Virtual Storage Devices in the Consolidated Storage Infrastructure

Dr. Song Jiang, assistant professor of electrical and computer engineering, received a 2009 National Science Foundation (NSF) CAREER Award. This award is NSF's most prestigious award in support of junior faculty who exemplify the role of teacher-scholar through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Such activities are expected to build a firm foundation for a lifetime of leadership in integrating education and research.

Dr. Jiang is building virtual storage devices in the consolidated storage infrastructure to support friendly performance interfaces and efficient implementations for users who outsource their dedicated storages to the shared system. Nowadays, the most typical computing model that includes such an infrastructure is cloud computing, in which data, software, computer processing power, and storage capacity are treated as a "cloud" of on-line resources and provided to customers as computing service. By using the service, users can buy the computing and storage capacity they need, and they can scale it, both up and down, as computing requirements change. The service is also inexpensive. Users do not have to pay the upfront cost to build their own computer clusters and instead pay only for capacity they actually use, just like paying the electricity bill according to the readings from power meters. The rate of the service can be kept very low because the resources are shared by hundreds and thousands of users. As the services are professionally maintained, they are also very reliable. All these advantages of cloud computing indicate it is a promising computing model for significantly increasing productivity of the IT industry and is promoted by major IT companies such as Google, Microsoft and Amazon.

International Outreach

A few years ago, the College of Engineering started a special program to attract undergraduate students from India. Several Memorandums of Understanding (MOUs) were signed with institutions in India. This effort resulted in attracting students who were studying engineering in India. This new program created a wave of undergraduate students who came to WSU from India. Those students have now graduated, received internships in the U.S and started their careers.

The program was started by Dr. Harpreet Singh on the advice of Yang Zhao, ECE Chair and Dean Ralph Kummler. The students lived together in De Roy Apartments on campus, enjoying an academic and homey atmosphere. These students also participated actively in the cultural activities of the University, including performing at the International Dance show. They also participated in cultural activities in the metropolitan Detroit area which endeared them to the local Indian community. They continue their association with WSU by acting as mentors to future undergraduate students from India.
From the Chair

Dear Alumni, Friends, and Colleagues:

It has been a tough year for the State of Michigan as the traditional industry base in our state is slowly eroding, with the unemployment rate hitting its highest percentage since early 1980s. Academic units in research-extensive state universities are facing two major challenges: maintaining high-quality education for our students with reduced support from the State and continuing innovative research for creating new jobs and technological development. I am glad to report to you that the faculty and staff in the ECE Department have worked very hard to meet these challenges. We have a long tradition of cutting-edge research and innovation—developing new knowledge and technologies. Some of our recent success stories and new initiatives are shared here.

- Dr. Song Jiang, an assistant professor in the ECE Department, received a 2009 National Science Foundation CAREER Award for his world-class research.

- Dr. Greg Auner, Director of Smart Sensors and Integrated Microsystems Program, and the Department of Surgery at the Detroit Medical Center are initiating a major new multidisciplinary institution known as the Advanced Surgical Technologies Institute (ASTI).

- Dr. Feng Lin is developing a method to estimate transitional probabilities in order to find better strategies to control tobacco use.

- Other research projects and initiatives are underway. With funds, mainly from Federal agencies, these projects have provided employment opportunities for graduate students, post-doctoral fellows, and staff engineers, as well as undergraduate students. In fact, more than 20 ECE undergraduates have been hired in the past year through the Research Experiences for Undergraduates Program, which provides direct financial support for undergraduate students to participate in research.

- The faculty and students of ECE Department welcomed Professor Robert Thomas, a distinguished alumnus and a member of Hall of Fame in the College of Engineering, back to campus as the 2008 Forest Brammer Lecture speaker.

- ECE faculty and students have won many awards and recognitions in the past year and the IEEE Student Branch won the 2008 SE Michigan Outstanding Student Branch Award.

Please take a few minutes to read about these and other new and exciting things going on in the ECE Department as it continues to move forward. I would again like to thank alumni, friends, and donors for your support. I look forward to your suggestions. Please feel free to contact me at yzhao@wayne.edu.

Yang Zhao, Professor and Chair

Research Experience for Undergraduates (REU) Program

The Electrical and Computer Engineering Department received a three-year REU grant from the National Science Foundation in the amount of $315,000. This award provides support to undergraduate students in science and engineering disciplines—in particular under-represented women and minorities—with cohort and high-quality research experiences in an interdisciplinary area of information technology and automotive engineering.

The program is run in an eight-week long intensive summer research camp involving 10 students per year. The program is cross-disciplinary, involving 12 participating faculty mentors from four departments: Electrical and Computer Engineering, Computer Science, Mechanical Engineering, and Biomedical Engineering. The program seeks to improve students’ skills in applying the scientific method to hands-on research and train each student in modern research techniques; lead students to greater independence in pursuing their research interests; and strive to increase the participation of women and under-represented minorities who enter and complete graduate programs in science and engineering.

The students will be matched with suitable mentors to participate in a wide range of individual research projects in the fields of computer modeling and simulation in vehicle safety study, embedded systems, computer-based control in vehicles, vehicular networks, telematics applications, and reliable and secure mobile Internet services. Detailed information of this program is available at http://ece.eng.wayne.edu/~smahmud/REU/Home.htm. For questions and inquiries please contact Dr. Cheng-Zhong Xu (czxu@eng.wayne.edu) or Dr. Syed M. Mahmud (smahmud@eng.wayne.edu).
News and Notes

Professor Recognized by IEEE
Professor Feng Lin was elected to IEEE Fellow status for his contribution to discrete event systems.

Professor Appointed as Associate Editor
Professor John Liu was appointed as Associate Editor for IEEE Transactions on Communications.

Future ECE Programs Discussed
Rakesh Varma, treasurer of the Michigan Democratic party, was recognized at a meeting where new programs for the ECE department were discussed.

New Seminar Series
A seminar series on electromagnetic compatibility, sponsored by the Monahan endowment fund, was arranged in the ECE department in 2008. The seminar series was participated in enthusiastically by faculty and students of the ECE department.

ECE Student Receives Recognition
Zdravko Nikolik, ECE student, has received the SAME award. The Award was presented at the SAME meeting in March 2009.

Dr. Song Jiang’s Algorithm Receives Recognition
MySQL (http://www.mysql.com), one of the largest database systems supporting many important applications worldwide, has adopted the LIRS replacement algorithm developed by Dr. Song Jiang.

Professor Basu’s Paper Recognized
Dr. Amar Basu’s paper published in the Journal of Micromechanics and Microengineering was selected as one of the journal’s highlights in 2008.

New ECE Scholarship Established
A scholarship was established recently in memory of John Varterasian who graduated from the WSU ECE Department with his master’s degree in 1965, by his daughter, Susan Plasencia. The scholarship is available to full-time ECE freshmen students.

WSU Selected for Award
Dr. Robert Erlandson was notified in March that the Wayne State University Enabling Technology program was selected by Goodwill Industries of Greater Detroit as recipient of the 2009 Community Partnership Award.

ECE Welcomes Two New Faculty Members
Assistant Professor Amar Basu joined the ECE faculty after receiving a Ph.D. in electrical engineering-circuits and microsystems from the University of Michigan in August 2008. He also has a master’s degree in biomedical engineering-biotechnology, a master’s degree in electrical engineering, and a bachelor’s degree in electrical engineering, all from the University of Michigan. Assistant Professor Basu’s primary research interests are MEMS and integrated microsystems for applications in biology and nanotechnology.

Assistant Professor Mark Ming-Cheng joined the ECE faculty in 2008. He was a research assistant professor at the Brown Institute of Molecular Medicine and Biomedical Engineering, the University of Texas Health Science Center at Houston. He received a bachelor’s degree and a Ph.D. in Electrical Engineering from National Tsing-Hua University in Taiwan. He was a joint postdoctoral researcher between National Cancer Institute and the Comprehensive Cancer Center at Ohio State University from 2003 to 2006. His research interests include biomedical microdevices, integrated microsystems, lab-on chip, controlled drug delivery systems, nanobiotechnology, nanofludics, BioMEMS, micro/nanofabrication and biosensors.

Staff Researcher Recognized
Dr. Olena Palyvoda, a Wayne State University SSIM staff researcher, was recognized with an image of distinction award by Nikon for their 2008 Nikon Small World Photomicrography Competition. She took the image using the Nikon microscope in the SSIM lab.

Rat embryo cortical neuronal network on nanolayered self assembled monolayers (4x).
For the users of the cloud computing service, it is a must to have the service quality assured. To this end, the service provider usually asks users to specify the resources they want for the job, including number of processors of predefined capability and amount of DRAM memory. However, it is currently very hard to specify the disk-based I/O service quality, which has a critical impact on the performance of data-intensive applications. The reason is that the hard disk is such a device that has a much higher throughput for a sequential access of its stored data than for a random access. As the applications’ access pattern is changing from time to time and cannot be known in advance by either users or service providers, the required throughput cannot be specified with a fixed number. Furthermore, as the disks are shared by multiple users at any time, a user cannot request a number of disks for his/her exclusive use. Having this challenging issue, service providers find it difficult to ensure the service quality for data intensive programs, which cover an important set of applications, such as analysis of genomic data and satellite image, and support of search engines.

This research project, funded by NSF, proposes to take an innovative approach to automatically quantify the instantaneous I/O throughput requirement that matches the performance requirement of the whole job. This is achieved through training a machine learning model to capture the performance characteristics of user-specified storage devices and running the model in the cloud to derive the throughput requirement in an on-line fashion. If successful, this research would pave the road to the wide acceptance of the storage consolidation technology in the cloud computing. As today’s computing more and more relies on efficient and reliable access of large amounts of data, the research has the potential to significantly improve productivity of IT services by fundamentally changing the way in which we use data in computing, that is, from access of isolated hard disks to utility services provided by a large data center. The $400,000 NSF award will support this project over a five-year period.

Dr. Jiang received his bachelor’s and master’s degrees in computer engineering from University of Science and Technology of China, and his Ph.D. from the College of William and Mary. He spent two years at Los Alamos National Laboratory as a post-doc researcher working on fault-tolerant operating systems for high-performance computing. His work has generated far-reaching impacts in the IT industry, including his designs and algorithms that have been officially incorporated into widely used operating systems such as Linux and NetBSD. This CAREER award is his third grant from NSF since he joined Wayne State University in 2004.

Smoking Behavior Progression with Cross-Sectional Data

In order to find better strategies to control tobacco use, it is critical to know the transitional probabilities among various stages of tobacco use. Traditionally, such probabilities were estimated by performing longitudinal surveys, which are time-consuming and expensive. In a recent project, jointly conducted with Dr. Xinguang Chen of the School of Medicine and funded by the National Institutes of Health, Dr. Feng Lin proposed a method to estimate transitional probabilities from cross-sectional survey data, which is more cost-effective to obtain and hence widely available. The method is based on a discrete event system framework. State probabilities and transitional (event) probabilities are introduced to the conventional discrete event system models. Various algorithms are derived that can be used to estimate the transitional probabilities. The method is tested using cross-sectional data of the National Survey on Drug Use and Health. The estimated transitional probabilities can be used in predicting future smoking behavior for decision-making, planning and evaluation of various tobacco control programs.

Dr. Lin received his Ph.D. from the University of Toronto and was a postdoctoral fellow at Harvard University from 1987 to 1988. Since 1988, he has been with Wayne State University. His research interests include systems and control, discrete-event...
Hall of Fame Inductees

Rob A. Rutenbar, B.S. ECE 1978, is currently the Stephen Jatras Chair in Electrical and Computer Engineering at Carnegie Mellon University where he has worked since 1984. In 1998, he co-founded Neolinear, Inc., to commercialize the first practical synthesis tools for analog designs and served as its chief scientist until its acquisition by Cadence Design Systems. He is also the founding director of the U.S. National Focus Research Center for Circuits and Systems Solutions, a consortium of 19 U.S. universities and more than 50 faculty members, funded by the U.S. semiconductor industry and the U.S. government to address future circuit challenges. Rob was the 2007 Forest Brammer Lecture speaker at WSU.

Anthony Mong-On Tai, M.S. EE 1974, Ph.D. EE 1978, headed the Environmental Research Institute of Michigan’s (ERIM) Electro-Optics Techniques and Devices Department in the Advanced Concepts Division from 1986 to 1993. In 1994, he co-founded EOTech, Inc. Anthony became the president and CEO of EOTech in 2000. Together with other members of the management team and several board members, he acquired EOTech from ERIM in 2002. After the company was sold to L-3 Communications Corp in 2005, Anthony became the chief technology officer of the company, which became L-3 Communications EOTech.

Andrew Jerome Heliw III, B.S. EE 1968, is the corporate general counsel and executive vice president of Internal Operations with Lakeshore Engineering Services, Inc. While in law school, Andrew was divisional electrical engineer in charge of the Jones and Laughlin Stainless Strip division and worked as a software designer for general Electric and Westinghouse. He later founded Advanced Systems and Design, Inc. and co-founded American Suppliers Institute. As a registered professional engineer and a patent attorney, Andrew focuses his legal practice on businesses in the technical and engineering fields.

Awards to ECE Students in 2009

Awards

Highest Scholastic Awards
  Jr: Bradley Martens  Sr: Zdravko Nikolik

Engineering Alumni Association Awards
EAA Frosh/Soph Award
  Luke Popiel

Robert G. Wingerter Award
  Priyanka Gupta, Special Recognition

S.S.Lamba Memorial Award
  Zdravko Nikolik

Andrej Olbort Travel Award For Excellence in Graduate Student Research
  Arati.M.Dixit

Outstanding Teaching Assistant Service Award
  Zaydoun Rawashdeh

ESFB Community Service Award
  Jamal Alezzani  Benjamin Langrill
  Luke Popiel  John Krebs

Undergraduate Research and Creative Projects Awards
  Lovepreet Kaur  Elizabeth Halash

Scholarships

Albert R. Alliason Memorial Scholarship
  Jamal Aleezani  Elizabeth Halash

Arthur R and Edith I.Carr Memorial Scholarship
  Joshua Sine

Chrysler Corporation Scholarship
  Justin Filipp

50th Anniversary Engineering Alumni Scholarship
  Jodi Bennet

John.H Varterasian Memorial Scholarship
  Lovepreet Kaur  Justin Filipp
  Joshua Sine

Marshall Family Scholarship
  Jamal Azeelani  Yusuf Anderson
  Luke Popiel  Muneer Al Ali

Washington Group International Scholarship
  Yusuf Anderson

William.R.Kales Memorial Scholarship
  Joshua Sine

Engineering Student Support Scholarship
  Dexter Flowers
IEEE Activities

IEEE is one of the most active engineering student organizations. In 2008-2009 the IEEE Wayne State University student branch hosted 20 events for the students of Wayne State University, along with volunteering for the college of engineering and conducting community service. They act as the bridge for the students between their academic life and the current industry trends and technologies.

IEEE-WSU organized a tour of DTE Energy’s River Rouge coal run power plant, showing the students the internal workings of a 10 story boiler, generators, and transformers that bring electricity to peoples’ homes. A second company tour was to Continental Automotive Systems where students saw first-hand how solar inverters convert solar power to electricity. Company information sessions were organized where representatives from Urban Science and Sun Microsystems informed students about the company and their future plans. IEEE-WSU, along with the S-PAC committee, hosted a Student Awareness Workshop (SPAW) at WSU in which nearly 100 students from five universities in Michigan and Canada participated. In this day long workshop, students learned about team building, communication skills, and time management in an interactive way from 10 professional engineers.

IEEE organized several technical talks for students. An Ultracapacitors in Plug-in Hybrid Electric Vehicles Seminar was presented by John Miller, who has more than 33 years experience in automotive, aerospace, white goods and energy storage fields. The seminar covered current limitations faced by automakers in producing plug-in cars like the Chevrolet Volt. Another seminar, Power System Analysis using MATLAB Software, was presented by Dr. Ali Abur, chair of Electrical and Computer Engineering at Northeastern University. The student organization not only helps students understand the latest industry developments but also helps them with their engineering courses. A workshop was organized to teach students Altium Designer software which is frequently used in classes. A soldering workshop was also organized where students learned the proper methods of soldering on an electric board. To relieve the stress for students, IEEE-WSU also organized some fun activities. An Open House was hosted where students had food and played games. A Christmas party was hosted for the Wayne State Electrical and Computer Engineering Department where students and faculty also enjoyed food, entertainment and games.

The student organization also acts as the student representative for the department faculty. A town hall meeting was organized where several students expressed their views and concerns to the department chair, Dr. Yang Zhao and other professors. Suggestions were well received by the faculty and steps are being taken to implement some of the suggestions. Students were also able to express their views through a voting system created to rate department professors.

IEEE-WSU has helped the College of Engineering recruit more students by volunteering at open house events and encouraging prospective students to choose engineering majors. The organization also organized a clothes drive for the homeless and is encouraging engineering students to be more actively involved in the college. IEEE-WSU has conducted various events throughout the past year to enrich the academic life of the students at their university. With their efforts, students will be a step ahead when they start working as engineers.

International Outreach

Several interesting stories evolved from these recruiting efforts including that of a student named Jaswinder who received an application to the program from Dr. Harpreet Singh. He joined the master’s program in ME and later, his younger brother, Parminder, joined as an undergraduate transfer in ECE. Parminder later completed a master’s in ECE. Then, another family member, Shammi, a cousin to the students, joined the master’s program in ME, with another cousin, Jasmeet, joining to obtain her master’s in ECE. Then another cousin, Amandeep joined the undergraduate program in ME. Jaswinder married and his wife also attended, earning a degree in Computer Science. To date, all have earned degrees at Wayne State University and have jobs in the U.S. They recall their glorious education at WSU and remark that the tuition the family has paid during all these years is equivalent to at least one Wayne State Building.
The 2008 Forest Brammer lecture was held on October 8, 2008 in the brand-new auditorium of the Marvin Denton Engineering Development Center. Professor Robert Thomas of Cornell University was the speaker. More than 80 ECE faculty, students, and guests, as well as representatives from Dr. Brammer’s family and the ECE Industrial Advisory Board, attended the Lecture. The Lecture was entitled The US Electrical Energy Systems, What is Next?

Professor Thomas received his B.S., M.S. and Ph.D. degrees from the ECE Department and is currently a professor of Electrical and Computer Engineering at Cornell University. He has been a member of the IEEE United States Activity Board’s Energy Policy Committee since 1991 and has served as the IEEE-USA Vice President for Technology Policy. He is the founding Director of the 11 university member National Science Foundation Industry/University Cooperative Research Center, Pserc (Power Systems Engineering Research Center). He was a member of the US Department of Energy (DOE) Secretary’s Power Outage Study Team and was on assignment to the USDOE in 2003 as a Senior Advisor to the Director of the Office of Electric Transmission and Distribution and a member of the DOE August 14, 2003 blackout investigation team. Professor Thomas was inducted into College of Engineering Hall of Fame in 2006.

The Brammer lecture series was established in 1990 in the ECE Department to honor Professor Forest E. Brammer who came to Wayne State University in August 1960 as head of the ECE Department. Dr. Brammer was a full-time faculty member until his retirement in 1982. He returned to the Department on a part-time basis that same year and served as undergraduate advisor through December 1989. The Lecture series are supported by the Forest Family Foundation and contributions from ECE faculty, alumni, and friends.

From left: Professor Robert Thomas; William Brammer, son of Dr. Forest Brammer; Professor Mike Polis, former ECE Chair; and Professor Yang Zhao.

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**FOREST BRAMMER LECTURE SERIES**

ECE needs your support to continue this important series as well as other programs.

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Advanced Surgical Technologies Institute (ASTI) Initiative

Greg Auner, Director of Smart Sensors and Integrated Microsystems Program, and the Department of Surgery at the Detroit Medical Center are starting a new multidisciplinary institution known as the Advanced Surgical Technologies Institute (ASTI).

This multi-disciplinary, multi-institutional initiative is designed to create a leapfrog in advanced science and technology directly translated to the surgical practice. The research involves the collaboration between a strategic group of premiere surgeons headed by the chief of surgery for the DMC and Children’s Hospital of Michigan with the Department of Electrical and Computer Engineering and the Smart Sensors and Integrated Microsystems (SSIM) Program to form an advanced team of medical practitioners, scientists and engineers in a first of its kind translational institute.

This initiative is truly multidisciplinary, targeting the development of advanced surgical tools for implementation of real time diagnosis and therapies and new surgical educational tools such as augmented reality and virtual reality for surgical simulation with a particular focus on cancer and laparoscopic surgery. ASTI currently involves a core group of 20 researchers in the ECE Department and associated SSIM program. The combined facilities of the ECE/SSIM programs and surgical institute provide an outstanding environment for this initiative. In fact, the new expansion of the College of Engineering will have significant dedication to this program. Clearly, this combination may be unique in the U.S.