Lecture 1: Zero-range limit, three-body problem, and dynamical symmetry

Chapter 1: Short-range resonant interactions and the universal zero-range limit
Part 1: Simplified atomic physics
Part 2: Two-body problem
Part 3: N-body problem
- Zero-range limit and ZRM
- Homogeneous gas

Chapter 2: Solution of the unitary three-body problem

Chapter 3: Symmetry properties of the unitary N-body problem
Part 1: Separability of the hyperradius
Excursion: s for $N \to \infty$
Part 2: Short-distance scaling law
Part 3: The Castin mode

Lecture 2: Many-body physics: methods and basic properties

Chapter 0: Lattice model

Chapter 1: Many-body methods
Part 1: Virial expansion
Part 2: Simple variational wavefunctions
BCS ansatz, Chevy ansatz
Part 3: Quantum Monte Carlo
Part 4: Diagrammatic approaches
- Diagrams for the lattice model
- Diagrams for the zero-range model, diagrammatic Monte Carlo
- Appendices

Chapter 2: Many-body physics: some basic properties
Part 1: Unpolarized unitary gas
Equation of state, long-range order, pairing gap, spectral function, second sound
Part 2: Fermi polaron
Part 3: Polarized gas

Lecture 3: 2-body & 3-body contacts   (C_2 & C_3)
- C_2
- Number of nearby pairs and triplets
- 3-body loss rate
- C_3 in the non-degenerate limit
- C_3 for the degenerate unitary gas : Heidelberg experiment