

*Department of Mathematics,  
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# Math 243 - Functional Analysis Seminar

**Prof. Isaac Goldbring**

University of California, Irvine

## The Connes Embedding Problem, $MIP^*=RE$ , and the Completeness Theorem

### 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. Earlier this year, a group of computer scientists proved a landmark result in 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 talk, 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, Gdelian-style refutation of CEP as well as the existence of many counterexamples to CEP. No prior background in any of these areas will be assumed.

Host: David Jekel

**Tuesday, September 28, 2021**

**11:00 AM**

**Zoom. For details, email [djekel@ucsd.edu](mailto:djekel@ucsd.edu)**

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