Center of Excellence
WIRELESS AND INFORMATION TECHNOLOGY
AT STONY BROOK UNIVERSITY

JANUARY FEBRUARY COVERAGE

Hack@CEWIT Kickoff, Interdisciplinary Agenda, Simplifying Data Communications, Leveraging University R&D Assets, Code for College

What We've Been Up To

Our team has been hard at work planning our latest and greatest program, Hack@CEWIT, kicking off this weekend at the Center.

We've partnered with 9 Hack@CEWIT sponsors, built an incredible industry mentorship program, lined up over 25 tech talks and deep dive workshops, and secured $5,000 in prizes.

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43 HOUR IOT HACKATHON · FEBRUARY 17-19, 2017 · WWW.CEWIT.ORG/HACK

WHAT IS HACK@CEWIT?

Hack@CEWIT is an interdisciplinary student hackathon focusing on industry-relevant IoT and microservices challenges. In T minus 3 days, we welcome 150+ hackers for a 43-hour weekend long hack — **at Stony Brook University.**

THE BIG IDEA

A Lab to Marketplace Approach: Hack@CEWIT is designed in conjunction with our core industry partners, sponsors, and member entrepreneurs to select scenarios that will have a direct, real-world application to their product portfolios.

Student-Powered Solutions: University students partner to build quick and effective applications that explore unique and cutting-edge interpretations of pre-existing and new IoT technologies alike.

LEARN MORE & STAY CONNECTED

View the Hack@CEWIT Program and visit www.cewit.org/hack for all additional information. As we count down the days and share event updates, connect with us on Twitter or reach us directly at **email: hack@cewit.org**, **phone: 631-216-7000**.

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MLH
MAJOR LEAGUE HACKING
POWERED BY DELL | Windows

Stony Brook University

SIMPLIFYING DATA CENTER COMMUNICATIONS

CEWIT, Stony Brook University researchers partner to design the Firefly architecture

Data centers are the central point of many, if not most, information systems today, but the masses of wires interconnecting the servers and piled high on racks begins to resemble last year's tangled Christmas-tree lights disaster. Now a team of engineers is proposing to eliminate most of the wires and substitute infrared free-space optics for communications.

"We and others tried radio frequency signaling, but the beams become wide over short distances," said Mohsen Kavehrad, W. L. Weiss Chair Professor of Electrical Engineering, Penn State. "The buildings could be a mile long and every rack should be able to communicate."

In an experiment conducted by Microsoft engineers, researchers found that radio-frequency signaling

resulted in high interference, limited active links and limited throughput — the amount of data that can go through a system. "We use a free space optical link," Kavehrad told attendees on Jan. 31 at Photonics West 2017 in San Francisco. "It uses a very inexpensive lens, we get a very narrow infrared beam with zero interference and no limit to the number of connections with high throughput."

The Free-space optical Inter-Rack nEtwork with high FLexibilitY — or Firefly — architecture is a joint project of Penn State, Stony Brook University and Carnegie Mellon University. It would use infrared lasers and receivers mounted on top of data center racks to transmit information. The laser modules are rapidly reconfigurable to acquire a target on any rack. Human interference is minimal because the racks are more than 6.5 feet high so most workers can walk between the rows of racks without breaking the laser beams.

According to Kavehrad, data centers may house 400,000 servers on racks filling a mile-long room. Data centers typically build for peak traffic, which means that most of the time about 30 percent of servers are offline. However, because they are still on, they continue to create heat and need cooling. Kavehrad estimates that by 2020, data centers will use a total of 140 billion kilowatts of electricity per hour, or the equivalent of $13 billion worth of electricity at today's rate — the output of 50 power plants.

While fiber-optic cabling and energy expenditure for idle servers are problems, throughput is more critical. When hundreds of cables merge into a few, data transfer bottlenecks form that reduce the speed at which the data center can deliver information. A flexible, configurable system can reduce bottlenecks and even the number of servers needed.

The researchers have designed the Firefly architecture, but it is not yet implemented. They have created a simplified, proof-of-concept system to show that their infrared laser can carry the signal and target the receiver. They are transmitting wavelength division multiplexed — multiple signals sent by different colored lights — bi-directional data streams each carrying data at a transmission rate of 10 Gigabits per second from a Bit Error Rate (BER) test set. BER testing determines the number of errors in a signal caused by interference, noise, distortion or sychronization problems.

The proof of concept setup has the bidirectional signal wavelength division multiplexed with a one-way cable television signal. The total data stream goes from fiber-optic cable to the infrared laser, across the room to the receiver and shows the results on a TV and the BER test set. A hand breaking the laser beam shuts off the system, but when the hand is removed, the signal is rapidly reacquired.

The system uses MEMs — microelectromechanical systems — with tiny mirrors for rapid targeting and reconfiguring, Kavehrad said. These MEMs use tiny amounts of electricity from four directions to reposition the mirror that targets the receiver. The movement of the mirrors is so small it is undetectable, but the computer program quickly locates the receiver and then narrows the target to pinpoint accuracy. The laser beam can also be rapidly moved to target a different receiver.

Also working on the NSF supported project were CEWIT-affiliated faculty members Samir R. Das, Professor of Computer Science, Himanshu Gupta, Associate Professor of Computer Science and Jon Longtin, Professor of Mechanical Engineering, Stony Brook University; with Vyas Sekar, Assistant Professor of Electrical, Computer Engineering, Carnegie Mellon University.

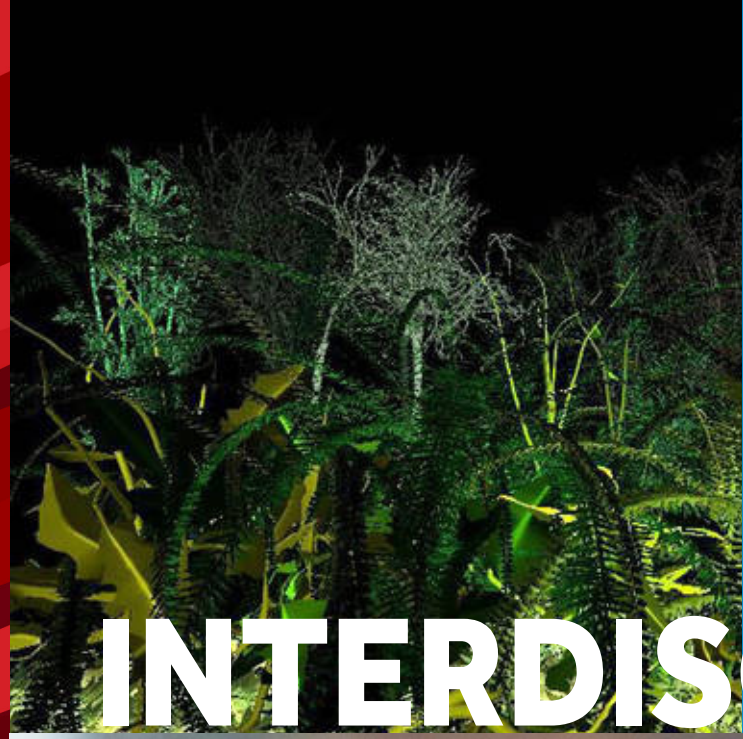
LEVERAGING R&D ASSETS

Dr. Imin Kao talks leveraging Stony Brook University's R&D assets, including its Centers of Excellence, to compete at the forefront of advanced manufacturing technologies

Stony Brook University's Dr. Imin Kao leads the regional New York Manufacturing Extension Partnership (New York MEP) center for Long Island, known as the Manufacturing and Technology Resource Consortium (MTRC). MTRC began its MEP designation in 2016. It brings a consortium approach to MEP services on Long Island, leveraging the Composite Prototyping Center and assets on Stony Brook University's (SBU) campus. These include multiple Centers of Excellence, Centers for Advanced Technology, the Small Business Development Center, and SPIR (Strategic Partnership for Industrial Resurgence) business and advanced engineering assistance programs.

FuzeHub, a New York State resource designed to connect manufacturers to programs and expertise for technology, commercialization, innovation, and business growth, recently interviewed Dr. Kao for the latest edition of their "Ask an Expert" series.

Dr. Kao's leadership of the MTRC is an extension of his individual expertise is in the areas of robotics and manufacturing automation, dexterous manipulation with soft fingers, wafer manufacturing, wiresaw, MEMS and intelligent fault detection and diagnosis. **Read the full interview**.



INTERDISCIPLINARY AGENDA

Hack@CEWIT features over 25 tech talks and deep-dive workshops to introduce a range of new technologies and possibilities to hackers

Hack@CEWIT is the Center of Excellence in Wireless and Information Technology (CEWIT)'s inaugural region-wide, interdisciplinary student hackathon focusing on industry-relevant internet of things (IoT) and microservices challenges in the Center's 100,000 s.f., next-generation research and education facility — at Stony Brook University.

Hack@CEWIT is a 43-hour hack over President's Day Weekend 2017 featuring an interactive speaker series, hands-on, deep-dive workshops, industry hacker guru programs, games, multimedia experiences, and opportunities for recruitment with top industry prizes for the most innovative, most ambitious, most original, most health-conscious, and most industry-applicable IoT hacks.

A Major League Hacking Event
Major League Hacking (MLH) is the official student hackathon league. Each year, we power over 200 weekend-long invention competitions that inspire innovation, cultivate communities and teach computer science skills to more than 65,000 students around the world. MLH is an engaged and passionate maker community, consisting of the next generation of technology leaders and entrepreneurs.

Jon Gottfried, co-founder of Major League Hacking and Hack@CEWIT keynote speaker, is one of the foremost experts on Developer Relations. Jon previously co-created the Hacker Union, worked as a Developer Evangelist at Twilio and Echo Nest, and served as National Director for StartupBus. Jon loves creating new technology and teaching people to do the same. A Stony Brook University class of 2011 graduate, Jon was recently named to the Forbes 30 Under 30 Education category.

HealthTech: Working with Softheon Web Services & Engineering Team
At Softheon we strive to create simple solutions to complex problems. Our innovative and easy-to-use products have revolutionized the way everyday people access health insurance, impacting over 1.6M lives.

Connect with leading Softheon healthtech engineers to access the hardware you need for your project goals while learning about the opportunities to work with Softheon's Identity, Payment, and Data Services APIs in the joint Softheon Software Services Track.

Softheon, a Hack@CEWIT host sponsor and CEWIT member company will further lead a suite of user interface, microservice, AZURE, and technical interviewing talks and workshops, while actively looking to recruit its next generation of talent.

Zero to Hero Tracks: Raspberry Pi and Arduino & ESP 8266
Ever wonder what a Raspberry Pi is? Get the lowdown on how to get started with this cheap delicious computer in your hack. Learn a little GPIO, get introduced to OpenHAB, an open-source framework for home automation and Internet-of-Things (IoT) device networking, and experience demos of advanced projects from Hacker Gurus.

Learn the basics of Arduino from setting up the IDE to programming "Hello World." Dive deeper to discover more advanced ways to interface with your Arduino including digital interfaces and web servers and combine your skills to create a full-fledged IoT device — an IoT Smart Light Switch and IoT Weather Station that can convert any room into a smart room.

ArtsTech Workshop: Building a DIY GameTrak Controller
The GameTrak is a video game controller that has become popular in electronic and computer music performances. Consisting of two ten-foot retractable tethers that send X, Y, and Z position data, it provides a large, expressive, and sensitive means of controlling sound or other elements of a digital work. However, since In2Games stopped producing the controller in 2006, versions that work out of the box with a computer have become more and more expensive and difficult to find on the secondhand market.

In this workshop, CEWIT's Matthew Cordaro will lead construction of a DIY version of the GameTrak he has developed. CEWIT resident artists Flannery Cunningham (composer) and Rebecca Uliasz (digital artist) will then introduce using such controllers in the visual programming languages Max/MSP and Jitter. Using the newly-constructed DIY GameTraks, hackers will explore basic control of sound and image, providing a window into using controllers as expressive tools.

CODING FOR COLLEGE

First-ever, state-wide coding challenge for SUNY and CUNY students is on: Making College Possible

As part of his Excelsior Scholarship Campaign, Governor Andrew Cuomo has launched "Making College Possible Coding Challenge," inviting students to create a digital prototype of a mobile app or website that will provide information about the Excelsior Scholarship and share what "making college possible" means for SUNY and CUNY students.

As part of the campaign, the Governor will tour SUNY and CUNY campuses in support of his plan to make college tuition free for middle-class families across New York. Under this groundbreaking proposal, more than 940,000 middle class families and individuals making up to $125,000 per year would qualify to attend college tuition-free at all public universities in New York State.

The "Making College Possible Coding Challenge" invites student developers and designers from all 64 SUNY and 25 CUNY campuses to build unique digital prototypes inspired by the Excelsior Scholarship around the theme "making college possible." The prototypes can be for mobile applications or websites, and will be informational tools students and scholarship applicants can use to learn more about the scholarship and life at SUNY and CUNY. **Continue Reading.**

OUR COMMUNITY

The Advanced Energy Center

Center for Advanced Technology in Diagnostic Tools and Sensor Systems (Sensor CAT)

The Center for Biotechnology

The Center for Corporate Education and Training at Stony Brook University

The Center for Dynamic Data Analytics (CDDA)

The Clean Energy Business Incubator Program (CEBIP)

The College of Business at Stony Brook University

The College of Engineering and Applied Sciences at Stony Brook University

Empire State Development: NYSTAR

IEEE Long Island Section

Long Island High Technology Incubator

The New York Academy of Sciences

Small Business Development Center at Stony Brook University

Stony Brook University

UPCOMING EVENTS

February 17-19, 2017 · Hack@CEWIT: IoT & Microservices

February 24, 2017 · Computer Science Distinguished Lecture Series: Esteemed Computer Scientist Moshe Vardi

March 2017 · Stony Brook Entrepreneurs Challenge 2017

March 2017 · Small Business Development Center New Workshops

March 9, 2017 · Workshop: Forefronts in Cryo-Scanning Electron Microscopy

June 8, 2017 · Stony Brook University 2017 Incubator Company Showcase

November 7 & 8, 2017 · CEWIT2017 Conference & Expo on Emerging Technologies for a Smarter World

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The Next Big Thing: Hack@CEWIT