C. Kraus: *An AMO toolbox for Majorana Fermions in Optical Lattices*

A striking consequence of topological order is the existence of robust zero-energy modes localized at defects and edges of topological phases. One prominent example are zero-energy Majorana fermions that were originally introduced as pure real solutions of the Dirac equation. Nowadays, they are not only discussed in the context of high energy and condensed matter physics, but it is also believed that they serve, due to their anyonic statistics, as building blocks for topological quantum computing devices.

While most of the proposals for realizing and detecting Majorana fermions have been related to solid state systems, I will present possibilities to investigate Majorana physics with AMO tools. I will explain how Majorana fermions can be created, manipulated and detected in systems of cold atoms confined to an optical lattice. These tools do not only allow to study fundamental questions related to Majorana fermions, but they will also enable us to efficiently implement topologically protected quantum algorithms.