Computer Science
Seminar

Knowledge Discovery of Graph Transformation Patterns by Deep Generative Models and Optimization

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Abstract: Inspired by the tremendous success of deep generative neural networks on modeling and generating continuous data like image and audio, in recent couple of years, deep graph generative learning is becoming a promising domain which focuses on generating graph-structured data. Most of them are unconditioned generative models which has no control on modes of the graphs being generated. Going beyond that, in this presentation, I will talk about a new topic named Deep Graph Transformation: given a source graph, we want to infer a target graph based on their underlying global and local transformation mapping. By automatically interpreting such generative transformation process, we aim to distill new rules and patterns of the underlying transformation mechanism. Deep graph transformation could be highly desirable in many promising applications on network synthesis and prediction, such as chemical reaction simulation, brain network modeling, and protein structure prediction. I will introduce our recent progress on new structured learning frameworks, convolution and deconvolution operations, and intepretability enhancement techniques for deep graph transformation. Furthermore, I will further talk about the computational bottlenecks of current optimization techniques for training deep neural networks, especially for complex, large data such as graphs. I will introduce our recent work on gradient-free optimization techniques for deep neural network optimization based on deep alternating optimization, which aims to overcome several existing fundamental drawbacks such as gradient vanishing, low concurrency, and biological implausibility.

Bio: Dr. Liang Zhao is an assistant professor at the Department of Information Science and Technology at George Mason University. He obtained his PhD degree in 2016 from Computer Science Department at Virginia Tech in the United States. His research interests include data mining, artificial intelligence, and machine learning, with special interests in spatiotemporal and network data mining, deep learning on graphs, nonconvex optimization, and interpretable machine learning.

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