Online Seminar on Chemotaxis

Date: 22nd of September 2022   10:00 – 11:00 in "Central EU" hour
(which is 16:00 – 17:00 in "Beijing" hour and 17:00 – 18:00 in "Seoul–Tokyo" hour)
Speaker: Li Chen (Universität Mannheim)
Title: Rigorous Derivation of the Degenerate Parabolic-Elliptic Keller-Segel System from a Moderately Interacting Stochastic Particle System

Abstract:
In this talk I will present a rigorous derivation of the degenerate parabolic-elliptic Keller-Segel system of porous medium type on the whole space in the sub-critical regime from a moderately interacting stochastic particle system. We established the classical solution theory of the degenerate parabolic-elliptic Keller-Segel system and its non-local version. This classical solution theory is used to obtain required estimates on the particle level. Then we derive the propagation of chaos result. Because of the non-linearity in diffusion and the singularity in aggregation we perform an approximation of the stochastic moderately interacting particle system using the cut-offed potential. The stochastic effect is introduced as a parabolic regularization of the system. We present the propagation of chaos result with two different types of cut-off scaling, namely logarithmic and algebraic scaling. For the logarithmic scaling we prove the convergence of trajectories in expectation. For the algebraic scaling we obtain it in the sense of probability. This result is obtained by studying the dynamics of a carefully constructed stopped process and applying a generalized version of the law of large numbers. Consequently, the propagation of chaos follows directly from these convergence results and the vanishing viscosity of the system. This is a joint work with Veniamin Gvozdik, Alexandra Holzinger, and Yue Li.

Organizers: Jie Jiang (jiang@apm.ac.cn) and Kentaro Fujie (fujie@tohoku.ac.jp)