UNIVERSITY OF RHODE ISLAND

Department of Mathematics
and Applied Mathematical Sciences

Applied Math and Scientific Computing Seminar

Location: Lippitt Hall 205

Time: Monday, March 31, 2025, 1:00pm

(refreshments at 12:55pm)

Introduction to Quantum Information Science:
Understanding Distributed Quantum Metrology in a Linear Network

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Abstract: In this talk, I will cover two main topics: an introduction to quantum information science and a study of distributed quantum metrology in a linear network [1, 2]. In the first part, I will discuss the background of quantum information science, potential applications, current state of the art, and future perspectives. In the second part of my talk, I will introduce a new frontier in quantum information science–Distributed Quantum Metrology (DQM), which enables the estimation of global functions of multiple distributed parameters beyond the capability of separable sensors. I will provide a full understanding of the minimal input resources and linear networks required to achieve DQM of arbitrary functions. The take-home message is that two non-vacuum inputs, one non-classical, are the minimum required to achieve DQM with arbitrary weights at the Heisenberg limit, the ultimate sensing limit allowed by quantum mechanics.

[1] W. Ge, K. Jacobs, Z. Eldredge, A. V. Gorshkov, and M. Foss-Feig, *Distributed Quantum Metrology with Linear Networks and Separable Inputs*, Physical Review Letters, 121, 043604 (2018).
[2] W. Ge and K. Jacobs, *Heisenberg-limited continuous-variable distributed quantum metrology with arbitrary weights*, ArXiv: 2412.01074 (2024).