2025 年　数学・数理科学グローバル講義Ⅲ（前期）

注）タイトルとアブストラクトが未定のもの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：Adeel Khan（Academia Sinica、代数幾何学・幾何学分野）
講義日程：2025 年 4 月 8 日、9 日、10 日、15 日、16 日　各日 14:00－16:00
タイトル：Fourier transforms in derived algebraic geometry
概要：The theory of constructible sheaves on manifolds admits a powerful extension called microlocal sheaf theory, developed by Kashiwara and Schapira. The study of categorical invariants in shifted symplectic geometry motivates us to pursue an extension of microlocal sheaf theory to the context of derived algebraic geometry. In this lecture series we will develop one central component of such an extension, namely the Fourier-Sato transform for constructible sheaves, which in this context will exhibit a surprising duality between derived and stacky phenomena. At the same time, we will also see how to lift this construction to other sheaf theories, such as l-adic sheaves, mixed Hodge modules, and even motivic sheaves (in arbitrary characteristic).

The lectures are intended to be accessible to graduate students in algebraic or symplectic geometry, and in particular will not assume any background on derived algebraic geometry or the six functor formalism.

数学・数理科学グローバル特別講義2
講師：Neal Bez（名古屋大学、実解析分野）
講義日程：5 月 19 日、20 日　15:00～17:00
　　5 月 21 日　10:00～12:00（談話会: 16:45 ～）
　　5 月 22 日　14:00～16:00
　　5 月 23 日　10:00～12:00
タイトル：Introduction to the Brascamp-Lieb inequality and its applications
概要：The main theme of these lectures is the Brascamp-Lieb inequality on Euclidean space. Firstly, we will introduce several examples and their applications, such as the Hölder inequality, the Young convolution inequality, and the Loomis-Whitney inequality. After that we will explain the general theory of the Brascamp-Lieb inequality, including Lieb's theorem and the characterization of the finiteness of the Brascamp-Lieb constant by J. Bennett, A. Carbery, M. Christ, and T. Tao. As part of the general theory, we will study a proof of the geometric Brascamp-Lieb inequality using heat flow.

数学・数理科学グローバル特別講義3

講師：Nadir Matringe（Institut de Mathematiques de Jussieu-Paris Rive Gauche、数論分野）

講義日程：5 月 28 日, 6 月 4 日,11 日 14:00～16:00

5 月 30 日, 6 月 6 日 15:00~17:00

タイトル：Intertwining periods and distinction problems

概要：I will present local intertwining periods. These meromorphic families of invariant linear forms on induced representations of local reductive groups are helpful to solve delicate problems concerning distinction with respect to a symmetric subgroup. As a first example I will discuss how they are used by Suzuki and Xue, in the proof of local conjectures of Prasad and Takloo-Bighash on inner forms of GL(n). I will also explain, in certain cases, how to relate their poles to those of local L functions. Finally I will explain a new method developed in a joint work with Offen and Yang, combining properties of local and global intertwining periods, to obtain local-global principles for certain automorphic periods. These results provide a proof of the direct implication of a global conjecture of Guo and Jacquet on inner forms of GL(n).

数学・数理科学グローバル特別講義4

講師：Tai-Peng Tsai（University of British Columbia、PDE 分野）

講義日程：6 月 16 日、17 日、19 日、20 日 各日 13：15～16：15

タイトル：Boundary conditions and derivative estimates of the Stokes system

概要：

The derivative estimates of the Stokes system is an essential part in the regularity theory of the incompressible Navier-Stokes equations. We will study the derivative estimates of the Stokes system in several settings: interior, global, local boundary with no-slip BC (boundary condition) and local boundary with Navier BC, in both stationary and time dependent cases. An important distinction is emphasized on whether we assume any pressure bound.

The following is the tentative list of topics:

1. Introduction

    1. The equations of incompressible fluids
    2. The regularity problem of the Navier-Stokes equations
    3. Weak solutions vs strong solutions
    4. Derivative estimates of the Stokes system
    5. Boundary effects and boundary conditions
2. Interior estimates
    1. Fundamental solution in whole space
    2. Interior estimates by cut-off
    3. Serrin's parasitic solution
    4. Interior estimates with no pressure condition
3. Global estimates in a domain (sketch only)
    1. Maximal regularity
    2. Semigroup theory and resolvent estimates
    3. Half space: Poisson kernel and Green tensor
4. Boundary estimates, under no-slip BC
    1. Stationary case, estimates for flat and curved boundaries
    2. Estimates with pressure condition
    3. Counterexamples with no pressure condition
    4. Estimates near a curved boundary
5. Boundary estimates, under Navier BC
    1. Stationary case, estimates for flat and curved boundaries
    2. Estimates with and without pressure condition
    3. Blowup of second derivative
    4. Estimates near a curved boundary