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Hong Kong - Singapore joint Seminar Series in Financial Mathematics/Engineering

Learning in Linear-quadratic Framework: From Single-agent to Multi-agent, and to Mean-field

Professor Renyuan Xu
University of Southern California

Abstract

Linear-quadratic (LQ) framework is widely studied in the literature of stochastic control, game theory, and mean-field analysis due to its simple structure, tractable solution, and local approximation power to nonlinear control problems. In this talk, we discuss several theoretical results of the policy gradient (PG) method, a popular reinforcement learning algorithm, for several LQ problems where agents are assumed to have limited information about the stochastic system. In the single-agent setting, we explain how the PG method is guaranteed to learn the global optimal policy. In the multi-agent setting, we show that (a modified) PG method could guide agents to find the Nash equilibrium solution provided there is a certain level of noise in the system. The noise can either come from the underlying dynamics or carefully designed explorations from the agents. Finally, when the number of agents goes to infinity, we propose an exploration scheme with entropy regularization that could help each individual agent to explore the unknown system as well as the behavior of other agents. This talk is based on several projects with Xin Guo (UC Berkeley), Ben Hambly (U of Oxford), Huining Yang (U of Oxford), and Thaleia Zariphopoulou (UT Austin).

About the speaker

Prof. Renyuan Xu is currently a WiSE Gabilan Assistant Professor in the Epstein Department of Industrial and Systems Engineering at the University of Southern California. Before joining USC, she spent two years as a Hooke Research Fellow in the Mathematical Institute at the University of Oxford mentored by Professor Rama Cont. She completed her Ph.D. in IEOR Department at UC Berkeley under the supervision of Professor Xin Guo in 2019. Her research interest lies in the span of mathematical finance, stochastic analysis, game theory and machine learning.

Date

April 6 2022 (Wed)

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Time

3:00pm – 4:00pm (HK Time)

Zoom

https://polyu.zoom.us/j/95950445262?pwd=bmo5aFQvWVVROUQzOXdPYXhuTEtEdz09

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