THE UNIVERSITY  OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Optimization and Machine Learning Seminar

How does generalization behave under suitable model capacities in modern machine learning? From deterministic equivalence to function spaces

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Abstract

In this talk, I will discuss some fundamental questions in modern machine learning:
- What is a suitable model capacity of a modern machine learning model?
- How to precisely characterize the test risk under such a model capacity?
- What is the corresponding function space induced by such a model capacity?
- What are the fundamental limits of statistical/computational learning efficiency within space?

My talk will partly answer the above questions, through the lens of norm-based capacity control. By deterministic equivalence, we provide a precise characterization of how the estimator's norm concentrates and how it governs the associated test risk. Our results show the predicted learning curve admits a phase transition from under- to over-parameterization, but no double descent behavior, and reshapes scaling laws as well. I will talk about the path-norm based capacities and the induced Barron spaces to understand the fundamental limits of statistical efficiency, particularly in terms of sample complexity and dimension dependence—highlighting key statistical-computational gaps.

Date:	July 30, 2025 (Wednesday)
Time:	4:00 pm – 5:00 pm
Venue:	Room 210, Run Run Shaw Building HKU

All are welcome