Titles and Abstracts

Gurbir Dhillon (Yale University)   Kazhdan–Lusztig theory for affine Lie algebras at critical level

Abstract   A basic problem in representation theory is to calculate the characters of irreducible highest weight modules. For semisimple Lie algebras this was resolved by Beilinson–Bernstein and Brylinski–Kashiwara in the early 1980s. For affine Lie algebras, this was resolved by Kashiwara–Tanisaki at non-critical central charges in the early 1990s. At the remaining critical central charge certain cases are known by work of Arakawa–Fiebig, Feigin–Frenkel, Frenkel–Gaitsgory, Hayashi, and Malikov. In forthcoming joint work with David Yang, we calculate the irreducible characters for the regular block at critical level, confirming a conjecture of Feigin–Frenkel.

Eugene Gorsky (University of California, Davis)   Tautological classes and symmetry in Khovanov–Rozansky homology

Abstract: We define a new family of commuting operators F_k in Khovanov–Rozansky link homology, similar to the action of tautological classes in cohomology of character varieties. We prove that F_2 satisfies "hard Lefshetz property" and hence exhibits the symmetry in Khovanov–Rozansky homology conjectured by Dunfield, Gukov and Rasmussen. This is a joint work with Matt Hogancamp and Anton Mellit.

Mee Seong Im (United States Naval Academy)   One-dimensional topological theories with zero-dimensional defects and finite state automata

Abstract: Quantum groups are related to 3-dimensional topological quantum field theories. Downsizing from three dimensions to one and from a ground field to a semiring, I will explain a surprising relation between topological theories for one-dimensional manifolds with defects and values in the Boolean semiring and finite-state automata and their generalizations. This is joint with Mikhail Khovanov.

Cris Negron (University of Southern California)   Quantum $SL(2)$ and logarithmic VOAs of type A_1

Abstract: I will discuss recent work with Terry Gannon, where we show that various non-semisimple tensor categories of representations for quantum $SL(2)$ are identified with corresponding categories of modules for non-rational (aka logarithmic) vertex operator algebras. Such relationships were conjectured to exist in works of Bushlanov, Feigin, Gainutdinov, Semikatov, and Tipunin from the mid 2000's. At the conclusion I may touch on related, somewhat conjectural, "logarithmic TQFTs" for quantum groups at roots of unity.

Andrei Negut (Massachusetts Institute of Technology)   On the trace of the affine Hecke category

Abstract: We propose a connection between the horizontal trace of the affine Hecke category and the elliptic Hall algebra, mirroring known constructions for the finite Hecke category. Explicitly, we construct a family of generators of the affine Hecke category, compute certain categorified commutators between them, and show that their K-theoretic shadows match certain commutators in the elliptic Hall algebra. Joint work with Eugene Gorsky.

Joshua Sussan (City University of New York, Medgar Evers)   p-DG structures in higher representation theory

Abstract: One of the goals of the categorification program is to construct a homological invariant of 3-manifolds coming from the higher representation theory of quantum groups. The WRT 3-manifold invariant uses quantum groups at a root of unity. p-DG theory was introduced by Khovanov as a means to categorify objects at prime roots of unity. We will review this machinery and show how to construct categorifications of certain representations of quantum sl(2) at prime roots of unity.