

Topological Langlands duality for 3-manifolds via DT cohomology

Friday 10 October 2025 14:00 (1 hour)

This talk concerns the Langlands program for 3-manifolds, initiated by Ben-Zvi–Gunningham–Jordan–Safronov. From the physical perspective, it arises as part of S-duality in 4d $N=4$ supersymmetric quantum field theory. One formulation of the Langlands duality conjecture for 3-manifolds involves infinite-dimensional DT cohomology, defined as the cohomology of certain perverse sheaves on the stack of representations of the fundamental group.

I will introduce a finite-dimensional subspace of DT cohomology, called the BPS cohomology, and explain that DT cohomology decomposes under parabolic induction (a.k.a. the Eisenstein series map) into the BPS cohomology. This reduces the Langlands duality conjecture to an isomorphism of finite-dimensional vector spaces. In addition, we provide a formula for the dimension of BPS cohomology for the 3-manifold T^3 , and show that Langlands duality for types B/C follows from the Jacobi identity of the theta function.

This talk involves joint works with Hyeonjun Park, Pavel Safronov, Chenjing Bu, Ben Davison, Anders Ibáñez Núñez, Tudor Pădurariu, and Lucien Hennecart.

Presenter: KINJO, Tasuki (Kyoto University)