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Young Scientist Forum : Functional nonparametric regression for track reconstruction

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This paper describes the reconstruction of trajectories from charged particles (tracks) inside a generic tracker considering tracks as functional data and including particle properties. First the clusters are broadly grouped in regions of phase space to break down the pattern recognition problem into groups of tracks which point into similar directions. Curves are then interpolated from discrete cluster measurements, and each curve is expressed as a function of the particle trajectory within the detector, its cluster shape and charge. Functional data analysis modeling, in particular Functional Principal Components Analysis, is then applied with a functional predictor (representing the particle features) and functional responses (the tracks). Finally, two types of regressions are performed on the functional responses, using linear models and more complex Support Vector Regression for the track reconstruction. The reconstruction is tested in high pileup environment as predicted for the HL-LHC and FCC-hh scenarios.

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Track Classification: 2 : Machine learning approaches