UNIVERSITY OF DELAWARE
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Contribution ID: **1**   Type: **Talk**

Energy Reconstruction with Convolutional Neural Networks in IceTop

Tuesday, 1 February 2022 17:00 (30 minutes)

IceTop, the surface component of the IceCube Neutrino Observatory, consists of 81 stations that detect air showers produced by cosmic ray interactions with the atmosphere. An accurate energy estimator for IceTop is essential for studying the nature of the cosmic ray spectrum around the knee (300 TeV - 1 EeV). Using over 400,000 simulated events, we trained an array of convolutional deep neural networks (CNNs) to reconstruct the energy of a cosmic ray primary based on the charges detected at the surface. Preliminary results show that charge-only CNN models can deliver an energy resolution better than 10%, with significant improvements when including reconstructed zenith. This result is consistent with independent energy reconstructions used by IceCube, and indicates the promise of a deep-learning approach.

Type of Contribution

talk

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Session Classification: Tuesday