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Type: **Talk**

## Improving the gamma-hadron separation for air showers at the IceCube Neutrino Observatory

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The IceCube Neutrino Observatory is a unique experiment located at the geographic South Pole. It is composed of two detectors: an optical array deep in the ice and an array of ice-Cerenkov tanks at the surface called IceTop. The combination of the two detectors can be exploited for the study of cosmic rays and the search for PeV photons. In particular, the in-ice detector measures the high-energy muonic component of air showers, and the surface detector all shower component and can be used for the general shower reconstruction. The aim of this work in progress is to discriminate between photon initiated and cosmic ray initiated air showers. This discrimination is performed using a machine learning technique named Random Forest. This is a supervised machine learning technique that predicts unknown data after studying labeled data. The physics quantities used for this study are the charges measured by the in-ice detector, the zenith angle, a parameter that describes the in ice containment of the shower, the reconstructed energy and a likelihood estimator that captures both the presence of individual muons and charge fluctuations in the surface array.

Furthermore, the planned enhancement of IceTop, comprised of surface radio antennas and scintillator panels, will contribute to the improvement of the gamma-hadron separation.

### Type of Contribution

talk

**Primary author:** BONTEMPO, Federico (Karlsruhe Institute of Technology)

**Co-author:** ICECUBE COLLABORATION

**Presenter:** BONTEMPO, Federico (Karlsruhe Institute of Technology)

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