Electrical & Computer ENGINEERING

Carnegie Mellon University

Special Seminar

Secure Signal Processing Solutions for Distributed Processing and Anomaly/Attack Detection in Cyber-Physical Systems (CPSs)

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Porter Hall
Basement
Room B34

ABSTRACT:
The CPSs are engineering systems with embedded control, communication, and sensing capabilities that can interact with humans through cyber space. The rapid growth of CPSs and the fact that privacy and security are key concerns in this context makes identification and prevention of cyber-attacks and development of privacy preserving mechanisms of significant practical importance. The first part of this talk is devoted to large-scale CPSs with nonlinear dynamics and sparse observations. I present a multi-rate consensus/fusion based distributed estimation framework for scenarios where network connectivity is intermittent. A distributed sensor selection algorithm is then presented with the objective of dynamically activating a time-variant subset of sensor nodes for adaptive resource management in CPSs. The second part of this talk is motivated by recent evolution of cutting-edge smart-sensor technologies (smart-meters) in CPSs. Managing privacy and security of such new technologies is of paramount importance in future smart grid and smart metering networks. A specific attack model for compromising Phasor Measurement Units (PMUs) will be discussed and a novel detection methodology will be introduced by transforming the attack detection problem into the problem of comparing statistical distance measures. Finally, the talk will be concluded by discussing attack and anomaly detection using Graph-based signal processing.

BIO:
Arash Mohammadi (S'08-M'13) received B.Sc. degree Control Systems from University of Tehran in 2005, the M.Sc. degree in Biomedical Engineering from Amirkabir University of Technology (Tehran Polytechnic) in 2007, and Ph.D. from York University in 2013. He is currently an Assistant Professor with Concordia Institute for Information Systems Engineering (CIISE), Concordia University, Montreal, Canada. Prior to joining Concordia University, he was a Postdoctoral Fellow at Department of Electrical and Computer Engineering, University of Toronto, Canada. He is the Vice-Chair of IEEE Signal Processing Montreal Chapter; serves as the leading Guest Editor in IEEE TRANSACTIONS ON SIGNAL & INFORMATION PROCESSING OVER NETWORKS on "Distributed Signal Processing for Security and Privacy in Networked Cyber-Physical Systems", and; was the Organizing Committee chair of "IEEE Signal Processing Society Winter School on Distributed Signal Processing for Secure Cyber-Physical Systems". He is also the Co-Chair of the "Symposium on Advanced Bio-signal Processing for Rehabilitation & Assistive Systems", which will be held in 2017 IEEE GlobalSIP, Montreal, Canada, and; is a Co-Organizer of the Special Session on "Bio-Signal Processing for Movement Assessment, Neuro-Rehabilitation and Assistive Technologies," which will be held in 2017 IEEE SMC, Banff, AB, Canada. His research interests include: biomedical signal processing, cyber-physical systems; information fusion; distributed signal processing for agent networks; secure networked control systems; consensus algorithms, large-scale dynamical systems, and; smart grids. Dr. Mohammadi has received several distinguishing awards, including the Eshrat Arjomandi Award for outstanding Ph.D. dissertation from Electrical Engineering and Computer Science Department of York University in 2013, and one of the best student paper awards from IEEE International Conference on Information Fusion (FUSION'12).).

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Light Refreshments