Spectral Theory and Dynamics of Quantum Systems

GRADUIERTENKOLLEG 1838

Guest Lecture

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Optimal functional inequalities and flows

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Abstract:
Functional inequalities are indispensable tools in analysis; yet, they do not form a cohesive mathematical theory. While many famous mathematicians have their names associated with one or the other inequality, their fame does not stem from this association. Nevertheless, Functional Inequalities are an attractive field as can be seen by the popularity of the book `Inequalities' by Hardy, Littlewood and Polya. Those who turn to this field strive to come to a deep understanding of particular examples. These are inequalities that, in their sharp form, can pose formidable problems in the Calculus of Variations, especially if one tries to answer questions such as “What is the best constant and what are the optimizers that furnish the cases of equality? Do the optimizers share the underlying symmetry of the variational problem or not, i.e., is there symmetry breaking?“

In recent years some new techniques have emerged, such as the use of flows and optimal transport theory. These not only provide elegant proofs of some known optimal inequalities; rather, they also yield new results that cannot be achieved when standard methods are used. In my talk, I will explain the flow technique and illustrate it on some examples. Moreover, I will discuss a recent application of this method that settles the phase diagram of the Caffarelli-Kohn-Nirenberg inequalities.