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Looking Back, Moving Forward

The past semester at the College of Information Sciences and Technology (IST) has been exciting. In August, when I stepped in as interim dean, I zeroed in on several initiatives that had been seeded during the previous year as we worked on a new strategic plan. One that is already seeing broad impact is IST's emphasis on data sciences and its applications, in collaboration with a diverse set of partners across Penn State. For example, we are planning a new undergraduate major and minor in this area, working closely with the Colleges of the Liberal Arts, Science and Communications. We launched two new research centers: the Center for Big Data Analytics and Discovery Informatics led by Dr. Vasant Honavar, in collaboration with the Institute for CyberScience and the Huck Institutes of the Life Sciences; and an inter-college Center for Collaborative Research on Intelligent Natural Gas Supply Systems (CCRINGSS), co-hosted with the Colleges of Business, Engineering and Earth and Mineral Sciences. Both centers have a strong focus on the discovery, organization, analysis and reasoning about complex heterogeneous data. These research efforts have been complemented by a healthy growth and expansion of data sciences courses in our research and professional graduate programs.

We have also continued to be leaders in the university ecosystem for entrepreneurship and innovation, launching several projects as part of the Fund for Innovation; continuing to build student community within IST's cluster in the inter-college Entrepreneurship and Innovation minor; and enriching and diversifying the associated student challenge events. Soon we will host the fourth annual Start-up Week. With support from President Barron, the event's footprint this year will be much larger, growing beyond the IST Building for the first time with an Innovation Expo at the HUB-Robeson Center, sponsored by Verizon Wireless with additional support from other corporations (Alcatel-Lucent, Arris, Cisco and PwC), and capped by an impressive lineup of keynote speakers on the final day, including Drew Houston, founder of Dropbox. All of the sessions will be streamed, so stay tuned and join us along the way!

Finally, I'd like to take this opportunity to officially welcome and introduce our new dean, Dr. Andrew Sears. Dr. Sears comes to us from the Rochester Institute of Technology where he served as the dean of the B. Thomas Golisano College of Computing and Information Sciences. This is a very exciting time for the College and I know that Dr. Sears will quickly see what a special place this



is thanks to our exceptional students, faculty, and staff. I want to thank you for your continued support and fellowship over the past year and I look forward to continuing to serve the College of IST and Penn State.

Dr. Mary Beth Rosson
Interim Dean



CYBER SHERIFF

IST researchers examine role of
'white hat' hackers in cyber warfare

From the Heartbleed bug that infected many popular websites and services, to the Target security breach that compromised 40 million credit cards, malicious hackers have proved to be detrimental to companies' financial assets and reputations. To combat these malevolent attackers, or "black hats," a community of benign hackers, i.e., "white hats," has been making significant contributions to cybersecurity by detecting vulnerabilities in companies' software systems and websites, and communicating their findings. Researchers at Penn State's College of Information Sciences and Technology (IST) are studying white hat behaviors and how the talents of the white hat community can be most effectively used.

"Our focus is to understand how this market functions," said Jens Grossklags, an assistant professor at the College of IST.

Grossklags, along with Mingyi Zhao, a doctoral student at the College of IST, and Kai Chen, a postdoctoral scholar at the College of IST, report their findings in their paper, "An Exploratory Study of White Hat Behaviors in a Web Vulnerability Disclosure Program." In their paper, they study white hat behaviors by analyzing a 3.5-year dataset which documents the contributions of 3,254 white hats and their submitted 16,446 Web vulnerability reports. The researchers collected their dataset from Wooyun, the predominant Web vulnerability disclosure program in China.

According to the researchers, undisclosed vulnerabilities in publicly and privately deployed software systems are a significant contributing factor to potentially damaging security incidents. Black hat hackers search for unknown software vulnerabilities and attempt to derive benefit by either exploiting such vulnerabilities to

steal data and damage service availability, or by selling information about such vulnerabilities on black markets. A recent example is the Heartbleed security bug that was discovered in April and dubbed one of the biggest security threats the Internet has ever seen. Heartbleed's target is an open-source software called OpenSSL that's widely used to encrypt Web communications. Heartbleed can reveal the contents of a server's memory, where sensitive data such as usernames, passwords and credit card numbers are stored.

"How can we make sure we detect the vulnerabilities and find them before a major security incident?" Zhao said.

A further complication, he added, is the interconnected nature of the Internet—an attack on an individual website or server has the potential to affect numerous websites. For example, in August 2013, a group claiming to be the Syrian Electronic Army was able to take down the New York Times by hacking into a website in Australia. According to media reports, the group gained control of the Times' domain name registrar, Melbourne IT. A domain name registrar is a site that sells domain names and controls a domain name server (DNS). By hacking into the DNS server, the group could redirect the traffic going to nytimes.com. The Syrian Electronic Army also said it hacked Twitter, which also reportedly uses Melbourne IT.

"We have to worry about Web security to an increasing degree," Grossklags said. "Websites are essentially living in an ecosystem where they are all somewhat related."

By submitting vulnerability discovery reports to public vulnerability disclosure programs (VDPs) and company-initiated vulnerability award programs (VRPs), the white hat community

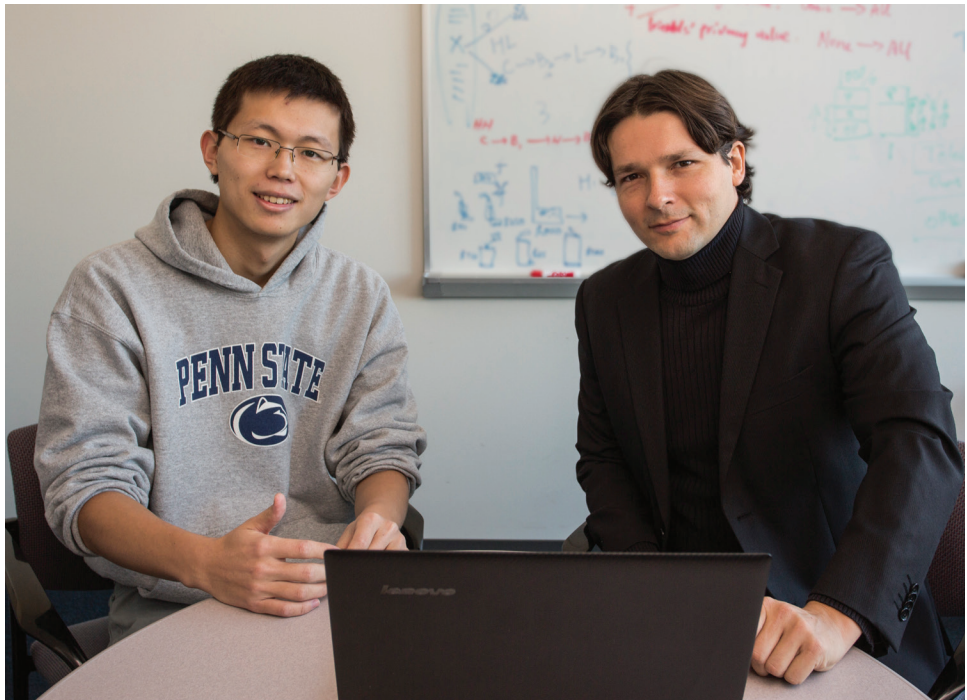
has emerged as a formidable force in the cybersecurity field, according to Zhao, Grossklags and Chen. Companies such as Facebook, Google and Mozilla have established VRPs that pay white hats to hack. A study based on the Google VRP and the Mozilla VRP, according to a previous study, has shown that harvesting vulnerabilities from the white hat community is cost-effective and compares favorably to hiring full-time vulnerability researchers. In addition, startup companies such as HackerOne and BugCrowd, act as brokers between white hats and software companies.

“This trend clearly shows that the white hat community is an important force to improve cybersecurity,” Zhao said.

In their study, the researchers identified several trends of Web vulnerability disclosure and white hat behaviors on Wooyun. Launched in 2010, Wooyun is continuously attracting white hats who submit more vulnerability reports on an increasingly broader range of websites. They explored white hat behaviors along the following three dimensions: vulnerability counts, vulnerability types and vulnerability discovery strategies.

Wooyun offers a platform on which white hats can submit any type of vulnerability report without direct compensation, Grossklags said. When a white hat finds a website vulnerability, he or she can submit a report to Wooyun. After an inspection of the report, Wooyun will inform the administrators of the vulnerable website about the report and give them two months to fix it. After the vulnerability is fixed, a report will be disclosed to the public. The motivation for white hats in disclosing the vulnerability, Grossklags said, is knowledge sharing, community learning, and building reputations within the white hat community.

A main focus of Zhao’s, Grossklag’s and Chen’s research involved examining the relationship between diversity in the white hat community and vulnerability discovery. The researchers discovered that the top contributors to Wooyun constituted only a small fraction of all vulnerability reports, and that less active hackers also contribute high-quality vulnerability reports across



a broad spectrum of websites. Grossklags and his colleagues concluded that the community as a whole, rather than a few expert white hats, plays a key role for vulnerability discovery.

“While rewarding top contributors may be beneficial, attracting more white hats to participate is equally helpful,” Zhao said.

Based on the preliminary results of their research, Grossklags, Zhao and Chen suggest that managers of VDPs and VRPs should not only focus on the top contributors, but also try to attract as many white hats as possible. However, they added, drawing more participation might require the design of new mechanisms for organizing and rewarding white hats. For example, Grossklags said, greater entry rewards could not only widen the white hat community but also provide incentive to not “drift off into the black hat community.”

A larger issue in vulnerability discovery, Grossklags said, is that no matter how many vulnerabilities are reported, it is virtually impossible to eradicate all of them.

“The pool of potential vulnerabilities is unlimited,” he said.

—Stephanie Koons

How many scholarly papers are on the Web?

At least 114 million, professor finds

Lee Giles, a professor at Penn State's College of Information Sciences and Technology (IST), computer science and engineering (CSE), supply chain and information systems, and director of the Intelligent Systems Research Laboratory, has devoted much of his career to developing search engines and digital libraries to facilitate researchers' access to scholarly articles. While numerous databases and search engines track scholarly documents, many researchers and academics are concerned about the extent to which these documents are available on the Web, and their ability to access them.

Giles and his advisee, Madian Khabsa, a doctoral candidate in CSE, recently conducted a study of two major academic search engines, Google Scholar and Microsoft Academic Search, to estimate the number of scholarly documents available on the Web. They presented their findings in "The Number of Scholarly Documents on the Public Web," published in the May 2014 edition of PLOS ONE, a peer-reviewed scientific journal published by the Public Library of Science.

Using statistical methods, Giles and Khabsa estimated that at least 114 million English-language scholarly documents are accessible on the Web, of which Google Scholar has nearly 100 million; at least 24 percent are freely available.

By having an idea of how many scholarly documents are on the Web, as well as how many are freely available, researchers can be better equipped to manage scholarly document research and related projects, Giles said. —*Stephanie Koons*



Combating terrorism

IST's Forster leads international effort to combat terrorism

The recent videotaped beheadings of American journalists James Foley and Steven Sotloff, as well as British aid worker David Haines, have raised international awareness of the brutal and sophisticated techniques of the Islamic State of Iraq and Syria, or ISIS, a Sunni jihadist group that formed in 1999 as an al Qaeda splinter group in Iraq.

According to Peter Forster, associate dean for online and professional education and information technology, and a senior lecturer in security and risk analysis (SRA) at Penn State's College of Information Sciences and Technology (IST), combating ISIS requires a focused, multifaceted, international effort to destroy the infrastructure that the Islamist extremist group has created.

"I think with ISIS, we've seen a change of terrorist tactics," Forster said. "They're very sophisticated in their marketing, and they use their online marketing very effectively."

Forster, who was recently appointed co-chair of the Partnership for Peace Consortium Combating Terrorism Working Group, is taking a role in formulating policies designed to decimate ISIS and other terrorist organizations. The Working Group, Forster said, "endeavors to develop an internationally recognized body of terrorism studies specialists to better understand international, regional and domestic terrorist threats," thereby educating future leaders, and providing policy analysis and assistance to those leaders

Under the co-chairmanship of Forster and Richard Prosen of the U.S. Department of State, PfPC has grown to approximately 50 participants representing 15 countries. —*Stephanie Koons*

They know what you're doing

IST researchers' new app tackles online 'privacy paradox'

Online social networks such as Facebook, Twitter and Google+ have become popular vehicles for sharing information and socializing. However, there is often a discrepancy between what social network users intend to share and the information that is actually being disclosed.

The National Science Foundation (NSF) recently awarded a collaborative grant (\$279,154 for Penn State and \$220,162 for University of Kansas) to IST Professors Dongwon Lee, Principal Investigator (PI), and Peng Liu; Mary Beth Rosson, interim dean of the College of IST; and professors in the Department of Electrical Engineering and Computer Science at the University of Kansas, Bo Luo, co-PI; and Jun (Luke) Huan, to support their project "Privacy Protection in Social Networks: Bridging the Gap Between User Perception and Privacy Enforcement." The goals of the

project are to develop methods to detect the discrepancies between users' information sharing expectations and actual information disclosure; to design a user-centered and computationally efficient formal model of user privacy in social networks; and to develop a mechanism used to effectively enforce privacy policies.

While many people are concerned about controlling the information they share on social media, they often don't take the protective measures needed to guard their privacy, such as setting strong passwords or modifying access control policies, which creates a "privacy paradox."

The research focus of Lee's team is unique in the sense that it encompasses both technological, algorithm-based solutions, and psychologically driven, human-oriented, solutions. —*Stephanie Koons*



Detecting app clones

IST researcher aims to develop system to detect app clones on Android markets

Mobile apps have exploded in popularity in recent years, as studies have reported that smartphone owners are spending more time on their apps versus the mobile web. However, users also face increased risks from attackers that clone codes from legitimate Android apps and repackage them with malicious code.

Peng Liu, a professor at Penn State's College of Information Sciences and Technology (IST), is part of a team that is developing technology that would enable users to accurately and efficiently distinguish app clones from their legitimate counterparts.

According to Liu, the rapidly increasing use of smartphones has enabled cyber attackers to benefit by cloning popular smartphone apps while embedding malicious code into the clones.

The most common types of malware are aimed at aggressive advertisements and stealing private information such as Social Security numbers, passwords, and credit card data. In addition, legitimate developers lose their revenue and users to app clones. According to a recent study, 14 percent of the advertising revenue and 10 percent of the user base for a developer are diverted to app clones on average, the researchers reported in their papers.

Liu and his collaborators designed and implemented the app clone detection system and evaluated it on five Android markets. As a result, "It takes less than one hour to perform cross-market app clone detection," the researchers said. —Stephanie Koons



iStock

IST research group at the forefront of digital photography revolution

While photographic images can arouse a wide variety of emotions, there is no universal standard for measuring aesthetic value. The research group of James Wang, a professor in Penn State's College of Information Sciences and Technology, was recently granted two patents, 8,755,596 and 8,781,175, by the U.S. Patent and Trademark Office (USPTO). The patents involve content analysis methods, intended to help digital photographers refine their skills by providing instant feedback on visual features believed to make photographs more pleasing to the eye.

The patent, "Studying aesthetics in photographic images using a computational approach," describes a method to automatically infer the aesthetic quality of a picture by comparing visual features with those of manually-rated photos. A second patent, "On-site composition and aesthetics feedback through exemplars for photographers," extends further by describing a

comprehensive system to enhance the aesthetic quality of the photographs captured by mobile consumers.

In the content analysis system they developed, a computer program compares a photo's attributes with a data set of rated photos, then generates a rating based on factors such as color, saturation, depth of field, and shape convexity. People learn to rate the aesthetics of photos from experiences gathered by seeing other photos.

Wang envisions a smartphone that would provide immediate feedback to photographers that would resemble a dialogue rather than a score generator, providing suggestions on how to maximize the emotional impact of photos on viewers.

—Stephanie Koons

Promoting international relations, diplomacy and development

IST professor addressed U.S. Department of State about the impact of MOOCs



In recent years, massive open online courses (MOOCs) have enabled millions of people across the world to access free higher education. A MOOC is an online course aimed at unlimited participation and open access via the Web. In addition to traditional course materials, MOOCs provide interactive user forums that help build a community for students, professors and teaching assistants.

Carleen Maitland, an associate professor at Penn State's College of Information Sciences and Technology (IST), along with Eric Obeysekare, an IST doctoral student, delivered a presentation to the U.S. Department of State in October 2014, at their new Collaboratory. They discussed Maitland's research on international students' experience with MOOCs, and how the State Department has adapted the model to promote international relations, diplomacy and development.

One of the Collaboratory's current projects, formally announced in October 2013, is the design and coordination of the MOOC Camp initiative, in which 205 courses have been taken by more than 4,500 students at more than 65 embassies and consulates around the world.

MOOC Camp utilizes a blended learning approach, in which students learn through a mix of online education and some in-person discussion or instruction. In the program's inaugural year, embassies, consulates and partner institutions hosted more than 200 total courses in more than 60 countries.

This project was supported by Penn State University's Center for Online Innovation in Learning (COIL). For more information, visit <http://coil.psu.edu/>. —Stephanie Koons

Shopping through the lens of IT

Penn State researchers are working on new smart cameras to help the visually impaired

Finding something at the grocery store seems simple, but it's a task that relies heavily on sense of sight; for those with visual impairments, shopping can be difficult or impossible to do alone.

To help make shopping easier for the visually impaired, Jack Carroll—a distinguished professor in the College of Information Sciences and Technology (IST) at Penn State—has completed a study that explored how smart cameras could eventually guide visually impaired shoppers to find the items they need. Carroll



worked on the study with Mary Beth Rosson, interim dean of the College of IST, as well as graduate student Jake Weidman as part of a \$10 million National Science Foundation-funded project that's seeking to replicate the human vision system using information technology (IT). —Katie Jacobs

Turning a hobby into a business

IST student José Ponte blends photography and technology

José Ponte wonders “Why not?” a lot.

Two years ago, Ponte, a self-taught photographer and Penn State senior majoring in Information Sciences and Technology with a Design and Development option, and a minor in Entrepreneurship and Innovation, purchased his first professional camera after thinking those two words.

He’d had small point-and-shoot cameras while growing up in Peru, but decided he’d like to try his hand at serious photography. So he bought a camera on a whim, and that day took a few photos and posted them to Facebook. The feedback was positive, and soon Ponte was regularly posting photos to Facebook, receiving enthusiastic praise that spurred him on.

Ponte’s early forays into photography have led to a budding but successful photography business, JM Ponte Photography, and a job at *Valley Magazine*, Penn State’s student-run life and style magazine, where he’s been photographing stories since 2013 after one of his mentors encouraged him to contact the magazine’s director of photography. To say Ponte is busy is an understatement, but he juggles his studies and his work with great enthusiasm.

Ask him why he’s drawn to two seemingly unrelated disciplines and he’ll tell you, unsurprisingly, “Why not? When people tell me that I can’t be a photographer and a coder, it only makes me want to do it more,” Ponte said.

“Photography and IST is a tug of war,” he explained. “Sometimes there are sleepless nights, full of shoots and editing versus homework and exams.” But Ponte also admitted that photography relaxes

him because he loves even the busy work involved.

“Sometimes I feel like—‘Wow! Did that just happen?’—when I see my work taking shape, and that makes all the sleepless nights worth it.”

It might seem like photography and information technology are unrelated, but Ponte would disagree. He’s passionate about bringing cutting edge technology to the art of taking photographs, and hopes that his entrepreneurial skills will help him bring the next great advancement to photography.

“Technology and photography can be combined in such a profound way, and I’ve seen what IST can do,” he said. “So let’s implement those things into photography and answer the question, ‘Why doesn’t this exist yet?’”

For instance, Ponte insists that Bluetooth can be used to access and share photos in real time across multiple platforms and print them, much like Polaroids did in the past.

“Let’s rethink the thrill of a dark room in the digital age and create old-school excitement with current technology,” he said, adding that people have always loved the idea of having images available immediately.

Ponte believes that owning his own business and working with the team at *Valley Magazine* is giving him the entrepreneurial skills necessary for his future. But he’s quick to add that it’s not his primary motivation for working so hard. He just really loves taking pictures.

“I like to make people feel confident



about themselves with my photos,” he said. “I’m really proud of that, and I tell my clients that I want them to feel good when they work with me.”

The JM Ponte Photography Facebook page is brimming with photos of joyful-looking models, and it’s easy to see that Ponte puts his subjects at ease to capture their essence in his photos. That’s also a reason, Ponte said, that he enjoys photographing fashion shoots for *Valley Magazine*.

In addition to his work with *Valley Magazine*, Ponte specializes in portrait photography because he enjoys working

with people more than taking landscape photographs. In addition, he explained he's most excited right now about environmental portrait photography, where the background setting matters as much as the subject.

"Imagine a miner, with dirt on his face, walking out of a mine," said Ponte. "As soon as you see that picture, your brain and senses start to work, you can smell the mine and know a bit about the subject and what he's going through."

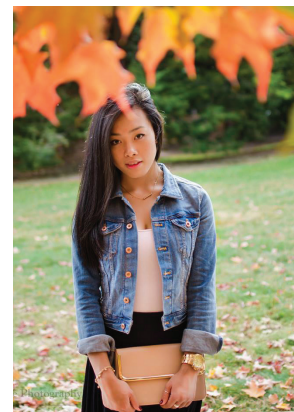
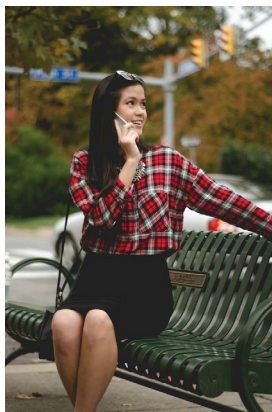
"Describing a person with a picture is the most powerful way to use photography." And when Ponte thinks about bringing environmental portrait photography to the next level, he again wonders, "Why not?"

"I refuse to believe that technology has caught up with photography, that there's not more to be done with, for instance, HDR photography," Ponte said. He is referring to High Dynamic Range photography, where coding is used to make digital photos look more beautiful and colors appear more vibrant.

Ponte is poised to create new ways to photograph and distribute more stunning photos, using technology and his skill as a photographer and entrepreneur. And of course, by continuing to ask, "Why not?"

"It's been a crazy two years, but I wouldn't trade it for anything!"

—Jennifer Cifelli



The Magic of THON

IST FTK dancers help raise spirits and funds for children fighting cancer



Photo courtesy of IST For The Kids

Three students from the College of Information Sciences and Technology (IST) laced up their dancing shoes for the 2015 Penn State IFC/Panhellenic Dance Marathon, commonly known as THON. Oliver Vickery, Megan Yarnall, and Rebecca Moses represented IST's For The Kids (IST FTK) club as dancers for the 46-hour, no sitting or sleeping dance marathon on February 20-22.

Vickery, Moses and Yarnall are just a few of the more than 700 dancers and 15,000 volunteers who participated in this year's event, making it the largest student-run philanthropy in the world.

This year, IST FTK raised \$38,910.76 toward the grand total of \$13,026,653.53. Since the first marathon in 1977, THON has raised more than \$127 million for the Four Diamonds Fund that benefits Pediatric Cancer Research.

It's no surprise that THON's success in fundraising is a result of the passion and effort of its volunteers. Although Yarnall, a senior majoring in security and risk analysis (SRA) and merchandise chairperson for the

club, is focused on fundraising, she doesn't worry about creating monetary goals.

"Our goal is to raise as much money as possible. Every penny counts so we are always happy and proud of whatever the overall total, and IST FTK's total, is," she said.

Vickery, also a senior who is a double major in IST and SRA, agreed that the organization never sets fundraising goals because THON is about more than simply raising money. "Our goal every year is to do everything we can to help all Four Diamonds families to win their battles against cancer," he said.

Vickery was eager to join the excitement on the dance floor of the Bryce Jordon Center after two years of working with IST FTK. His work with the organization, he said, changed his perspective on life and taught him to focus on the positive.

"I have met so many incredible people who are going through so many hardships, who have taught me to cherish the parts of life that we often take for granted," said

Vickery, who is serving as executive chair of IST FTK this year. "You never know when something like cancer will turn your life on its head."

Fellow dancer Rebecca Moses, a senior majoring in SRA, is "ecstatic" to be involved with the event, as both a dancer and co-chair of family relations for IST FTK.

"As college students, we have a million things going on and it's easy to get caught up with things that aren't really important. I think that THON helps us all to think beyond ourselves," said Moses. "We all have our own problems we face day-to-day, but being able to help children who are fighting for their lives is very gratifying."

"THON is unlike anything else," said Vickery. "The magic that exists inside the Bryce Jordan Center during THON weekend is something that needs to be experienced in person to fully appreciate!"

—Jennifer Cifelli

Entrepreneurship and Innovation

IST joins Intercollege minor in Digital Entrepreneurship and Innovation

The Digital Entrepreneurship and Innovation cluster, available to students this academic year, is part of the Intercollege minor in Entrepreneurship and Innovation (ENTI). The ENTI minor aims to teach students to become leaders who embrace innovation, develop the skills and knowledge to deliver products and services to meet market needs, and address significant problems in all disciplines.

The ENTI minor involves two parts: 9 credits of required core courses, supported by the Provost's Office, and 9 to 10 credits in one of the focus areas called "clusters." The IST cluster, "Digital Entrepreneurship and Innovation," consists of three specialized courses that focus on

harnessing digital technologies and digital business models to start new businesses, or to contribute to the innovation activities of existing organizations.

"IST's Digital Entrepreneurship and Innovation cluster has been a wonderful addition to the ENTI Minor," said Liz Kisenwether, design director of the ENTI minor, assistant professor in the School of Engineering Design, and co-director of the Lion Launch Pad, a student-centric business accelerator program. "[Digital Entrepreneurship and Innovation Minor Director] Lee Erickson is one of our strongest advocates for entrepreneurial students from different majors, working together to find and solve tough problems

with IT."

Fundamental to the IST Cluster, and to the ENTI Minor collectively, is interactive, hands-on experiences. Students are involved in IST Startup Week, take part in the PSU mHealth Challenge, the IST IdeaMaker Challenge, and are required to "get out of the building" and interact with potential customers and partners.

"IST's Digital Entrepreneurship and Innovation classes leverage the 'lean start-up' philosophy and require students to get out of the classroom to apply what they are learning," Says Erickson. "We push students to fail fast and learn quickly."

—Mae Sevick

A 5,000 mile job search

World Campus student from Hawaii travels cross-country to attend the IST Future Forum



As a junior World Campus student at the College of Information Sciences and Technology (IST), Creighton Hartling typically engages with his classmates and professors in the virtual realm. However, when the opportunity arose to network with future employers, he decided that he would rather go about it in person. He traveled from his home in Kona, Hawaii, to the University

Park Campus to attend the IST Future Forum held on January 29.

"I came [to University Park] for a better opportunity to pursue a career and internship," Hartling said.

Every year, IST's Office of Career Solutions and Corporate Engagement holds two career fairs exclusive to the College of IST—Pro Expo in the fall, and Future Forum in the spring. The events are intended to allow students to explore career and internship opportunities while giving employers exclusive access to the IST talent pool.

"It's just a learning experience to talk to so many companies in one area," Hartling said.

Like many World Campus students, Hartling took a somewhat circuitous route in getting to this point in his education. A stone fabricator and tile installer for his father's company, he started a degree program at the University of Hawaii before stepping away when his daughter was born. Since he had "always enjoyed working with technology but had never pursued it," he decided to enroll in the College of IST's World Campus program in January 2014. While he is interested in many aspects of technology, he says he has narrowed his focus to working with databases and project management.

"There's so much in IST that's fun, it's hard to pinpoint," he said.

The most enjoyable part of being a World Campus student, Hartling said, is meeting students from all over the world via videoconferencing.

"I find it neat that I'm interacting with everybody globally in one class," he said. —Stephanie Koons

STUDENT SPOTLIGHT

Determined to **SUCCEED**

IST student entrepreneur pursues passions despite brain injury



“I’m still human—my dreams didn’t die with my injury,” says Krista Krebs, entrepreneur, marketing director for Innoblue, and a senior at Penn State’s College of Information Sciences and Technology (IST).

Krebs began her journey at Penn State as a part-time disability student in the fall of 2010. Six years ago, while a high school senior, Krebs was accidentally kicked in the head while playing basketball. The accident left her with a concussion, and a chronic brain injury stemming from post-concussion symptoms.

Krebs has lived every day of the past six years with a constant headache, burrowing pain and sporadic episodes of cataplexy that can come on due to mental or physical exertion, which in Krebs’ case manifest as the loss of motor function—such as the ability to stand, or to move at all—while remaining awake, resulting in an alert mind trapped in a paralyzed body.

With determination and grit, Krebs worked through the pain, the confusion, the loss of her identity as an athlete, and adapting to a new way of life, to earn her high school diploma. When it came time to make decisions about higher education, Krebs knew she would go to Penn State as planned, despite the advice of doctors who thought the environment too challenging for someone with Krebs’ injury.

“I wake up every day with the pain in my head; a lot of times, it’s difficult to want to get out of bed,” Krebs says. “But as soon as I sit up, I get out of bed, and put my feet on the floor, my passions give me purpose and the fuel to keep going, one day at a time.”

Originally hoping to study architecture, Krebs fell in love with the College of IST after her experience in the “Spend a Summer Day” program at Penn State. She loved the technology, she says, the problem solving, and “the connection between the design and the user” that working on software provided.

Krebs cites Rosalie Ocker’s IST 301 (Information and Organizations) class as a pivotal moment in her college career. In IST 301, students learn to work in what are called “Partially-Distributed Teams (PDT),” meaning that part of the team is in Ocker’s class at Penn State, and their partners may be across the world, in countries ranging from Spain, to China, to Lithuania.

Krebs worked with a student from Singapore, Apoorva Tyagi, who quickly became a close friend. They bonded over American TV shows, learning each other’s culture, their love of technology, and dreams of entrepreneurship. Tyagi and Krebs would go on to co-found MangoPair this past December, which has recently launched a new app for Android called Snapview. The app allows users to “browse popular image subreddits all in one place,” according to its website, and works in combination with the popular website Reddit.com

The experience in Ocker’s class, and meeting Tyagi, led Krebs to more seriously pursue her dreams of entrepreneurship. She enrolled in Lee Erickson’s Entrepreneurship 297E class, got involved with the community for entrepreneurs at Penn State, Innoblue, and launched a startup. She credits IST Startup Week, as well, for showcasing speakers who inspired her.

After a week at Carrick Brain Center in January 2014, Krebs “felt awful physically,” she admits. “But how I felt spurred my

decision to take an entrepreneurship class—I wanted to return for something that inspired me to pursue my budding passion.”

Krebs gives credit to what she calls the “amazing work of the Penn State Office for Disability Services” and the phenomenal professors she has encountered in every department at Penn State, who have worked with her to achieve her goals. “Everyone has been supportive,” Krebs says, “Everyone.”

“My injury doesn’t define me,” says Krebs. “Illness doesn’t have to ruin your life—you’d get through it, too,” she insists. “I’ve met so many people, including Apoorva, that I perhaps wouldn’t have met had my path been ‘normal.’ It’s hard to imagine a different path now, and my life without the amazing people I’ve met. I may be at school longer, it may take me longer to graduate, but as a result, I am more deeply involved. I have taken every opportunity I can to make the most of my time at Penn State.”

As of now, Krebs lives with the pain and other symptoms resulting from her mild-traumatic brain injury, and the loss of her identity as an athlete, and fuels those experiences into her drive to succeed; to achieve; to do something that she feels proud of.

Krebs has a 3.99 grade-point average and a burgeoning business; heavily involved in student activities, she is on track to graduate in December 2015.

“I love being dependable,” Krebs said. “I love to learn; I love to be a good friend and family member; I love meeting new people and hearing about their lives.”

“And it was time to share my story. I wanted to feel understood. It’s part of the human condition—to want to be understood, to want to share. I was helped by others’ stories. Maybe mine can inspire someone else.” —*Mae Sevic*

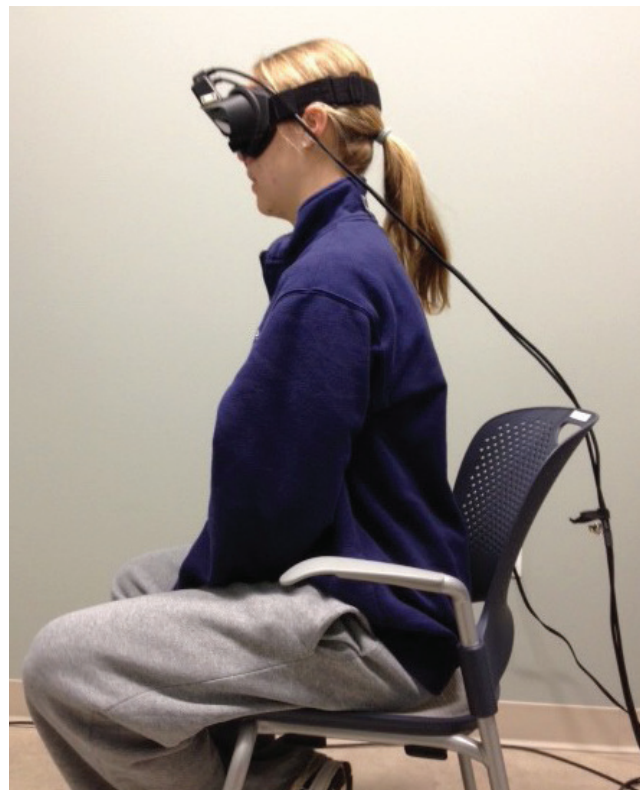


Photo courtesy of Krista Krebs





TOOLS

DISK

TARGET

APPLIED

SENSOR

SHARED

DEFINITION

CURRENT

MAY

MOVING

WIRELESS

MANAGE

BIOGEOCHEM

EXAMPLES

RECONSIDER

PRACTITIONERS

CAPTURE

WITHIN

THOUGHT

ARCHIVES

ZETTABYTES

INTERNET

DESCRIBING RADIO-FREQUENCY

DISTRIBUTED

BUSINESS

SETS

GENOMICS

COMPLEXITY

TECHNOLOGIES

MANAGEMENT

TERABYTES

CASE

NEEDED

REQUIRING

TIME

SOFTWARE

PERFORMANCE

RESEARCH

INFORMATION

ELAPSED

PETABYTES

SYSTEMS

INCLUDE

TOLERABLE

FC

ABILITY

SIZE

MPP
SIGNIFICANT

LOGS

DEFINING
RELATED

COST
COMPUTING

STORAGE

SINCE

PARALLEL

SAN

QUALITIES

MASSIVELY

GROW



The big data explosion is transforming the way that governments, organizations and academic institutions conduct business and make discoveries, and is also making an impact on people's daily lives. However, the massive amounts of data that are being generated require the proper tools and techniques to make that information useful. In addition, skilled data analysts are needed to make the most of big data. The College of Information Sciences and Technology (IST) is at the forefront of a movement to maximize the potential of big data through innovative research and educational initiatives. "Data is everywhere," said Vasant Honavar, professor and Edward Frymoyer Chair at the College of IST. "But having this data is not enough. You have to get some useful, actionable knowledge out of it."

Honavar is the director of the Center for Big Data Analytics and Discovery Informatics, which was approved in December 2014 and is co-sponsored by the College of IST, the Institute for CyberScience and the Huck Institute for the Life Sciences. The goal of the center is to pursue interdisciplinary fundamental and applied research, and research-based advanced training in discovery informatics. Discovery informatics is an emerging field

of study that brings together computing and information scientists, statisticians, cognitive and social scientists as well as experts in specific areas of sciences and humanities to: understand and formalize the representations and processes that are crucial to discovery in the sciences as well as the humanities; design, develop and evaluate computing and information artifacts that embody such understanding; and apply the resulting artifacts and systems to facilitate discovery.

Big data refers to data whose size, complexity, or the rate of acquisition, exceed the capabilities of current data management and data analytics tools. Big data originate from many sources, including the web, biomedical sciences, sensor networks, business and commerce, scientific literature, digital media, and social networks.

"Many fields of science that were data-poor are now data-rich," Honavar said.

The Center for Big Data Analytics and Discovery Informatics will pursue high-impact fundamental research in discovery informatics, covering topics in areas such as artificial intelligence, computational discovery, machine learning, and social network analytics. The center will serve as a focal point that links faculty across the

campus who have an interest in research and education in informatics in general and discovery informatics in particular. IST faculty will collaborate with researchers in multiple colleges including: the Eberly College of Science, the College of Engineering, the College of Health and Human Development, the College of the Liberal Arts, and the College of Earth and Mineral Sciences.

"Big data cuts across all those areas," Honavar said. "We are bringing different areas of expertise together to work on common problems."

According to Honavar, modern data analytics techniques that integrate sophisticated probabilistic models, statistical inference, and data structures into machine learning algorithms have resulted in powerful ways to extract actionable knowledge from data in many different domains. Creative applications of data analytics are enabling biologists to gain insights into how living systems acquire, encode, process and transmit information; health scientists to not only diagnose and treat diseases but also help individuals make healthy choices; economists to understand markets; and security analysts to uncover threats to national security.

"A lot of this potential comes from

integrating and analyzing data that previously resided in silos,” he said.

The main issue in big data research, Honavar said, is improving technologies for data management and analytics to realize the full potential of big data. According to Honavar, Penn State researchers in areas such as biology, engineering and health are seeking to generate research that uses the vast amounts of data that are now available to them. However, he added, the researchers “need sophisticated data analytics techniques” to utilize that data. Researchers at the College of IST and the Department of Statistics are developing new algorithms for analyzing data that would complement the work that is being done by researchers in other disciplines.

In addition to fostering interdisciplinary research and providing research opportunities for graduate students, Honavar said, the Center for Big Data Analytics and Discovery Informatics will also support curriculum initiatives by the College of IST and other colleges. The center will work towards establishing a doctoral program and/or dual-title degrees in informatics to provide research-based interdisciplinary training in informatics. It will also seek to contribute to undergraduate curricula in informatics and data analytics, and offer undergraduate students opportunities to be involved in cutting-edge research in discovery informatics.

Honavar, who joined the College of IST in September 2013, brings a wealth of knowledge and experience in the area of big data to his role as director of the Center for Big Data Analytics and Discovery Informatics. In 2013, he was honored with the National Science Foundation (NSF) Director’s Award for Superior Accomplishment for “exemplary leadership in the implementation and execution of the Big Data Initiative and related innovative interagency collaboration.” The award recognized Honavar’s leadership of the NSF “Core Techniques and Technologies for Advancing Big Data Science & Engineering (BIGDATA)” program.

In March 2012, the White House Office of Science and Technology Policy announced the Big Data Research and Development Initiative. Six federal departments and agencies announced more



than \$200 million in commitments with a goal of developing better data management and data analytics tools, accelerating scientific discovery, and fostering a new generation of data scientists equipped to harness big data to address national priorities such as improving human health and advancing national security.

Honavar received his doctorate in computer science and cognitive science in 1990 from the University of Wisconsin-Madison, specializing in artificial intelligence. Between 2010 and 2013, he served as a program director in the Information and Intelligent Systems Division of the Computer and Information Sciences and Engineering directorate of the NSF while maintaining his research program in artificial intelligence at Iowa State University, where he served on the faculty of Computer Science and of Bioinformatics and Computational Biology from 1990 to 2013.

While Honavar has extensive experience with data analytics in numerous areas, he says he is especially excited about the potential of big data in health sciences. In the health domain, he said, the wide adoption of electronic medical records offer unprecedented opportunities for innovations in healthcare that help deliver higher quality care at lower cost by leveraging large quantities of data to support evidence-

based approaches to clinical practice. For example, he said, traditionally, in order to test a new therapy for a particular illness, researchers would recruit, at the most, a few hundred participants for clinical trials. It is not uncommon, Honavar said, for a drug that is approved for use based on a limited clinical trial to have been found to have mixed results on a more diverse population. There’s always a chance, he added, that the effectiveness of the drug, and its possible side effects, vary across subpopulations. In those cases, harmful side effects often aren’t discovered until much later in the process, after the drug has been fielded.

“Now that we have the ability to monitor physiological signals and various other aspects of health using extremely cheap sensors, you can get data from large patient populations that are actually going through the treatment regimen and effectively extend the clinical trial beyond the initial period,” he said. “This has huge potential in terms of improving health care.”

Other ways in which big data can be useful to society, Honavar said, include enabling scientists to examine the effects of climate change and allowing for the effective use of social media by health care professionals to promote lifestyle changes.

In the past, social scientists could make theories but not test them in a lab setting; they now have access to “electronic modes of interaction where we can study societies and virtual communities as they are being formed.” With the rising popularity of the massive open online course (MOOC), which is aimed at unlimited participation and open access via the web, educators “can get data about individual students on a level of granularity that was never possible before” and determine what teaching strategies are most effective.

“If you want to make informed decisions, then you need to look at the data,” he said. “You need to bring the scientific method to decision making in almost every domain of human endeavor.”

—Stephanie Koons

BIG DATA HIGH FASHION

Data analytics may be the
hot new trend in fashion



Big data may be the next new thing to hit the fashion industry's runways, according to a team of researchers.

By analyzing relevant words and phrases from fashion reviews, researchers were able to identify a network of influence among major designers and track how those style trends moved through the industry, said Heng Xu, associate professor of information sciences and technology, Penn State.

"Data analytics, which is the idea that large amounts of data are becoming more available for finding patterns, establishing correlations and identifying emerging trends, is very hot these days and it is being applied to many industries and fields—from health care to politics—but what we wanted to see is if data analytics could be used in the fashion industry," said Xu. "We were drawn to the question of whether or not we could really trace a hidden network of influence in fashion design."

The researchers, who presented their findings today (December 18) at the Workshop of Information Technology and Systems in Auckland, New Zealand, analyzed 6,629 runway reviews of 816 designers from Style.com, formerly the online site for *Vogue*, one of the most influential fashion magazines. The reviews covered 30 fashion seasons from 2000 to 2014.

Xu said her team extracted keywords and phrases from these reviews that described silhouettes, colors, fabrics and other details from each designer's collections and added them to the dataset. The researchers then created an approach to rank the designers and map influences within the group.

To evaluate the accuracy of their model, the researchers compared their network against three industry-recognized lists of influential designers, including Times, Fashion Merchandising Degrees, and A Celebration of the 20 Most Influential Designers, and found that it closely matched these lists.

"There is no one gold standard for the most influential designers, but we believe these are a good place to start a comparison," said Xu.

While professionals in many industries are welcoming data analytics, this type of analysis may meet some skepticism from fashion designers, who view their work as a form of art and more difficult to quantify, said Yilu Zhou, associate professor of information systems, Fordham University, who worked with Xu.

"But, what we are finding from the data is that we can find footprints—there are clues—that can be traced back to individual designers," said Zhou.

The researchers said the technology could one day help industry professionals to better predict fashion trends and identify up-and-coming designers.

"We all know the big designers now, but could we use this type of technology to find out who will be the next big fashion designer, the next Jason Wu, for example, and what the next big design trend is going to be?" said Zhou.

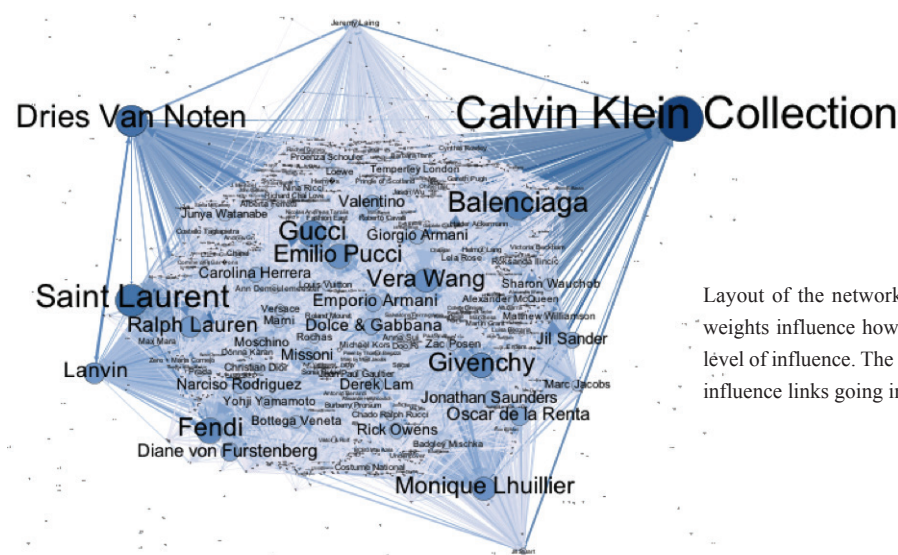
Xu said that the technology may also help consumers by helping them create wardrobes that are in their budget and are also in style.

"Buying from leading designers is expensive, but if you had information on what design elements were beginning to trend, it might help you buy the latest fashion more inexpensively," said Xu. "Also, designs do come back in style, so you could identify clothes that you may already have in your wardrobe to match the new styles."

Xu and Zhou, who also worked with Yusan Lin, their research assistant from the department of computer science and engineering, Penn State, said that they expect the technology to improve as data and data sources become more available.

Eventually, data scientists could analyze real-time data from social media sites, such as Twitter, Pinterest and Instagram to predict fashion styles, Xu said.

—Matt Swayne



Layout of the network is created by using ForceAtlas algorithm, where the edge weights influence how the nodes spread out. Sizes of nodes are proportional to the level of influence. The dispersed nodes around the network are designers without any influence links going in nor going out. (Image: Heng Xu Lab/Penn State)

ALUMNI PRESIDENT'S MESSAGE

Alumni and friends,



Mark Poblete (IST '07)
President,
IST Alumni Society

As I write this, State College seems in the midst of yet another never-ending winter, and yet things are heating up in the College of IST and across our University community. Your IST Alumni Society board of directors met last month, and I'm thrilled to report that many new and improved initiatives are on the horizon to help connect and engage alumni, students, faculty and friends of IST across the years and around the world.

Over the past few months, we've hosted several successful regional social events in Pittsburgh, Philadelphia and the Washington D.C./Northern Virginia area to bring alumni together and help support IST students participating in this year's Penn State Dance Marathon. Our inaugural "Access 2 Alumni" event brought professionals and students together in casual networking sessions on campus to prepare for the spring IST Future Forum, and we're planning additional similar events, as well as expanded alumni panels and other touch points with students and student organizations in the months to come.

In November, we debuted the "IST Alumni Spotlight," an opportunity to celebrate the accomplishments of IST alumni who are truly making a difference in their fields. Our first three spotlights feature alumni making an impact in digital media, business intelligence and technology policy – but more importantly, they also recognize achievements in philanthropy, community service and leadership, all hallmarks of the well-rounded education that Penn State is renowned for. Our 18th president, Dr. Eric Barron, speaks frequently of the concept of "engaged scholarship"—providing an enriched out-of-class experience for students who want to make a difference beyond their academic studies. The alumni we've featured in the Spotlight embody that spirit in their contributions to their communities and serve as role models for our students as they prepare to take the next step in starting their careers after Penn State.

There's much more in the works, so stay tuned to your inbox and to social media (we're on Facebook, Twitter, and LinkedIn) for more ways to get involved. In the meantime, mark your calendars and plan to join us for our annual Blue/White Tailgate, which has quickly become one of the Society's flagship events and a wonderful opportunity to reunite with friends and meet other alumni and students. This year's tailgate will be on Saturday, April 18, near the Ashenfelter Multi-Sport Facility and the Bryce Jordan Center. Keep an eye out for an email with registration information—we can't wait to see you there!

Finally, a personal note of thanks and gratitude to a few individuals without whom the Society and College would not have been nearly as successful over the past year: to interim dean Mary Beth Rosson, whose advocacy for our alumni has been an integral part of the College's long-term growth strategy; to director of alumni relations Erin Pursel, for keeping me accountable and challenging our entire board to think about innovative ways to serve our fellow alumni; to IST Advisory Board chair Bob Morgan, for his leadership and stewardship of that board, which ensures that IST's leadership receive critical guidance and support at this time of transition; and to your Society board and committee/sub-committee chairs, a constant source of Penn State pride, dedication and more than a few lighthearted moments: Russ Beck, Garrett Miller, Kelsey Bailey, Chase Tralka, Adam Krempasky, Colleen Cwenar and Paul Horn. To everyone else—too numerous to mention!—thank you as well, and know that your efforts don't go unnoticed.

See you all Blue/White weekend!
For the Glory,

Mark Poblete (IST '07)
President, IST Alumni Society

Meet the Director of Alumni Relations

Meet Erin Pursel, the newest addition to the Office of Development and Alumni Relations in the College of Information Sciences and Technology (IST). Pursel, director of alumni relations for IST and a 2003 Penn State alum, recently returned to University Park via Rehoboth Beach, Delaware, to spend more time with her family, including husband Bart and daughter Harper, named after the author of Pursel's favorite novel, *To Kill a Mockingbird*.

Being back at Penn State is "absolutely fantastic" said Pursel, who admitted the perks of her new position are numerous, but that she has a few favorite parts. "I love working with the alumni because they're so passionate and spirited; and scholarship students, for the excitement and gratefulness they bring to my job," she said.

In addition to being an enthusiastic Penn State Football fan who attends every game with her family, Pursel also enjoys cooking, and eating at restaurants that are "adventurous and new." Deciphering the

ingredients of favorite dishes to replicate at home with her husband, who Pursel knew she would marry after their very first date, is a favorite pastime as well.

Pursel, who calls herself "reserved at first but actually really friendly," draws her inspiration and work ethic from her father, who she said is the hardest working man she knows, and from her mom, who encouraged Pursel to pursue any career she chose. She received her degree in political science after taking a few courses and falling in love with the subject, but had originally set her sights on a career in medicine.

After graduating, Pursel left Happy Valley to follow a career in restaurant management and marketing in Rehoboth Beach, where she happily worked until this past September, when she accepted her current position as director of alumni relations. And that brought her home again, to Penn State and family, and to IST where she is warmly welcome! —*Jennifer Cifelli*



Erin Pursel

Hometown: Hublersburg, PA

Stay Connected with the IST Alumni Society!

The IST Alumni Society is the official group within the Penn State Alumni Association for graduates of the College of Information Sciences and Technology. Visit ist.psu.edu/alumni to become a member.



ALUMNI SPOTLIGHT

Adam Tampanello (IST '05)

IST Degree Makes Tampanello “On Demand” In Workforce

For Adam Tampanello, a 2005 graduate of the College of Information Sciences and Technology (IST), working as a project manager for HBO has unique perks, such as the occasional celebrity sighting. Still, many aspects of his job require the same skills as other careers in the information technology field—business savvy, technical knowledge and interpersonal skills.

“You have the best of both worlds,” Tampanello said. “You know enough about business and you know enough about technology so you can marry the two.”

Tampanello, who lives in New York City, is the project manager for HBO’s on-demand platform, which handles distribution for HBO’s on-demand content to domestic cable companies. He has been at HBO for three-and-a-half years and started at the company as a senior business analyst. Prior to starting at HBO, he worked for GE for six years in a variety of eCommerce roles. Tampanello joined through the Information Management Leadership Program and worked overseas in Brussels, Belgium. The interdisciplinary nature of the IST program, Tampanello said, helped him in landing a job that combined technology and finance.

“That’s the great thing about the degree, it’s something that’s really transferable to different fields,” he said.

As project manager at HBO, Tampanello’s job is to “manage the end-to-end scheduling, encoding and distribution of HBO content to different cable companies’ on-demand platforms.” He oversees the companies’ needs and advises them on ways the content distributors can provide the best possible user experience for HBO content. He works on cross-functional teams that include software and broadcast engineers as well as business executives. In addition, he is taking on an important role in launching HBO’s standalone over-the-top service. This will allow HBO to offer



consumers access to its content without requiring a traditional multichannel video-program distribution.

“Technology and competition are dramatically disrupting the traditional television experience,” he said.

Tampanello, who is from the Philadelphia area, spent his first two years of college at Penn State Abington. The College of IST was in its early stages while he was searching for schools, he said, and he was drawn to the versatility and flexibility of the IST curriculum.

“I knew I was interested in a technical degree, but through IST, I learned that I was much more interested in the application of technology than I was in a more traditional programming degree,” he said. “I made the decision to enroll in IST in 2001 and haven’t looked back.”

Tampanello said that the most rewarding aspects of his position at HBO include the fact that he is able to get insight into other departments while networking

with his colleagues.

“It’s a very professional environment, but people know how to get their work done while still having fun,” he said.

Tampanello lives in Manhattan with his wife, Maggie, also an IST graduate who works in media. In his spare time, Tampanello said that he likes to travel and frequent the diverse restaurants in the Big Apple.

Tampanello maximized the benefits of his IST education, he said, by being as well-rounded as possible. He minored in business and had three internships while in college. He also took advantage of the services offered by IST’s Office of Career Solutions and Corporate Engagement, such as the Future Forum career fair. His advice to current IST students, he said, would be to diversify their skill sets and experiences.

“IST is a really flexible degree that can be used across a wide array of industries and platforms,” he said. —Stephanie Koons

Megan Costello (IST '08)

A new kind of translator: IST alum Costello bridges the gap between tech and legalese



Although technology and law have become increasingly intertwined in recent years, a gulf still exists between the two fields. As both a technologist and a licensed Pennsylvania attorney, Megan Costello (IST '08), strives to bridge this gap between complex technological topics and the legal community by focusing her law practice on cyber law issues faced by start-up companies, entrepreneurs, freelancers and e-commerce.

"I thought it would be really awesome to be a

translator between the law and tech communities," she said.

In November 2013, Costello founded technoLAWgical, a law practice with a mission of helping the "innovators and the creative minds who work on the bleeding edge of technology." As a Pennsylvania-based solo practice, technoLAWgical strives to give one-on-one attention to clients through insight, counseling and legal services that are tailored to meet each client's individual legal needs.

Technology and law

are in a constant state of "tug of war," Costello said. Technology, which is always pushing the boundaries of innovation, "keeps society moving forward at an amazing speed." However, she added, entrepreneurs and start-up companies sometimes find that the legal system restricts their ability to innovate.

On the other hand, Costello said, the law is much more reactive than technology and responds to certain topics on a case-by-case basis. She says there is a unique need for the

law to adapt to groundbreaking technologies quickly and efficiently, and believes that this change starts with people who have underlying knowledge of both spheres of practice—a hybrid professional who can "talk tech and legalese at the same time."

"It's more important than ever in the legal world for someone to have a background in technology and law," Costello said.

Costello's resume certainly fits that profile. She graduated from the University of New

ALUMNI SPOTLIGHT

Hampshire School of Law in 2012 and spent time at the University of Pittsburgh School of Law as a visiting student. On her website, she offers legal services to entrepreneurs, freelancers, e-commerce practitioners and developers. Some of the most common issues she deals with are business formations and contracts, trademarks, copyrights and licensing. In addition to maintaining the website for her practice, she writes a blog that covers various topics in cyber law, entrepreneurship, intellectual property and other high-tech related issues.

“My goal with my blog is to make the law fun and memorable for my readers,” Costello said. “While legal aspects of some issues can often be dry or even boring to some, connecting these issues with tangible examples in technology and pop culture helps them learn about these subjects in entertaining ways.”

Costello, who recently moved back to State College, Pa., says that she strives to tailor her law practice to the high-tech needs of her clients. Instead of having a brick-and-mortar office, she chooses to meet with clients where they are most comfortable. This could entail meeting over coffee, visiting a company’s headquarters or video conferencing via Skype. She advertises her firm entirely online and doesn’t believe that a traditional office is necessary for the clientele she serves.

“The most important thing in this type of business is flexibility,” she said. “I feel that my clients really appreciate my willingness to provide this as part of my services.”

One of the most common issues she encounters in the legal community, Costello said, is that many lawyers do not fully understand the intricacies of emerging technology and tools like social media. The legal field can be antiquated in its practices,

she said, and sometimes can’t keep pace with rapid technological development.

“I’ve noticed that there are many attorneys who are technophobic,” Costello said. “As a person who understands and implements emerging technologies in my own practice, I’ve found that I am able to help so many attorneys who lack that knowledge but who are looking to learn more about technology.”

Conversely, Costello said, many technologists lack knowledge in areas such as copyrights and licensing agreements. They may be afraid that services will cost too much, or that the attorney will know too little about their technology. Others may be “so swept up in their innovation that they often forget to ask, ‘What are the legal implications of what I’m doing?’”

“Meeting with a lawyer early on is such an important step to technologists,” Costello said. “It not only ensures that they are complying with the law, but also protects their interests in their technology and intellectual property. After all, why would you put your heart and soul into a project if you couldn’t assert your rights over it?”

Costello said that she discovered her own passion for technology at a young age, and that is what led her to enroll at the College of IST, where she minored in security and risk analysis (SRA) and English. One of her most memorable experiences at IST, she said, was creating an ad hoc mesh network—a communications network made up of radio nodes organized in a mesh topology—with a team of students and IST faculty members Stan Aungst and David Hall.

“I feel that from IST I’ve been able to branch out into a lot of different things and help people,” she said.

Costello has shared her knowledge about legal and technological topics through a variety of outlets. She is a published author on various cyber law topics and is a contributing author of two books, including *Data Security and Privacy Law* and *Computer Software and Hardware Agreements*. In addition, she has been featured in speaking engagements throughout Pennsylvania. She has taught multiple continuing education courses on implementing new technology in practice and using social media ethically, and is now giving back to her alma mater by teaching an introductory SRA course through Penn State’s World Campus.

While technoLAWgical may be a small practice, Costello says she has big goals for the future. She would like to expand her practice and “explore harder-hitting issues in technology and policy like privacy and cybersecurity—two very important underlying practices that are a cornerstone of the IST and SRA majors.”

“I hope that in the future, my client base will continue to grow and that I am able to continue helping people with these cutting-edge legal issues,” she said.

In addition to growing her practice, Costello said, she would like to broaden her horizons by writing her own books on technology law. Also, as a Penn State alumna, she plans to dedicate more time to getting connected to the place that fostered her interest in technology law.

“I want to be able to help Penn State students learn about these emerging issues and to help them become the next wave of legal and technical professionals who will ultimately build and foster new policies in technology,” Costello said. —*Jennifer Cifelli*

David Strausser (IST '13)

Making waves in Baja: IST alum Strausser aims to make an impact in tech education in Latin America



During three years spent working in Mexico, IST alum David Strausser got the sense that something was lacking in the technology realm, so he decided to do something about it.

Strausser, who graduated with an associate's degree in IST through Penn State World Campus in 2013, founded a technology website called TechChicas.com, which he described as, "a site meant to be a solution to help fix the problem of the lack of technology education for women in Latin America.

"There are a lack of social systems in many Latin America countries," Strausser said, "and gender inequality is a serious issue. Not only is there a huge gap between men and women, but technology-related courses are geared towards men with little to no consideration for the needs or desires of what women want to learn."

Strausser's wife, Raquel, is the main editor for TechChicas, and they have writers contributing from five different countries, "all with the mission of educating women," he said. Strausser said he hopes to one day turn his work with TechChicas.com, "into a full-blown charity," with the goal of holding technology classes for women in foreign countries.

In addition to his work with TechChicas, Strausser is also a binational adviser for the Ministry of Tourism in Baja California, Mexico, and a business development director for Baja Bound Mexican Insurance Service. "All of this happened because of my IST degree," Strausser said.

"The IST degrees opened doors for me, even before I started working,"

he said. "While studying, I was able to get one tech-related position after another, moving up the ladder until landing at Baja Bound and with the Baja California Government. Without Penn State, I would probably still be working at a big-box retail location and not doing work that has a true impact on the beautiful Baja peninsula."

Strausser said that while he has always been able to see "the big picture," his IST classes helped him learn how to prioritize and organize in the tech industry.

"Right now, with Baja Bound, we are working out a deal with the Mexican Government to sell their fishing licenses online," Strausser said. "I was able to see potential problems such as changes to privacy policy, compatibility issues and systems integration to name a few, in order to build a proposal that covered everything. These are skills that without the training of the IST program, I could not have done."

Whenever something technological arises in his work, Strausser said, "I always say, 'there's that tuition bill at work,' and it is true. It has made a huge impact in my life, enabling me to get to the next level. My IST degree gives me an advantage over competitors in the same field because I use technology-based solutions to answer problems." Strausser sees his IST degree as an asset that has enabled him to advance in his career in ways he had never imagined.

"An IST degree can give somebody many more opportunities than just doing IT work," Strausser said. "The possibilities are limitless, as I am showing now," —*Mae Sevick*



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