International Year of Quantum Science and Technology (IYQ)-2025, at TCG CREST (Kolkata, India)

INTERNATIONAL YEAR OF Quantum Science and Technology

Prof. Nilanjana Datta
University of Cambridge, UK.

Date & Time:
3rd November, 2025 @ 12:00 PM IST

Venue:
Classroom-4, TCG CREST

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Title – Zero-error communication under discrete-time Markovian dynamics

Abstract

Consider a quantum memory modelled by an open quantum system with (discrete-time) Markovian dynamics. Our task is to store information in it in such a way that it can be retrieved perfectly, even after the system is left to evolve for an arbitrarily long time. We show that this is impossible for classical (resp. quantum) information precisely when the dynamics is mixing (resp. asymptotically entanglement breaking). Furthermore, we provide tight universal upper bounds on the minimum time after which any such dynamics 'scrambles' the encoded information beyond the point of perfect retrieval. On the other hand, for dynamics that are not of these kinds, we show that information must be encoded inside the peripheral space associated with the dynamics in order for it to be perfectly recoverable at any time in the future. This allows us to derive explicit formulas for the maximum amount of information that can be stored perfectly in the quantum memory. The case of small but non-zero probability of error in retrieving the encoded information is also considered. This is based on joint work with Satvik Singh.

Organized by:

CQuERE (Centre for Quantum Engineering, Research and Education), TCG CREST, Kolkata, INDIA

For more details, please visit the website: http://www.tcgcrest.org/iyq2025

For any queries, feel free to contact us through the email: iyq.2025@tcgcrest.org