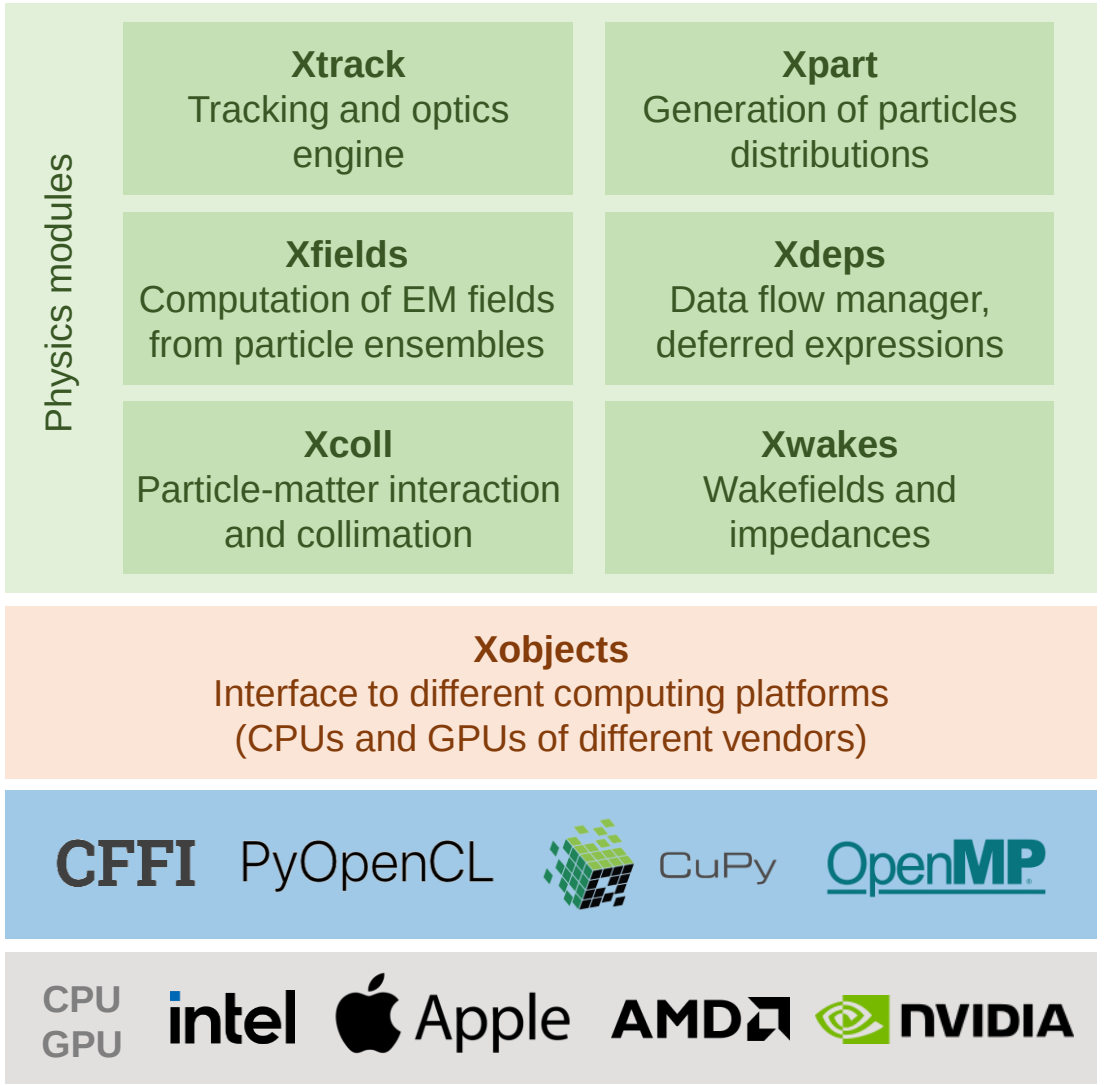
Xsuite

- **Suite of Python packages** for the simulation of beam dynamics in particle accelerators, developed at CERN
  - Open source, on GitHub, installable with pip
  - Runs on CPUs and GPUs (same user code)
- **Lattice description,** symplectic maps, deferred expressions for knobs, machine imperfections
- **Single-particle tracking and optics**: twiss, matching, survey, tracking
- **Collective effects**: space charge, beam-beam, wakefields, IBS, Toscheck scattering
- **Particle-matter interaction**: collimation via Xcoll (native, FLUKA, Geant4)
- Used for LHC, HL-LHC, injectors, FCC-ee, light sources, medical synchrotrons, ...



Resources for Xsuite users

Website	Entry point with links to everything below xsuite.web.cern.ch
User's guide	Installation, tutorials and examples for the main functionalities (start here) https://xsuite.readthedocs.io/en/latest/usersguide.html
Reference guide	API documentation of all modules and classes xsuite.readthedocs.io/en/latest/apireference.html
Physics manual	Physics models implemented in the code (PDF) xsuite.github.io/xsuite/docs/physics_manual/physics_man.pdf
Mattermost channel	Questions, discussions. CERN Mattermost team "xsuite" mattermost.web.cern.ch/xsuite
GitHub	Source code of all packages. Bug reports, questions, and feature requests. github.com/xsuite/xsuite/issues

Content of the tutorial

Hands-on with Jupyter notebooks, using as example the **PIMM lattice** (proton and ion therapy synchrotron, CERN/PS 99-010, basis of the CNAO and MedAustron machines)

00 **The Xtrack environment**

01 **Loading lattices**

02 **Lattice inspection and optics matching**

03 **Mixed beams - basics**

04 **Mixed beams - slow extraction, phase-space analysis**

05 **Mixed beams - slow extraction, spill simulation**

Notebooks and data files: https://github.com/xsuite/tutorial_mixed_beams
Requirements: *pip install xsuite matplotlib jupyter nafflib*