Statistical Learning Theory of Deep Neural Networks for Data with Low-Dimensional Structures

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Talk will take place from 11:15AM - 12:05PM through Zoom.

Abstract: In the past decade, deep learning has made astonishing breakthroughs in various real-world applications. It is a common belief that deep neural networks are good at learning various geometric structures hidden in data sets, such as rich local regularities, global symmetries, or repetitive patterns. One of the central interests in deep learning theory is to understand why deep neural networks are successful, and how they utilize low-dimensional data structures. In this talk, I will present some statistical learning theory for deep ReLU networks where data exhibit low-dimensional structures, such as lying on a low-dimensional manifold. The learning tasks include regression, classification and learning operators between Hilbert spaces. When data are sampled on a low-dimensional manifold, the sample complexity crucially depends on the intrinsic dimension of the manifold instead of the ambient dimension of the data. These results demonstrate that deep neural networks are adaptive to low-dimensional geometric structures of data sets.

Bio: Dr. Wenjing Liao is an assistant professor in the School of Mathematics at Georgia Tech. She obtained her Ph.D. in mathematics at University of California, Davis in 2013. She was a visiting assistant professor at Duke University and a research scientist at Johns Hopkins University before joining Georgia Tech. She works on theory and algorithms in the intersection of applied math, machine learning, imaging and signal processing. Her current research interests are numerical methods for data analysis, statistical learning theory and deep learning. She received NSF CAREER in 2022.