Chenran Xu

Doctoral Researcher

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Education

M. Sc. in Physics — *Karlsruhe, Germany*

Karlsruhe Institute of Technology — *Apr. 2018 - Jun. 2020*

Thesis: *Bayesian Optimization of Injection Efficiency at KARA using Gaussian Processes*

B. Sc. in Physics — *Karlsruhe, Germany*

Karlsruhe Institute of Technology — *Oct. 2014 - Apr. 2018*

Thesis: *Investigation of the Long Term Stability of the EDELWEISS Muon Veto System*

Experience

Karlsruhe Institute of Technology — *Karlsruhe, Germany*

Research Associate — *Jul. 2020 - Now*

- **Deep Reinforcement Learning**: Applied DRL for automatic accelerator control tasks.
- **Bayesian Optimization**: Implemented BO algorithms for various automatic tuning tasks; Conducted experiments at multiple facilities, including the synchrotron KARA, the ARES linac, and the European XFEL.
- **NN-based Laser Modulation**: Built spatial light modulator setups for laser profile modulation; Trained U-Net based models to improve the modulation quality.
- **Surrogate Modelling**: Trained neural network surrogate models of a linear particle accelerator.

Karlsruhe Institute of Technology — *Karlsruhe, Germany*

Student Research Assistant, *HIWI* — *2018 - 2020*

- Research data management and storage
- Established metadata scheme

Publications

Journal Articles

Bayesian Optimization of the Beam Injection Process into a Storage Ring
Chenran Xu, Tobias Boltz, Akira Mochihashi, Andrea Santamaria Garcia, Marcel Schuh, Anke-Susanne Müller
Phys. Rev. Accel. Beams 26 (3 Mar. 2023) p. 034601. American Physical Society, 2023. doi: 10.1103/PhysRevAccelBeams.26.034601

Conference Proceedings

Surrogate Modelling of the FLUTE Low-Energy Section
C. Xu, E. Bründermann, A.-S. Müller, A. Santamaria Garcia, J. Schäfer
Proc. IPAC'22, 2022. doi: 10.18429/JACoW-IPAC2022-TUPOPT070

Optimization Studies of Simulated THz Radiation at FLUTE
C. Xu, E. Bründermann, A.-S. Müller, A. Santamaria Garcia, M. Schwarz, J. Schäfer
Proc. IPAC'22, 2022. doi: 10.18429/JACoW-IPAC2022-WEPOMS023

Transverse and Longitudinal Modulation of Photoinjection Pulses at FLUTE
M. Nabinger, A.-S. Müller, M.J. Nasse, C. Sax, J. Schäfer, C. Widmann, **C. Xu**
Proc. IPAC'22, 2022. doi: 10.18429/JACoW-IPAC2022-TUPOPT068

Machine Learning Based Spatial Light Modulator Control for the Photoinjector Laser at FLUTE
C. Xu, E. Bründermann, A. Eichler, A.-S. Müller, M.J. Nasse, A. Santamaria Garcia, C. Sax, C. Widmann
Proc. IPAC'21, 2021. doi: 10.18429/JACoW-IPAC2021-WEPAB289

First Steps Toward an Autonomous Accelerator, a Common Project Between DESY and KIT
A. Eichler, E. Bründermann, F. Burkart, J. Kaiser, W. Kuropka, A. Santamaria Garcia, O. Stein, **C. Xu**
Proc. IPAC'21, 2021. doi: 10.18429/JACoW-IPAC2021-TUPAB298

Selected Talks and Posters

DPG Spring Meeting of the Matter and Cosmos Section — *Dresden, Germany*

Talk: *Beam Trajectory Control with Lattice-Agnostic Reinforcement Learning* — *2023*

3rd ICFA Beam Dynamics Mini-Workshop on ML Applications for Particle Accelerators — *Chicago, US*

Poster: *Fast THz Radiation Optimization for Linear Accelerator using Surrogate Model* — *2022*

10th MT ARD ST3 Meeting — *Berlin, Germany*

Speed Talk & Poster: *Bayesian optimization of simulated THz radiation at FLUTE* — *2022*

DPG Spring Meeting Mainz22 — *Mainz, Germany*

Talk: *Optimization Studies of Simulated THz Radiation at FLUTE* — *2022*

9th MT ARD ST3 Meeting — *Hamburg, Germany*

Invited Talk: *Towards Automatic Tuning and Control of Accelerators* — *2021*

DPG Spring Meeting AKBP — *Dortmund, Germany*

Talk: *Bayesian Optimization of Injection Efficiency at KARA Using Gaussian Processes* — *2021*

Teaching

KIT: Analysis I-II, Further Mathematics I-III

Teaching Assistant & Tutor — *2016-2018*

KIT: Classical Experimental Physics I

Teaching Assistant — *2021*

TU Darmstadt: Numerical Methods of Accelerator Physics

Guest Lecture: Bayesian Optimization — *2022*

Skills

Technical Skills	Python, C++, Matlab, Latex, Git
DevOps	Docker, Apptainer
Languages	Chinese (*native*) English, German (*professional*)

Organization and Outreach

2022	**Co-Organizer,** 10th MT-ARD-ST3 Pre-Meeting Machine Learning Workshop	*Hamburg, Germany*
2023	**Co-Organizer,** 1st Collaboration Workshop on Reinforcement Learning for Autonomous Accelerators	*Karlsruhe, Germany*
2023	**Maintainer,** RL4AA Collaboration Github organization and website: rl4aa.github.io	