Mutation of τ-tilting subcategories

Juan Ignacio Gargano
Universidad de Buenos Aires, Argentina
jigargano@iafe.uba.ar

Inspired by the categorification of cluster algebras via quiver representations, Adachi, Iyama and Reiten introduced τ-tilting theory [1] by combining tilting theory and Auslander-Reiten theory. It quickly became a central topic in representation theory of Artin algebras.

In the paper [1], the authors introduced the notion of support τ-tilting modules inside the category $\operatorname{mod}\Lambda$ of finitely presented Λ-modules, and showed that they have some remarkable properties. Firstly, they showed that the set of all support τ-tilting modules is in bijection with fuctorially finite torsion classes in $\operatorname{mod}\Lambda$. Secondly, they showed that all support τ-tilting modules have the same number of isomorphism classes of indecomposable direct summands and, moreover, each of these indecomposable direct summands can be replaced by exactly one other indecomposable module, giving rise to a process usually known as mutation.

Recently, Asadollahi, Sadeghi and Treffinger [2] introduced the notion of support τ-tilting subcategories for abelian categories with enough projective objects. This allows the study τ-tilting theory in categories where the Auslander-Reiten translation τ cannot be defined. A central result in [2] shows that every support τ-tilting subcategory induces a functorially finite torsion class, generalizing the result in [1].

Unfortunately, the mutation of support τ-tilting subcategories does not exist for every abelian category with enough projective objects. In this talk, I will talk about a joint work in progress with Hipolito Treffinger, where we explore the necessary and sufficient conditions for the existence of a mutation process of support τ-tilting subcategories. Time permitting, I will name some of the possible applications of our results in the categorification of cluster algebras.

Trabajo en conjunto con Hipolito Treffinger (Instituto de Investigaciones Matemáticas Luis A. Santaló (CONICET-UBA)).

Referencias

[1] T. Adachi, O. Iyama and I. Reiten, -tilting theory, Compositio Mathematica 150(2014), No. 3, 415–452.

[2] J. Asadollahi, S. Sadeghi and H. Treffinger, On -tilting subcategories, Canadian Journal of Mathematics 77(2025), No. 3, 975–1012.