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Improvements of the LOOT model for primary vertex finding based on the analysis of development results

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The recognition of particle trajectories (tracks) from experimental measurements plays a key role in the reconstruction of events in experimental high-energy physics. Knowledge about the primary vertex of an event can significantly improve the quality of track reconstruction. To solve the problem of primary vertex finding in the BESIII inner tracking detector we applied the LOOT program which is a deep convolutional neural network that processes all event hits at once, like a three-dimensional image. We used mean absolute error to measure the quality of the trained model, but a thorough analysis of the results showed that this metric by itself is inadequate without considering output distributions of the vertex coordinates. Correcting all errors allowed us to propose special corrections to the loss function that gave quite acceptable results. The process of our problem investigation and its outcomes are presented.

Summary

Primary authors: REZVAYA, Ekaterina; GONCHAROV, Pavel (Sukhoi State Technical University of Gomel, Gomel, Belarus); Mr NEFEDOV, Yury (JINR); OSOSKOV, Gennady (Joint Institute for Nuclear Research); ZHEMCHUGOV, Alexey (JINR)

Presenter: REZVAYA, Ekaterina

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