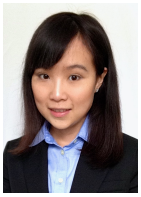
Cornell University $\mathbb{I}$*nformation,* $\mathbb{S}$*ystems, and* $\mathbb{N}$*etworks seminar*

High-Dimensional Change-Point Detection

Rhodes Hall 655: May 22, 2013 @ 12:00PM



ISN Seminar Speaker:

Yao Xie

Duke University

Abstract

How do we quickly detect small solar flares in a large video stream generated by NASA satellites? How do we improve detection by efficient representation of high-dimensional data that is time-varying? Besides astronomical imaging, high-dimensional change-point detection also arises in many other applications including computer network intrusion detection, sensor networks, medical imaging, and epidemiology. In these problems, each dimension of the data is obtained by a sensor, and there are multiple sensors monitoring the emergence of a signal—an abrupt change in the distribution of the observations. The goal is to detect such a signal as soon as possible after it occurs, and make as few false alarms as possible.

Two key challenges in high-dimensional change-point detection are 1) how to extract useful statistics, 2) how to find an efficient representation of the data. Many high-dimensional data exhibit low-dimensional structures such as sparsity, or the data may lie on a low-dimensional manifold. The approach I take is to exploit these low-dimensional structures in change-point detection. I will describe a mixture procedure that exploits sparsity, and MOUSSE, an online algorithm for tracking the evolving data manifold and extracts efficient statistics for change-point detection. If time permits, I will also describe some recent work on low complexity change-point detection algorithms based on dimension reduction.

Biography

Yao Xie joined Duke University as a Research Scientist in the Electrical and Computer Engineering Department at Duke University after receiving her Ph.D in Electrical Engineering (minor in Mathematics) from Stanford University in 2011. She will join Georgia Institute of Technology, Industrial and Systems Engineering Department, in August 2013. She completed research internship at General Electric Global Research Center, Medical Image Lab in 2007, and held the General Yao-Wu Wang Stanford Graduate Fellowship from 2007 to 2010. She is interested in sequential statistical methods, statistical signal processing, big data analysis, compressed sensing, optimization, and has been involved in applications to wireless communications, sensor networks, medical and astronomical imaging.