On Machine Learning Methods for Mean Field Games and Mean Field Control Problems

SPEAKER: Mathieu Laurière, Princeton University

TIME: 1:45 pm-2:45 pm, Tuesday, December 3, 2019

VENUE: Room 310, Pudong Campus, 1555 Century Avenue (上海纽约大学310教室, 上海市浦东新区世纪大道1555号)

ABSTRACT

In this talk, we will present stochastic numerical methods for mean field games and mean field control problems (also called optimal control of McKean-Vlasov dynamics). These problems arise as the limit of Nash equilibria or social optima in games when the number of players grows to infinity. The first part of the talk will be dedicated to methods based on neural networks to compute solutions when the model is fully known, motivated by applications in high dimension or with common noise. The second part of the talk will introduce a framework for “mean-field reinforcement learning”, which can be viewed as the asymptotic limit of multi-agent reinforcement learning with a large number of interacting learners. In each case, theoretical proofs of convergence as well as numerical simulations will be provided. The talk is mostly based on joint work with René Carmona and Zongjun Tan.

BIOGRAPHY

Mathieu Laurière is a Postdoctoral Research Associate at Princeton University, in the Operations Research and Financial Engineering (ORFE) department. He obtained his MS from University Paris 6 and ENS Cachan, and his PhD from University Paris 7. Prior to joining Princeton University, he was a Postdoctoral Fellow at the NYU-ECNU Institute of Mathematical Sciences at NYU Shanghai. His research interests span the areas of stochastic optimal control, partial differential equations and numerical methods, with a focus on games and control problems with mean-field interactions.