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Seminar

Stochastic Partial Differential Equations as Scaling Limits of Interacting Particle Systems

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Abstract: Interacting particle models are often employed to gain understanding of the emergence of macroscopic phenomena from microscopic laws of nature. These individual-based models capture fine details, including randomness and discreteness of individuals, that are not considered in continuum models such as partial differential equations (PDE) and integral-differential equations. The challenge is how to simultaneously retain key information in microscopic models as well as efficiency and robustness of macroscopic models.

In this talk, I will discuss how this challenge can be overcome by elucidating the probabilistic connections between particle models and PDE. These connections also explain how stochastic partial differential equations (SPDE) arise naturally under a suitable choice of level of detail in modeling complex systems. I will also present some novel scaling limits including SPDE on graphs and coupled SPDE. These SPDE not only interpolate between particle models and PDE, but also quantify the source and the order of magnitude of stochasticity. Scaling limit theorems and new duality formulas are obtained for these SPDE, which connect phenomena across scales and offer insights about the genealogies and the time-asymptotic properties (extinction probabilities and asymptotic propagating speed) of the underlying population dynamics.

Date: 20 September 2022 (Tuesday)
Time: 10:30 am – 11:30 am
Venue: Room 222, Lady Shaw Building,
The Chinese University of Hong Kong, Shatin

All are Welcome!