Department of Mathematics Seminar

Operator algebras and their various applications

By

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Abstract: In this talk I first highlight some major aspects of my research, that is, the applications of operator algebras to statistical mechanics, quantum information and the principle of large deviations. Next, I will briefly talk about some of my future research plans.

Sequentially, I will outline the following mathematical concepts:

• Strict (also called C^*-algebraic) deformation quantization, as algebraic rigorous framework to model the macroscopic limit of many-body quantum theories, and emergent phenomena such as spontaneous symmetry breaking and phase transitions.

• Group theory in the construction of coherent states, as abstract tool to develop quantum channels which can be used to realize classical information transmission or to deliver quantum information, such as quantum entanglement.

• The theory of large deviations in the context of probability measures on matrix algebras and tensor products of increasing size to study and formalize the concept of entropy, including applications to stochastic processes and the Feynman-Kac formula.

Finally, I would like to point out some words on my future research directions, which are more of an applied flavour:

• Integration of network structures into limiting equations in the context of graphops, and applications to applied sciences.

• Analysis of neural fields that model the large scale behaviour of large groups of neurons, playing a role in Parkinson's disease.

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Time: 15:30
Place: SA141 - Mathematics Seminar Room