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Research fields: Operator Algebras

Keywords: Ergodic group theory, discrete groups, orbit equivalence relations, measured groupoids, amenability, rigidity

Present research:

Ergodic group theory is a field that compiles recent studies across ergodic theory and the theories of discrete groups and operator algebras, and is mainly concerned with group-actions on measure spaces. From such a group-action, we can construct an orbit equivalence relation and a von Neumann algebra. We mean by an orbit equivalence relation the equivalence relation whose equivalence class is an orbit of the action. Von Neumann algebras are a traditional target in the theory of operator algebras, and many examples of them are constructed from group-actions on measure spaces. Both notions are closely related, and their studies are interactive. Around 1970s, there were great achievements in the study of orbit equivalence relations and von Neumann algebras coming from amenable groups and their actions. In recent decades, there have been studies toward non-amenable groups vastly developed.

Among others, ergodic group theory aims to find out interesting aspects of discrete groups in the setup of orbit equivalence relations or von Neumann algebras. Its approaches are various and involve not only operator algebras but also ergodic theory, harmonic analysis, Lie group theory, geometric group theory, differential geometry, topology, probability theory, descriptive set theory, etc.

My first work concerns *rigidity*, which asserts that a given group-action can be recovered from its orbit equivalence relation. This kind of rigidity is originated in Zimmer's 1980 result for higher-rank simple Lie groups and also related with the Mostow rigidity, a cerebrated theorem in geometry. So far I have dealt with the mapping class group of a surface, amalgamated free products of rigid groups, the Baumslag-Solitar groups, etc. Rigidity of their actions depends on special characters of the groups and has an application to the isomorphism problem of von Neumann algebras. My recent work concerns central sequences (which often play an important role in understanding operator algebras) in orbit equivalence relations and pursues their relationship with the acting group.

Notice for the students:

I hope you are very interested in measure theory, functional analysis and Fourier analysis. I also hope you get interested in various mathematics.