Computer Science Seminar

Graph-Structured Optimization for Anomalous Pattern Detection in Attributed Networks

Dr. Feng Chen

Albany-State University of New York

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 the existing methods are either heuristic or computationally intractable for large-scale attributed networks. In this talk, I will present a general graph-structured optimization framework for solving 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.

Bio: Dr. Feng Chen is currently an Assistant Professor in the Computer Science Department at the University at Albany - State University of New York, where he directs the Event and Pattern Detection Laboratory. Before joining UAlbany, he was a post-doctoral at the EPD Lab and the iLab at Carnegie Mellon University. He holds a Ph.D. in computer science from Virginia Tech in 2012. His research interests are in large-scale data mining, graph mining, and machine learning, with a specific focus on event and anomalous pattern detection in massive, complex, and high-dimensional network data. His research has been funded by NSF, NIH, ARO, IARPA, and the U.S. Department of transportation, and been reported in over 80 peer-reviewed journal and conference papers. He is the recipient of an NSF CAREER award in 2018 and a member of the IEEE and the ACM.

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