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Character sheaves, HOMFLY-PT homology, and Hilbert schemes of points on \mathbb{C}^2

Abstract

Many interesting TQFTs can be realized as sigma models. When coupled with a sheaf theory, sigma models can be used in algebraic geometry to construct TQFTs valued in (higher) categories. With the advent of higher categorical algebra developed by Lurie and others, this perspective has been employed to great success in geometric representation theory, as exemplified, for instance, by the work of Ben-Zvi, Gaitsgory, Nadler, and others in the various forms of the geometric Langlands program.

In this talk, I will demonstrate how the study of categorified link invariants can also benefit from this point of view, using the theory of Soergel bimodules as an example. In particular, I will describe the value of the corresponding TQFT on the circle and relate it to the category of character sheaves, yielding, as a consequence, a relation between the HOMFLY-PT link homology theory and coherent sheaves on the Hilbert schemes of points on \mathbb{C}^2 , a conjecture of Gorsky-Negut-Rasmussen. This is joint work with Penghui Li.