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Model theory of tracial von Neumann algebras

Abstract

Tracial von Neumann algebras are a widely studied class of objects belonging to the mathematical area of operator algebras and have numerous interactions with a wide variety of other areas of mathematics, including representation theory, group theory, ergodic theory, and quantum physics, to name a few. With the advent of continuous logic, they became amenable to being studied through the model-theoretic lens, as was first carried out by Farah, Hart, and Sherman.

In this lecture series, we will introduce these mathematical objects and explain the logic appropriate for studying them. We will then move on to some applications of model-theoretic ideas to the study of tracial von Neumann algebras, including the model-theoretic take on the recent negative resolution of the famous Connes Embedding Problem as well as how model-theoretic techniques can be used to shed light on some problems concerning embeddings into ultrapowers. We will conclude the course by discussing further model-theoretic facts about tracial von Neumann algebras, such as the number of theories of II_1 factors and the lack of existence of model companions.

The course will be fairly self-contained and only prior exposure to basic (classical) model theory will be assumed.

Reading materials

Visit <https://www.math.uci.edu/~isaac/singapore.html>