Stochastic Webinar

Quantitative propagation of chaos for multi-species moderately interacting particle systems with attractive Coulomb potentials

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Shuchen Guo is currently a PhD student at the University of Oxford under the supervision of Prof. José Carrillo and Prof. Gui-Qiang Chen. His research focuses on stochastic analysis and PDE,especially mean-field limits for many-particle systems and kinetic theory. He obtained his Bachelor's degree from the University of Chinese Academy of Sciences (UCAS) under the supervision of Prof. Xiang-Dong Li in 2019, and his Master's degree from the Academy of Mathematics and Systems Science (AMSS, CAS) under the super-vision of Prof. Dejun Luo in 2022.

Abstract： We derive a class of multi-species aggregation-diffusion systems from stochastic interacting particle systems via relative entropy method. We generalise the framework of propagation of chaos to multi-component cases, and get the quantitative L^1-convergence result by adopting moderately interacting particle systems without further cut-off. It holds global-in-time since we establish the well-posedness of aggregation-diffusion systems up to any time $T > 0$ under a sufficient smallness condition on the initial data. To obtain the main result, we estimate the relative entropy between the joint distribution of the particle system and a PDE system at the intermediate level, then the relative entropy between the intermediate PDEs and the limiting aggregation-diffusion system. The core of the first step is to show convergence in probability by stopping time argument, while the second step is done by evaluating a combination of relative entropy and L^2-distance. Our method is robust enough that we do not need to pose assumptions on the interaction matrix, and we can handle attractive or repulsive interaction potentials up to the Coulomb singularity, which is the most physical case.

讲座时间：

2024.10.24 周四下午16:00-17:00
会议地点：**ZOOM会议室会议ID：3541437366密码：123456**
主办单位：
中科院数学与系统科学研究院应用数学所
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