

Joshua Isaacson – HEP seminar – October 4, 2022
Fermilab

The title is: Achilles: A modern theorist-driven lepton-nucleus event generator

The abstract is:

Currently, event generators for neutrino experiments are the dominant systematic uncertainty for these experiments. Next generation experiments (DUNE, SBND, and HyperK) will be systematics limited for the first time in neutrino physics. To ensure the success of these programs, advancements in lepton-nucleus event generators are required. Achilles is a new theorist-driven lepton-nucleus event generator developed with an emphasis on modularity. We have taken inspiration from the LHC event generator community to develop methods for handling BSM physics and intranuclear cascades (final state interactions). This approach for BSM allows for a quick implementation of almost completely arbitrary new physics models into the code for study at neutrino experiments. Additionally, Achilles is the first neutrino event generator to correctly handle all spin-correlations during the decay of final state particles. Achilles relies on state of the art nuclear many-body approaches to model the interaction vertex and the intranuclear cascade, both benchmarked against the e4nu data in the quasielastic region. While currently only quasielastic and coherent scattering are implemented, the nuclear model used within Achilles has been validated for the meson-exchange current and resonance production. Finally, the future outlook for the Achilles generator will be discussed.