Contribution ID: **39** Type: **Poster/Demo**

Reinforcement Learning Based Radiation Optimization at a Linear Accelerator

Thursday, March 7, 2024 3:10 PM (1 minute)

Low energy linear accelerators can generate intense ultra-short THz pulses of coherent synchrotron radiation (CSR) by using chicanes and/or undulators to bend the path of the electron bunch. Additionally, potential users of the THz light might have particular requests for their experiments, which calls for a way to more flexibly tailor the emitted spectrum.
It's often a complex and time-consuming task to optimize the accelerator setting for maximal radiation outcome, as the input parameters are often correlated and the system response is non-linear.
In this contribution, we apply reinforcement learning techniques to optimize the linear accelerator FLUTE at KIT, with the goal to maximize its THz pulse generation. The agent is trained in a high-speed simplified simulation model. The utilization of domain randomization allows the pre-trained RL agent to generalize its policy to higher-fidelity simulations and different accelerator setups, indicating its potential for real-world tasks.

Primary Keyword

ML-based optimization

Secondary Keyword

reinforcement learning

Tertiary Keyword

Primary author: XU, Chenran (Karlsruhe Institut für Technologie (KIT))

Co-authors: SANTAMARIA GARCIA, Andrea (Karlsruhe Institute of Technology); MÜLLER, Anke-Susanne (KIT)

Presenter: XU, Chenran (Karlsruhe Institut für Technologie (KIT))

Session Classification: Poster/Demos

Track Classification: Optimization & Control