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Dark matter searches in the very-high-energy gamma-ray band: can deep learning help?

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Ground-based gamma-ray telescopes based on the imaging atmospheric Cherenkov technique (IACTs) are one of our best tools to access the very-high-energy (few tens of GeV and above) gamma-ray sky. Consequently, these instruments have the capability to offer observations in this particular energy band that may hint at the answers of some of the most pressing questions in Cosmology, like that of the nature of the dark matter. For instance, if one assumes that dark matter particles with masses larger than a few tens of GeV produce gamma-ray signatures in their annihilation or decay, IACTs become excellent detectors of indirect signatures of such a hypothetical particles. The performance of these telescopes turned into dark matter detectors is strongly affected by our ability to reconstruct the properties of the primary particle that originates the extended atmospheric showers that are imaged by the telescopes: this particle reconstruction enables us to classify gamma-ray events from the much more frequent background of cosmic-ray events. In this contribution we will briefly review the state-of-the-art of dark matter searches with IACTs and discuss prospects for what the incoming Cherenkov Telescope Array, the next-generation gamma-ray observatory, may offer us in the near future. We will finalize arguing how deep learning can help us with the reconstruction of CTA events, thus potentially improving its sensitivity to dark matter signatures.

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