MERI ZAIMI, Perimeter Institute

Knot contact homology as a planar limit of Chern-Simons theory

In the context of holographic duality in physics, it is expected that the quantum knot invariants obtained from $SU(N)$ Chern-Simons theory in the planar limit ($N \to \infty$, $q \to 1$ and q^N fixed) are related to knot contact homology, and hence to augmentation varieties. In particular, it is conjectured that the augmentation polynomial of a knot is the classical limit of a deformed $\hat{A}$-polynomial, which describes recursions for colored HOMFLYPT polynomials. In this talk, I will discuss how to study this connection via the "HOMFLYPT difference module", which encodes the relations among the HOMFLYPT polynomials with different antisymmetric colorings. The construction relies on a spider category for $U_q(gl_N)$ where, in addition to the usual objects carrying integer labels, associated to the antisymmetric powers of the standard representation, we include objects carrying formal labels, which allow the color to be treated as a variable. The main result is that the classical limit of the HOMFLYPT difference module is isomorphic to the degree 0 part of the abelianized knot contact homology. The conjecture relating the augmentation polynomial to the deformed $\hat{A}$-polynomial can be reformulated in terms of certain algebraic properties of the module. This is based on work with Ben Webster.