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Machine Learning for Background Hit Rejection in the Mu2e Straw Tracker

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The Mu2e experiment at Fermilab will search for charged lepton flavor violation (CLFV) via muon to electron conversion, with a goal of improving the previous upper limit by four orders of magnitude and reaching unprecedented single-event sensitivities. The signal of CLFV conversion is a ~105 MeV electron, which is detected using a high-precision straw tracker. Protons produced by muon capture in the stopping target can create highly ionizing straw hits, and these hits constitute a background that can impact reconstruction efficiency. In this talk, I will discuss improving the rejection of this background by replacing a simple cut on the energy deposited in the straw with a TMVA-based machine learning algorithm. In particular, it is found that a neural network using the ADC waveform shape and Time-Over-Threshold significantly improves both the signal electron acceptance and proton rejection efficiency.

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