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Nota di contenuto	Towards Strongly Interacting Bosons and Fermions -- Hubbard Models for Bosons and Fermions -- Detection and Observables -- Experimental Apparatus -- Interacting Fermions in Optical Lattice Potentials -- Quantum Phase Revival Spectroscopy and Multi-body Interactions -- Interacting Mixtures of Bosons and Fermions in Optical Lattice Potentials -- Coherent Interaction of a Single Fermion with a Small Bosonic Field.
Sommario/riassunto	This thesis explores ultracold quantum gases of bosonic and fermionic atoms in optical lattices. The highly controllable experimental setting discussed in this work, has opened the door to new insights into static and dynamical properties of ultracold quantum matter. One of the highlights reported here is the development and application of a novel time-resolved spectroscopy technique for quantum many-body systems. By following the dynamical evolution of a many-body system after a quantum quench, the author shows how the important energy scales of the underlying Hamiltonian can be measured with high precision. This achievement, its application, and many other exciting results make this thesis of interest to a broad audience ranging from

quantum optics to condensed matter physics. A lucid style of writing accompanied by a series of excellent figures make the work accessible to readers outside the rapidly growing research field of ultracold atoms.