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The performance of the MAGIC telescopes using deep convolutional neural networks with CTLearn

The Major Atmospheric Gamma Imaging Cherenkov (MAGIC) telescope system is located on the Canary Island of La Palma and inspects the very high-energy (VHE, few tens of GeV and above) gamma-ray sky. MAGIC consists of two imaging atmospheric Cherenkov telescopes (IACTs), which capture images of the air showers originating from the absorption of gamma rays and cosmic rays by the atmosphere, through the detection of Cherenkov photons emitted in the shower. The sensitivity of IACTs to gamma-ray sources is mainly determined by the ability to reconstruct the properties (type, energy, and arrival direction) of the primary particle generating the air shower. The state-of-the-art IACT pipeline for shower reconstruction is based on the parameterization of the shower images by extracting geometric and stereoscopic features and machine learning algorithms like random forest or boosted decision trees. In this contribution, we explore deep convolutional neural networks applied directly to the pixelized images of the camera as a promising method for IACT full-event reconstruction and present the performance of the method on observational data using CTLearn, a package for IACT event reconstruction that exploits deep learning.

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