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Exploring nucleon spin structure through neutrino neutral-current interactions

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The net contribution of the strange quark spins to the proton spin, Δs , can be determined from neutral current elastic neutrino-proton interactions at low momentum transfer combined with data from electron-proton scattering. This is because the probability of neutrino-proton interactions depends on the axial form factor, which represents the spin structure of the proton and can be separated into its quark flavor contributions. Low momentum transfer neutrino neutral current interactions can be measured in MicroBooNE, a high-resolution liquid argon time projection chamber (LArTPC) in its first year of running in the Booster Neutrino Beamline at Fermilab. The signal for these interactions in MicroBooNE is a single short proton track. We present our work on the automated reconstruction and classification of proton tracks in LArTPCs, an important step in the determination of neutrino-nucleon cross sections and the measurement of Δs .

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