A POPULAR DESCRIPTION OF THE PROJECT

Khovanov homology is a mathematical tool used to study knots, that is, loops in the space that are twisted and tangled in various ways. Khovanov homology goes beyond simply identifying different knots by assigning a collection of algebraic structures to each knot, structured in a multi-dimensional grid of information. This grid, or homology, helps mathematicians understand the complexity and properties of knots in a more profound way, revealing properties that traditional knot invariants might miss.

Khovanov–Rozansky homology is a more general notion than Khovanov homology and gives more information about the knot, at the price of being less tractable. We plan to study the structures on Khovanov homology that are transferred from Khovanov–Rozansky homology. This is one part of the project.

Strongly quasipositive knots are a special class of knots with specific properties that make them particularly interesting in the study of knot theory. These knots can be represented as a series of simple, positive twists and braids, making them easier to analyze and understand. These knots arise in the context of complex surfaces and can provide valuable information about the structure of complex surfaces in the four-dimensional space. We plan to apply Khovanov homology to study strongly quasipositive knots.

The last part of the project deals with objects admitting symmetries. If a space admits a symmetry, then this symmetry should be somehow visible in the invariants associated to it. The third part of the project is about unveiling this symmetry of invariants. One of the main difficulties is that symmetry is a doubly-edged sword. On the one hand, symmetry allows for a better organization of the invariants. On the other hand, symmetry restricts flexibility, by prohibiting various constructions. The project is about finding tools that overcome this obstacle in the case of Morse theory.