



Jan Kaiser

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2015 - 2018 ● **Hamburg University of Technology**
Computer Science (B.Sc.)

2018 - 2020 ● **Hamburg University of Technology**
Computer Science (M.Sc.)
ANN-based Data Augmentation
Anomaly Detection for UAVs

2020 - present ● **DESY**
Doctoral Researcher
Reinforcement Learning for Accelerator Control
ANN-based Virtual Diagnostics

Involvement in RL

- PhD project developing RL solutions to various accelerators
 - Transverse beam parameter tuning at ARES
 - Multi-agent RL-based beam threading at ARES (ongoing)
 - Beam dump loss and temperature feedback at European XFEL (ongoing)
 - FEL intensity tuning and LCLS (ongoing)

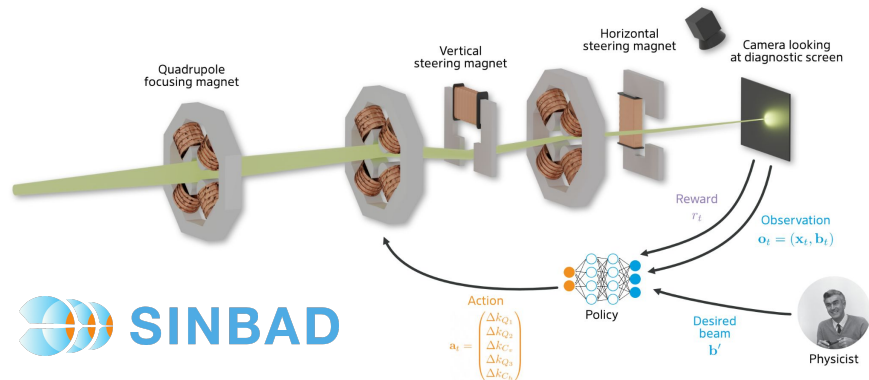
Interested in ...

- RL for tuning and as a feedback on complex real-world systems
- Sim2real transfer
- Reward design
- Observation design (including feature engineering)

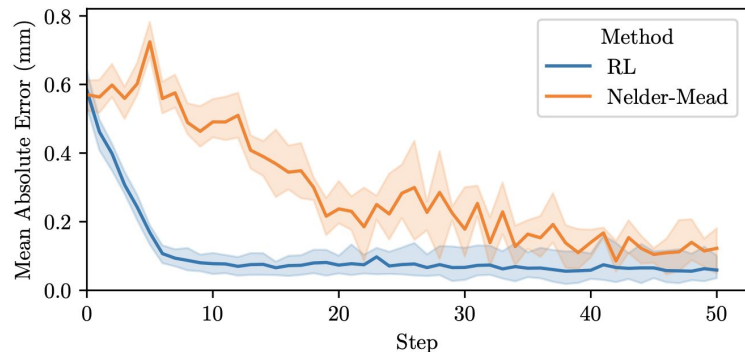
Transverse Beam Tuning at ARES

Successfully deploying RL to an accelerator with zero-shot learning

- Deploy a RL-trained optimisation algorithm to the **real-world** ARES accelerator with **zero-shot learning**
- Equivalent of **3 years of experience** tuning the transverse beam parameters
- **Faster optimisation** than alternative optimisation algorithms
- **Better final beam** than alternative optimisation algorithms



Algorithm	MAE Median (mm)	Convergence Median (Steps)
Do Nothing	1.122	0
Zero	0.588	1
FDF	0.699	1
Random	0.267	101
Powell	0.259	119
COBYLA	0.105	34
Nelder-Mead	0.007	112
Bayesian	0.081	101
Ours	0.008	7
Ours (Machine)	0.036	12



Transverse Beam Tuning at ARES

Successfully deploying RL to an accelerator with zero-shot learning

- **Autonomously** achieve tune in less than **5 minutes** what takes human operators over **20 minutes**
- Deployed application for using RL agent **in production**

