

Efficient pseudomode mapping for strongly coupled open quantum systems

Dr Graeme Pleasance (*Stellenbosch University & NITheCS*)

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Venues: NITheCS Seminar Room, Stellenbosch University and online

ABSTRACT

The pseudomode (PM) method has emerged as powerful tool for treating both the dynamics and thermodynamics of strongly-coupled open quantum systems. Despite its versatility, current challenges with the method – particularly with regard to parameter optimisation and optimal choice of ansatz (coupled PMs, non-Hermitian couplings, etc.) – persist.

In this talk, I will introduce a new, generalisable approach for extracting the parameters of a coupled PM network that is both efficient and scales to an arbitrary number of PMs. This enables the low-cost simulation of potentially highly complex, non-Markovian environments, while avoiding issues where the choice of ansatz can introduce numerical instabilities into the dynamics. I will finally demonstrate the effectiveness of the approach on the spin-boson model.

BIOGRAPHY

Graeme Pleasance is a postdoctoral researcher in the Quantum@SUN group at Stellenbosch University, led by Prof Francesco Petruccione. He graduated with an MSci in Theoretical Physics from the University of Birmingham, UK, in 2013 and received his PhD from the University of Sussex, UK, in 2018. From 2018 to 2022, he held a postdoctoral research position in the Quantum Research Group at the University of KwaZulu-Natal. His research interests lie broadly in the theory of open quantum systems, quantum thermodynamics and quantum information.

Currently, he is working on the development of nonperturbative techniques for treating strongly-coupled open quantum systems, with applications to nonequilibrium thermodynamics.



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