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Implicit Bias and Provable Generalization in Overparameterized Neural Networks

Abstract:

When training large neural networks, there are typically many solutions that perfectly fit the training data. Nevertheless, gradient-based methods have a tendency to reach those which generalize well, and understanding this “implicit bias” has been a subject of extensive research. In this talk, I will discuss three works that show settings where the implicit bias provably implies generalization in two-layer neural networks: First, the implicit bias implies generalization in univariate ReLU networks. Second, in ReLU networks where the data consists of clusters and the correlations between cluster means are small, the implicit bias leads to solutions that generalize well, but are highly vulnerable to adversarial examples. Third, in Leaky-ReLU networks (as well as linear classifiers), under certain assumptions on the input distribution, the implicit bias leads to benign overfitting: the estimators interpolate noisy training data and simultaneously generalize well to test data. Based on joint works with Spencer Frei, Itay Safran, Peter L. Bartlett, Jason D. Lee, and Nati Srebro. Bio: Gal is a postdoc at TTI-Chicago and the Hebrew University, hosted by Nati Srebro and Amit Daniely as part of the NSF/Simons Collaboration on the Theoretical Foundations of Deep Learning. Prior to that, he was a postdoc at the Weizmann Institute, hosted by Ohad Shamir, and a PhD student at the Hebrew University, advised by Orna Kupferman. His research focuses on theoretical machine learning, with an emphasis on deep-learning theory.