



SCMS Colloquium

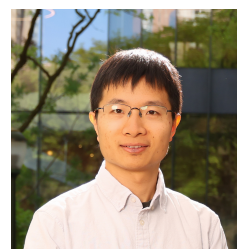
Toward a Mathematical Theory of Deep Learning: Lessons from Personal Research

Weijie Su

University of Pennsylvania

Time: Jul 23th, 10:30–11:30 AM

Venue: Rm 102, SCMS



Abstract:

A century ago, breakthroughs like relativity and quantum mechanics emerged from or developed alongside rigorous mathematical theories. Today's AI revolution presents a stark contrast: progress remains predominantly empirical while mathematical theory lags significantly behind. In this talk, I will share perspectives on current efforts to establish theoretical foundations for deep learning, drawing from my personal research experiences. We will examine the strengths and limitations of various approaches—including toy models, phenomenological models, and conditional-theory approaches—and explore why certain methods succeed in capturing specific behaviors while failing to provide comprehensive understanding. The talk concludes by highlighting opportunities for the mathematics community to contribute to advancing the theoretical foundations of deep learning.

About the speaker:

Prof. Weijie Su is an Associate Professor in the Department of Statistics and Data Science (The Wharton School) and, by courtesy, in the Departments of Mathematics, and Computer and Information Science at the University of Pennsylvania. Prof. Su serves as a co-director of the Penn Research in Machine Learning Center. He obtained his Ph.D. from Stanford University in 2016 and received his bachelor's degrees in mathematics and economics from Peking University in 2011. He is a recipient of the Stanford Theodore W. Anderson Dissertation Award in 2016, an NSF CAREER Award in 2019, an Alfred Sloan Research Fellowship in 2020, the IMS Peter Gavin Hall Prize in 2022, and the SIAM Activity Group on Data Science Early Career Prize in 2022.

