

RICE QUANTUM GROUP MEETING SEMINAR SERIES



Date: May 27, 2022, Friday

Time: 3PM - 4PM

Venue: SST 300

Research Group: Prof. Thomas Killian's Group

Presenter: **Soumya K Kanungo**

Title: **Rydberg-atom synthetic dimensions**

Abstract: A discrete degree of freedom can be engineered to match the Hamiltonian of particles moving in a real-space lattice potential. Such synthetic dimensions are powerful tools for quantum simulation because of the control they offer and the ability to create configurations difficult to access in real space. In this talk, I will present our recent results where we demonstrate a synthetic dimension based on Rydberg levels coupled with millimeter waves in an ultracold 84Sr atom. Tunneling amplitudes between synthetic lattice sites and on-site potentials are set by the millimeter-wave amplitudes and detunings respectively. Alternating weak and strong tunneling in a one-dimensional configuration realizes the single-particle Su-Schrieffer-Heeger (SSH) Hamiltonian, a paradigmatic model of topological matter. Band structure is probed through optical excitation from the ground state to Rydberg levels, revealing symmetry-protected topological edge states at zero energy. We also show the edge-state energies are robust to perturbations of tunneling-rates that preserve chiral symmetry but can be shifted by the introduction of on-site potentials

Short Bio: Soumya is a senior graduate student in Prof. Thomas Killian's ultracold atoms lab. His research interests lie in exploring Rydberg atoms and their interactions with radiation, especially towards their usage for quantum simulation. He obtained his BS-MS degree in Physics from the National Institute of Science, Education and Research (NISER), Bhubaneswar, India. When he is away from work, he likes to spend his time playing soccer and lots of poker.

Note: *Snacks and Coffee will be served during the event.*