	1958
Webster, William D	1969
Williams, Nelson	1972
Wurtzler, Daniel R	1982
Zike, David Scott	1982
Zlatic, Milton T	1971

Organizations

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Arch Coal Inc.
BAE Systems
BASF Corporation
Boeing Company
Boeing Foundation
Carfax Inc
Cargill Incorporated
Caterpillar Foundation
ConocoPhillips
Express Scripts Foundation
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McKesson Foundation, Inc.
Microsoft Corporation
Northrop Grumman Foundation
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Raytheon Company
San Antonio Area Foundation
Schwab Fund for Charitable Giving
Shell Oil Company Foundation
Sisters of St Joseph of Carondelet
Swisher Mgmt Consulting Corp
Texas Instruments Foundation
Tradebot Systems Inc.
Union Pacific Corporation
Union Pacific Railroad Corporation

Thanks For Your Generosity

Computer Science alumni pledged $21,165 and the department received $28,185 in outright gifts and matching gifts for a total of $49,350 in gifts during the 2011-2012 fiscal year. ***Thank you for your generosity***! We used your support last year to fund scholarships to undergraduate students. ***The students are the real beneficiaries of your phonathon gifts***. Your gifts provide scholarship support, new laboratory equipment, new faculty development, and student activities. Your support makes a big difference on our ability to say yes to the students. This year, we will begin calling our alumni on January 22, 2013. When the phone rings, please take a moment to share some of your Rolla experiences with a current student, and say, "Yes," when asked for a pledge. Taxpayer support accounts for less than 30 percent of the university's revenue, making your contribution a vital ingredient in the revenue pie. ***Your gift continues to matter very much!*** Private funding helps distinguish Missouri S&T from other universities, increasing the value of our education. Any amount you give will be appreciated, and most importantly, your participation will help make us a leader in alumni giving among public universities.

Missouri University of Science and Technology
Computer Science Department

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500 West 15th Street
Rolla, MO 65409-0350

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Fax: 573-341-4501
E-mail: dawnd@mst.edu
Web site: http://cs.mst.edu/

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Keep in Touch with Computer Science Department

We enjoy keeping you informed about Computer Science at Missouri S&T. We'd like to hear from you, too! Let us know where you are and what you are doing! If you have received an award, promotion, or have family or professional news you would like to share, please complete this form and mail to: Computer Science Department, Missouri University of Science and Technology, 500 West 15th Street, 325 Computer Science Department, Rolla, MO 65409-0350. Or, if you prefer, you can e-mail us your comments at dawnd@mst.edu. Thanks for keeping in touch. It's always good to hear from old friends.

Name: _____ Phone: _____

E-mail: _____ Graduation Year and degree(s): _____

Mailing Address: _____

_____

_____

Job Title: _____

Business name and address: _____

_____

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News or comments: _____

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