UNIVERSITY OF KWAZULU-NATAL
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NITheCS
National Institute for Theoretical and Computational Sciences

S E M I N A R

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(Stellenbosch University)

Dr Graeme Pleasance is a postdoctoral researcher in the Quantum@SUN group at Stellenbosch University.

Non-Markovianity and entanglement in collision models with initial system-environment correlations

ABSTRACT:

Collision models (CMs) have been established as a useful tool for analysing non-Markovian open dynamics based on the ability to control the environment memory through simple feedback mechanisms. Previous types of feedback mechanism have relied on modifying the basic CM setup to allow for ancilla-ancilla collisions and initially correlated ancilla states. In this talk, I will introduce a new class of non-Markovian CMs with initially correlated environment states, whose correlations are generated through applying a sequence of unitary operations to successive groups of ancillas. Our primary focus will be to examine the extent to which initial ancilla-ancilla entanglement can influence the non-Markovianity of the open dynamics. To this end, I will demonstrate that the open dynamics of such non-Markovian CMs can be mapped onto a composite CM, where the memory part of the environment is incorporated into an enlarged Markovian system. This establishes a direct correspondence between the two feedback mechanisms in which system-environments correlations are either created dynamically through ancilla-ancilla collisions, or through correlations generated within the initial environment state. This framework is then applied to an all-qubit CM, where the degree of non-Markovianity is quantified according to the trace distance measure in relation to initial ancilla-ancilla entanglement. It is established that while entanglement can enhance the non-Markovianity of the dynamics, the presence of maximal entanglement can have a deleterious effect by producing entirely Markovian behaviour.

Date:
Friday, 22 November 2024

Time:
14h00-15h00 SAST

***Venues*:**
- NITheCS Seminar Room
  University of KwaZulu-Natal
  Westville Campus
  3rd Floor, H-Block,
  School of Chemistry and Physics
- Online

WHO SHOULD ATTEND?
This talk is intended to be accessible to postgraduate students. All are welcome!

ENQUIRIES:
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REGISTER: https://bit.ly/3AQTFT6

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