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Longitudinal Beam Diagnostics and Phase Space Reconstruction in the LHC Using ML - Poster

Wednesday 31 January 2024 17:30 (5 minutes)

Accurate knowledge of longitudinal beam parameters is essential for optimizing the performance and operational efficiency of particle accelerators like the Large Hadron Collider (LHC). However, conventional methods to determine them, such as fitting techniques and tracking-based longitudinal tomography, are time-consuming and limited to analyzing data from a few bunches only. To address this, we propose the development of a machine learning (ML) model that leverages the existing high-resolution measurements of longitudinal bunch profiles and utilizes an encoder-decoder architecture to achieve two primary objectives. Firstly, it efficiently extracts the physical beam parameters, such as injection errors, bunch length, and bunch intensity, eliminating the need for computationally expensive fitting methods. Secondly, it reconstructs the longitudinal beam distribution. The ML model is designed to operate in real-time, enabling online monitoring of multi-bunch beams. This application demonstrates the potential of ML-techniques in enhancing beam diagnostics and allowing more precise control of large particle accelerators.

Would you like to be considered for an oral presentation?

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