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Computer Science Seminar Series

National Capital Region

Advancing Optimization for Learning from Sequential Data with Deep Autoregressive Models

Speaker: Prof. Mingrui Liu
George Mason University
Friday, February 9, 2024
11:15AM– 12:15PM, NVC 213

Abstract

Deep autoregressive models, which predict the next value based on the previous values within that sequence using deep neural networks, are ubiquitous in sequential data learning such as time-series analysis and natural language processing. Examples include recurrent neural networks, long-short-term memory networks, transformers, and recent foundation models. Despite its empirical successes, the underlying theoretical and algorithmic foundations remain limited. The critical challenge is that the loss landscape of autoregressive models is nonsmooth, with a potentially unbounded smoothness parameter. In this talk, I will introduce my group's recent efforts on new optimization algorithms for deep autoregressive models. First, I will talk about how to learn a single distribution efficiently: I will introduce an efficient adaptive gradient algorithm which is provably better than gradient descent under unbounded smoothness setting. Second, I will talk about how to learn multiple distributions efficiently: I will introduce our new algorithms in the setting of federated learning and meta-learning, which aim to learn from data mixtures and perform well on existing individual distribution or downstream tasks.

Biography
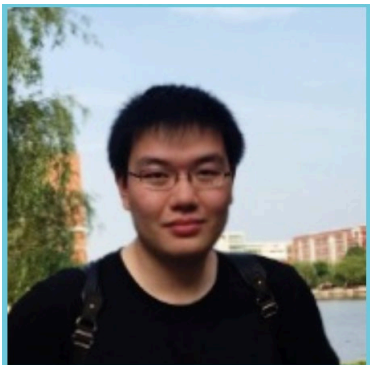
Mingrui Liu is an assistant professor at the Department of Computer Science at George Mason University since August 2021. Before that he was a postdoctoral fellow at Boston University from 2020-2021. He received his Ph.D. in Computer Science at The University of Iowa in August 2020. His research interests include machine learning, mathematical optimization, statistical learning theory, and deep learning. He has served as an area chair for NeurIPS/AISTATS/IJCAI. His research has been recognized by a Cisco Faculty Research Award and a AAAI New Faculty Highlights.