


复旦大学数学科学学院
数学综合报告会

报告题目：Unified continuous-time q-learning for mean-field game and mean-field control problems

报告人：魏晓利 副教授 (哈尔滨工业大学)

时间：2026-01-07 星期三 15:00-16:00

地点：光华楼东主楼 1801

报告摘要：

In this talk, we study the continuous-time q-learning in mean-field models when the population distribution is not directly observable. We propose the integrated q-function in decoupled form (decoupled Iq-function) from the representative agent's perspective and establish its martingale characterization, which provides a unified policy evaluation rule for both mean-field game (MFG) and mean-field control (MFC) problems. Moreover, we consider the learning procedure where the representative agent updates the population distribution based on his own state values. Depending on the task to solve the MFG or MFC problem, we can employ the decoupled Iq-function differently to characterize the mean-field equilibrium policy or the mean-field optimal policy respectively. Based on these theoretical findings, we devise a unified q-learning algorithm for both MFG and MFC problems by utilizing test policies and the averaged martingale orthogonality condition. For several financial applications in the jump-diffusion setting, we obtain the exact parameterization of the decoupled Iq-functions and the value functions, and illustrate our q-learning algorithm with satisfactory performance.

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