PHYSICAL MATH SEMINAR

Analysis and Synthesis of Complex Quantum Systems

Vivishek Sudhir

MIT

ABSTRACT:

Today's most sensitive physical experiments, such as those used to detect gravitational waves or to probe the quantum nature of gravity, consist of thousands of subsystems, put together by decades of human ingenuity, that together operate in a quantum-noise-limited fashion. Given such a complex system, how can we construct a consistent, accurate, and economical, quantum description of it? Conversely, given a desired specification, how can we synthesize a quantum system that realizes the specification? In recent work (arXiv:2410.09976), we established a systematic framework for the analysis and synthesis of linear time-translation-invariant quantum systems. This is achieved by realizing the central role played by the "conjugate symplectic" Lie group in the description of such systems, and exploiting some of the structure properties of this group to inform techniques to analyze, synthesize, and completely characterize the performance of such systems. This talk will motivate this approach, sketch some of the highlights, and contextualize its power within the broader setting of formal systems theory.

TUESDAY, NOVEMBER 19, 2024

2:30 PM – 3:30 PM

Building 2, Room 449