Panel Title: Deep Learning in Smart Healthcare

Organizer
Yingying (Jennifer) Chen (Rutgers University)

Panelists
Kit August (Industry)
Mooi Choo Chuah (Lehigh University)
Rich Martin (Rutgers University)
Yan Wang (Temple University)

Organizer Bio

Yingying (Jennifer) Chen is a Professor of Electrical and Computer Engineering and Peter Cherasia Endowed Faculty Scholar at Rutgers University. She is the Associate Director of Wireless Information Network Laboratory (WINLAB). She also leads the Data Analysis and Information Security (DAISY) Lab. She is an IEEE Fellow. Her research interests include mobile sensing and computing, cyber security and privacy, Internet of Things, and smart healthcare. Her background is a combination of Computer Science, Computer Engineering and Physics. She had extensive industry experiences at Nokia previously. She has published over 200 journal articles and conference papers. She is the recipient of multiple Best Paper Awards from EAI HealthyIoT 2019, IEEE CNS 2018, IEEE SECON 2017, ACM AsiaCCS 2016, IEEE CNS 2014 and ACM MobiCom 2011. She is also the recipient of NSF CAREER Award and Google Faculty Research Award. She received NJ Inventors Hall of Fame Innovator Award and is also the recipient of IEEE Region 1 Technological Innovation in Academic Award. Her research has been reported in numerous media outlets including MIT Technology Review, CNN, Fox News Channel, Wall Street Journal, National Public Radio and IEEE Spectrum. She has been serving/served on the editorial boards of IEEE Transactions on Mobile Computing (IEEE TMC), IEEE Transactions on Wireless Communications (IEEE TWireless), IEEE/ACM Transactions on Networking (IEEE/ACM ToN) and ACM Transactions on Privacy and Security. For more information, please refer to http://www.winlab.rutgers.edu/~yychen/.

Abstracts and Bios

Title: TAP and Intelligent Technology for Connected Lifestyles - Trust, Accessibility, and Privacy
Katherine Grace August (Industry)

Abstract: In early 2020, the world was transformed by an unprecedented public health emergency – a global pandemic caused by Coronavirus and associated Covid-19 – and a shattering cascade of consequences spreading most velociously through healthcare systems, the economy, education, government, transportation, justice, and virtually every aspect of life public, and private. Technology and technology disparity have emerged as pivotal in world affairs, and public policy has taken a higher priority in determination of systems requirements than consumers or product-driven markets. It became clear that timely and comprehensive ***access to intelligent technology and a connected lifestyle*** should not be considered discretionary but compulsory for ***every human being***. The Covid-19 outbreak also made clear that fragmented noncompatible dispersive systems do not serve present nor future needs. Providing assistance (Accommodation) and connection (Accessibility) to people with differing abilities, for example the elderly and those with hearing loss and other disabilities, underrepresented, minorities, economically challenged, and marginalized populations has become even more difficult and uncertain. While people with special needs are often served by separate or dedicated devices and may be supported by alternative systems, their lack of availability and interoperability created major challenges. The digital divide has amplified existing disparities, leading to great harm to many individuals, their families, and communities

with sickness and death, economic devastation, and tremendous suffering expected to impact families, communities, and nations for generations. Previous forecasts about Internet of Things (IoT) Connected Lifestyles (CL), predictions of tremendous increases, nevertheless did not anticipate the present unprecedented needs of the society as a whole, affecting every one of its constituents. Moreover, this great expansion of IoT extended to Connected Healthcare (CH) and includes its requirements for example, Trust and Privacy, which is all now integrally linked with CL. As a result, there is an urgent, immediate and ubiquitous increasing demand from stakeholders of every type, and a widening diversity of users. Intelligent Technology and Connected Lifestyles in this context will improve not only safety and security, but it will allow our essential interactions with the world. The envisioned world of IoT connected healthcare, intelligent technology and connected lifestyles will be only possible under a system of Trust, Accessibility, and Privacy (TAP).

Biography: Katherine Grace August, PhD (Kit) is a Research Guest at Stevens Institute of Technology – ECE Intelligent Networks. Current research projects involve humanitarian activities following the UN Sustainable Development Goals and focus on employing low cost mainstream technology to reduce inequity for those with differing abilities such as hearing loss, and promoting improved opportunity for underrepresented, minorities, women and girls through inventing. Research experience in neurorehabilitation with robots, haptics, augmented and virtual reality, functional brain imaging, signal processing, wireless, systems engineering, and the like. Former Bell Labs MTS New Service Concepts Systems Engineering 1991 – 2002. Current Stevens Consultant project: NSF SPECTRA. IEEE Standards Group P2933 TIPPSS for Connected Healthcare (Trust Identity Privacy Protection, Safety, Security). Current IEEE SIGHT Project: 'Do Good Things, Justice for All,' an experiential learning system to understand hearing loss, and provide augmentative communications to reduce disparity. 18 United States Patents; 50 International Patents; Citations: 3078, h index 21, i10 index 24; IEEE NJ Coast Section Volunteer and Region 1 Award 2020; 'Hear, here!' Do Good Robotics Startup Competition Finalist University of Maryland, 2019; IEEE HAC 'Justice for All' Event 2019; Chair of PACE SIGHT Group, IEEE NJ Coast Section History Chair, AP-VT-EMC Vice Chair; Whitaker Scholar 2009-2012 at ETH Zurich. Kit received the PhD in Biomedical Engineering, NJIT, the MSCS-MIS, Marist College, and BFA Communications Design, Parsons The New School for Design.

Google Scholar: https://scholar.google.com/citations?user=v_azvz4AAAAJ&hl=en

LinkedIn: https://www.linkedin.com/in/kit-august-0000331/

Team Blog: https://www.sites.google.com/site/sensosmartvirtualsensors/do-good-robotics-competition-hear-here

IEEE NJ Coast Section History Wiki: https://ethw.org/IEEE_New_Jersey_Coast_Section_History

Title: Robust Deep Learning Models for HealthCare with Explanations
Mooi Choo Chuah (Lehigh University)

Biography: Dr. Mooi Choo Chuah is a Full Professor in the Department of Computer Science & Engineering at Lehigh University. She received her PhD degree in Electrical Engineering from University of California San Diego in 1991. She spent 12 years at Bell Laboratories where she was involved in designing future wireless internet systems. Her work at Bell Laboratories resulted in her being awarded 63 US patents and 15 international patents in multiple areas e.g. Quality of Service in wireless networks. Dr. Chuah joined Lehigh University in 2004 and directed the Wireless Infrastructure and Network Security Laboratory. She was one of the NSF Advance Chairs in 2011 and was elected an IEEE Fellow in 2014. She has served as associate editor for several top journals including IEEE Transactions on Mobile Computing. She has also served as Technical Co-Chair for ACM/IEEE CHASE 2017, IEEE INFOCOM 2010, a Co-Chair for 2013 Globecom Next Generation Networking Symposium and a Co-Chair for IEEE MASS 2019 Security & Privacy Track. She was also named as a National Academy Inventors Fellow in Dec 2017. Her current research interests include robust deep learning models for healthcare data mining, object and activity recognition, autonomous driving, future intelligent data systems.

Title: Towards Unobtrusive Patient Discrimination Using A Smart Pill-Bottle
Rich Martin (Rutgers University)

Abstract: Accurately accounting for medication use is important for the efficacy and safety of patients and family members. Monitoring is also important for medication adherence. This work investigates passive identification of persons taking medication using a sensor-equipped pill-bottle. The bottle is equipped with inertial and switch sensors in both the cap and body, making the added hardware unobtrusive, low-cost, and wireless. Our system uses inertial data to build a patient discrimination model using classification techniques. We evaluated the system using two datasets that we collected from 36 subjects. Our results show that using binary Support Vector Machine (SVM), the system can discriminate one individual among 3 people with over 90% accuracy and recall, and has greater than 80% accuracy and recall, using a single sensor. Identifying the exact person in a set of 3 subjects has an accuracy higher than 91%. We also show that we can infer the correct class of previously unseen subject in a group of 3 subjects by using one-class SVM, with 75% average overall accuracy and 83% average recall.

Biography: Dr. Richard Martin is an associate professor of computer science at Rutgers University. His current research interests include low energy sensing and medication adherence. He is a member of the Network Information Laboratory (WINLAB). His awards include the best paper award at the 2004 IEEE Conference on Sensor and Ad Hoc Communication Networks as well as a CAREER award from the National Science Foundation. Dr. Martin has served as an investigator on grants from the Defense Advanced Research Projects Agency, the National Science Foundation, and IBM. He received a B.A. from Rutgers University, and an M.S. and Ph.D. in computer science from the University of California at Berkeley.

Title: Enable Low-cost Human-Computer Interaction and Continuous User Authentication Using Wearables

Yan Wang (Temple University)

Biography: Dr. Yan Wang is an Assistant Professor with the Department of Computer and Information Sciences at Temple University. Before joining Temple University, he was an Assistant Professor with the Department of Computer Science at SUNY Binghamton University. Dr. Wang's research interests span Mobile and Pervasive Computing, Smart Healthcare, Internet of Things, and Cyber Security and Privacy. He is the recipient of the Best Paper Awards from IEEE CNS, IEEE SECON, and ACM AsiaCCS. He received the Stuart K. Tewksbury Award for the 2014-2015 academic year in the Stevens Institute of Technology. He is also the Winner of the ACM MobiCom Student Research Competition, 2013. His research has been reported in numerous media outlets, including IEEE Spectrum, Yahoo Tech, MIT Technology Review, CNN, Fox News Channel, Wall Street Journal, and National Public Radio. He has served as the Publication Chair for IEEE DySPAN 2019 and ACM WiSec 2019, the student travel grant co-chair of MobiCom 2016, the web chair of CNS 2016 and 2017. He also has served as TPC for many top-tier conferences and journals, including MobiCom, INFOCOM, CNS Transactions on Mobile Computing, Transactions on Networking, etc.