연세대학교 수학계산학부

YONSEI
Math Seminar 2021-2

The Connes Embedding Problem, MIP*=RE, and Model Theory

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Every Wednesday, 11:00-12:20 (ZOOM)

Abstract : The Connes Embedding Problem (CEP) is arguably one of the most famous open problems in operator algebras. Roughly, it asks if every tracial von Neumann algebra can be approximated by matrix algebras. In early 2020, a group of computer scientists proved a landmark result in quantum complexity theory called MIP*=RE and, as a corollary, gave a negative solution to the CEP. However, the derivation of the negative solution of the CEP from MIP*=RE involves several very complicated detours through C*-algebra theory and quantum information theory.

In this series of lectures, I will present the "standard" derivation of the failure of CEP from MIP*=RE. In addition, I will present joint work with Bradd Hart where we show how some relatively simple model-theoretic arguments can yield a direct proof of the failure of the CEP from MIP*=RE while simultaneously yielding a stronger, Gödelian-style refutation of CEP as well as the existence of "many" counterexamples to CEP.

I will assume no prior knowledge of operator algebras, quantum complexity theory, or model theory and will try to develop as much of the story from scratch as possible.

관련자료
https://www.math.uci.edu/~isaac/yonsei.html

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