Computing and Information Sciences

COLLEGE OF ENGINEERING

KANSAS STATE UNIVERSITY
MESSAGE FROM THE DEPARTMENT HEAD

It is with great pleasure that I share with you the 2011 annual research report for the department of computing and information sciences (CIS) at Kansas State University. The CIS department is continuing to make progress with strong support of our faculty excellence in research and teaching. Our graduate program continues to strengthen and students are in high demand, and we have strong interdisciplinary teaching and research programs.

I am pleased to announce that Dr. Patrice Chalin joined our department as an associate professor in fall 2011. Prior to this, Dr. Chalin was an associate professor at Concordia University. He works in the area of software engineering and high-assurance computing, and has previously collaborated with faculty in our department.

In 2011, Dr. John Hartcliff was appointed as a University Distinguished Professor, the highest honor given to a faculty member at Kansas State University. In addition to John Hartcliff, Dr. David Schmidt is also a University Distinguished Professor. The CIS department is honored to have two University Distinguished Professors (out of a total of three in the College of Engineering). Dr. Scott DeLach was the recipient of the College of Engineering Frankenhofer Outstanding Research Award in 2011. This award is given annually to a faculty member who has demonstrated excellence in research and promotion of graduate programs in the past five years.

The research programs in our core areas continue to grow strongly. Faculty in the CIS department are extensively involved in multidisciplinary research supported by our high-performance computing infrastructure. In 2011, Dr. Dan Andersen received a major grant from the National Science Foundation Major Research Instrumentation program to substantially improve the high-performance computing infrastructure on campus.

With additional support from Kansas State University, he will be developing the computing cluster as a university resource in the coming years. Our cybersecurity program has seen growth built on its previous successes. A group of faculty members in our department obtained a grant from the NSF Scholarship for Service Capacity Building program to develop cybersecurity curriculum for a broad cross-section of students. Another group of faculty members partnered with faculty from the electrical and computer engineering department to receive a large NSF Cyber-Physical System program grant to study multi-agent based control and security issues in power distribution systems. Finally, a team of CIS faculty worked with two companies, National Technical Systems and CABLE Technologies, and the K-State Institute for Commercialization to establish CyberSep, a consortium to explore development of cybersecurity services.

CIS faculty are actively involved in providing professional service to the computer science discipline. In addition to participating in the organization of national and international conferences, our faculty have organized several regional conferences and workshops. These include the Greater Kansas Cybersecurity Workshop, Mid-America Cybersecurity Conference and Workshop on Systems of Medical Devices.

This 2011 report cannot cover all of the CIS accomplishments for the year. Please visit the website https://www.cis.ksu.edu for a more complete picture.

Gordip Singh
Department Head
Computing and Information Sciences
Kansas State University
High-performance computing at K-State

by Daniel Anderson and Jennifer Tidball

A group of Kansas State University scientists is boosting research across campus by making the largest supercomputer in the state even bigger. The project also will benefit researchers at other schools in Kansas.

The scientists, led by Daniel Anderson, associate professor of computing and information sciences, have recently received a three-year $700,000 grant from the National Science Foundation's Major Research Instrumentation Program to upgrade K-State's research computing cluster called Beocat. The scientists also received $300,000 in matching funds from the university.

Beocat is a cluster of servers that provides computational support for large research projects and is located in the university's computing and information sciences department in the College of Engineering. The cluster's design type is called Beowulf, so the designers called the university's form Beocat in honor of the K-State Wildcats.

Beocat supports research in four colleges and 12 to 15 departments across campus, and the upgrade will at least double its research capacity. While the average desktop or laptop has between two and four cores in its central processing unit, Beocat has 1,200 cores. It also has 10 machines, each with 64 gigabytes of memory, which is much more than the average two to four gigabytes that come with a desktop or laptop. The upgrade will give Beocat six individual machines with a terabyte of memory and more than 2,000 total cores.

"That's like 1,500 laptops stacked up, or 1,000 desktops stacked up and working together," Anderson said.

The extra memory will be especially helpful for some of the larger research projects across campus. For example, it takes about 50 gigabytes of space to analyze a single genome. A group of biologists on campus may want to analyze 10,000 genomes—a huge computing task that requires a lot of memory. But an upgraded Beocat will be able to handle such a large research load in a timely manner.

The number of Beocat users has been doubling every 12-18 months as student and faculty get excited about its potential. Beocat has about 450 users working in various areas such as life sciences, genetics, chemistry and agriculture. Research has involved looking at the flowering time of plants, understanding water policies and practice changes that affect the Ogallala Aquifer in western Kansas, and collaborating with the University of Kansas and the University of Oklahoma to study the effects of carbon flux and migration.

Additionally, the supercomputer's work fits in with the university's 2025 vision, Anderson said. Having better on-campus resources, such as an upgraded supercomputer, will help faculty members produce more accurate and cost-effective research, particularly in computer science, Manhattan, who manages Beocat.

Other co-principal investigators on the project include Dena Caragea, assistant professor of computing and information sciences; Brett Eory, university distinguished professor of physics; Walter Dodds, university distinguished professor of biology; and David Steward, professor of civil engineering. Senior personnel on the project include Jianwen Chen, assistant professor of biochemistry, and Christine Akers, assistant professor of chemistry.

So what's next for research computing at K-State? For more updates, see the magazine's website. In years past, the go-to tools for researchers were specific to their field, whether it was a telescope or a microscope. Increasingly, it's computers and big data sets.

The current grant will give researchers about 600TB of storage, but areas like genomics can generate 1TB of data per genome—and K-State is leading an effort to sequence 5,000 of them. The work simulating economic, sociological and ecological factors in southwest Kansas to help protect the Ogallala Aquifer uses the 25TB LIDAR dataset to calculate ground topology and cover.

"This type of capacity will drive lab experiments as well as provide simulations," Anderson said. "Research now involves theory, lab work and simulation, which is computer driven. This upgrade will help with simulation because you can model things first, that might be very expensive, before you actually apply them." Not only does the supercomputer help scientists and researchers at Kansas State University, but researchers at colleges throughout the state of Kansas— including Emporia State University, Benedictine College and Bethany College—are also able to use the supercomputer.

"This supercomputer allows faculty to have better access to getting research done with their research dollars," Anderson said. "It will also enable us to reach out and really have an impact on the community colleges and four-year institutions throughout the state. This will also help the Kansas work force because we are going to be graduating more people who actually know how to use these cutting-edge technologies."

The group has started installing the upgraded equipment. The upgrade will involve faculty as well as students, particularly Adam Tygart, sophomore in computer science, Manhattan, who manages Beocat.
Gurdeep 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 Andreassen  
Associate Professor  
Ph.D., Computer Science, University of California, Santa Barbara, 1997  
M.Sc., Computer Science, California Polytechnic State University, SLN, 1992  
B.Sc., Computer Science and Mathematics, Westminster 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.

Dolna Caragea  
Assistant Professor  
Postdoctoral, Computer Science, Iowa State University, 2004-2006  
Ph.D., Computer Science, Iowa State University, 2004  
M.Sc., Computer Science, University of Bucharest, Romania, 1997  
B.Sc., 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.

Patrice Chalin  
Associate Professor  
Ph.D., Computer Science, Concordia University, 1995  
M.Sc., Computer Science, Concordia University, 1989  
B.Sc., Computer Science, Concordia University, 1988  
Research: Program synthesis and software verification, medical device integration, coordination and interoperability, software engineering, web-based enterprise applications.  
Teaching: Software specification, semantics of programming languages.

Scott A. DeLoach  
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, 1977  
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 Hatchiff  
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.

Kazushi 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.

Mitchell Nelson  
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.
Ximing (Steven) Ou
Assistant Professor
Ph.D., Computer Science, Princeton University, 2005
M.S., 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.

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 Vaserman
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.

Beth Unger
B.S., Mechanical Engineering, Michigan State University, 1961
M.S., Mathematics, Michigan State University, 1963
Ph.D., Computer Science, The University of Kansas, 1978
Research: Database and knowledge system design, data security, information technology for learning, university of the future.
Teaching: Databases, data security.

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.

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

The Angus group carries out cyber security research under the direction of Dr. Simon Ou. Angus’ 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.

Angus 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, NRC-Canada, 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/~denerga/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. Nellisen

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 prediction Ganda TurboSIP tool to evaluate Pb-free solder joints in electronic control packaging for satellite systems, etc.

**Distributed Systems Lab**
http://www.cis.ciu.edu/Brocat

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, BroCat, 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.cit.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
- visualization, 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 spacial and temporal data

Application 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). Application areas currently being pursued in the laboratory for knowledge discovery in databases include user modeling, adaptation and personalization, data-theoretic approaches to information security and tamper-resistant sensor networks; geoinformatics, bioinformatics, and medical informatics: information extraction for question answering; information trust; and opinion mining, sentiment analysis and subjectivity analysis.

**MACR Laboratory**
http://macr.cit.ksu.edu

The multivalent 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 multivalent 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 multivalent and cooperative robotic systems used to demonstrate our approaches.

The lab has produced the organization-based multivalent systems engineering methodology (OMASE) and its associated agent Tool 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 Stanford Systems Inc. Sansen Laboratory
http://sansen.cit.ksu.edu

The laboratory for specification, analysis and transformation of software (SaanToS) 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. SaanToS researchers are currently focusing on applications in security, software product lines, integrated medical devices and sensor networks. Since 1998, SaanToS 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://parcol.cit.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.
Bobby

Schmidt

Vasserman

Antoft
- Co-PI (with John Hartill, co-PI Xinning Ou, Robby, and Andrew Appel—Princeton), Air Force Office of Scientific Research (AFOSR), "Evidence-Based Trust in Large-Scale MLS Systems," Total Amount: $5,000,000, KSU Portion: $2,000,000, May 2009 - August 2014.

Andrensen
- PI (with co-PI Walter Dodds, Brent Eddy, David Stewart, and Dina Caragea), National Science Foundation (NSF), "MRE: Acquisition of a Hybrid GPU Computing Cluster for High-End Applications in Science and Engineering," $700,000, September 2011 – August 2014.
- Co-PI, National Science Foundation (NSF) EPSCoR RII Track II (Award no. 0951943), "Oklahoma and Kansas A cyberCommons for Ecological Forecasting," ($1.5 M to K-State, $640 between KS and OK), September 2009 – August 2012.
- Co-PI (with PI John Hartill, 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: $859,548, September 2009 - August 2012.

Caragea
- PI (with PI Vaast Hanoura, ISU), National Science Foundation (NSF), "Collaborative Research: Learning Classifiers from Autonomous, Semantically Heterogeneous, Distributed Data," $1,45,504, July 2007 – June 2011.
- Co-PI (with PI Daniel Anderson, co-PI Walter Dodds, Brent Eddy, and David Stewart), National Science Foundation (NSF), "MRE: Acquisition of a Hybrid GPU Computing Cluster for High-End Applications in Science and Engineering," $700,000, September 2011 – August 2014.
- Co-PI (with PI Steven Welch, co-PI Sanjay Das), National Science Foundation (NSF), "Cyberinfrastructure Implementation for Genoprobe to Phenoprobe Research," $314,847, October 2009 – March 2012.
- Co-PI (with PI Tony Grant, co-PIs Susan Brown, Samantha White, and Anthony New), Seed Grant, IGF, KSU, "Comparative Transcriptome Analysis of Two Host Races of the Grasshopper Homopterus Viridis—Searching for Evidence of Host-Associated Divergence and Incipient Speciation," $10,000, 2010 - 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 Moving and Model Ecosystems under Directional Change," $1,095,472, 2009-2012.
Antoff
- Program committee member, 23rd Symposium on Implementation and Application of Functional Languages (IFL 2011), Lawrence, Kan., Oct. 3 – 5, 2011.
- Reviewer, Logical Methods in Computer Science, 2011.
- Reviewer, Information and Computation, 2011.
- Reviewer, Theoretical Computer Science, 2011.

Andersen
- Program committee, GPN Annual Meeting, Kansas City, Mo., June 2-4, 2011.
- International program committee member and session chair, 2010 International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA’10), Las Vegas, Nev., July 18-21, 2010.
- International program committee member, 2011 International Conference on Internet Computing (ICOMP’11), Las Vegas, Nev., July 18-21, 2011.
- GPIN CI program committee (K-State representative), 2011.
- GPIN strategic planning session, K-State representative, June 1, 2011.

Caragea
- Program committee member, AAAI Doctoral Consortium (DC) Program, in conjunction National Conference on Artificial Intelligence (AAAI), 2011.
- Program committee member, IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2011.
- Program committee member, First IEEE International Conference on Computational Advances in Bio and Medical Sciences (ICCABS), 2011.
- Program committee member, International Conference on Knowledge Engineering and Ontology Development (REOD), 2011.
- Program committee member, Conference on Statistical, Computational, and Visualization Methods in Medical Informatics, 2011.
- Reviewer and panelist for NSF: CISE Directorate, IIS Division, 2011.

Chafin

DeLoach
- Program committee, International Conference on Agents and Artificial Intelligence (ICARIS), 2011.
- Program committee, International Workshop on Agent-Oriented Software Engineering (AOSE), 2011.
- Reviewer, IEEE Transactions on Smart Grid, 2011.

Gustafson
- Writing/revising articles for the McGraw-Hill Encyclopedia of Science and Technology.
- Writing reviews for Computing Reviews.
- Serving on program committee for International Symposium on Visual Computing.

Hatcliff
- Co-chair, Workshop on Systems of Systems of Medical Devices (SoSMD), Lawrence, Kan., Nov. 2011.

Hsu
- Program chair, International Joint Conference on Artificial Intelligence (IJCAI) Workshop on Heterogeneous Information Network Analysis (HINA), 2011.
- Editorial board, Intelligent Data Analysis, 2011.

Hilton
- National Science Foundation (NSF) review panel, 2011.
- Session chair, PDPTA, 2011.
- Session chair, CAINE, 2011.

Ou
- Invited speaker, National Center for Configuration Analytics and Automation (NCCAA) Meeting/Workshop, University of North Carolina at Charlotte, May 2011.
- Program committee member, Conference on Privacy, Security and Trust (PST), 2011.
- Program committee member, 6th Symposium on Configuration Analytics and Automation (SafeConfig), 2011.
- Reviewer, Future Internet, 2011.

Robby
- Program committee member, 13th International Workshop on Verification of Infinite-State Systems (INFINITY), 2011.

Schmidt
- Steering committee, Static Analysis Symposium and Conference on Verification, Model Checking, and Abstract Interpretation, 2011.
- Program committee, Conference on Verification, Abstract Interpretation, and Model Checking (co-chair and International Andrie Ehrenfels Memorial Conference: Perspectives of System Informatics, 2011.

Singh
- Advisory Board, Computer Science Department, Mississippi State University, 2011.

Vasserman
- Reviewer, IEEE Internet Computing magazine, 2011.
- Reviewer, Privacy Enhancing Technologies Symposium (PETs), 2011.
- Reviewer, IEEE International Conference on Computer and Communications Technology (ICCTC), 2011.
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, high-performance computing.

Certificate program

Graduate certificate in real-time embedded systems.

Resources for current and prospective graduate students

- CIS admissions: http://cis.knls.edu/program/gradadmission
- CIS research projects: http://cis.knls.edu/research
- CIS profile on Peterson’s Online guide: http://graduate-schools.petersons.com

How to apply

For a graduate application 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: 785-532-7333; email: cis-gradapps@kns.edu
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 advisers 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 academy. 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.

Katherine (Kacy) Clark  
Principal Consultant / Architect  
Cloud Technology Partners

Terry Ecklund  
Private IT Consultant

Lynn Frick  
Database Administrator  
Kansas State University Foundation

Dominic Gelles  
Software Engineer  
L-3 Communications

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

Martin Malley  
Assistant Vice President  
Union Pacific Railroad

Don Moonday  
President / Co-Founder  
Palcon Technology Group, LLC

Mark Schonhoff  
Vice President  
Cerner Corp.

Ken Switzer  
President / Founder, Retired  
Pegasus Programming Solutions

Dr. Ray Vaughn  
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