Special Year on Optimization, Statistics and Machine Learning (2019-20)

The special year was conceived in spring 2017 and then held in 2019-20. Needless to say, given the pace of progress in AI, it feels like decades ago. But it did have a notable impact on the field as well as the scientific community in Princeton.

First, IAS's engagement with this field was timely --within 5 years of the "ImageNet" paper of 2012 (the big bang that formed modern AI)-- and thus a signal to many disciplines that something special was going on. This was noticed and appreciated widely around the world. Within Princeton, the special year involved joint activities with diverse academic units in town: Special lecture series or workshops were co-organized with IAS's School of Humanities; the Princeton Neuroscience Institute; and Princeton Center for Theoretical Science. There were weekly seminars and discussion groups at the IAS special year. In fall'19 the SY participants banded together to teach a "Theory of Deep Learning" graduate course at Princeton Computer Science. Arora has periodically taught this course and each time updated the course notes.

Prominent visitors/speakers in the special year included senior leaders such as LeCun, Bengio, Hassabis, Kohli, Manning, etc. The year came to a slightly early end after February'20 due to the Covid situation.

Looking back, a lot has changed in AI since 2020, starting with release of GPT3 that summer. But the influence of the Special Year continues to be felt. Many/most participants of the special year are now deeply engaged in AI and quite a few have radically changed their research agendas. (Post-covid in 2022 there was also a Simons Foundation funded Workshop on theory of deep learning and AI that brought many of them together, and led to new collaborations.) Several have had stints in leading frontier model teams, and many student and postdoc participants are currently employed there. Many IAS faculty (e.g., Avi, Akshay) continue to explore interests in AI. Princeton has one of the most active groups working on AI for Math and has produced the leading open model for AI for Math, Goedel Prover v2 (an even better v3 is forthcoming). The Goedel prover group (led by Arora and Chi Jin) are now engaged in a collaboration with Rutgers mathematicians (led by Kontorovich) in a new 3-year project (funded by Darpa) for automated theorem proving using Lean. The university has many AI initiatives, which also feed back indirectly into AI activities at the IAS.