FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

The Sampling Complexity of Learning Invertible Residual Neural Networks

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Time: 2024-12-26, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

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Abstract: In recent work, it has been shown that determining a feedforward ReLU neural network within high uniform accuracy from point samples suffers from the curse of dimensionality in terms of the number of samples needed. As a consequence, feedforward ReLU neural networks are of limited use for applications where guaranteed high uniform accuracy is required. We consider the question of whether the sampling complexity can be improved by restricting the specific neural network architecture. To this end, we investigate invertible residual neural networks which are foundational architectures in deep learning and are widely employed in models that power modern generative methods. Our main result shows that the residual neural network architecture and invertibility do not help overcome the complexity barriers encountered with simpler feedforward architectures. Specifically, we demonstrate that the computational complexity of approximating invertible residual neural networks from point samples in the uniform norm suffers from the curse of dimensionality. Similar results are established for invertible convolutional residual neural networks.