Machine Learning Applications for Track Fitting on the STAR Forward Tracking System

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The Forward Tracking System (FTS) at the STAR detector is used to measure charged particles from polarized proton-proton collisions at forward rapidities. The FTS consists of two separate detectors, the Forward Silicon Tracker (FST) with three planes and the Small-strip Thin Gap Chamber (sTGC) with four planes. One of the challenges with analyzing the data recorded from these detectors is determining which tracks are real from all possible tracks. Previously, track finding was accomplished by narrowing down pairs of hits by “cutting" the data according to certain criteria. However, a more efficient track finder is possible with recent advancements in accessibility and efficiency of machine learning techniques. Using a Multilayer Perceptron (MLP) classifier, pairs of hits in simulations of both the FST and sTGC are trained and tested to classify them as real or fake hit pairs. This research aims to create a machine learning model to efficiently identify real pairs without calculating any criteria within the FST and sTGC. This will include optimizing different parameters for the classifier to train over, as well as different hyperparameters used to tune the classifier itself.