Indian Institute of Science, Bangalore
Quantum Technology Initiative

Special lecture on

Control of open quantum systems, information backflow and using decoherence to our advantage

Date and Time

5th February 2021, 8:30 PM

Speaker

Dr. Pablo Poggi

Research Assistant Professor of Physics & Astronomy,
Center for Quantum Information and Control (CQuIC)
University of New Mexico.

About the Speaker

Pablo Poggi did his PhD at the University of Buenos Aires working with Prof. Diego Wisniacki and Prof. Fernando Lombardo studying topics of quantum control in closed and open quantum systems. After graduation he was a Postdoctoral Fellow at the Center for Quantum Information and Control in the University of New Mexico (UNM) from 2018 to 2020, where he developed an interest in broader topics like quantum simulation, quantum chaos and quantum metrology. Since November 2020, he has been working as Research Assistant Professor of Physics and Astronomy at UNM, where he continue to work on several projects related to the aforementioned topics.

Meeting Link : Join Teams Meeting

Abstract

The development of quantum technologies requires an exquisite level of precision in the control of quantum systems. Such control is always hindered, to some degree, by different sources of imperfections, such as noise, inhomogeneity and decoherence. This last source of error, in particular, arises from unavoidable coupling to environmental degrees of freedom. Learning how to fight decoherence and, even better, use it to one's advantage, is thus of paramount of importance to implement the full power of quantum information processing devices. In this talk, I will give a brief introduction to the theory of open quantum systems, focusing on the differences between Markovian and Non Markovian quantum maps and discuss what strategies are available to manipulate the evolution of a quantum system coupled to an environment. Then, I will focus on a recent work about the relationship between non Markovianity (NM) and quantum optimal control. Here we tackle the problem of generating entanglement within a subset of noninteracting subsystems, each one coupled to the same non-Markovian environment. We revealed that NM plays a crucial role in all the entangling protocols considered and showed that the degree of NM completely determines the success of the entangling operation performed by the control. Finally, I will discuss how one particular aspect of NM, namely the existence of an information backflow from the environment back to the system, allows us to explain the success of these control protocols.

The speaker will be accompanied by his collaborator Mr. Nicolás Mirkin. He is an advanced PhD student in the Quantum Chaos and Control Group at the University of Buenos Aires led by Prof. Diego Wisniacki. His expertise revolves around the study of several aspects of open quantum systems, including fundamental limits to the speed of quantum evolution, quantum control, non Markovianity and quantum metrology.

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