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Multi–objective Bayesian optimization of an electron injector linac for 4th generation light sources: A comparative Study with MOGA

Wednesday 13 August 2025 15:10 (20 minutes)

The performance of electron injector linear accelerators (linacs) critically influences the beam brightness and stability in 4th generation light sources. In this study, we employ a multi-objective Bayesian optimization (MOBO) framework to optimize the injector linac design, targeting the simultaneous minimization of transverse emittances and energy spread at the linac exit. This data-efficient approach leverages Gaussian process regression and acquisition functions to navigate the high-dimensional design space with significantly fewer simulations than conventional methods. We compare the results of MOBO with those obtained from the well-established Multi-Objective Genetic Algorithm (MOGA), highlighting differences in convergence speed, solution diversity, and computational efficiency. Our findings demonstrate that MOBO achieves comparable or superior optimization outcomes with reduced computational cost, offering a powerful alternative for accelerator design and tuning in next-generation light source facilities.

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No

Footnotes

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