RUTGERS - CAMDEN MATH SEMINAR SERIES

12:45PM - 1:45PM

TUESDAY, MARCH 25TH, 2025

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Title: Continuity Equations in Fibered Wasserstein Spaces – A common framework for meanfield and graphon dynamics

Abstract: During the past fifteen to twenty years, the concept of meanfield approximation has become one of the leading paradigms in the mathematical analysis of large multiagent systems. This prominence can be explained by its mathematical versatility, its modelling power, and its general amenability to various families of numerical schemes.

However, meanfield limits are, by essence, confined to operating at the level of homogeneous particle systems, wherein the dynamics of each agent only depends on purely spatial quantities (e.g. its own position and that of the others). In order to provide a macroscopic description of heterogeneous multiagent systems, a more recent trend has consisted in leveraging the concept of graph limit, introduced by Lovasz and Szegedy. These are quite natural and relatively easy to manipulate, albeit a bit rigid as they lead to considering ODEs in Lebesgue spaces, coined graphon dynamics.

In this ongoing work in collaboration with Nastassia Pouradier Duteil (INRIA, Sorbonne Université), we investigate a new class of evolutions taking the form of continuity equations over spaces of Young measures endowed with an adequate "fibered" Wasserstein metric. The main interest in doing so is that the latter combine some of the desirable features of both meanfield and graphon dynamics, while providing an embedding of both in natural limit cases. In this context, I will present the basics of all three models, discuss some of the topological properties of fibered Wasserstein distances, and expose Carathéodory and Cauchy-Lipschitz well-posedness results for the underlying dynamics.

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