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Skeins, clusters, and character sheaves

Skein algebras are certain diagrammatically defined algebras spanned by tangles drawn on the cylinder of a surface, with multiplication given by stacking diagrams. Quantum cluster algebras are certain systems of mutually birational quantum tori whose defining relations are encoded in a quiver drawn on the surface. The category of quantum character sheaves is a q -deformation of the category of ad-equivariant D -modules on the group G , expressed through an algebra $D_q(G)$ of “ q -difference” operators on G .

In this talk I will explain that these are in fact three sides of the same coin – namely they each arise as different flavors of factorization homology, and hence fit in the framework of four-dimensional topological field theory.