



Numerical Analysis Seminar

Cooperative multi-agent reinforcement learning: a mean-field control perspective

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Abstract

Multi-agent systems are rapidly finding applications in a variety of domains, including robotics, distributed control, telecommunications, and economics. Multi-agent reinforcement learning (MARL) addresses the sequential learning and decision-making problem in a multi-agent system. Despite its popularity and empirical success, MARL suffers from the curse of many agent: the sample complexity scales exponentially with respect to the number of agents, N .

In this talk, we will first introduce a mean-field control (MFC) approach to approximate cooperative MARL, with approximation error $\mathcal{O}(\frac{1}{\sqrt{N}})$. By establishing an appropriate form of the dynamic programming principle for both the value function and the Q function, we further propose a model-free kernel-based Q-learning algorithm to solve the MFC problem. The convergence rate and the sample complexity of the proposed algorithm are independent of the number of agents N , which resolves the curse of many agent. Empirical studies on a network traffic congestion problem demonstrate that the proposed algorithm outperforms other existing MARL algorithms when N is large.

Date:	April 27, 2022 (Wednesday)
Time:	2:00 - 3:00pm (Hong Kong Time)
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656

All are welcome