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FACT - First Energy Spectrum from a SiPM Cherenkov Telescope

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The First G-APD Cherenkov Telescope (FACT) is an Imaging Air Cherenkov Telescope located on the Canary Island of La Palma. It is the first of its kind which uses Geigermode-Avalanche Photo Diodes (G-APDs) as photosensors to detect the Cherenkov radiation emitted from secondary particles in a high-energy gamma-ray air shower.

A new analysis chain was developed using modern data mining methods and unfolding techniques to obtain the energy spectrum of an observed source. This analysis chain was applied to data of the Crab Nebula, the so called “standard candle” in Cherenkov astronomy.

The analysis chain starts with the preprocessing of the raw data. For this task, we developed the data analysis tool *fact-tools*. It performs a raw data calibration, an extraction of the registered Cherenkov photon pulses, a cleaning process, and calculates several parameters describing the measured image of the air shower. *fact-tools* is embedded in the *streams* framework which was developed in cooperation with the department of computer science at the TU Dortmund.

The image parameters calculated by *fact-tools* are used to perform a background suppression. For this separation, we used the data mining framework RapidMiner. It supports the application of a large variety of multivariate methods for classification tasks. The easy to use “drag & drop” graphical user interface allows straightforward designing of the separation process.

The resulting data set is unfolded using the software TRUEE in order to obtain the energy spectrum of the observed source.

The different steps of the analysis chain will be presented, and the Crab Nebula energy spectrum measured by FACT will be shown for the first time.

Collaboration

FACT

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