

AI-assisted design of final cooling system for a muon collider

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The design of novel accelerator components such as ionisation cooling channel for a muon collider necessitates extensive simulation and optimization studies. We present the application of Bayesian Optimization and surrogate model - based evaluation of lattice parameters, which allowed to surpass the baseline cooling performance. Robust emittance estimation throughout the cooling channel is crucial when optimising the cooling of non-gaussian, correlated muon beams. We compare various anomaly detection algorithms applied to 6D phase space, show how these techniques can enhance the emittance estimation and discuss potential further application of other unsupervised learning methods in the design studies of future facilities.

Primary Keyword

ML-based optimization

Secondary Keyword

anomaly detection

Tertiary Keyword

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