The Deep Bootstrap Framework

We propose a new framework for reasoning about generalization in deep learning. The core idea is to couple the Real World, where optimizers take stochastic gradient steps on the empirical loss, to an Ideal World, where optimizers take steps on the population loss. This leads to an alternate decomposition of test error into: (1) the Ideal World test error plus (2) the gap between the two worlds. If the gap (2) is universally small, this reduces the problem of generalization in offline learning to the problem of optimization in online learning. We then give empirical evidence that this gap between worlds can be small in realistic deep learning settings, in particular supervised image classification. For example, CNNs generalize better than MLPs on image distributions in the Real World, but this is "because" they optimize faster on the population loss in the Ideal World. This suggests our framework is a useful tool for understanding generalization in deep learning, and lays a foundation for future research. This talk is based on this paper.

Preetum Nakkiran, Ph.D.

Research Scientist
Apple

Date: Monday, November 21, 2022
Time: 2:00 – 3:00 p.m. US Central Time
Location: **Blocker 220** (in person)
Online: 998 4499 3279 (ID) & 724615 (PWD)
Faculty host: Venkatesh Shankar, MKTG

Biography

Dr. Preetum Nakkiran is a Research Scientist at Apple, in the Machine Learning Research Group. His research builds conceptual tools for understanding learning systems, including deep learning---using both theory and experiment as appropriate. His past works include Deep Double Descent, the Deep Bootstrap Framework, and Distributional Generalization. Preetum obtained his PhD in Computer Science at Harvard, advised by Boaz Barak and Madhu Sudan. During his PhD, he co-founded the Harvard ML Foundations Group, and co-ran the corresponding seminar series. He did his postdoc at UCSD with Misha Belkin, and was part of the NSF/Simons Collaboration on the Theoretical Foundations of Deep Learning. He has also worked with Google Research and OpenAI, and is the prior recipient of the Google PhD Fellowship and the NSF GRFP. Dr. Nakkiran did his undergraduate work in EECS at UC Berkeley.

You can also click this link to join the seminar https://tamu.zoom.us/j/99844993279?pwd=TkJodWFVRURyMmkwakI4SWZGeVJTQT09

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