Beam-based optimization (FCC, superKEKB, IOTA)

Motivation: improve accelerator performance in terms of

Orbit correction
Beta-beating, dispersion, coupling
Tune, chromaticity correction
Tracking, DA optimization/prediction

input

Known errors (simulations)
Known excitations (measurements)
BPMs readings, BLM, beam profiles (measurements)
Beam-lifetime (simulations)

Standard Methods:
SVD, MICADO, others
Beam-based alignment
Tracking

AI Methods:
Genetic Algortihms, Particle Swarm, BO, Reinforcement Learning, surrogate models, others

output

Definition of corrections (linear/non-linear)
Definition of tolerances (simulations)

Active learning strategies for FCC-ee HEB

[Use case	FCC-ee HEB ;
[Motivation	Parameters optimisation for the FCC-ee High Energy Booster. The goal would be to optimise the lattice, the knobs and the cycling taking into account the interplay between different collective effects;
[Expected results	robust strategies to mitigate several unwanted effects such as TMCI and an optimised cycling for injection, energy ramp-up, top-up and extraction to the collider ring ;
[Methods	Smart parameters scan, Active learning, surrogate models (other methods to be investigated);
[Data	Tracking simulations with collective effects (FCC-eeHEBcase) ;
[Input	Lattice, knobs, beam, RF, errors ;
[Output	Knobs, cycling, stability criteria.