Du
17
JAN.
2022
au
25
MARS.
2022

14h00
-
16h00

2022-T1 MATHEMATICAL MODELING OF ORGANIZATION IN LIVING MATTER

Course: Reaction-diffusion eqs and the evolution of dispersal (K.-Y. Lam) on Mondays 14h-16h

INSCRIPTION

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In this course, we introduce some basic tools and discuss some recent progress of reaction-diffusion models motivated spatial ecology and evolution. This course will start by reviewing some basic theory of elliptic and parabolic estimates. The main content consists of three parts.

The first part concerns the single species model, covering persistence, critical domain size, global attractivity of positive solutions.Basics of the theory monotone dynamical systems; principal eigenvalue of elliptic/parabolic equations will be introduced.

The second part concerns the competition of multiple species. We will discuss the competition model introduced in [Dockery et al., J. Math. Biol. (1998)] and discuss their proof of the case of two species in detail, and their conjecture regarding the Morse decomposition of the N species case. We will then discuss recent progress on N specie. We also introduce the concept of evolutionarily stable strategies and other notions from adaptive dynamics, and discuss related results for stream populations. Basics of the theory of principal Floquet bundle, and elements from dynamical systems will be discussed.

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The third part concerns a mutation-selection model introduced in [Diekmann et al., Theor. Pop. Biol, (2005)] concerning the competition of infinitely many species. We will discuss the result in [Perthame and Souganidis, Math. Model. Nat. Phenom. (2016)] concerning stationary solutions, and related results in stream populations [Hao et al. Indiana Univ. Math. J. (2019)]. We will also discuss recent progress on the time-dependent problem, including the uniqueness in constrained Hamilton-Jacobi equations [Calvez et al., Cal. Var. Par. Diff. Eq., (2020)].

Most of the course will be self-contained and is aimed at graduate students with knowledge at masters level real analysis.



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HORAIRES

L'institut :
• lundi au vendredi de 8h30 à 18h,
• fermé les jours fériés.

Le musée - Maison Poincaré :
• lundi, mardi, jeudi et vendredi
de 9h30 à 17h30,
• samedi de 10h à 18h,
• fermé le mercredi et le dimanche.