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November 2009

A Newsletter of the Department of Computer Science and Engineering at the University of Notre Dame

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CSE Receives GAANN Fellowships Grant

The Department of Computer Science and Engineering (CSE) has been awarded one of the prestigious Graduate Assistantships in Areas of National Need (GAANN) fellowship grants from the United States Department of Education (DOE). The DOE awards GAANN grants to academic departments and programs in order to provide fellowships to assist exceptional graduate students who demonstrate financial need and plan to pursue the highest degree available in a field designated as an area of national need. Students awarded a GAANN fellowship will have an excellent academic record and be committed to preparing themselves for a career in teaching and research. As part of their experience, GAANN fellows in the CSE department will participate in teaching workshops offered by Notre Dame's Kaneb Center for Teaching and Learning; they will also have their own mentored teaching experience.

This program is administered by a Faculty Advisory Committee consisting of Professor **Kevin W. Bowyer**, the Schubmehl-Prein Chair; Professor **X. Sharon Hu**, the department's director of graduate studies; Professor **M. Brian Blake**, Associate Dean of Engineering for Strategic Initiatives, and Research Professor **Gregory R. Madey**, who has previously served as director of graduate studies in CSE. Bowyer is also the principal investigator for the grant, which in this first year of funding will provide $217,760 to students pursuing their doctorates.

Graduate students or potential graduate students wishing to apply for a GAANN Fellowship in the department should contact Bowyer or Hu. Candidates from under-represented groups are especially encouraged to apply.

Notre Dame Team Receives NSF Grant for Open Source Engineering

A faculty team (from computer science and engineering — **Gregory R. Madey**, research professor, and **Douglas Thain**, assistant professor; from civil engineering and geological sciences — **Ahsan Kareem**, the Robert M. Moran Professor, and **Tracy L. Kijewski-Correa**, the Leo E. and Patti Ruth Linbeck Associate Professor, and from sociology — **David Hachen**, associate professor) has received a $1.45 million grant from the National Science Foundation titled "Open Sourcing the Design of Civil Infrastructure." Their project creates a virtual organization and online collaborative facility that will enable new ways of designing and evaluating civil infrastructure by applying concepts from the open source software community.

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Thain Receives NSF Grant for Collaborative Storage


Douglas Thain

Assistant Professor **Douglas Thain** has received a Collaborative Research Infrastructure grant from the National Science Foundation to build a wide area testbed for data-intensive computing. The Distributed Research Testbed will consist of I/O-intensive computing nodes deployed at the universities of Chicago, Florida, Hawaii, Notre Dame, and Mississippi. This testbed will provide an infrastructure for creating and evaluating new software systems for cloud and grid computing.

Chen's Paper Selected Close Runner-up of 2008 Roberts Prize

Professor **Danny Z. Chen's** article titled "Arc-modulated radiation therapy (AMRT): A single-arc form of intensity-modulated arc therapy," published in the *Journal Physics in Medicine and Biology (PMB)* in Nov. 2008, has been selected as the close runner-up of the prestigious 2008 Roberts Prize for the best paper published in *PMB* in 2008. The *PMB* published 520 articles in 2008.


Danny Z. Chen

Chawla Receives NSF Grant

Assistant Professor **Nitesh Chawla** has received a three-year National Science Foundation (NSF) award of $164,948 for the project titled "Incremental Learning from Unbalanced Data in Nonstationary Environments." The project is funded from the Power, Controls and Adaptive Networks program of the Electrical Communications and Cyber Systems division of the NSF.

According to Chawla, the ultimate goal of computational intelligence has long been emulating brain-like intelligence by discovering and learning patterns from data. However, in related research, the data have been assumed to be generated by an underlying fixed physical process. New algorithms have emerged that accommodate new data or data with unbalanced distributions. However, learning from a non-stationary environment, where the underlying process that generates the data changes over time, has received less attention, whereas the problem of learning in a non-stationary environment that incrementally provides unbalanced data has received hardly any attention. Since the brain can and routinely does learn in such settings, the need for a general framework for learning from and adapting to a non-stationary environment that introduces unbalanced data can be hardly overstated. Spam detection, epidemiological studies, or analysis of climate change, are just a few examples of such scenarios.


Nitesh Chawla

Given such a scenario of unbalanced data, the goal of this project is to develop a general framework that would recognize if and when there has been a change, learn novel content, reinforce existing knowledge that is still relevant, and forget what may no longer be relevant.

Hentz Co-authors Biometrics Paper

The biometrics research that **Amanda Hentz** (B.S., CS; '09) completed during her senior year grew into a research paper that was presented at the International Conference on Biometrics Theory, Applications, and Systems in Washington, D.C., Sept. 28-30, 2009. Her research looks at how the recognition accuracy of iris biometrics is affected by whether or not a person is wearing normal prescription contact lenses. Titled "Contact Lenses: Handle with Care for Iris Recognition," the paper was co-authored with Ph.D. student **Sarah Baker**, Schubmehl-Prein Department Chair **Kevin W. Bowyer**, and Professor **Patrick Flynn.** Hentz is employed by Lockheed Martin.

Blake Receives NSF Award


M. Brian Blake

Professor **M. Brian Blake**, associate dean for strategic initiatives in engineering, was awarded a new $32K National Science Foundation (NSF) award to support the Web Services Challenge (http://ws-challenge.org). The event brings together academic institutions and research labs from around the world to take part in a web services composition competition. This is the fifth year of the event and the fourth time that it has been funded by the NSF.

Dingler, Garrison, Hu, and Niemier Receive Best Paper Award

Graduate student **Aaron Dingler,** senior **Michael Garrison**, Professor **X. Sharon Hu**, and Assistant Professor **Michael Niemier** co-authored a work that received the Best Paper Award at the IEEE Symposium on Nanoscale Architectures, held July 30-31, 2009, in San Francisco, Calif . Their paper, "System-level Energy and Performance Projections for Nanomagnet-based Logic," examines how realistic implementations of the drive circuitry needed to control circuit elements made from nanoscale magnets can affect system-level energy and performance. This work found that realistic fabrication mechanisms should not inhibit logical correctness and that this technology appears capable of out-performing low-power CMOS equivalents with similar energy requirements.

Hu Receives NSF Award


X. Sharon Hu

Professor **X. Sharon Hu**, together with **Michael Lemmon**, professor of electrical engineering, received a three-year National Science Foundation (NSF) award of $525,000 from the new Cyber-Physical Systems (CPS) program for their project titled "Dynamically Managing the Real-time Fabric of a Wireless Sensor-Actuator Network (WSAN)."

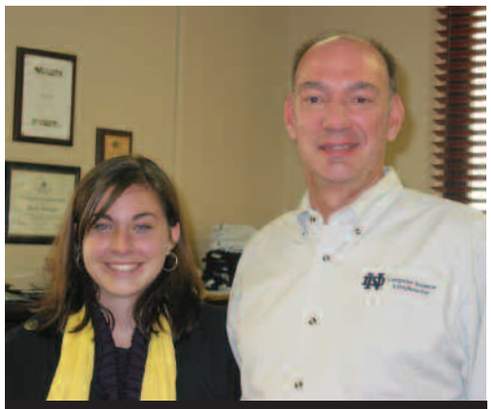
This project aims to study the implementation of feedback control algorithms with hard real-time constraints over wireless sensor-accuator networks, examples of which include the electric power grid or water distribution networks. (The term cyber-physical systems, according to NSF, refers to the tight conjoining of and coordination between computational and physical resources.)

Jim Notwell, left, and Sean McRoskey

Undergraduates Receive Best Student Paper Award

Seniors **Sean McRoskey** and **Jim Notwell** received the best student paper award for their paper titled "Mining in a Mobile Environment," which was published during the Third International Workshop on Knowledge Discovery from Sensor Data held in conjunction with the 15th Association for Computing Machinery Special Interest Group Conference on Knowledge Discoverty and Data Mining held in Paris June 28 through July 1, 2009. The paper is co-authored by assistant professors **Nitesh Chawla** and **Christian Poellabauer.**

Winners Announced for Social Impact of Computing Contest


Katherine Heit and Kevin W. Bowyer

A competition open to high school juniors, the Schubmehl-Prein Prize for the Best Essay on the Social Impact of Computing is supported by the Schubmehl-Prein Chair in Computer Science and Engineering at Notre Dame. The topic for the 2009 competition was "What are the potential social and ethical implications of the $100 laptop?"

Winners of the 2009 competition were: first place — **Katherine Heit**, St. Thomas Aquinas High School (Overland Park, Kan.); second place — **Danielle Harris**, Mayfield Senior School (Pasadena, Calif.); and third place — **David Purington**, Damien High School (LaVerne, Calif.). Honorable mentions included **Bryan Dongre**, Brookfield Senior High (Brookfield, Wis.) and **Erica Smith**, St. Agnes Academy (Houston, Texas).

Heit recently visited the University and met with **Kevin W. Bowyer**, the Schubmehl-Prein Chair of the Department of Computer Science and Engineering and one of the organizers of the competition.

For more information about the 2010 competition, as well as links to winning entries from previous years, visit *http://www.cse.nd.edu/EssayContest*.

Chawla Speaks on Next Generation Data Mining at NSF Workshop

On Oct. 1, during the Climate Change, Environmental Issues, and Data Mining Session of the Next Generation Data Mining Summit (NGDM '09) sponsored by the National Science Foundation, Assistant Professor **Nitesh Chawla** presented a talk entitled "A Complex Networks Perspective on Global Climate, Commerce, and Environment."

Chawla addressed the increased frequency of extreme events and how that will intensify the occurrence of natural hazards, which affect global population, health, and economies. He also reviewed the degrees of uncertainty at local, regional and global scales of such events — the influx of massive volumes of observed and simulated data related to them — and how this requires scalable methods that rely on parallel architectures or cloud computing. During his talk he proposed complex networks based methodologies for modeling the multi-variate spatial relationships, long-range teleconnections, and dependence structures in climate variables. Taking a data-centric approach, Chawla outlined unified framework for characterizing observed data, as well as for developing predictive insights, and showed that structural properties of climate networks have useful interpretations within a specific domain. He concluded that complex networks enables the study of stability and/or changes in climate by observing the network dynamics over time.

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Computer Science and Engineering displays its commitment to the environment by choosing FSC certified paper for its newsletter. Please recycle it when you are finished.

Eleven CSE Students Receive Ph.D.

Eleven PhD students in CSE completed their degrees in the past year: **William Acosta**, **Christopher Boehnen**, **Michael Chapple**, **David Cieslak**, **Timothy Dysart**, **Sarah Frost-Murphy**, **Shannon Kuntz**, **David Salyers**, **Shyamkumar Thoziyoor**, **Timothy Wright**, and **Xuwen Yu**.

This year's grads have taken positions in academia (including University of Toledo, University of Notre Dame), at national labs (including Oak Ridge National Labs), and in industry (including Amazon, VMWare, and IBM).

The department has now averaged more than 10 Ph.D. graduates per year for the past three years.


Peter M. Kogge

Kogge Authors Lead Article in "Petascale Computing" Special Issue

The Sept./Oct. issue of *Computing in Science and Engineering* (CiSE), published by the IEEE, was devoted to petascale computing. A petascale computer is capable of executing a million billion floating-point operations per second. The first petaflops systems went into operation in 2008.

Peter M. Kogge, the Ted H. McCourtney Professor of Computer Science and Engineering, authored the lead article, which was titled "The Challenges of Petascale Architectures." According to Kogge's article petaflops systems will eventually mature into petascale systems capable of 1,000 times more general computation than robust terascale systems. However, to achieve this, he suggests the need for architectures that are inextricably intertwined with technology and applications.

Kogge also recently chaired a Defense Advanced Research Projects Agency study group that reported on the feasibility of constructing an exascale computer, which would be a thousand times more powerful than a petascale computer.