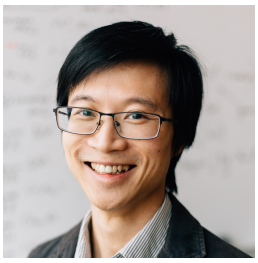
MISSOURI S&T

Mathematics & Statistics Colloquium

Friday, February 19, 2021, 4:15pm-5:15pm
Zoom Meeting ID: 941 6389 5998
Password (if prompted): 371814



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Stochastic PDE as scaling limits of interacting particle systems

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 of the underlying population dynamics.

Biographical Sketch. Louis Fan received his PhD in Mathematics from the University of Washington-Seattle in 2014. After spending one year as a postdoc in the Department of Statistics and Operations research at UNC-Chapel Hill, Fan held the position of Van Vleck visiting assistant professor at the University of Wisconsin-Madison from Fall 2015 to Summer 2018. Since Fall 2018, he has held the position of assistant professor at Indiana University-Bloomington. His research is in probability theory and applications, with interests in stochastic analysis for complex systems; interacting particle systems; stochastic partial differential equations; phylogenetics and phylogenomics; and random growth models.