Learning with Attributed Networks: Algorithms and Applications

Attributes - that delineating the properties of data, and connections - that describing the dependencies of data, are two atomic components that are often used to characterize most real-world phenomena. The synergy between these two principal elements renders a unique data representation referred as attributed networks. In fact, many of us find ourselves inundated with vast amounts of data that can be structured into attributed networks, and their use has been attractive to researchers and practitioners in different domains, examples include social media networks, collaboration networks, protein-protein interaction networks, critical infrastructure networks, to name a few. To gain deep insights from attributed networks, it requires us to have a fundamental understanding of their unique characteristics and be aware of the related computational challenges.

My research aims to develop a suite of novel learning algorithms to understand, characterize, and gain actionable insights from attributed networks, to benefit high-impact real-world applications. In this talk, I will elaborate on learning algorithms for attributed networks at two different levels: (i) attribute level - by designing feature selection algorithms to find high-quality features; and (ii) node level - by presenting network embedding algorithms to learn discriminative node embeddings. Meanwhile, many real-world attributed networks are naturally dynamic with frequent structure and content changes. As a result, the results of learning algorithms will become stale over time, I will also present a family of online algorithms for attributed networks in a dynamic environment to continuously update the learning results on the fly. At the end, I will briefly talk about our efforts on advancing real-world applications on attributed networks by incorporating the objectives of external tasks into the learning process to tailor specific needs.