A. Paramekanti: *Accessing strongly correlated atomic states and probing atom currents in synthetic gauge fields*

We show that new phases, such as chiral Mott insulators or superfluids with novel spin textures, arise for bosons in an optical lattices in the combined presence of strong correlations and synthetic magnetic fields or spin orbit coupling. Such phases are uncovered using a variety of tools such as inhomogeneous mean field theory, DMR calculations, slave boson approaches, and classical Monte Carlo simulations. We also show how anisotropic quenches of the lattice potential can detect equiibrium bulk or topological edge currents associated with such states for both bosons or fermions.