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Deep Learning based Algorithms in Astroparticle Physics

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In recent years, the astroparticle physics community has successfully adapted supervised learning algorithms for a wide range of tasks, including event reconstruction in cosmic ray observatories[1], photon identification at Cherenkov telescopes[2], and the extraction of gravitational wave signals from time traces[3]. In addition, first unsupervised learning approaches of generative models at observatories for cosmic rays showed promising results[4]. Besides simulation acceleration, here, the refinement of physics simulations was investigated by training a refiner network to make simulated time traces to look like data traces. This may have ground-breaking outcomes on machine learning algorithms and shows the potential to explore unsupervised learning for physics research.
In this presentation we summarize the latest developments in machine learning in
the context of astroparticle physics and discuss the far-reaching scope of future applications.

[1] DOI: 10.1016/j.astropartphys.2017.10.006
[2] DOI: 10.1016/j.astropartphys.2018.10.003
[3] DOI: 10.1016/j.physletb.2017.12.053
[4] DOI: 10.1007/s41781-018-0008-x

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