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EMERGING TECHNOLOGIES FOR A SMARTER WORLD

13th International
Conference and Expo
November 7th & 8th
CEWIT

PROCEEDINGS

Center of Excellence
WIRELESS AND INFORMATION TECHNOLOGY
AT STONY BROOK UNIVERSITY

AGENDA

Tuesday, November 7, 2017

8:00AM - 6:30PM	International B2B Meetings		
8:00AM - 9:00AM	Welcome, Registration, Continental Breakfast, & B2B Networking		
9:00AM - 11:30AM	Breakout Session 1		
	TRACK A **HEALTH TECHNOLOGIES** **Social Determinants with Big Data & Machine Learning to Disrupt $3T US Healthcare Market** **Taking the Big Leap from a Great Scientific Concept to Commercial Viability** **Enplants: A Theoretical Transdisciplinary Cognitive Augmentation Technology Illustrating the Critical Role of Imagination in Envisioning Future Science Scenarios** **Artificial Neural Network with Electroencephalogram Sensors for Brainwave Interpretation: Brain-Observer-Indicator Development Challenges** **Cost, Convenience and Chaos Guide the Consumer Health Journey – Now What?!** **Qualitative Imaging Pathology (QuIP): Towards Generation, Management, and Exploration of Combined Radiomics and Pathomics Datasets for Cancer Research**	**TRACK B** **SMART MANUFACTURING** **Manufacturing USA and the Digital Manufacturing & Design Innovation Institute: Advancing Manufacturing Technologies Across the USA** **Digital Manufacturing Research and Applications** **Data-driven Manufacturing System Modeling and Control** **Smart Robots for Smart Manufacturing** **Cybersecurity Standards and Compliance Mandates**	**TRACK C** **BUSINESS** **VENTURE CAPITAL PANEL** **OPEN PITCH CHALLENGE & INTERNATIONAL B2B**
11:45AM - 12:30PM	Opening Keynote		
12:30PM - 1:45PM	Luncheon		
1:45PM - 4:00PM	Breakout Session 2		
	TRACK A **HEALTH TECHNOLOGIES** **Aging in Place** **An Authentication Protocol for Wearable Medical Devices** **A Virtual Reality Grocery Shopping Game to Improve Heath Awareness in Young Adults** **How Technology is Shaping the Future of People with Developmental Disabilities** **Telemedicine And Vulnerable Populations: Improving Access and Care For Those Who Need It Most**	**TRACK B** **INTERNET OF THINGS** **5G Wireless - Way More Than Higher Data Rates** **Joint Resouce Allocation and Routing in Wireless Cognitive Radio Networks** **Robust Computation Offloading and Resource Scheduling in Mobile Edge Computing** **A Convolutional Neural Network for Transit Mode Detection Based on Smartphone Platform** **Mobile Edge Cloud Architecture** **Can AC Computing be an Alternative for Wirelessly Powered IoT Devices?**	**TRACK C** **BUSINESS:** **PITCH CLINIC** **ENTREPRENEUR'S TOOLKIT TALKS** **Positioning your Company for Fundability** **How to Assemble a Board of Advisors**
4:15PM - 5:30PM	Chief Technology Officer Panel		
5:30PM - 6:30PM	Cocktail Reception, Research Poster Session & B2B Networking		

Wednesday, November 8, 2017

8:00AM - 9:00AM	Continental Breakfast & B2B Networking
9:00AM - 11:30AM	Breakout Session 3

TRACK A
CYBERSECURITY

- Securing Software Updates In IoT: Does One Size Fit All?
- Challenge Cases for Collaboration with Industry and Academia in Anomaly Detection Algorithm Research Cost, Convenience and Chaos Guide the Consumer Health Journey – Now What?
- Android Security and Lifecycle Management
- Inside Cybersecurity – Why Security is Failing?
- IPv6 Based WSN Performance Analysis
- A Cloud Computing Service that Protects Client Devices and Enterprises from Malware in Email Attachments and Web Sites
- Cybersecurity Challenges of Systems-of-Systems for Fully-Autonomous Road Vehicles

TRACK B
SMART URBAN SYSTEMS

- Research and Modeling for Intelligent Fault Diagnosis of Air Conditioning System in Electric Bus
- Mobile IPv6 Protocols and High Efficiency Video Coding For Smart City IoT Applications Cybersecurity Standards and Compliance Mandates
- Forewarned is Forearmed – Predicting Construction Related Traffic Conditions
- Improving the Consumption and Water Heating Efficiency in Smart Buildings
- Smart Buildings and Smart Cities and Everything Around Them
- Determining Optimal Locations of Electrified Transportation Infrastructure on Interstate/US-Highways
- Panasonic LinkRay Solution: Information at the Speed of Light

TRACK C
BUSINESS

ENTREPRENEUR'S TOOLKIT TALKS

- What is Patentable?
- Tax Matters for Technology Ventures
- How to Identify and Win SBIR Contracts
- Alan Alda Center for Communicating Science

TRACK D
VISUAL & DECISION INFORMATICS

- CVDI Visual Exploration of Big Data
- Semantic Information Integration and Applications in Biomedical and Health-care Domains
- Reinforcement Learning Based Decision Informatics in CVDI
- Crossroads Between Signal Processing and Machine Learning – CVDI Approach
- Data Management for Visual Analytics on Data Streams

11:45AM - 12:30PM	Closing Keynote
12:30PM - 2:00PM	Luncheon
2:00PM	Conference Adjourned

ABSTRACTS

Tuesday, November 7 • Breakout Session 1 • 9:00AM - 11:30AM

TRACK A • HEALTH TECHNOLOGIES

SOCIAL DETERMINANTS WITH BIG DATA & MACHINE LEARNING TO DISRUPT $3T US HEALTHCARE MARKET

Eugene Sayan, CEO, Softheon, Inc.

The social determinants of health are the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. With Big Data and Machine Learning to analyze over 2.4M lives for 40% insurance carriers participating in ObamaCare, Softheon is leading the social determinants research to make healthcare affordable and plentiful.

Eugene Sayan leads Softheon in its mission to develop innovative solutions for healthcare payers, providers, and government agencies. Since 2000, he has been responsible for the corporate strategic vision and direction. Prior to Softheon, he led big data and process management initiatives for Fortune 1000 companies and completed a tenure at IBM. He received a bachelor's degree in electrical engineering & telecommunication from Istanbul Technical University and a Masters in Computer Science from the New York Institute of Technology.

TAKING THE BIG LEAP FROM A GREAT SCIENTIFIC CONCEPT TO COMMERCIAL VIABILITY

Robert J. Beckman, Managing Partner, The Channel Group, LLC/BioMed Transition Partners

In virtually every academic center around the globe, there is a scientist today who is working on a medical technology innovation which she or he believes will have significant impact on improved healthcare outcomes. Yet, beyond receiving academic grants, few receive interest or support from professional investors and even fewer develop into viable commercial entities. The road to success is long and littered with unanticipated challenges. But, for those who persevere, the satisfaction and glow of personal achievement and potential rewards are worth the considerable effort and commitment. Every medical technology innovation requires capital. Each day multiple business plans arrive on the desks of investors promising that the company's medical technology will revolutionize medicine and will uproot the status quo of the standard of care. Each promising huge profit return from rapid growth. Most are based on conceptual science with little if any proof of principle. Many identify market size that is highly circumspect and even worse the promise of unachievable market share. To break through the clutter great science should be paired with an enlightened view of the large number of issues that will need to be addressed and a strategic framework that recognizes the need for expert collaboration and external support....and most importantly an open mind. "Taking the Big Leap from Great Scientific Concept to Commercial Viability" will provide a practical framework for advancing ideas into meaningful concepts that might attract the interest of those who can help transform ideas into approved products.

Robert Beckman is the founder and Managing Partner of The Channel Group (TCG), a strategic advisory company focused on venture development and strategic transactions in healthcare. Each of the TCG partners have advanced degrees in science/medicine and most have been leaders in large and entrepreneurial companies. Formed in 2002, TCG works with clients around the globe in biotechnology, medical technology, clinical diagnostics, imaging and research tools. TCG has alliance partners in investment banking and, European and Israel based clinical /regulatory and commercial development. Beckman has served in the executive leadership of healthcare companies in both Fortune 500 companies and entrepreneurial startups. He was one of the founders and served in Board leadership at BIO and the New York Biotechnology Association (now NYBIO). He has a long history and continues to be engaged globally in supporting the development healthcare innovation. Mr. Beckman studied in undergraduate and graduate programs in Pharmaceuticals at Columbia University. He spent his early career in strategic planning for large healthcare companies in pharmaceuticals, clinical diagnostics and medical technology. He joined Revlon Healthcare as Vice President, Marketing Services and advanced to the position of General Manager of the Biochemical and Diagnostic Division of companies there. After Revlon's pharmaceutical businesses were acquired by Rorer Pharmaceuticals, Mr. Beckman led a management buyout of a division of Armour Pharmaceuticals, which became the foundation of Intergen Company. As Founder and CEO of Intergen Mr. Beckman executed a successful acquisition campaign and built a profitable manufacturing-based life science company with facilities globally. Intergen was sold in 2002 and The Channel Group was formed soon after.

ENPLANTS: A THEORETICAL TRANSDISCIPLINARY COGNITIVE AUGMENTATION TECHNOLOGY ILLUSTRATING THE CRITICAL ROLE OF IMAGINATION IN ENVISIONING FUTURE SCIENCE SCENARIOS

S.Mason Dambrot, Research Fellow, Brain-Machine Interface Consortium, Artificial General Intelligence Society

The future is inherently probabilistic and therefore not deterministically knowable, thereby often fueling an often incorrect conservative perspective asserting that attempts to envision alternate futures diverging from current facts is of little use, and even impossible. Nevertheless, constructing theoretical science/technology scenarios that may emerge in the medium- to long-term future involves a number of well-established methodologies that rationalizing these efforts. At the same time, however, the ability to foresee these unknown developments that lie beyond current knowledge requires the rather nontechnical creative use of imagination. A critical component of both my thesis of Exocortical Cognition (IEEE Xplore, 2017)—and particularly in my accompanying CEWIT 2017 paper that expands on the key Exocortical Cognition component of enplants (endogenous implants) and proposes a hypothetical method in which future transdisciplinary generations of synthetic genomics, bionanotechnology and counterfactual keyless quantum entanglement make possible the synthetic genomic expression of technology-capable neural tissue for surgery-free neuroprostheses. This proposed technology could allow implant-free real-time Biological Brain-Machine Interface (B2MI) functionality without invasive transcranial surgery or the tissue inflammation and other complications associated with current neuroprosthetic implants. To these ends, this presentation has describes my proposed Exocortical Cognition framework, and details of my hypothetical enplant technology; the primary techniques (both deterministic and imaginative) used to envision and construct future scenarios; and the interdigitation between these two realms of inquiry, research and development.

S. Mason Dambrot is a Research Fellow at Artificial General Intelligence Society, and Research Fellow at Brain Machine Interface Consortium. He is a member of the Institute of Electrical and Electronics Engineers; IEEE Systems, Man and Cybernetics Society; IEEE Engineering in Medicine and Biology Society; IEEE Future Directions Committee Symbiotic Autonomous Systems Initiative, IEEE Brain Community; IEEE Life Sciences Community; IEEE Nanotechnology Council; IEEE Sensors Council; Humanity+ (previous Board Member); and Lifeboat Foundation (Advisory Board). As an invited speaker and panelist, he has spoken on Exocortical Cognition, Synthetic Biology, Philosophy of Science, Post-Scarcity Economics, Sociopolitical Futures, Transhumanism, and other topics at the 2016 IEEE International Conference on Systems, Man and Cybernetics (SMC 2016), New York Academy of Sciences, City University of New York, Cooper-Union, Extreme Futures Technology and Forecasting Conference, World Technology Summit, Science House, Singularity NYC, New York Future Salon, and other venues. Mason's recent publications include Exocortical Cognition: Heads in the Cloud—A transdisciplinary framework for augmenting human high-level cognitive processes (IEEE Xplore, 2017); Enplants: Genomically engineered neural tissue with neuroprosthetic and communications functionality (in review); The Zeitgeist of Change: The evolutionary neurobiology of political behavior and Of Mind and Money: Post-scarcity economics and human nature (Transpolitica.org and Kindle, 2015); and Neuroprosthetics: Past, Present, and Future, a chapter in Brain Computer Interfaces Handbook: Technological and Theoretical Advances (Taylor & Francis Group, in press). He has an interdisciplinary background in Neuroscience, Artificial Intelligence, Complexity Theory, Philosophy of Science, and Ethics.

ARTIFICIAL NEURAL NETWORK WITH ELECTRO-ENCEPHALOGRAM SENSORS FOR BRAINWAVE INTERPRETATION: BRAIN-OBSERVER-INDICATOR DEVELOPMENT CHALLENGES

Nicholas Polosky, Associate Computer Scientist/Engineer I, ANDRO Computational Solutions, LLC

This paper reports on challenges associated with the development of an electroencephalogram (EEG) based personalized device for monitoring of brain activities pertaining large scale neural dynamics. The envisioned device interprets signals and categorizes them on classes of typical responses. This could enable a speechless interaction between an observer and a participant wearing the device. This framework is different from the brain-computer-interface (BCI) framework as it focuses on indicators relevant to the human observer, brain-observer-indicator (BOI). EEG detects resting states of the brain with associated patterns, rhythms, synchrony between regions, and spectral changes in response to a cognitive event. Event-related-potential (ERP), derived from EEGs, reflects the changes in electrical activity in response to stimuli. Deflections in the ERP reflect specific aspects of cognitive processes associated with various stimuli. Detailed imaging of brain wave signal origins is important for studies of neurological processes, but for many everyday smart applications these levels of detail are superfluous. Recognition of patterns of brain activity from ERPs and oscillatory processes have a broad application base, if the pattern-activity mechanism is characterized for each application. The scope of the project includes research and development of a smart interaction support system BOI relying on utilization of an EEG toolkit and an artificial neural network for personalizing the applications. The objective is to develop software that will support applications requiring feedback (training, integrity, simple actions), along with a method for obtaining statistical data on the associated brain activity for engineering studies geared to improve signal acquisition and device performance for each application. The intent is to support the market of wearable devices and to enable an observer to obtain a real-time feedback from a participant. For example, a feedback regarding the participant's thinking is derived from measurements, and assessed to evaluate such indicators as concentration (boredom, flow, frazzle), understanding (yes, no, etc.), etc. These indicators are important to observer for improving the quality of interaction. The methodology is to utilize data from databases and simulations relying on standard EEG measurement sets to develop the framework for software with an artificial neural network in its core to accommodate application-specific development, enable personalization, and set placeholders for new features. In future, this initial capability will be evaluated with human subjects, refined to reduce clutter and noise, address useful signal variances and latencies for typical categories of thoughts. The findings from preliminary stages of the project are encouraging but indicate multiple challenges that must be addresses including a trade between a reduction of noise and complexity of classification software, improvements in pattern recognition and definition of classes. Specific challenges we will discuss in the paper include categorization of patterns, patterns recognition in noise free simulated environment, de-noising strategies in anticipating environment, and artificial neural network performance criteria. Intended results are application framework for evaluation of BOI in medical, education, and entertainment settings.

COST, CONVENIENCE AND CHAOS GUIDE THE CONSUMER HEALTH JOURNEY – NOW WHAT?!

Gil Bashe, Managing Partner, Global Health Health, Finn Partner

Gone is the day of the family physician. Gone is the day when ""see your doctor"" drove brand-selection conversation. Today, patients maintain a relationship with a health insurance plan for three-to-five year at most, and their connection to a family physician for even less. In the United States, the multi-payer system lacking universal electronic health records, has transformed the American consumer into a free-agent within the payer system. Mega pharma, provider and payer enterprises no longer have solutions to unify the very fragmented health system. Entrepreneurs and innovators have a vital role to play in healing the US heath system. How? During this presentation, Gil will share information from the proprietary FINN Futures Health data - a 1,000 person study examining the influence of economics on American health decisions and choice - including the relationship among patient, physician, payer and product innovator. The session will outline how entrepreneurs need to position their products with private equity and business partners to advance their ideas within the marketplace.

Gil Bashe's healthcare career spans patient, physician, provider, payer, and policy sectors. At the center of Gil's life and work is the belief that communication influences quality patient care. Prior to joining Finn Partners, Gil was Executive VP and Health Practice Director at Makovsky for more than 12 years. During his tenure, Gil was named by PR News as one of the nation's "Top Crisis Communicators" and inducted into its Hall of Fame. Gil is among the few communications executives with private-equity background. In 1999, he was tapped by GTCR Golder Rauner, one of the nation's largest venture funds, as CEO of Health!Quest Communications. An integrated marketer, he led CommonHealth, the global WPP Group health-marketing network and at its sister-company Hill & Knowlton, he was the first global Practice Director for its Health and Pharmaceutical Practice. Before this, Gil led the specialist healthcare firm, Medicus PR, recognized in 1994 by the influential industry publication Inside PR as "Hottest Healthcare Agency." That same year, he was named by Inside PR as "Health and Medical All-Star." Winner of numerous awards for creativity and industry leadership, including the PharmaVOICE 100 in 2016, he was listed among "The Top Brains in the New World of Work" by Fast Company magazine. Gil is immediate-past chair of the American Heart Association (AHA) Founder's Affiliate and an advisory board member of the Galien Foundation.

QUALITATIVE IMAGING PATHOLOGY (QUIP): TOWARDS GENERATION, MANAGEMENT, AND EXPLORATION OF COMBINED RADIOMICS AND PATHOMICS DATASETS FOR CANCER RESEARCH

Erich Bremer, Director for Cyberinfrastructure, Health Sciences Division of Applied Informatics, School of Medicine, Stony Brook University

Cancer is a complex multifactorial disease state and the ability to anticipate and steer treatment results will require information synthesis across multiple scales from the host to the molecular level. Radiomics and Pathomics, where image features are extracted from routine diagnostic Radiology and Pathology studies, are also evolving as valuable diagnostic and prognostic indicators in cancer. This information explosion provides new opportunities for integrated, multi-scale investigation of cancer, but also mandates a need to build systematic and integrated approaches to manage, query and mine combined Radiomics and Pathomics data. In this talk, we will describe a suite of tools and web-based applications towards building a comprehensive framework to support the generation, management and interrogation of large volumes of Radiomics and Pathomics feature sets and the investigation of correlations between image features, molecular data, and clinical outcome. This system is named QuIP.

Erich Bremer is the Director for Applied Informatics, Department of Biomedical Informatics (BMI), supervising a team of software developers for multiple projects within BMI. He has served as the Advisory Council representative for Stony Brook University to the World Web Consortium (W3C) for several years participating in the development of WebID, a de-centralized authentication and identity system for the Web. Prior to this, he served as the Associate Director for Medical Informatics, and lead engineer and director for the Academic Research Computing and Networking (ARCAN) for Stony Brook Medicine. He has varied background in computers with expertise in networking, systems, databases, and software development but currently is focused of W3C Semantic Web Technologies including RDF, SPARQL, and OWL-based ontologies for various areas like Pathomics and collaborative imaging systems using W3C-based technologies. He received his MSc and BS in Computer and Systems Engineering at Rensselaer Polytechnic Institute of Technology in 1991 and 1990, respectively, and is currently a part-time PhD student in Computer Science at Stony Brook University.

ABSTRACTS

Tuesday, November 7 • Breakout Session 1 • 9:00AM - 11:30AM

TRACK B • SMART MANUFACTURING

SESSION OVERVIEW

Moderator: William Murray, Business Development, Digital & Additive Manufacturing, New York State Division of Science, Technology & Innovation (NYSTAR)

Smart Manufacturing, more popularly known as Digital Manufacturing, or Industrial Revolution 4.0, looks at a product over the entire life cycle – from idea creation on the back of a napkin, to end of life/disposal of the product. Digital Manufacturing is about connecting all aspects of the life cycle with data, and using that data in such a way to derive as much efficiency and effectiveness as possible. We call this the "digital thread". In this session, you will hear from five different experts in various elements of Digital Manufacturing discussing some of the exciting things going on in this realm. Energy saving strategies in manufacturing, robotics applications, cybersecurity, the Digital Manufacturing Design and Innovation Institute (DMDII) and more.

Bill Murray is one of four New York Manufacturing Extension Partnership (NY MEP) representatives embedded in the Manufacturing USA innovation institutes, under a grant from NIST-MEP administered by Empire State Development's Division of Science, Technology & Innovation. Bill is supporting two Manufacturing USA Federal manufacturing Institutes: America Makes (Additive Manufacturing) and DMDII (Digital Manufacturing). Both Institutes are represented in New York State through RIT, located in Rochester NY. Bill's role is to promote these two institutes to small and medium-sized manufacturers across New York State to strengthen their competitiveness. Prior to joining ESD Bill was a volunteer doing humanitarian work for the North Country Mission of Hope in Nicaragua for one year. Before that he was the Executive Director for CITEC, the MEP Center serving the North Country region of New York State.

MANUFACTURING USA AND THE DIGITAL MANUFACTURING & DESIGN INNOVATION INSTITUTE: ADVANCING MANUFACTURING TECHNOLOGIES ACROSS THE USA

Michael Fornasiero, Program Manager, Workforce Development and SMM Engagement, UI Labs

Technology in our daily lives is evolving rapidly and the same goes for the technologies impacting a manufacturing enterprise. These advancements and transformations offer exciting new opportunities for those who understand how to embrace the changes ahead and lead their organizations through evolution. Few leaders will escape the challenge of digital transformation and even fewer organizations will thrive, let alone survive, if they fail to adopt new technologies and adapt their workforce. The Digital Manufacturing and Design Innovation Institute (DMDII) is working to digitize manufacturing enterprises and their supply chains as part of the Manufacturing USA network of public-private partnerships. This network of institutes reaches across manufacturers, government organizations, and academic institutions to advance manufacturing research, technology transition, and workforce development. Manufacturing USA was formally established in 2014 to increase U.S. manufacturing competitiveness and promote a robust and sustainable national manufacturing R&D infrastructure. The Manufacturing USA network is operated by the interagency Advanced Manufacturing National Program Office (AMNPO), headquartered in the National Institute of Standards and Technology (NIST), in the Department of Commerce, the office operates in partnership with the Department of Defense, the Department of Energy, NASA, the National Science Foundation, and the Departments of Education, Agriculture, and Labor. In this talk you will learn more about Manufacturing USA, its network of institutes, and the programs at DMDII that are driving the advancement of digital manufacturing and design technologies across both large industry and small to mid-sized manufacturers. We will also explore the impact that digital transformation will have on manufacturing organizations, the steps they can take to plan successful technology adoption, and some of the current workforce hurdles faced by manufacturers and their impact on our economy.

Michael Fornasiero is the Program Manager of Workforce Development and SMM Engagement at UI LABS. In his role, Michael is responsible for the development of strategy and programs focused on workforce development, and advancing the adoption of new technologies by small to midsized manufacturers. UI LABS' workforce development programs focus on building both awareness and capabilities in students and workers that engage with digital manufacturing and design technologies, along with helping industry and academic leaders understand how emerging technologies are impacting jobs and their organizations. Prior to joining UI LABS in 2016 as the American Society of Mechanical Engineers Advanced Manufacturing Fellow, Michael was a Mechanical Engineer at GE Global Research in the Manufacturing Processes Lab where he worked on challenges in Additive Manufacturing, Non-traditional Machining, Automation, and Simulation. He has a master's in Mechanical Engineering from Rensselaer Polytechnic (NSF GK-12 Fellow) and a bachelor's in Mechanical Engineering from Clarkson University.

DIGITAL MANUFACTURING RESEARCH AND APPLICATIONS

Michael Thurston, Research Professor and Director, Center of Excellence in Advanced & Sustainable Manufacturing, Rochester Institute of Technology

Digital manufacturing is a major component of the fourth industrial revolution that is represented by Industry 4.0. This presentation will provide a brief overview of digital manufacturing and the Digital Manufacturing and Design Innovation Institute. Digital manufacturing research currently underway at RIT in Design for Manufacturing and Augmented Reality for Manufacturing Applications will be reviewed.

Dr. Michael Thurston is the Technical Director of the Golisano Institute for Sustainability at Rochester Institute of Technology. He is also Director of the NY State Center of Excellence in Advanced and Sustainable Manufacturing located at RIT. Dr. Thurston has Mechanical Engineering degrees from RIT and completed his PhD at the University of Buffalo. He has been working at RIT in the area of sustainable production since 2001. Prior to that he worked at General Motors and Delphi in new product development. Dr. Thurston is involved with several Manufacturing USA Institutes. He currently serves on the Technical Advisory and Executive Committees of the Digital Manufacturing and Design Innovation Institute (DMDII), a Department of Defense sponsored Institute, and is leading several research projects in this area. Dr. Thurston is also the Remanufacturing technology lead for the newly awarded Department of Energy REMADE Institute which will be headquartered in Rochester.

DATA-DRIVEN MANUFACTURING SYSTEM MODELING AND CONTROL

Qing Chang, Professor, Department of Mechanical Engineering, Stony Brook University

Today's Factory operation faces ever-increasing challenges of variability due to greater customization, new technology insertions, random disruptions (e.g., random machine failures) and

dramatically fluctuating market demands. In order to stay competitive and continue to capture economic benefits, one must understand the complex dynamics of the manufacturing system to properly identify inefficiencies and cost savings opportunities on the production line. We developed a data-driven modeling and analysis method to monitor production system real-time performance. In the meanwhile, an efficient system diagnostic/prognostic tool is developed to identify bottlenecks and permanent production loss. Based on the analysis, a decision support tool including an adaptive decentralized control mechanism and supervisory control methods are devised. We demonstrated through case study (based on automotive production lines) that the method can effectively identify the system inefficiency and mitigate the problem to improve overall profits.

Professor Qing (Cindy) Chang's research interest includes manufacturing dynamic system modeling and simulation, real-time energy management of manufacturing systems, real-time production control, intelligent maintenance of manufacturing systems and battery manufacturing and re-manufacturing. Dr. Chang received a CAREER award from the National Science Foundation (NSF) in 2014. Before joining Stony Brook in 2011, she worked in General Motors Research & Development Center, where she won General Motors Boss Kettering Awards and The Charles L. McCuen Special Achievement Awards. She has published 70+ refereed journal articles and conference papers and holds 3 United States patents. Dr. Chang has served on numerous international/domestic conference/symposium organizing committees and chairmanships of technical sessions for IEEE, ASME, SAE, and SME etc. Dr. Chang obtained M.S. in Mechanical Engineering from University of Wisconsin – Madison and PhD in Mechanical Engineering from University of Michigan – Ann Arbor.

SMART ROBOTS FOR SMART MANUFACTURING

John Wen, Professor and Head, Industrial and Systems Engineering (ISE), Rensselaer Polytechnic Institute

Industrial robot is experiencing unprecedented growth, driven by increasing automation in factories and wider adoption across the globe. However, their use is mostly for high volume, repetitive tasks such as in automotive welding, painting, part transfer etc. For less structured tasks such as assembly and inspection, which requires dexterity and perception, and for rapid repurposing between short-run jobs, effective deployment of robots remain challenging. A key issue is that the vast majority of today's industrial robots are programmed by the laborious teach-and-playback method and do not tightly integrate sensor measurements with robot motion. In addition, the sheer weight and rigidity of these robots and their lack of sensor integration means human workers stay out of the robot workspace and do not routinely interact with them. To be effective in the emerging smart factories, robots need to be collaborative, safe, cognitive, and mobile; in other words, become smarter. In particularly, they need to be quickly repurposed for different tasks, incorporate a multitude of sensors in their operations, keep track of human workers and other robots for better coordination in addition to safety, and be able to navigate in semi-structured environments. In response to these needs, new "collaborative robots," smart sensors and soft actuators have been developed. The key to harness the potential of this new development is the algorithms and software that enable component integration to achieve robust new capabilities. Robot Operating System (ROS) is an open-source distributed communication platform developed by Willow Garage a decade ago to address this need. ROS allows the robotic community to share and improve algorithms and use crowd-sourcing to address common challenges. The impact has been transformative. To date, there are thousands of open-source packages providing tools for motion planning, machine vision, machine learning, navigation, simulation and visualization, and many others. However, there are significant barriers for industrial deployment due to the cost of adoption and learning curve for workers. The recently established Advanced Robotics for Manufacturing (ARM) Institute, as part of the Manufacturing USA Network, is focusing on addressing these obstacles. The goal is to bring the transformative impact from research labs to the factory floor. This talk will discuss the vision and approach of the ARM Institute, its technical and education roadmaps, and several example projects on combining open source software algorithms with proprietary platforms to render industrial robots smarter and effective in industrial environments. The ARM Institute also intersects with other Manufacturing USA Institutes in broad technology areas such as smart manufacturing and digital manufacturing, and focused application areas such as composites manufacturing, biopharmaceutical manufacturing, and lightweight metal manufacturing.

John T. Wen received B.Eng. from McGill University, M.S. from University of Illinois, and Ph.D. from Rensselaer Polytechnic Institute, all in Electrical Engineering. He was a system engineer at Fisher Controls, and a member of technical staff at the Jet Propulsion Laboratory. Since 1988, he has been with Rensselaer Polytechnic Institute where he is currently the Head of Industrial and Systems Engineering and a Professor in the Department of Electrical, Computer, and Systems Engineering. From 2005-2013, he served as the Director of the Center for Automation Technologies and Systems (CATS), a New York State designated Center for Advanced Technology. He co-leads the New York State participation in the recently awarded DOD Manufacturing USA Institute, Advanced Robotics for Manufacturing (ARM). He was awarded the 2013 IEEE Control Systems Society Transition to Practice Award base in part on his co-invention of the Adaptive Scanning Optical Microscope (ASOM). Dr. Wen's research interest lies in the modeling and control of dynamical systems with applications to precision motion, robotic manipulation, distributed systems, thermal management, and materials processing. Dr. Wen is a Fellow of IEEE.

CYBERSECURITY STANDARDS AND COMPLIANCE MANDATES

Randall Sandone, Executive Director, Critical Infrastructure Resilience Institute, University of Illinois at Urbana-Champaign

Driven by market dynamics, evolving legal and contractual liability concerns, and new government mandates, a sea-change is occurring in the realm of cybersecurity. The long elusive search for the holy grail of cybersecurity – the one product that would solve our cybersecurity problems – is finally beginning to be abandoned in favor of a more practical, more effective, more rational focus on ongoing cyber risk management practices. The shift represents a tacit recognition that we will probably never really solve the cybersecurity problem. Instead, we must implement and maintain sound, standardized cyber risk management techniques and practices that seek to identify and reduce risks and vulnerabilities to systems; to detect and appropriately respond to attacks; and to recover normal operations as quickly as possible after an attack. Implementing such mature cyber risk management practices is not a one-off exercise. It is an ongoing and critical business process that requires the active participation of management, operational staff, as well as information technology staff.

Voluntary adoption and maintenance of "home-grown" cyber risk management practices may soon be a thing of the past. In response to Presidential Executive Order 13636, the National Institute of Standards and Technology (NIST) produced and published the NIST Cyber Security Framework (CSF) to serve as a standard cyber risk management process for government and industry alike. Since its publication, the NIST CSF has seen rapid and wide scale adoption as a government standard and is increasingly being eyed by the insurance industry, acquisition professionals, and industry associations as a potential industry

ABSTRACTS

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TRACK C • BUSINESS

standard to which compliance may become mandated by contracts or by market pressures.

Also in response to Executive Order 13636, the Department of Defense released a modification to the Defense Federal Acquisition Regulations mandating that all defense contractors handling controlled unclassified information meet heightened cybersecurity protections detailed in NIST Special Publication 800-171. Failure to meet the NIST 800-171 criteria could lead to disbarment and ineligibility to obtain defense contracts. Prime contractors will be held responsible through flow-down provisions for the compliance of their subcontractors and supply chain members.

How are market forces driving new cyber security requirements in government and the private sector? What are those new requirements? How can small and medium-sized companies address these evolving requirements and stay competitive?

Randall J. Sandone is the Executive Director of CIRI. Mr. Sandone has had a comprehensive career guiding research and technology projects in settings ranging from start-ups to Fortune 100 companies. His strengths lie in relationship building and project management. His professional experience is in the software development sector. Mr. Sandone was the founder and CEO of a high- assurance software company that became the global leader in its market. The company grew to a staff of 120 with offices throughout the United States, Europe, the Middle East, and Pacific Rim. He established strategic marketing and distribution alliances with "Big Iron" computer manufacturers such as Sun Microsystems, IBM, and Fujitsu-Siemens. Mr. Sandone has secured significant customer relationships with a wide range of organizations in the defense, intelligence, and law enforcement communities as well as commercial customers including Credit Suisse, UBS, Chase Bank, the Federal Reserve, Volkswagen AG, and Major League Baseball. In this and in other executive leadership positions for a number of globally-oriented companies he was responsible for technology transition and licensing, commercialization, product development, and financial management. Mr. Sandone is a former member of the University of Illinois College of Engineering Advisory Board and was a finalist for Ernst & Young's "Entrepreneur of the Year for Illinois and Northern Indiana" and finalist for KPMG's "Illinois Technology Award." Mr. Sandone is also a member of the Strategic Advisory Board of the Maritime and Port Security Information Sharing and Analysis Organization (MPS-ISAO).

VENTURE CAPITAL PANEL

CEWIT has recruited a set of very highly accomplished investors from far and wide to give you the lowdown on what they do, what qualities they look for in investment candidates, and to take your questions . Expect a case study or two.

MODERATOR:
Dan Conley, Shirt Sleeve Angel

Angels + Life.Sci Investors are organized by Dan Conley who leads DealScreening, DealScrubbing, Due Diligence and Investments for over a dozen earlystage life sciences companies. Dan backs "Best of the Best CEOs" who lead Fundable Teams - across the USA, and in a variety of Life Science niches. Dan has created outsized returns for his Conley Family Office and co-investors. Robotics and automation, A. I. machine learning, Big Data and Analytics are portfolio focus now that robots are growing Stem Cells and other Tissues to reduce genetic drift & create repeatable experiments.

PANELIST:
Adam Bazih, Executive-in-Residence, Kairos Ventures

Dr. Adam Bazih provides management, marketing, financial, and commercialization expertise to Kairos portfolio companies, enabling them to grow, stabilize, and meet critical milestones. Success ultimately begins and ends with focus. Adam works hand-in-hand with company founders and teams, helping them develop and execute upon a strategy, conduct quantitative market analysis, articulate and meet crucial milestones, financial modeling/fundraising, and business development. Dr. Bazih is a seasoned executive with nearly a decade of entrepreneurship and investment experience. Adam has both founded, led, and invested in multiple high-tech startups, taking them from inception to large successful exits. Adam's entrepreneurship abilities were featured in Medgadget and multiple other scientific journals and publications. Additionally, Adam has consulted to numerous Fortune 100 companies on multi-million dollar projects and understands the intricacies of combining IP, technical know-how with strategy and tacit knowledge to create long-term value. Dr. Bazih received his undergraduate degrees in microbiology and chemistry from the University of Oklahoma Honors College. Adam completed graduate studies in medicine at UCLA, business management/entrepreneurship at Stanford University GSB, and received his MBA from the University of Chicago Booth School of Business.

PANELIST:
Mark Elenowitz, Founder and CEO, TriPoint Global Equities

Mr. Elenowitz is responsible for the overall corporate development of the firm and advising clients on structuring, financings and acquisitions. He has extensive experience in advising clients on SOX 404 compliance, employee option programs, and capital markets navigation including acting as a member of the board of directors. For over 24 years he has worked with numerous public and private companies. Mr. Elenowitz integrates a strong, successful entrepreneurial background with extensive financial services and capital markets experience. He has assisted numerous companies in a ""soup-to-nuts"" process, preparing them for life as a public company and advising them on an ongoing basis as to further rounds of financing, strategic acquisitions and a broader investor base via a listing on a higher securities exchange or market. He is an expert in capital markets investigative analysis of trading activity, short selling and market activity providing investigative services for Board of Directors, Special Committees and public companies. Mr. Elenowitz also serves as an expert witness in FINRA arbitrations and court actions. Mr. Elenowitz is also Managing Director of TriPoint Capital Advisors, LLC, a merchant banking and financial consulting affiliate of TriPoint Global Equities. He is the recipient of several entrepreneurial awards and has been profiled in BusinessWeek and CNBC, as well as several other publications. He is a graduate of the University of Maryland School of Business and Management with a B.S. in Finance. He holds Series 24, 62, 63, 79, 82 and 99 licenses.

PANELIST:
Thomas Thornton, Senior Vice President and Executive Director, Northwell Ventures

Tom is responsible for identifying and fostering innovative ideas that enhance the growth of Northwell Health clinical and non-clinical enterprises, working with senior leadership to develop and advance ideas in these areas, bringing these ideas into practice and the market, as well as building strategic partnerships and relationships within the broader regional ecosystem and beyond. In this role, he manages all the Northwell Health's Innovation programs; including technology commercialization, enterprise growth and investment management. Prior to joining Northwell Health, Tom led the Healthcare Innovation Alliance at Cleveland Clinic Innovations; a program aimed at forming multi-institutional collaborations to foster and accelerate the commercialization of medical innovations.

Tuesday, November 7 •
11:45AM - 12:30PM

PANELIST:
Brian Keil, Managing Director, New York Ventures, Empire State Development

Brian Keil is the Managing Director for New York Ventures, the venture capital arm of the State of New York. New York Ventures manages all of the State's venture investment activities and is focused on generating economic growth across NY State through its investments in innovative, technology-based companies. Prior to joining New York Ventures, Brian was VP of Strategy & Corporate Development at Arbitron (now Nielsen Audio) and a Managing Director at the Peacock Fund, the venture capital arm of NBC Universal. Before joining the Peacock Fund, Brian worked at GE Capital and Bain & Co. Brian holds an MBA in Finance from The Wharton School and a BS in Industrial Engineering from The University of Southern California. Brian is a Chartered Financial Analyst.

OPEN PITCH CHALLENGE

Networking, and the latest information are what CEWIT2017 is all about! In this session you will be allocated 2.5 minutes in an open forum to describe your business and objectives. Our panel of judges will select companies to move up to the Pitch Clinic, which will name at least one prize winner. For Pitch Clinic eligibility you must bring a 7-minute slide presentation with you, ready to go upon selection.

Judging Criteria:
- What problem does your technology/solution solve? The nature of your technology/ solution.
- What are the barriers to competition?
- Why will customers buy-in?
- Management: Who you are and why you can get the job done.

GUEST JUDGE:
SYLVAN SCHEFLER, VICE CHAIRMAN, TIGRESS FINANCIAL PARTNERS

Sylvan Schefler is a Vice Chairman and an Investment Banker focusing on providing growth capital and M&A advisory services to public and private middle market companies. Mr. Schefler has over forty years' experience in all aspects of investment banking. Prior to joining Tigress Financial Partners, Mr. Schefler was a Managing Director, Investment Banking, at Burnham Securities. Mr. Schefler began his career at Drexel Burnham Lambert in 1959.

He became a partner of the firm in 1968 and a member of The Board of Directors and The Executive Committee in 1971. He joined the High Yield group in 1983 where he was involved in billions of dollars of financings and corporate finance activity. He was Chairman of his own firm Maxima Group LLC and then rejoined Burnham Securities where he was responsible for Investment Banking. Mr. Schefler has served on the Board of Directors of many public and private companies. He also served on many charitable boards including The Simon Wiesenthal Center. Mr. Schefler received a BA from Cornell University then served as a Lieutenant in the US Army. Mr. Schefler holds FINRA Series 7, 24, and 63 licenses.

GUEST JUDGE:
Neil Kaufman, Chairman, Long Island Capital Alliance and Corporate Attorney

Neil Kaufman represents emerging growth, middle market and public companies and investment firms in their corporate, securities, financing, borrowing, merger & acquisition and other legal matters. He is particularly well known for advising clients with respect to SEC regulation, public offerings, private placements and mergers & acquisitions, as well as all types of commercial contracts. Mr. Kaufman additionally serves as the chairman of the Long Island Capital Alliance, a not-for-profit organization devoted to assisting emerging growth companies

GUEST JUDGE:
Harvey Brofman, Managing Director, AngelFire Ventures

Harvey Brofman is a seasoned professional and serial entrepreneur in the healthcare space for over 25 years. Harvey is an early pioneer leading the development and adoption of new technology for systems and solutions in multiple segments within the healthcare space including the medical, pharmacy, pharmaceutical, CRM and payor components of the industry. He is known among peers as a leader and innovator. Played a driving role in the evolution of systems, telecommunications, and standards out of manual and disparate systems. His days are split between Angel Investing, working with other angels and startups. and being a sounding board for and advising portfolio companies. Harvey is also a board member of the New York Angels and serves as a mentor and/ or advisor to a number of early-stage ventures."

OPENING REMARKS & KEYNOTE SPEAKER

ARTIFICIAL INTELLIGENCE - APPLICATIONS AND CUSTOMER ENGAGEMENT

Dan Bodner, President & CEO, Verint Systems

Customer Engagement has become a priority for many companies worldwide, and a strategic objective for B2C (Business to Consumers) companies who seek to create brand differentiation based on superior customer service. Artificial Intelligence technology can disrupt the Customer Engagement market with new innovations such as Virtual Agents and Robotics Process Automation. Customer Engagement teams will be able to leverage natural language processing and machine learning to deliver significant cost efficiencies while improving the consumer experience and the consumer satisfaction with the brand. Mr. Bodner will discuss how Artificial Intelligence can help achieve strategic customer engagement objectives, and its impact on the customer engagement workforce and the consumers.

Verint is a global leader of Actionable Intelligence data mining software with over $1B in annual revenue, 5,000 employees and more than 10,000 customers worldwide. Mr. Bodner, Verint's President and CEO, started the company in 1994 with a focus on Actionable Intelligence innovation, reflecting his vision of helping organizations gain actionable insights from large amounts of structured and unstructured data. Under Dan's leadership, the company had a successful IPO in 2002 and is listed on the NASDAQ exchange under the symbol VRNT. Today, Verint is a recognized global market leader and visionary in two Actionable Intelligence growth markets: Customer Engagement and Cyber Intelligence. Mr. Bodner holds a B.Sc. degree in Electrical Engineering and a M.Sc. degree in Telecommunications and Computer Science.

ABSTRACTS

Tuesday, November 7 • Breakout Session 2 • 1:45PM - 4:00PM

TRACK A • HEALTH TECHNOLOGIES

AGING IN PLACE

Elinor Schoenfeld,
Research Professor, Department of Family, Population & Preventive Medicine,
Stony Brook University Medicine

The expanding aging population has become a significant social and healthcare burden worldwide. Currently, 13% of the US population is 65 years of age or older, and by 2060, this number will rise to more than 20% of the population, representing about 100 million Americans. Nearly 30% of older adults live alone and are aging in place, introducing challenges to a health care system that struggles to meet their medical and social support needs. Aging adults utilize the health care system at a higher rate as they manage multiple chronic health conditions (e.g., diabetes, Alzheimer's, hypertension, cardiac disease). This requires a coordinated and responsive system that provides emergent, acute, transitional and long-term care across settings. While telemedicine has improved access and convenience, its on-demand approach reduces care continuity and provides only pre-scheduled and sporadic assessments. This research uses technologies that monitor health and function continuously in real time, promote timely interventions, and address current shortfalls in health care resources and costs. This paper presents the technology requirements to support aging in place by tracking long-term trends of an individual's functional health and disease progression. Close monitoring has the potential to detect changing conditions and quantify multiple aspects of functionality, wellness states, and local environment in real time. Using personal and environmental sensors has the potential to detect or even predict critical events for immediate/preemptive intervention. Based on these requirements, we present and compare current technologies, especially sensors that collect physical/physiological data, and describe real-time algorithms for analysis/ detection/ learning of patterns and trends. Finally, we describe the challenges for using these technologies for tracking functional health and disease progression in older adults, and what technical components are needed to conduct a preliminary study for both assessing the technology's suitability as well as creating a comprehensive research agenda to support aging in place.

Dr. Schoenfeld received her MS and her PhD from the Roswell Park Division of the University at Buffalo with a concentration in epidemiology. Since joining the faculty at Stony Brook University School of Medicine in 1988, she has developed a research program in community engaged research, and helped build a clinical research coordinating center. She has served as PI, Co-PI, or Co-I on close to 40 NIH, HRSA, state and private foundation funded research conducting intervention studies and determining risk factors for a number of conditions including various types of cancers, diabetes, leading causes of visual impairment, periodontal disease, cardiac arrest, osteoporosis, and obesity. She currently serves as Associate Director for the Master's Program in Clinical Research where she directs courses in Epidemiology, and Data Management and Informatics. She serves as research mentor for students and junior faculty with an interest in clinical and translational research. Dr. Schoenfeld was appointed to the Patient Centered Outcomes Research Institute's (PCORI) Advisory Board on Addressing Disparities and holds voluntary appointments in the School of Nursing, Program in Public Health, and the School of Medicine Department of Biomedical Informatics at Stony Brook University.

AN AUTHENTICATION PROTOCOL FOR WEARABLE MEDICAL DEVICES

Wei Lin, Associate Professor,
Department of Biomedical Engineering,
Stony Brook University

Wearable medical devices are playing more and more important roles in healthcare. Unlike the wired connection, the wireless connection between wearable devices and the remote servers are exceptionally vulnerable to malicious attacks, and poses threats to the safety and privacy of the patient health data. Therefore, wearable medical devices require the implementation of reliable measures to secure the wireless network communication. However, those devices usually have limited computational power that is not comparable with the desktop computer and thus, it is difficult to adopt the full-fledged security algorithm in software. In this study, we have developed an efficient authentication and encryption protocol for internet-connected wearable devices using the recognized standards of AES and SHA that can provide two-way authentication between wearable device and remote server and protection of patient privacy against various network threats. We have tested the feasibility of this protocol on the TI CC3200 Launchpad, an evaluation board of the CC3200, which is a Wi-Fi capable microcontroller designed for wearable devices and includes a hardware accelerated cryptography module for the implementation of the encryption algorithm. The microcontroller serves as the wearable device client and a Linux computer serves as the server. The embedded client software was written in ANSI C and the server software was written in Python.

Wei Lin received B.Ss degree in Biomedical Engineering in 1986 and M.S. degree in Mechanical Engineering in 1989 from Shanghai Jiaotong University, Shanghai, China. He received Ph.D. degree in Mechanical Engineering from Stony Brook University in 2001, Stony Brook, NY, U.S. Dr. Lin joined the Department of Applied Mechanics in Fudan University, Shanghai, China as the assistant professor in 1989 and lecturer in 1993. He joined the Department of Biomedical Engineering as the assistant professor in 2004 and associate professor in 2013. His current research interests include medical instrumentation, wearable medical devices and high performance computing in embedded systems. Dr. Lin is a member in IEEE and Biomedical Engineering Society.

A VIRTUAL REALITY GROCERY SHOPPING GAME TO IMPROVE HEATH AWARENESS IN YOUNG ADULTS

Klaus Mueller, Professor,
Department of Computer Science,
Stony Brook University

The current situation of obesity in children and adults is indicative of the inability to choose the right product from a typical collection of various similar products in the supermarket. To obtain a more quantitative idea regarding their shopping patterns, we have developed a prototype of a game which offers a virtual shopping experience to the player by letting him move around and shop in a virtual reality grocery store environment. The idea behind developing the game instead of a questionnaire was (1) to provide a more engaging and memorable experience, (2) to enable educators to conveniently collect the player's choices, and (3) to tune the difficulty of the experience in real time via leveling.

The first scene of the game is the creation of a shopping list. This enables the shopper to make a rough note of the products to be bought. The next scene stores the basic information regarding the player like name, age and gender. The subsequent scene takes the player to the shopping environment where he navigates

using a keyboard. The products are selected and placed in the cart by clicking on them. In order to enhance the user friendliness, the 'check cart' option is provided which displays the items selected so far. After choosing all the products the shopping ends and the player is evaluated by assigning scores from 0-100. The final scene is where the player is taught about the choices he has made and better products are recommended. This is achieved with the help of specially designed user friendly labels with color codes for better and faster understanding. The levels are adaptive and depend on how healthy / unhealthy products the customer is choosing. Initially, healthy and unhealthy products are equally distributed. If the player makes a healthy choice, a healthy product in each category will be replaced by an unhealthy product. The contrary happens in case the player selects an unhealthy product. The products are numbered from 1 to 7, where 1, 2. and 3 are healthy and 5, 6. and 7 are unhealthy and 4 is neutral.
The merit of the game was quantitatively assessed using the scores from 30 players collected during game play. Each player played the game twice and the scores obtained before and after studying the labels were recorded in Group 1 and Group 2, respectively. The ANOVA test of significance was applied on the data and the p value obtained was <0.0001 proving the hypothesis that the game had a positive impact on the players. We henceforth conclude that the game has successfully achieved its aim of educating the players and has convinced them to switching over to healthier food products. Future work will assess if the behavior was changed long-term, by inviting the players again and comparing their scores with the past.

Klaus Mueller received a PhD in computer science from the Ohio State University. He is currently a professor in the Computer Science Department at Stony Brook University and is also a senior adjunct scientist in the Computational Science Initiative at Brookhaven National Labs. His current research interests are visualization, visual analytics, data science, medical imaging, and high-performance computing, He won the US National Science Foundation CAREER award in 2001, the SUNY Chancellor Award in 2011, and the IEEE Meritorious Service Award in 2016. Mueller has authored more than 170 peer- reviewed journal and conference papers, which have been cited more than 7,500 times. He served as paper chair for IEEE SciVis in 2011 and 2012, and is currently an Associate Editor-in- Chief of IEEE Transactions on Visualization and Computer Graphics. He was until recently the chair of the IEEE Technical Committee on Visualization and Computer Graphics and is a senior member of the IEEE.

HOW TECHNOLOGY IS SHAPING THE FUTURE OF PEOPLE WITH DEVELOPMENTAL DISABILITIES

Christos G. Morris,
CEO, eVero Corporation

Focusing on both current and future technologies, eVero founder and CEO Christos Morris will be discussing the role of technology in assisting those organizations which serve intellectual and developmentally disabled (I/DD) populations. Given the dynamic nature of technology in this unique setting, Mr. Morris will examine the ever-increasing inclusion and effectiveness that mobile devices, GPS, smart homes, and data management software play in overall service management and corresponding service delivery analytics. Additionally, Mr. Morris will emphasize the challenges of constantly monitoring the technological landscape to quickly and effectively employ technology to meet ever-changing regulatory data collection, reporting and data exchange mandates. Technology has already proven to be invaluable in assisting people with intellectual and developmental disabilities to live more independently; by monitoring the full spectrum of service delivery throughout the entire continuum of care. This level of data management takes on increased importance given the industry's new direction which includes Managed Care and Self Directed Service Models.

As CEO of the eVero Corporation, Mr. Morris possesses an in-depth knowledge of the regulatory mandates and work-flow requirements inherent to serving the I/DD community. This includes the key influencing business and technical drivers that critically effect client-specific operational efficiencies. Christos' vision was to structure eVero as a one stop solution company which provides its clients with subject matter expertise in case management software, technical infrastructure and data integration including bi-directional data feeds to core client internal databases; billing, human resources and case management systems. Under Christos' leadership eVero has steadily expanded its client base that now includes government agencies, health care institutions, and large health service organizations. Christos also helped found eVero Corporation's unique Outreach Program where select Individuals with disabilities enrolled in a Supported Employment Program (SEMP) are hired and trained by eVero to become Computer Instructors. These employees are now, in turn, teaching other Individuals in the SEMP Program basic computer skills to further their personal growth. Over the last several years, this Program has more than tripled in size and now includes "courses" that emphasize interviewing skills. Christos is an active participant on a number of boards and committees representing organizations that serve the community and is often a presenter on the role of technology in the Health Services Industry.

TELEMEDICINE AND VULNERABLE POPULATIONS: IMPROVING ACCESS AND CARE FOR THOSE WHO NEED IT MOST

James Powell, Clinical Instructor,
Department of Medicine; Medical Director of Developmental Disabilities Institute/ Opti-Healthcare Hospital,
Stony Brook University Medicine

As part of a Balancing Incentive Program Innovation Grant through the New York State Department of Health, 2076 individuals with neurodevelopmental disorders and intellectual disabilities were enrolled in a comprehensive urgent care program. Its purpose was to improve access to care and reduce unnecessary hospitalizations, as this population is up to 50% more likely to visit the ED than the general population. As part of the program, a 24/7 nurse triage call center could dispatch an urgent care nurse into the private or group home after hours and on weekends, when primary care practices were closed. The early success of the program freed up more funds, which were used to implement a telemedicine component: the traveling nurses were equipped with a telemedicine roller bag equipped with diagnostic tools and a video tablet with which to connect to a remotely located Doctor or Nurse Practitioner. In short, the clinic came to the patient's residence. The provider was able to use the telemedicine bag's devices to speak with and examine the patient using the stethoscope, a high definition camera with dermatology, ENT , even an ECG and spirometry. Of the nearly 300 telemedicine visits made between February and September, approximately 80% averted an ER visit. The value of this program was multi-fold: in cost savings from averted ER visits, in cost avoidance for agencies who did not need to send staff with the individual to wait the ER, or add on-call nurses in the evenings and weekends, and in enhanced patient engagement and outcomes for those who live independently and do not have in-residence nursing support. We will talk about the use of the program as well struggles related to implementation, technology and patient engagement. This talk will explore the direction of telemedicine and as well as discussions about what to expect in the future.

ABSTRACTS

Tuesday, November 7 • Breakout Session 2 • 1:45PM - 4:00PM

TRACK B • INTERNET OF THINGS

Dr. James R. Powell, Jr. is the Chief Medical Officer for Long Island Select Healthcare Inc. (LISH), a federally qualified health center with eight locations in Suffolk County. LISH was created in August 2016 with the merger of the United Cerebral Palsy of Suffolk County (UCP), Developmental Disabilities Institute (DDI), and Family Residences and Essential Enterprises (FREE) health centers. Dr. Powell is a board-certified Internist as well as the Medical Director of both DDI and UCP. He has been a member of the voluntary faculty at Stony Brook University as well as the Options for Community Living Incident Review Committee. He is currently on staff at Mather Memorial, St. Charles and Peconic Bay Medical Center. A former board member of the American Academy of Developmental Medicine and Dentistry, Dr. Powell has presented lectures nationally regarding primary care and telemedicine. He recently completed New York State Department of Health grant which brought telemedicine to individuals homes. Dr. Powell was born and raised on Long Island and returned to the area to settle down after attending Binghamton University, Ross University School of Medicine and the University of Connecticut School of Medicine.

5G WIRELESS - WAY MORE THAN HIGHER DATA RATES

Bob DiFazio, Vice President, InterDigital Labs, InterDigital Communications, Inc.

The wireless industry is in the midst of designing the next generation of mobile communications technology - 5G - which is expected to have a transformative effect on many vertical industries. Previous generations focused on voice and mobile broadband services, which will continue to move forward in the 5G era, but there is a much stronger emphasis on connected devices and the Internet of Things (IoT). Low power wide area (LPWA) capabilities will be integral to 5G networks and support the billions of very low cost, long battery life devices. Ultra-reliable and low latency operation will enable exciting new uses cases such as assisted and autonomous driving, commercial unmanned aerial vehicles, robotics, and gaming. Key industry standards bodies and forums, such as 3GPP and ITU-R, are aggressively moving forward with standardization and there are already numerous trials and pre-standards deployments.

Dr. Robert A. DiFazio is the Vice President of InterDigital Labs in the company's Wireless Business Unit. He manages and actively participates in numerous research and development projects addressing 5G cellular technology, next generation Wi-Fi, millimeter wave radio systems, small cell and heterogeneous wireless networks, machine-to-machine communications, and advanced systems for efficient use and sharing of spectrum to meet the ever-increasing demand for wireless data. He contributes to technology planning at InterDigital and the company's collaboration with many universities. Dr. DiFazio has almost forty years of experience in research, design, implementation, and testing of new technologies for commercial and military wireless systems. Prior to InterDigital, he spent more than twenty years at BAE Systems working on software defined radios, smart antenna systems, jam resistant modems, and low probability of intercept communication and navigation systems. He has a Ph.D. from the NYU Tandon School of Engineering (formerly, Brooklyn Poly). He serves on the Industry Advisory Committee for the NYU-Poly Department of Electrical Engineering and Computer Science and on the Industry Advisory Board for New York Institute of Technology. He is a Senior Member of the IEEE and holds over forty issued and numerous pending US patents.

JOINT RESOUCE ALLOCATION AND ROUTING IN WIRELESS COGNITIVE RADIO NETWORKS

Yang Qin, Associate Professor, Department of Computer Science, Harbin Institute of Technology Shenzhen Graduate School, China

In recent years, CRNs (cognitive radio networks) have attracted the attention of many researchers in the wireless networks domain. CRN is a prominent solution to improve the efficiency of spectrum utilization.. Routing and transmission reliability are key technologies in CRNs, which are hot research directions for multi-hop CRNs in recent years. How to transmit data efficiently in multi-hop CRNs is a fundamental research problem. A novel opportunistic routing (OR) based on intra-session network coding, is proposed. Due to the intermittency of the spectrum in space and time domain, the available spectra of SU are dynamically change and heterogeneous. Opportunistic routing has to face new challenges in multi-hop CRNs, e.g., the impact of PU behavior and spectrum sensing on forwarding candidates selection. In order to reduce the computational complexity of the optimization problem, a heuristic algorithm to select forwarding candidates and assign channels is presented for multi-hop CRNs, including candidate selection algorithm considering the queue state of a node and ETX, and channel assignment algorithm taking into account the transmission time and the available time of a given channel. The simulation results show that the proposed scheme performs significantly better than traditional routing and classical opportunistic routing in which channel assignment strategy is employed.
Then, the packets from different sessions are coded together, which can significantly improve throughput by means of increasing information in a transmission. A novel coding aware OR, cognitive radio opportunistic routing (CROR) is proposed. It exploits a novel routing metric, successful delivery ratio (SuDR), which is based on packet loss rate and successful spectrum utilization. And then, a novel candidate select algorithm and coding algorithm are proposed for multi-channel CRNs. Simulation results demonstrate that the proposed routing CROR achieves better performance in increasing the throughput and bandwidth utilization efficiency and reducing the probability of PU-SU packet collision compared with traditional opportunistic routing.

Yang Qin is an associate professor of Harbin Institute of Technology Shenzhen Graduate School October 2008. She has been an IEEE Senior Member since June 2006 and was awarded the Shenzhen Region Talent recognition = in May 2010. Her research interests include Wireless and Mobile Networks, Cross-layer design on QoS routing and scheduling, protection and restoration, Opportunistic Routing, and Network Coding.She has published over 100 papers internationally, including IEEE Networks, IEEE/OSA Journal of Lightwave Technology (JLT) IEEE Communications Magazine, Optical Express, IEEE Globecom.

ROBUST COMPUTATION OFFLOADING AND RESOURCE SCHEDULING IN MOBILE EDGE COMPUTING

Songtao Guo, Department of Computer Science, Southwest University, China

Mobile Edge computing (MEC) as an emerging computing paradigm enables mobile devices to offload their computation tasks to nearby resource-rich edge clouds so as to augment computation capability and reduce energy consumption of mobile devices. However, due to the mobility of mobile devices and the admission of edge clouds, the connection between mobile devices and edge clouds may be unstable, which will affect offloading decision, even cause offloading failure. To address such an issue, in this paper, we propose a robust computation offloading strategy with failure recovery (RoFFR) in an intermittently connected MEC system aiming to reduce energy consumption and shorten application completion time. We first provide an optimal edge cloud selection policy when multiple edge clouds are available near mobile devices. Furthermore, we formulate the RoFFR problem as two optimization problems, i.e., local execution cost minimization problem and offloading execution cost minimization problem while satisfying the task-dependency requirement and application completion deadline constraint. By solving both optimization problems, we present a distributed RoFFR algorithm for CPU clock frequency configuration in local execution and transmission power allocation and data rate control in cloudlet execution. Experimental results in a real testbed show that our distributed RoFFR algorithm outperforms several baseline policies and existing offloading schemes in terms of application completion cost and offloading data rate.

Songtao Guo received his B.S., M.S. and Ph.D. degrees in Computer Software and Theory from Chongqing University, Chongqing, China, in 1999, 2003 and 2008, respectively. He was a professor from 2011 to 2012 at Chongqing University. At present, he is a full professor at Southwest University, China. He was a senior research associate at the City University of Hong Kong from 2010 to 2011, and a visiting scholar at Stony Brook University, New York, USA, from May 2011 to May 2012. His research interests include wireless sensor networks, wireless ad hoc networks and parallel and distributed computing. He has published more than 70 scientific papers in leading refereed journals such as IEEE TC, TCOM, TMC, JPDC, etc, and international conferences such as IEEE INFOCOM, ACM IQWOS, IEEE SECON, ICPADS, GLOBECOM, ICC, etc, in which more than 30 papers are published as the first author. He has received many research grants as a Principal Investigator from the National Science Foundation of China and Chongqing and the Postdoctoral Science Foundation of China.

A CONVOLUTIONAL NEURAL NETWORK FOR TRANSIT MODE DETECTION BASED ON SMARTPHONE PLATFORM

Grace Wang, Professor, Department of Computer Science, New Jersey Institute of Technology

Knowledge of people's transit mode is important in many civilian areas, such as urban transportation planning. Current methodologies in collecting travelers' transit modes can be costly and inaccurate. The increasing sensing and computing capabilities of smartphones and their high penetration rate enable automatic transit mode detection. This paper designs and implements a light-weight and energy-efficient transit mode detection application only using the accelerometer on smartphones.In this application, we collect accelerometer data in an efficient way and build a convolutional neural network to determine transit modes. Convolutional neural networks with different architectures and traditional classification methods are compared in our testbeds. The results show that the proposed convolutional neural network can achieve the highest accuracy in detecting transit modes.

Grace Guiling Wang, PhD, is an associate professor in the Department of Computer Science at New Jersey Institute of Technology. Her research focuses on wireless sensor networks, vehicular networks, network security and mobile computing. Wang's past work on mobile sensor networks has been internationally recognized and widely cited by peer researchers. Now she pioneers in solving the energy problem in sensor networks by utilizing the wireless recharging technology and sensor replacement and reclamation strategy. She also works on another project studying the symbiosis of sensor networks and vehicular networks to provide a more effective and reliable solution to improve driving safety. These projects are supported by the National Science Foundation. Wang has published papers in highly competitive top-tier conferences such as INFOCOM, ICNP, ICDCS and PerCom, and prestigious journals such as IEEE Transactions on Mobile Computing, ACM Transactions on Sensor Networks, and IEEE Transactions on Vehicular Technology. Her papers have also been widely cited by other conference and journal papers. She received her PhD degree in computer science and a minor degree in statistics from The Pennsylvania State University and her BS degree in software from Nankai University, China.

ABSTRACTS

Tuesday, November 7 • Breakout Session 2 • 1:45PM - 4:00PM

TRACK B • INTERNET OF THINGS

MOBILE EDGE CLOUD ARCHITECTURE

Sayed Chhattan Shah, Assistant Professor, Department of Information Communication Engineering, Hankuk University of Foreign Studies, South Korea

Mobile edge cloud is emerging as a promising technology to internet of things and cyber physical system
applications such as smart home and intelligent video surveillance. In smart home, various sensors are deployed to
monitor the home environment and physiological health of individuals. The data collected by sensors are sent to an
application, where numerous algorithms for emotion and sentiment detection, activity recognition and situation management are applied to provide healthcare- and emergency-related services and to manage resources at the home. The executions of these algorithms require a vast amount of computing and storage resources. To address the issue, the conventional approach is to send the collected data to an application on a n internet cloud. This approach has several problems such as high communication latency, communication energy consumption and unnecessary data traffic to the core network. To overcome the drawbacks of the conventional cloud -based approach, a new system called mobile edge cloud is proposed. In mobile edge cloud, multiple mobile and stationary devices interconnected through wireless local area networks are combined to create a small cloud infrastructure at a local physical area such as home. Compared to traditional mobile distributed computing systems, mobile edge cloud introduces several complex challenges due to the heterogeneous computing environment, heterogeneous and dynamic network environment, node mobility, and limited battery power. The real time requirements associated with internet of things and cyber physical system applications make the problem even more challenging. In this talk, we will discuss the applications and challenges associated with design and development of mobile edge cloud system and an architecture based on a cross layer design approach for effective decision making.

Sayed Chhattan Shah is an Assistant Professor of Computer Science in the Department of Information Communication Engineering at Hankuk University of Foreign Studies Korea. He is also Director of Mobile Grid and Cloud Computing Laboratory. His research interests lie in the fields of parallel and distributed computing systems, mobile computational clouds and ad hoc networks. He received his Ph.D. in Computer Science from Korea University in 2012 and his M.S. in Computer Science from National University of Computer and Emerging Sciences in 2008. Prior to joining HUFS, he was a Senior Researcher at the Electronics and Telecommunications Research Institute South Korea and Engineer at the National Engineering and Scientific Commission Pakistan. He also held faculty positions at Seoul National University of Science and Technology,Korea University, Dongguk University, Hamdard University and Isra University. Shah is an Editor of IEEE Internet Initiative and Associate Editor of Information Processing Systems. He has served as the Conference Chair and on program committees of various international conferences. He is a senior member of IEEE, and a member of IEEE Communications Society, International Telecommunication Union, Korean GNSS Society, and International Association of Engineers.

CAN AC COMPUTING BE AN ALTERNATIVE FOR WIRELESSLY POWERED IOT DEVICES?

Emre Salman, Associate Professor, Department of Electrical and Computer Engineering, Stony Brook University

Energy autonomy is one of the fundamental challenges facing future Internet-of-things (IoT). Relying on existing battery technologies is not only impractical, but also insufficient due to stringent constraints on form factor and limited power densities of conventional electrochemical charge storage techniques. Wireless/RF power harvesting has recently received considerable attention due to the ubiquity of RF energy around the world such as mobile phones, TV/radio broadcast, and mobile base stations. A primary issue in existing wireless power harvesting methods is the strong dependence of the harvested power on the distance between the source and the load due to signal attenuation throughout the space. In this talk, a novel vision will be presented on developing an efficient computing paradigm for wirelessly powered IoT devices such as RFIDs. The proposed method investigates the direct use of AC power for computing while increasing the energy efficiency by more than an order of magnitude. This significant increase in energy efficiency enhances the on-site IoT device intelligence, thereby allowing for local decision making mechanisms. The proposed methodology facilitates numerous applications in structural/environmental monitoring, computational RFIDs, IoT security, and implantable bio-electronics. At the end of the talk, several exciting future directions at the intersection of circuits, communication, and electro-mechanics will be discussed.

Emre Salman is an associate professor at the Department of Electrical and Computer Engineering at Stony Brook University (SUNY), where he directs the Nanoscale Circuits and Systems (NanoCAS) Laboratory. He received the PhD degree from the University of Rochester in 2009 and the BSc degree from Sabanci University, Turkey in 2004. His broad research interests include energy efficient integrated circuits (ICs) for emerging applications such as Internet-of- things and bioelectronics. Emre received NSF CAREER Award in 2013, Outstanding Young Engineer Award from IEEE Long Island in 2014, and multiple Outreach Initiative Awards from IEEE Circuits and Systems Society. He is a Stony Brook University Discovery Prize finalist and recipient of a best paper award from Semiconductor Research Corporation (SRC) TECHCON in 2016. Emre has authored and co-authored one tutorial book, three book chapters, more than 60 papers in refereed IEEE/ACM journals and conferences, and holds two issued, two pending US patents. He is a senior member of IEEE.

TRACK C • BUSINESS

PITCH CLINIC

Your chance to "sell" your business case to the pro's! Participants selected in the Open Pitch Challenge will deliver a 7-minute slide deck to our panel of judges and conference attendees for information and feedback. Winner(s) will receive a valuable business prize.

GUEST JUDGE
Sylvan Schefler, Vice Chairman,
Tigress Financial Partners

Sylvan Schefler is a Vice Chairman and an Investment Banker focusing on providing growth capital and M&A advisory services to public and private middle market companies. Mr. Schefler has over forty years' experience in all aspects of investment banking.

GUEST JUDGE
Neil Kaufman, Chairman,
Long Island Capital Alliance and
Corporate Attorney

Neil Kaufman represents emerging growth, middle market and public companies and investment firms in their corporate, securities, financing, borrowing, merger & acquisition and other legal matters. He is particularly well known for advising clients with respect to SEC regulation, public offerings, private placements and mergers & acquisitions, as well as all types of commercial contracts. Mr. Kaufman additionally serves as the chairman of the Long Island Capital Alliance, a not-for-profit organization devoted to assisting emerging growth companies.

GUEST JUDGE
Harvey Brofman, Managing Director,
AngelFire Ventures

Harvey Brofman is a seasoned professional and serial entrepreneur in the healthcare space for over 25 years. Harvey is an early pioneer leading the development and adoption of new technology for systems and solutions in multiple segments within the healthcare space including the medical, pharmacy, pharmaceutical, CRM and payor components of the industry. He is known among peers as a leader and innovator. Played a driving role in the evolution of systems, telecommunications, and standards out of manual and disparate systems. His days are split between Angel Investing, working with other angels and startups. and being a sounding board for and advising portfolio companies. Harvey is also a board member of the New York Angels and serves as a mentor and/or advisor to a number of early-stage ventures.

SPECIAL PRIZE
2-Hour Consultation
Silverman Acampora, LLP
Anthony Acampora, Partner-in-Charge

When not managing the Firm, Anthony handles complex commercial litigation in the state and federal courts and manages the attorneys and cases in the Litigation Group. He began his career with a large New York City firm primarily representing banks, factors, and a wealth of other financial institutions. During the last 30 years, his practice has steadily expanded to include a wide variety of businesses and business owners across every market sector. Anthony has represented and advised business clients in virtually every type of commercial dispute. Whether it is during the early stages of litigation, at trial, or in the state and federal appellate courts, Anthony often enables our clients to realize results that other attorneys have deemed to be unattainable. Equally adept in the boardroom as he is in the courtroom, our business clients turn to Anthony for advice concerning corporate governance, board of director liability and responsibility, and business succession issues. Anthony works closely with the Business Law Group regarding the litigation implications of deal structure. He advises the Firm's other practice groups when litigation issues present themselves.His charity work also included a board position for the National Multiple Sclerosis Society, Long Island Chapter, for which he acted as Chair of the Governance Committee.

ENTREPRENEUR'S TOOLKIT TALKS

POSITIONING YOUR COMPANY FOR FUNDABILITY

Lori Hoberman, Founder,
Hoberman Law Group

Venture Capital Practice lawyer Lori Hoberman will discuss the essential elements of a Business Plan or Executive Summary that investors must see and find attractive.

Lori S. Hoberman is a well-known force in the in the New York City venture community. As a lawyer and mentor, she advises entrepreneurs and their investors on how to build successful businesses and strategically guides them through the emerging, later stages and exits of their companies. Lori works with client copmanies in a range of technology industries, while counseling angel and institutional investors in their investments and in the formation of investment funds. After years of leading startup company practices at large firms such as Fish & Richardson and Chadbourne & Parke, Lori decided to become an entrepreneur. Lori sustains Mentorship of 37 Angels and chairs the NYC Chapter of the MIT Enterprise Forum. A co-founder of several companies, all of her clients followed her to the new, Hoberman Law Group. Forbes has commented that Hoberman differs from other lawyers in that -- "She not only knows people, she connects the dots between the entrepreneur and the resources needed."

HOW TO ASSEMBLE A BOARD OF ADVISORS

David Calone, President and CEO,
Jove Equity Partners

Seasoned investor and Board Member David Calone will share his insights into how to recruit, benefit from, and compensate members of your Board of Advisors.

David L. Calone is the CEO of Jove Equity Partners LLC, a venture capital firm that helps build technology companies in the internet, software, digital media, energy, real estate, transportation and healthcare industries. He serves as a director of eight privately-held companies located throughout the country and is a co-inventor on fifteen issued U.S. patents. He helped organize the recently formed bipartisan Congressional Caucus on Innovation and Entrepreneurship in the U.S. House of Representatives through which he has been a leading advocate for federal policies that promote the creation and development of start-ups and other small businesses. He is the co-founder of the newly launched Long Island Emerging Technologies Fund which creates and provides seed funding for early stage technology companies on Long Island. Since 2008, Mr. Calone has served as the Chairman of the Suffolk County Planning Commission where his efforts were recognized with a National Association of Counties' 2012 National Achievement Award. He is also on the board of directors of Accelerate Long Island, the Long Island Angel Network, United Way of Long Island and the Community Development Corporation of Long Island. Previously, Mr. Calone served as a federal prosecutor at the U.S. Department of Justice where he received the national "Attorney General's Award"for prosecuting terrorism and international crime, and as a Special Assistant Attorney General in the NY State Attorney General's Office where he prosecuted health care fraud and helped negotiate the largest Medicaid settlement in state history. He is an honors graduate of Harvard Law School and has an economics degree from Princeton University where he was named a USA Today College Academic All-American.

ABSTRACTS

Tuesday, November 7 • Breakout Session 2 • 1:45PM - 4:00PM

CHIEF TECHNOLOGY OFFICER PANEL

VISIONING THE FUTURE TRENDS IN INFORMATION TECHNOLOGY

The CEWIT2017 CTO Panel will feature an exchange on IT's transformative trends, operational models, and its critical intersections with business, society, economics, health, and media. CEWIT hosts this issue-relevant discussion with the strategic leaders that are positioning the industry to rapidly adapt and capitalize on emerging technology trends. Moderated by Rich Bravman, Chief Strategy Officer, Affinity Solutions, Inc.

Moderator
Rich Bravman, Chief Strategy Officer, Affinity Solutions, Inc

Panel moderator, Rich Bravman serves as the Chief Strategy Officer of Affinity Solutions, Inc. He served as the Chief Operating Officer at Affinity Solutions, Inc. since August 2013. Mr. Bravman was an Executive Advisor at Forté Ventures LP. He served as the President and Chief Executive Officer of Pivot3, Inc. He served as the Chief Marketing Officer and Vice President of Corporate Development at NCR Corp. since December 2009. He is an entrepreneurial leader with over 37 years of functional, general management and board level experience in technology companies ranging in scale from start-up to global S&P 500 public companies. He has a proven track record in strategy formation, team building, fund raising, marketing, engineering, corporate development, product planning and operations.

Panelist
Otto Berkes, CTO, CA Technologies

As chief technology officer of CA Technologies, Otto Berkes is responsible for technical leadership and innovation, further developing the company's technical community, and aligning its software strategy, architecture and partner relationships to deliver customer value.

Otto joined CA on June 15, 2015. As a 25-year industry veteran, he has a passion for innovation and development. He has extensive experience leading the development of cutting-edge products and technologies. An early champion of mobile computing, he led the development of touch-based technologies, user interfaces, hardware architectures, and physical designs that were the forerunners to today's tablets.

Panelist
Bruce Lieberthal, Vice President, Chief Innovation Officer, Henry Schein, Inc.

Bruce serves as the Chief Innovation Officer for Henry Schein, Inc., reporting to Jim Harding, Henry Schein's Global CTO. Previously, from 2009 until this year, he was the Vice President, Emerging Technologies for Henry Schein, Inc., reporting to the president of Schein's Global Practice Solutions Group. Bruce also has oversight responsibility for Henry Schein Medical Systems (MicroMD) and the DDX business. He led the ConnectDental team for 2 years and currently works closely with the Corporate Business Development Group advising them on technology opportunities. He started, at Henry Schein, as the Director of Product Management to the leadership team in Utah when Discus Dental Software was acquired by HSI in May 2007 and was promoted, in 2008, to Vice President of Product Management and Development, managing all of HSPS' software lines and development teams.

Bruce was the founder of Direct Vision Software, the General Manager of Discus Dental Software and has been a leader in dental technology for more than 30 years. He practiced dentistry for 14 years between 1984 and 1997, and brings much knowledge to the Henry Schein team.

Panelist
Kamal Bherwani, CTO, Inversora Agroindustrial Global

Kamal Bherwani serves as the Chief Technology Officer of Inversora Agroindustrial Global (IAG, S.L.) leading technology strategy, architecture and operations, both on front-office side and the back-office parts of IAG's businesses. He also serves as Managing Director of Technology Investments and oversees all phases of investments in technology companies for the Group.

Mr. Bherwani's technology career spans over 25 years where he has served as a Senior Technology Manager of multi-bullion dollar enterprises, both in the public and private sectors and has served on the Board of several non-profit, technology and investment organizations. Mr. Bherwani served as the Chief Digital Officer of Promotora de Informaciones, S.A. (Grupo Prisa SA. PRISA) since January 2010. Mr. Bherwani has over twenty-two years of technology and operational experience.

He served as the Chief Information Officer of Health & Human Services and Executive Director of HHS-Connect for the City of New York, where he implemented several award-winning initiatives that have been globally and nationally recognized. He served as Chairman and Chief Executive Officer of Relativity Development Corporation and Chief Information Officer of Bridas Corporation. He serves as the Chairman of HZO, Inc. He serves as the Chairman of Magine TV and is on the Board of Directors of Bounty Hunter and Chatterbox, Punch.in, Carteirra.

Mr. Bherwani is Advisor to the Mayor's Office of the City of New York, Stony Brook University's Center of Excellence in Wireless and Information Technology (CEWIT) Advisory Board and on the Board of Advisors of Violy and Company. Mr. Bherwani also serves on multiple Advisory Boards, including IBM Cloud and Smarter Infrastructure Advisory Board and Dell's President's Advisory Board. He serves as a Director of HzO, Inc.

Panelist
Dr. Purna Prasad, Vice President & CTO, Northwell Health

Dr. Purna Prasad is a recognized leader and researcher in the field of clinical information technology and biomedical engineering with three decades of experience, now serving as the Vice President and Chief Technology Officer for information technology at Northwell Health. Dr. Prasad has directed best-practice projects and enterprise change management efforts to ensure continuity of mission-critical clinical systems serving the highest caliber of patient diagnostic, monitoring, and therapeutic support. Purna's pioneering work in biomedical research resulted in the first networked physiological monitoring system for acute care, distant patient care using telemedicine, computerized brain monitoring system, sleeping brain monitoring and diagnosis, and application of robotics in medicine.

Wednesday, November 8 • Breakout Session 3 • 9:00AM - 11:30AM

TRACK A • CYBERSECURITY

SECURING SOFTWARE UPDATES IN IOT: DOES ONE SIZE FIT ALL?

Justin Cappos, Associate Professor, Department of Systems and Security, New York University

If you want to compromise millions of machines and users, software updates are an excellent attack vector. Simply signing packages is a good starting point, but as we will see, it still leaves systems open to a variety of attacks. In our prior work, we built security mechansisms for software updates that are used in production in Docker, VMware, Digital Ocean, and most Linux distribution. However, we discovered this security framework did not work well for automobiles, leading us to design a new system specifically for automobiles. This talk discusses the challenges in this space and explores how many different designs may be needed for different IoT domains (medical, automotive, consumer, IoT, power grid, etc.) and in which ways they may need to vary.

Justin Cappos is an associate professor in the Computer Science and Engineering department at New York University. Justin's research philosophy focuses on improving real world systems, often by addressing issues that arise in practical deployments. His research advances are deployed in widely used software including Python, VMware, DigitalOcean, Docker, git, and most Linux distributions. Due to the practical impact of his research, Justin has received several awards including being named to Popular Science's Brilliant 10 list in 2013.

CHALLENGE CASES FOR COLLABORATION WITH INDUSTRY AND ACADEMIA IN ANOMALY DETECTION ALGORITHM RESEARCH

Steve Cento, Sector Engineering Fellow, Aerospace Systems (NGAS) Sector, Northrop Grumman Corporation

As one of the world's leading air and space platform manufacturers, the resilience of our products is essential for the mission of our customers. Part of the complete resilience solution is automatically detecting anomalous events and behaviors. It is imperative that we explore new and innovative approaches for these real time detection capabilities. Northrop Grumman Aerospace Systems (NGAS) leverages real time test beds consisting of integrated closed-loop software and hardware system used to simulate complex, flight-realistic test case scenarios, and generate simulated test telemetry and message data sets. Our objective in doing so is to simulate anomalies and/or "state changes" in the corresponding communications network. Our "challenge" is whether collaborators, that we provide our test data to, can automatically detect these anomalies, and have them do so with a varying degree of a-priori information. These test message data sets are public release cleared and International Trade in Arms Regulations (ITAR)/ Export Administration Regulations (EAR) cleared, so we can broadly release them to universities and Information Technology (IT) companies upon request. Our presentation will provide a high level overview of: (1) our test bed, (2) examples of the simulated test message data sets that our system generates, (3) the universities and IT companies we are currently collaborating with, and (4) our associated research and development objectives.

Steve Cento is a Sector Engineering Fellow for Northrop Grumman Aerospace Systems (NGAS) Sector in Bethpage NY.

During his 31 year professional career at Northrop Grumman Corporation, Steve has served as lead engineer and program/engineering manager on numerous Government contract and internal R&D program efforts, specializing in development and transition of cutting-edge advanced Geospatial Intelligence (GEOINT) and multi-source information integration technologies, and associated software capabilities/ products. Prior to that time, Steve worked for eight years as a Data Scientist in the biomedical community, including managing the Biostatistics Laboratory Computing Facility at Sloan-Kettering Institute (SKI) in NYC.

Mr. Cento has a B.S. dual degree in Mathematics and Computer and Information Science from Brooklyn College of C.U.N.Y., and has done graduate work in Computer Science at New York University (NYU) Courant Institute, and in Biostatistics at Cornell Graduate School of Medical Sciences.

ANDROID SECURITY AND LIFECYCLE MANAGEMENT

Bruce Willins, Engineering Fellow, Zebra Technologies

With over 2B active users, the Android operating system is increasingly being deployed in enterprise mission critical applications. As the target of many cyberattacks, significant focus has been directed on identifying and remediating Android vulnerabilities. In 2016 Android vulnerabilities grew (year-over-year) by over 400%. As stated in a recent Homeland Security study, and the topic of this session, "The most important defense against mobile device security threats is to ensure devices are patched against the publicly known security vulnerabilities.

In this session, we explore Android vulnerabilities, what Google is doing to mitigate and remediate vulnerabilities, and what enterprises are doing to secure their Android platforms. We explore the basics of Common Vulnerability Exposures (CVE's) and the Common Vulnerability Scoring System. We look at the fundamentals behind Android security updates and resources available to practitioners. Finally, we conclude with best practices and explore how analytics may simplify Android security management.

Bruce Willins is an Engineering Fellow at Zebra Technologies. Mr Willins has over 30 years of experience in marketing and development of high technology products. He has served in numerous senior level positions, including; VP of Engineering For Hauppauge Computer, ;VP of R&D at Symbol Technologies, VP of Engineering / GM Strategic Business at SMC Networks, and President/Founder of Netways Inc. Mr Willins is a a past member of the Motorola Science Advisory Board (SABA) and a Symbol Technologies Fellow. He is the recipient of the IEEE Charles Hirsch award, has numerous patents, and is a frequent lecturer.

ABSTRACTS

Wednesday, November 8 • Breakout Session 3 • 9:00AM - 11:30AM

TRACK A • CYBERSECURITY

INSIDE CYBERSECURITY – WHY SECURITY IS FAILING?

Domenick Gandolfo, Co-Founder & Chief Security Strategist, Cybersafe Solutions

The presentation focuses on why security is failing at most organizations. There is a failure of people, process, and technology. There has been a disconnect or lack of understanding by the C-Suite when it comes to cybersecurity. Employees are clicking on malicious attachments and links and there is either no policies or too many policies in place that are not being enforced from the top down. The security mindset of "We're fine until proven otherwise" leads to cybersecurity failure and will continue to do so. Threats are evolving and cybersecurity is not and there has been a set it and forget it mentality when it comes to implementing cybersecurity technologies. Most organizations are primarily focused on prevention and although prevention is ideal, it's inherently flawed and will fail. When prevention fails, there is a lack of visibility, detection, response and containment. History has shown that a lack of visibility, detection, response and containment capabilities has played a critical role in the breaches that continue to occur day in and day out. In order to address today's evolving threats, a continuous monitoring and detection oriented approach needs to be taken which focuses on improving an organization's overall security posture. By maintaining ongoing awareness of information security, vulnerabilities, and threats provides organizations the support to make risk management decisions. A modern day cyber defense platform requires full visibility via continuous network and endpoint security monitoring. By adding detection, response and containment to the prevention that is already in place completes the 360 degrees of security protection.

Domenick Gandolfo is Co-Founder and Chief Security Strategist of Cybersafe Solutions and is a seasoned cybersecurity veteran with over 19 years of hands-on experience in data security and data compliance. Prior to founding Cybersafe Solutions, Domenick was Chief Security Officer at the country's largest urology practice and was tasked with developing a comprehensive technology and security roadmap. During his tenure, he drove a complete redesign of server and network infrastructures while supporting 1,000 employees across 62 locations. His career has also included IT management and consulting positions in Education and the private sector, and he has worked with Fortune 500 companies including Cisco, EMC, Hitachi, Avaya and Dell. Domenick holds the prestigious and globally recognized Certified Information Systems Security Professional (CISSP) designation. He also holds the GIAC Certified Incident Handler (GCIH), GIAC Penetration Tester (GPEN) and GIAC Certified Forensic Analyst (GCFA) information security certifications. Domenick has also held previous certifications as a Cisco Certified Network Professional (CCNP), Microsoft Certified Systems Engineer (MCSE) and a Citrix Certified Administrator (CCA).

IPV6 BASED WSN PERFORMANCE ANALYSIS

Babak Beheshti, Associate Dean, School of Engineering and Computing Sciences, New York Institute of Technology

Wireless sensor networks (WSNs) are considered a fundamental extension of the internet of things (IoT). Based on resource constrained platforms, sensor nodes relied on low power network protocols, incompatible with the IP based Internet. With the advent of the IETF 6LoWPAN standard, WSNs are becoming an integral part of the Internet. The 6LoWPAN standard allows low power, low cost micro- controllers to collect data from any remote location, and be connected data collection entities via the Internet.

This paper provides a background to the current state of the IPv6 based IoT development, comparing and contrasting the technologies and tools available for WSN research. Additionally the powerful simulation environment, Conticki, is introduced and used to provide significant analysis data to complement physical deployment of WSNs.

Babak D. Beheshti is the Associate Dean and Professor of the School of Engineering, New York Institute of Technology; where he has served since 1987. Babak's areas of interest include wireless sensor networks, embedded real time systems, wireless and cellular systems, and digital signal processing. Babak has over 20 years of experience in R&D for embedded systems and wireless technology industry, where he has successfully managed joint R&D programs with many Asian, European and US companies including Siemens Mobile, Nokia, Samsung, KDDI and LG.

Babak has been an active member of IEEE since 1991 having held positions at section, region and major board levels. He is currently member of Publication Services & Products Board of IEEE, as well as Region 1 Student Activities Chair.

Babak is the recipient of the 2014 IEEE, MGA Leadership Award: For dedicated leadership in serving IEEE members at the Section, Region, USA, and global levels, and for contributing significantly towards achieving the goals of the IEEE Member and Geographic Activities Board; the IEEE Millennium Medal; the IEEE Long Island Section Athanasios Papoulis Outstanding Educator Award; and three IEEE Region 1 Awards, including 2008 IEEE Northeastern Region Technical Innovation Award "For Providing Technical Leadership in the Development of State-of-the Art Reconfigurable Wireless Technologies."

A CLOUD COMPUTING SERVICE THAT PROTECTS CLIENT DEVICES AND ENTERPRISES FROM MALWARE IN EMAIL ATTACHMENTS AND WEB SITES

Rick Boivie, Manager, Advanced Internet and Security Technologies, IBM Research

The world has seen a significant increase in cyberattacks that leverage malware-bearing email attachments and malware-infected web sites. A recent report by Symantec reports that 1 in every 359 emails sent in July, 2017 included malware – a 20% increase over previous months. Even more alarming is the fact that such malware is inexpensive and readily available for purchase .

The root of this problem is the lack of a mechanism that allows users to process email attachments and web links safely. Today, when a user clicks on an attachment in an email, the user's software opens the attachment with a program such as Adobe Reader or in a browser tab and the user's device can become infected if the program has a vulnerability that an attacker can exploit with a carefully designed attachment. Similarly, when a user clicks on a link to a web site, the user's device can become infected if the web site contains malware. Unfortunately, existing solutions such as anti-virus software are not foolproof and are vulnerable to previously unknown (zero-day) attacks.

We propose a ""lightweight"" Cloud-based Service that can protect a user's ""device"" (which can be a laptop computer, or a mobile device such as an iphone, ipad or android device) from malware in email attachments and web sites without adversely affecting the user experience. By protecting the user device, the Service also prevents the malware from establishing a ""beachhead"" on a device that could be used to infect other systems

in a business or other enterprise. The Cloud-based Service leverages a Secure CPU technology that protects the confidentiality and integrity of a ""Secure Object"" from the other software on a system, virtualization technology that is used in conjunction with the Secure CPU technology to provide ""secure virtual machines"", and a graphical desktop sharing tool that allows a user to safely interact with an attachment or a web site through a secure virtual machine.

The Cloud-based Service leverages an extension to a web browser (Google Chrome in our proof of concept implementation) and provides several protections: 1) it protects the integrity of client devices and enterprises from the unintentional downloading of malware when a user opens an attachment or clicks on a web link; 2) It protects the confidentiality of user information by protecting the integrity of client devices and by protecting client information within secure virtual machines; 3) it protects the integrity of any public keys or digital certificates that a secure virtual machine may use to authenticate the identity of web sites (e.g. so that a user can have a high-level of confidence that he is connected to his bank's web site, say, and not a fraudulent web site that has been set up to collect credentials and other information).

Importantly, the Cloud-based Service can protect against these attacks -- including previously unknown (zero-day) attacks -- without having to determine whether an email attachment or web site is malicious. The Cloud-based Service doesn't know and doesn't care.

Dr. Rick Boivie, a member of the IBM Academy of Technology at IBM's T. J. Watson Research Center, has a long history of innovation in the areas of computer architecture, operating systems, networking and security -- as an individual researcher, first-line manager, second-line manager and technical executive. He had leadership roles going back to IBM's first Unix systems and first TCP/IP systems (and wrote IBM's first ethernet driver).

He was technical lead and then manager of the group in Milford, Connecticut that developed the hardware and software for the ""New NSFNET"". The ""New NSFNET"" was the principal backbone of the Internet from 1988 to 1995 and increased the capacity of the links in the Internet backbone from 56 Kbits/second to 1.5 Mbits/second and then to 45 Mbits/second. This was the spark that ignited the worldwide Internet revolution of the 1990's. (In late 1987 or early 1988, he and a colleague also built what may have been the world's first Internet firewall.)
More recently, he led a project to develop a highly secure CPU chip (SecureBlue) that has been used in 10's of millions of systems to protect these systems from physical attack and physical tampering. Even more recently, he invented and developed an initial prototype of SecureBlue++, an innovative CPU architecture that builds upon SecureBlue and provides ""fine-grained"" SecureBlue-like protection to protect the confidentiality and integrity of an application's information from the other software on a system including privileged software, like the operating system, device drivers and application's that run with root privileges -- and malware that obtains root privileges by exploiting a bug in privileged software.

He has been named an IBM Master Inventor and an IBM Distinguished Engineer and has received a number of ""Outstanding Innovation"", ""Outstanding Technical Achievement"" and Corporate awards.

CYBERSECURITY CHALLENGES OF SYSTEMS-OF-SYSTEMS FOR FULLY-AUTONOMOUS ROAD VEHICLES

Warren Axelrod, Research Director, U.S. Cyber Consequences Unit

We are experiencing rapid development of in-vehicle, vehicle-to-vehicle, intelligent roadway, and infrastructure systems, as well as advancements in ride-hailing systems. However, progress in some areas is happening much faster than in other areas. For example, in-vehicle self-driving automotive systems are evolving rapidly whereas the pace seen with intelligent roadway systems development is relatively sluggish. At the same time, such systems are also beginning to interconnect and interoperate to form highly complex systems-of-systems for which the attack surfaces and vulnerabilities are expanding exponentially.

Currently, many of these systems are standalone and proprietary and do not interoperate, although some few standards are emerging that will encourage conformity among systems. However, such systems must be seamlessly integrated if we are to deploy safe and secure fully-autonomous road vehicles. From experience in other fields, if we do not establish such standards early on, we can expect to see vulnerabilities of, and threats to, resulting interconnected and interoperating systems-of-systems grow so much and so quickly that they could overwhelm potential benefits of these systems from improved safety and economies of fuel use. Warnings about cybersecurity consequences of such complexities appear from time to time in academic publications and the popular press, but few companies and government agencies are taking heed of these admonitions and of suggestions to focus on improving cybersecurity for the entire system-of-systems. Meanwhile, the self-driving-vehicle juggernaut ploughs ahead.

Here, we identify likely cybersecurity consequences that will arise because current efforts reflect uncoordinated design and development, particularly of supporting infrastructure systems. We describe how such risks might be mitigated proactively by introducing cybersecurity requirements early in the design, development and deployment processes. We also discuss how we might establish universal automotive and transportation security and safety standards that are enforceable and can be enforced globally across in-vehicle and ex-vehicle systems. While we see impressive near-term advances, particularly with in-vehicle systems and vehicle-to-vehicle systems, such innovations will eventually hit a roadblock if infrastructure systems, both physical and cyber, do not receive the attention required to achieve acceptable levels of cybersecurity and safety.

C. Warren Axelrod is the Research Director for Financial Services with the US Cyber Consequences Unit. Previously, he was the Business Information Security Officer and Chief Privacy Officer for US Trust. He was a founding member of the FS/ISAC and represented financial services cybersecurity interests in the National Information Center in Washington, DC during the Y2K date rollover. He testified before Congress on cyber security in 2001.

Warren was honored with the Information Security Executive Luminary Leadership Award in 2007, and received Computerworld Premier 100 award in 2003. He won the 2009 Michael P. Cangemi Best Book/Best Article Award for his article on security metrics in the ISACA Journal. Warren's recent books include Engineering Safe and Secure Software Systems (2012), Outsourcing Information Security (2004), and Enterprise Information Security and Privacy (2009), for which he was coordinating editor. He has published over a hundred professional articles. Warren received his Ph.D. in managerial economics from Cornell University, and both a B.Sc. inelectrical engineering and an M.A. in economics and statistics, with honors, from Glasgow University. He certified as a CISSP and CISM. He is a member of IEEE, ACM, (ISC) 2 and ISACA.

ABSTRACTS

Wednesday, November 8 • Breakout Session 3 • 9:00AM - 11:30AM

TRACK B • SMART URBAN SYSTEMS

RESEARCH AND MODELING FOR INTELLIGENT FAULT DIAGNOSIS OF AIR CONDITIONING SYSTEM IN ELECTRIC BUS

Yi Zhong, Professor, School of Information Engineering, Wuhan University of Technology, China

Electric bus is highly regarded as the main future vehicle with low energy consumption, no exhaust emissions. Air conditioning (AC) system becomes the second largest energy consumption part of electric bus, which will greatly affect recharge mileage and driving performance. With increasing complexity of the inverter AC, there is a high degree of non-linearity, imprecision and uncertainty relationship between phenomenon characteristics and fault performance. It is very important to set up effective and reliable diagnostic model for AC system in electric bus. AC system failure can be divided into soft-fault (progressive fault) and hard-fault sudden failure) generally. The phenomenon of hard-fault is relatively obvious and serious, such as fan stop running, inverter failure , compressor failure, and flowing valve blocked etc. The phenomenon of soft-fault is generated by gradual parameters change during its long time operation, such as refrigerant leakage, evaporator and condenser dirty pollution, etc. Because of its progressive characteristics cannot easy to be found immediately, it will influent cooling efficiency, passenger comfort in electric bus and waste battery energy finally. In this paper, soft-fault diagnosis is mainly looked as our research and modeling target.

In this paper, various types of feature parameters are extracted and analyzed for related soft-fault firstly; and then new fault prediction model of BP neural network is established with improved particle swarm algorithm. There are mainly three steps of prediction data modeling to determine quickly the type and trend of AC system failure soft-fault: characteristic parameters extraction; data preprocessing; the best particles calculation.

However, the neural network model of the soft-fault diagnosis in high-dimensional complex problems is easy to fall into the local extreme point, named as ""dimension disaster"". Different test samples may also have different results evenly because of the principle of empirical risk minimization (ERM). According to the small sample problems of the least structural risk, its prediction model has nothing to do with the dimension of the sample with certain sparseness. Improved support vector machine (SVM) model is proposed to optimize particle parameters in improved particle swarm algorithm. SVM parameter is optimized for the following classification training by improved particle swarm optimization algorithm. Penalty parameter C and Gaussian kernel function parameters of SVM will influent the model predicted results greatly by improved particle swarm algorithm. With actual operation data collection in AC system test-bed and two simulation models, comparative experiments are realized under different soft-fault conditions. From soft-fault diagnosis results of different prediction models, we can see that it spends less training time and has higher predictive accuracy with optimized SVM parameters through the improved particle swarm algorithm.

Yi Zhong has engaged in the field of digital signal processing, embedded system design and intelligent control theory for over 15 years and came to Stony Brook University for visiting exchange and research in 2012 and 2014.Yi is a tenured faculty member in the School of Information Engineering, Wuhan University of Technology, Wu Han, P.R.China where he has served since 2002, and currently serves as the Dean of Electronic Science and Technology Department . Yi has also been an active consultant and has held positions of increasing responsibility in technical management in the areas of AC Intelligent control systems , Medical robot equipments as well embedded microprocessor based systems, having worked directly with the world's most widely known handset manufacturers such as Songz Automobile Air Conditioning CO.LTD in China. Yi received his BEEE and MSEE both in the School of Information Engineering from Wuhan University of Technology, in 1999 and 2002, respectively and received Ph.D. of Information and Communication Engineering in 2007. Yi is author of numerous articles and papers, and has presented in many conferences on topics ranging from Embedded Control Systems to System Fault Diagnosis.

In recent years, Yi has presided and mainly involved 5 National Natural Science Funds in China, and published more than 15 papers in domestic and foreign academic journals and international conferences. Yi is currently one of communication review experts of the National Natural Science Foundation in China and is peer reviewer of several famous international journals.

MOBILE IPV6 PROTOCOLS AND HIGH EFFICIENCY VIDEO CODING FOR SMART CITY IOT APPLICATIONS

Daniel Minoli, Principal Consultant, DVI Communications

A large portion of the human population now lives in cities and by 2050 even a larger fraction of people will be urban dwellers. Many metropolitan areas have seen tremendous real estate development in recent years, yet the roads, water mains, sewers, and power grids have seen no, or extremely limited, upgrades. Whatever infrastructure is in place is aging and, unfortunately, may experience temporary use rationing as upgrades are made, as often one reads in the local press and/or experiences personally. It is clear that technological solutions are needed to manage the increasingly-scarce infrastructure resources under the limitations imposed by population growth, limited financial resources, and, in many instances, local political inertia. The Internet of Things (IoT) offers the promise mof improving the resource management of many assets related to city life – including the flow of goods, people, and vehicles, and the greening of the environment -- by optimizing energy consumption and maximizing life-activity efficiency. This review article assesses some of the application issues, the technical requirements, and some of the technical solutions, including the use of Mobile IPv6 Protocols (MIPv6) and High Efficiency Video Coding (HEVC), associated with a broad-based deployment of IoT capabilities in urban settings; these IoT-based solutions enables city administrations to approach a desired state where citizens can reliably enjoy the Quality of Life benefits afforded by a Smart City paradigm.

Daniel Minoli, Principal Consultant, DVI Communications, has published 60 well-received technical books, 300 papers, 5 market research reports, and made 85 conference presentations. He has many years of technical-hands- on and managerial experience in planning, designing, deploying, and operating secure IP/IPv6-, VoIP, telecom-, wireless-, satellite- and video networks for global Best-In- Class carriers and financial companies. Over the years Mr. Minoli has published and lectured extensively in the area of M2M/Internet Of Things (IoT), network security, satellite systems, wireless networks, IP/IPv6/Metro Ethernet, video/IPTV/multimedia, VoIP, IT/Enterprise Architecture, and network/Internet architecture and services. Mr. Minoli has taught IT and Telecommunications courses at NYU, Stevens Institute of Technology, and Rutgers University. He has acted as Expert Witness and/or IP Technical Consultant in over a dozen legal cases encompassing patent infringement, and other legal matters.

Benedict Occhiogrosso is a Co-Founder of DVI Communications. He is a graduate of New York University Polytechnic School of Engineering. Mr. Occhiogrosso';s experience encompasses a diverse suite of technical and managerial disciplines including sales, marketing, business development, team formation, systems development program management, procurement and contract administration budgeting, scheduling, QA, technology operational and strategic planning. As both an executive and technologist, Mr. Occhiogrosso enjoys working and managing multiple client engagements as well as setting corporate objectives. Mr. Occhiogrosso is responsible for new business development, company strategy, as well program management. Mr. Occhiogrosso also on occasion served as a testifying expert witness in various cases encompassing patent infringement, and other legal matters.

FOREWARNED IS FOREARMED – PREDICTING CONSTRUCTION RELATED TRAFFIC CONDITIONS

Mark Yedlin, Director of Simulation Modeling Services, Greenman-Pedersen, Inc.

The New Jersey Dept. of Transportation (NJDOT) is undertaking a complete rehabilitation of the NJ-495 Bridge over US 1&9 and Paterson Plank Road in the Township of North Bergen, NJ. This bridge is one of the top ten most structurally deficient bridges in the state. NJ-495 is the direct route connecting the New Jersey Turnpike and the Lincoln Tunnel. The 8 lane bridge is located midway between these facilities. While only 1,200 feet in length, the bridge is a critical link in the transportation network:
It is 1.8 miles from the Lincoln Tunnel and 1.7 miles from the New Jersey Turnpike.

- Approximately 40 million vehicles per year travel through the Lincoln Tunnel with 144,000 vehicles per day traveling over this bridge.
- The bridge includes the busiest exclusive bus lane in the United States connecting New Jersey riders to the Port Authority bus terminal in New York. Up to 650 buses an hour travel over the bridge in this lane.
- A combination of lanes and ramps will be closed for approximately 30 months starting in mid-2018.

Given its location and significance, numerous stakeholders are involved in the project including the NJDOT, Port Authority of NY & NJ, New Jersey Turnpike Authority, New Jersey Transit, Hudson County, and local municipalities.

The NJDOT requested that GPI develop and employ sophisticated travel demand and microscopic traffic simulation modeling of the entire NJ-495 corridor using dynamic routing algorithms to develop optimal construction staging and traffic mitigation plans for the project and identify traffic impacts during construction. Static Port Authority models of NJ-495 were substantially expanded, updated, and converted to dynamic models of pre-construction conditions and validated against field observations. Models of traffic operations during construction were then created. These models were used to evaluate detour routes through local streets during critical construction stages and develop mitigation scenarios to minimize traffic impacts during both morning and afternoon peak periods.
The modeling represents a sizeable area including the construction zone, the 3.5-mile NJ-495 corridor, parts of the NJ Turnpike, and NJ Route 3 (just shy of MetLife Stadium), local streets, and Lincoln Tunnel. The simulation modeling is vital to address a variety of questions from the stakeholders:

- What are the expected traffic conditions during construction?
- Where will traffic go?
- What are the effects of additional traffic on the alternate routes?
- How can we mitigate these effects?

The presentation will indicate how each of these questions was addressed as well as reactions from the numerous and varied stakeholders.

Mark Yedlin has over 40 years of experience as a transportation professional specializing in the development and application of traffic simulation models to evaluate proposed improvements to traffic operations. He has held corporate executive and project management positions overseeing numerous transportation studies including simulation analyses of construction staging and work zones, traffic and transit improvements, ITS, traffic safety and air quality. Mr. Yedlin was one of the original developers of FHWA's popular traffic simulation software, now known as CORSIM. Mr. Yedlin serves on the Transportation Research Board Visualization in Transportation Committee and Nassau County Traffic Safety Board and was a founding member of the Intelligent Transportation Society of New York. Since joining GPI 6 years ago, he's been responsible for developing simulation models to evaluate traffic mitigation plans for construction projects as well as models to evaluate the effectiveness of Transit Signal Priority. This work was featured in Thinking Highways magazine and merited a 2014 diamond award from the New York Chapter of the American Council of Engineering Companies. He holds a B.S. Degree in Physics from Fordham University, a B.S. Degree in Civil Engineering from Columbia University and an M.S. in Transportation Engineering from Polytechnic Institute of NY now the NYU Tandon School of Engineering.

IMPROVING THE CONSUMPTION AND WATER HEATING EFFICIENCY IN SMART BUILDINGS

Danilo de Freitas Melo, Professor, Department of Electrical Engineering, Federal Center for Technological Education of Minas Gerais (CEFET-MG), Brazil

Nowadays, more than one out of every two inhabitants of the planet lives in a town or city and in a few years we will probably have dozens of mega-cities with millions of people living in large buildings. Our modeling ability for the cities of tomorrow must be based on criteria other than the infinite availability of energy and resources. The Internet of Things (IoT) is enabling a new breed of smart buildings, implying more accurate and useful information for improving operations in the convenience and efficiency viewpoints. According to the U.S. Energy Information Administration (EIA), there are currently, only in the USA, about 50,000 large commercial buildings (greater than 200,000 square feet) which use about 980 million gallons per day. In apartments and houses, showers are by far the biggest consumers of water, responding for about 25% of the total volume consumed every month. When winter hits big cities and temperatures fall, the hot water consumption increases dramatically. In large residential buildings a considerable amount of treated water is wasted every day by users who dispense cold water present in the pipelines until the heated water is perceived at the points of use. There is a similar scenario in many countries around the world. This work proposes an IoT scheme supported by Asterisk-based IP PBX and intelligent sensors for smart management of hot water usage in large buildings. The hot water reservoirs of large buildings are typically located on the last floor. They keep the heated water stored for use by the consumers.

ABSTRACTS

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TRACK B • SMART URBAN SYSTEMS

The water present in the piping that feeds the consuming units, in turn, is usually cold. Whenever users want to use hot water, all the cold water inside the piping is usually dispensed, until the hot water from the main reservoir reaches the showers and sinks faucets. This behavior results in a large waste of treated water and reduces the energy efficiency of the heating system. A commonly adopted solution consists in applying a dedicated circulating pump to maintain the hot water along the piping. Although this is a more suitable solution than discarding the cold water in the pipeline, it has some drawbacks due the low thermal efficiency and energy waste during the periods in which the hot water consumption is low. In this work the authors use local sensors for water temperature monitoring in the pipelines. The need for hot water circulation in the pipelines is decided by an automated system hosted in a cloud server. An open source Asterisk based IP-PBX system manage all the information in a proper way. The proposed solution allows each user to program the hot water availability using an Interactive Voice Response (IVR). The same easiness is also available in apps for mobile platforms. The results and conclusions are validated by data obtained from a water heating system of a residential building in the southeastern region of Brazil. Water and energy savings are tangible and significant compared to conventional systems.

Danilo Melo received the B.S.in Electrical Engineering from the Centro Federal de Educação Tecnológica de Minas Gerais (CEFET-MG), Belo Horizonte, Brazil, in 1994, and the M.S. and degree in electrical engineering from the Universidade Federal de Santa Catarina, Florianópolis, in 1997. Since 1994, he has been a Faculty Member with CEFET-MG. His current research interests include Smart Cities, Internet of Things, cloud computing, datacenters, parallel and distributed computing.

SMART BUILDINGS AND SMART CITIES AND EVERYTHING AROUND THEM

Dan Turissini, Chief Technology Officer, SPYRUS, Inc.

Smart Cities and the Smart Buildings that comprise them have the enormous potential of leveraging the explosive growth in the Internet of Things to revolutionize our way of life. Benefits of this ubiquitous connectivity are not limited to building and energy infrastructure, but will extend to surrounding environments: intelligent transportation; climate management; surveillance; telemedicine; tenant management. The IoT explosion affects our every day life, expanding the vulnerability landscape. Whether this is in the form of remote sensors/ switches that monitor and manage public services (water, power, sewage); or, remotely accessed, smart phone ready, appliances, home security and other gadgets, even the camera on your home computer or TV.

Key to secure solution development is the emergence of low power, low cost platforms such as the Raspberry Pi, Snapdragon, and TI's OMAP that provide aggregators and gateways sensor information to secure physical infrastructure endpoints/ functions. Gateways, separately or with added low power accelerators, can provide the basis for networks of interconnected processing elements to implement "fog" computing, allowing analytics and compute intensive functions to be performed at the "edge" mitigating latency and providing high availability through redundancy. This allows the incorporation of security coprocessors and accelerators to mitigate vulnerabilities and threats.

Security in interconnected environments is a critical challenge, often a back seat to pushing bells and whistles. Bridging multiple interdependent technologies, a staggering potential for attack arises through malware injection with the resultant potential of DOS, personal data exfiltration, or "botnets" for distributed global attacks. Available technology can provide effective, efficient and accountable security in our design, traditionally an afterthought with some elements added after the design process for perimeter defenses that are no longer a defining demarcation in cyberspace. The flexibility of the IoT paradigm has added multiple new attack surfaces. The more flexible and configurable the solution, the deeper hackers can dive into enormous repositories of sensitive/ private data. Worse, leap anonymously into other assets.

Cloud compounds this problem. Leading IoT ecosystems (Microsoft Azure, Amazon Web Services, Google, etc.), provide a backbone for end-to-end solution connectivity, but offload enhanced security to individual applications/ relying parties.

We will describe the landscape for secure data collection and analysis within the IoT environment and describe methodologies for incorporating secure hardware roots of trust for mission critical applications public and private critical infrastructure and homeland security. We will describe today's network-enabled IoT devices' intrusion vulnerabilities to hijacking threats that escalate to DDOS (i.e., well-publicized Mirai Trojan Horse virus), and elaborate how enforcement within any strong security solution must be anchored in hardware points of trust. We will describe the utility of embedded security controllers, whereby the cryptographic security boundary of is the die itself, allowing it to be embedded in other products for specialized applications. Current PKI HSMs (both elliptic curve and legacy RSA cryptography) are available with EAL5+/ 6 certifications (tamper evident), coupled with a broad range of cryptography, can serve as trust anchors for emerging paradigms such as Continuous Diagnostics and Mitigation.

Dan joined SPYRUS in June as Chief Technology Officer responsible for the enhancement and broader adoption of the company's products and services. A founder of Operational Research Consultants, Inc. in 1991, he led as Chief Executive to become a thought leader in identity verification and trusted authentication. He negotiated its merger with WidePoint where he piloted a seamless transition to a well-funded $120M market cap prior to his 2015 exit.

Since, he's provided expert consulting in identity and access control, cryptographic, biometric, and Public Key Infrastructures. Efforts resulted in patents granted in the USA and six other nations. A systems engineering/ integration innovator and leading expert in trusted managed services, he has achieved Trusted Authority certifications for Public and Private enterprises, pivotal in achieving the vision of implementing the next generation of Cyber Security for his clients.

Vice Chair, AFCEA Homeland Security Committee, he actively evangelizes for the protection of Critical Infrastructure and Citizen privacy. On AFCEA's Educational Foundation Board he is dedicated to providing educational incentives, opportunities and assistance in science, technology, engineering, and mathematics. He holds a BS degree from the US Merchant Marine Academy (Alumni's Outstanding Professional Achievement Award) and a Masters from the George Washington University.

DETERMINING OPTIMAL LOCATIONS OF ELECTRIFIED TRANSPORTATION INFRASTRUCTURE ON INTERSTATE/ US-HIGHWAYS

Mahmoud Alahmad, Associate Professor, Durham School of Architectural Engineering and Construction, University of Nebraska-Lincoln

Electric cars are the next big thing in the transportation industry, as an environmentally friendly way of getting around. With a lot of advancement in the field of battery technology, there has been a substantial growth in the total number of electric cars. It is seen that U.S. electric vehicle sales has seen a rise of 37% in 2016. With a 32% compound annual growth rate (CAGR) over the past four years, U.S.electric vehicles have made a great impact in the market. One of the primary factors restricting the growth of the electric vehicle market is the lack of well-distributed charging infrastructure network. In order to be market ready for electric vehicles, there need to be charging stations installed at strategic locations so that the electric vehicle users could go to their destination city without any range anxiety.

Determining the location for electric vehicle-scharging stations within a particular area of interest can be a key factor for a successful deployment. In this paper, an algorithm has been developed to calculate the number of charging infrastructures for a particular model of an electric vehicle when traveling between two points in a particular Interstate or US- Highway. The algorithm developed is essentially a search algorithm, incorporating many constraints in its formulation, including: range anxiety, rated mileage of the electric vehicle, population of the cities near or on the Interstate or US-Highway, and distance between origin city and destination city. With few assumptions, a mathematical formula is modeled which calculates the real mileage of the electric vehicle which in turn is used in the search algorithm to determine the number of charging infrastructures to be installed. Case studies have been shown for the state of Nebraska, USA with two different models of electric vehicles, to validate the algorithm. In addition, the results were plotted in the state map of Nebraska and detailed analysis were done to check whether the whole of the Interstate or the US-Highway were covered using the proposed charging infrastructures. Also, the neighboring cities to be benefitted were analyzed if there was to be a charging infrastructure placed in a particular location. Effort has been made to prioritize the cities chosen to be installed with charging infrastructure. To do so, the population of the cities has been considered and the number of Interstates and/or US-Highways that are being benefitted from the location are taken into account. By prioritizing, it is made sure that high prior cities and important corridors of Interstates and US-Highways can be focused for development based on the State's economy to making it market ready for Electric Vehicle expansion.

Mahmoud A. Alahmad has been an IEEE member for over 10 years and active in IEEE volunteer activities at the institute wide levels. Mahmoud is a tenured faculty member in the Durham School of Architectural Engineering and Construction at the University of Nebraska-Lincoln, Omaha, Nebraska, where he has served since 2006. Mahmoud received the B.S., M.S., and Ph.D. degrees from the University of Idaho, Moscow, ID, USA, in 1989, 1991, and 2005, respectively, all in electrical engineering. Mahmoud is author of numerous articles and papers, and has presented in many conferences on topics ranging from Smart Grid, real-time remote energy monitoring, battery power management and power electronics, and renewable energy alternatives. Mahmoud is a registered Professional Engineer (PE) with over 10 years of industry experience in the design of electrical power systems for the built environment. He is currently investigating the economic and environmental impact of electrified transportation and modeling and design of charging infrastructure for battery electric vehicles.

PANASONIC LINKRAY SOLUTION: INFORMATION AT THE SPEED OF LIGHT

Oliver Akinrele, Deputy Director, Panasonic Innovation Center

LinkRay is a data distribution solution based on Panasonic Light ID technology using an embedded digital signal within an LED light, to provide smartphone/mobile users with information and an enhanced experience in a variety of environments and applications.

Senior level leader in global information technology management processes, product management, research and development, support management, customer advocacy, business unit operations and product engineering with a strong track record of identifying and translating technical logistics into operational gains which help drive profitability. Dynamic contributor in the information technology with 25+ years of experience in delivering strategic, impactful IT development and support solutions to support mid-market and Fortune 500 organizations.

ABSTRACTS

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TRACK C • BUSINESS

ENTREPRENEUR'S TOOLKIT TALKS

WHAT IS PATENTABLE?

George Likourezos, Partner, Carter, Deluca, Farrell & Schmidt, LLP

Barriers to competitors are of critical value in building a viable, ongoing business. Patents are a major tool employed by technology companies to carve out protected market space. Patent lawyer George Likouezos explains how to estimate the Patentability of an your invention.

Mr. George Likourezos is a law partner at the intellectual property law firm of Carter, DeLuca, Farrell & Schmidt, LLP in Melville, NY. He specializes in patent law and is registered to practice before the United States Patent and Trademark Office. He has particular expertise in fields of technology including digital electronics, computer architecture, communication systems, electrical circuits and components, optical scanning and imaging, semiconductor devices, semiconductor manufacturing and related electromechanical arts. Mr. Likourezos also has expertise in analyzing patents and IP portfolios in connection with litigation, mergers and acquisitions, product clearance investigations, patentability studies, and for advising R&D teams. He has a B.S. in electrical engineering and an M.S. in Operations Management from Polytechnic University (now NYU Tandon School of Engineering). He earned his J.D. at Touro Jacob D. Fuchsberg Law Center. Mr. Likourezos serves on the advisory board of several technology companies, and is a Board member of the Long Island Capital Alliance and ADDAPT.

TAX MATTERS FOR TECHNOLOGY VENTURES

Karen O'Connor, Tax Director, Marcum, LLP

Expert Karen O'Connor covers this subject, from revenue to deductables, including R&D expenses.

Karen L. O'Connor is a Tax Director at Marcum LLP, working closely with start-up companies, family-owned businesses and large, multi-state companies. Ms. O'Connor provides tax consulting, planning, financial statement disclosure and ongoing compliance services to both public and private entities. With nineteen years of professional experience she has served companies in a variety of industries.

HOW TO IDENTIFY AND WIN SBIR CONTRACTS

Marcie Sonneborn, SBIR & Innovation Specialist, Central New York Technology Development Organization (TDO)

SBIR expert Marcie Sonneborn will provide an overview of how to find an SBIR "RFP" for which you may be competitive, applications, and awardee criteria.

Marcene S. Sonneborn is a Regional Innovation and SBIR Specialist for the Central New York Technology Development Organization (TDO). The TDO's SBIR/STTR program has supported small companies for over 20 years in a multi-region area to generate over $200 million in R&D awards. In this capacity, Marcie conducts workshops around New York State for companies interested in federal technology programs including SBIR, Small Business Technology Transfer Research (STTR), NIST Programs, and others. She also provides one-on-one assistance to companies and entrepreneurs to help them to coordinate the proposal preparation process. She reviews proposals for her clients prior to submission, and assists them when they are preparing their SBIR/STTR project budgets. She also uses the NYS Empire State Development network of resources to provide expertise to clients from across New York if capabilities are not available within the client's region.

Marcie also provides technical and business development assistance to TDO clients, principally in the areas of research and development, technology transfer and commercialization, intellectual property protection and licensing agreements, technology-business organizational planning, management team development, and strategic planning and marketing. She coaches clients to make presentations to venture capitalists and to participate in venture capital forums.

Marcie's specialty is marketing and strategic planning for technology-based and emerging growth companies. She has her MBA from the Syracuse University Whitman School of Management and received her degree in the Innovation Management Program, with emphasis in marketing and finance. Marcie is a Professor of Practice in Entrepreneurship at the SU School of Information Studies. She was formerly an adjunct faculty for the Whitman School of Management Entrepreneurship and Emerging Enterprises Program, teaching courses in entrepreneurship, innovation and creativity. Marcie is a recipient of the Tibbetts Award from the U.S. Small Business Administration. This award is given for economic impact of technological innovation, business achievement and effective collaborations, and effective state and regional impact and support.

Marcie also has published articles on technology management, wrote an assessment workbook for ""Taking Your Business Online,"" and a chapter on the marketing of financial services for a textbook which was published in Eastern Europe. She has participated as the marketing representative on a management team for management training programs in Eastern Europe. She also has worked in marketing research and survey design, including participation on a subcontract to a Fortune 50 company designing and developing technology products for ten plus years into the future.

ALAN ALDA CENTER FOR COMMUNICATING SCIENCE

Valeri Lantz-Gefroh, Improvisation Program Director, Alan Alda Center for Communicating Science, Stony Brook University

Valeri Lantz-Gefroh will describe the work of the Center and how it helps company personnel and individuals improve their skills in communicating the value of technology to those unfamiliar with their art, and why to fund it.

Valeri Lantz-Gefroh is a Lecturer in the School of Journalism where she serves as the Improvisation Program Director in the Alan Alda Center for Communicating Science. She teaches workshops and graduate courses at Stony Brook University and School of Medicine, and travels around the country teaching improvisation at other universities, medical schools, hospitals, conferences and labs. Val was the creator of Science on Tap, an award winning live event and web show. She created Science Unplugged, an outreach program, where she mentors and coaches students from the Alda Center to give science talks in high schools and public libraries.

TRACK D • VISUAL AND DECISION INFORMATICS

CVDI VISUAL EXPLORATION OF BIG DATA

Arie E. Kaufman, Distinguished Professor, Department of Computer Science; Chief Scientist, CEWIT, Stony Brook University

Scientists, engineers and physicians are now confronted with a fire hose of data. Visualization provides these users with effective ways of interacting, interrogating and reasoning with their large datasets. Visualization harnesses the widest bandwidth of the users' input – their visual sense. Furthermore, immersive visualization and immersive analytics are novel ways that allows the users to utilize virtual reality and the entirety of their visual bandwidth, effectively engulfing the user in the data and enabling natural user interfaces including collaborative interaction. The challenges are in creating the visualization and the virtual/augmented reality environments and tools to support the exploration and analysis of big data, including machine learning techniques. We are specifically interested in medical imaging and the tools necessary to support non-invasive diagnosis and treatment. We discuss several examples of visual analytics and immersive analytics tools and applications. We further present a gamut of resources and facilities available in the CVDI center to support visual exploration of big data. We present a custom-built 5-wall Cave environment, called the Immersive Cabin (IC), driven by a GPU cluster for both computation and 3D stereo rendering. Combined with a range of interaction and navigation tools, the IC can support numerous interactive applications of big data. One specific example is virtual colonoscopy which utilizes an interactive immersive navigation system inside the volume-rendered virtual colon to locate colonic polyps, the precursor of colorectal cancer. Current visualization displays, however, have not kept up with the explosive growth in data size and resolution, which is beginning to match the resolution of the visuals that surround us in daily life. To ameliorate this challenge, we have developed a life-like, realistic immersion into the petascale data to be explored, appropriately called The RealityDeck. It is a one-of-a kind pioneering Giga-pixel immersive and collaborative display system – a unique assembly of high-res display panels, GPU cluster, networking, sensors, and human-computer interaction technologies.

Arie Kaufman is a Distinguished Professor of the Computer Science, Director of the Center of Visual Computing (CVC), Chief Scientist of the Center of Excellence in Wireless and Information Technology (CEWIT), and Site Director of the NSF IUCRC CVDI (Center for Visual and Decision Informatics) at Stony Brook University. He served as Chairman of the Computer Science Department 1999-2017. He has conducted research for 40 years in visualization, computer graphics, virtual-reality, medical imaging and their applications, has published more than 300 refereed papers, books, and chapters, has delivered more than 20 invited keynote/plenary talks, has been awarded/filed more than 40 patents, and has been a principal/co-principal investigator on more than 100 research grants. He is a Fellow of IEEE, a Fellow of ACM, was elected to the European Academy of Sciences, the recipient of the IEEE Visualization Career Award (2005), and was inducted into the Long Island Technology Hall of Fame (2013), as well as the recipient of numerous other awards. He was the founding Editor-in-Chief of the IEEE Transaction on Visualization and Computer Graphics (TVCG), 1995-1998. He has been the co-founder/papers co-chair of IEEE Visualization Conferences; Volume Graphics Workshops, Eurographics/SIGGRAPH Graphics Hardware Workshops, and ACM Volume Visualization Symposia. He previously chaired and is currently a director of IEEE CS Technical Committee on Visualization and Graphics. He received a PhD in Computer Science from the Ben-Gurion University, Israel, in 1977.

SEMANTIC INFORMATION INTEGRATION AND APPLICATIONS IN BIOMEDICAL AND HEALTHCARE DOMAINS

Yuan An, Associate Professor, College of Computing and Informatics (CCI), Drexel University

Semantic information integration (SII) aims at discovering, extracting, integrating, and using meaningful information from multiple, distributed, and heterogeneous sources. In the big data era, Semantic Information Integration (SII) not only needs to overcome the issue of variety, but also needs to deal with volume, velocity, and veracity. In this talk, we will discuss some enduring challenges in semantic information integration and the efforts we have put into several research projects in biomedical and healthcare domains. We will show the recent advancements in semantic information extraction made by different groups who applied deep neural networks. We will also present the directions we are working on to improve the state of the arts.

Dr. Yuan An is an associate professor in the College of Computing and Informatics (CCI at Drexel). He earned a PhD degree in Computer Science from the University of Toronto, Canada, in 2007. He joined the College of Information Science and Technology (former iSchool at Drexel) in the same year. His research focus is on developing and evaluating data integration and data mining methods and algorithms in business, scientific, biomedical, and healthcare domains. Dr. An has led projects on semantic driven information extraction and integration funded by the NSF I/UCRC Center for Visual and Decision Informatics (CVDI). Dr. An has experience in developing and evaluating in healthcare information systems. He has conducted research on understanding and analyzing the workflow and clinicians' requirements when using IT to manage chronic diseases. Collaborating with clinicians and healthcare researchers, Dr. An developed a flexible EHR using custom data collection templates and has a strong research record in HIT research.

REINFORCEMENT LEARNING BASED DECISION INFORMATICS IN CVDI

Peter A. Beling, Professor of Systems and Information Engineering, University of Virginia

A growing area of research within CVDI focuses on application of reinforcement learning and related machine learning techniques to support control and decision-making in cyber-physical and other engineering systems. This talk explores three principal elements of this research: (1) Robust/adaptive models of individual and multi-agent decision-making and control. This element includes theory and algorithms for reinforcement and inverse reinforcement learning (RL and IRL), dynamic programming, Markov decision processes (MDPs), and other paradigms distinguished by explicit modeling of agent decision-making in terms of concepts of state and reward. (2) Data-driven modeling of the environments supporting autonomy. The RL paradigm assumes knowledge of states (or features), rewards, and control actions. In engineering system applications, however, the integration or development of sensors and algorithms for estimation of these quantities can be a non-trivial problem. This element also includes the simulation models that can provide surrogates for real-world, action-reward interactions and state transitions in the learning paradigm. (3) Innovative applications that embrace uncertainty and

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TRACK D • VISUAL AND DECISION INFORMATICS

state space complexity. In some settings, such as the recent triumph of the approach in the game of Go, RL algorithms can be applied directly to create value. In complex, engineered systems, however, it is often the case that the value of learning-based prediction and control can only be realized as a component of a larger decision process. Concepts and methods for integration of learning into planning and operations are themselves an important research topic.

Peter A. Beling is Professor and Interim Chair of Systems and Information Engineering at the University of Virginia. Dr. Beling's research interests are in machine learning and decision-making, with emphasis on applications to decision making in prognostics and health management and cyber-physical systems. He directs the UVA site of the Center for Visual and Decision Informatics, a National Science Foundation Industry/University Cooperative Research Center, and the Adaptive Decision Systems Laboratory, which focuses on data analytics and decision support in cyber-physical systems. He is a member of UVA's Data Science Institute and its Link Lab for Cyber-Physical Systems. Dr. Beling is General Co-Chair of the 2017 Annual Conference of the Prognostics and Health Management Society and the 2018 Conference on Systems Engineering Research.

CROSSROADS BETWEEN SIGNAL PROCESSING AND MACHINE LEARNING – CVDI APPROACH

Professor Moncef Gabbouj, Director, NSF IUCRC Center for Visual and Decision Informatics, TUT-Site, Department of Signal Processing, Tampere University of Technology

In this talk, we shall briefly introduce the main research directions and highlight the key achievements within CVDI exploring principles from signal processing and machine learning and their applications in the new generation decision-making environments in several application areas. In particular, we shall focus on the challenges and the gaps in the field and pinpoint the potential of the high gain that can be achieved by properly combining both approaches. The latter include signal processing, machine learning and particularly deep learning, pattern recognition, computer vision and even quantum mechanics. The applications span a wide area, including but not limited to biomedical and other industrial applications with emphasis on big data analytics.

Moncef Gabbouj received his BS degree in electrical engineering in 1985 from Oklahoma State University, and his MS and PhD degrees in electrical engineering from Purdue University, in 1986 and 1989, respectively. Dr. Gabbouj is a Professor of Signal Processing at the Department of Signal Processing, Tampere University of Technology, Tampere, Finland. He was Academy of Finland Professor during 2011-2015. His research interests include Big Data analytics, multimedia content-based analysis, indexing and retrieval, artificial intelligence, machine learning, pattern recognition, nonlinear signal and image processing and analysis, voice conversion, and video processing and coding. Dr. Gabbouj is a Fellow of the IEEE and member of the Academia Europaea and the Finnish Academy of Science and Letters. He is the past Chairman of the IEEE CAS TC on DSP and committee member of the IEEE Fourier Award for Signal Processing. He served as associate editor and guest editor of many IEEE, and international journals and Distinguished Lecturer for the IEEE CASS. He organized several tutorials and special sessions for major IEEE conferences and EUSIPCO. Dr. Gabbouj guided 45 PhD and 58 Masters students and published 700 papers.

DATA MANAGEMENT FOR VISUAL ANALYTICS ON DATA STREAMS

Raju Gottumukkala, Ph.D., Director of Research, Informatics Research Institute, University of Louisiana Lafayette

Applying visual analysis on data streams presents many benefits such as automated analysis and interactive visualization on real-time information generated from many sources such as mobile/web applications, e-commerce, social networks, or sensor networks. A public health tracking system should enable the decision makers to not only identify high-risk population vulnerable to an infectious disease in a geographical area, but also to have the ability to explore intervention strategies that are most efficient. Similarly, during emergencies, information is flooded from a wide variety of sources and decision makers should be able to identify emerging trends and patterns on the ground for effective response. The data management processes that feed the visual analytics decision-making environments should overcome many issues related to data pre-processing, data sharing, and data integration. The talk discusses some key barriers to achieving fast and dynamic analysis of data streams arising from multiple data sources, ongoing efforts, including the visual analytics sandbox implementation and data management projects, within CVDI and potential future research topics under consideration.

Dr. Raju Gottumukkala is the LEQSF Regents Assistant Professor with the College of Engineering and the Director of Research for Informatics Research Institute. His research interests are in addressing real-world sensing, communication and information processing related challenges in building networked cyber-physical systems. Specific topics of interest include quality of service of data streams, big data platforms, data mining, linear optimization, software defined networks, visual analytics, formal methods, reliability engineering, and time evolving graphs. He is also the PI for Visual Analytics Sandbox - a big data platform (http://visualanalyticscloud.org) funded by NSF for processing high-volume, high-velocity data streams. His has generated over $7M in research funding over several years sponsored by various state and federal agencies including NSF, NIHS/DHS S&T, DOE, and industry. He has over 14 peer-reviewed conference/journal publications, and 2 U.S. Patents. He is also one of the 37 recipients of the 2017 Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities. The homeland security community adopted several of his research projects including the Fuel Demand Estimation Model for Regional Evacuation, the Louisiana Hazard and Risk Information Portal, the Intelligent Levee Surveillance System (iLevee) and Louisiana Business Emergency Operations Center (LA BEOC).

Wednesday, November 8 • 11:45AM - 12:30PM

CLOSING KEYNOTE

WORKING TOWARD A SMARTER SOCIETY

Kimihiro Okubo
President & CEO, DOCOMO USA

More than just communication between people, IoT holds incredible value in its ability to connect things and potential to greatly impact society. We are beginning to see the true extent of this impact with the increased use of IoT across various industries in recent years. The fifth-generation mobile communication network, essential to the further growth of IoT, is also currently in development with a target for commercial release in 2020. This presentation will cover mobile operators' views on the coming era of 5G in addition to how we envision using IoT to make a smarter society, what we are doing to expand IoT, and several case studies.

Mr. Kimihiro "Kimi" Okubo is the President & CEO of NTT DOCOMO USA, Inc. and Director of NTT DOCOMO, INC. Mr. Okubo has more than 20 years of experience at NTT DOCOMO, INC. From April 1997 to June 2004, Mr. Okubo worked at the NTT DOCOMO, INC. R&D center in Tokyo. He contributed to the 1999 launch of Japan's first mobile Internet access service, "imode," by developing the packet exchange gateway system to connect DOCOMO's mobile network with the Internet.

From July 2004 to March 2010, Mr. Okubo worked in the Corporate Strategy and Planning Department at DOCOMO in Tokyo, where his main mission was to develop business strategies for LTE and WiMAX. He led a cross-functional team for the launch of DOCOMO's LTE service and was also in charge of developing a business plan for LTE service.

From April 2010 to March 2013, as the General Manager of the Strategic Marketing Department, Mr. Okubo led six projects which succeeded in enhancing subscriber satisfaction in areas including network quality, after-sales service, subscriber inquiries and pricing plans. This helped DOCOMO to receive the highest marks among Japan's mobile operators, for two consecutive years, in the J.D. Power Asia Pacific annual retail customer satisfaction study.

From April 2013 to March 2015, as Director of the Radio Access Engineering Department at the Tokyo Headquarters of DOCOMO, Mr. Okubo was responsible for optimizing the business operations of the public service "DOCOMO Wi-Fi". Mr. Okubo successfully expanded the number of active users and contributed to cellular traffic offloading to DOCOMO's Wi-Fi network.

Mr. Okubo earned his MBA at The MIT Sloan School of Management, June 2016; and a Master's degree in Electrical and Electronic Engineering at Hokkaido University, March 1997.

POSTERS

MONITORING A PERSON'S HEART RATE AND RESPIRATORY RATE DURING SLEEP ON A SHARED BED USING GEOPHONES

Zhenhua Jia,
Rutgers University

Earlier work has studied how to use one geophone to detect heartbeats via sensing vibrations when a single subject occupies a bed. In this study, we develop a system called VitalMon, aiming to monitor a person's respiratory rate as well as heart rate, even when she is sharing a bed with another person. In such situations, the vibrations from both persons are mixed together. VitalMon first separates the two heartbeat signals based on the spatial difference between two sources with respect to each geophone, and then distinguishes the respiration signal embedded in amplitude fluctuation of the heartbeat signal.

TOWARDS AN AUTONOMOUS UNDERWATER VEHICLE USING SONAR IMAGING FOR BRIDGE SCOUR ASSESSMENT

Brent Horine
Manhattan College

Bridge scour is a leading cause of bridge failures. Currently, divers perform the inspection. An autonomous system to assess bridge scour erosion using imaging sonar on underwater vehicles will facilitate more frequent inspections and in unsafe conditions. We discuss an innovative image analysis process applied to a sonar images test set from known scour critical bridges. We will review progress towards adapting the algorithms to run in real-time on an Nvidia Jetson TX1 embedded processor and discuss implementation challenges of a low cost end-to-end system, including sonar integration, autonomous navigation and path planning, vehicle design and construction, and GIS development.

3D PRINTED ELECTRONICS

Mwamba Bowa
University of Tennessee

Additive manufacturing, has shown strong potential in reduced energy use, sustainability and cost effectiveness. Electronic systems and subsystems are built using a variety of material and processes, which require a large carbon footprint, significant waste material and high production time. We propose the application of additive manufacturing technology to support an integrative process for combining circuit board fabrication, solder mask process, electronic component pick and place and enclosure manufacturing. The integration of these separate processes, into a single high efficiency additive manufacturing process will yield significant savings in energy use, carbon footprint, waste product and production time and cost.

AUTOMATING MOSQUITO SURVEILLANCE USING AUDIO MONITORING AND CLOUD-BASED RECOGNITION USING BAYESIAN INFERENCE

Brent Horine
Manhattan College

Mosquito borne illnesses are a significant human health concern. Current mosquito survey techniques are labor intensive and suffer latency between initial collection in a trap and actionable results. We present an automated, connected system for mosquito surveillance using audio monitoring of wing flap frequency and identification using a cloud-based Bayesian inference algorithm. Some closely related species have similar frequencies, so we add features including harmonic levels, temperature, humidity, light, time, location, and trap-type information. We confirm using image capture triggered by the audio match. We describe our end-to- end platform including hardware, firmware, and cloud software.

MEMORY BASED FAULT TOLERANT RECONFIGURABLE SOLAR CELLS WITH EMBEDDED CMOS

Samarth Revankar
California State University, Fullerton

With advancement in photovoltaic (PV) cells manufacturing its usage in commercial and domestic application increased drastically. However, when PV module is deployed for powering loads such as micro-autonomous drones and satellite at non-serviceable and hostile areas can result in lowering in performance or non-functionality of the load. To address such issues it's proposed to use a monolithic CMOS-on- PV with an embedded computing device. We are presenting a memory based fault detection and mitigation technique for such PV module. The proposed technique compares the currently measured power with the previously measured power of the load from the memory for fault detection.

HOW DO WE AID VISUALLY IMPAIRED PEOPLE SAFELY MANAGE UNFAMILIAR ENVIRONMENTS?

Martin Goldberg
The Graduate Center,
City University of New York

We present an innovative approach to use assistive technology aiding visually impaired persons with orientation, navigation and mobility. We propose an integrated cyber-physical framework where a smart agent and a smart environment share information and work together to aid visually impaired people safely manage unfamiliar environment. The agent is a cyber entity represents an individual outfitted with customized body worn wireless sensors controlled by a device called the personal information hub. The smart environment, with sensing and computing capability embedded in physical infrastructures, 'talks' to the agent providing the aid specific to this environment according to the agent's prescribed needs.

INFORMATION + COMMUNICATION TECHNOLOGY UTILIZATION AND THE EMERGENCE OF A POPULAR POLITICAL REVOLUTION

Martin Smyth
Stony Brook University

This research described in this poster applies insights from political economy, statistical thermodynamics and complexity economics to explore the role of mobile internet information and communication technology (ICT) in the emergence of a popular political revolution, particularly under conditions of persistent regime suppression. The diffusion of mobile internet ICT is observed to condition the propagation of information across a population, such that a revolution may be considered to be a 'self-computing' cyber-physical system (CPS). It is anticipated that the findings of a proposed computational modeling investigation will yield important insights about the dynamics of revolutions against politically repressive regimes.

OPTIMAL DIVISIBLE LOADS SCHEDULING FOR RESOURCE-SHARING NETWORK

Fei Wu
Stony Brook University

Virtualization is an important technique in multi-tasking and parallel systems, where the limited computing and communication resources can be shared by different end-users. For a multi-tasking processor, the processor's speed may be time-varying due to the arrival and departure of other background jobs. This poster studied an optimal scheduling problem on a single level tree network, whose processing speed and channel speed are time-varying. To model the big data scenario, Divisible Load Theory (DLT) is utilized. To evaluate our method, speedup and finishing time are used as criteria in the numerical test.

IMOTION-CONTROLLED GAMES AS AN ALTERNATIVE APPROACH TO STROKE REHABILITATION

Amna Haider
Stony Brook University

A major concern with the current method of stroke rehabilitation is accessibility and exercise adherence. The use of gaming platforms can address this issue by providing physical therapy that is translatable between the clinic and home. Existing games in the field have many wires and detect only one direction of movement through remotes, limiting the types of performable exercises. Our game innovates the market by using two separate detection systems in parallel, Arduino and Microsoft Kinect. Together these provide accessible and cost-effective at-home rehabilitation that improves patient compliance, increases the range of incorporable exercises, and makes the gameplay virtually wireless.

IMPROVING SAFETY IN CYBER PHYSICAL VEHICLE SYSTEMS THROUGH ANALYSIS OF NETWORK LATENCIES

Steven Muldoon
George Washington University

Network delays degrade safety in Cyber Physical Vehicle Systems, jeopardizing the reduction of US crash fatalities by 20% in 2020 and beyond. Cyber Physical Vehicle Systems (CPVS) expand "Internet of Things" into the automotive domain. Reducing thousands of crash related casualties by employing CPVS is a significant, attainable objective. While, a key enabler for increasing CPVS safety is low latency communications, many proposed CPVS architectures do not adequately consider network latency. The subject systems engineering research explores latency sensitivities adversely impacting vehicle safety, and proposes alternative approaches toward solutions. This study is relevant to researchers, systems engineers, and automotive stakeholders.

SCHEDULING AND TRADE-OFF ANALYSIS FOR MULTI-SOURCE MULTI-PROCESSOR SYSTEMS WITH DIVISIBLE LOADS

Yang Cao
Stony Brook University

This piece of work is about a scheduling problem in parallel and distributed systems. We manage the execution of jobs, which require system resources so that certain optimality conditions are met, which can be minimal finishing time, lowest monetary cost, etc. In our work, multiple sources are scheduled to communicate with the processing nodes in a specific sequence which solves the finishing time optimization problem. The data type we are studying is divisible load, which can be divided into arbitrary sizes. A system monetary cost model is proposed. Trade-off relationship between monetary cost and minimal finishing time is also discussed.

NON-CONTACT THERMAL MEDIUM-BASED BREATHING ANALYSIS

Breawn Schoun
University of Colorado Denver

Respiratory monitoring is used in medical applications to detect abnormal breathing conditions. In sleep studies, respiration monitoring detects disorders such as obstructed breathing and sleep apnea. Respiration monitoring methods either place sensors on the patient's body, causing discomfort and altering natural breathing, or they measure respiration remotely at the cost of accuracy. We present a method of non-contact analysis that monitors respiration directly and remotely. We place a thin medium perpendicular to the individual's face, and record the heat signature from their breath on the material using a thermal camera. We then use image processing to extract respiratory behaviors.

DATA-DRIVEN ROBUST CONTROL FOR TYPE 1 DIABETES UNDER MEAL AND EXERCISE UNCERTAINTIES

Nicola Paoletti
Stony Brook University

We present a fully automated, closed-loop design for an artificial pancreas (AP) which regulates the delivery of insulin for the control of Type I diabetes without meal announcement from the patient. To handle uncertainties related to the patient's daily activities, we develop a data-driven robust model-predictive control framework, based on learning uncertainty sets from data to capture meal and exercise patterns. Our extensive computational evaluation demonstrates the potential of our approach to support high carbohydrate disturbances and to regulate glucose levels in virtual patients learned from population-wide survey data (CDC's NHANES database).

DESIGNING A BLUETOOTH-ENABLED WEARABLE FITNESS TRACKER TO ASSIST FAMILY EFFORTS TO PREVENT CHILD OBESITY

Steven Crimarco
Stony Brook University

In the past 40 years, child obesity has more than tripled in the United States, with currently one in every five children having obesity. Using Bluetooth technology to connect two devices wirelessly, the proposed design is for a set of cheap and easily accessible fitness devices used as a family-based child prevention strategy. The device plans to record child's fitness data only when the parent and child are in range of each other, motivating parents to help their children exercise. The device will also be paired with a game to motivate children and track progress.

WORD EMBEDDINGS FOR GENOME ANNOTATION WITH DEEP LEARNING

Ailsa Yurovsky
Stony Brook University

Advances in deep learning have enabled the construction and training of networks that can perform multi-feature learning on enormous data sets. Our project for genome annotation using deep learning will scan through thousands of entire genomes, learning the multi-feature classification at a nucleotide-level. We present word embeddings as a good representation of semantic and syntactic relationships of the input to our network. We demonstrate that our word embeddings capture local sequence similarity and biological features. We present the architecture of our deep learning network prototype and show that longer embeddings help the network achieve better accuracy.

AUTOMATING LIFECYCLE-PHASE IDENTIFICATION IN MICROSCOPY IMAGES OF ZEBRAFISH EMBRYOS

Shahira Abousamra
Stony Brook University

Microscopy imagery usually consist of time-sequential frames with multiple focus-layers per frame, and manual annotation of these frames to identify patterns of interest is highly time-consuming. Here, we propose a method for automating this process by utilizing computer vision and deep learning. We first condense the focus-slices in each time-frame into a single image maximizing the information from all layers. We then detect the possible locations of interest and use deep-learning to identify specific instances of patterns that occur during cell-division of zebrafish embryos. We show the superiority of our proposed technique in terms of accuracy and time efficiency.

POSTERS

APPLYING BIG-DATA ANALYTICS TO OPEN HEALTH DATA: AN ANALYSIS OF TRENDS IN NEW YORK STATE

A. Ravishankar Rao
Fairleigh Dickinson University

Many governments publicly release large amounts of health data, including patient outcomes and detailed costs. Due to the size and complexity of these data sets, a Big Data Analytics framework becomes essential to understand open health data. Significant hurdles that need to be overcome include merging data from disparate sources and applying interpretive analytics. We present a Python-based framework that merges data from disparate sources and applies interpretive analytics. We analyzed data released by New York State under the SPARCS open data program and identified an alarming increase in mental health issues amongst teenagers. Our code is available at https://github.com/fdudatamining/framework"

CLASSIFICATION OF PANCREATIC CYSTS IN COMPUTED TOMOGRAPHY IMAGES USING A RANDOM FOREST AND CONVOLUTIONAL NEURAL NETWORK ENSEMBLE

Konstantin Dmitriev
Stony Brook University

There are many different types of pancreatic cysts. These range from completely benign to malignant, and identifying the exact cyst type can be challenging in clinical practice. This work describes an automatic classification algorithm to classify the four common types of pancreatic cysts using computed tomography images. The proposed approach utilizes the general demographic information about a patient, as well as the imaging appearance of the cyst. It is based on a Bayesian combination of the random forest classifier and a new convolutional neural network. A 10-fold cross-validation on 134 patients reported a classification accuracy of 83.6%.

A NOVEL DATA CENTER VIRTUALIZATION FRAMEWORK

Jun Duan
Stony Brook University

Virtualization is an essential step before a bare-metal data center being ready for commercial usage, because it bridges the foreground interface for cloud tenants and the background resource management on underlying infrastructures. In this work, we propose a virtualization framework that considers multi-tenancy and load balancing simultaneously. First, the framework accommodates heterogeneous network communication patterns by supporting arbitrary traffic matrices among virtual machines in virtual private clouds. Second, our framework achieves load balancing using an elaborately designed link establishment algorithm. Our framework concentrates on the fat-tree architecture, which is widely used in today's data centers.

MAXIMIZING CNN ACCELERATOR EFFICIENCY THROUGH RESOURCE PARTITIONING

Yongming Shen
Stony Brook University

Convolutional neural networks (CNNs) are revolutionizing machine learning, but they present significant computational challenges. Current FPGA-based CNN accelerators use a single processor that computes one CNN layer at a time. This approach is inefficient because the same processor is used to compute CNN layers of radically varying dimensions. We present a new CNN accelerator design methodology which partitions the available FPGA resources into multiple heterogeneous processors, each of which is tailored for a different subset of the CNN layers. Multiple smaller specialized processors increase computational efficiency and overall accelerator throughput, yielding up to 3.8x speedup on popular CNNs.

RCUBE: A POWER EFFICIENT AND HIGHLY AVAILABLE NETWORK FOR DATA CENTERS

Zhenhua Li
Stony Brook University

In this paper, we propose a novel server-centric network structure RCube, which is energy efficient and can deploy a redundancy scheme to improve the availability of data centers. Moreover, RCube shares many good properties with BCube, yet its network size can be adjusted more conveniently. We also analyze the power efficiency of the network and availability of RCube under server failure. Our comprehensive simulations demonstrate that RCube provides higher availability and flexibility to make trade-off among many factors, such as power consumption and aggregate throughput, which makes RCube a very empirical structure for an enterprise data center network product.

APPLICATION OF THE BIOLOGICALLY INSPIRED HIERARCHICAL TEMPORAL MEMORY (HTM) THEORY FOR DOCUMENT CATEGORIZATION

Deven Shah
Stony Brook University

We analyse the performance of the Hierarchical Temporal Memory(HTM) model for automated classification of text. HTM is a biologically inspired theory based on the working principles of the human neocortex. Our current study intends to provide an alternative framework for text categorization using the principles of the spatial pooler learning technique in the HTM Theory. The spatial pooler algorithm converts the binary input into sparse bit representations with similar input text having overlapping spatial patterns, making it easy for classifying the patterns into categories. The result of testing the HTM theory on 20 newsgroup standard dataset gave an accuracy of 83.19% which is at par with most of the popular machine learning based classifiers.

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Shahira Abousamra
Stony Brook University

Microscopy imagery usually consist of time-sequential frames with multiple focus-layers per frame, and manual annotation of these frames to identify patterns of interest is highly time-consuming. Here, we propose a method for automating this process by utilizing computer vision and deep learning. We first condense the focus-slices in each time-frame into a single image maximizing the information from all layers. We then detect the possible locations of interest and use deep-learning to identify specific instances of patterns that occur during cell-division of zebrafish embryos. We show the superiority of our proposed technique in terms of accuracy and time efficiency.

LEVERAGING TARGET K-COVERAGE IN WIRELESS RECHARGEABLE SENSOR NETWORKS

Pengzhan Zhou
Stony Brook University

We have considered target k-coverage in Wireless Rechargeable Sensor Networks. First, we conduct theoretical analysis on the improvement of charging capability of MC. Second, we study a distributed algorithm that can assign sensors into balanced clusters around targets. Third, we optimize the number of sensors being charged in each cluster while guaranteeing target k-coverage. A λ-GTSP charging algorithm is proposed. Next, we further consider mobile targets such that original clusters are expanded until a re-clustering condition is met. Finally, we demonstrate that the new framework can greatly improve the charging capability of MC and reduce the operating cost.

FAIR CACHING STRATEGIES FOR PEER DATA SHARING IN PERVASIVE EDGE COMPUTING ENVIRONMENTS

Yaodong Huang
Stony Brook University

Edge devices with sensing, storage and communication resources are penetrating our daily lives. Many novel applications can be created when nearby peer edge devices share data. We address the fair caching problem in Peer data sharing. We take fairness and delay as consideration and propose an approximation algorithm of 6.55 approximation ratio. We further propose a distributed algorithm for nodes without knowing the global information of the network. We extend the distributed algorithm for continuous caching decisions over long time periods. Evaluation shows that our algorithms significantly improve data caching fairness while keeping the contention induced latency low.

COMPACTING SECURITY AUDIT LOGS USING VERSIONED DEPENDENCE GRAPHS

Junao Wang
Stony Brook University

Increasingly, large organizations are being targeted in long-running attack campaigns that can last months or years. System audit logs provide crucial information that underpins the forensic analysis. Unfortunately, audit data collected over months or years can grow to enormous sizes. Large data size leads to storage concern and slowness of forensic analysis tasks. We formulate several powerful criteria for identifying redundant records in audit data that can be discarded or merged. We show that these data reductions can cut data sizes by a factor of 2.4x to 17x without losing the accuracy of forensic analysis.

SLEUTH: REAL-TIME ATTACK SCENARIO RECONSTRUCTION FROM COTS AUDIT DATA

Md NahidHossain
Stony Brook University

SLEUTH is a system for real-time reconstruction of attack scenarios on an enterprise host. To meet the scalability and real-time needs of the problem, we develop a platform-neutral, main-memory based, dependency graph abstraction of audit-log data. We use efficient, tag-based techniques for attack detection and reconstruction, including source identification and impact analysis. We also develop methods to reveal the big picture of attacks by constructing compact, visual graphs of attack steps.

MINING RELATIONSHIP-BASED ACCESS CONTROL (REBAC) POLICIES

Thang Bui
Stony Brook University

Relationship-based access control (ReBAC) provides a high level of expressiveness and flexibility that promotes security and information sharing. We formulate ReBAC as an object-oriented extension of attribute-based access control (ABAC) in which relationships are expressed using fields that refer to other objects, and path expressions are used to follow chains of relationships between objects. ReBAC policy mining algorithms have potential to significantly reduce the cost of migration from legacy access control systems to ReBAC. We present the first algorithm for mining ReBAC policies from access control lists (ACLs) and attribute data represented as an object model.

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IMPLEMENTING AN INTEGRATED, ANIMAL-THEMED GAME ON A THIGH FITNESS BAND TO PROMOTE PHYSICAL ACTIVITY IN OBESE CHILDREN

Brandon Zhuang
Stony Brook University

The aim was to create a child-friendly fitness band that incorporates an integrated game, in which users are rewarded based on their level of physical movement. A muscle sensor was tested on the quadriceps and the data showed different intensity patterns between running and walking. The design discreetly packages the electronics in the band with the LCD screen disguised inside an animal. The game implements a points system based on user physical activity. The different muscular activity patterns detected demonstrates the device's feasibility. Furthermore, the animal-themed casing and rewarding game system makes our device more inclusive and child friendly.

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