

N-body techniques for astrophysics:

Lecture 1:

Definition of an N-body simulation, examples of numerical solvers (Euler, Leapfrog); concept of computational complexity

Lecture 2:

Direct N-body codes for collisional systems (Hermite scheme, block time-step algorithm, regularization, stellar evolution recipes, special purpose hardware, graphics processing units)

Lecture 3:

Examples of direct N-body codes (STARLAB, HiGPUs, ..)

Lecture 4:

N-body methods for collisionless systems (softening, tree codes, particle mesh and fast multipole codes, high performance computing architectures)

Lecture 5:

Algorithms for gas (smoothed particle hydrodynamics, mesh codes, adaptive mesh refinement codes)

Lecture 6:

Examples of codes for collisionless systems without and with gas (ChanGa, RAMSES, ...)

Lecture 7:

Sub-grid physics (star formation, supernovae, radiative transfer)

Lecture 8:

Initial conditions for N-body simulations (random sampling of a distribution function, examples)