Dr. Randy Paffenroth

Space-Time Signal Processing for Distributed Pattern Detection in Sensor Networks

February 27 at 11am
LSC 214-6

Abstract:

In this talk we will present theory and algorithms for detecting weak, distributed patterns in network data. The patterns we consider are anomalous temporal correlations between signals recorded at sensor nodes across a network. We use robust matrix completion and second order analysis to detect distributed patterns that are not discernible at the level of individual sensors. When viewed independently, the data at each node cannot provide a definitive determination of the underlying pattern, but when fused with data from across the network the relevant patterns emerge. We are specifically interested in detecting weak patterns in computer networks where the nodes (terminals, routers, servers, etc.) are sensors that provide measurements (of packet rates, user activity, central processing unit usage, etc.). The approach is applicable to many other types of sensor networks including wireless networks, mobile sensor networks, and social networks where correlated phenomena are of interest.

Bio:

Dr. Paffenroth graduated from Boston University with degrees in both mathematics and computer science. After defending his thesis in the spring of 1999, he was awarded his Ph.D. in Applied Mathematics from the University of Maryland in June of 1999. After attaining his Ph.D., Dr. Paffenroth spent seven years as a Staff Scientist in Applied and Computational Mathematics at the California Institute of Technology. In 2006 he joined Numerica and has since held the position of Computational Scientist and, most recently, Program Director. As Program Director, Dr. Paffenroth's responsibilities include the management of a team of scientists as well as mathematical research, proposal development, and software engineering. Before joining the Numerica team, Dr. Paffenroth developed theory and software for high-order methods for boundary integral formulations of partial differential equations at the California Institute of Technology. His current technical interests include machine learning, signal processing, compressed sensing, and the interaction between mathematics, computer science and software engineering.