

The 18th Takagi Lectures

November 5 (Sat)–6 (Sun), 2016

Graduate School of Mathematical Sciences
The University of Tokyo, Tokyo, Japan

ABSTRACT

Ngô Bảo Châu:

On Geometry of Arc Spaces, the Hankel Transform and Function Equation of L-Functions

Since the beginning of the century, several approaches to Langlands functoriality conjecture have been proposed by Langlands himself, by Braverman–Kazhdan and Lafforgue, In this lecture I will explain how these ideas may be combined and connected to recent works on singularities of certain arc spaces.

* * * * *

D. Vogan:

The Size of Infinite-Dimensional Representations

The simplest geometric invariant of a differential equation $Df = 0$ is its characteristic variety: the collection of zeros (in the cotangent bundle) of the principal symbol of D . This invariant carries over to the theory of \mathcal{D} -modules: a \mathcal{D} -module \mathcal{M} on a manifold X has a characteristic variety $\text{Ch}(\mathcal{M}) \subset T^*(X)$.

The beautiful and sophisticated extension of the Riemann-Hilbert correspondence to (regular holonomic) \mathcal{D} -modules relates them to perverse sheaves on X , and provides powerful techniques for computing these perverse sheaves. But the much more elementary invariant $\text{Ch}(\mathcal{M})$ remains difficult or impossible to compute in important examples (like Schubert varieties).

I will discuss the (classical) representation-theoretic incarnations of these ideas, and recent work offering ways to compute something like characteristic cycles.

* * * * *

G. Williamson:

On the Representation Theory of Algebraic Groups

I will survey some recent progress in our understanding of the representation theory of reductive algebraic groups (character formulas for simple modules, (derived) equivalences of categories, . . .). The situation in characteristic zero is well understood. By contrast the situation in positive characteristic is complicated and many mysteries remain. One of the fascinating aspects of the subject is the richness and

diversity of available techniques, as well as the connections to several branches of representation theory (finite groups, Lie algebras, quantum groups). I will survey what is known and not known and then move on to a discussion of application of ideas from categorification as well as connections to topology via perverse sheaves (Lusztig's conjecture and the Finkelberg–Mirkovic conjecture).