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Title: Deep-learning-driven event reconstruction of simulated data from one LST of CTA

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What is this contribution about?
In this contribution we present the application of convolutional neural networks to the full event reconstruction of simulated data from one Large-Sized Telescope (LST) of CTA, a new generation Imaging Atmospheric Cherenkov Telescope (IACT) designed to study the very-high-energy gamma rays below 200 GeV.

Why is it relevant / interesting?
Event reconstruction for IACTs consists of inferring the energy and arrival direction of the gamma rays by analyzing the images of the particle showers they produce in the atmosphere. Dominating background consists of hadrons that mimic the signal. Hence, it is crucial to use a technique that is able to recognize the gamma-like images and to infer the aforementioned properties.
CNNs have the potential to improve this analysis, since they can exploit all the pixel-wise information contained in the images - differently from the currently adopted technique, which is based on parameters extracted from the images.

What have we done?
We built three independent implementations of CNN-based event reconstruction models, using different network architectures, different data pre-processing methods and different training techniques. We trained and tested the networks on sets of full simulated events.

What is the result?
A first result is that the three implemented architectures have very similar performances, proving the stability of this technology. Moreover, instrument response functions obtained with CNNs are competitive with those obtained using the standard parameter-based technique, reaching better performances especially at low energies (<200 GeV). In particular, CNNs prove to be more effective in reconstructing the arrival direction, leading up to a 40% improvement of the angular resolution.