

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: <https://cde.nus.edu.sg/ece>

Area: Quantum Technology (QT)

Host: Asst Prof Tan Kok Cheng Anthony

TOPIC	:	From bare AI agents to autonomous quantum many-body numerics
SPEAKER	:	Mr Dominik Kufel Department of Physics, Harvard University
DATE	:	Tuesday, 6 October 2026
TIME	:	10:00AM-11:00AM
VENUE	:	E1-06-03

ABSTRACT

Numerical studies of quantum many-body systems, from ground-state phase diagrams to real-time dynamics, pass through similar stages: implement the model, converge the calculation, measure the right quantities, and interpret what they mean. Each stage has well-established practices, yet carrying all of them through consistently is slow and error-prone. I'll describe a system in which a large language model runs this pipeline end to end. We start from off-the-shelf AI agents, which fail in instructive ways, and build a custom scaffolding around them: the agent decides what to compute, dedicated helpers handle job submission and data reading, and mandatory checks catch the mistakes we've seen before. Our current implementation uses tensor-network methods, but the structure carries over to most numerical approaches. We test it on hard models with established answers, including some from our own group, and feed its failures back so it improves with each run. Once it passes those tests, we point it at open problems — I'll show first examples of what it finds, and what a physicist still has to bring to the table.

BIOGRAPHY

Dominik Kufel is a fifth-year PhD student at Harvard University, advised by Norman Yao, and a Harvard AI Fellow. His research sits at the intersection of AI and quantum many-body physics, spanning geometric deep learning, quantum information and quantum sensing. He builds AI agents that carry out science end-to-end, from forming hypotheses to designing and running experiments, with the goal of discovering new materials and exotic phases of matter. He helped build toward autonomous science at Periodic Labs during its early days.

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