

:CONNECT



CORPORATE Pg 6 CONNECTIONS

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:CONNECT

SUMMER 2016

COORDINATED SCIENCE LAB

College of Engineering
University of Illinois at
Urbana-Champaign

csl.illinois.edu

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A MESSAGE FROM OUR DIRECTOR

Perhaps never has the famous proverb “When the going gets tough, the tough get going” been as true for the Coordinated Science Lab as it is today.

The University of Illinois at Urbana-Champaign has had to weather uncertainty and a significant reduction in state appropriations for higher education institutions during the past fiscal year. Hence, CSL, like all other campus units, had to adjust its budget in light of major cuts in state support.

But in these uncertain times, CSL has shown its grit. In spite of budget challenges, our research programs have persevered and even flourished.

Only consider:

- In July, two CSL faculty, **Gary Eden** and **Tamer Başar**, received Multi-University Research Initiative (MURI) awards from the U.S. Dept. of Defense.
- Illinois investigators **Elyse Rosenbaum** and **Ravi Iyer** received NSF funding to create two new Industry/University Cooperative Research Centers (I/UCRC) to be headquartered at CSL.
 - **The Center for Advanced Electronics through Machine Learning (CAEML)** will design new models, methods and tools that enable fast and accurate design and verification.
 - **The Center for Computational Biotechnology and Genomic Medicine** will improve the applicability, timeliness, efficiency, and accuracy of computational infrastructure to address pressing genome-based challenges.

- **The Information Trust Institute** received \$18.7 million this summer from DARPA to develop a more advanced testbed that will enable faster response and recovery following an attack on the electric grid.

Three of these initiatives—both I/UCRCs and the ITI testbed—call for significant collaboration with industry, adding to our sizable interactions with the corporate world. All of the initiatives will advance the state-of-the-art in each field.

CSL also continues to attract top faculty. This fall, we welcome four new faculty members, with two more joining us in October and January. Our graduate students also persist in their accomplishments. This fall, we’ll recognize one of them with the inaugural CSL PhD Thesis Award. And our researchers have received a number of other accolades, which you will read about in subsequent pages.

We hope that a long-term budget solution that recognizes the importance of higher education institutions to the economic well-being of the State of Illinois and its citizens emerges in the coming year. In the meantime, I am most grateful that CSL is well-positioned to weather all challenges, thanks to the dedication and tireless innovative work of our faculty, staff and students.

KLARA NAHRSTEDT



RAKESH KUMAR IMPROVES BITCOIN MINING PROFITS:

A new technique, developed by a team led by CSL and ECE Associate Professor Rakesh Kumar, could maximize bitcoin mining profits by up to 30%, representing an application of a larger body of work in approximate computing.

Bitcoins are the most popular form of cryptocurrency today. A bedrock of the Bitcoin framework is mining, a computationally intensive process that monetarily rewards so-called miners when they verify the trustworthiness of online transactions between two parties. It has become increasingly difficult to profit from Bitcoin mining because of the required computational power, but this new approximation technique will work to increase profits and security for miners.

IBM NEXT-GEN COGNITIVE COMPUTING SYSTEMS:

In April, IBM Research began a multi-year collaboration with the University of Illinois at Urbana-Champaign to create the Center for Cognitive Computing Systems Research [C3SR], which will be housed within the College of Engineering.

Opening this summer, the C3SR will integrate and advance scientific frontiers in both machine learning and heterogeneous computing systems optimized for new cognitive computing workloads. The C3SR will be headed by CSL and electrical and computer engineering professor Wen-Mei Hwu, who will be supported by a team of faculty members, graduate students, and software engineers who bring strong expertise in both learning and systems research.

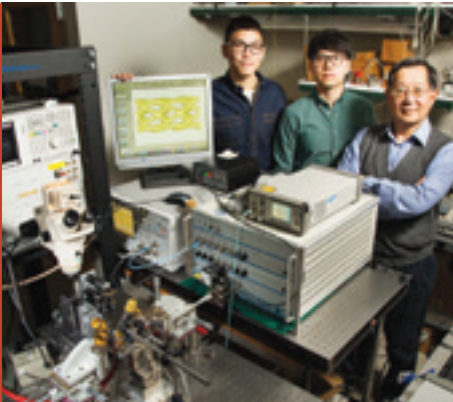


RECORD-SPEED DATA TRANSMISSION COULD MAKE BIG DATA MORE ACCESSIBLE:

By Liz Touchstone

As big data has gotten bigger, the need has grown for a high-speed data transmission infrastructure that can accommodate the ever-growing volume of bits transferred from one place to another. With record-breaking speeds for fiber-optic data transmission, University of Illinois engineers have paved a fast lane on the information superhighway—creating on-ramps for big data in the process.

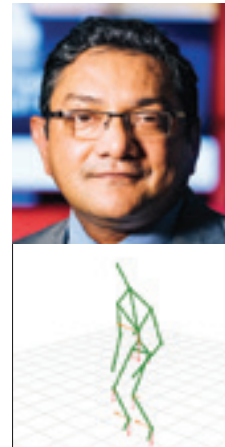
The research team was led by electrical and computer engineering and CSL professor Milton Feng and also included professor emeritus Nick Holonyak Jr. and graduate researchers Michael Liu and Curtis Wang.



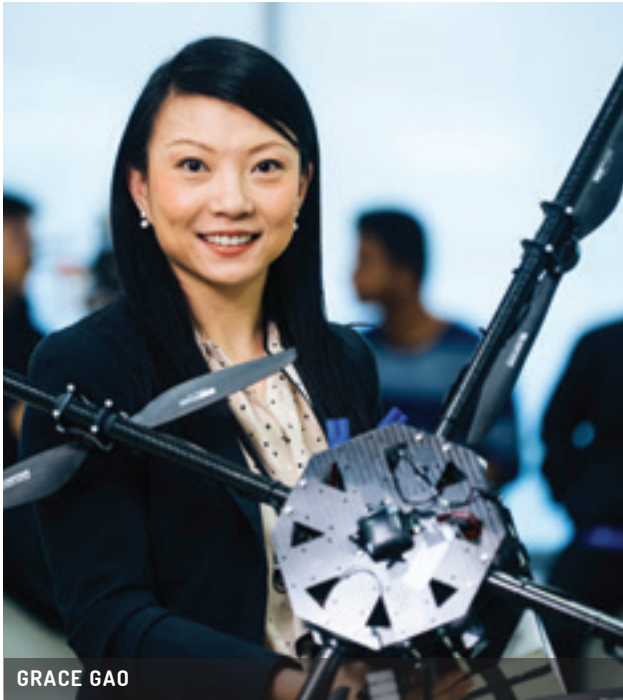
NEW ILLINOIS-DEVELOPED TECHNOLOGY ENABLES AT-HOME REHAB CARE:

To regain full functionality, many stroke or trauma patients must continue physical or occupational therapy even after returning home from the hospital. But often, their progress diminishes once they are home, said Rama Ratnam, a senior research scientist at the University of Illinois at Urbana-Champaign.

Ratnam is leading a group of Illinois and ADSC researchers who have developed a new system that makes it easier for a doctor or therapist to keep tabs on a patient's progress remotely. The technology employs Kinect cameras, which capture 3D motion data, and then adds a mathematical layer that eliminates noise and produces a smooth motion that gives health care providers an accurate picture of how a patient is performing an exercise.



:NEWS BRIEFS



GRACE GAO

GRACE GAO WINS AIAA ILLINOIS TEACHER OF THE YEAR:

CSL Assistant Professor Grace Gao has received the American Institute of Aeronautics and Astronautics Illinois Chapter's 2016 Teacher of the Year award. Gao, an associate professor of aerospace engineering, values her role as an educator. "I love seeing how much the students learn and how much they grow from the start of a semester," said Gao. "I want them all to be successful."

YUTING NG RECEIVES BEST PAPER AWARD:

Aerospace engineering graduate student Yuting Ng, advised by CSL Assistant Professor Grace Gao, developed a technique that improves GPS signals by combining several satellite signals into a single signal that is strong enough to offset any disruptions. The technique is detailed in the paper "Mitigating Jamming and Meaconing Attacks Using Direct GPS Positioning," which won Best Paper Award at the 2016 IEEE/ION Position Location and Navigation Symposium.



PHIL KREIN

PHIL KREIN NAMED TO NATIONAL ACADEMY OF ENGINEERING:

Philip Krein, CSL emeritus professor and the Grainger Endowed Emeritus Chair in Electric Machinery and Electromechanics, has been elected to the National Academy of Engineering. He is recognized for

contributions to power electronics energy conversion technology and power electronics education. Election to the NAE is one of the highest professional honors an engineer can garner.



SUJAN GONUGONDLA

SUJAN GONUGONDLA WINS BEST PAPER AWARD:

Sujan Gonugondla, an electrical and computer engineering PhD student, advised by CSL Professor Naresh Shanbhag, won the Best Student Paper Award at the 41st IEEE International Conference

on Acoustics, Speech, and Signal Processing. The paper detailed a technique that can make integrated circuits operate faster, consume less energy, and maintain a high level of correctness at the system level, even when there are errors at the circuit level.



MICHAEL BAILEY

2016 APPLIED NETWORKING RESEARCH PRIZE:

A team of researchers, including CSL and electrical and computer engineering Associate Professor Michael Bailey, has received the Applied Networking Research Prize [ANRP] for their paper, "Neither Snow

Nor Rain Nor MITM...An Empirical Analysis of Email Delivery Security." In collaboration with colleagues at the University of Michigan and Google, Bailey found that email security is significantly better than it was two years ago, but still has widespread issues.



Exelon

Raytheon



Dow AgroSciences



SIEMENS

accenture

Honeywell

: CORPORATE CONNECTIONS

How CSL's growing relationship with industry is a win-win for all parties



This summer, the CSL family launched three new initiatives—the Center for Advanced Electronics through Machine Learning (CAEML), the Center for Computational Biotechnology and Genomic Medicine (CCBGM), and ITI's Cyber-Physical Experimentation Environment for RADICS (CEER).

While the centers have vastly different focus areas, they do share one similarity: an interdependence on industry. CAEML and CCBGM are both part of NSF's Industry/University Cooperative Research Centers (I/UCRC) program and have 11 and nine industry members, respectively, who help define the centers' vision and select projects. CEER has five corporate partners that are contributing both data and real-world expertise to the electric grid testbed project.

All three new centers underscore the important role that industry plays in CSL research. Federal agencies have undoubtedly helped spur private-public partnerships, writing mandatory collaboration into more calls for proposals (NSF requires corporate

membership for the I/UCRC program, for example). But beyond that, researchers and companies are simply finding that partnering on grand challenges benefits everyone.

"We're interested in impact and part of having impact is addressing the right problems," said Normand Paquin, CSL associate director for research. "Having close interactions with industry enables us to pursue the right problems."

For researchers in the Information Trust Institute, which is housed in CSL, industry partnerships have helped create new tools that not only work in theory, but also improve the security of today's power grid.

By working hand-in-hand with utilities and energy companies, researchers have been able to directly access on-grid testing facilities, retrieve data and use it to validate solutions, and engage with workers on the ground. Some companies have also donated equipment for testing purposes. As a result, Illinois researchers were better able to shape research goals



for the Trustworthy Cyber Infrastructure for the Power Grid [TCIPG] initiative along with its successor, the Cyber Resilience Energy Delivery Consortium [CREDC], which the Dept. of Energy launched in 2015. In addition, the collaboration helped clarify the need for better network monitoring software tools, which led Illinois researchers to found the start-up company Network Perceptions.

Likewise, CSL's SONIC Center, a multi-university research center led by Illinois, has brought together commercial companies, defense contractors, and DARPA, to address the fundamental problem of computing on deeply scaled nanotechnologies. Companies such as GlobalFoundries, Micron, IBM, Raytheon, Texas Instruments, Intel, Applied Materials, United Technologies, along with many others, are working with SONIC researchers to develop new models of computation, architectures and prototypes in silicon and beyond. Novel concepts such as deep in-memory and in-sensor computing platforms have been developed in conjunction with Shannon- and brain-inspired models of computation to push the limits of energy efficiency and information processing densities of computing systems in nanoscale technologies.

Ravi Iyer, principal investigator of CCBGM, anticipates that industry will play an equally important role in

ITI Receives \$18.7M to Develop Testbed for Electric Grid Security

The Information Trust Institute has received an \$18.7 million grant from the Defense Advanced Research Projects Agency [DARPA] to develop a testbed that will enable researchers to validate new technology and provide faster response and recovery following an attack on the electric grid. Building on previous testbed work at Illinois, researchers will create a framework that provides the same conditions as the real grid, enabling the development and validation of cyber security tools in an environment with unprecedented system fidelity.

The project, called Cyber-Physical Experimentation Environment for RADICS [CEER], will leverage expertise, tools, and data provided by industry collaborators. As a result, the CEER testbed will take a generational leap forward providing a professional testbed interface, mimic utility operation, and represent a variety of grid conditions under normal operation or attack.

Fast Facts

MISSION: to develop a testbed that will enable researchers to validate new technology and provide faster response and recovery following an attack on the electric grid.

PI: Tim Yardley, Associate Director for Technology, ITI

ITI COLLABORATORS:

David Nicol and Tom Overbye, ECE

INDUSTRY COLLABORATORS: SimSpace, Schweitzer Engineering Laboratory [SEL], ABB, Dragos Security, and a regional utility





We have incredible students, and industry sees the value in having access to them. When industry partners with us, it opens up avenues for student internships in their companies. It's been a great tool for tech transfer.

ELYSE ROSENBAUM
PI & DIRECTOR OF CAEML

his new center, a collaboration with Mayo Clinic: "Industry engagement in a collaborative research environment will be vital to successfully improving the applicability, efficiency, and accuracy of the computational infrastructure to address pressing genome-based challenges."

If academia benefits from companies' real-world expertise, industry sees partnerships with Universities as a good return-on-investment.

"As vendors, we tend to look at short-term to mid-term solutions, and rely on academia to look at long-term solutions," said John Wang, department manager of energy and automation at the ABB Corporate Research Center. ABB Group is a power and automation company and CEER contractor. "Universities don't have to worry about changing customer priorities and can stick with research projects for longer cycles than we can. In our long relationship with Illinois, we've both realized that we are complementary to each other, and together we can do really innovative things."

In addition, companies like having first access to top talent. "We have incredible students, and industry sees the value in having access to them," said Elyse Rosenbaum, principal investigator and director of CAEML. "When industry partners with us, it opens up avenues for student internships in their companies. It's been a great tool for tech transfer."

Corporate connections aren't new to CSL or academia in general. But the nature of them is changing. While CSL still enjoys relationships with individual companies—Boeing and IBM have recently announced their support of new Illinois projects, for example—more collaborations are spanning different sectors. CCBGM, claims computing, pharmaceutical, and agricultural companies among its corporate members. CREDC works with energy manufacturers, utilities, oil companies, and avionics and aerospace manufacturers, among others.

In fact, there's a growing awareness that it takes all parties—academia, government, and industry—to solve the the societal problems facing our nation, says Tim Yardley, ITI associate director of technology and PI of the CEER program.

"Working on difficult emerging challenges that face the world requires the insight of those in the trenches of industry, as well as the vision of the researchers who can look at, develop, and leverage cutting-edge approaches and technology and mold that to solve these challenges," Yardley said.



NSF Funds Two CSL Industry/ University Cooperative Research Centers

The Coordinated Science Laboratory has received funding for two new National Science Foundation [NSF] Industry/University Cooperative Research Centers [I/UCRC], funded by NSF and several industry partners for the next five years. I/UCRCs aim to partner university research with industry needs in order to transfer research results and technological advances to the U.S. marketplace.

The two centers—the Center for Advanced Electronics through Machine Learning [CAEML] and the Center for Computational Biotechnology and Genomic Medicine [CCBGM]—will capture research needs in two critical fields: microelectronic circuits and systems for semiconductors; and a platform for generating, interpreting, and applying genomic data.

“CSL excels at interdisciplinary research that solves big societal problems and has enjoyed productive relationships with companies for decades,” said CSL Director Klara Nahrstedt. “It is these qualities that have positioned us to lead two of these new centers.”



Fast Facts

Center for Advanced Electronics through Machine Learning (CAEML)

MISSION: To enable fast, accurate design and verification of microelectronic circuits and systems by creating machine learning algorithms to derive models used for electronic design automation.

PI: Elyse Rosenbaum, ECE

CSL COLLABORATORS: Maxim Raginsky, Andreas Cangellaris, José Schutt-Ainé

RESEARCH PARTNERS: Georgia Tech and North Carolina State

MEMBER COMPANIES: 11

URL: go.illinois.edu/caeml

Center for Computational Biotechnology and Genomic Medicine (CCBGM)

MISSION: To develop a new platform for generating, interpreting, and applying genomic data for a wide variety of applications quickly, efficiently, and accurately.

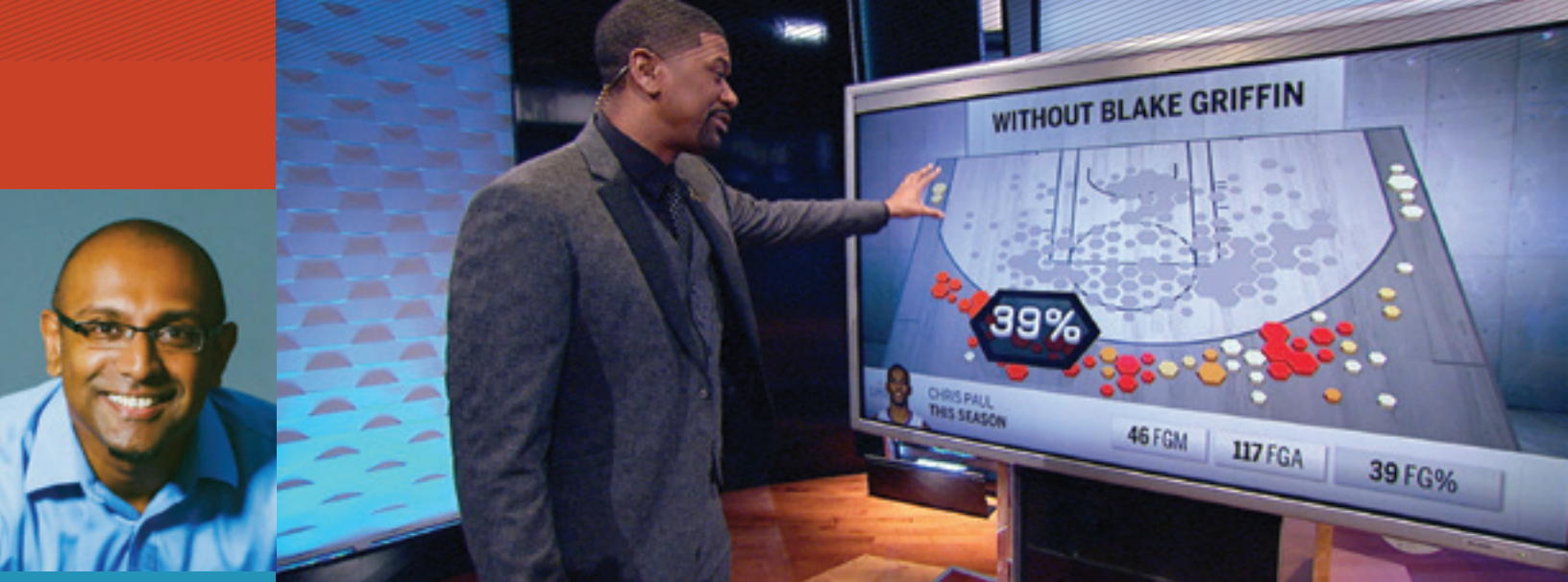
PI: Ravi Iyer, ECE

CSL COLLABORATORS: Deming Chen, Wen-mei Hwu, Zhi-Pei Lang, Steve Lumetta, Olgica Milenkovic, Klara Nahrstedt, Shobha Vasudevan, Tandy Warnow

RESEARCH PARTNERS: Mayo Clinic

MEMBER COMPANIES: 9

URL: ccbgm.illinois.edu



:ALUMNUS RAJIV MAHESWARAN FOUNDS SECOND SPECTRUM

Big data is finding uses in countless organizations and industries, from agriculture to medicine. CSL alumnus Rajiv Maheswaran saw another application for big data analytics: the sports industry.

Harnessing the power of pattern recognition, machine learning, and computer vision, Maheswaran co-founded Second Spectrum, an innovative sports analytics and data visualization startup. The company develops platforms for sports insights and experiences that inform the playing decisions of some of the biggest teams in sports and appear on media outlets like ESPN and FOX Sports.

“We work on machine understanding of sports that enables everyone to engage with content they care about in more personalized and interactive ways,” said Maheswaran, who received his PhD in electrical and computer engineering in 2003, advised by CSL Professor Tamer Başar.

Maheswaran utilizes his engineering background to explore the data-driven world of sports: he uses machine learning in data analysis to extract meaningful insights; computer vision is used to augment information in videos, like player location, movement, and other visual features.

“The best parts of my work are tackling problems that are both technically interesting and have practical value, and thinking about the best ways of discovering and communicating information to everyone, leveraging sports as a vehicle,” said Maheswaran.

“

The best parts of my work are tackling problems that are both technically interesting and have practical value.

RAJIV MAHESWARAN

:QUICK LOOK

CSL faculty are helping chart the course in many fields, ranging from computing to semiconductors. Here's a quick look at a few faculty members who are providing thought-leadership in their areas of expertise.

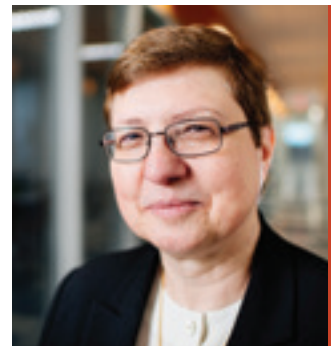
BILL GROPP

Bill Gropp [Computer Science] recently co-chaired a National Academies study that guides the National Science Foundation's future directions in advanced computing. The study's recommendations aim to maintain America's leadership in science and engineering, ensure that resources meet community needs, aid the scientific community in keeping up with the revolution in computing, and sustain the infrastructure for advanced computing.



KLARA NAHRSTEDT

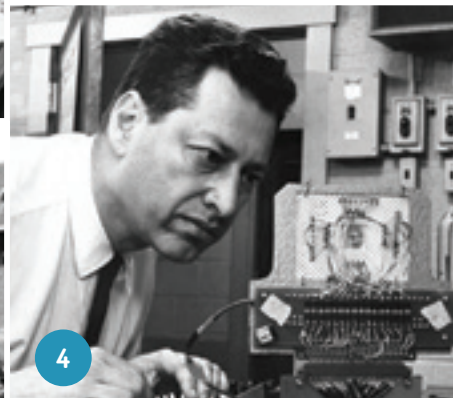
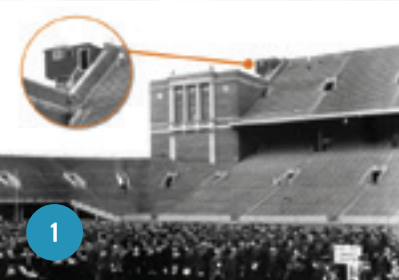
CSL Director Klara Nahrstedt [Computer Science] is currently serving a three-year term on the Computing Research Association's Computing Community Consortium Council. The Council is instrumental in leading CCC's visioning programs, which help create and enable visions for future computing research. In addition, she organized a panel on smart cities at IEEE SmartComp 2016 and co-organized a half-day conference on smart cities at the CRA/CCC Symposium 2016.



NARESH SHANBHAG

As the SONIC Center Director, Naresh Shanbhag [ECE] is helping imagine new methods of computing on nanoscale devices. On July 29, he participated in the Semiconductor Research and Development Roundtable at the invitation of the White House Office of Science and Technology Policy and the National Economic Council to brainstorm on strategies to keep the U.S. semiconductor industry globally competitive. This event was held at the Eisenhower Executive Building next to the White House in Washington, D.C. He also chaired a visioning workshop on "Nanotechnology-inspired Future of Computing," sponsored by the Computing Community Consortium, held August 31-September 1 in Washington, D.C.





CSL: 65 YEARS OF INNOVATION

As the incubator of a navigational compass for nuclear submarines, the plasma display, and PLATO, the first computer-assisted educational program, the Coordinated Science Laboratory has a 65-year tradition of creating technology that has transformed everything from defense to medicine.

CSL, which is believed to be the oldest multidisciplinary research laboratory at the University of Illinois at Urbana-Champaign, celebrates its 65th anniversary in 2016. Take a look at some of the biggest markers of innovation in CSL's rich history.

SECRET SHACK (1)

Memorial Stadium housed more than football in the 1950s. In the southwest corner of the stadium, a wooden shack was perched near the upper-level seats. Only a select group of CSL scientists knew that the shack was being used to conduct top-secret radar research for the military.

Formed in 1951 near the start of the Korean War, the Secret Shack was used to develop a side-looking airborne radar later used in Germany to peer across the Iron Curtain. The system's 18-foot antenna was mounted along the side of an aircraft, which permitted the plane to fly parallel to the border and peer into enemy territory within a 40-mile range.

THE SUPER COMPASS (2)

Over the years, CSL has maintained a clear sense of direction. So it is only fitting that one of its earliest inventions was the electric vacuum gyroscope—a “super compass” as some called it. The electric vacuum gyroscope became the central component of the inertial navigation system, which made it possible for

nuclear submarines to navigate the seas of the world while submerged for months.

Within the gyroscope, electrical forces held a 2-inch beryllium ball a few thousandths of an inch away from encircling metal plates and within a vacuum. Free of mechanical and air friction, the ball could spin for years without appreciable slowdown.

THE PLATO PHENOMENON (3)

CSL had the distinction of creating the first computer-assisted instructional program in the world. Its name: PLATO, or Programmed Logic for Automatic Teaching Operations.

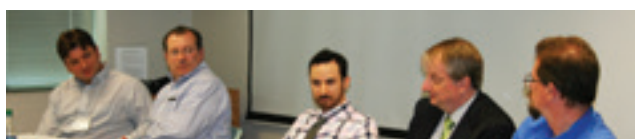
In the first generation of PLATO, users sat at a station resembling a telephone booth. They faced television screens and communicated with the computer using a keyboard that looked like a typewriter. PLATO profoundly influenced computer-based education systems throughout the country.

FLAT-PANEL PLASMA DISPLAY (4)

Plasma displays, now the forerunners of high-definition flat-panel televisions, were first invented in a lab at CSL. In 1964, CSL researchers designed the plasma display panel, originally conceived as an interactive component of PLATO [Programmed Logic for Automatic Teaching Operations] educational network.

The researchers who developed the plasma display, Donald Bitzer, Gene Slottow and Robert Willson, were inducted into the National Inventors Hall of Fame in 2013, which honors legendary inventors whose innovations and entrepreneurial endeavors have positively impacted society.

:EVENTS

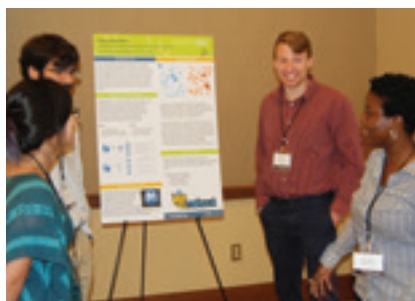


CYBERFAB WORKSHOP

CSL hosted the Automated Cyber-Environments for Semiconductor Fabrication Data Collection and Analysis [CyberFab] Workshop in May, which allowed material and semiconductor fabrication researchers to learn about cyber-infrastructure tools. The workshop is part of the National Science Foundation-funded DIBBs: Timely and Trusted Curator and Coordinator Data Building Blocks project, and a collaboration between CSL, Frederick Seitz Materials Research Laboratory, Micro and Nano Technology Laboratory, Computational Science and Engineering, Information Trust Institute, and the National Center for Super-computing Applications.

CIRI KICKOFF

Established in 2015 as a Center of Excellence by the U.S. Department of Homeland Security Science and Technology Directorate, the Critical Infrastructure Resilience Institute [CIRI] hosted a kickoff event in April. CIRI, led by the University of Illinois, is addressing the challenge of enhancing the security and resilience of the nation's critical infrastructure. The event hosted many dignitaries from DHS and the University, and emphasized the importance of the center and its role in the nation's security.



DIGITAL FORENSICS WORKSHOP

The Information Trust Institute held the 4th International Workshop on Digital Forensics Curriculum Standards in May. The workshop, which hosted research-oriented professionals and educators, was a key step in creating an innovative digital forensics curriculum for the University of Illinois, with the intention of disseminating it broadly as a standardized approach. There is a shortage of qualified digital forensics practitioners in the United States. This course will provide a comprehensive research-oriented program to help fill this void.

:PEOPLE



BETH DENNISON RETIRES AFTER 20 YEARS AT CSL:

For the past 20 years, Elizabeth Dennison was an integral part of the CSL, providing administrative support, research guidance, and a passion for cultivating community. She started in 1996 as a lab manager for CSL Professor Ravi Iyer. In

2002, she became Assistant Director of CSL, and was promoted to Associate Director in 2009. In 2015, Dennison received the CSL Academic Professional Award. On April 30 of this year, Dennison retired from the University.



KAREN CROMWELL NEW ASSOCIATE DIRECTOR OF ADMINISTRATION:

Karen Cromwell was named CSL's Associate Director of Administration, effective May 1. Cromwell was the Director of Business Operations in CSL, a position she held since 2007. In that role, she provided business guidance,

policy, and strategy for CSL and the College of Engineering. In her new role, she is responsible for overseeing the day-to-day operations of the lab, assisting in business development activities, and directing facility use and maintenance, among other duties.

WELCOME TO NEW CSL FACULTY



HAITHAM HASSANIEH

Haitham Hassanieh joined ECE and CSL in the spring as an assistant professor. His primary research interests are in networking, distributed computing, and developing communication through innovative devices and algorithms. Hassanieh hails from Lebanon, where he earned his

undergraduate degree at the American University of Beirut. He received his master's and PhD in electrical engineering and computer science from MIT.



ALEXANDER SCHWING

ECE Assistant Professor Alex Schwing received his PhD in computer science from ETH Zurich and joins CSL from the University of Toronto. His research is centered on machine learning and computer vision, including techniques such as conditional random fields and

structured support vector machines.



ANDREW MILLER

Andrew Miller joins Illinois as an ECE and CSL assistant professor of computer engineering. In addition to a strong focus on Bitcoin research, he is interested in distributed systems, programming languages, and cryptography. He earned his PhD in computer science from

the University of Maryland.



ZHIZHEN (JANE) ZHAO

Zhizhen [Jane] Zha, ECE and CSL assistant professor, earned her PhD in physics from Princeton University and taught at Courant Institute of Mathematical Sciences. Her research interests include applied and computational harmonic analysis, signal processing, and

dimensionality reduction.



:NEW NCPRE COURSE

It can be hard to choose—or even know—the right path, and to find a way to take it. Even if you are an expert in your field, you may find that knowing how to navigate workplace pitfalls is just as important to your career as technical skills.

To help professionals prevent and solve problems at work, C.K. Gunsalus, director of the National Center for Professional & Research Ethics (NCPRE) and CSL and business administration professor emerita, has led the design of a new Coursera offering.

Gunsalus, her NCPRE colleagues, and a range of professional guest experts, in collaboration with of the Center for Innovation in Teaching and Learning, tackle the pitfalls that professionals can encounter through a three-course specialization called “Professional IQ: Preventing and Solving Problems at Work.”

The three courses are “Foundations of Professional Identity,” “Shaping Your Professional Brand,” and “Leadership and Influence.” The course is free, open to any learner, and accepts new learners on a rolling basis.

The course includes guests from AMD, start-up Zip-DX, Sierra Training, the University of Illinois Community Credit Union, lawyers, management professionals, and more. Material is also drawn from Gunsalus’s book, “The Young Professional’s Survival Guide: From Cab Fares to Moral Snares,” published by Harvard University Press in 2012.

The program will use tailored quizzes and exercises to help cement learning. Those who complete all three courses and a capstone project on a fee-paying basis will qualify for Coursera’s specialization track and will receive a certificate.

For more information: go.csl.illinois.edu/ncpre-course

This new
Coursera offering
helps learners
tackle the pitfalls
that professionals
can encounter.

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