Computing and Information Sciences

KANSAS STATE UNIVERSITY • COLLEGE OF ENGINEERING

Contents

MESSAGE FROM THE DEPARTMENT HEAD

It is with great pleasure I share the 2010 annual research report for the Kansas State University Department of Computing and Information Sciences (CIS). The CIS department continues to move forward strongly with our faculty excelling in research and teaching. Our graduate program continues to grow, our students are in high demand, and we have strong interdisciplinary teaching and research programs.

In 2010, the Center for Information and System Assurance (CISA) in CIS, with Dr. Simon Ou as director, was designated as a National Center of Academic Excellence for Research in Information Assurance by the National Security Agency and Department of Homeland Security for the period 2010-2015. This designation was received based on the excellent record of CIS faculty in research, extramural funding and teaching in cybersecurity, as well as external collaborations with leading researchers in both academia and industry.

I am also pleased to note that Dr. Eugene Vasserman joined our department as an assistant professor starting fall 2010. He completed his Ph.D. in computer science from the University of Minnesota in Minneapolis in 2010, specializing in the area of computer security.

As a significant achievement, Dr. John Hatcliff and Dr. Robby received the International Conference on Software Engineering prestigious Most Influential Paper Award for their paper "Bandera: extracting finite-state models from Java source code" published in 2000. The Most Influential Paper Award is given jointly by ACM and IEEE at the world's premier software engineering conference, to the paper that is judged to have had the most influence on the theory and practice of software engineering during the 10 years since its original publication. Separately, this paper also received the Impact Paper Award from ACM SIG-SOFT.

Our faculty continue to be strong in multidisciplinary research. In 2010, a multidisciplinary, five-year, $3 million project led by Dr. Mitch Neilsen from CIS was funded by the NSF GK-12 STEM Fellows program. This project, with collaborators Virg Wallentine (CIS), Nathan Bean (CIS), Gurdip Singh (CIS), Naiqian Zhang (biological and agriculture engineering) and Jackie Spears (education), will place up to eight graduate students each year in up to 16 schools to integrate information technology and sensor systems into K-12 curriculum.

We renovated several classrooms and labs in Nichols Hall in 2010 to provide a better learning environment for students. This includes making Nichols 126 available 24 hours a day to students exclusive as their work area. Our ACM student chapter, advised by Dr. Dan Andresen, has been very active in engaging students in activities. Their accomplishments include a 3rd-place finish in the High-Performance Computing Contest held at the International SuperComputing Conference in New Orleans in November 2010; and four teams placing 3rd, 6th, 10th and 15th among 32 teams competing at the ACM Programming Contest held in Lincoln, Nebraska, in 2010.

The 2010 annual report cannot cover all CIS accomplishments for the year. Please visit our website at http://www.cis.ksu.edu for a more complete picture.

Gurdip Singh

Gurdip Singh
Department Head
Computing and Information Sciences
Kansas State University

1

Self-adaptive systems
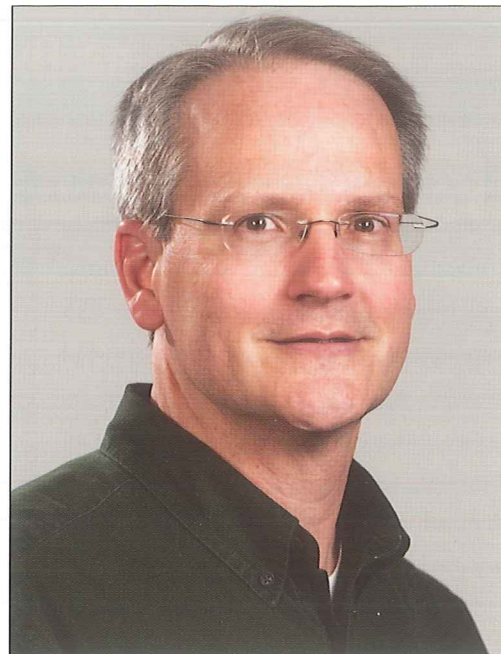
by Dr. Scott DeLoach

Computing and Information Sciences 2010

Today's software is at least an order of magnitude more complex than that being developed a decade ago. Users today are demanding applications that operate autonomously, adapt in response to dynamic environments and interact with other distributed applications in order to provide solutions to a wide range of problems. To respond appropriately, software needs to be aware of what it is doing and why, in order to take the appropriate steps to achieve its objectives. There are several instances of these kinds of systems including information systems, service-oriented systems, wireless sensor networks and multi-robot systems. In each of these types of systems, one key element of adaptivity is the allocation of tasks to appropriate system elements. However, an equally important aspect of adaptivity is understanding why those tasks need to be performed.

Self-adaptive systems are designed in a top-down, engineering approach. This is in contrast to self-organizing systems where system behavior emerges from the composition of components that act and interact locally. Self-adaptive systems evaluate their current behavior in light of their overall objectives and change that behavior to better achieve their goals. What is "better" depends on the application. Typical objectives include efficiency, robustness or secure operation. One of the key challenges of self-adaptive systems is allowing the system to adapt its behavior without introducing unintended consequences. Science fiction is replete with examples of intelligent systems that become smarter than their human creators.

For the past several years, the K-State CIS Multiagent and Cooperative Reasoning (MACR) Laboratory has brought together researchers with various expertise to solve interesting problems in the area of distributed, intelligent and self-adaptive systems. Application areas have included multiagent systems, cooperative robotics, sensor networks and a wide variety of networked systems. MACR Lab research incorporates existing methodologies and techniques from other related disciplines – including artificial intelligence, robotics and software engineering – into an integrated and comprehensive approach to developing distributed, self-adaptive systems. Current research areas include the following:

- Development of methodologies, techniques, models and tools to support the creation of self-adaptive systems that can adapt to achieve their overall goals without the threat of destructive and unexpected behavior. MACR lab researchers have de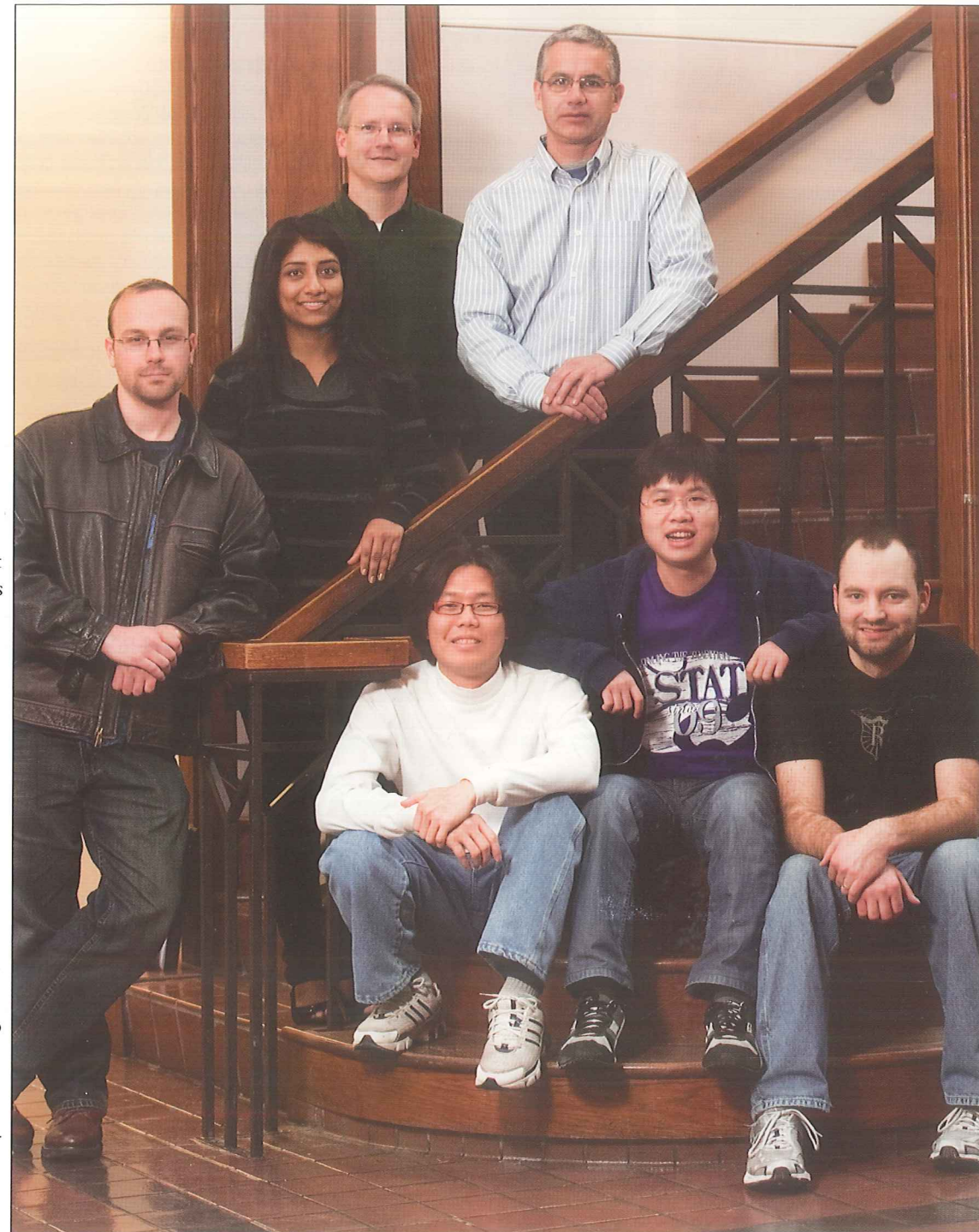veloped a tailorable methodology, the organization-based multiagent systems engineering (O-MaSE) methodology, that allows designers to create highly adaptive systems based on an organization-theoretic approach. The O-MaSE methodology and its accompanying integrated design and development environment, agentTool, have been used to develop adaptive multiagent systems at K-State and several other institutions around the world. These designs are translated into systems that use runtime models to determine their current state of problem solving and adapt their behavior to produce an efficient solution.

- Use of semi-autonomous robot teams for dangerous missions such as search and rescue, minefield operations, reconnaissance and surveillance, ordnance detection and clearance, and urban warfare. Currently deployed ground robots typically require one operator per robot, while more sophisticated UAVs require multiple operators due to the concurrent demands of control, monitoring and decision-making. CIS researchers have been working on key technologies to allow a small number (one or more) of operators to a control multiple teams of robots in a variety of applications. This technology will be able to be widely applied to multiple situations where human operators need to provide oversight and control of teams of semi-autonomous robotic vehicles.

- Collaborative human-robot teams where humans and robots are deployed side by side as partners on missions that require tightly integrated and choreographed activities. These combined teams will require team members to adapt to each other, the environment and the state of the team problem-solving process. The key to adaptation is providing teams with the knowledge of how team members' performance capabilities change over time. CIS researchers have been developing a common framework for incorporating humans and robots into a single team. The impact will be a clearer understanding of the applicability of human performance factors in the use of human-robot teams.

- How to apply self-adaptation to computer networks to provide enhanced systems security. One approach being considered maps the output of current intrusion detection systems to the security goals of the system. The system then weighs possible responses and their impact on the operational goals of the system to determine the best response in terms of effectiveness in dealing with attacks and minimal impact on the system. In related work, CIS researchers are attempting to create a dynamically evolving system that adapts proactively without affecting system functionality. The goal is to allow the network to reason about its current state and make changes that are invisible to the user but appear chaotic and exponentially increase the difficulty of infiltrating the network for an attacker.

A key result of MACR laboratory research over the last decade has been the development of a set of technologies and methodologies that can be easily adapted to a wide variety of distributed complex and adaptive systems. These technologies and methodologies are derived from the central concept of a human organization, which in general are highly adaptive to external as well as internal influences. While most people have an intuitive idea of what an organization is, when asked to define it explicitly, there are large numbers of "correct" answers. From early research on artificial organizations, we learn that organizations have typically been defined as including the concept of a set of agents who play roles within a structure that define the relationships between various roles. Thus, our central model of an organization consists of a set of agents (human or artificial) who play roles within the organization in order to achieve goals of interest to the organization. Based on this simple model, we have defined a set of architectures and algorithms that support organizations and their ability to adapt themselves to their ever-changing environment.

The overall goal of the MACR laboratory is to allow future systems to meet the high expectations of their users by allowing those systems to adapt effectively to their dynamic environment and changing objectives without unintended or detrimental results. More details on current and past MACR lab research and researchers can be found online at http://macr.cis.ksu.edu/.

Gurdip Singh
Department Head and Professor
Ph.D., Computer Science, State University of New York at Stony Brook, 1991
M.S., Computer Science, State University of New York at Stony Brook, 1989
B.Tech, Computer Science and Engineering, Indian Institute of Technology, 1986
Research: Distributed algorithms, middleware services, sensor networks, optimization, modular design.
Teaching: Distributed computing, network protocols, operating systems, embedded systems.

Torben Amtoft
Associate Professor
Ph.D., Computer Science, University of Aarhus, 1993
M.Sc., Computer Science, University of Copenhagen, 1989
B.Sc., Mathematics and Computer Science, University of Copenhagen, 1985
Research: Program analysis, language-based security, program slicing, information-flow analysis, dependency analysis.
Teaching: Databases, algorithms, logic and verification, formal language theory, programming languages.

Daniel Andresen
Associate Professor
Ph.D., Computer Science, University of California, Santa Barbara, 1997
M.S., Computer Science, California Polytechnic State University, SLO, 1992
B.S., Computer Science and Mathematics, Westmont College, 1990
Research: Parallel and distributed computing, scheduling and run-time systems, high-performance scientific computing, distributed-sensor networks, telemedicine.
Teaching: Operating systems, distributed systems, computer architecture, WWW technology.

Doina Caragea
Assistant Professor
Postdoctoral, Computer Science, Iowa State University, 2004-2006
Ph.D., Computer Science, Iowa State University, 2004
M.S., Computer Science, University of Bucharest, Romania, 1997
B.S., Computer Science, University of Bucharest, Romania, 1996
Research and teaching: Bioinformatics, artificial intelligence, machine learning, data mining and knowledge discovery, visual data mining, ontologies and information integration, information retrieval and semantic web.

Scott A. DeLoach
Associate Professor
Ph.D., Computer Engineering, Air Force Institute of Technology, 1996
M.S., Computer Engineering, Air Force Institute of Technology, 1987
B.S., Computer Engineering, Iowa State University, 1982
Research: Applying software engineering methods, techniques, and models to design and development of intelligent, complex, adaptive, and autonomous multiagent systems; building tools and techniques necessary to design and build cooperative robotic systems; building and developing hybrid intelligent systems that include humans, software agents, and mobile hardware agents.
Teaching: Agent-oriented software engineering, software engineering, software management.
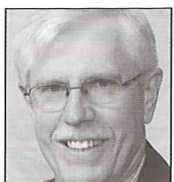
David A. Gustafson
Professor
Ph.D., Computer Science, University of Wisconsin, 1979
M.S., Computer Science, University of Wisconsin, 1973
B.S., Meteorology, University of Utah, 1969
B.S., Mathematics, University of Minnesota, 1967
Research and teaching: Software engineering, software metrics, software testing, design analysis, robotics, vision, face recognition, emotion recognition, biometrics, healthcare applications of robots.

John Hatcliff
Professor
Ph.D., Computer Science, Kansas State University, 1994
M.Sc., Computer Science, Queen's University, Kingston, Ontario, Canada, 1991
B.A., Computer Science/Mathematics, Mount Vernon Nazarene College, 1988
Research: Formal methods in software engineering, software verification, security analysis and certification, model checking, static analyses of programs, concurrent and distributed systems, middleware, model-integrated computing, semantics of programming languages, compiler construction, logics and type theory.
Teaching: Foundations of programming languages, software specification and verification, logic and set theory, construction of concurrent systems, compiler construction, formal language theory, software engineering, functional programming, logic programming.

Rodney Howell
Associate Professor
Ph.D., Computer Science, The University of Texas at Austin, 1988
B.S., Computer Science, Wichita State University, 1984
Research: Real-time scheduling, algorithm analysis, self-stabilizing systems.
Teaching: Analysis of algorithms, data structures, formal language theory, symbolic logic, real-time scheduling theory.

William Hsu
Associate Professor
Ph.D., Computer Science, University of Illinois at Urbana-Champaign, 1998
M.S., Computer Science, Johns Hopkins University, 1993
B.S., Computer Science and Mathematical Sciences, Johns Hopkins University, 1993
Research: Laboratory for Knowledge Discovery in Databases (KDD)—research group emphasizing machine learning and intelligent systems.

Masaaki Mizuno
Professor
Ph.D., Computer Science, Iowa State University, 1987
M.S., Computer Science, Pennsylvania State University, 1982
M.S., Electrical Engineering, Keio University, Japan, 1980
B.S., Electrical Engineering, Keio University, Japan, 1978
Research and teaching: Operating systems, distributed systems, real-time embedded systems, object-oriented systems.
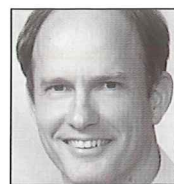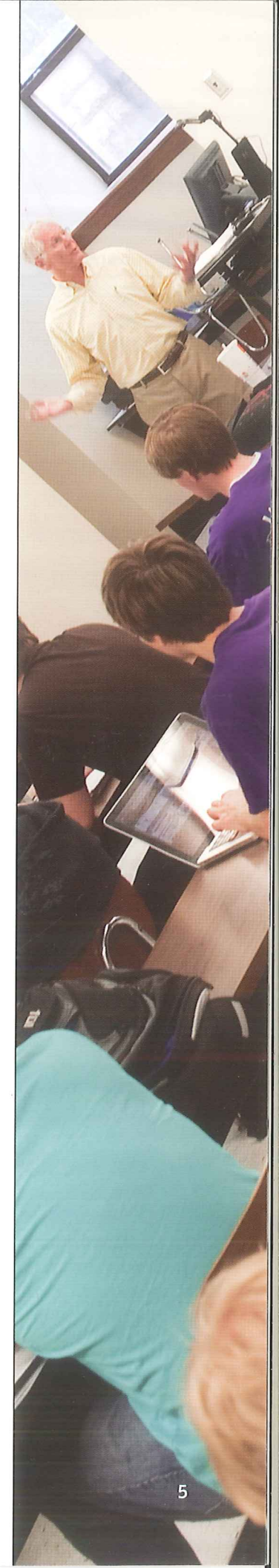
Mitch Neilsen
Associate Professor
Ph.D., Kansas State University, Computer Science, 1992
M.S., Kansas State University, Computer Science, 1989
M.S., Kansas State University, Mathematics, 1987
B.S., University of Nebraska-Kearney, Mathematics, 1982
Research: Distributed computing systems, real-time embedded systems, computational engineering, natural resources.
Teaching: Computer architecture, operating systems, networking, real-time systems.

Xinming (Simon) Ou
Assistant Professor
Ph.D., Computer Science, Princeton University, 2005
M.E., Computer Science, Tsinghua University, 2000
B.E., Computer Science, Tsinghua University, 1998
Research and teaching: Computer security, enterprise network defense, intrusion detection and analysis, security metrics, programming languages, high-assurance systems.
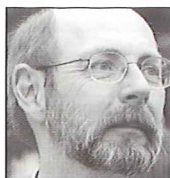
Faculty

Robby
Associate Professor
Ph.D., Computer Science, Kansas State University, 2004
M.S., Computer Science, Kansas State University, 2000
B.S., Computer Science, Oklahoma State University, 2000
Research: Software verification, specification, analysis, transformation, specialization, testing, software engineering, model-driven software development.
Teaching: Specification and verification of software, programming languages, compiler design and implementation.

David A. Schmidt
Professor
Ph.D., Computer Science, Kansas State University, 1981
M.S., Computer Science, Kansas State University, 1977
B.A., Mathematics, Fort Hays State University, 1975
Research: Abstract interpretation, static program analysis, denotational semantics.
Teaching: Programming methodology, program validation, software architecture.

Eugene Vasserman
Assistant Professor
Ph.D., Computer Science, University of Minnesota, 2010
M.S., Computer Science, University of Minnesota, 2008
B.S., Biochemistry, Neuroscience, University of Minnesota, 2003
Research: Distributed system security, privacy and anonymity, peer-to-peer systems, network security, medical and embedded device security, applied cryptography usable security.
Teaching: Secure networks and distributed systems.

Virgil Wallentine
Professor
Ph.D., Computer Science, Iowa State University, 1972
M.S., Computer Science, Iowa State University, 1970
B.S., Mathematics, Iowa State University, 1965
Research: Parallel scientific simulations, verification of concurrent software, health IT systems.
Teaching: Parallel and distributed systems, impact of computing on society.

Research

Argus Group—Cyber Security Research
http://people.cis.ksu.edu/~xou/argus/
CISA—Center for Information and Systems Assurance
http://www.cisa.ksu.edu

The Argus group carries out cyber security research under the direction of Dr. Simon Ou. Argus' focus is on the defense aspect of cyber warfare, and our philosophy is that successful cyber defense can only be achieved through automated coordination of various observation and action points in an enterprise environment. Traditional solutions like firewalls and IDS systems are limited in effectiveness, since they only look at one aspect of the system and lack the capability of "connecting the dots" among various information sources to gain a global picture of a system's security status. Our research aims at providing enabling technologies for such automated correlation and analysis with solid theoretical foundation and empirical study.

Argus is part of the Center for Information and Systems Assurance (CISA) at Kansas State University, an umbrella organization established in 2009 for all cybersecurity and information assurance research in the university. Faculty at CISA conduct research in computer and network security, high-assurance software systems, language-based security, security in health IT systems and security in distributed sensor systems. CISA has extensive collaboration with a number of external industry and government partners such as Rockwell Collins, HP Labs, DRDC-Ottawa, National Institute of Standards and Technology, Idaho National Laboratory, IAI Inc. and Telcordia Technologies. Research in CISA is funded by the National Science Foundation, Department of Defense and a number of industry partners.
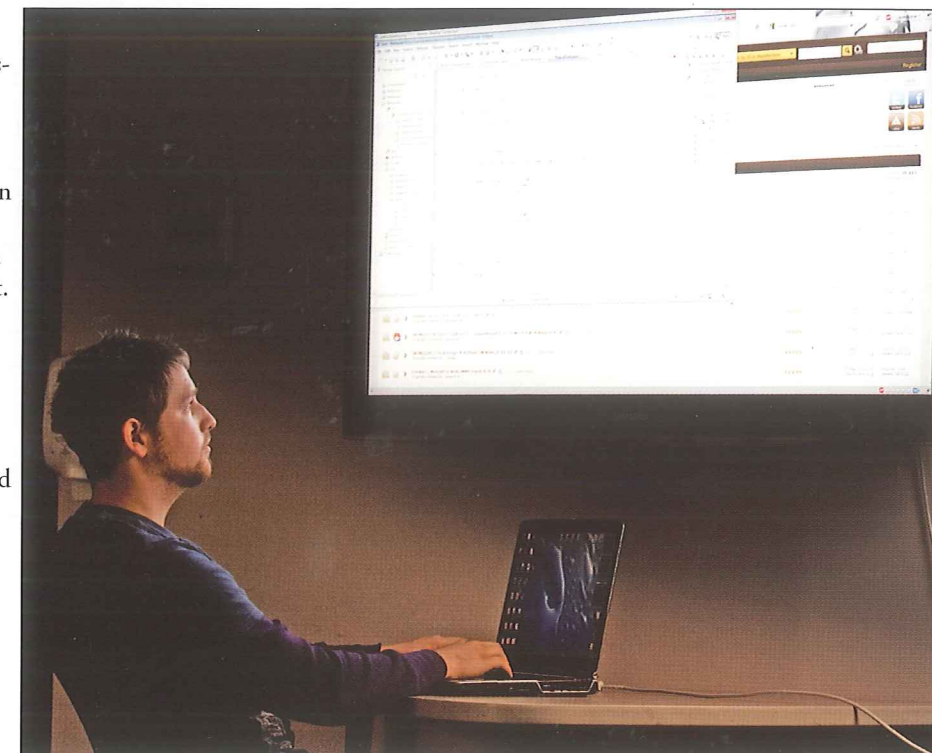
Machine Learning and Bioinformatics (MLB) Group
http://people.cis.ksu.edu/~dcaragea/mlb

The MLB group aims to design algorithms and develop tools for analyzing large amounts of data, in particular, molecular sequence and gene-expression data. Main projects focus on the following:

- ontology engineering and classifier learning from semantically heterogeneous data sources
- EST data analysis, alternative splicing discovery and gene prediction
- gene regulatory network discovery from gene-expression data and sequence information

The MLB group is collaborating with the artificial intelligence and machine learning group at Iowa State University to produce an open-source system for knowledge acquisition and information integration from semantically heterogeneous data sources (NSF funding), and with the Bioinformatics Center at Kansas State University to produce bioinformatics and genomics tools (funding from K-State EcoGen and Targeted Excellence Program).

Collaborative Work on Computational Engineering – M. Neilsen
www.damsafety.info

The U.S. Department of Agriculture (USDA) and U.S. Army Corps of Engineers (USACE) are partnering with Kansas State University to incorporate research and field experience into computational tools for use in design and analysis of water-control structures. These tools provide the basis for optimal use of natural materials such as vegetation to protect embankments and spillways. Tools developed or under development through this cooperative work were highlighted in a booth at the Association of State Dam Safety Officials' (ASDSO) Annual Conference in 2009. Current work involves developing tools to analyze

breach failures and tools to perform risk assessment across the United States. Other computational engineering research uses finite-element analysis (FEA) to develop a turbo, solder interconnect preditor (Sandia TurboSIP) tool to evaluate Pb-free solder joints in electronic control packaging for satellite systems, etc.

Distributed Systems Lab
http://www.cis.ksu.edu/beocat

The Distributed Systems Lab supports a wide range of interdisciplinary research around a core interest in efficient, effective distributed systems. Key projects include the K-State research computing cluster, BeoCat, the largest academic cluster in Kansas with 1,000 cores; enhancing the efficiency of SOAP/XML communications; medical informatics; ecological modeling; and veterinary telemedicine. Our work is frequently cross-disciplinary and common collaborators go beyond engineering, ranging from agricultural economics to veterinary medicine. Since 1998, the Distributed Systems Lab has received funding from agencies such as the National Science Foundation, U.S. Food and Drug Administration, U.S. Department of Agriculture and NSF EPSCoR.

KDD Lab
http://www.kdd.cis.ksu.edu

The laboratory for Knowledge Discovery in Databases (KDD lab) aims at developing technologies for building models of events and processes from data, and then using these models to help make decisions. Research in the KDD lab focuses on developing algorithms and techniques for the following:

- data mining, machine learning, and probabilistic reasoning over large data sets and text collections
- human language technologies: computational linguistics and information extraction
- visualizing, learning, and reasoning about events and event streams
- analysis of spatial data: georeferencing, spatial outlier detection, deduplication, etc.
- modeling cognitive processes to better understand how humans reason about causality, especially with spatial and temporal data

Applications of these algorithms include software tools for bioinformatics, epidemiology, health informatics, computational physics, sensor network optimization and computer security.

Tools developed by the lab have been used

by the Department of Defense, Office of Naval Research (ONR), Army Research Lab (ARL), National Agricultural Biosecurity Center (NABC) and Kansas Department of Transportation (KDOT). Federal and corporate sponsors of the KDD lab since 1999 include the NSF, DHS, ONR, ARL, Raytheon and American Diagnostic Medicine.

The KDD lab maintains a research collaboration with the University of Illinois at Urbana-Champaign, including the National Center for Supercomputing Applications (NCSA).

MACR Laboratory
http://macr.cis.ksu.edu

The MultiAgent and Cooperative Robotics (MACR) Laboratory focuses on applying software engineering methods, techniques, and models to the design and development of intelligent, complex, adaptive and autonomous multiagent systems.

Current research focuses on building the tools and techniques necessary to design and build cooperative robotic systems, where the robots work autonomously but cooperate as part of a team. This research also includes building and developing hybrid intelligent systems that include

humans, software agents and mobile hardware agents. Key elements of this work are—

- a set of methods and techniques for analyzing and designing complex, adaptive systems;
- a set of organization-based models upon which the system analysis, design and implementation are based;
- a set of generic technologies that implement organization-based models; and
- a set of multiagent and cooperative robotic systems used to demonstrate our approaches.

The lab has produced the organization-based multiagent systems engineering methodology (OMaSE) and its associated agentTool development environment. The MACR Lab is collaborating with the Human-Machine Teaming Laboratory at Vanderbilt University to integrate humans as teammates into cooperative robotics teams. Since 2002, the MACR Lab has received more than $3.8 million in funding from the National Science Foundation, the Air Force Office of Scientific Research, United States Marine Corps, M2 Technologies and Stanfield Systems Inc.

SAnToS Laboratory
http://santos.cis.ksu.edu

The Laboratory for Specification, Analysis and Transformation of Software (SanToS) aims to develop technologies and tools for effective construction of high-confidence software systems. Work in the lab emphasizes—

- use of rigorous analysis techniques with solid mathematical underpinnings,
- a variety of forms of code and model-integrated software specifications to capture crucial system correctness properties, and
- use of software models as a key mechanism for capturing essential software structure leading to system analysis and verification.

The lab has produced tools including the Bandera and Bogor software model checking frameworks, the Cadena modeling frameworks for component-based systems, and the Indus static

and analysis and slicing frameworks that are widely recognized within the academic software engineering and verification communities. SAnToS researchers are currently focusing on applications in security, software product lines, integrated medical devices and sensor networks. Since 1998, SAnToS Laboratory has received more than $8.5 million in funding through agencies and companies such as the National Science Foundation, Army Research Office, Air Force Office of Scientific Research, Defense Department Advanced Projects Agency (DARPA), NASA, Lockheed Martin, Rockwell Collins, IBM, Honeywell and Intel.

The Sensor Networks laboratory
http://persnl.cis.ksu.edu

The Sensor Networks Laboratory is conducting research to develop tools and methodologies for development of sensor applications, and supports multidisciplinary research that draws on faculty expertise from several disciplines. The lab has the following goals:

- develop model-driven tools for designing and deploying large-scale sensor networks
- provide the infrastructure support necessary to enable K-State researchers to perform multidisciplinary research and address challenges posed by the next generation of sensor systems
- Provide laboratory support in various courses to educate and train students for networking and distributed computing research

The lab is currently supported by the K-State's Targeted Excellence Program to promote multidisciplinary research. With additional instrumentation support grants from NSF and DoD, an experimentation test bed has been established to rapidly prototype large-scale sensor applications and to evaluate developed technologies. Multidisciplinary projects in the areas of veterinary telemedicine, hydrology, grain science, agronomy, agricultural engineering and environmental monitoring are being pursued in collaboration with researchers from several departments in engineering, veterinary medicine, agronomy and agriculture.
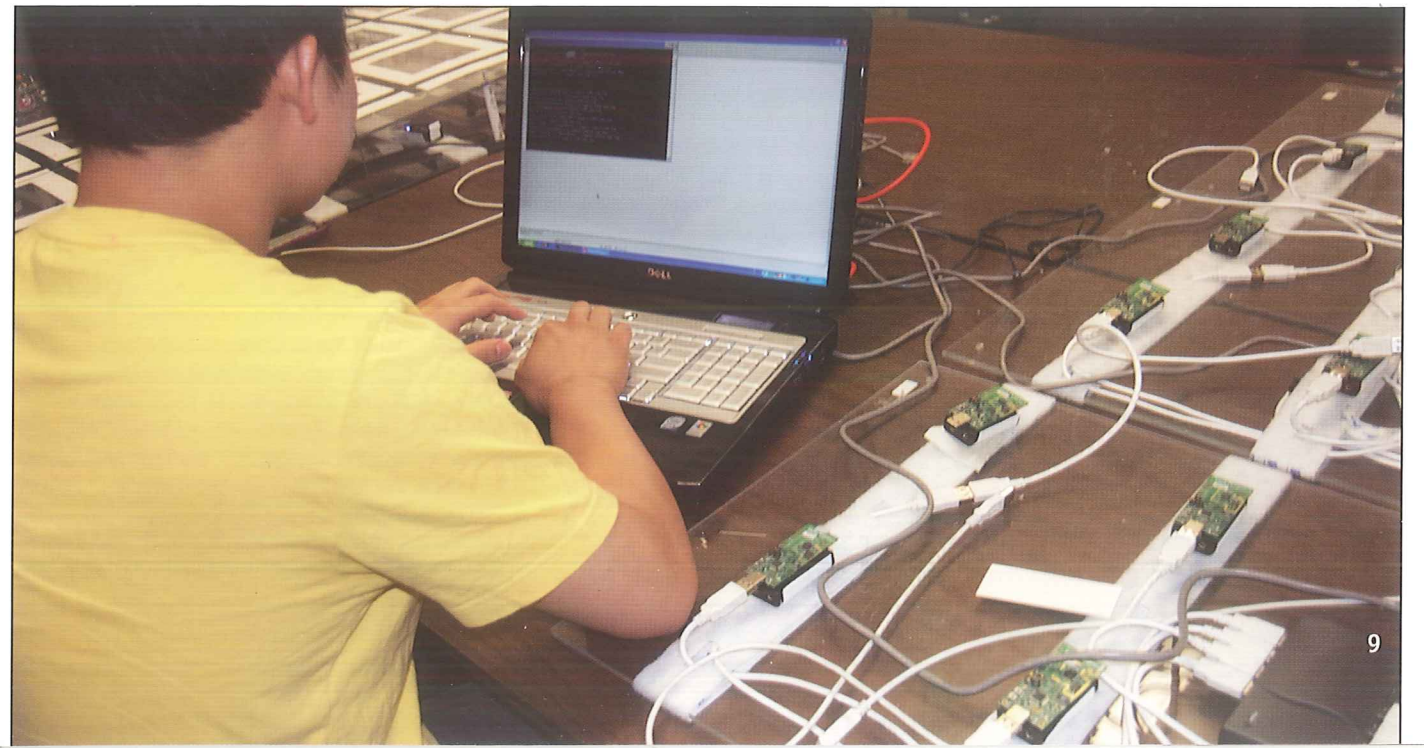
Amtoft

- Amtoft, T., Hatcliff, J., and Rodriquez, E.: "Precise and automated contract-based reasoning for verification and certification of information flow properties of programs with arrays," Proceedings of ESOP 2010 (part of ETAPS 2010), pp. 43 - 63, Springer LNCS 6012, 2010.
- Amtoft, T., Androutsopoulos, K., Clark, D., Harman, M., and Li, Z.: "An alternative characterization of weak order dependence," Information Processing Letters, 110: 939 - 943, October 2010.
- Amtoft, T., Hatcliff, J., Rodriquez, E., Robby, Hoag, J., and Greve, D.: "Specification and Checking of Software Contracts for Conditional Information Flow," pp. 341 - 380 in "Design and Verification of Microprocessor Systems for High Assurance Applications" (edited by David S. Hardin), Spring 2010.

Andresen

- Andresen, D., Dodds, W., Krishtalka, L., Luo, Y., McMullen, D., Palmer, M., Xiao, X., and Yuan, M.: "The CyberCommons: Cyberinfrastructure for Understanding and Forecasting Ecological Change in the Central Plains Grasslands," Poster session, Cyberinfrastructure in the EPSCoR's Workshop, Arlington, Virginia, October 7 - 8, 2010.
- Andresen, D., Dodds,W., Krishtalka, L., Luo, Y., McMullen, D., Palmer, M., Xiao, X., and Yuan, M.: "The CyberCommons: Cyberinfrastructure for Understanding and Forecasting Ecological Change in the Central Plains Grasslands," Poster session, Great Plains Network (GPN) Annual Meeting, Kansas City, MO, June 2 - 4, 2010.
- Andresen, D., Dodds, W., Krishtalka, L., Luo, Y., McMullen, D., Palmer, M., Xiao, X., and Yuan, M.: "The CyberCommons: Cyberinfrastructure for Understanding and Forecasting Ecological Change in the Central Plains Grasslands," Poster session, "Improving Observing Network Coordination: A Cyberinformatics Forum," Boulder, CO, May 17 - 19, 2010.
- Carranco, L., and Andresen, D.: "SOAP Optimization over WCF via Client-Side Caching," Proceedings of the 2010 International Conference on Semantic Web and Web Services (SWWS'10), pp. 11 – 17, Las Vegas, NV, July 12 - 15, 2010.
- Kirkconnell, C., and Andresen, D.: "A REST-Based Messaging Server for Ruby on Rails." To appear in the Proceedings of the 2010 International Conference on Internet Computing (ICOMP'10), pp. 165 – 171, Las Vegas, NV, July 12 - 15, 2010.

Caragea

- Caragea, C., Caragea, D., Silvescu, A., and Honavar, V.: "Semi-Supervised Prediction of Protein Subcellular Localization Using Abstraction-Augmented Markov Models," Special Issue on Machine Learning in Computational Biology (MLCB) BMC Bioinformatics. October 26, 2010; 11 Suppl 8:S6.
- Steller, M., Kambhampati, S., and Caragea, D.: "Comparative analysis of expressed sequence tags from three castes and two life stages of the termite Reticulitermes flavipes," BMC Genomics 2010, 11:463.

- Kim, H.S., Murphy, T., Xia, J., Caragea, D., Park, Y., Beeman, R., Lorenzen, M., Manak, J., Butcher, S. and Brown, S.: "BeetleBase in 2010: revisions to provide comprehensive genomic information for Tribolium castaneum," In: Journal of Nucleic Acid Research (NAR), 2010, Vol. 38, Database issue D437-D442.
- Travers, S. E., Tang, Z., Caragea, D., Garrett, K.A., Hulbert, S. H. , Leach, J. E. , Bai , J., Saleh, A., Knapp, A.K., Fay, P.A., Nippert, J., Schnable, P.S., and Smith, M.D.: "Spatial and temporal variation of big bluestem (Andropogon gerardii) transcription profiles with climate change," In: Journal of Ecology, 2010, 98, pp. 374 - 383. Selected as Editor's Choice for March 2010 (Journal of Ecology, March 2010).
- Xia, J., Caragea, D. and Brown, S.J.: "Prediction of alternatively spliced exons using support vector machines," In: International Journal on Data Mining and Bioinformatics (IJDMB). Vol. 4, No. 4, pp. 411-430, 2010.
- Caragea, C., Silvescu, A., Caragea, D. and Honavar, V.: "Abstraction-Augmented Markov Models," In: Proceedings of the IEEE Conference on Data Mining (ICDM). Regular paper. Sydney, Australia. pp. 68-77, 2010.
- Volkova, S., Caragea, D., Hsu, W.H., Drouhard, J. and Fowles, L.: "Boosting Biomedical Entity Extraction by Using Syntactic Patterns for Semantic Relation Discovery," In: Proceedings of the IEEE/WIC/ACM International Conference on Web Intelligence (WI'10), Toronto, Canada. 272-278, 2010.
- Caragea, C., Silvescu, A., Caragea, D., and Honavar, V.: "Semi-Supervised Sequence Classification Using Abstraction-Augmented Markov Models," In: Proceedings of the ACM Conference on Bioinformatics and Computational Biology. Niagara Fall, NY, 2010.
- Volkova, S., Caragea, D., Hsu, W., and Bujuru, S.: "Animal Disease Event Recognition and Classification." In: Proceedings of the First International Workshop on Web Science and Information Exchange in the Medical Web (MedEx'10). Collocated with the 19th World Wide Web Conference Raleigh, NC, 2010.
- Elshamy, W., Caragea, D. and Hsu, W.H.: "KSU KDD: Word Sense Induction by Clustering in Topic Space," In: Proceedings of the SemEval Workshop. Poster program. Collocated with the 48th Annual Meeting of the Association for Computational Linguistic (ACL'10), Uppsala, 2010.

DeLoach

- DeLoach S. and Garcia-Ojeda, J.: "O-MaSE: An Customizable Approach to Designing and Building Complex, Adaptive Multiagent Systems," International Journal of Agent-Oriented Software Engineering (IJAOSE). Volume 4, no. 3, pp. 224-280, 2010.
- DeLoach, S. and Miller, M.: "A Goal Model for Adaptive Complex Systems." International Journal of Computational Intelligence: Theory and Practice. Volume 5, no. 2, 2010.
- DeLoach, S.: "Analyzing GMoDS Goal Models Using Petri Net Semantics." Multiagent & Cooperative Robotics Laboratory Technical Report No. MACR-TR-2010-03. Kansas State University. May 2010.

- Oyenan, W. and DeLoach, S.: "Towards a Systematic Approach for Designing Autonomic Systems." Web Intelligence and Agent Systems: An International Journal. Volume 8, no. 1, pp. 79-97, 2010.
- Oyenan, W., DeLoach, S., and Singh, G.: "An Organizational Design for Adaptive Sensor Networks," Proceedings of the IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT '10). Toronto Canada, September 2010.
- Garcia-Ojeda, J., and DeLoach, S.: "The O-MaSE Process: A Standard View," Proceedings of the IEEE FIPA Workshop on Design Process Documentation and Fragmentation (FIPA DPDF), held in conjunction with The Multi-Agent Logics, Languages, and Organizations Federated Workshops (MALLOW 2010). Lyon, France, 2010.
- Oyenan, W., DeLoach, S., and Singh, G.: "Designing Adaptive Sensor Networks Using an Organization-Based Approach," Multiagent & Cooperative Robotics Laboratory Technical Report No. MACR-TR-2010-04. Kansas State University. June 2010.
- Zhong, C. and DeLoach, S., "Integrating Performance Factors into an Organization Model for Better Task Allocation in Multiagent Systems," Multiagent & Cooperative Robotics Laboratory Technical Report No. MACR-TR-2010-02. Kansas State University. April 2010.
- Oyenan, W. and DeLoach, S.: "Using Category Theory to Compose Multiagent Organization Design Models," Multiagent & Cooperative Robotics Laboratory Technical Report No. MACR-TR-2010-01. Kansas State University. March 25, 2010.

Gustafson

- Lancaster, J. and Gustafson, D.: "Predicting Performance in Robotics Search and Tag," Proc of ANNIE, St Louis, November 2010.
- Gupta, P. and Gustafson, D.: "OO Testing beyond Statement Coverage," Proc, Las Vegas, November 2010.
- Born, K. and Gustafson, D.: "NgViz: Detecting DNS Tunnels," 6th Annual Cyber Security and Information Integrity Workshop, Oak Ridge, TN April 2010.
- Born, K. and Gustafson, D.: "Detecting and Visualizing Domain-Based DNS Tunnels through the N-Gram Frequency Analysis," 9th Annual Security Conference, Las Vegas, 2010.
- Born, K. and Gustafson, D.: "Detecting and Visualizing Domain-Based DNS Tunnels through the N-Gram Frequency Analysis," Special issue of Journal of Information System Security, 2010.

Hatcliff

- Hatcliff, J. and Zucca E. (editors): "Formal Techniques for Distributed Systems," Proceedings of the Joint 12th IFIP WG6.1 International Conference, FMOODS 2010 and 30th IFIP WG6.1 International Conference, FORTE 2010, Amsterdam, The Netherlands, June 2010. Lecture Notes in Computer Science (LNCS) 2619, Springer, 2010.
- Amtoft, T., Hatcliff, J., Rodriguez, E., Robby, Hoag, J., and Greve, D.: "Specification and Checking of Software Contracts for Conditional Information

Flow (extended version)," Invited book chapter in "Design and Verification of Microprocessor Systems for High-Assurance Applications", pp. 341--380. Springer, 2010. ISBN 978-1-4419-1538-2.
- Jung, G. and Hatcliff, J.: "A type-centric framework for specifying heterogeneous, large-scale, component-oriented, architectures," Science of Computer Programming, 75 (1), pp. 615-637, July 2010.
- Amtoft, T., Hatcliff, J., and Rodriguez, E.: "Precise and Automated Contract-Based Reasoning for Verification and Certification of Information-Flow Properties of Programs with Arrays," Proceedings of the 2010 European Symposium on Programming (ESOP 2010), LNCS 6012, pp. 43 - 63, March 2010.
- King, A., Arney, D., Lee, I., Sokolsky, O., Hatcliff, J., and Procter, S.: "Prototyping Closed-Loop Physiologic Control with the Medical Device Coordination Framework," Workshop on Software Engineering in Health Care (SEHC 2010), Cape Town, South Africa, May 2010.

Howell

- Howell, R., and Mizuno, M., "Propagation Delays in Fixed-Priority Scheduling of Periodic Tasks." Euromicro Conference on Real-time Systems 2010 (ECRTS 2010), July 2010, Brussels, Belgium (Acceptance Ratio 24%).

Hsu

- Volkova, S., Caragea, D., Hsu, W.H., and Bujuru, S.: "Animal disease event recognition and classification," Proceedings of the First International Workshop on Web Science and Information Exchange in the Medical Web (MedEx 2010). Raleigh, NC, USA. April 30, 2010.
- Volkova, S., and Hsu, W.H.: "Computational knowledge and information management in veterinary epidemiology," Proceedings of the 8th IEEE International Conference on Intelligence and Security Informatics (ISI 2010). Vancouver, BC, Canada. May 23-26, 2010.
- Roy Chowdhury, S., Scoglio, C., and Hsu, W. H.: "Simulative modeling to control the foot and mouth disease epidemic," Proceedings of the International Conference on Computational Science (ICCS 2010) Workshop 27: Frontiers in the Computational Modeling of Disease Spreading. Procedia Computer Science, 2010(1), pp. 2261 - 2270. Amsterdam, The Netherlands, May 31 - June 2, 2010.
- Elshamy, W., Caragea, D., and Hsu, W. H.: "KSU KDD: Word-sense induction by clustering in topic space," Proceedings of the 5th International Workshop on Semantic Evaluation, ACL 2010, pp. 367-370, Uppsala, Sweden, July 15 - 16, 2010.
- Weninger, T., Ramachandran, S., Greene, D., Hart, J., Kancherlapalli, A., Hsu, W. H., and Han, J.: "Speech-Assisted Radiology System for Retrieval, Reporting and Annotation," Proceedings of the 16th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 2010), Washington DC, July 25 - 28, 2010.
- Volkova, S., Caragea, D., and Hsu, W. H., Drouhard, J., and Fowles, L.: "Boosting Biomedical Entity Extraction by Using Syntactic Patterns for Semantic

Relation Discovery," Proceedings of the 2010 IEEE/WIC/ACM International Conference on Web Intelligence (WI 2010), August 31 - September 3, 2010.

Mizuno

- Howell, R., and **Mizuno, M.**, "Propagation Delays in Fixed-Priority Scheduling of Periodic Tasks." Euromicro Conference on Real-time Systems 2010 (ECRTS 2010), July 2010, Brussels, Belgium (Acceptance Ratio 24%).

Neilsen

- **Neilsen, M.L.**: "Symbolic schedulability analysis of task sets with arbitrary deadlines," Proceedings of the 16th International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'10), Paper No. PDP4851, July 12-14, 2010.
- **Neilsen, M.L.**, Temple, D.M., and Hanson, G.J.: "Integrating dam breach modules to analyze earth embankment dams," Proceedings of the 7th International Conference on Scientific Computing (CSC'10), Paper No. CSC5108, July 12-14, 2010.
- **Neilsen, M.L.**: "Symbolic schedulability analysis of task sets with preemption thresholds," Proceedings of the 2nd International Sensor Networks and Applications Conference (SNA 2010), Paper No. 1022, Nov. 8-10, 2010.
- Visser, K., **Neilsen, M.L.**, Lobrecht, M., Temple, D.M., Hanson, G., and Moody, H.F.: "WinDAM B: Earthen embankment overtopping analysis software," Proceedings of the 2010 Federal Interagency Hydrologic Modeling Conference, June 27 - July1, 2010.
- D. Temple, **Neilsen, M.L.**, and Lobrecht, M., et.al: "SITES 2005.1.5 – Water Resource Site Analysis Computer Program – User Guide," Version 2005.1.5, 2010.

Ou

- Xie, P., Li, J., **Ou, X.**, Liu, P., and Levy, R.: "Using Bayesian Networks for Cyber Security Analysis," The 40th Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2010), Chicago, USA, June 2010.

Robby

- Amtoft, T., Hatcliff, J., Rodriguez, E., **Robby**, Hoag, J., and Greve, D.: "Specification and Checking of Software Contracts for Conditional Information Flow (extended version)," Invited book chapter in "Design and Verification of Microprocessor Systems for High-Assurance Applications", pp. 341--380. Springer, 2010. ISBN 978-1-4419-1538-2.
- Chalin, P., **Robby**, James, P.R., Lee, J., and Karabotsos, G.: "Towards an Industrial Grade IVE for Java and Next Generation Research Platform for JML," International Journal on Software Tools for Technology Transfer (STTT), Volume 12, Number 5, pp. 391-403, Springer, 2010.
- Deng, X., Walker, R., and **Robby**, "Program Behavioral Benchmarks for Evaluating Path-Sensitive Bounded Verification Techniques," Technical Report SAnToS-TR2010-08-20, Kansas State University, August 2010.

Schmidt

- Doh, K.,Kim, and **Schmidt, D.A.**: "Abstract parsing of string updates and user input," (http://santos.cis.ksu.edu/schmidt/absupdate.pdf), Report 2010-1.
- **Schmidt, D.A.**: "Modular, parsing-based, flow analysis of dictionary data structures in scripting languages." David A. Schmidt (http://santos.cis.ksu.edu/schmidt/absdict.pdf) Report 2010-2.

Singh

- Zhu, H. and **Singh, G.**: "A Communication Protocol for a Vehicle Collision Warning System," IEEE/ACM International Conference on Cyber, Physical and Social Computing, December 2010. Won the Best Paper Award.
- Oyenan, W., DeLoach, S., and **Singh, G.**: "An Organizational Design for Adaptive Sensor Networks," Proceedings of the IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT '10). Toronto Canada, September 2010.
- Kolesnikov, V. and Singh, G.: "Realizing optimization opportunities for distributed applications in the middleware layer by utilizing InDiGO framework," In the Proceedings of the 9th International Symposium on Parallel and Distributed Computing (ISPDC 2010), July 7-9, 2010.
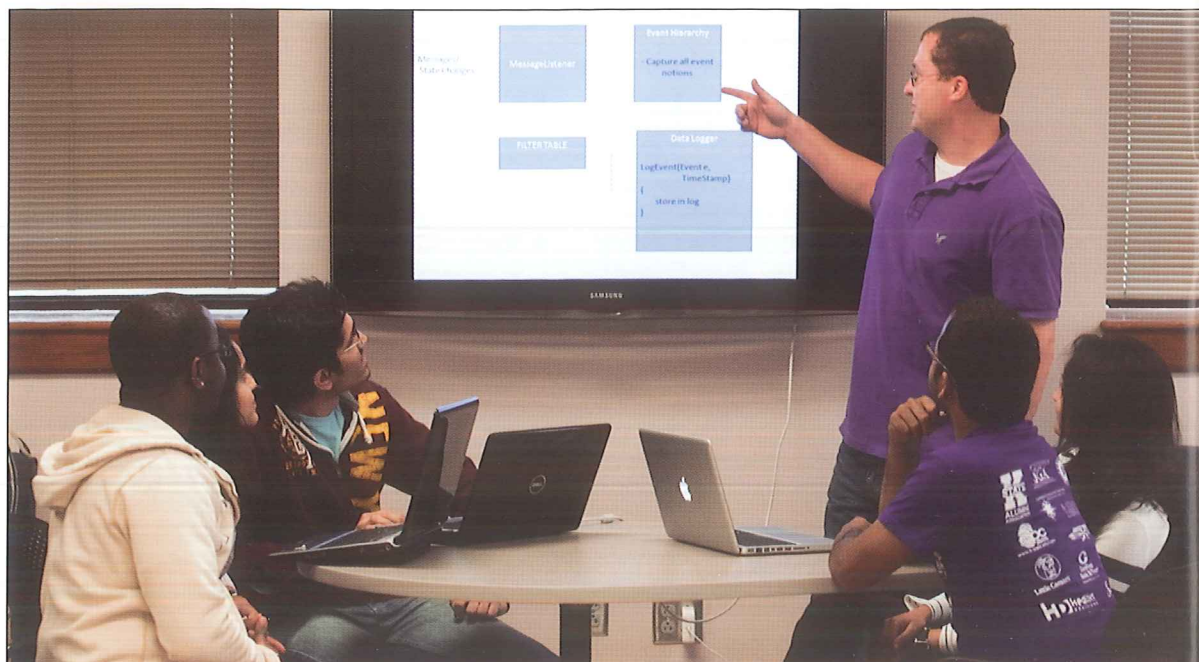
Amtoft

- PI, National Science Foundation (NSF), Cyber Trust Program, "Collaborative Research: Access Control and Downgrading in Information-Flow Assurance," $200,000, September 2006 – August 2010.
- Co-PI [with PI John Hatcliff, co-PIs Xinming Ou, Robby, Andrew Appel (Princeton)], Air Force Office of Scientific Research (AFOSR), "Evidence-Based Trust in Large-Scale MLS Systems," Total Amount: $3,000,000, KSU Portion: $2,000,000, May 2009 - August 2014.
- Co-PI (with PI John Hatcliff, co-PIs Xinming Ou and Robby), Rockwell Collins Advanced Technology Center, "A Domain-Specific Language for Defining High-Assurance Secure-Network Guards (Phase II)," $85,000, September 2009 - August 2010.

Andresen

- Co-PI (with PI John Hatcliff, co-PIs Robby and Steve Warren), National Science Foundation (NSF) CPS (Award no. 0932289), "CPS: Medium:Collaborative Research:Infrastructure and Technology Innovations for Medical Device Coordination," NSF Collaborative Grant with the University of Pennsylvania. Total Amount: $1,500,000, KSU Portion: $839,548, September 2009 - August 2012.
- Co-PI, National Science Foundation (NSF) EPSCoR (Award no. 1006860), "Prairie Light: Next- Generation Networking for Midcontinent Science," $1,176,000, August 2010.
- Co-PI (with PI John Hatcliff, co-PIs Robby, Eugene Vasserman, and Steven Warren), Mass General Hospital (NIBIB (NIH) Quantum), "Development of a Prototype Healthcare Intranet for Improved Health Outcomes," $ 375,000, September 2010 – August 2011.
- Co-PI (with PI Gurdip Singh, co-PIs Scott DeLoach, Bala Natarajan, and Steven Warren), National Science Foundation (NSF) CRA, "Experimentation Platform for Developing Customized, Large-Scale Sensor Systems," $200,000, March 2006 – March 2010.

Caragea

- Co-PI (with PI Steve Welch, co-PI Sanjoy Dos), National Science Foundation (NSF), "Cyberinfrastructure Implementation for Genotype to Phenotype Research," $314,847, 2009-2011.
- PI (with PI Vasant Hanoavar, ISU), National Science Foundation (NSF), "Collaborative Research: Learning Classiers from Autonomous, Semantically Heterogeneous, Distributed Data," $145,504, July 2007 – June 2011.
- Co-PI (with co-PIs Eduard Akhunov, Bikram Gill, Frank White, Karen Garrett, James Nelson, Susan Brown, Loretta Johnson, Michael Herman, Jianming Yu, Sanjeev Narayanan, and Ludek Zurek), KSU Targeted Excellence Program, "Advanced Genomics at K-State: Ultra-High Throughput DNA Sequencing," $850,000, 2008-2011.
- Senior Personnel (with PI Walter Dodds, et al.), National Science Foundation (NSF), EPSCoR TRACK II Oklahoma and Kansas, "Wiring the Central Plains: Cyberinfrastructure to Monitor and Model Ecosystems under Directional Change," $1,605,472, 2009-2012.
- Senior Personnel (with PI Cynthia Weinig, Co-PIs Steve Welch, Justin Maloof, and Sanjoy Das), National Science Foundation (NSF), "DBI – Plant Genome Research Project, TRMS: Ecological Annotation of Gene Function and Computational Analysis of Gene Networks." KSU award amount: $1,212,620, CIS SRO: 7%, 2010 – 2015.
- Co-PI (with PI Susan Brown, co-PIs Richard Beeman, Yoonseong Park, and Subbarantnam Muthukrishnan), Seed Grant ACG, KSU, "Comparative Genomics of Our Beetles in the Genus Tri-bolium," $120,000, 2010-2012.
- Co-PI (with PI Tony Grace, co-PIs Susan Brown, Samantha Wisely, and Anthony Joern), Seed Grant, IGF, KSU, "Comparative transcriptome sequence analysis of two host races of the grasshopper Hesperotettix viridis—searching for evidence of host-associated divergence and incipient speciation," $10,000, 2010 - 2011.

Grants

DeLoach

- PI, (with co-PI J. Adams), Air Force Office of Scientific Research (AFOSR/NM), "Human-robot teams informed by human performance moderator functions," $604,480, June 2009 – May 2012.
- PI (with co-PIs D. Gustafson and J. Adams), U.S. Marine Corp/M2 Technologies/K-State Urban Operations Lab, "Controlling Robot Teams in Urban Environments (Single-Platform Multi-Sensor Control System)," $465,000, 2007 – 2010.
- Co-PI (with PI Gurdip Singh, co-PIs Douglas McGregor and Jim Edgar), Targeted Excellence Program, KSU, "Center for Sensors and Sensor Systems," $1,500,000, July 2006 – June 2011.
- Co-PI (with PI Gurdip Singh, co-PIs Daniel Andresen, Bala Nataranjan, and Steven Warren), National Science Foundation (NSF) CRA, "Experimentation Platform for Developing Customized, Large-Scale Sensor Systems," $200,000, March 2006 – March 2010.

Gustafson

- Co-PI (with PI Scott DeLoach, co-PI J. Adams), U.S. Marine Corp/M2 Technologies/K-State Urban Operations Lab, "Controlling Robot Teams in Urban Environments (Single-Platform Multi-Sensor Control System)," $465,000, 2007 – 2010.

Hatcliff

- PI (with co-PIs Daniel Andresen, Robby, and Steve Warren), National Science Foundation (NSF) CPS (Award no. 0932289), "CPS:Medium:Collaborative Research: Infrastructure and Technology Innovations for Medical Device Coordination," NSF Collaborative Grant with the University of Pennsylvania. Total Amount: $1,500,000, KSU Portion: $839,548, September 2009 - August 2012.
- PI [with co-PIs Torben Amtoft, Robby, Xinming Ou, and Andrew Appel (Princeton University)], Air Force Office of Scientific Research (AFOSR), "Evidence-Based Trust in Large-Scale MLS Systems," Total Amount: $3,000,000, KSU Portion: $2,000,000, May 2009 - August 2014.
- PI (with co-PIs Torben Amtoft, Xinming Ou, and Robby), Rockwell Collins Advanced Technology Center, "A Domain-Specific Language for Defining High-Assurance Secure-Network Guards (Phase II)," $85,000, September 2009 - August 2010.
- PI (with co-PIs Dan Andresen, Robby, Eugene Vasserman, and Steven Warren), Mass General Hospital (NIBIB (NIH) Quantum), "Development of a Prototype Healthcare Intranet for Improved Health Outcomes," $ 375,000, September 2010 – August 2011.
- PI (with co-PIs Robby, Gurdip Singh, Virg Wallentine, and Steven Warren) NSF/FDA, "An Integrated Development and Certification Environment for a Medical Device Coordination Framework," $80,000, 2010-2011.

Hsu

- Co-PI, (with PI Marty Vanier), Department of Defense, "Multimodal Information Extraction: The Predictive Epidemiology Domain," $150,000, April 2009 – March 2010.

Neilsen

- Co-PI (with PI Marty Vanier), Department of Defense, "Simulative Models for Prediction of Epidemics," $50,000, April 2009 – March 2010.

- PI, USDA/ARS: "Software Tools for Watershed Dam Design and Analysis," $106,900, April 2005 – April 2010.
- PI, USDA/ARS: "Development of Software Tools for Predicting Embankment Erosion of Earthen Dams," $40,000, September 2007 – September 2011.
- PI, USDA/NRCS: "Integration of Spillway Erosion Technology with WinTR-20 with WinDAM," $45,000, 2007 - 2011.
- PI (with co-PIs Gurdip Singh, J. Spears, N. Zhang, and Virg Wallentine), National Science Foundation (NSF), GK-12 STEM Fellowship Program: "Infusing system design and sensor technology in education (INSIGHT)," $2.8M, ($540K for 2010), April 2010 – March 2015.
- PI, Sandia National Laboratories, "Interface Development for Thermal Battery Models," $80,000, October 2009—September 2011.

Ou

- PI, National Science Foundation (NSF) CAREER, "Reasoning under Uncertainty in Cybersecurity," $429,661, March 2010 - February 2015.
- PI, National Science Foundation (NSF), "TC: Small:Collaborative Research: Models and Techniques for Enterprise Network Security Metrics," $396,676, October 2010 – September 2013.
- PI, National Science Foundation (NSF), "Research Experience for Undergraduates Supplement," $15,000, March 2010 – February 2015.
- PI, National Science Foundation (NSF), "CT-ISG: Model-Based, Automatic Network Security Management," $258,500, August 2007 – July 2010.
- PI, HP Labs Innovation Research Program, "A New Approach to Rigorous Risk Analytics Using Attack Graphs," $73,000, August 2010 – July 2011.
- Co-PI [with PI John Hatcliff, co-PIs Torben Amtoft, Robby, and Andrew Appel (Princeton)], Air Force Office of Scientific Research (AFOSR), "Evidence-Based Trust in Large-Scale MLS Systems," Total Amount: $3,000,000, KSU Portion: $2,000,000, May 2009 - August 2014.
- Co-PI (with PI John Hatcliff, co-PIs Torben Amtoft and Robby), Rockwell Collins Advanced Technology Center, "A Domain-Specific Language for Defining High-Assurance Secure-Network Guards (Phase II)," $85,000, September 2009 - August 2010.

Robby

- PI, National Science Foundation (NSF) CAREER, "CAREER: A Formal, Integrated Analysis Framework for Contract-Based Reasoning of Strong Properties of Open Systems," $400,000, 2007-2012.
- Co-PI [with PI John Hatcliff, co-PIs Torben Amtoft, Xinming Ou, and Andrew Appel (Princeton University)], Air Force Office of Scientific Research (AFOSR) "Evidence-Based Trust in

Large-Scale MLS Systems," Total Amount: $3,000,000, KSU Portion: $2,000,000, May 2009 - August 2014.
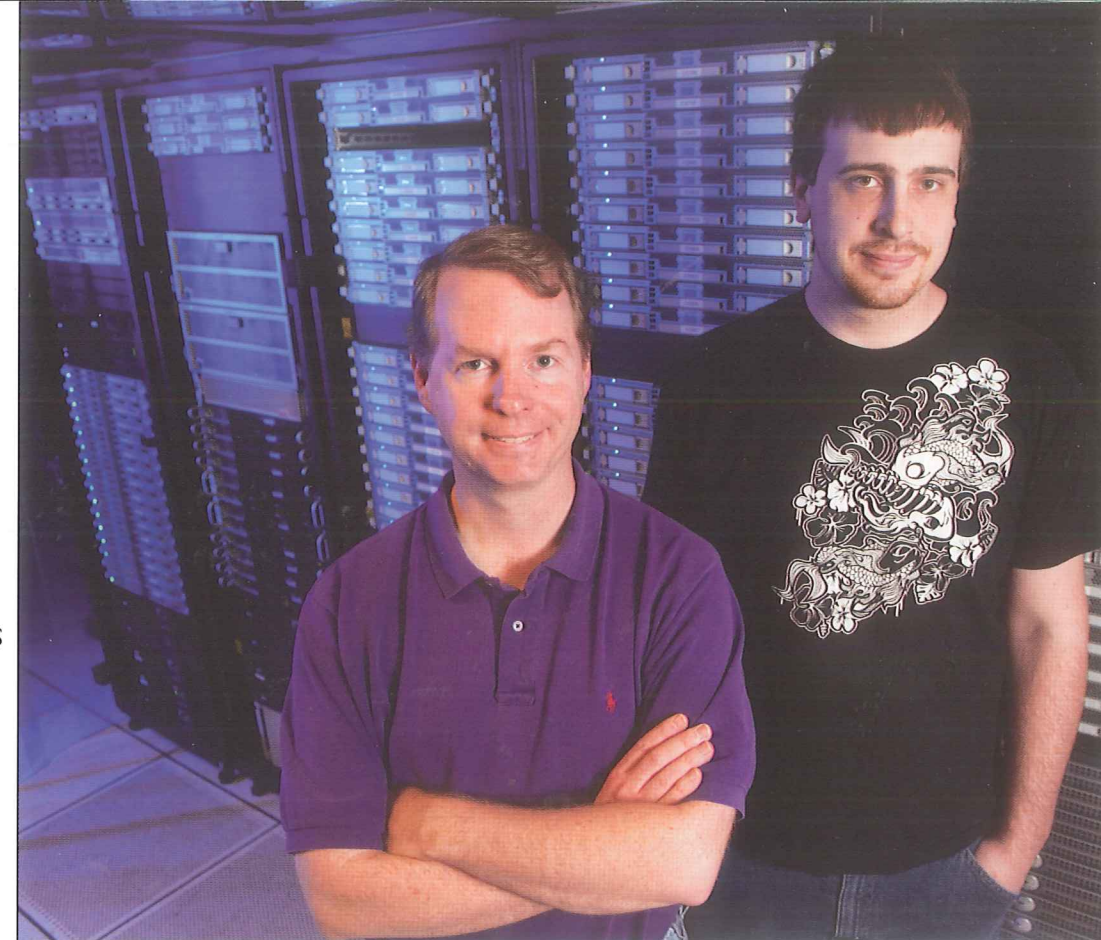- Co-PI (with PI John Hatcliff, co-PIs Dan Andresen, Eugene Vasserman, and Steven Warren), Mass General Hospital (NIBIB (NIH) Quantum), "Development of a Prototype Healthcare Intranet for Improved Health Outcomes," $375,000, September 2010 – August 2011.
- Co-PI (with PI John Hatcliff, co-PIs Daniel Andresen and Steven Warren), "NSF Infrastructure and Technology Innovations for Medical Device Coordination," (U.S. National Science Foundation— CNS 0932289). NSF Collaborative Grant with the University of Pennsylvania. Total Amount: $1,500,000, KSU Portion: $839,548, September 2009 - August 2012.
- Co-PI (with PI Gary Leavens, University of Central Florida; co-PIs Samik Basu, Iowa State University; Yoonsik Ceon, University of Texas at El Paso; Curtis Clifton, Rose-Hulman Institute; Cormac Flanagan; University of California at Santa Cruz; David Naumann, Stevens Institute of Technology; and Hridesh Rajan, Iowa State University), National Science Foundation (NSF) Computing Research Infrastructure (CRA), "CRI:CRD: Collaborative Research: A JML Community Infrastructure –Revitalizing Tools and Documentation to Aid Formal Methods Research," $895,000, KSU portion: $220,000, June 2007 – June 2010.
- Co-PI (with PI John Hatcliff, co-PIs Torben Amtoft and Xinming Ou), Rockwell Collins Advanced Technology Center, "A Domain-Specific Language for Defining High-Assurance Secure-Network Guards (Phase II)," $85,000, September 2009 - August 2010.
- Co-PI (with PI John Hatcliff, co-PIs Gurdip Singh, Virg Wallentine, and Steven Warren) NSF/FDA, "An Integrated Development and Certification Environment for a Medical Device Coordination Framework," $80,000, 2010-2011.

Schmidt

- PI, National Science Foundation (NSF) CNS-0939431, "Abstract Parsing: Static Analysis of Dynamically Generated String Output," $299,327, August 2009 - July 2011.

Singh

- PI, National Science Foundation (NSF) CSR, "Methodologies for Customization of Distributed Algorithms and Middleware," $316,999, August 2006 – July 2011.
- PI, National Science Foundation (NSF), "Research Experience for Undergraduates Supplement," $12,000, July 2007 – June 2010.
- PI (with co-PIs Douglas McGregor, Jim Edgar, and Scott A. DeLoach), Targeted Excellence Program, KSU, "Center for Sensors and Sensor Systems," $1,500,000, July 2006 – June 2011.
- PI (with co-PIs Daniel Andresen, Scott DeLoach, Bala Nataranjan, and Steven Warren), National Science Foundation (NSF) CRA, "Experimentation Platform for Developing Customized, Large-Scale Sensor Systems," $200,000, March 2006 – March 2010.

- Co-PI (with PI Mitchell Neilsen, co-PIs J. Spears, N. Zhang, and V. Wallentine), National Science Foundation (NSF), GK-12 STEM Fellowship Program: "Infusing System Design and Sensor Technology in Education (INSIGHT)," $2.8M, ($540K for 2010), April 2010 – March 2015.
- Co-PI (with PI John Hatcliff, co-PIs Robby, Virg Wallentine, and Steven Warren), NSF/FDA, "An Integrated Development and Certification Environment for a Medical Device Coordination Framework," $80,000, 2010-2011.

Vasserman

- Co-PI (with PI John Hatcliff, co-PIs Daniel Andresen, Robby, and Steven Warren), Mass General Hospital (NIBIB (NIH) Quantum), "Development of a Prototype Healthcare Intranet for Improved Health Outcomes," $375,000, September 2010 – August 2011.

Wallentine

- PI, K-State Targeted Excellence Program, "Bioinformatics at K-State," $925,000, 2006 – 2010.
- Co-PI (with PI John Hatcliff, co-PIs Robby, Gurdip Singh, and Steven Warren), NSF/FDA, "An Integrated Development and Certification Environment for a Medical Device Coordination Framework," $80,000, 2010-2011.
- Co-PI (with PI M. Neilsen, co-PIs G. Singh, J. Spears, and N. Zhang), National Science Foundation (NSF), GK-12 STEM Fellowship Program: "Infusing System Design and Sensor Technology in Education (INSIGHT)," $2.8M, ($540K for 2010), April 2010 – March 2015.

Amtoft
- Reviewer, Journal of Systems and Software, 2010.
- Reviewer, Theoretical Computer Science, 2010.

Andresen
- Program committee, 1st IET International Conference on Frontier Computing (FC'10), Taichung, Taiwan, August 2010.
- International program committee, 10th IEEE International Conference on Computer and Information Technology (CIT-10), Bradford, UK, June 29 – July 1, 2010.
- International program committee, 2010 International Conference on Grid Computing and Applications (GCA'10) Las Vegas, NV, July 12-15, 2010.
- International program committee, 2010 International Conference on Semantic Web & Web Services (SWWS'10) Las Vegas, NV, July 12-15, 2010.
- International program committee, the 2010 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA'10), Las Vegas, NV, July 12-15, 2010.
- Program committee, GPN Annual Meeting, Kansas City, MO, June 2-4, 2010.
- K-State representative, GPN CI Program Committee, 2010.

Caragea
- Session chair, 4th Annual Arthropod Genomics Symposium Arthropod Genomics: New Approaches and Outcomes, Kansas City, June 2010.
- Session chair, First ACM International Conference on Bioinformatics and Computational Biology (ACM-BCB), Niagara Falls, August 2010.
- Program committee, AAAI Doctoral Consortium (DC) Program, in conjunction with The National Conference on Artificial Intelligence (AAAI), 2010.
- Program committee, First ACM International Conference on Bioinformatics and Computational Biology (ACM-BCB), 2010.
- Program committee, IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2010.
- Program committee, The 14th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD), 2010.
- Reviewer, IEEE/ACM Transactions on Computational Biology and Bioinformatics (TCBB), International Journal on Data Mining and Bioinformatics (IJDMB), 2010.
- IEEE Transactions on Neural Networks (TNN), Multimedia Tools and Applications (MTAP), 2010.
- Reviewer and panelist, NSF, CISE Directorate, IIS Division, 2010.
- Honored with WESP Making a Difference Award, Spring 2010.
- Invited panelist, Society of Women in Engineering (SWE), KSU, Fall 2010.

DeLoach
- Reviewer, Data & Knowledge Engineering (DKE) Journal, 2010.
- Reviewer, The Computer Journal, 2010.
- Reviewer, International Journal of Autonomous and Multiagent Systems, 2010.
- Reviewer, IEEE International Workshop on Safety, Security & Rescue Robotics, 2010.
- Program committee, IEEE FIPA Workshop on Design Process Documentation and Fragmentation (FIPA DPDF), 2010.
- Program committee, IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA), 2010.
- Program committee, International Workshop on Agent-Oriented Software Engineering (AOSE), 2010.
- Program committee, ACM SAC—Special track on AOse Methodologies, Infrastructures and Processes, 2010.
- Editorial board, International Journal of Agent-Oriented Software Engineering, 2010.

Gustafson
- Organizing committee, Semantic Vision Challenge, 2010.
- Committee, ISVC2010 Conference, 2010.

Hatcliff
- Program co-chair, International Conference on Formal Techniques for Distributed Systems, Amsterdam, The Netherlands, June 2010.
- Co-organizer, Software Certification Consortium Workshop (Toronto, Canada), November 2010.
- Steering committee, ACM Conference on Partial Evaluation, 2010.
- Steering committee, International Conference on Formal Techniques for Distributed Systems, 2010.
- Program committee, International Conference on Runtime Verification (Malta), 2010.
- Program committee, International Conference on Verified Software: Theories, Tools, Experiments (Toronto, Canada), 2010.
- Program committee, International ACM Workshop on Software Engineering in Health Care (Capetown, South Africa), 2010.

Hsu
- Editorial board, Intelligent Data Analysis, 2010.

Neilsen
- Session chair, PDPTA, 2010.

Ou
- Poster and demo co-chair, ACM Conference on Computer and Communications Security (CCS), 2010.
- Tutorial speaker, ACM Conference on Computer and Communications Security, 2010.
- Program committee, Workshop on Assurable & Usable Security Configuration, 2010.
- Program committee, International Symposium on Resilient Control Systems, 2010.
- Program committee, 4th International Conference on Network and System Security, 2010.
- Review panel, National Science Foundation, 2010.
- Proposal reviewer, Air Force Office of Scientific Research, 2010.
- Reviewer, Transactions on Information Forensics & Security, IEEE Security & Privacy, Security and Communication Networks, Journal of Computer Security, Future Internet, International Journal of Information Security, IET Information Security, Transactions on Dependable and Secure Computing, John Wiley & Sons, 2010.

Robby
- 12th Workshop on Formal Techniques for Java-like Programs (FTfJP), 2010.
- Reviewer, International Journal on Software and System Modeling (SoSyM), 2010.
- Reviewer, ACM Transactions on Software Engineering and Methodology (TOSEM), 2010.
- Panelist, NSF CCF Program Panel, 2010.

Schmidt
- Steering committee, Static Analysis Symposia, 2010.
- Steering committee, VMCAI (Verification, Model Checking, and Abstract Interpretation) and secretary of the VMCAI Corporation, 2010.
- Advisory board, Journal of Higher-Order and Symbolic Computation, 2010.

Singh
- Panelist, Graduate Research Fellowship Program Panel, February 2010.
- Panelist, CNS Program Panel, April 2010.
- Publications chair, IASTED International Conference on Parallel and Distributed Computing and Systems, November 2010.

The CIS department offers two B.S. degrees: one in information systems (IS) and one in computer science (CS). The CS degree program now has two options:

- a traditional computer science track, which focuses on foundational and scientific issues, including courses on operating systems and databases; and
- a software engineering track, which focuses on software development, including enterprise information systems, project management, software security, parallel programming and software development in a team environment.

Both degree programs allow students flexibility in their programs of study. Students are encouraged to pursue a minor or to study interdisciplinary subjects while still completing their degrees within four years.
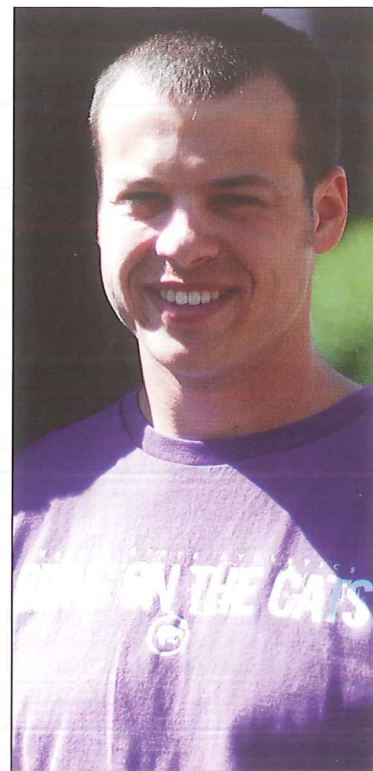
Computer science requirements for each of the three options have a core consisting of 16 credit hours and an option-specific set of 17 hours of advanced courses. The 16 credit-hour core also serves as the minor in computer science.

ACM Student Chapter

The local ACM chapter is a professional organization for CIS majors. Average attendance at monthly meetings is 30-40 students. Typically more than a dozen attend the ACM regional programming contest for a chance to interact with their peers and develop professional skills.

AAAI Robotics Competition

The joint undergraduate and graduate robotics team prepares to participate in robotics events at the annual convention of the Association for the Advancement of Artificial Intelligence. The team has competed each of the last five years in this event, a popular project for both undergraduate and graduate students.

The department of computing and information sciences is committed to excellence in scholarly activities in research and graduate teaching. We offer courses and a rich variety of projects in the areas of programming languages, high-assurance software, distributed computing, networking, software engineering, bio-informatics, computer security and data mining. In addition to basic research, our curriculum emphasizes collaborative and interdisciplinary research, collaboration with industrial partners, and development and distribution of software tools. We offer two master-level degrees, the master of science (M.S.) and master of software engineering (M.S.E.), and the doctor of philosophy degree in computer science. We offer the M.S.E. degree via distance learning, and a graduate certificate program in real-time embedded systems in collaboration with other engineering departments.

Admission requirements

Applicants for our graduate degrees must possess a bachelor's degree, with at least a 3.0 grade point average or equivalent, from an accredited institution. Students not possessing a degree in computer science must have background that includes the equivalent of core undergraduate computer science courses.

Areas of concentration

Programming language, high-assurance software, distributed computing, networking, software engineering, bio-informatics, computer security and data-mining, high-performance computing.

Certificate program

Graduate certificate in real-time embedded systems.

Resources for current and prospective graduate students

- CIS admissions: *http://cis.ksu.edu/programs/grad/admissions*
- CIS research projects: *http://cis.ksu.edu/research*
- CIS profile on Peterson's Online guide: *http://graduate-schools.petersons.com*

How to apply

For a graduate applicaion and other information, contact:

Graduate Studies
Department of Computing and Information Sciences
234 Nichols Hall
Kansas State University
Manhattan, KS 66506 USA
Phone:785-532-6350; Fax: 785-532-7353;
email: cis-gradapps@ksu.edu
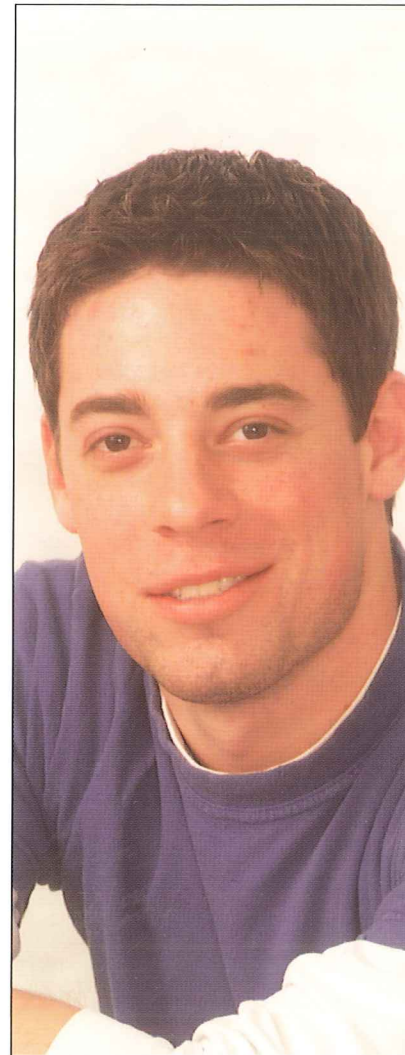
ADVISORY BOARD

The CIS advisory board is composed of leaders in the development and deployment of software in industry. Because software is pervasive throughout our society, these advisors are technical, management and executive leaders in a broad spectrum of industrial sectors—software development, e-commerce, health IT, transportation, manufacturing, retail, communications, wealth management, military and academia. This industrial leadership helps us in three ways:

- Through industrial and university affiliations, it connects us to our alumni, practicing professionals, industry leaders, government leaders and academic researchers. These connections enable us to build collaborative relationships between academia and industry.
- It provides advice on the "state of the practice" in the software industry. This perspective helps us better prepare students for the software development profession, and better integrate our research results into real products and industrial processes.
- Advisory board members provide financial support from both personal and industry sources.

Susan Chambers
Executive Vice President
Wal-Mart

Katherine (Kacy) Clark
Vice President
Wellington Management Company

Terry Ecklund
Director, Strategic Initiatives
Triple I Consulting

Lynn Frick
Database Administrator
Kansas State University Foundation

Dominic Gelinas
Programmer
Texas Instruments

Dr. Mary Lou Hines
Vice Provost
UMKC (Board Chair)

Connie Jaynes
Retired
Shell Oil

Martin Malley
Vice President of Information Technology
Union Pacific

Don Mounday
President
Falcon Technology Group

Shane Runquist
Software Engineer
Garmin

Mark Schonhoff
Vice President
Cerner Corp

Ken Switzer
President
Pegasus Programming Solutions

Norman Tsiguloff
Business Management Executive
Oxford Companies, LLC

Neil Tucker
Retired
PeopleSoft

Dr. Ray Vaughn
Associate Vice President for Research
Mississippi State University

Dr. Tieren Zhou
Founder and President
Techexcel Corp.

Emeritus Members

Jerry Havemann
Vice President, Retired
Cargill

Jacqualine Trombly
Operations Director, Retired
Lucent Inc.

Dennis Yeo
Founder
Multigen/Paradigm

CONTACT INFORMATION

Name	Title	Phone	Office	Email
Singh, Gurdip	Dept. Head/Professor	(785) 532-7945	Nichols 234	gurdip@ksu.edu
Amtoft, Torben	Associate Professor	(785) 532-7917	Nichols 219C	tamtoft@ksu.edu
Andresen, Dan	Associate Professor	(785) 532-7914	Nichols 219B	dan@ksu.edu
Caragea, Doina	Assistant Professor	(785) 532-7908	Nichols 227C	dcaragea@ksu.edu
DeLoach, Scott	Associate Professor	(785) 532-7951	Nichols 324E	sdeloach@ksu.edu
Gustafson, David A.	Professor	(785) 532-7923	Nichols 227A	dag@ksu.edu
Hatcliff, John	Professor	(785) 532-7950	Nichols 324D	hatcliff@ksu.edu
Howell, Rodney R.	Associate Professor	(785) 532-7735	Nichols 227D	rhowell@ksu.edu
Hsu, William	Associate Professor	(785) 532-7905	Nichols 324C	bhsu@ksu.edu
Mizuno, Masaaki	Professor	(785) 532-7928	Nichols 227B	masaaki@ksu.edu
Neilsen, Mitchell L.	Associate Professor	(785) 532-7918	Nichols 219D	neilsen@ksu.edu
Ou, Xinming (Simon)	Assistant Professor	(785) 532-7941	Nichols 316B	xou@ksu.edu
Robby	Associate Professor	(785) 532-7904	Nichols 324B	robby@ksu.edu
Schmidt, David A.	Professor	(785) 532-7912	Nichols 219A	das@ksu.edu
Vasserman, Eugene	Assistant Professor	(785) 532-7944	Nichols 316A	eyv@ksu.edu
Wallentine, Virgil	Professor	(785) 532-7365	Nichols 316C	virg@ksu.edu

KANSAS STATE
UNIVERSITY

College of Engineering

Computing and Information Sciences

234 Nichols Hall
Manhattan, KS 66506-5201
459