TOPICS IN PROBABILITY/MATHEMATICAL PHYSICS: LARGE SCALE STOCHASTIC DYNAMICS

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TEXT: There is no text, but lectures will be based on papers and a few reference texts (TM Liggett Interacting Particle Systems, C. Kipnis and C. Landim Scaling Limits of Interacting Particle Systems).

Many physical and applied science models, such as for fluids, traffic, etc., consist of a large number of interacting stochastic components moving on a background space. A theme in statistical physics is to understand such systems in various scales. For instance, typically the `mass density' in the system, in terms of certain large time and space units, will satisfy a PDE whose coefficients and type reflect the particle interactions.

In this course, in the context of specific particle models, we will explore the evolution of the mass density and its fluctuations, the motion of a distinguished particle, and the growth of certain associated interfaces. All of these topics are the subject of current probability/mathematical physics research, and connect in interesting ways with PDE, analysis and dynamical systems.

A background in probability theory is requested, but the main prerequisite is interest, and I would be happy to discuss the course with anyone.