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NITheP Webinar
Thursday, 22 April 2020, 14h00

Dr Kade Head-Marsden | Harvard University

"Dilation based quantum algorithms for the time-evolution of open quantum systems"

How an open quantum system evolves in the presence of its environment is crucial to better understanding and improving many processes including the communication of quantum information and the transfer of energy. In the dissipative Markovian regime, energy or information lost by the system is never recovered, however, in the non-Markovian regime, recurrences of quantum properties such as coherences and entanglement can occur. Accurately modeling these recurrences could allow for improved experimental parameter estimation and for the potential control of noise processes in quantum technologies. While classical method development has made immense progress towards this goal, recent advances in Noisy Intermediate-Scale Quantum (NISQ) computers allow for an alternative, and potentially more natural, framework to model important quantum processes. However, modelling and predicting open quantum systems presents the inherent challenge of mapping non-unitary evolution into the framework of unitary gates offered by these quantum processors. In this talk, I will discuss my recent work on algorithm development in reduced density matrix theory, which extends the Kraus mapping formalism through dilation methods to capture open quantum system dynamics on quantum computers.

BIOGRAPHY

Dr Kade Head-Marsden received her B.Sc. in mathematics and chemistry from McGill University in 2014, and her Ph.D. in theoretical chemistry under the supervision of Professor David Mazziotti at the University of Chicago in 2019.

She is currently a postdoctoral fellow in the NarangLab at Harvard University, focusing on modelling quantum systems, including electronic structure and the dynamics of open quantum systems, using classical and quantum resources.

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