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Improving Track Reconstruction with Standard Arrows in IceCube

Tuesday, September 30, 2025 6:00 PM (20 minutes)

Reconstructing the incoming direction of muons is a fundamental task in neutrino astronomy. In water- and ice-Cherenkov telescopes, accurate muon reconstruction is important to the entire span of an analysis, from background rejection to accurately determining the position of neutrino point sources. It is therefore crucial to both optimize and understand the performance of muon track reconstruction in neutrino telescopes.

In this talk, we introduce the idea of “standard arrows,” muons with an enhanced pointing precision enabled by their interaction with a small plastic scintillator detector deployed inside of an optical module. Because of their exquisite pointing resolution, we expect standard arrow datasets can have wide applicability in neutrino telescopes, including verifying muon reconstruction algorithms and serving as training sets for machine learning models. Lastly, we will detail R&D efforts on such a scintillator detector to be deployed as part of the IceCube Upgrade, along with its expected performance.

Neutrino Properties

N/A

Neutrino Telescopes & Multi-messenger

N/A

Neutrino Theory & Cosmology

N/A

Data Science and Detector R&D

Development of plastic scintillator detector deployed in optical module

Author: THOMPSON, Will (Harvard University)

Presenter: THOMPSON, Will (Harvard University)

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