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Applications of Machine Learning in Beam Commissioning and Operation at CSNS

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The integration of machine learning (ML) techniques into beam commissioning and operations at CSNS has shown promising potential for improving beam quality, operational efficiency. This work presents a comprehensive overview of recent ML applications across multiple stages of CSNS operations. A key foundation of these efforts is the development of an AI-ready dataset generation platform, which enables systematic extraction, transformation, and labeling of data from the control system database. Building upon this data infrastructure, intelligent beam commissioning algorithms have been developed and tested. In parallel, ML-based fault detection and early warning systems have been deployed to monitor critical subsystems in real time, enabling timely intervention and reducing unplanned downtime. Looking ahead, preliminary efforts are underway to explore the use of large language models (LLMs) to assist with beam operations, particularly in areas such as automated information retrieval, natural language interaction. Collectively, these applications highlight the transformative potential of AI in modern accelerator facilities.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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