

2026年 数学・数理科学グローバル講義 I (前期)

注) タイトルとアブストラクトが未定のもののみは分かり次第掲載します。

数学・数理科学グローバル特別講義1

講師: Jérémie Brieussel (Montpellier University、幾何学的群論分野)

講義日程: 2026年4月13日(月)~17日(金) 各日 13:00-15:00

タイトル: Random walks on infinite groups

概要: A random walk is the sequence of products of independent elements of a group following a given probability law. A finitely generated group can be viewed as a geometric object by means of its Cayley graph, thus a random walk is a way to explore randomly the geometry of a group. What properties of the group are reflected in the random walk? It turns out, and this is the aim of this course, that there are various connexions between characteristics of the random walk and algebraic, geometric, analytic and dynamical features of the group.

- Lecture 1: Kesten's theorem relating return probability to the Cheeger constant of isoperimetry.
- Lecture 2: Tail events and harmonic functions, entropy criterion for Liouville property.
- Lecture 3: Poisson boundary, ray criterion for identification.
- Lecture 4: Choquet-Deny groups are virtually nilpotent.
- Lecture 5: A panoramic view of finitely generated groups through the eyes of a random walker.

The course is aimed to be self-contained and will assume no specific prior knowledge.

数学・数理科学グローバル特別講義2

講師: Alberto Minguez (University of Vienna/University of Sevilla、数論分野)

講義日程:

4月 8日(水) 10:00~12:00

4月 10日(金) 15:00~17:00

4月 13日(月) 10:00~12:00

4月 15日(水) 10:00~12:00

4月 17日(金) 15:00~17:00

タイトル: The unitary dual of p -adic reductive groups

概要: The classification of the unitary dual of a topological group is a problem of central importance in representation theory and harmonic analysis. Beyond its intrinsic interest, it governs the spectral decomposition of representations

and provides the local constituents that appear in many global constructions in modern number theory. In this course we will study the unitary dual of p -adic reductive groups through the example of $GL(n,F)$, where F is a p -adic field. This setting allows one to treat concrete questions while encountering most of the phenomena that arise more generally. The course will begin with a brief introduction to smooth representations of p -adic groups, including cuspidal representations, parabolic induction, and basic structural results. A central step will be the classification of all irreducible smooth representations of $GL(n,F)$. We will then investigate which of these representations are unitary, focusing on representations obtained by normalized parabolic induction and on the analysis of complementary series and their endpoints. The aim is to obtain a concrete understanding of this example while highlighting ideas that extend to general reductive groups.

数学・数理科学グローバル特別講義 3

講師: Hélène Guérin (Université du Québec à Montréal, 確率論分野)

講義日程:

5月26日(火)9:30~11:30

5月27日(水)14:00~16:00

5月28日(木)14:00~16:00

6月2日(火)9:30~11:30

6月3日(水)14:00~16:00

タイトル: Interacting Particle Systems: From Applications to Theory

概要: One of the objectives of this lecture is to build a bridge between probability theory and applications. We will start from various questions, mainly related to our environment or industrial questions, model them using probabilistic objects, and then use probability theory to study them.

This lecture does not aim to be exhaustive, as probabilistic models and applications are highly diverse, and there are numerous probabilistic methods for studying them. We will focus on certain models of interacting particles and on the concept of propagation of chaos. We will review some key concepts related to the convergence of processes in order to examine two types of stochastic particle systems in detail.

- Lecture 1: Models of interacting particle systems in various fields
- Lecture 2: Propagation of chaos
- Lecture 3: Convergence of processes: tightness, C -tightness, Aldous' criterion, and so on
- Lecture 4: Analysis of a diffusive interacting particle system
- Lecture 5: Analysis of interacting piecewise deterministic Markov processes

数学・数理科学グローバル特別講義4

講師:Shinya Okabe

講義日程:

6月1日(月)15:00 - 17:00

6月2日(火)15:00 - 17:00

6月3日(水)10:00 - 12:00

6月4日(木)14:00 - 16:00

6月5日(金)15:00 - 17:00

概要:

A gradient flow is an evolution equation that describes the process of steepest descent of a target functional in an appropriate sense. For example, the mean curvature flow can be understood as the L^2 gradient flow of the surface area of a surface. The curve-shortening flow, which can be interpreted as the one-dimensional version of the mean curvature flow, is the L^2 gradient flow of the length of a curve. In recent years, there has been research on considering more general Sobolev gradient flows for geometric functionals, such as the curve-shortening flow in the H^1 sense. This lecture will explain Sobolev gradient flows for several functionals defined on curves. If time permits, we will also discuss their applications to isoperimetric inequalities.