A Probabilistic Approach to Rumor Source Detection and Graph-based Message Passing Algorithms

**Date**: 21 May 2015 (Thursday)
**Time**: 10:30 am - 11:00 am
**Venue**: CS Seminar Room, Y6405, 6th Floor Yellow Zone, Academic 1, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon Tong

**Abstract**

Epidemic-like spreading of information is an important big-data topic. In particular, rampant spreading of malicious information has been identified as a major cyber-security challenge in the networks. Indeed, big-data detection of these malicious information sources has many important applications, e.g., rooting out a computer virus or rumor spreading in the Internet or an online social network respectively. Given a snapshot observation of the nodes in the network possessing the malicious information, how to reliably identify the source of the spreading? This is a challenging combinatorial hard problem that is complicated by the dynamics of the spreading and the computational barrier when the graph is huge.

In a recent seminal work (IEEE Transactions on Information Theory 2011), Shah et al formulated this as a maximum likelihood estimation problem and proposed a graph-theoretic notion of rumor centrality to solve this problem exactly for degree-regular tree graphs. For general graph topology, this maximum likelihood estimation is still an open problem. We propose a novel probabilistic approach to this rumor source detection problem by providing a probabilistic characterization to the rumor boundary of the observed graph data. This probabilistic approach leads to the design of distributed message passing algorithm for huge graphs.

The paper was presented at the Optimization and Big Data 2015 in Edinburgh, UK, May 6-8, 2015.

Research Interests: Network Economics; Big data Analytics; Cloud Computing; Nonlinear Optimization and its applications.

All are welcome!