Fall 2017

Mathematical Sciences Colloquium

"Graph-structured sparse optimization for anomalous pattern detection in attributed networks"

Abstract: Big data are often created by aggregating multiple data sources and modeled as large-scale attributed networks. Many applications of big data analytics are concerned of discovering anomalous patterns (subnetworks) that are interesting or unexpected, such as detection of disease outbreaks, subnetwork biomarkers, network intrusions, cyber threats, societal events, among others. Despite considerable attention to the problem, most of existing methods are either heuristic or computationally intractable for large-scale attributed networks. In this talk, I will present a general graph-structured sparse optimization approach to the problem that runs in nearly-linear time and at the same time provides rigorous guarantees on quality. We frame the problem as a constrained combinatorial problem, in which the objective function is defined based on attribute data and the constraint is defined based on network topology (e.g., connected, dense, isomorphic to a query graph). The key idea is to iteratively search for a close-to-optimal solution by solving easier sub-problems in each iteration: (1) identification of the subnetwork that maximizes the objective function in a sub-space determined by the gradient of the current solution and the topology constraint; and (2) approximate projection of the identified subnetwork onto the feasible space that satisfies the topology constraint. We will demonstrate the effectiveness and efficiency of the proposed approach using several real-world datasets.

Speaker: Feng Chen

(SUNY Albany)

Monday, October 2, 2017

Time: 4:00 – 5:00 PM

Location: AE214

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