An Index for Inclusions of Operator Systems

Roy Araiza

1. Abstract

Motivated by the work of Jones, Pimsner, Popa (and others) concerning the index of II_1 factors, I will present an analogue of this to the category of operator systems (and operator spaces). During this short lecture I will cover the basic formulation and properties, while comparing the index of graph operator systems to the Lovász theta invariant of the graph. I will end with some questions and a comparison to more recent work in physics.

The coproduct of operator A-systems

Alexandros Chatzinikolaou

1. Abstract

In this talk I will discuss the construction of the coproduct in the category of operator A-systems, that is, operator systems that are bimodules over a unital C*-algebra. I will talk about its relation to the amalgamated free product of C*-algebras and its presentation as a quotient by an operator system kernel. Finally, I demonstrate how graph operator systems are examples of operator A-systems but their coproduct may fail to be a graph operator system. This is based on my first work arXiv:2208.02687

Quantum theory in finite dimension cannot explain every general process with finite memory

Marco Fanizza

1. Abstract

Arguably, the largest class of stochastic processes generated by means of a finite memory consists of those that are sequences of observations produced by sequential measurements in a suitable generalized probabilistic theory (GPT). These are constructed from a finite-dimensional memory evolving under a set of possible linear maps, and with probabilities of outcomes determined by linear functions of the memory state. Examples of such models are given by classical hidden Markov processes, where the memory state is a probability distribution, and at each step it evolves according to a non-negative matrix, and hidden quantum Markov processes, where the memory state is a finite dimensional quantum state, and at each step it evolves according to a completely positive map. Here we show that the set of processes admitting a finite-dimensional explanation do not need to be explainable in terms of either classical probability or quantum mechanics. To wit, we exhibit families of processes that have a finite-dimensional explanation, defined manifestly by the dynamics of explicitly given GPT, but that do not admit a quantum, and therefore not even classical, explanation in finite dimension.
This results also implies that there exist finitely correlated states which are not C*-finitely

correlated.

(From https://arxiv.org/abs/2209.11225 with Josep Lumbreras and Andreas Winter)