

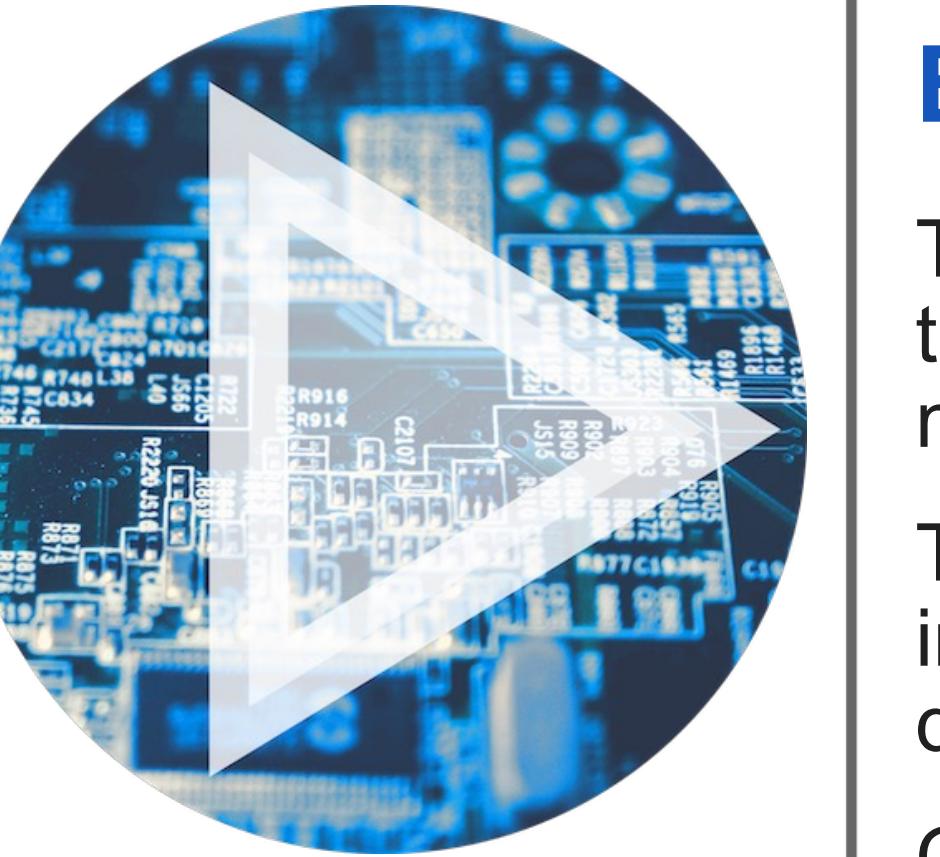
Optimizing Fab Operations Using Simulation & AI Algorithms

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PySCFabSim

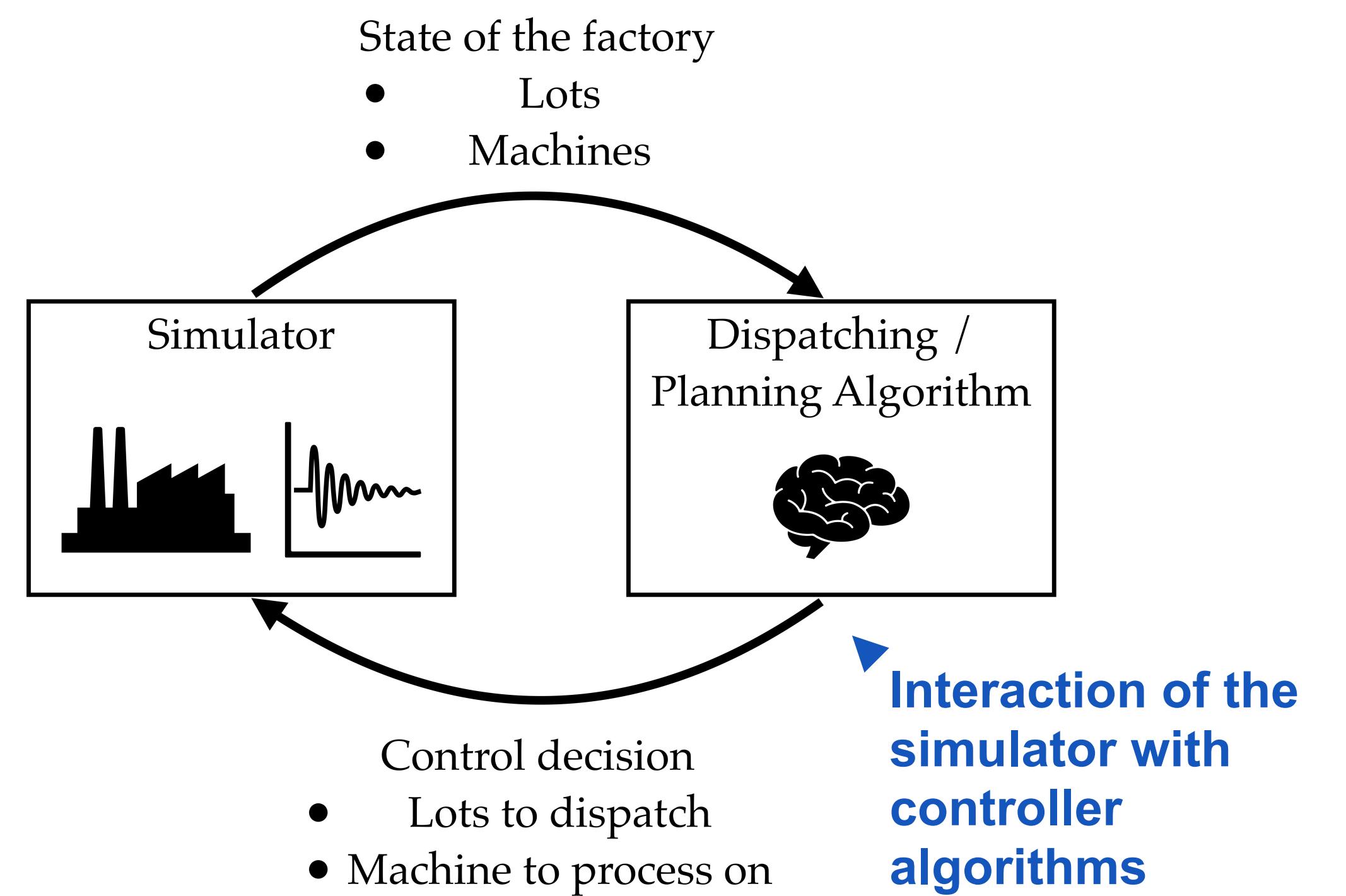
An open-source semiconductor fab simulator. Developed to accelerate research & development of AI-based dispatching & planning algorithms in the semiconductor industry.



Integration with New Algorithms

The tool provides a Python interface to integrate & test new control strategies with the simulator.

A gym-like interface for RL is also available.



Extensions for the Simulator

To minimize the memory & computation footprint of our tool, all non-essential functionality is implemented modularly, in plugins.

The simulator can be extended using the provided Python interface. Developers can develop own plugins to collect data to support decision making, or logging performance.

One can also alter the fab's behavior, alter the production flow, or implement alternative handling of simulated errors.

Graphical User Interface

We developed multiple plugins for configuring simulation parameters and visualizing the state and performance of virtual factory.

Monitoring with Weights & Biases

```

class IPlugin(metaclass=ABCMeta):
    + on_sim_init(self, instance)
    + on_sim_done(self, instance)
    + on_lots_release(self, instance, lots)
    + on_lot_done(self, instance, lot)
    + on_step_done(self, instance, lot, step)
    + on_before_dispatch(self, instance, machine, lots)
    + on_dispatch(self, instance, machine, lots, machine_end_
        lot_end_time)
    + on_machine_free(self, instance, machine)
    + on_lot_free(self, instance, lot)
    + on_breakdown(self, machine, breakdown_event)
    + on_preventive_maintenance(self, machine, preventive_maintenance_event)
    + get_output_name(self)
    + get_output_value(self)
    + on_cqt_violated(self, instance, machine, lot)
    + on_next_day(self, instance, day_number: int)
    + on_cqt_satisfied(self, instance, machine, lot)

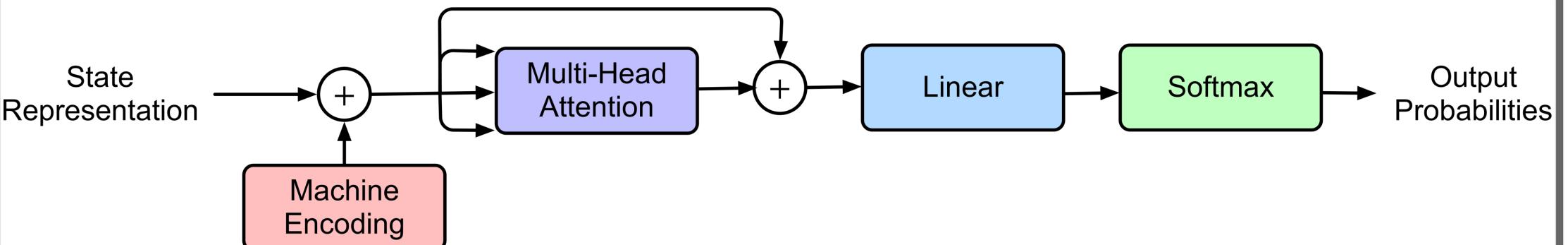
```

▶ Online changes in parameters

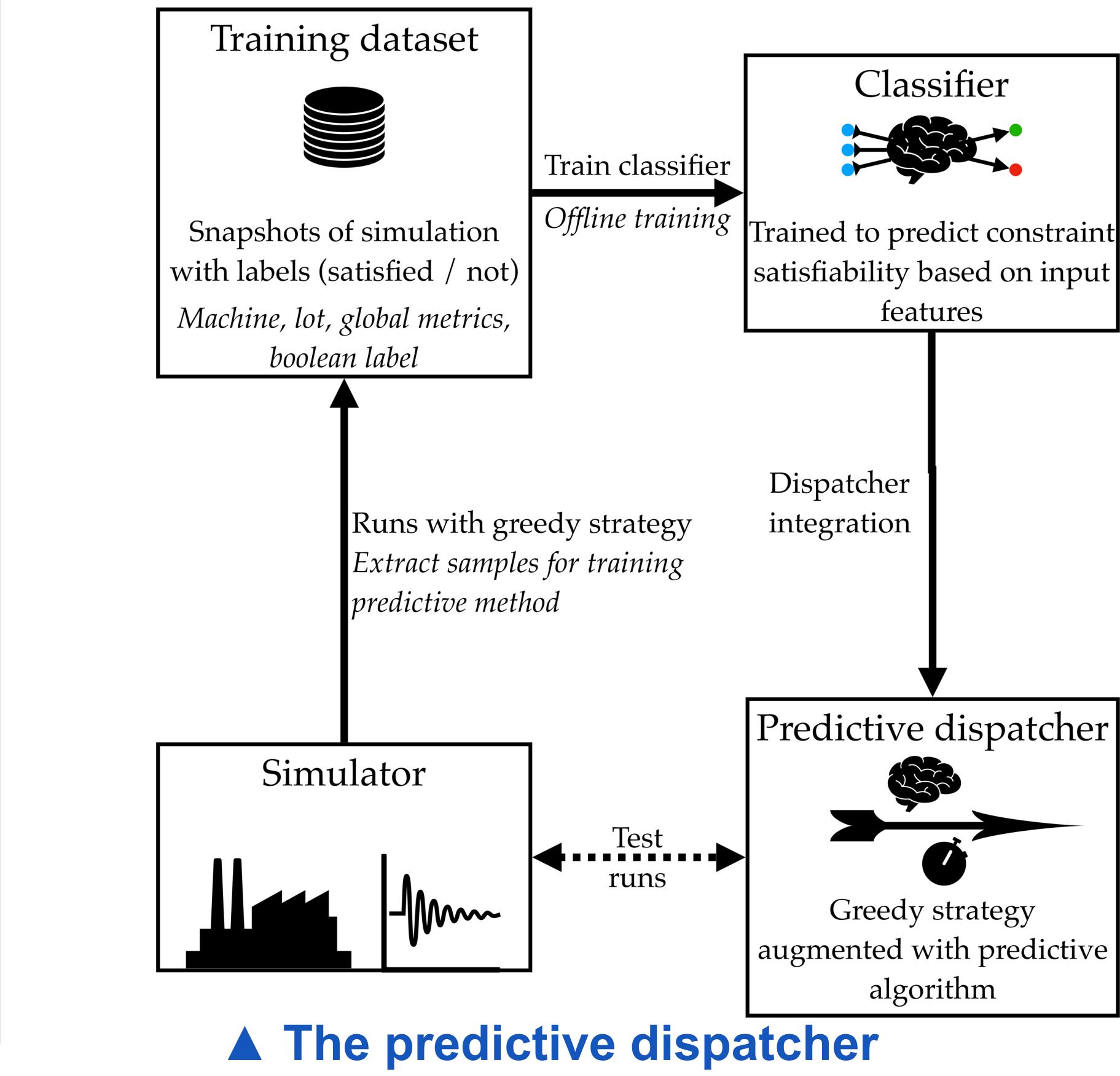
Interface for plugin development ▶

Machine Learning-based Agents

- Predictive dispatcher using deep learning
- Dispatchers optimized with genetic programming
- Attention-based RL-agent, trained with the combination of deep reinforcement learning and self-supervised learning



▲ The attention-based dispatcher's neural network



Acknowledgement

This work was partially funded by KWF project 28472, cms electronics GmbH, FunderMax GmbH, Hirsch Armbänder GmbH, incubed IT GmbH, Infineon Technologies Austria AG, Isovolta AG, Kostwein Holding GmbH, and Privatstiftung Kärntner Sparkasse.

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<https://prosysscience.github.io/PySCFabSim-release/>