

Workshop on GRT: Geometric Satake and beyond

Tsinghua Sanya International Mathematics Forum (TSIMF)
Sanya, Hainan Province, China
October 29–November 2, 2018

Abstracts

Gwyn Bellamy (University of Glasgow)

Birational models of symplectic quotient singularities

In this talk I will give a complete description of the birational geometry of the symplectic quotient singularities associated to wreath product groups. In particular, I will explain how one can show that all crepant resolutions of these singularities are given by Nakajima quiver varieties and describe what happens to the geometry as one crosses the walls inside the movable cone. This is based on joint work with Alistair Craw.

Alexis Bouthier (Paris VI Jussieu)

Affine Springer fibration

In this talk, we study a local counterpart of the Hitchin fibration, studied by Ngô. We are interested in the geometry of such objects, which are infinite dimensional and the sheaf theory on it. This way, we will explain how to geometrize some characters of representations p -adic groups. It is a joint work with D. Kazhdan and Y. Varshavsky.

Jingren Chi (Université Paris-Sud)

Geometry of Kottwitz–Viehmann varieties

Kottwitz–Viehmann varieties are certain analogues of affine Springer fibers that show up when studying orbital integrals of spherical Hecke functions on a p -adic reductive group. We will explain the current state of knowledge about its basic geometric properties, including a dimension formula and a conjectural description of its number of irreducible components.

Will Donovan (Tsinghua University)

Perverse sheaves of categories on mirror moduli spaces

The moduli spaces associated to the A-side and B-side of mirror symmetry carry much-studied bundles with connections, which may be related by a mirror map. Using recent developments in the study of perverse sheaves of categories, I explain a categorification of such structures for certain examples. The construction uses perverse schobers on partial completions of the moduli spaces: I show how to prove mirror symmetry statements for these, and explain further applications to homological mirror symmetry. This talk will discuss joint work with T. Kuwakagi, and joint work with M. Wemyss.

Michael Finkelberg (Independent Moscow University)

Drinfeld–Gaitsgory–Vinberg interpolation Grassmannian and geometric Satake equivalence

Let G be a reductive complex algebraic group. We fix a pair of opposite Borel subgroups and consider the corresponding semiinfinite orbits in the affine Grassmannian Gr_G . We prove Simon Schieder’s conjecture identifying his bialgebra formed by the top compactly supported cohomology of the intersections of opposite semiinfinite orbits with $U(\mathfrak{n}^\vee)$ (the universal enveloping algebra of the positive nilpotent subalgebra of the Langlands dual Lie algebra \mathfrak{g}^\vee). To this end we construct an action of Schieder bialgebra on the geometric Satake fiber functor. We propose a conjectural construction of Schieder bialgebra for an arbitrary symmetric Kac–Moody Lie algebra in terms of Coulomb branch of the corresponding quiver gauge theory. This is a joint work with V. Krylov.

Sam Gunningham (University of Texas, Austin)

Symmetries of convolution categories and the quantum Ngo action

I will describe a remarkable symmetric monoidal category associated to a reductive group G , which acts centrally on any G -category. This construction quantizes the universal centralizer group scheme, together with its action on Hamiltonian G -spaces used by Ngo in his proof of the Fundamental Lemma. The category and its central action appear most naturally in a Langlands dual incarnation, which is phrased in terms of convolution on the affine Grassmannian, via work of Bezrukavnikov, Finkelberg and Mirkovic. This is joint work with David Ben-Zvi.

Jiuzu Hong (University of North Carolina at Chapel Hill)

Conformal blocks for parahoric group scheme over algebraic curve

Conformal blocks attached to a curve is defined via Wess–Zumino–Witten model in conformal field theory. It admits many nice properties including propagation and factorization.

The sheaf of conformal blocks over a family of smooth projective curves admits a projective flat connection, and the sheaf of conformal blocks on the compactification of moduli space of algebraic curves is locally free. In this talk, I will present similar results for conformal blocks attached to certain parahoric group scheme over algebraic curves.

This is a joint work with S. Kumar.

Jun Hu (Beijing Institute of Technology)

On the modified affine Hecke algebras and quiver Hecke algebras of type A

We introduce some modified forms for the degenerate and non-degenerate affine Hecke algebras of type A . These are certain subalgebras living inside the inverse limit of cyclotomic Hecke algebras. We construct faithful representations and standard bases for these algebras and give some explicit description of their centers. We show that there are algebra isomorphisms between some generalized Ore localizations of these modified affine Hecke algebras and of the quiver Hecke algebras of type A . As an application, we show that the center conjecture for the cyclotomic quiver Hecke algebra of type A holds if and only if the center conjecture for the cyclotomic Hecke algebra of type A holds.

David Jordan (University of Edinburgh)

The quantum Frobenius on character varieties and multiplicative quiver varieties

Lusztig’s quantum Frobenius is a remarkable “short exact sequence” relating the small quantum group, the restricted/divided powers quantum group, and the classical enveloping algebra. The quantum Frobenius exhibits a remarkable compatibility with the procedure of quantum Hamiltonian reduction. In this talk, we exploit this to analyze quantum character varieties and quantum multiplicative quiver varieties at roots of unity, and show that they define Azumaya algebras (etale-locally matrix bundles) over their classical degenerations. This is joint work with Jordan Ganev.

Penghui Li (IST Austria)

Some progress on Betti Geometric Langlands Conjecture in genus 1

We recall the Betti Geometric Langlands Conjecture proposed by Ben–Zvi–Nadler. In genus 1 case, we use an uniformization method to calculate the elliptic character sheaves in terms of Lusztig’s character sheaves. And then construct a functor from the category of elliptic character sheaves (the semistable part of automorphic category) to the spectral category in the Conjecture. The functor is fully-faithful if and only if certain conjecture of Hecke categories holds. We also prove the analogous conjecture for Weyl groups. Construction of the functor uses three previous results: Ben–Zvi–Nadler’s identification of character sheaves as trace of Hecke category, Bezrukavnikov’s Langlands duality for affine Hecke category, and Ben-Zvi–Nadler–Preygel’s gluing of the spectral categories (in genus 1). Most of the talk is a joint work with D. Nadler.

David Nadler (University of California, Berkeley)

TBA

Hiraku Nakajima (Kyoto University)

TBA

Sian Nie (Chinese Academy of Sciences)

On the irreducible components of affine Deligne–Lusztig varieties

Affine Deligne–Lusztig varieties are closely related to the reductions mod p of Shimura varieties. I will talk about recent progress on the description of their irreducible components.

You Qi (California Institute of Technology)

TBA

Raphaël Rouquier (University of California, Los Angeles)

Finite groups of Lie type and Hilbert schemes

I will discuss a program that involves relating modular representations of finite groups of Lie type in non-defining characteristic to deformations of certain algebraic varieties. For GL_n , these are Hilbert schemes of points on surfaces. The combinatorics should be controlled by toroidal algebras (and categories by higher versions of those), and this gives rise to (q, t) -decomposition matrices.

Travis Schedler (Imperial College London)

Multiplicative quiver varieties and 2-Calabi–Yau algebras

I will explain local and global approaches to the symplectic geometry of (multiplicative) quiver varieties, which includes character varieties for (punctured) Riemann surfaces. Particularly I will discuss the existence and construction of symplectic resolutions. Closely related is the question of whether multiplicative preprojective algebras (for non-Dynkin quivers) satisfy the 2-Calabi–Yau property. A positive answer would show that these algebras coincide with their derived version—which by Etgu–Lekili govern the Fukaya categories of plumbed cotangent bundles of surfaces.

It should also show that multiplicative quiver varieties are étale-locally isomorphic to ordinary quiver varieties. I will explain progress on this question. This includes joint work with my PhD students Kaplan and Tirelli.

Linhui Shen (Michigan State University)

TBA

Eric Vasserot (Université de Paris VII)

TBA

Xinwen Zhu (California Institute of Technology)

A multi-filtration on weight spaces

I will discuss a multi-filtration on weight spaces of representations of reductive algebraic groups, analogous to the Kostant–Brylinski filtration. I will explain how to use it to study vector-valued conjugate invariant functions on the group. Joint work with Liang Xiao.