

ITTC Collaborates on SensorNet

With the “Unified Architecture for SensorNet with Multiple Owners” project, ITTC joins Oak Ridge National Laboratories (ORNL) in developing a comprehensive sensor management system. The Department of Energy’s largest science and energy laboratory is directing the creation of a nationwide sensor network that will identify and assess chemical, biological, radiological, nuclear, and explosive (CBRNE) threats. SensorNet will process and disseminate critical information to emergency management decision makers and first responders.

Many ORNL partners are working on a wireless network that interconnects sensors and conveys data to a collection point. Principal investigator **Gary Minden**, director of ITTC’s Communications and Networking Systems Laboratory (CNSL), and his team are working on a different facet of SensorNet. They are developing a sensor network that can be rapidly deployed with elements that are controlled by different organizations.

For example, in venues like the Kansas Speedway, different organizations are charged with the safety and security of the racetrack, race participants, and fans. NASCAR events bring thousands of fans to the racetrack, but the intermittent nature of these events requires that subcontractors handle security, parking, wireless Internet, and other services. Currently, the technological foundation does not exist to effectively integrate intelligence from these independent groups. Linking cameras, sensors, and communication between Speedway personnel could alert staff to possible incidents that may jeopardize safety.



Ph.D. student Pradeepkumar Mani programs tiny devices called “motes” for the SensorNet project. Sensors will be attached to the programmed motes. The mote will then collect data from the sensor and transmit the data to a collection point.

Likewise, a number of public service organizations are involved in traffic control, medical support, firefighting, and utilities and need to be kept up to date on appropriate events during the five to six days of the race.

ITTC researchers will study low-cost sensor nodes in addition to the wireless interconnected network and the overall service architecture. These nodes—tiny, ubiquitous, networked sensors—possess data processors allowing them to perform simple computations, such as chemical detection and video transmission. The partially processed data can be sent to an on-site headquarters for additional analysis.

Minden’s team will develop and deploy a simple system to understand how SensorNet works in the field. ■

Digital Library Receives Upgrade

ITTC researchers are collaborating on a National Science Foundation (NSF) project that is transforming a digital library into a “research assistant.” This assistant will sift through thousands of scholarly articles and highlight relevant text and citations, freeing scientists from much tedious legwork.

The NSF Computing Research Infrastructure grant supports the expansion of the online Scientific Literature Digital Library (CiteSeer). The Web site receives more than 1 million hits a day from computer

continued on page 3

ITTC added seven new faculty from top-tier universities, research organizations, and companies this fall. The Center's history of excellence attracted researchers from Purdue University, Penn State, and Canada's McGill University. Before joining ITTC, one new investigator established research programs within the U.S. Naval Research Laboratory (NRL). Innovative researchers from Motorola, BBN Technologies, and Science Applications International Corporation (SAIC) also joined the faculty. Their research will serve as a catalyst for even greater advancements in our thrust areas.

Among the new student faces this fall was **Jeffrey Young**, a National Science Foundation (NSF) Fellow. Selected for their potential to advance science, mathematics, or engineering, fellows may attend any accredited university within the United States or internationally. The South Carolina native chose KU and ITTC for his graduate work in computer science. Young joins Self Fellows **Heather Amthauer** and **Chris Taylor** at the Center. These are a few of the elite students who conduct research at ITTC. Currently, we have 137 students: 37 Ph.D., 82 M.S., and 18 B.S.

ITTC Research Assistant Professor **Jianwen Fang** joined the Center last spring. His newly funded "Computational Prediction of Beta-Sheet Arrangement" project is developing technology to better understand protein mutation. (To learn more on his project, please see page 5.) In addition to Fang, ITTC has attained four bioinformatics researchers in the last three years. These researchers are building a quality life-sciences research program within the Center.

Veteran ITTC researchers continue to excel in their endeavors. **Gary Minden**, director of ITTC's Communications and Networking Systems Laboratory (CNSL), is principal investigator on the SensorNet project, a comprehensive, national sensor management system. (SensorNet is featured on page 1.) Minden, who has spent the last few months at The Swiss Federal Institute of Technology Zurich (ETH Zurich), continues developing innovative high-performance networking systems. He leads federally funded task forces and projects and has served as a program manager at the Defense Advanced Research Projects Agency (DARPA).

Susan Gauch, who leads ITTC's Intelligent Systems Laboratory (ISL), has begun developing resources for the expansion of the Scientific Literary Digital Library (CiteSeer). The Web site receives more than a million hits a day. (The CiteSeer article begins on page 1.) Gauch, who has earned international recognition for her online information retrieval research, recently returned from a technology conference in California. She was invited to present Veatros, a spin-off company that she and her husband, **John Gauch**, a fellow ITTC investigator, started. Project participants praised the company, and Gauch made important contacts at the conference.

To further aid the technology transfer process, KU has become a member of the iBridge™ program. (For more information on this program, please see page 6.)

The mix of experienced faculty and those beginning their careers balances the Center. Tenured faculty mentor our new researchers, while our younger investigators fill the Center with energy and enthusiasm. ■



Director Victor Frost

Familiar Faces Augment ITTC

Joe Evans, Deane E. Ackers distinguished professor of EECS, rejoined ITTC this fall. He became the director of research information technology at the KU Center for Research. He returned to the University after a two-year appointment with the National Science Foundation (NSF) as its program director of networking in the Computer and Network Systems Division of the Directorate of Computing & Information Science & Engineering.



In the past, he has served as ITTC acting director and as director of ITTC's former Networking and Distributed Systems Laboratory.

Pam Heimerich came to ITTC this fall as a program assistant to ITTC Director Victor Frost. In addition to serving as the Center's hiring manager, Heimerich manages and tracks ITTC accounts and prepares and files immigration and visa documents for staff. She will organize workshops, conferences, symposia, and other presentations.



Before joining ITTC, Heimerich worked at the University of Kansas Center for Research (KUCR) where she spent eight years in the compensation and appointments group. She has worked at KU since 1988.

Wes Mason spent nine months as an ITTC student system administrator before joining the Center as a full-time network specialist this summer. His duties include Windows/Linux system administration and maintenance, development of new system automation tools, maintenance and updates to Kickstart and Unattended, and technical support for ITTC personnel. Before coming to ITTC, he worked for Atipa Technologies, in Lawrence, as a cluster engineer. ■

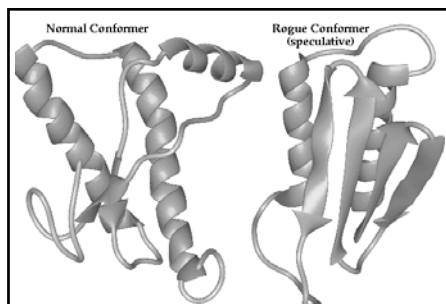


Technology Helps Assess Misfolded Proteins

Researchers have linked many neurodegenerative diseases—including Alzheimer’s, Parkinson’s, Huntington’s, and mad cow—to protein “misfolding.” Misfolded proteins form aggregates in the cerebral tissue that result in brain cell damage and ultimately death.

ITTC Research Assistant Professor **Jianwen Fang’s**

“Computational Prediction of Beta-Sheet Arrangement” project is developing technology to aid in the understanding of protein misfolding. While scientists have identified this phenomenon as an important trigger to the onset of neurodegenerative illnesses, they do not understand what activates the conformation transformation. While proteins have hundreds of millions of potential folds, they most often find the correct three-dimensional fold within minutes. But when proteins misfold, they quickly begin converting healthy ones.



As shown in the rogue conformer (on the right), proteins may misfold. These misfolded proteins convert normal ones and accumulate in the brain, damaging tissue.

Fang will develop new computational models to predict the likelihood of the existence of two adjacent β -strands in a β -sheet. Beta sheets are one of the secondary structures that involve long-range interactions within proteins. Fang is developing “smart” tools that will delineate strand arrangement and protein maturation. The long-term objective of the project is a better understanding of inter- and intra- molecular long-range interactions. Greater knowledge of the body’s inner workings could provide possible solutions to prevent misfolding of proteins as well as better prediction of 3-D structures of proteins.

The Kansas Network of Biomedical Research Excellence (K-INBRE) is funding the ITTC project. The University of Kansas Medical Center leads this multi-institution effort to link scientific partners throughout Kansas and to strengthen biomedical research and the training of researchers within this field. Fang received a pilot grant, which supports a new project in Cell and Developmental Biology. He will use the data to compete for National Institutes of Health (NIH) funds.

Fang joined ITTC’s Bioinformatics and Computational Life-Sciences Laboratory (BCLSL) last spring. He holds joint positions, as he continues as a bioinformatics specialist in KU’s Bioinformatics Core Facility. His research develops computational methods to analyze data and speed up drug development. ■

Digital Library Receives Upgrade

continued from page 1

and information scientists and other researchers. Maintained by Penn State University, the searchable archive, at citeseer.ist.psu.edu, houses nearly 700,000 articles, primarily on computer and information science.

The “Next Generation CiteSeer” project is adding new and expanding existing services, moving the archive from a static collection of information to a dynamic, collaborative research assistant.

“It is very exciting to do research on a high-visibility project that makes thousands of other researchers more effective,” says **Susan Gauch**, director of ITTC’s Intelligent Systems Laboratory and professor of EECS. Gauch is KU’s lead researcher on the multi-institution project, led by Penn State.



For CiteSeer, Gauch will help create an interactive site that alerts researchers to newly published articles of interest and also

performs automated personalized searches. The enhanced features, along with increased reliability and sustainability will promote collaborative usage, leading to the formation of active CiteSeer research communities. The Next Generation CiteSeer will improve researchers’ ability, especially those who lack quality libraries, to quickly and effectively use the literature in their field.

Since developing one of the original Internet “metasearch” engines in 1993, Gauch has garnered international recognition for her online information retrieval research. Her search engines simultaneously examine multiple search engines, such as Yahoo and Google, for results. Gauch recognizes not everyone who types in a particular search phrase is looking for the same results. She helps people tailor their online searches.

“CiteSeer is a tool used by many computer scientists. Therefore, the results of Dr. Gauch’s work will have a broad impact for the research community,” says **Victor Frost**, ITTC director and Dan F. Servey distinguished professor of EECS. ■

New Faculty Investigators Energize Center

The Center has secured seven first-rate additions to its distinguished faculty. Their research will serve as a catalyst for even greater advancements in ITTC thrust areas.

For the past three years, **Shannon Blunt** worked with the Radar Division of the U.S. Naval Research Laboratory (NRL) in Washington, D.C., conducting waveform diversity research. He received his Ph.D. in electrical engineering from the University of Missouri-Columbia in 2002.

As a new EECS assistant professor at KU, Blunt is investigating the means of making the simultaneous operation of multiple radars feasible. In particular, he is working on waveform diversity, the process through which multiple interfering received radar signals are accurately separated. By applying diversity techniques to radar systems, radars may better co-exist with each other as well as with communication systems within the radio frequency (RF) spectrum.

Competing military and commercial demands for spectrum are growing rapidly. The medium is crowded, as cell phones, personal digital assistants (PDAs), and other wireless devices devour the spectrum. Waveform diversity will ease the congestion by allowing RF devices to adaptively mitigate the interference they experience from other devices.

"I chose KU because of the well-respected and recognized Radar Systems and Remote Sensing Lab (RSL) within ITTC," says Blunt. "I believe it will provide an excellent environment within which to collaborate and pursue my research interests."

Donna Haverkamp has worked as a senior research scientist for the Fortune 500 company SAIC and Space Imaging, a leading supplier of satellite-based information. Her expertise lies in intelligent image-understanding systems. These systems identify objects in images and establish relationships among the different elements. From medical image interpretation to troop planning, the deciphering of these images is critical.

Haverkamp brings real-world experience into the laboratory and classroom. She understands the needs of industry and has garnered government funding for projects. She joins ITTC's Intelligent Systems Laboratory (ISL).

"I hope to help establish a strong program in EECS regarding image processing and computer vision, as well as make KU known as a strong research base in this area," says Haverkamp.

She earned her Ph.D. in electrical engineering from KU in 1997 and is excited to be returning to her alma mater.



Erik Perrins' industrial experience, serves as a valuable compliment to his academic experience. He has an affinity for the theory and science of engineering while having an understanding of how to bridge the gap between the classroom and the world of potential applications.

The assistant professor of EECS conducts research in digital communications, with emphasis on both theoretical and practical problems. Associated with ITTC's Communications and Networking Systems Laboratory (CNSL), Perrins researches wireless communications, advanced modulation techniques, channel coding, and synchronization. Practical research problems lie in the intersection of wireless communications and digital hardware design.

Advances in communications, especially digital transmissions, have facilitated wireless devices and other information technologies. The evolution of these technologies will be dependent on the progression of communication architecture.

"I look forward to working on these problems with students, both in the classroom and in the lab," says Perrins, who earned his Ph.D. in electrical engineering and communication theory from Brigham Young University in May 2005.

After earning his Doctor of Science degree from Washington University in 1991, **James Sterbenz** resumed his work with IBM as an advisory engineer scientist. He joined GTE Laboratories in the mid-1990s. As senior network scientist and research group manager for BBN Technologies, Sterbenz led government-funded research, in Cambridge, Mass., from 1999 to 2003.

In nearby Amherst, Sterbenz began his academic career at the University of Massachusetts. The following year he also taught at Northeastern University in Boston. Since 2004, Sterbenz has been visiting professor at the University of Lancaster in the United Kingdom.

Sterbenz knew ITTC would provide an excellent research infrastructure, but he wanted to teach as well. The associate professor position at KU allows him to do both.

His research radically rethinks the status quo of existing network infrastructure, rather than incremental changes to it.

"I hope to continue building a research program in survivable and resilient networking, in collaboration with Lancaster University as well as several other international collaborators," says Sterbenz, who is affiliated with ITTC's Communications and Networking Systems Laboratory (CNSL).



New Faculty Investigators Energize Center

continued from page 4

Weichao Wang earned his Ph.D. degree in computer science from Purdue University in May 2005. As a teaching assistant, Wang honed his skills as an educator and motivator. He also gained important research experience, contributing to several proposals that received industry or government funding.



He chose the University of Kansas because of its supportive and collaborative research atmosphere. He is working with fellow researchers to bolster security within computer systems. This will enable users to enjoy the convenience of these systems without worrying about the disclosure of personal information or violation of privacy.

“KU provides a perfect environment for young researchers like me who would like to contribute to both education and research,” says Wang, who is associated with ITTC’s Communications and Networking Systems Laboratory (CNSL).

Wang is developing methods that integrate networking, security, scientific visualization, and other components to prevent and detect malicious activities in ad-hoc and sensor networks. He is designing protocols and mechanisms to improve information security and privacy within these systems.

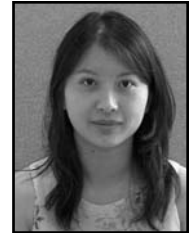
Alexander Wyglinski received his Ph.D. degree in Electrical Engineering in 2004 from McGill University, located in his hometown of Montreal, Quebec, Canada. His dissertation research dealt with increasing the data rates of current wireless local area network (WLAN) implementations by devising several novel and practical adaptive algorithms. Several high-profile research projects, especially the Agile Radio endeavor, attracted Wyglinski to ITTC. He joined the Center in July as a research assistant professor and is affiliated with the Center’s Communications and Networking Systems Laboratory (CNSL).



Public places, such as airports, hotels, universities, coffee shops, and even whole city blocks are examples of where wireless access hotspots are provided via a wireless local area network, or WLAN. Wyglinski’s research focuses on the development of next generation wireless access systems. He is developing algorithms that will enable higher data rates and wireless coverage equivalent to cellular telephones in WLAN systems.

“ITTC is a great place to conduct research in the area of wireless access systems. The in-house expertise and research facilities available here will help me help make the future of seamless wireless access a reality,” says Wyglinski.

Anne Ya Zhang received her Ph.D. degree in information sciences and technology from Pennsylvania State University in 2005 and her bachelor’s degree in biological sciences and biotechnology from China’s Tsinghua University in 2000.



Zhang chose the University of Kansas because of its support of bioinformatics, which uses computer technology and information sciences to organize, interpret, and predict biological structure and function. She sees many opportunities for collaboration among her fellow researchers at the University.

“I am excited to be at the University of Kansas. It is a great opportunity for me with so many possibilities for cutting-edge bioinformatics research,” says Zhang, who is affiliated with ITTC’s Bioinformatics and Computational Life-Sciences Laboratory (BCLSL).

The proteome, or complete set of proteins, is organized in an intricate web called the protein-protein interaction (PPI) network. When these fundamental components of cells malfunction, the consequences are severe. Faulty proteins are thought to cause such illnesses as Alzheimer’s disease, cystic fibrosis, and numerous cancers. Zhang, an EECS assistant professor, is developing computational tools to help biologists analyze data on the PPI network. Knowledge of protein function will help scientists design drugs that are more effective with fewer side effects to treat illnesses, Zhang said. ■

Information and Telecommunication Technology Center A KTEC Center of Excellence at The University of Kansas

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Achievements and Acclaim

Petr Earns Kemper Fellowship

Dave Petr, who is affiliated with ITTC's Communications and Networking Systems Laboratory (CNSL), received a Kemper Fellowship Award this fall. The award recognizes outstanding teachers and advisers at KU as determined by a seven-member selection committee. The professor of EECS has been teaching and conducting research for 15 years at the University. ■

Dawood Accepts Teaching Post

Muhammad Dawood, a former ITTC research assistant professor, received a tenure track faculty position with the School of Electrical and Computer Engineering at New Mexico State University this past summer. ■

T2 Conference Praises Veatros

Susan Gauch, president of ITTC spin-off company Veatros and director of ITTC's Intelligent Systems Laboratory (ISL), and **Tim Johnson**, ITTC's executive director, attended a technology transfer conference in California this fall. Project T2 organizers asked Gauch to present Veatros, which she says was warmly received. Veatros markets the U.S. patented computer software product VidWatch, which continuously monitors television broadcasts for discrepancies. From contacts developed at the conference, Veatros has engaged **Victor Hwang**, President of Larta Institute, as Chief Strategy Officer to identify and pursue new business opportunities for the company. ■

Frost Helps Select Provost

Victor Frost, ITTC director and Dan F. Servey distinguished professor of EECS, will serve on an 18-member committee that will conduct a national search for the next provost and executive vice chancellor for the KU Lawrence campus. Provost David Shulenburg announced that he would step down at the end of June 2006. ■



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KU Participates in National Pilot Program

The University of Kansas is one of seven flagship institutions chosen to launch the iBridge™ Network in the United States. The Web-based application aims to provide the research community with an added channel to disseminate discoveries, research methods, and findings. The iBridge Network application can be used to license and distribute a variety of information including research artifacts and activities. The program, which went online in October 2005, seeks to link researchers, university technology managers, and end users while safeguarding universities' interests in their intellectual property. The iBridge Network aims to expand the number and scope of collaborative projects by facilitating exchanges among researchers.

Kauffman Innovation Network (KIN), an initiative created by the Ewing Marion Kauffman Foundation to advance innovations through education, has licensed the iBridge Network application to the universities in the pilot program. The iBridge Web site provides a platform to showcase research projects and the resulting research artifacts and licensable technologies, such as software, research tools, databases, teaching materials, surveys, and

reference materials. Currently, the KU iBridge Web site, <http://ibridgenetwork.org/ku/>, has 50 technologies listed from both the Lawrence and Medical Center campuses. Eight ITTC technologies are featured. Each technology has a description of the innovation and documents its state of development, potential applications, and contact information. It is anticipated that the iBridge Network will facilitate finding strategic partners for commercialization of KU technologies.

KIN provides initial training and comprehensive learning materials, and works with pilot universities to implement the iBridge Network. The Kauffman Foundation, a private, nonpartisan organization, is the only foundation in the nation to focus on entrepreneurship as its major field of interest. ■