

“Quantum simulation and computation with cold atoms and ions”
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Abstract: Optical coherent control of ultracold neutral or charged atoms provides a powerful platform for quantum simulation of strongly correlated many-body physics and for implementation of quantum computation. In this talk, I will show how to control gauge fields for neutral atoms and to simulate the spin Hall effect, how to describe resonantly (strongly) interacting atoms in an optical lattice, how to control the interaction configuration to probe exotic many-body phenomena, and how to reconstruct the full correlation function of ultracold atoms through Fourier sampling of the time-of-flight images. I will also show how to realize robust and scalable quantum computation with ions or cavity atoms through probabilistic photon coupling.