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Towards the Composition of sub-PeV Cosmic Rays at IceCube

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With the implementation of a low-energy trigger, the surface array of the IceCube Neutrino Observatory is able to record cosmic-ray induced air showers with a primary energy of just a few hundred TeV. This extension of the energy range closes the gap between direct and indirect observations of primary cosmic rays and provides the potential to test the validity of hadronic interaction models in the sub-PeV regime. Composition analyses at IceCube highly benefit from its multi-detector design. Combining the measurement of the electromagnetic shower component and low-energy muons at the surface with the response of the in-ice array to the associated high-energy muons improves the reconstruction accuracy and opens new possibilities to extract the primary particle's mass.
In this talk, a new methodical approach for the analysis is presented, including techniques for the identification of coincident background in the in-ice detector and a machine learning model based on convolutional neural networks to determine the elemental composition. The achieved performance in reconstructing the primary mass and energy of air shower events is discussed.

Submitted on behalf of a Collaboration?

Yes

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