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Type: **Talk**

Composition of 100 TeV - 100 PeV Cosmic Rays with IceCube and IceTop using Boosted Decision Trees

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IceTop is the surface component of the IceCube South Pole Neutrino Observatory and dedicated to the indirect detection of cosmic rays (CRs). The recent implementation of a new trigger that only requires 2 of IceTop's 6 central infill stations hit by a CR-induced air shower allowed to reduce the primary energy threshold for the detection of low-energy CRs from 1.6 PeV to 250 TeV. This led to a narrowing of the gap between direct and indirect CR measurements and coverage of the entire knee region of the spectrum.

Apart from the reconstruction of primary energy, shower core position and zenith angle, this work aims to create a supervised machine-learning model that is capable of correctly predicting the mass composition of CR primaries. This requires the combination of signals from the surface and the corresponding tracks of high-energy muons within the deep in-ice detector below. For this purpose, tree-based methods, namely random forests and boosted decision trees, have been trained for regression and classification tasks on Monte Carlo shower data of four primary types. Additionally, plans for a potential implementation with neural networks are presented.

Type of Contribution

talk

Primary author: SAFFER, Julian (Karlsruhe Institute of Technology)

Co-author: ICECUBE COLLABORATION

Presenter: SAFFER, Julian (Karlsruhe Institute of Technology)

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