Contribution ID: **174** Type: **Parallel talk**

TrackFormers Part 2: Enhanced Transformer-Based Models for High-Energy Physics Track Reconstruction

High-Energy Physics experiments are rapidly escalating in generated data volume, a trend that will intensify with the upcoming High-Luminosity LHC upgrade. This surge in data necessitates critical revisions across the data processing pipeline, with particle track reconstruction being a prime candidate for improvement. In our previous work, we introduced "TrackFormers", a collection of Transformer-based one-shot encoder-only models that effectively associate hits with expected tracks. In this study, we extend our earlier efforts by incorporating loss functions that account for inter-hit correlations, conducting detailed investigations into (various) Transformer attention mechanisms, and a study on the reconstruction of higher-level objects. Furthermore we discuss new datasets that allow the training on hit level for a range of physics processes. These developments collectively aim to boost both the accuracy, and potentially the efficiency of our tracking models, offering a robust solution to meet the demands of next-generation high-energy physics experiments.

AI keywords

transformers, inference, pattern recognition, foundation models

Primary authors: FERRER-SANCHEZ, Antonio (Valencia); SHALUGIN, Evgeniy (Radboud University); DOBREVA, Nadezhda (CERN, Radboud and Nikhef); RUIZ DE AUSTRI, Roberto; CARON, Sascha; PSHENOV, Slav (Nikhef); ODYURT, Uraz (University of Twente); Dr ZHAO, Yue (SURF, NL); WOLFFS, Zef

Presenter: Dr ZHAO, Yue (SURF, NL)

Track Classification: Inference & Uncertainty