THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Numerical Analysis Seminar

Mean-Field Control for Diffusion Aggregation system with Coulomb Interaction

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Abstract In this talk, I will represent a recent work on mean-field control problem for a multi-dimensional diffusion-aggregation system with Coulomb interaction (the so called parabolic elliptic Keller-Segel system). The existence of optimal control is proved through the Γ-convergence of the corresponding control problem of the interacting particle system. There are three building blocks in the whole argument. Firstly, for the optimal control problem on the particle level, instead of using classical method for stochastic system, we study directly the control problem of high-dimensional parabolic equation, i.e. the Liouville equation of it. Secondly, we obtain a strong propagation of chaos result for the interacting particle system by combining the convergence in probability and relative entropy method. Due to this strong mean field limit result, we avoid giving compact support requirement for control functions, which has been often used in the literature. Thirdly, because of strong aggregation effect, additional difficulties arise from control function in obtaining the well-posedness theory of the diffusion-aggregation equation, so that the known method cannot be directly applied. Instead, we use a combination of local existence result and bootstrap argument to obtain the global solution in the sub-critical regime. The talk is based on a joint work with Yucheng Wang and Zhao Wang.

Date:	June 17, 2025 (Tuesday)
Time:	3:00 pm – 4:00 pm
Venue:	Room 210, Run Run Shaw Building, HKU

All are welcome