

Hall algebras of quivers via coherent sheaves and D-modules

Monday, March 3, 2025 2:00 PM (1 hour)

I will report on joint work in progress with Yukinobu Toda, and with Sabin Cautis and Yukinobu Toda.

The Ringel (spherical) Hall algebra of a quiver is half of a quantum Kac-Moody algebra, and has a categorification (due to Lusztig) using D-modules on the stack of representations of the quiver. The K-theoretic preprojective Hall algebra of a quiver is expected to be half of a quantum affine algebra defined by Okounkov-Smirnov, and has a categorification (due to Porta-Sala) using categories of coherent sheaves on the cotangent of the stack of representations.

I will discuss a conjectural comparison between these two categorifications. The main objects in the study of (Porta-Sala) Hall algebras are quasi-BPS categories. In joint work with Yukinobu Toda, we compare quasi-BPS categories with categories of twisted coherent D-modules on the stack of representations of the quiver. These are the first examples of a more general construction for the cotangent of smooth stacks, called “limit categories”, which we compare with categories of D-modules on the stack.

I will exemplify the various conjectures with results for the Jordan quiver, which are obtained in joint work (in progress) with Sabin Cautis and Yukinobu Toda.

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