From Data Mining to Knowledge Mining in Smart Infrastructure

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Abstract

Given the tremendous production of data in smart grids and smart cities, there is a need for new powerful tools that can automatically generate useful knowledge from a variety of data, and present it to systems operators and stakeholders. In an effort to create knowledge mining tools, researchers have been exploring methods and algorithms developed in learning methods, statistical inference, information theory, perception, network modeling, and operations research communities. This first part of this talk will address a compendium of ideas on the applicability of sensor networks, and machine learning tools for data mining and data fusion. The effective use of causality inference and information theory makes it possible to develop knowledge mining tools that derive useful new knowledge not only from large amounts of data but also from limited and weakly relevant data sets. The second part of the talk outlines our current research direction on smart grids and smart cities by which we characterize the interdependency and interconnectivity of electricity networks with other urban utility networks around the novel concept of co-mobility.

Biography

Dr. Reza Arghandeh is an assistant professor in the Electrical and Computer Eng Dept and the Center for Advanced Power System. He is the director of Collaborative Intelligent Infrastructure Lab (CI2). He has been a postdoctoral scholar at the University of California, Berkeley's California Institute for Energy and Environment 2013-2015. He has five years industrial experience in power and energy systems. He completed his Ph.D. in Electrical Engineering with a specialization in power systems at Virginia Tech. He holds Master's degrees in Industrial and System Engineering from Virginia Tech 2013 and in Energy Systems from the University of Manchester 2008. From 2011 to 2013, he was a power system software designer at Electrical Distribution Design Inc. in Virginia, focusing on applications for the Distribution Engineering Workstation (DEW) software platform. Dr. Arghandeh’s research interests include, but are not limited to, power systems monitoring, distributed energy resources integration, data analysis and decision support for smart grids and smart cities using statistical inference, machine learning, information theory, and operations research. He is a recipient of the Association of Energy Engineers (AEE) Scholarship 2012, the UC Davis Green Tech Fellowship 2011, and the best paper award from the ASME 2012 Power Conference and IEEE PESGM 2015. He is the chair of the IEEE Task Force on Big Data Application for Power Distribution Network and secretary of the IEEE Working Group on Distribution Power Quality.