Bosonic and Fermionic Cold atoms in optical lattices. MIGUEL A.
CAZALILLA, Donostia International Physics Center, ANDREW F. HO, University
of Birmingham, THIERRY GIAMARCHI, University of Geneva — We examine the
properties of coupled one dimensional tubes of Bosons or Fermions, in an optical
lattice. For bosons, we find that the intertube coupling induces a deconfinement
transition where the system goes from a one dimensional Mott insulator to a three
dimensional superfluid. We compute the phase diagram and physical properties and
discuss the results in connection with experiments on cold atoms. For fermions, the
presence of the optical lattice allows for a richer phase diagram than for standard
interacting fermions in one dimension. We analyse the resulting phases and discuss
how to observe them for cold atoms

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