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Machine learning enhancements for Cherenkov telescopes data analysis

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The Cherenkov Telescope Array Observatory (CTAO) will provide incredible opportunities for the future of ground-based very-high-energy (VHE) gamma-ray astronomy. To optimise its scientific output, the CTAO will have a Science Alert Generation (SAG) system to reconstruct and analyse observations in real time, as part of the Array Control and Acquisition (ACADA) system. This work aims at implementing deep learning algorithms for the enhancement of standard analysis implemented in real-time, where changes in the observational conditions and performance constraints can have a higher impact on the overall sensitivity of the analysis. We developed two applications of Convolutional Neural Network (CNN) based models, trained offline on 20k simulations. One model consists in an autoencoder that learns the background level of a given observation, and subtracts its contribution from the counts map. The second model consists in a 2-dimensional regressor that extracts hotspots for the localisation of candidate sources in the field of view. Finally, we compare results from the two models with results from the standard techniques. We achieve comparable results, with the advantage of not requiring a priori knowledge on the background model for online inference.

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