BIG DATA

Big Opportunities

IU EVERY DAY

" IU was the essential step between a small town and chasing my dreams. My mentors, my best friends —IU grads. My daily life, defined by IU.

I'm an IU alum, and IU Alumni Association member. IU is in my soul."

LORRY PLASTERER, BS'11
MODEL / ACTRESS / FASHION DESIGNER / MEMBER

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BIG DATA
Big Opportunities

Data science holds potential to change long-standing approaches to scientific discovery. [page 10]

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SoIC inauguration celebration

Peter Lee, corporate vice president and head of Microsoft Research, speaks at the new School of Informatics and Computing inauguration event. [page 5]

Big data, fad or defining trend?

Regularly, new terms burst into prominence on the global scene and become important in defining our world. For example, a decade ago few of us knew what a "green business" is; now it is an important characteristic that we all recognize. (Until this year not many of us knew what "twerking" meant either, but maybe that will have a briefer half-life.)

The information and computing world shares this phenomenon. Terms like artificial intelligence and software engineering were coined in the early days of the field and have helped to define it as it has evolved.

In the last few years, a new term has become ubiquitous not only within the academic world but among the general public: "big data." The general population may not all know what it means but most people have heard of it. A natural question is: is this a fad or a defining trend? Experts in the information and computing field believe that it is definitely the latter.

Big data refers to a new paradigm of understanding our world. Until recently, computers helped us analyze systems through modeling and simulation. Scientists and others created mathematical models of various phenomena and then studied how they performed in a range of situations. Anyone who has flown on a Boeing 777 has implicitly put their trust in this approach, as the 777 was the first major commercial airplane designed via computer versus physical simulation.

In contrast, the world of big data looks for patterns in massive data sets, without necessarily knowing what one is looking for or having a model that corresponds to the data. Think of the reconstruction of the horrific Boston Marathon bombing from huge amounts of disparate video data – no one knew what would be found, but a pattern of the blast emerged and the perpetrators were identified. Or in the medical world, large, multiple databases about the drugs that people take and those people's health histories are enabling us to better understand drug interactions. Big data applications occur in every sector: businesses understanding the purchasing habits of their customers, scientists analyzing environmental phenomena, public health officials tracking the patterns of seasonal flu.

The breadth of the IU School of Informatics and Computing makes it uniquely well-suited to the world of big data. All areas of the school form the foundation of this field and all are essential to it: computer science such as databases and high-performance computing, informatics such as health and bio-informatics, information and library science such as data archiving and information management, and overarching areas such as complex networks and systems.

Thus it is natural that the School has embarked upon a major initiative in data science that is discussed in this issue. This includes setting up a new program in data science that includes nearly 40 faculty members from all areas of our school – and several from other units such as statistics – and our recent launch of an online graduate program in

Dean Bobby Schnabel

THE BREADTH OF THE IU SCHOOL OF INFORMATICS AND COMPUTING MAKES IT UNIQUELY WELL-SUITED TO THE WORLD OF BIG DATA.

data science that is available worldwide at a very reasonable cost. The online program will enable people working in areas in which big data is important as well as others who are interested to learn conveniently about the management, analysis, and application of massive data – including such important topics as cloud computing, information visualization, data analytics, and big data in health-care – directly from our most esteemed faculty. We particularly welcome the participation of our alumni!

Bobby

Photo by Chris Myers

Photo by Chris Myers

Photo by Chris Myers

Photo by Liz Kaye

Photo by Liz Kaye

SoIC inauguration celebration

The School of Informatics and Computing celebrated its inauguration as a new school on Friday, September 27, 2013. The event, headlined by Peter Lee, corporate vice president and head of Microsoft Research, also featured Indiana University President Michael McRobbie and Dean Bobby Schnabel. The ceremony took place on the IU Bloomington campus and was streamed live to IUPUI, where it was preceded by an address from Daniel F. Evans Jr., president and CEO of IU Health. The School was thrilled to celebrate with hundreds of guests on both campuses with a variety of events throughout the day. Guests in Bloomington enjoyed a jazz trio from the Jacobs School of Music and an organ interlude on the Great Organ by Professor of Music Christopher Young. They also learned about the wide range of research at the School from nearly 50 faculty and student posters. IUPUI held an open house as well, which featured demonstrations from the School's departments and programs and provided tours of the Audio/Visual Lab where visitors were able to experience interactive technology created by students and faculty.

Clockwise from top left: SoIC Dean Bobby Schnabel (right) speaks with keynote speaker Peter Lee before the event; attendees learn about the breadth of the School's research through nearly 50 posters in the IMU Solarium; Associate Dean Howard Rosenbaum (center) speaks with faculty and guests; Chancellor Bantz addresses the audience at IUPUI; attendees mingle and learn about research at IUPUI.

New, affordable online program in data science

The School launched a new online data science program, and people from around the globe started the program in January.

The program will teach concepts and skills essential for success in this rapidly emerging field: data collection, data management and infrastructure, data analysis, and data visualization. Three-credit courses available in the 12-credit certificate program include:

- Big Data Applications and Analytics
- Cloud Computing for Data Intensive Sciences
- Information Visualization
- Big Data in Drug Discovery, Health and Translational Medicine
- Data Management: Volume, Variety, Velocity, Veracity
- Big Data Software Tools and Project
- Big Data Analysis for Web and Text
- High-Performance Computing

With a projected 1.7 million U.S. jobs in the next five years, data science professionals will be in high demand by employers. Email datasci@indiana.edu to learn more about this exciting career development opportunity.

Biggers leads IU's Center of Excellence for Women in Technology

Biggers

The Center of Excellence for Women in Technology (CEWiT) at IUB officially launched in October.

CEWiT falls under the Office of the Provost umbrella and is dedicated to promoting success, retention, increased engagement, and promotion of IU women faculty, staff, and students from multiple disciplines and career intentions who engage with computation and technology. Alliances have formed for each of these three advocacy groups. The focus hits close to home for SoIC, given that the School has been named a Pacesetter by the National Center for Women & Information Technology, which works to increase women's participation in IT.

The connection between SoIC and the program is strengthened by SoIC's Assistant Dean for Diversity and Education Maureen Biggers' role as director of CEWiT. She has focused her career on promoting student retention, leadership, teams, diversity, and broadening participation in computing. Biggers came to the School in 2008 from Georgia Tech. During her tenure, undergraduate female enrollment at IUB has more than tripled.

The student leadership team of CEWiT's student organization, WESiT (Women Empowering Success in Technology), pose in their photo booth at the Tech Expo during the CEWiT launch event.

Bioinformatics paper selected in international genome big data challenge

A bioinformatics research team from IUPUI, led by Executive Associate Dean Mathew Palakal and his students Deepali Jhamb and Akshay Desai, Computer and Information Science student Premkumar Duraiswamy, and Research Scientist Dr. Meeta Pradhan is one of the winning teams in an international challenge set forth by the organizers of the 12th Annual International Conference on Critical Assessment of Massive Data Analysis (CAMDA). The challenge was to find discernible patterns of meaningful information in the genomic data of 38 human subjects (7 terabytes of genome data) from the Korean Personal Genome Project.

The team developed an innovative systems biology pipeline for the analysis of next generation sequencing data, focusing on the relationships between genes with rare variants. Through their innovative big data analytics methods, they identified the prevalence of genes in two major domains: neurodegenerative diseases and tumor related genes. This observation suggests that the Korean population might be more susceptible to these two major classes of complex diseases, when compared with other populations.

As one of the winning teams, the group presented their findings at the CAMDA conference in Berlin in July.

Career services breaks fall records

Career services had a record-breaking fall. They welcomed 83 employers and 773 students to the Fall Informatics and Computing Career Fair at IUB, eclipsing last year's record number of students by nearly 100. The next day, 170 interviews took place, over 20 more than the previous high mark. By the end of the semester, 663 on-campus interviews had taken place in the School.

These marks come after a record-setting 2012-13 academic year. Nearly 130 companies recruited SoIC students on campus, and 1,076 interviews were conducted on campus. A total of 211 companies hired full-time and/or summer 2013 interns from the School.

Students speak with recruiters at the Fall Career Fair at the Bloomington Convention Center.

IUPUI graduate students complete care unit analysis for mental illness

The School at IUPUI and White Pine Systems, LLC (dba SPINN), a leading provider of patient engagement solutions, announced that a team of health informatics graduate students has completed the Mental Health Care Unit (MHCU) analysis, proposing requirements for technology-enabled patient engagement that will improve operating efficiency and outcomes.

The MHCU analysis explores the challenges of treating people with addiction and mental illness and considers how online and mobile patient relationship management tools can improve outcomes and lower cost in community-based mental and addiction health programs.

The School has worked with White Pine following their Care Unit Method for the last five years. "Each semester, we have two teams of graduate students participate in these projects. So far, the teams have conducted analyses for care units including diabetes, hypertension, pregnancy, breast cancer, substance abuse, palliative health, and Parkinson's disease," said Josette Jones, associate professor of health informatics. "Our students tell us this is one of the best projects in their graduate studies."

IUPUI helps Allegient use 'causality' to improve Internet searches

An Indianapolis firm has developed software designed to sift through massive collections of journal articles more efficiently than traditional Internet search engines. Allegient LLC and subcontracted IUPUI informatics experts wrote algorithms that go beyond word searches to look for "causality," or relationships between words suggesting one thing caused another.

Allegient is trying to get a foothold in the fast-growing corner of big data called text mining, the practice of trolling text written in plain language in order to find patterns and ultimately important nuggets of information. The market is growing quickly. Market research estimates current annual global sales of $400 million and reaching $1 billion in five years, driven by companies' rising appetite for searching social media. The software searches full sentences looking for structures suggesting that one thing leads to another, such as "it" followed by "has propensity toward." Users then see a set of articles ranked by relevance. Mathew Palakal, executive associate dean at IUPUI, predicted the software eventually will be refined to a simplicity that will allow even elementary schoolchildren to use it.

Ph.D. student Jerome Mitchell receives 2013 NASA Earth and Space Science Fellowship

Third-year IUB computer science Ph.D. student Jerome Mitchell was awarded a 2013 NASA Earth and Space Science Fellowship (NESSF).

The NESSF program supports graduate students in basic and applied research in earth science and space science. Of the 330 applications NASA received for the earth science research award, 56 received the award. Each recipient will receive $30,000, renewable for up to three years.

Mitchell's proposed research, which capitalizes on the Center for Remote Sensing of Ice Sheets' (CReSIS) high-quality data products, is to develop learning algorithms to automate determining layers in polar radar imagery. This would unburden domain experts from the process of determining key features in the datasets.

IUPUI group develops massive multiplayer game for Gen Con

When Gen Con opened its doors in August, a massive multiplayer alternate reality game created by 40 students and five faculty at IUPUI was center stage.

The game, "Return of Aetheria," used video mapping and projectors, which created a large crystalline display, stereoscopic 3D, and a phone app, utilized the entire convention center as a play area, and had costumed actors portraying characters in the game.

The students and faculty spent eight months crafting the game in which players are guided through various quests to save and restore magic to the world.

As quests were completed, players saw the results upon the large crystalline display in real time through video mapping projectors. As the game continued, additional dramatic events appeared on the crystalline structure and surrounding space.

The game was developed as a part of an educational partnership between Gen Con, which takes place in Indianapolis, and the School's Media Arts and Science program at IUPUI.

SoIC takes on Grace Hopper

A group of women from the School invaded Minneapolis during the Grace Hopper Celebration of Women in Computing. Nearly 30 students from IUB and nine students from IUPUI enjoyed the conference, held October 2-5 in the North Star state. Featured speakers at the event included the COO of Facebook and a VP from Facebook. The women learned about the latest in technology through information sessions, networked with peers and employers, and attended a career fair, to name a few activities.

[INdevelopment]

2013 Annual Fund Raised $181,752

$175,000 goal
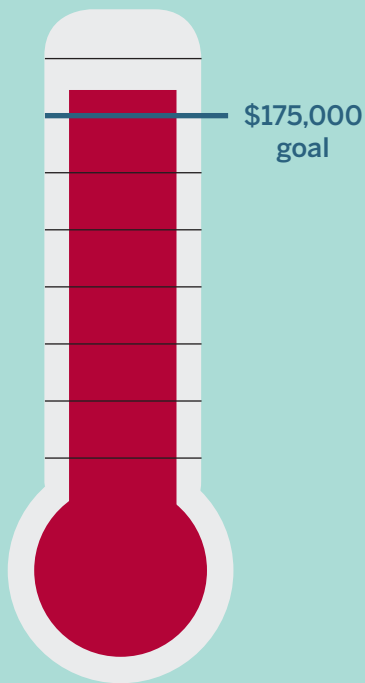
Thank you to our 691 donors!

Get to know the Annual Fund Steering Committee

Since 2011, Josh Esslinger has devoted time to the School's Annual Fund Steering Committee. He and ten other alumni advise Associate Director of Annual Giving Alan Goodno on strategies to build the School's annual fund. They also spend some of their own time telling others why it's important to them.

"It's important to me that the School's reputation is a good one, because it means my degree is valuable," says Esslinger. He is a 2003 Media Arts and Science graduate and co-founder of LifeShare Technologies, a Shelbyville, Indiana, company that supports seniors, their caregivers, and their families with integrated communication plans.

With the help of Josh and other dedicated volunteers, the fund has grown by more than 200% in the past three years.

Another member, Kristin Moore, graduated in 2011 with a B.S. in Informatics. She works for IU Health in Indianapolis and enjoys meeting new people with whom she has something in common: a SoIC degree. It's a door-opener that expands her horizons.

"I'm meeting interesting people who are doing great things with their degrees," she says. "I love staying involved with the School and am having a great experience doing it."

Newest member Tom Sparrenberger, '06, M.S., Information Science, is a third-generation IU graduate who loves the School and wants to ensure its strong standing. He recently relocated from New York to the Bay Area, where he works for Ernst & Young. He was eager to give back to the School when he was invited to join the committee.

"I'm proud to have graduated from a recognized leader in the field," he says, "and welcome the opportunity to maintain its strength."

Connecting with fellow alumni and doing good for the School drives these and other volunteers to get involved. As volunteers, they know first-hand the impact of annual fund gifts: from tuition help given directly to current students to aiding faculty colloquia and recruitment, these gifts play a vital role in supporting critical programs that strengthen the School, its faculty, and its students.

If you'd like to join this great group of people and build your network with alumni across the country and around the world, contact Alan Goodno at 812-856-2315 or agoodno@indiana.edu.

Introducing the School's new development staff

Gallagher

Associate Director of Development Gina Gallagher holds three Indiana University degrees: a master's in English and bachelor's degrees in English and political science. In addition, she recently completed her M.A. in Higher Education at the University of Michigan. Gina supports the assistant dean in directing the school's fundraising duties, writing proposals, conducting research, and working with volunteers. Gina hails from northwest Indiana and is a die hard Chicago Bears and Chicago Bulls fan.

Goodno

Alan Goodno came to IU for his M.S. in Higher Education and Student Affairs after completing his undergraduate studies at the University of Georgia. After falling in love with Bloomington as a student, he was thrilled to have the opportunity to stay. He succeeds Mary Beth Roska as associate director of annual giving, as she assumes alumni relations and stewardship duties. Alan supervises volunteers of the steering and student class fund committees, coordinating all aspects of the annual fund effort. He also oversees Accelerator, the School's exclusive corporate giving program.

Big Data, Big Opportunities

*By Jim Shea, senior director of planning and communications
and Geoffrey Fox, distinguished professor and associate dean for research*

The rate of data growth is accelerating at staggering proportions. According to Google CEO Eric Schmitt, "Between the birth of the world and 2003, there were five exabytes of information created. We now create five exabytes every two days." (Quoted in *The Huffington Post*, December 11, 2013)

The daily count is illustrative of the trends: more than a billion Google searches, more than 144,000 hours of video and more than half a billion photos uploaded, and almost a quarter trillion emails sent. All captured and maintained every single day!

Some of the main data generators are social media: Facebook, Twitter, LinkedIn, and YouTube are prominent, although there are a host of others. They've become so much a part of many people's daily lives that it's sometimes hard to remember that none of them existed a decade ago.

In addition to our Internet behavior, retail companies maintain records of our purchasing behavior. Insurance companies track records of our driving, property ownership, and healthcare behavior. Doctors and hospitals keep our health records. Cell phone providers maintain records of every call and text.

When you add up all these data for the billions of people in the world, it's a lot of data! It's so much data, that "big data" probably doesn't do it justice. Enormous. Gigantic. Humongous. Beyond the choice of adjective, big data has the potential to solve a range of problems in nearly every field.

What do we do with such overwhelming amounts of data? The emerging field of data science has grown as a discipline to develop professionals with the expertise to derive meaning from this mass of data and make a difference in fields ranging from healthcare to retail, from defense to manufacturing, and many others. Data science is a multi-faceted field that encompasses mathematics, statistics, computer science, cyberinfrastructure (high-performance computing), and information management/visualization. IU and the School of Informatics and Computing have faculty expertise in each of these areas, so we are well-positioned to make an impact in this burgeoning field.

Data science holds the potential to change long-standing approaches to scientific discovery. In September 2008, *Wired* magazine announced the end of science or rather the end of science as we learned at school. Traditionally we learn about theories (such as Newton's laws) and observations (apples dropping from a tree) to test and illuminate the theory. Around 1985 a third approach to science emerged; the building of models and use of supercomputers to calculate their implications. This is going gung-ho with the high-performance computing community building exascale computers to get better fidelity and model larger systems. *Wired* refers to the fourth paradigm with big data driving science. One derives knowledge by unconstrained examination of big science datasets. One example is the virtual observatory; in the past, the lonely dedicated astronomers went up to the mountain to observe the cosmos through their favorite telescope and devoted their career to a focused study. Now the young astronomer sits in front of a console making totally new discoveries by comparing data stored on the internet and coming from many telescopes. A hallmark of big data is the integration of data. Astronomers integrate telescopes, physicists integrate accelerators, while Netflix and Pandora integrate data from content and rankings to choose the best experience for their customers. More data is more powerful than more theories. Humans once feared being surpassed by better computers; now they fear the data deluge.

Beyond its potential to change the fundamental nature of scientific discovery, the number of jobs projected in this field is astonishing. According to a McKinsey Global Institute report, within the next five years the U.S. could face a shortage of 140,000-190,000 people with deep analytical skills and an additional 1.5 million managers with the know-how to use analysis of big data to make effective decisions. The first group, with the deep analytical skills, translates roughly to the computer science part of our School, whereas the knowledgeable managers, translates roughly to the informatics portion of our School. These will be high-paying jobs that will be influential in most organizations.

The rest of the world will demand these skills as well. Gartner, Inc., an information technology research and advisory company, projects 4.4 million IT jobs globally to support big data by 2015.

Many of the projected jobs in this field will go unfilled. "There is not enough talent in the industry. Therefore, only one-third of the IT jobs will be filled. Data experts will be a scarce, valuable commodity," according to Peter Sondergaard, senior vice president at Gartner and global head of research. (Gartner Symposium, October 21-25, 2012).

In response to the incredible needs in the data science area, the School has been moving rapidly to launch programs that take advantage of our deep faculty expertise in data science. Nearly 40 IUB faculty have identified as part of the data science program, which is co-chaired by Distinguished Professor Geoffrey Fox and Professor Beth Plale.

The School's initial data science effort is an affordable, online four-course program that launched in January (see box). A full master's degree in data science is being developed as well with an anticipated launch in fall 2014.

SoIC's new online data science program

The online data science program includes the following courses:

- Big Data Applications and Analytics
- Cloud Computing for Data Intensive Sciences
- Information Visualization
- Big Data in Drug Discovery, Health and Translational Medicine
- Data Management: Volume, Variety, Velocity, Veracity
- Big Data Software Tools and Project
- Big Data Analysis for Web and Text
- High-Performance Computing

The first four courses were available in January 2014. The rest of the courses will be available in August 2014.

The IU Trustees voted to approve the program as a certificate at its December 2013 meeting. The final approval process for the certificate is making good progress and should be completed soon.

The School made affordability a priority. The fee for the four-course program is $4,500.

[CUTTINGedge]

Thomas Sterling named first recipient of HPC Vanguard Award

IUB Professor of Computer Science Thomas Sterling has been named the first recipient of *The Exascale Report*'s HPC Vanguard Award. Mike Bernhardt, publisher of *The Exascale Report* and creator of the award, made the announcement at the Supercomputing 2013 conference in Denver in November. Sterling's peers in the high performance computing (HPC) and emerging exascale communities selected him for the award.

"As one of the HPC community's most recognized and respected luminaries, Thomas Sterling exemplifies this award and is well deserving of this recognition," said Bernhardt. "The HPC Vanguard Award acknowledges his unquestioned leadership position at the forefront of the HPC community and his tireless efforts to improve education and awareness – always striving to drive the high-end, technical computing community forward."

At IUB, Sterling is chief scientist and executive associate director of the Center for Research in Extreme Scale Technologies (CREST) and a professor of computer science. Through the years, Sterling's research has contributed to revolutionary developments in HPC. He holds six patents, has co-authored six books, and is considered a giant in the field of extreme scale computing.

Currently, Sterling's research focuses on the ParalleX execution model for extreme scale computing, with the goal of devising a new model of computation to guide the development of next-generation exascale computing systems. ParalleX is the conceptual centerpiece of the XPRESS project, sponsored by the U.S. Department of Energy Office of Science X-Stack program.

At CREST, a research center affiliated with the IU Pervasive Technology Institute, Sterling has been instrumental in garnering millions of dollars in new research funding from federal agencies, including the National Science Foundation, the U.S. Department of Energy, and the U.S. Department of Defense.

Cronin receives Price Medal

Rudy Professor of Information Science Blaise Cronin received the Derek J. De Solla Price Memorial Medal from the journal *Scientometrics* at the International Society for Scientometrics and Informetrics conference in Vienna, Austria, in July.

Cronin

The medal honors scholars who have made outstanding contributions to the fields of quantitative studies of science. Cronin received the recognition for his "excellent research activity and performance," according to Tibor Braun, founder and editor-in-chief of *Scientometrics*.

Scientometrics awards the medal biannually after a nominating and voting process by a group comprised of the editors and members of the advisory board of *Scientometrics* and former Price awardees.

"To receive the Price medal is a highlight of my career, given that I have been working in the field for more than 30 years. The award ceremony – 'the Oscar of bibliometrics,' as it has been called – took place in the resplendent Festsaal of the University of Vienna, which merely added to the specialness of the occasion," said Cronin of the award.

IUPUI faculty recognized at international conference on computer games

Professor of Media Arts and Science Joseph Defazio, Associate Lecturer Travis Fass, and Rebecca Finch, doctoral student in the human-computer interaction program authored a paper that was accepted to the 18th annual International Conference on Computer Games, CGAMES.

The paper, "Building Multi-User Virtual Worlds," explores virtual worlds and their practicality in educating students. The focus of the paper is the design and development of an academic course on multi-user virtual worlds. The paper serves as a blueprint for the creation of a multiplayer virtual game where students interact with one another in either real time or through a series of simulated events.

Using virtual environments as an educational tool is a relatively new concept and one that could innovate the world of teaching.

"We have yet to realize the full potential of multi-user virtual worlds and augmented reality experiences in cross-disciplinary educational opportunities," said Defazio.

The 2013 CGAMES conference took place from July 29 to August 1, in Louisville, Kentucky.

IUPUI's Davide Bolchini receives Google Faculty Research Award

Davide Bolchini, interim chair of the Department of Human-Centered Computing and assistant professor of human-computer interaction recently received the prestigious Google Faculty Research Award.

Bolchini

The award is accompanied by a grant that will support the study "Augmenting Screen-Reader Navigation by Linkless Dialogues" being conducted by Bolchini and human-computer interaction Ph.D. candidate Prathik Gadde. The study investigates how the blind and visually impaired can interact with and navigate through complex websites to compensate for their lack of sight. The study will examine novel solutions that could make surfing the Web easier for visually challenged users.

The work will leverage a five-year collaboration with the Indiana School for the Blind and Visually Impaired.

Google Research Awards' mission is to organize the world's information and make it universally accessible and useful. As part of that vision, the Google Research Awards program aims to identify and support world-class, full-time faculty pursuing research in areas of mutual interest.

This round, Google received 550 proposals from 50 countries. After expert reviews, 105 projects were selected for funding, with an acceptance rate of 19 percent.

Camp leads IU's involvement in $23.2 million Army cyberattack research program

Camp

Models for Enabling Continuous Reconfigurability of Secure Missions, a five-year, $23.2 million cooperative agreement, will form a collaborative research alliance consisting of Indiana University, Penn State University, Carnegie Mellon University, University of California Davis, University of California Riverside, and the Army Research Laboratory.

The aim of the alliance is to create a science to detect and model cyberattacks and the risk and motivations behind them and to create a response that can counter the attack and neutralize the cyberattackers in real time.

IUB's L. Jean Camp will serve as the principal investigator for the IU portion of the work, with Bennett I. Bertenthal, a professor in the College of Arts and Sciences' Department of Psychological and Brain Sciences, and Diane S. Henshel, an associate professor in the School of Public and Environmental Affairs, joining in the work as co-investigators.

The funding for the program is renewable for an additional five years and $25 million. IU's portion for the initial five-year agreement is $2.6 million. The project will support 17 faculty and more than 30 graduate students among the partnering universities.

Plale to lead IU's efforts in $5 million RDA collaboration

Professor Beth Plale directs IU's involvement in an effort led by Rensselaer Polytechnic Institute (RPI) to expand United States leadership and engagement in the international data community through the Research Data Alliance (RDA). RDA is accelerating the development of global infrastructure for data sharing and exchange among diverse research areas – including tools, code, institutional policy, and best practices – that provide the foundation for new data-driven insights and discoveries.

The $5 million grant broadens the reach of RDA/US with three pilot programs in the U.S. and expanded participation in the international RDA. The new grant is a collaboration between RPI, Indiana University Bloomington, and the Corporation for Networked Research Information, and part of a suite of activities at the new Rensselaer Institute for Data Exploration and Applications.

Plale and IU will lead two of the three pilot programs, including a series of "data challenges" that will encourage and reward the community to adapt and use the techniques and tools developed by RDA working groups. The team will also lead a program to engage emerging data scientists and users. RDA/US will provide internships for students and fellowships for early career professionals to contribute to and use the products of RDA, according to Plale.

[AS SEEN ON TV]

Socialbot consultation for *The Good Wife*

The writers of the CBS drama *The Good Wife* consulted with IUB Professor Fil Menczer on the use of socialbots in social media for this season's "Whack-a-Mole" episode. Menczer was contacted by the writers after they read about his work with socialbots in a *New York Times* article. We don't want to ruin the show, but the show used Menczer's expertise to shape a plotline about socialbots bringing traffic to a social news site. Watch the episode on CBS.com.

ILS's Herring receives the ASIS&T Award for Research in Information Science

Herring

IUB Professor of Information Science Susan Herring has been selected as the recipient of the 2013 ASIS&T Award for Research in Information Science. She is the first IU recipient of the award, which was inaugurated in 1984 with posthumous awards to Fritz Machlup, Derek de Solla Price, and Ithiel de Sola Pool.

The award was presented at the 76th Annual Meeting of the Association for Information Science and Technology (ASIS&T) in November in Montreal, Canada. The award recognizes an individual or individuals for an outstanding research contribution in the field of information science.

Herring received the award for her work in computer-mediated research for "extending the boundaries of the field in an original but meaningful way that resonates with developments in the information world as we know it today."

IUB Executive Associate Dean David Leake named Academic Leadership Program fellow

Leake

David Leake was one of four IUB professors named to the 2013-14 Academic Leadership Program, which develops leadership potential for faculty who have demonstrated an interest in and aptitude for academic administration.

The Committee on Institutional Cooperation (CIC), a consortium of the 15 universities of the Big Ten conference plus the University of Chicago, sponsors the program, which includes three seminars hosted by different CIC universities and participation in campus-based activities.

The other IUB faculty members include Claude Clegg, professor of history in the College of Arts and Sciences, Lesa Hatley Major, interim dean and associate professor in the School of Journalism, and Michael Reece, associate dean and professor of applied health science in the School of Public Health.

Faculty members are selected to take part in the program, which leverages the resources and expertise of CIC member institutions to provide professional development opportunities.

Team including IUB researchers competes in Department of Defense robot design challenge

IUB robotics researchers were on a team that competed in the first stage of the $2 million U.S. Department of Defense's DARPA Robotics Challenge to develop robots that can execute complex tasks in dangerous, degraded, human-engineered environments.

Phase 1, which began in October 2012, culminated with trials in December. Teams that advanced will receive additional funding from the Defense Department's Defense Advanced Research Projects Agency (DARPA) and move into Phase 2. Teams will have 12 months to refine their designs before the final head-to-head competition in December 2014.

Members of IU's Intelligent Motion Lab, led by Assistant Professor of Computer Science Kris Hauser, worked with nine other universities on team DRC-Hubo to create their own robot platform and operation software for the humanoid robot Hubo. The IU contingent worked on giving Hubo the ability to climb ladders.

The DRC-Hubo team concerted its efforts throughout the summer with representatives from each of the 10 participating universities gathering on-site at Drexel's campus to collaborate.

Each university team was charged with programming Hubo to perform one of eight disaster recovery-related tasks. IU and Purdue tackled ladder climbing, Drexel programmed the robot to get into and out of a vehicle, and Delaware researchers developed a way for it to drive and navigate. Engineers from Ohio State worked on a way for it to climb over rough terrain, Georgia Tech's group programmed the robot to clear debris and break through a concrete wall, Swarthmore roboticists worked to get the robot to open a door, Worcester engineers handled the task of turning a valve, and Columbia scientists programmed the robot to reattach a hose.

Kris Hauser and Team Hubo at the DARPA Robotics Challenge.

IUB's Frischer unveils virtual ancient Roman emperor's villa

IU's first archaeo-informaticist, Professor of Informatics Bernie Frischer, brought to life one of the Roman Empire's best-known and best-preserved imperial villas – Hadrian's Villa – during a public launch of the Digital Hadrian's Villa Project in November in Washington, D.C.

Frischer, a digital archaeologist and one of the first academics to use 3-D computer modeling to reconstruct cultural heritage sites, spent five years leading the development of a 3-D virtual world modeling the Roman emperor Hadrian's Villa at Tivoli, Italy.

The virtual simulation interprets the entire 250 acres and the more than 30 buildings of the second-century site. Using a live 3-D multi-user online learning environment, visitors can interactively explore the entire villa complex.

Combining information garnered from scholarly studies of how the villa was used with the virtual world gaming platform Unity 3D, Frischer and the Virtual World Heritage Laboratory, which he directs at the School, partnered with the Institute for Digital Intermedia Arts at Ball State University to offer visitors the opportunity to take on the roles of historically accurate avatars – from Imperial Court members and Roman senators to soldiers and slaves – during their interactive tours.

Located near Tivoli, about 20 miles east of Rome with the Sabine Hills, the villa – now a World Heritage Site – served as a retreat for Hadrian and his court of an estimated 3,000 workers. It included what is considered the greatest Roman example of the integration of architecture, gardens, sculpture, and water features. The villa also contained palaces, temples, libraries, banquet halls, state rooms, quarters for guests and slaves, and innovative buildings such as the so-called Maritime Theater.

IUB's Natarajan receives ARO Young Investigator Award

Natarajan

Assistant Professor Sriraam Natarajan has been selected to participate in the Army Research Office (ARO) Young Investigator Program (YIP). The objectives of YIP are to attract outstanding young university faculty members to Army research, and to support and encourage their teaching and research careers. Natarajan will receive $150,000 for three years to support his research on the applicability and steerability of machine learning.

Natarajan's research aims to increase the number of people who can make effective use of machine learning by extending the process by which domain experts can directly communicate with powerful learning algorithms. His research allows users to guide learning algorithms by providing knowledge about a specific task. Also, his research seeks to extend the power of learning algorithms by allowing them to request guidance from the human expert as necessary thus allowing a natural machine-human interaction.

[BOOKSHELF]

# RKCSI faculty and students publish three books

Three books have recently been published by faculty and students affiliated with IUB's Rob Kling Center for Social Informatics (RKCSI).

Associate Professor of Library and Information Science and Co-director of the Rob Kling Center for Social Informatics Pnina Fichman and Ph.D. student Madelyn Sanfilippo published their book, *Multiculturalism and Information and Communication Technology*, in November. The two share research on the relationship between information and communication technology and culture through the lenses of social informatics, social determinism, and technology determinism. The book is a part of the Information Concepts, Retrieval, and Services book series by Morgan & Claypool Publishers. Books are written by experts from around the world, addressing topics pertaining to information science and applications of technology to information discovery, production, distribution, and management. The series currently features 30 titles and is growing.

Associate Professor and RKSCI faculty fellow Nathan Ensmenger co-authored the third edition of *Computer:*

A History of the Information Machine. The new edition expands the book's coverage of the history of computing to include social networking and mobile computing. In addition, the book details the rise of Google and Facebook, and explores the way in which these powerful companies, and the technologies they produce, are changing the way we work, consume, learn, and socialize.

Ph.D. student David Nemer, the 2013-14 Rob Kling Social Informatics Fellow, published a photographic book detailing his fieldwork in Brazil for his doctoral dissertation. Last year, he spent six months studying the usage of technology in favelas (shantytowns) in Brazil. He captured the everyday life and how residents use digital technology, which he published in his book *Favela Digital: The other side of technology*. He promoted his book at several European universities, including Humboldt University of Berlin, University of Kaiserslautern (Germany), Monash University (Italy), University of Cape Town (South Africa), and University of London (UK). Learn more about the book at favela-digital.com.
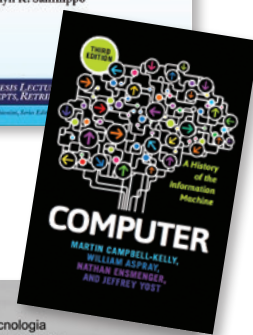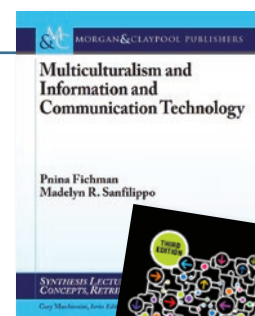
IUB adds 11 faculty members to accommodate increasing enrollments

The School of Informatics and Computing added 11 new faculty members this academic year to accommodate increasing enrollments and growing interest in the School. The new faculty span most areas of the School, including complex systems, computer science, digital humanities, artificial intelligence, bioinformatics, programming, and human computer interaction.

Simon DeDeo, assistant professor of complex networks and systems, joined the School from the Santa Fe Institute, where he was a research fellow. He also was the principal investigator on an Emerging Frontiers grant from the National Science Foundation. He studied physics and applied mathematics at Harvard University, Cambridge University, and Princeton University, where he received his Ph.D.

Associate Professor **Funda Ergun** received her Ph.D. in computer science from Cornell University. After completing her postdoctoral work at the University of Pennsylvania, she joined Bell Labs. She has also taught at Case Western Reserve University and Simon Fraser University. Her research interests are randomized and streaming algorithms, as well as the theoretical aspects of high-speed networks.

Digital archaeologist **Bernard Frischer** is a professor of informatics. He is also a classicist and the author of many books, websites, and articles on virtual heritage, classics, and the survival of antiquity. His resume includes teaching at UCLA and the University of Virginia, where he also served as director of the Virtual World Heritage Laboratory. Frischer earned his Ph.D. from the University of Heidelberg.

Assistant Professor **Sriraam Natarajan** specializes in the field of artificial intelligence, with an emphasis on machine learning and its application to biomedical problems. He was previously an assistant professor at the Wake Forest University School of Medicine and a postdoctoral research associate at the University of Wisconsin-Madison. He earned his Ph.D. from Oregon State University.

Filippo Radicchi joined the faculty as an assistant professor, focusing on the application of methods and tools of statistical physics to the study of complex systems and networks. Prior to joining the School, Radicchi was a senior researcher in the Department of Chemical Engineering at the University Rovira i Virgili in Spain. He also served as a research specialist at the ISI Foundation and Amaral Laboratory at Northwestern University. He earned his Ph.D. in physics at Jacobs University in Berlin.

Professor of Bioinformatics **Cenk Sahinalp** came to the School from Simon Fraser University, where he directed the lab for computational biology and served as a professor and Canada research chair in computational genomics. Prior to his stint at SFU, he worked at Case Western Reserve University, University of Warwick, and Bell Labs. His research focuses on biomolecular sequence analysis, RNA structure and interaction prediction, topological properties of biomolecular networks, and more recently QSAR analysis.

Associate Professor **Jeremy Siek**'s areas of research include programming, program language design, type systems, and computer optimization for high-level languages. Siek was previously an assistant professor at the University of Colorado Boulder. Prior to his time at Colorado, Siek was a postdoctoral researcher at Rice University where he developed the idea of gradual typing.

Katie Siek, associate professor of informatics, joined the School from the University of Colorado Boulder where she led the Wellness Innovation and Interaction Lab. Her primary research interests are in human computer interaction, health informatics, and ubiquitous computing. Prior to her appointment at Colorado, she completed her Ph.D. and M.S. in computer science at Indiana University Bloomington.

Assistant Professor of Human Computer Interaction Design **Norman Makoto Su** was most recently a postdoctoral research fellow in the School of Information and Library Studies at University College Dublin. Su received his Ph.D. in the School of Information and Computer Sciences at the University of California, Irvine.

Assistant Professor **Sam Tobin-Hochstadt** joined the School from Northeastern University, where he served as a research assistant professor. His work focuses on software evolution, dynamic languages, type systems, module systems, and metaprogramming. He popularized the phrase "scripts to programs." Tobin-Hochstadt earned his Ph.D. from Northeastern.

Assistant Professor **Qin Zhang**'s research interests are focused in algorithms for big data. Zhang was previously a postdoctoral fellow at Center for Massive Data Algorithmics in the Department of Computer Science at Aarhus University in Denmark. He obtained his Ph.D. in computer science and engineering from Hong Kong University of Science and Technology.

The School also added two lecturers, **Saul Blanco Rodriguez** (lecturer) and **Mitja Hmeljak** (visiting lecturer).

## IUPUI welcomes two new faculty members

Amy and Stephen Voida, both Ph.D.'s coming from Cornell University, joined IUPUI as assistant professors in the Department of Human-Centered Computing for fall 2013. Amy will also hold a courtesy appointment with the School of Philanthropy.

Amy conducts research in the areas of human-computer interaction, computer-supported cooperative work, and ubiquitous computing, with a focus on the use of information and communication technologies in the nonprofit sector. Her work is currently funded by the National Science Foundation's Human-Centered Computing program. Amy holds a Ph.D. in human-centered computing and a M.S. in human-computer interaction from the Georgia Institute of Technology.

Stephen's research interests include personal information management, pervasive healthcare, and ubiquitous computing. He received a M.S. in human-computer interaction and a Ph.D. in computer science from the Georgia Institute of Technology. He has been nominated for and won best paper awards at premiere conferences in his field, and his research has been supported by the NSF, Google, Intel, and a CCC/CRA Computing Innovation postdoctoral fellowship.

IUB's Fox strategic partner for new national supercomputing system
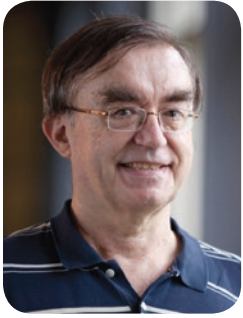
Fox

IU will provide crucial services for two powerful new super-computing systems recently funded by the National Science Foundation (NSF), bringing jobs and resources to the state.

The Texas Advanced Computing Center (TACC) at the University of Texas at Austin and its partners will design, build and deploy Wrangler, a data analysis and management system for the national open science community. Wrangler is supported by a $6 million NSF grant and is scheduled for production in January 2015. Indiana University will provide data access reliability and security for Wrangler by replicating its 10 petabyte disk storage system in the IU Data Center.

The NSF has also awarded $12 million to the San Diego Supercomputer Center at the University of California to deploy Comet, the world's first virtualized high performance computing cluster. IU's Geoffrey Fox, distinguished professor of computer science and informatics and principal investigator of the NSF's FutureGrid project, is a strategic partner for the Comet project. Fox is a leader in the use of virtual systems in supercomputing, and the Comet project makes use of FutureGrid's expertise.

"The Wrangler and Comet systems will vastly improve U.S. research capabilities," said Craig Stewart, Wrangler co-PI and executive director of the Pervasive Technology Institute at IU. "For Wrangler, the state-of-the-art IU Data Center will act as a national and international waypoint for data movement and also store data sets used in citizen science projects."

About his role in the new systems, Fox said, "Virtual clusters, software defined systems, and cloud software platforms will change future approaches to computing. I am pleased that FutureGrid's innovative work is valuable here."

Schnabel, Palakal strengthen relationships on India visit

School of Informatics and Computing Dean Bobby Schnabel and IUPUI Executive Associate Dean Mathew Palakal traveled to Pune, India, January 18-24, to develop and strengthen connections with partners in the area.

The trip included a reception for alumni and prospective students at which Schnabel provided School updates, including an overview of the School's new data science initiatives.

The itinerary also included two days at Persistent Systems, a global company specializing in software and product innovation, to discuss a partnership between Persistent and Indiana University in health informatics and data science. The School's relationship with Persistent started with Dr. Anand Deshpande, the company's founder, chairman, and managing director. Deshpande, who received his Ph.D. in computer science from IU in 1989, serves on the Dean's Advisory Council of the School.

Schnabel and Palakal also visited the IT education and training company SEED Infotech Ltd. to discuss the School's new online data science program. SEED has over 35 training locations in India.

A meeting with Symbiosis International University to explore joint programs and collaboration on the new data science program was also part of the trip.

Among the School's 634 international students, 266 are from India – the largest population of international students in the School.

Fox's big data MOOC named one of the "10 great MOOCs for techies"

IUB Distinguished Professor and Associate Dean for Research Geoffrey Fox's massive open online course (MOOC) Big Data Applications and Analytics was named one of the "10 great MOOCs for techies" by *Computerworld*.

The MOOC investigates the use of clouds running data analytics collaboratively for processing big data. This free MOOC is extended and offered for credit as part of the School's affordable online program in data science.

The 12-section course has a total of 24 hours of recorded video. It is self-paced and allows students to learn on their own schedules.

Students will get hands-on experience with clustering, recommender systems, genomic data, and more. Upon completion of the course, enrollees earn digital badges to represent their new knowledge and skills in lieu of a grade.

Fox developed the course and works with a team that includes Sidd Maini (UX/project manager), Eric Tsao (web developer), and Yishi Yang (UX/interaction design).

The MOOC is built using the Google Course Builder software with extensions that will be released as open source.

According to Mary Pratt, author of the *Computerworld* article, they compiled the list by searching for MOOCs and aligning the topics with company's top technology needs for skills as well as the topics that are appealing to businesses and IT professionals.

Dean Bobby Schnabel speaks to prospective students in Pune, India.

[ALUMNInews]

Alumni profiles

Deema AlGhanim
B.S. Informatics
Data Consultant, DayNine
San Francisco, CA

Deema is a data consultant at DayNine Consulting, a global consulting firm that deploys Workday Human Capital and Financial Management Software. Deema works with clients of all sizes on the migration of their data from legacy systems to Workday and applying big data analytics, which are key to helping clients make predictions and informed decisions for solving critical business issues.

Christina Dunbar
M.S. Media Arts and Science and Graduate Certificate in Human-Computer Interaction
UX Designer, Healthx
Indianapolis, IN

Christina is a user experience designer for Healthx, a health technology company that provides cloud-based solutions for the health insurance industry to drive member engagement and provider collaboration. As a user experience designer, Christina is designing products to improve the clinical workflow and reshape the consumer's healthcare experience. Christina has also worked as a user researcher at Pearson and a project manager at the Veterans Affairs Medical Center.

Josh Esslinger
B.S. Media Arts and Science
Co-founder, LifeShare Technologies
Indianapolis, IN

As with any startup, everyone wears many hats, and Josh truly enjoys that kind of environment. On any given day, Josh could be meeting with clients, working on the application user interface, giving a product demo, managing finances, or creating new marketing materials. Josh thrives on being part of a company that offers a unique set of solutions for a senior market with a lot of opportunity.

Josh Feinberg
B.S. Computer Science
Consultant, Ciber
Chicago, IL

Josh helps design and implement backend systems for the human resources, payroll, procurement companies, and departments. He utilizes Common Business-Oriented Language (COBOL) and a tool called ProcessFlow to help these companies run.

Carol Tilley
Ph.D. Information Science
Assistant Professor, University of Illinois Graduate School of Library and Information Science
Champaign-Urbana, IL

In the past year, Carol has been crowned the Comic Book Crusader and a comics rock star. Since her research was picked up in *The New York Times* and other media outlets in February, she has since given comics-focused talks at New York ComicCon and C2E2 (the Chicago Comics and Entertainment Expo) and was profiled in a short documentary on the Big Ten Network, "Carol Tilley: Comic Book Crusader." Her popular graduate class on comics reader's advisory is the first of its kind for library and information science programs.

Peter Welsch
Master of Information Science/
Master of Library Science
Deputy Director of Online Platform,
Office of Digital Strategy, The White House
Washington, D.C.

Pete is the technical lead for the Office of Digital Strategy, which uses digital media to promote the President's agenda. In addition to serving as a project manager, contributing to strategic discussions, and overseeing the developers responsible for maintaining WhiteHouse.gov, Peter is part of the team behind We the People, the White House petitions platform.

New online magazine

With an ever-growing alumni list now over 16,000, we're changing magazine distribution in an effort to be more green. Beginning with our next issue, every other *Indiana Informatics* magazine will be an e-magazine only. We will continue to publish two magazines annually; one will be printed and mailed to your mailing address, and the other will be distributed digitally and will only be available online. Make sure your contact information is up to date with the Indiana University Alumni Association by visiting alumni.indiana.edu/my-iu. Questions? Contact Kelsey Keag at kkeag@indiana.edu.

Clockwise from top left:

IU alumnus **David Frigstad**, BS'78, MBA'79, chair of global growth consulting firm Frost & Sullivan, speaks at the fall Bay Area event at the Plug & Play Tech Center in Sunnyvale, CA.

Bill D'Amico, BS'83, MA'85, MS'93, **George Cohn**, BA'72, MS'76, **Marilyn Ritter**, BS'71, and Jessica Falkenthal visit at the fall Bay Area IT Professional Networking event.

Amanda Bushey, BS'07, **Cherysh Getz**, BS'09, and **JP LaFrance**, BS'13 at the annual OkTECHberFest networking and social event at Sun King Brewery in Indianapolis.

[SOIC SNAPSHOT]

Photo by Liz Kaye

IUPUI graduate students (left to right) Meng Zhang, M.S. HCI, Reecha Bharali, M.S. HCI, and Weizhi Li, M.S. MAS, attend the inauguration events of the new School of Informatics and Computing.