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Research fields: Dynamical Systems, Operator Algebras

Keywords: Discrete groups, orbit equivalence, measured groupoids, amenability, rigidity

Present research:

My research interests have intersection with discrete group theory, ergodic theory and operator algebras. Many of my works concern orbit equivalence between group actions on measure spaces. Two group actions are called orbit equivalent if there exists an isomorphism between the spaces which preserves orbits of the actions. Historically the study of orbit equivalence stems from the study of von Neumann algebras, one kind of operator algebras. Many important examples of von Neumann algebras are constructed from group actions on measure spaces, and those algebras usually reflect properties of orbit equivalence relations of the actions rather than the actions themselves. So there are constant interactions between the studies of orbit equivalence and von Neumann algebras. Around 1970s, there was a great achievement for the study of actions of amenable groups. In recent decades, there are lots of studies toward actions of non-amenable groups developed.

My research field is called measured group theory. This name was born around 2010. One of the aims of this field is to seek interesting aspects of countable groups through orbit equivalence relations of their actions. Methods therein are various, involving not only ergodic theory and operator algebras but geometric group theory, probability theory, descriptive set theory, etc. My first work focused on *rigidity*. It asserts that for a given measure-preserving group-action on a standard probability space, its isomorphism class can be recovered from its orbit equivalence class. This kind of rigidity phenomena originated in Zimmer's theorem (1980) for actions of higher rank simple Lie groups, which has deep connection with the Mostow rigidity, a celebrated theorem in geometry. So far I have dealt with the mapping class group of a surface, amalgamated free products of special kind, Baumslag-Solitar groups, etc.

In another direction, I studied central sequences for orbit equivalence relations, in view of central sequences playing an important role for understanding operator algebras. I studied their relationship with properties of the acting group, especially inner amenability.

Notice for the students:

I hope you find what you want to study. I also hope you enjoy and know measure theory, functional analysis and Fourier analysis.