SHARE THE VISION

OCTOBER 8, 2015

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
INNOVATION & START-UP SHOWCASE

ILLINOIS

PROGRAM OF EVENTS

Program of Events

SHARE THE VISION · OCTOBER 8, 2015
University of Illinois at Urbana-Champaign Innovation & Start-Up Showcase
Hosted by the Office of Technology Management and the University of Illinois Research Park

Faculty Presenters

SHOWN IN ORDER OF PRESENTATION

Healthcare: Therapeutics

Martin Burke

CHEMISTRY

A BILLION YEAR HEAD START

ABSTRACT: Natural products represent a billion year head start in the process of discovering new medicines, and most of this potential remains untapped. The problem is that the process of making such complex molecules and their derivatives is difficult and slow, and this bottleneck precludes practical access to the full range of this untapped functional potential. REVOLUTION Medicines has exclusively licensed from UIUC an automated building block-based synthesis platform initially developed in my lab that for the first time enables practical, generalized access to complex natural products and their derivatives for medicinal chemistry. The company is now advancing and harnessing its REVBLOCKS platform to redesign evolution's products into new medicines for treating serious human diseases.

RESEARCH: Development of molecular prosthetics as a general strategy for the understanding and improvement of human health where small molecules with the capacity to perform protein-like functions can serve as substitutes for missing or dysfunctional proteins.

HONORS: ▸ Elias J. Corey Award for Outstanding Original Contribution in Organic Synthesis by a Young Investigator, 2013 ▸ Arthur C. Cope Scholar Award, American Chemical Society (ACS), 2011 ▸ Howard Hughes Medical Institute Early Career Scientist, 2009

START-UP COMPANY: **REVOLUTION Medicines:** developing new therapies through an innovative approach that reconfigures natural substances into best-in-class medicines. The company launched in 2015 with a $45 million investment from Third Rock Ventures. (www.revolutionmedicines.com)

LICENSES: Professor Burke's MIDA boronates, which enable diverse arrays of small molecules to be generated simply and quickly by repeatedly using a single reaction to join different organic sub-units, have been licensed to **Sigma Aldrich, BoroPharm**, and **Ally Chem**. More than 130 MIDA boronates are now commercially available and these building blocks are being widely utilized to promote the discovery of new medicines by **more than 70 pharmaceutical companies around the world**.

Jianjun Cheng

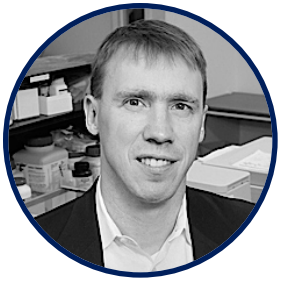
MATERIALS SCIENCE & ENGINEERING

SELECTIVE CELL LABELING AND CANCER TARGETING

ABSTRACT: Cell surface protein receptors play a vital role in regulating the interaction between cells and the extracellular environment, especially the influx and efflux of materials including therapeutic agents. The differentiation of cell surface protein receptors between normal and diseased cells will potentially enable targeted delivery of therapeutic agents into the diseased cells and thus minimize undesired side effects. However, the difference in the population of existing receptors between diseased and normal cells in one individual is either too small to impart good high selectivity or highly specific to certain cell types. Our group recently developed a controlled labeling strategy to label cell types of interest with chemical groups by using chemically modified metabolic sugar precursors. This controlled labeling strategy, coupled with various efficient Click chemistries, can be used for diagnosis and treatment of diseases, especially cancers. My presentation will cover basic chemistry design and demonstration of the controlled labeling strategy and its key properties and applications in cancer-targeted treatment.

RESEARCH: Developing functional molecular, polymeric and nano-materials and exploring their applications in nanomedicine for drug/gene delivery, imaging and diagnosis

HONORS: ▸ Fellow, American Institute for Medical & Biological Engineering (AIMBE), 2015 ▸ Fellow, ACS-POLY, 2015 ▸ NIH Director's New Innovator Award, 2010



Paul Hergenrother

CHEMISTRY, CARLE WOESE INSTITUTE FOR GENOMIC BIOLOGY

TRAVERSING THE VALLEY OF DEATH IN ANTICANCER DRUG DISCOVERY

ABSTRACT: Anticancer drug discovery is typically a lengthy, expensive, and high-risk enterprise. Statistics show that even after multiple years and millions of dollars, only 5% of candidates that enter a Phase I trial in oncology gain FDA approval. We have pioneered a strategy that enables us to more intelligently choose drug candidates in a rapid and cost-effective manner. In this strategy we evaluate drug candidates in pet dogs with cancer, offering hope for these veterinary cancer patients and their owners, and allowing us to optimize treatment parameters in real cancer patients with heterogeneous tumor populations, metastatic disease, etc.

A case study for this strategy will be presented, the discovery and development of the anticancer drug PAC-1. PAC-1 selectively induces cancer cell death though a novel mechanism, activation of procaspase-3. The dosing, timing, and formulation of PAC-1 was optimized through its evaluation in canine cancer patients; over 50 dogs with cancer have been treated with PAC-1 and its derivatives, and PAC-1 shows considerable promise in some of the most difficult-to-treat canine cancers. Largely on the basis of this dog data, the FDA approved our Investigational New Drug application and PAC-1 is now being taken by human cancer patients as part of a Phase I clinical trial at the University of Illinois Cancer Center in Chicago, and at Johns Hopkins University. For more information please see the listing on clinicaltrials.gov: https://clinicaltrials.gov/ct2/show/NCT02355535

RESEARCH: Using organic compounds to identify novel cellular targets that can be exploited in the treatment of diseases including cancer and drug-resistant bacteria.

HONORS: ▸ Kenneth L. Rinehart Jr. Endowed Chair in Natural Products Chemistry ▸ Eli Lilly Award in Biological Chemistry, 2008

START-UP COMPANIES: **Vanquish Oncology:** developing procaspase-3 activating compounds, known as PAC-1, as a cancer therapeutic. The compound is now in Phase I clinical trials. (www.vanquishoncology.com)

Douglas Mitchell

CHEMISTRY, CARLE WOESE INSTITUTE FOR GENOMIC BIOLOGY

GENOMICS-ENABLED NATURAL PRODUCT DISCOVERY

ABSTRACT: Natural products have been, without question, the most prolific source of all medicines, especially antibiotics. Genome sequencing has revealed that our knowledge of natural product structure and function is astonishingly incomplete. Therefore, exploration of uncharted natural product chemical space will undoubtedly lead to improved, and entirely new, medicines. Against this backdrop, our group focuses on elucidating the biosynthesis, structure, and function of natural products. This talk will highlight our recent advances in genomics-enabled natural product discovery while covering a few case studies in enzymatic biosynthesis that could be exploited to introduce new drug leads.

RESEARCH: Identifying and characterizing novel antibiotic compounds through genome-mining, isolation and characterization of novel natural products, and mechanistic studies of key natural product biosynthetic enzymes.

HONORS: ▸ Pfizer Award in Enzyme Chemistry (ACS Division of Biological Chemistry), 2015 ▸ National Fresenius Award, Phi Lambda Upsilon (National Chemistry Honor Society), 2015 ▸ NIH Director's New Innovator Award, 2011 ▸ Packard Fellowship, 2012

David Kranz

BIOCHEMISTRY

A NEW GENERATION OF CANCER THERAPEUTICS: T CELLS AND T CELL RECEPTORS

ABSTRACT: In the past two years there has been a large investment (billions$) by venture firms and pharmaceutical companies in the area known as adoptive cell therapies (ACT). The goal of this new generation of cancer therapeutics is to destroy tumors with very specific and potent agents, a patient's own T cells (i.e. one of the key types of white blood cells). The investment in this strategy has been based on exciting, and widely publicized, early clinical results. However, there remain many questions about how the approach will be more broadly applied to millions of patients. One avenue that our lab has focused on over the past twenty years has been to engineer improvements in the key molecule involved in the specific-cancer targeting activity of T cells, the T cell receptor. Our lab's work

has identified some of the parameters involved in improving both protein- and cell-based therapeutics in this class of agents. The technologies developed around these studies formed the basis of two University of Illinois start-up companies, **BioDisplay** and **ImmuVen**, which were acquired by pharmaceutical companies. This presentation will discuss the science behind this work, and its potential application toward helping cancer patients with more efficacious treatments that have significantly reduced side effects (e.g. compared to chemo).

RESEARCH: Understanding a fundamental issue in immunology: how mammals can eliminate millions of different antigens that are "foreign" (e.g. viruses, bacteria) without destroying antigens that are "self" (e.g. one's own tissues). The specific focus of the lab is on the antigen-specific receptor expressed by T lymphocytes (T cell receptor, TCR).

HONORS: ▸ Phillip A. Sharp Professor of Biochemistry

START-UP COMPANY: **BioDisplay:** Developed yeast-display methodology using flow cytometry to provide high-throughput screening, which in turn speeds the process of directed drug discovery. **Immuven:** developing new biotherapeutics to treat cancer, infectious disease, and autoimmune disorders. The platform allows rapid selection and optimization of T cell receptors with high affinity to targets in cancer, infections, and autoimmune pathways.

Healthcare: Medical Devices

John Rogers

MATERIALS SCIENCE & ENGINEERING

MILLIMETER-SCALE WIRELESS WEARABLES

ABSTRACT: Advanced concepts in antenna design, hybrid materials, computing platforms and energy harvesters form the technology foundations for the world's smallest wireless sensors. This talk demonstrates these ideas through a family of wearable systems configured to mount on the fingernails, for robust operation over months of continuous use, without removal, during normal daily activities. Application opportunities range from authentication, hardware security and data transactions, to personal health monitoring and UV sensing. Joint development activities with two large corporate partners will be highlighted.

RESEARCH: Electronic materials for devices that have unusual properties, including those that match the soft, curvilinear surfaces of biological tissues. Applications in wearables, advanced surgical tools, and other biomedical systems.

HONORS: ▸ Elected to the National Academy of Sciences, 2015 ▸ Smithsonian Award for American Ingenuity in the Physical Sciences, 2013 ▸ $500,000 Lemelson Prize, 2011 ▸ MacArthur Fellowship, 2009

START-UP COMPANIES: **mc10:** commercializing classes of electronics that can fold, twist, and conform to three dimensional surfaces. Applications range from wearable sports monitors to advanced surgical tools, to disease management and others. (www.mc10.com) **Semprius:** commercializing low cost, high performance concentrator photovoltaic modules for utility scale power generation. The company's unique mirco-transfer printing technology enables CPV modules with world-record efficiencies. (www.semprius.com) **X-celeprint:** commercializing a cost-effective and scalable manufacturing platform based on micro-transfer printing for integrating micro-scale devices such as lasers, LEDs, or integrated circuits onto non-native substrates. (www.x-celeprint.com) **Wearifi:** creating the world's thinnest, smallest, most flexible, and most lightweight near-field communication wearable device technology.

Curtis Johnson

BECKMAN INSTITUTE FOR ADVANCED SCIENCE & TECHNOLOGY

MECHANICAL IMAGING OF THE HUMAN BRAIN

ABSTRACT: Medical diagnostics have a long history of utilizing the mechanical properties of tissues to identify the presence of pathology through manual palpation. Our group harnesses the inherent mechanical contrast in disease to noninvasively characterize brain tissue through an imaging method called magnetic resonance elastography. Pathology can result in tissue stiffness and viscosity changes by an order of magnitude relative to healthy tissue, thus making tissue mechanical properties potentially very sensitive markers of tissue health. This talk will discuss our development of the high-resolution brain elastography method for applications in neurology and neurosurgery in partnership with the Carle Foundation Hospital. In particular, we will highlight the work in pre-surgical evaluation of intracranial tumors and the medial temporal lobe in epilepsy.

RESEARCH: The development of novel imaging methods for characterizing the structure, function, and health of tissue, particularly interested the use of tissue mechanics for applications in neurosurgery, neurology, and neuroscience.

HONORS: ▸ Junior Fellow of the International Society for Magnetic Resonance in Medicine ▸ BRAIN Grand Challenges Young Investigator Award, 2014

Paul Braun

MATERIALS SCIENCE & ENGINEERING, BECKMAN INSTITUTE FOR ADVANCED SCIENCE & TECHNOLOGY

SENSOR MATERIALS FOR *IN VIVO* EXTENDED CONTINUOUS GLUCOSE MONITORING

ABSTRACT: Diabetes is a worldwide epidemic, and as such, extensive research efforts towards glucose measurement technologies have been maintained for the last 3 decades. Although continuous glucose monitoring (CGM) has garnered considerable attention due to the advantages in maintaining tight glycemic control, successes in continuous monitoring have been limited, and thus today, most glucose monitoring is still performed using single use test strips. CGM requires sensors with high precision, accuracy, sensitivity and stability, and if possible, a linear response, characteristics that prior to our developments have not been demonstrated in a sensor material. We have now developed a new class of hydrogels that volumetrically respond to glucose with the aforementioned features.

A photonic crystal is incorporated into such glucose responsive hydrogel matrix as a signal transducer to convert the hydrogel volume change into diffracted wavelength shift which is recorded by a spectrometer, although other readout modalities are also possible. The sensor materials meet key CGM requirements in physiological buffer solutions and serum at body temperature. Furthermore, miniaturized devices suitable for *in vivo* blood glucose monitoring can be formed using such sensor materials.

RESEARCH: The formation and study of nano and microstructured materials through self and directed assembly. The Braun group uses and develops new materials chemistry approaches to the synthesis of these materials, which enables realization of novel form factors of matter with advanced functionalities.

HONORS: ▸ Friedrich Wilhelm Bessel Research Award, 2010
▸ Defense Science Study Group, 2010-2011

START-UP COMPANIES: **Autonomic Materials:** self-healing technologies that extend coating lifetimes, minimizing upkeep and repair. (www.autonomicmaterials.com) **Xerion Advanced Battery:** developing next-generation ultra-high power, high energy lithium ion batteries using scalable manufacturing methods. (www.xerionbattery.com)

Stephen Boppart

ELECTRICAL & COMPUTER ENGINEERING, BIO-ENGINEERING, BECKMAN INSTITUTE FOR ADVANCED SCIENCE & TECHNOLOGY

LABEL-FREE MULTIMODAL MULTIPHOTON IMAGING FOR MOLECULAR HISTOPATHOLOGY

ABSTRACT: Multiphoton imaging provides three-dimensional high-resolution imaging, and has been established as a powerful technology in biomedicine. The most attractive aspect of multiphoton imaging is the wealth of molecular contrast that can be generated from various modalities. Coherent anti-Stokes Raman/stimulated Raman scattering (CARS/SRS) probes molecular vibrations, two-/three-photon fluorescence (2PF/3PF) visualizes intrinsic fluorophores, and second/third harmonic generation (SHG/THG) maps non-centrosymmetirc media and heterogeneity. Integrating multiple modalities enables label-free imaging of complementary endogenous biomolecules, and is therefore highly desirable for biomedical diagnostics. However, integration and further clinical translation of these techniques are not trivial due to the complexity of the laser(s) and the imaging system, and the compromises that are often made for multiple modalities. We have developed a solution that uses a compact ultrafast source to replace bulky lasers, and a pulse processing device to arbitrarily tailor the illumination pulses for multiple modalities. We demonstrate an integrated multimodal multiphoton imaging platform using fiber supercontinuum and pulse shaping. The high-quality fiber supercontinuum is generated in a highly nonlinear all-normal-dispersion fiber, achieving a spectrum spanning the optical biological window with high coherence, high power, and long-term stability. Adaptive pulse shaping of the supercontinuum pulses enables high-performance CARS/2PF/SHG/3PF/THG imaging of normal/cancerous human breast tissue, as well as the longitudinal molecular/structural changes during mammary tumor formation in a carcinogen-induced rat tumor model. This multimodal multiphoton imaging platform offers improved simplicity and expanded versatility, and the results show a promising path for the translation and commercialization of multiphoton imaging for molecular histopathology and intraoperative surgical applications.

RESEARCH: Using light to image biological tissue and diagnose disease. Using advanced imaging techniques such as optical coherence tomography (OCT), nonlinear interferometric vibrational imaging (NIVI), interferometric synthetic aperture microscopy (ISAM), and multi-photon microscopy, it is feasible to generate high-resolution, real-time, non-invasive images of biological tissue at the cellular and molecular level for diagnosing diseases such as cancer.

HONORS: ▸ Abel Bliss Professor of Engineering ▸ *MIT Technology Review's* Top 100 Young Innovators in the World, ▸ International Han Sigrist Prize in Laser Medicine, ▸ Fellow of AAAS, IEEE, OSA, SPIE, AIMBE

START-UP COMPANIES: **Photonicare:** developing a handheld imaging tool that enables physicians to quickly and accurately diagnose middle ear infections during routine examinations. (www.photonicareinc.com) **DiagnosticPhotonics:** placing a live view of tissue microstructure at the physician's fingertips, providing immediate insight that enables more informed decisions and better care. (www.diagnosticphotonics.com)

Robotics & Computer Vision

Steven LaValle

COMPUTER SCIENCE

VIRTUAL REALITY: WHAT'S IT GOOD FOR?

ABSTRACT: That is for you to figure out! You may have seen articles appearing everywhere these days on virtual reality (VR) technology and how it is poised to become the next great medium or platform. Industry leaders are investing billions into this field, including the 2014 purchase of Oculus by Facebook for $2 billion. VR has been overhyped before, which led to an unfortunate implosion of interest in the 1990s. The difference now is that the commodity components from the smartphone industry--computers, sensors, and displays--have surprisingly enabled low-cost, wide-field-of-view VR headsets to be mass produced. The question remains: What is this new medium or platform good for? Smartphones were once designed to be telephones, but their success is based on almost everything but making phone calls. Examples include maintaining social networks (Facebook) and arranging transportation (Uber). VR is in the early stage that smart phones were in 15 years ago. The current generation is targeted at video games, but most transformative uses of VR are yet to be discovered. While industry leaders use their experience and power to push in directions that seem like more of the same, we will also see numerous small teams trying completely new ideas from scratch. This is where universities and startups can exert great influence over our future.

RESEARCH: The design of planning algorithms focused on problems that involve continuous spaces, complicated geometric constraints, differential constraints, and/or sensing uncertainties. Such problems are fundamental in areas such as robotics, computer graphics, architectural design, and computational biology.

HONORS: ▸ Director, Motion Planning Lab ▸ Principal scientist at Oculus VR for two years, prior to its aquisition by Facebook. ▸ Featured in Museum of Science and Industry, Chicago's Robot Revolution Exhibit ▸ Editor for IEEE International Conference on Robotics and Automation, ICRA 2013, 2012, 2011.

Mani Golparvar-Fard

CIVIL & ENVIRONMENTAL ENGINEERING

FLYING SUPERINTENDENTS: ACTIONABLE DATA ANALYTICS FOR CONSTRUCTION PROJECTS VIA CAMERA-EQUIPPED DRONES AND 3D BUILDING MODELS

ABSTRACT: Early detection of actual or potential performance deviations in field construction activities is critical to project management. It provides an opportunity to initiate proactive actions to avoid delays or minimize their impacts. Despite their importance, current monitoring practices are tedious and non-systematic. They also involve qualitative assessments and visually complex reporting. This talk addresses these inefficiencies by introducing a new platform that provides the easiest and quickest access to construction performance "analytics" via images captured with camera-equipped aerial robots and 4D (3D+time) building models. The platform offers an end-to-end data analytics solution, including automated data capture, processing, and delivery via an online interactive interface accessible through commodity smartphones and tablets. Several real-world pilot projects will also be presented where the platform is providing actionable analytics on a daily basis to optimize construction workflows.

RESEARCH: Computer vision sensing and analytics for construction performance monitoring

HONORS: ▸ Faculty Entrepreneurial Fellow from the College of Engineering, University of Illinois, 2015 ▸ CETI outstanding early career researcher from FIATECH, 2014 ▸ James R. Croes Medal from the American Society of Civil Engineers, 2013 ▸ CES2013 Innovation Award from Consumer Electronic Show, 2013

START-UP COMPANIES: **CloudPoint Labs:** Transforming planogram auditing, omni-channel retailing, construction monitoring, and automotive experiences with cloud-based computer vision. (www.cloudpoint.io)

Sanjay Patel

ELECTRICAL & COMPUTER ENGINEERING

INVENTING THE FUTURE OF MOBILE IMAGING AT UNIVERSITY OF ILLINOIS AND PERSONIFY

ABSTRACT: Personify was spun out of the University of Illinois in 2010 as a company in the 3D imaging space. Since then, we've enjoyed a symbiotic relationship with the University jointly imagining and developing the future of mobile imaging through technology, design, and product development. Today, Personify is in the vanguard of mobile imaging, developing new ways for people create, broadcast, and share concepts and ideas through video and images captured on their mobile devices. Working with the University, we are embarking on a bold vision whereby mobile devices can be used to capture holographic videos for immersive displays such as VR headsets.

RESEARCH: Computer architecture, ASIC design, imaging, computer vision, mobile sensing, and mobile computing

HONORS: ▸ College of Engineering Willett Faculty Scholar, 2002-2009 ▸ IBM Faculty Partnership Award, 2003-2004, 2004-2005

START-UP COMPANY: **Personify:** using the most advanced technologies in computer vision to develop fresh and immersive video experiences, which can facilitate real and meanginful connections with everyone, everywhere. (www.personify.com)

Ranjitha Kumar

COMPUTER SCIENCE

DATA-DRIVEN DESIGN

ABSTRACT: The Web has transformed the nature of creative work. For the first time, millions of people have a direct outlet for sharing their creations with the world. As a result, the Web has become the largest repository of design knowledge in human history, and the ensuing "democratization of design" has created a critical feedback loop, engendering a new culture of reuse and remixing.

The means and methods designers employ to draw on prior work, however, remain mostly informal and ad hoc. How can content producers find relevant examples amongst hundreds of millions of possibilities and leverage existing design practice to inform and improve their creations? My research explores data-driven techniques for working with examples at scale during the design process, automating search and curation, enabling rapid retargeting, and learning generative probabilistic models to support new design interactions. Knowledge discovery and data mining have revolutionized informatics; in this talk, I'll discuss what we can learn from mining design.

RESEARCH: Human-computer interaction, with a Focus on bringing data mining and machine learning to bear on problems in design.

HONORS: ▸ ACM CHI Best Paper Award, 2013 ▸ ACM UIST Best Paper Nomination, 2012 ▸ Google PhD Fellowship in Design Development, 2011–2013

START-UP COMPANIES: **Apropose:** a start-up out of Stanford that is developing an analytics platform helps designers search, aggregate, and operationalize design data from the millions of sites on the Web. The company closed a $1.875M seed funding round co-led by New Enterprise Associates (NEA) an d Andreesen Horowitz. (www.apropose.com)

Naira Hovakimyan

MECHANICAL SCIENCE & ENGINEERING

DATA-DRONES OF THE SOCIOTECHNICAL SOCIETY OF FUTURE

ABSTRACT: Technological advances today have the potential to transform the life of everybody within the next 20-30 years in a dramatic way. The society of non-distant future assumes co-existence of humans, pilotless planes, driverless cars, and robots, in which machines and human beings share the airspace, the roads, and populate indoor environments. This idea poses significant challenges, falling within the scope of engineering, psychology, social science, politics, ethics, and economics.

Inspired by this vision, we focus on the development of aerial co-robots that are required to safely interact with humans in a shared space and assist humans in a variety of tasks. Potential applications include building situation awareness for public safety, precision farming, health care, assisted living, filming, precision surveying, inspection and many others.

RESEARCH: Robust adaptive control and estimation, networks of autonomous systems, game theory and applications of those in safety-critical systems of aerospace, mechanical, electrical, petroleum, and biomedical engineering.

HONORS: ▸ Grafton and Wilkins Professor of Mechanical Science & Engineering ▸ Society of Women Engineers Achievement Award ▸ American Institute of Aeronautics and Astronautics Mechanics & Control of Flight Award ▸ Humboldt Prize, 2014

START-UP COMPANY: **IntelinAir:** developing data-drones for enhanced situational awareness and real-time decision making in precision farming, public safety, inspection, forestry, and many others. The company closed $1.5 million in seed funding from angel investors in January 2015, and is going for a Series A round this Fall. (www.intelinair.com)

Networked Systems & Security

Brighten Godfrey

COMPUTER SCIENCE

BUILDING TRUSTWORTHY NETWORKS WITH VERIFICATION

ABSTRACT: We rely on network infrastructure to deliver critical services and ensure security. Yet networks today have reached a level of complexity that is far beyond our ability to have confidence in their correct behavior – resulting in significant time investment and security vulnerabilities that can cost millions of dollars, or worse. In this talk, I will discuss the emerging field of network verification, which transforms network security by rigorously checking that the policy intent of a network engineer is correctly realized across the live running network. Our research work developed a technique called data plane verification, which has discovered problems in operational environments and can verify policies with millisecond-level latency in dynamic networks. In just a few years, data plane verification has moved from early research prototypes to production deployment. I'll also discuss the future of network verification in academic research and industry.

RESEARCH: Design and analysis of networked systems and algorithms, low latency networked systems, data center network architectures, software-defined networks, network security and debugging, and social network analysis algorithms.

HONORS: ▸ Sloan Fellowship, 2014 ▸ National Science Foundation CAREER Award, 2012 ▸ IEEE Communications Society & Information Theory Society Joint Paper Award, 2012

START-UP COMPANY: **Veriflow Systems:** commercializing a technology that provides a fundamental advance in the ability to secure online systems. Veriflow Systems is backed by a strong team of investors, including New Enterprise Associates (NEA), the National Science Foundation, and the US Department of Defense. (www.veriflowsystems.com)

Klara Nahrstedt

COMPUTER SCIENCE

IMPACT OF ELECTRIC VEHICLES ON PHYSICAL AND DIGITAL POWER-GRID INFRASTRUCTURE

ABSTRACT: With the rapid increase of electric vehicles in many urban areas, this type of transport has a major impact on the physical infrastructure and on the cyberinfrastructure of our power grid. We will discuss the impact of electric vehicles on (a) road electrification via static and dynamic wireless charging as part of the physical power grid infrastructure and (b) real-time security for V2G (Vehicle-to-Grid) communication as part of the digital power grid infrastructure.

RESEARCH: : Multimedia systems, wireless and wired networks, scheduling, QoS routing, resource management for distributed multimedia systems, 3D tele-immersive systems, and trustworthy cyber-physical systems. Professor Nahrstedt is a leading researcher in multimedia systems and networks. Her fundamental work on QoS routing, energy-efficient dynamic soft-real-time CPU scheduling for mobile multimedia devices (GRACE-OS), and multi-view 3D video distribution algorithms (View-Cast, 4D-Telecast) has been widely recognized in academia and industry.

HONORS: ▸ Director, Coordinated Science Laboratory ▸ Chair, ACM SIG Multimedia, 2007-2013 ▸ $10,000,000 NSF Frontier Award for Trustworthy Health and Wellness (THaW), 2013

Robin Kravets

COMPUTER SCIENCE

THE INTERNET OF THINGS: THE PROMISES AND THE CHALLENGES

ABSTRACT: Every day, users are interacting with hundreds and thousands of devices in both intentional and unintentional ways. Currently, these devices are being linked through local and cloud services to form an Internet of Things (IoT). As users interact with this IoT in stores, museums and other public spaces to find useful localized information, they leave breadcrumbs in the form of information traces about their presence, preferences and behavior. By intentionally exposing pieces of their personal information, users could benefit from complex services and enhanced interactions. Additionally, organizations, including retail locations and museums, can provide sophisticated benefits in exchange for this information. However, to prevent unintentional leaks of personal information, users must be able to manage their information exposure. To this end, the users and organizations need to collaborate through an IoT ecosystem that benefits both the users and organizations, while allowing the users to protect their personal information.

RESEARCH: Communication issues in networks that are challenged by mobility, including wireless LANs, ad hoc networks, sensor network, delay and disruption tolerant networks, vehicular networks, mobile social networks and personal area networks with a focus on solutions that enable effective power management, connectivity management, data transport, congestion management, location management, routing and security.

HONORS: ▸ Co-chair, ACM MobiCom, 2013 ▸ MobileFirst Google Focused Research Grant ▸ Google Open Web Things Expedition

Gul Agha

COMPUTER SCIENCE

BUILDING SMART INFRASTRUCTURE FOR SMART CITIES

ABSTRACT: Over the past 15 years, we have developed software, hardware and networking technology to support sensing as a service for the Internet of Things. We have applied our technology to provide civil infrastructure monitoring solutions. Sensing at multiple scales, we can assess structural conditions in real-time. Such assessments will rationalize maintenance as well as provide situation awareness after extreme events such as earthquakes and hurricanes. Our pilot smart sensor network deployment on bridges demonstrates an attractive value proposition for developing smart cities: providing infrastructure monitoring capabilities to increase efficiency while improving public safety.

RESEARCH: Mechanisms to simplify the development of scalable parallel, distributed and mobile computing systems. Developing concurrent programming languages and systems which support applications with high-performance, fault-tolerance or real-time requirements.

HONORS: ▸ Fellow of the Institute of Electrical and Electronics Engineers (IEEE) ▸ Former Editor-in-Chief of ACM Computer Surveys and of IEEE Parallel and Distributed Technologies ▸ IEEE Computer Society Meritorious Service Award.

START-UP COMPANY: **Embedor Technologies:** monitoring the structural health of civil infrastructure using wireless networked sensors that are capable of sensing at multiple scales to facilitate reliable, real-time structural condition assessment for extreme events and long-term deterioration. (www.embedortech.com)

Poster Sessions

Actif

ALEX LEE

Actif provides wearable technology to promote the active lifestyle. Our system allows the user to effectively communicate with others sharing the road. The technology is integrated into premium build materials to give the user a seamless experience.

AxoBot

KUNHYUCK LEE

AxoBot is developing a pre-fabricated orthosis to help any class of patients with physical disabilities to benefit from the low-cost customizable prosthesis by mass-producing the modulated actuators programmed with optimized "body-movement-algorithm."

Chairdrop

DAVID KIRBY

Chairdrop aims to streamline the traveling experience of people with disabilities by enabling travelers to rent wheelchairs and other medical equipment at their destination, rather than pack and travel with their own.

Corvae

RYAN BROWN

Corvae has created a portable and wireless electrocardiograph monitor with real-time analytics and an intuitive interface. Both raw and processed data are made available wirelessly on web and mobile platforms. The Corvae heart monitoring platform will enable firefighters, nurses, and outpatients peace of mind and efficient data analysis. Corvae aims to provide intuitive displays, wireless connectivity, and real time analytics to customers in need.

Cretmo Labs

ADAM BURNS

42 million manual wheelchair users worldwide, face shoulder injury due to repeated pushing. I3 is a revolutionary and affordable wearable technology that tracks shoulder usage to minimize injury and improve quality of life.

Electricity Demand Forecasting

SPENCER GUERRERO

Campus load is determined by many high electricity consumptive buildings, including labs, dormitories, office buildings, a chilled water plant and the Blue Waters supercomputer. Combining advanced statistical techniques this team has developed and deployed an algorithm that forecasts hourly campus load for the next 5 days. Back tests suggest possible savings for the Urbana campus of 20% on electricity hedging costs.

Invoq Health

MAYANK KALE

Invoq Health builds intuitive and scalable mobile technologies for community health organizations. The software can be used to collect, store, transfer and analyze health data on the field. It empowers organizations to maintain a complete database of their patients and deliver effective health services at point-of-care.

LAIT

JOHN TOENJES AND TONY REIMER

LAIT is a mobile app platform that theatrical producers use to deliver content to audience members instantly, on cue, through their phones. LAIT also can gather audience responses, making each show a two-way interactive experience.

Malleable and Processable Thermoset Based on Dynamic Polyurea

HANZE YING

This team has developed a new type of thermosets materials based on dynamic polyurea. While keeping the advantages of conventional thermosets including high mechanical strength and solvent resistance, the new materials also show new properties of processability and recyclability induced by the feature of reversible urea bond.

Psyonic

AADEEL AKHTAR

Psyonic develops highly advanced prosthetic hands at 10x less cost to improve the lives of people with amputations worldwide.

MetroFlow

NILS OBERG AND BLAKE LANDRY

MetroFlow develops software tools for modeling the water quality of highly-urbanized areas with combined sewer systems.

The Mouve

MARCO FABREGA

The Mouve allows you to create, share, and discover events with your friends and to the masses, while getting real-time footage to give you a sneak peak of what to expect.

Trigger-Induced Activation of Caged Metabolic Precursor for Selective Cell Labeling and Cancer Targeting

HUA WANG

This team has developed a controlled labeling strategy to label cell types of interest with chemical groups. This controlled labeling strategy, coupled with various efficient Click chemistries, can be used for precise diagnosis and treatment of diseases, especially cancers.

Your New Scope

JIMMY NI

Your New Scope produces a wearable treatment kit that makes psoriasis treatment at home easy, especially for severe cases.The product allows treatment to be monitored and adjusted in real time through app/device seamlessly by doctors.

Start-Up Presentations

SHOWN IN ORDER OF PRESENTATION

Start-Ups in Healthcare

PhotoniCare

RYAN SHELTON, PHOTONICAREINC.COM

Developing handheld imaging tools to revolutionize the management of middle ear infections, the leading cause of hearing loss and surgeries in children. PhotoniCare's CLEARVIEW device improves outcomes and reduces healthcare costs, making it a win-win for everyone. Clinical studies using the device are underway at multiple locations across the U.S. The company has raised nearly $2M in non-dilutive capital in 2015 from multiple sources. ▸ Champaign, IL

BioNanoCon

ABHINAV LUTHRA, BIONANOCON.COM

Advancing the progress of membrane protein drug development through Nanodisc technology. Nanodiscs are nanoscale membrane bilayer patches encircled by an amphipathic alpha-helical protein called the membrane scaffold protein. By providing a native-like environment to the membrane protein target, Nanodiscs offer enhanced stability while being homogenous and monodisperse. ▸ Urbana, IL

Electrocyt

BOBBY REDDY, ELECTROCYT.COM

Porting the power of the traditional diagnostic labs to the comfort and convenience of local testing centers and patient's homes with novel devices such as LifeCounts, the world's first handheld Complete Blood Count diagnostic platform.▸ Champaign, IL

Neurolux

TONY BANKS

Providing ultra-miniaturized wireless neural implant devices to the neuroscience community. Ultrathin, flexible optofluidic neural probes enable wireless delivery of agents and optical manipulation in deep brain tissue of freely behaving animals. Combinatorial optogenetic, pharmacological, and viral approaches yield a powerful tool for in vivo dissection of neural circuitry. ▸ Champaign, IL

Phi Optics

CATALIN CHIRITESCU, PHIOPTICS.COM

Developing optical imaging systems through its Quantitative Phase Imaging platfom. Phi Optic's product is an electro-optic device that attaches to new and existing research grade optical microscopes and provides faster and more accurate imaging of live cells and tissues than currently possible with the state-of-the-art technology. ▸ Champaign, IL

IntelliWheels

SCOTT DAIGLE, INTELLIWHEELS.NET

Developing technology to improve mobility options for wheelchair users, including handrim grips, easy-push gears, and wheels designed to reduce stress on shoulders. ▸ Champaign, IL

Glucosentient

TIAN LAN, GLUCOSENTIENT.COM

Developing technology that is transforming the personal glucose meter into a device that is capable of quantitatively and conveniently detecting non-glucose targets. The technology translates the amount of non-glucose target to glucose, which is then measured by the PGM. The technology is robust and widely applicable, including heavy metal ions (environmental monitoring), small molecules (drug monitoring, drugs-of-abuse tests), protein markers (immunoassay diagnostics) and nucleic acid (molecular diagnostics) quantification. ▸ Champaign, IL

Exalt Diagnostics

BRIAN CUNNINGHAM, EXALTDIAGNOSTICS.COM

Imagine having a machine that can perform nearly any biological diagnostic test, including identifying an infectious disease, monitoring for the presence of biomarkers for cancer and heart disease, performing daily viral load tests, checking the authenticity of medications, and detecting allergens in food – and that your machine will instantly share results with your physician and networks of clinicians who use the information to rapidly spot trends that improve the effectiveness of healthcare in entire communities. You, and everyone you know, already owns this machine: It's your smartphone. Exalt Diagnostics was established to commercialize patented technology from the research group of Prof. Brian Cunningham at the University of Illinois at Urbana-Champaign that enables the internal camera of any mobile device to function as a high-sensitivity and high-resolution instrument for point-of-care diagnostics. The company is leveraging NSF-funded research that has resulted in working prototype systems that have been demonstrated for several representative applications with high market potential. ▸ Champaign, IL

Aptimmune Biologics

FEDERICO ZUCKERMANN, APTIMMUNE.COM

Aptimmune is developing mucosal vaccines for viral diseases of swine with a focus on porcine reproductive and respiratory syndrome (PRRS) and influenza. Aptimmune's formulations utilize patented revolutionary technologies. The first product will launch in 2016.▸ Champaign, IL

BioAnalytics

MICHAEL WILLARD, BIOANALYTICSYSTEMS.COM

BioAnalytics is a biotechnology company developing next generation tools for protein analysis. Using a proprietary chemical method of modifying existing antibodies, BioAnalytics is able to amplify antibody binding strength by over 100X. BioAnalytics uses this technique in conjunction with a broadly applicable method of reducing immunoassay complexity and cross reactivity to provide tests with half the number of steps, 2X faster turnaround times, 100X higher sensitivity, 37X improved specificity, and 390X reduced cross reactivity in multiplexed applications. BioAnalytics is currently focused on developing tests for use in academic research and pharmaceutical development, but ultimately plans to apply their technology to point-of-care medical diagnostics. ▸ Champaign, IL

Start-Ups in Engineering/IT

Voxel8

JENNIFER LEWIS, VOXEL8.CO

Providing new functional materials, such as thermoplastics and highly conductive silver ink, with a 3D printing platform to create customized electronic devices like quadcopters, electromagnets, and functional 3D electromechanical assemblies. The company recently announced $12 million in Series A financing; they have been named "one of the 50 smartest companies of 2015" by the MIT Technology Review and "one of the 9 best ideas from CES 2015" by Fast Company. ▸ Somerville, MA

FreeSkies

JAY MULAKALA, FREESKIES.ORG

FreeSkies envisions a world where aerial data collection is simple and accessible to everyone through the development of autonomous software for drones. Our flagship software, the FreeSkies CoPilot, is the best way to capture aerial videos and photos with ease. You don't need to be an expert drone pilot to capture exciting visuals. ▸ San Francisco, CA

OceanComm

ANDY SINGER AND THOMAS RIEDL, OCEANCOMM.CO

Developing a high-speed wireless underwater modem which enables wireless video streaming underwater and wireless remote control of underwater vehicles. Currently, the oil and gas industry heavily relies on remotely operated vehicles (ROVs) to find and produce resources offshore. These vehicles are all tethered today, which results in significant operational costs. A wireless solution could eliminate the costs of having to tether an ROV.
▸ Champaign, IL

Embedor Technologies

GUL AGHA, EMBEDORTECH.COM

Embedor Technologies is creating solutions for monitoring the structural health of civil infrastructure using wireless networked sensors. Embedor's smart sensor platform and software framework are capable of sensing at multiple scales to facilitate reliable, real-time structural condition assessment for extreme events and long-term deterioration. ▸ Champaign, IL

FlipWord

THOMAS REESE, GETFLIPWORD.COM

Developing a browser application that switches a few words on every webpage to the user's desired language, so he or she can learn a new language passively. FlipWord is the winner of the 2015 Cozad New Venture business plan competition at the University of Illinois. ▸ Champaign, IL

AE Machines

ERIC MINNICK, AEMACHINES.COM

Building tools to allow people to design and automate machine movement thereby allowing businesses to implement simple automation in their processes and realize the cost and efficiency gains that accompany such implementation. Initially, AE Machines will be a web-based software provider, allowing non-technical users to design and program simple machines via an intuitive user interface. ▸ Champaign, IL

Agrible

CHRISTOPHER M. HARBOURT, AGRIBLE.COM

Agrible creates analytic tools for farmers and agriculture companies that provide field-specific data and forecasts to help with decision-making in the field. Each morning, the company's flagship product, Morning Farm Report, provides growers with information on yields, fieldwork logistics, rainfall, and more, specific to their fields. This enables them to make the best decisions based on the best agronomic data available. Agrible won the 2015 Innovation Celebration Entrepreneurial Excellence: New Venture Award. ▸ Champaign, IL

Wearifi

TONY BANKS

Providing the world's thinnest, smallest, most flexible, and most lightweight near-field communication wearable device technology. ▸ Champaign, IL

Network Perception

BILL SANDERS AND ROBIN BERTHIER, NETWORK-PERCEPTION.COM

Developing and launching firewall analysis technology for critical infrastructures. Network Perception's software solutions automatically audit the security and compliance of critical networks by analyzing the configurations of firewalls and routers. ▸ Champaign, IL

Harmonia

RICK TAUBE, ILLIACSOFTWARE.COM

Building music technologies for the 21st century. Harmonia software provides realtime music analysis, automatic grading, and course analytics. Harmonia was awarded a $225,000 STTR Phase I grant in 2014. ▸ Champaign, IL

Office of Technology Management

University of Illinois at Urbana-Champaign, Ceramics Building, Suite 319, 105 S. Goodwin Avenue, Urbana, IL 61801
217.333.7862 • otm@illinois.edu • otm.illinois.edu • Twitter: @ILinnovations

DIRECTOR

Lesley Millar-Nicholson • 217.333.6807 • millar@illinois.edu

PORTFOLIO MANAGEMENT BY AREA

AGRICULTURE & VETERINARY MEDICINE

Brad Edwards, Technology Manager
217.244.6453 • ebedward@illinois.edu

COMPUTER SCIENCE

Svetlana Vranic-Sowers, Senior Technology Manager
217.244.7243 • svsowers@illinois.edu

LIFE SCIENCES

Lisa Dhar, Senior Associate Director
217.333.3715 • ldhar10@illinois.edu

RK Narayanan, Ph.D., Associate Technology Manager
217.300.1614 • rkn@illinois.edu

ENGINEERING

Nathan Hoffmann, Assistant Director
217.244.4747 • nhoffma2@illinois.edu

Jeffrey Wallace, Senior Technology Manager
217-265-0548 • jrwallac@illinois.edu

Steven Wille, Associate Director
217.244.5956 • stvwille@illinois.edu

ARTS, EDUCATION, SOCIAL SCIENCES & HUMANITIES

Steven Wille, Associate Director
217.244.5956 • stvwille@illinois.edu

Research Park and EnterpriseWorks

University of Illinois at Urbana-Champaign, 60 Hazelwood Drive, Champaign, IL 61820
217.333.8324 • researchpark.illinois.edu • Twitter: @UIResearchPark

DIRECTOR

Laura Frerichs • 217.333.8323 • lfrerich@illinois.edu

ASSOCIATE DIRECTOR

Laura Bleill • 217.244.7744 • lwbleill@illinois.edu

Design: Lauren Allen; www.laurenallendesign.com