USC Viterbi
School of Engineering
Ming Hsieh Department of Electrical and Computer Engineering

Ming Hsieh Institute **Seminar Series**

Quantum Science & Technology

A chiral light-matter interface with superconducting qubits.

Chaitali Joshi
Quantum Research Scientist
Google Santa Barbara

Date: Thursday, November 30, 2023
Time: 2:00pm – 3:30pm
In-person: EEB 248

Abstract: Noise Improving qubit connectivity in quantum networks is crucial for distributed information processing, and for reducing resource overheads in certain error correction protocols. While superconducting circuits have shown great promise for large-scale quantum processors, controlling the flow of light in complex qubit networks has remained a challenge. In this talk, I will discuss our recent work on realizing nonreciprocal light-matter interactions in the microwave domain using a transmon qubit strongly coupled to a 1D waveguide. By modulating the atom-waveguide coupling using magnetic fields, we gain control over the direction of photon emission from the qubit, with the ratio of forward-to-backward coupling rates exceeding 100. I will discuss applications of this platform, including photon-mediated gates between distant qubits and the preparation of many-body dark states in chiral atom arrays. In the second part, I will discuss our exploratory work on using disordered superconducting materials for nonlinear devices suitable for quantum links operating in the millimeter-wave frequency regime. Work based on: Phys. Rev. X 13, 021039 (2023), Phys. Rev. Applied 18, 064088 (2022)

Biography: Chaitali is currently a quantum research scientist at Google Santa Barbara. Previously, she was an IQIM/AWS Postdoctoral scholar in Electrical Engineering at Caltech, where she worked on waveguide quantum electrodynamics with superconducting qubits. She obtained her PhD from Cornell University in 2020, where she worked on nonlinear and integrated photonics for time-frequency manipulation of quantum states of light.

Hosted by: Quntao Zhang, Wade Hsu, Mengjie Yu, Jonathan Habif & Eli Levenson-Falk