WABASH
EXTRAMURAL MODERN ANALYSIS
SEMINAR

April 8

2:00pm

at

Wabash College

Crawfordsville, IN

Times given are Eastern Daylight Time,
which is currently local time for Central Indiana.

2:00-2:30	*Conversation*
2:30-3:30	**An Exotic Full Factor** *SRIVATSAV KUNNAWALKAM ELAYAVALLI, IPAM and UCLA*
3:30-4:00	*Refreshments and Conversation*
4:00-5:00	**Complete Log Sobolev Inequality for SU(2) Tensor Representations and Beyond** *YIDONG CHEN, UIUC*
5:00–...	*Farewells*

The purpose of Wabash Seminar talks is to present surveys of interest to all analysts, including graduate students and scholars working in areas far from the speaker's specialty. Come and meet your fellow analysts, learn what's going on, and spread the word.

Next Meeting: TBD

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An Exotic Full Factor

SRIVATSAV KUNNAWALKAM ELAYAVALLI

I will construct a full factor N such that any of its ultrapowers are non-isomorphic to any ultrapower of $L(F_2)$, in other words, N is not elementarily equivalent to $L(F_2)$. This provides the first explicit example of two full factors that are not elementarily equivalent. Moreover, our techniques also allow us to show that this factor N is also not pseudocompact, i.e., not elementarily equivalent to any matrix ultraproduct, settling a problem left open by Farah, Hart and Sherman. This is joint with Chifan and Ioana.

Complete Log Sobolev Inequality for SU(2) Tensor Representations and Beyond

YIDONG CHEN

Quantum Markov semigroups (QMS) are noncommutative generalizations of classical Markov semigroup, where the underlying probability spaces are replaced by operator algebras. Quantum Markov semigroups model open quantum systems weakly interacting with an environment. As such, they have received considerable attention from the community of quantum information science. One of the fundamental functional inequalities for QMS is the noncommutative analog of the (modified-)logarithmic Sobolev inequality ((M-)LSI). It is well-known that classical LSI (resp. MLSI) satisfies the so-called tensorization property. This property is crucial in showing the equivalence between LSI and Talagrand's concentration inequality. It turns out tensorization is not satisfied in general by the quantum analog of LSI and MLSI. One partial solution is to introduce the concept of a complete modified logarithmic Sobolev inequality (CLSI). This definition naturally satisfies tensorization property. Two central problems in the study of CLSI are: (1) obtain tight estimates of CLSI constant, and (2) calculate CLSI constant in realistic physics models. In this talk, we will focus on solving one instance of the second problem: the so-called Dicke's superradiance model in quantum optics. Mathematically, this model is intimately related to the tensor representation of $SU(2)$. We will provide a framework to calculate the CLSI constant for this model. Using the same framework, we will also obtain CLSI constant for some other interesting models including models involving QMS on type III von Neumann algebras. The last example opens the door to study second quantized open quantum systems. This talk is based on the manuscript: https://arxiv.org/abs/2209.11099.