GeOFF: Generic Optimization Framework and Frontend

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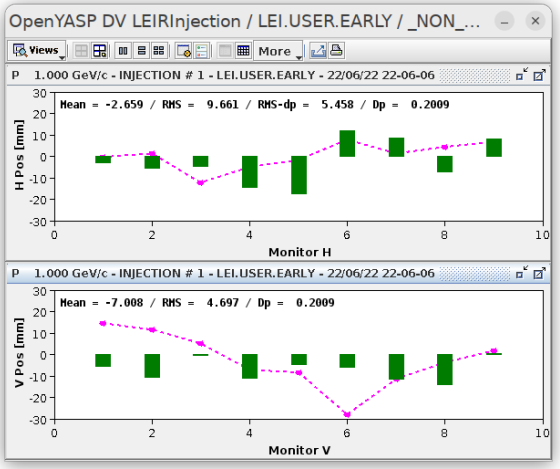
BE Seminar
1 July 2022

Motivation

many optimization problems in CERN accelerator operations:

- beam steering without optics model



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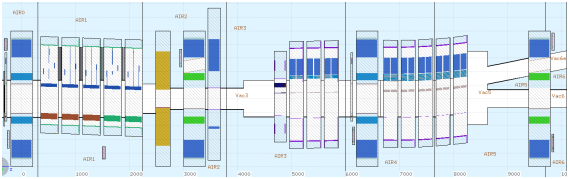

Originally developed by D. Bjorkman

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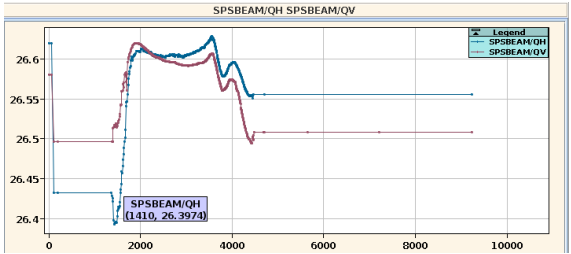

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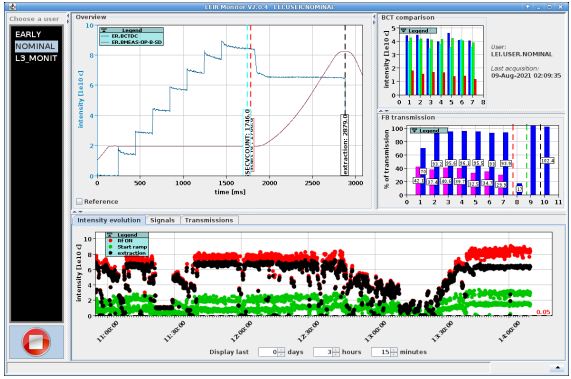
- simple corrector adjustments at Linac 3, ISOLDE, ...



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- done manually with no “obvious” algorithm to follow (experience helps, however!)

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- machine learning on the rise!
- each package has slightly different API
- most algorithms take control, don't account for pauses, disturbances, cancellations, replays

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LEIR Steering | SPS Septum | LN3 Kickers

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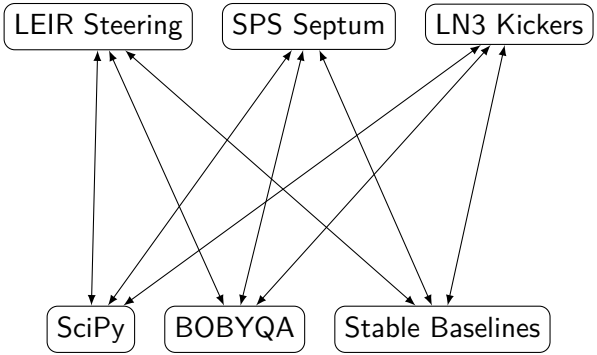
- many different optimizers



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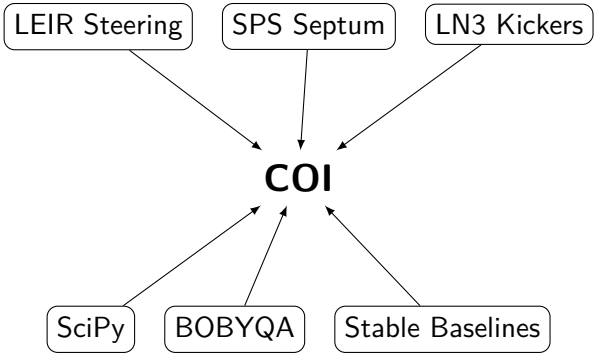
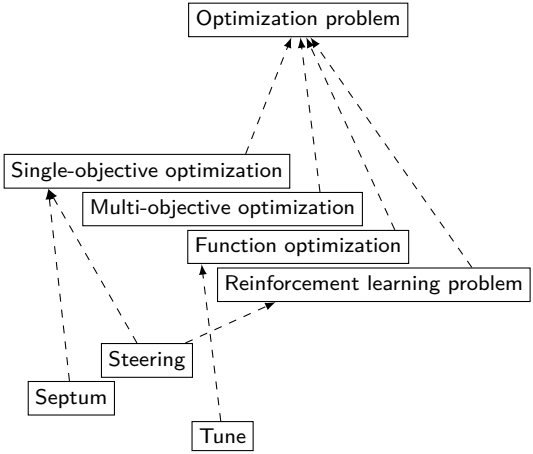
- many different optimization problems
- many different optimizers
- avoid combinatorial explosion with common optimization interfaces



Common Optimization Interfaces (COI)

- standardized interfaces and adapters for various packages



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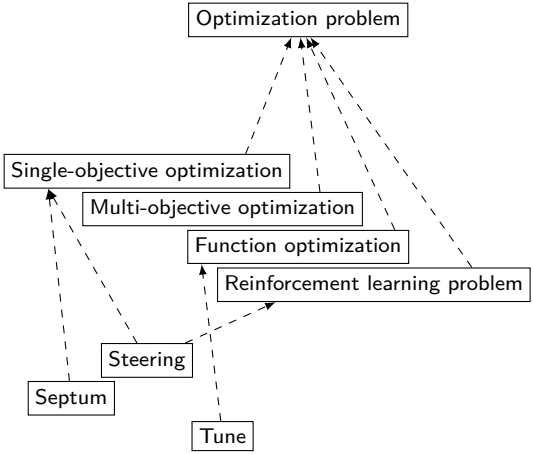

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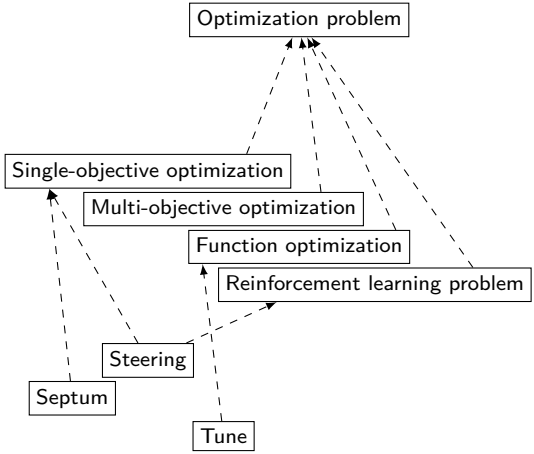

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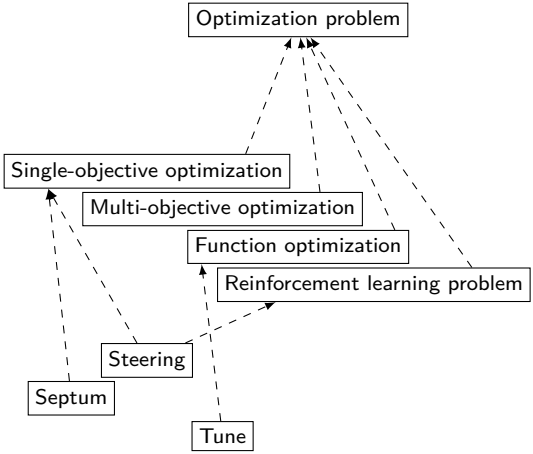

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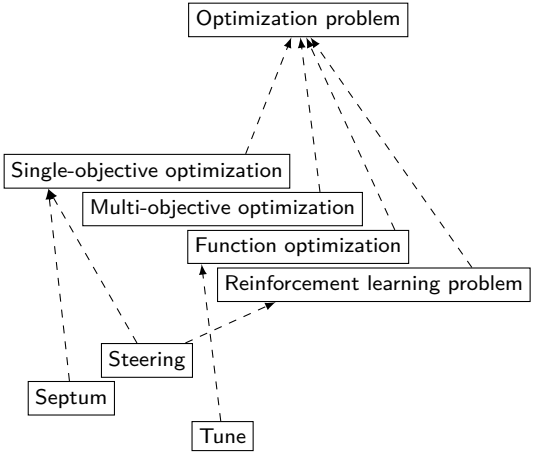

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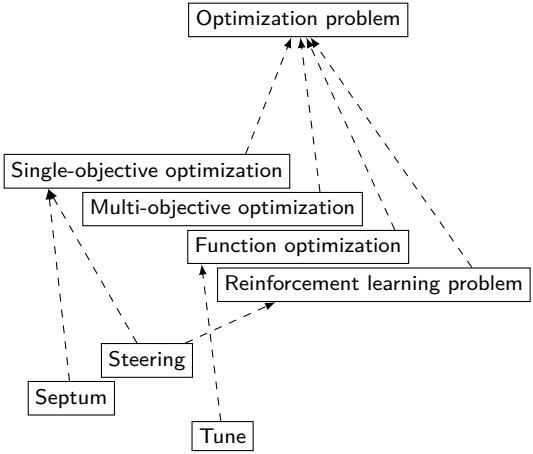

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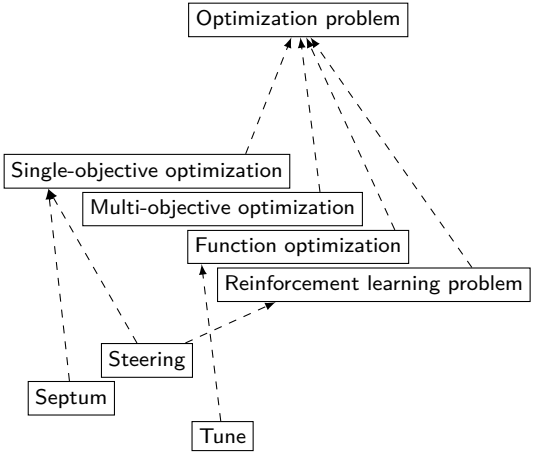

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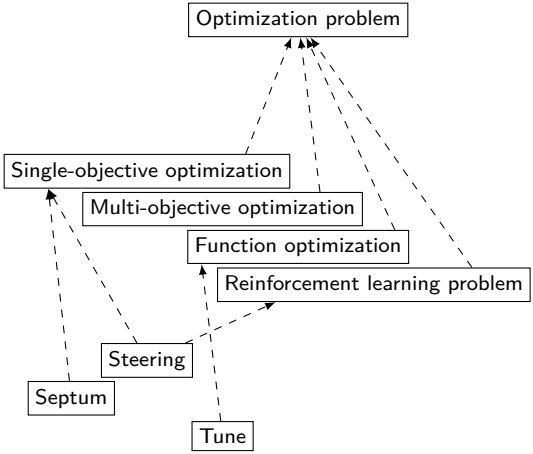
  - wants to plot additional data?



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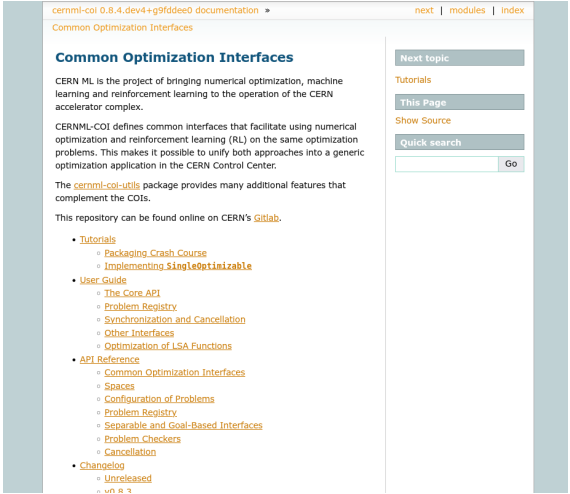

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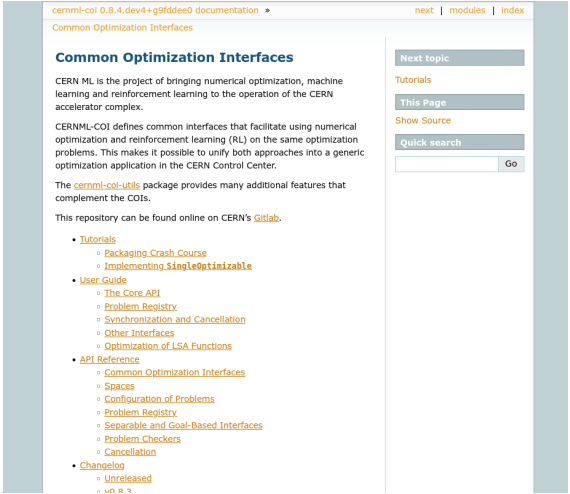

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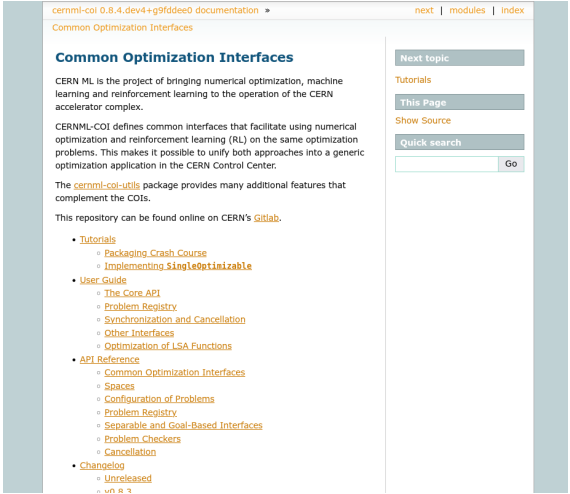

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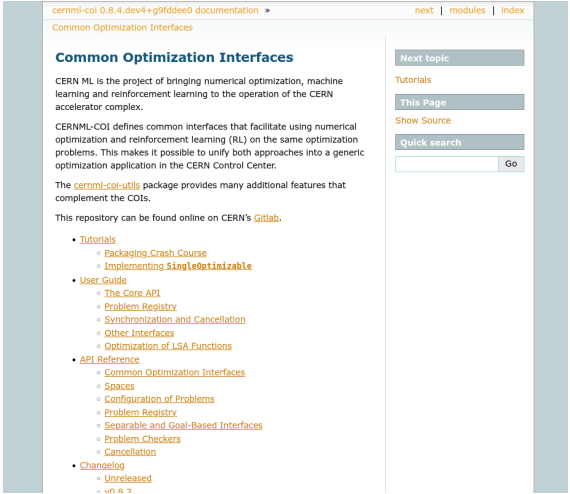
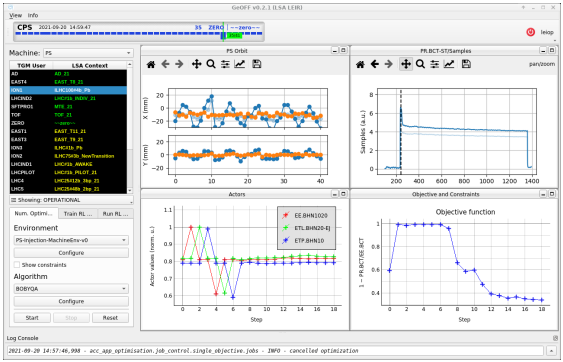
- both surface-level user guides and in-depth API references



Generic Optimization Frontend & Framework (GeOFF)



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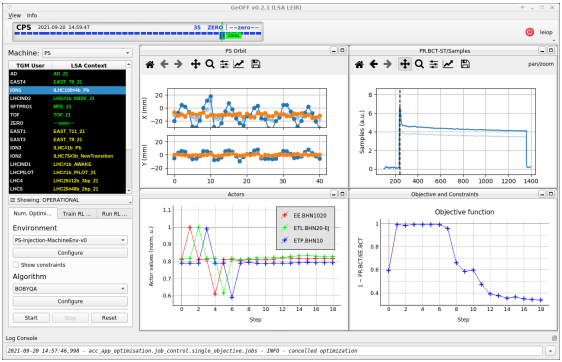

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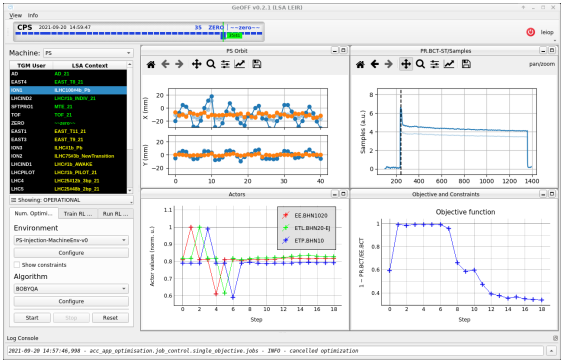

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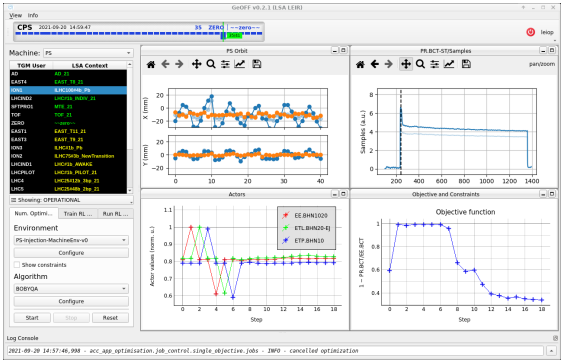

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- built-in list of optimizers plus runtime load mechanism

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- ISOLDE: generic transfer line optimizer under investigation

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  - upload trained models

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- prototype GUI to present this platform to the user
- strong focus on customizability and plugin mechanisms
- successful use at several machines