UNIVERSITY OF CHICAGO
DEPARTMENT OF COMPUTER SCIENCE

PRESENTS:

"*Operational quantum tomography*"

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Abstract:
As quantum processors become increasingly refined, robust and reliable characterization becomes a critical topic. One class of characterization techniques, tomography, uses experiments to infer the parameters of a proposed model of the system. We have developed a general framework called operational quantum tomography (OQT) that uses experimental observables as these model parameters, thus avoiding the mathematical ambiguities that are suffered by contemporary protocols such as gate set tomography.

OQT learns about quantum systems by using sequential Monte Carlo methods to perform Bayesian inference. We have demonstrated the stability and generality of our OQT framework by simulating characterization tasks such as randomized benchmarking and quantum state tomography. We have also applied it to perform gate set tomography on a trapped-ion qubit using experimental data. In this talk I will highlight the advantages of OQT by showing how it can be used to perform Ramsey interferometry. Ramsey interferometry cannot be addressed by traditional gate set tomography as the set of experiments is not informationally complete, a problem which we overcome through the use of prior information in our Bayesian framework.

Bio:
OLIVIA DI MATTEO *received a Ph.D. in physics (quantum information) from the University of Waterloo in 2019. She is currently a Quantum Information Science Associate at TRIUMF in Vancouver, Canada. Her research interests include quantum circuit synthesis and resource estimation, quantum tomography, quantum software, and the applications of combinatorial designs, machine learning, and high-performance computing in quantum information science.*

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Host: Fred Chong