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Analysing arrival directions of ultra-high-energy cosmic rays using convolutional neural networks.

The problem of ultra-high energy cosmic ray sources identification is greatly complicated by the fact that even highest energy cosmic rays may be deflected by tens of degrees in the galactic magnetic fields. We show that arrival directions for the deflected cosmic rays from several nearest active galaxies form specific patterns in the sky, which can be effectively recognized by the convolutional neural networks. We use one of the recently developed convnet implementations for the images defined on sphere to train the classifier which is able to detect the event patterns from particular sources which could be present in the data. We calculate the minimal detectable from-source event fractions for several realistic source candidates and discuss the method limitations in detail.

Significance

References

https://doi.org/10.1088/1475-7516/2020/11/005
https://arxiv.org/abs/2105.06414

Speaker time zone

Compatible with Europe

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Session Classification: Posters: Orange

Track Classification: Track 2: Data Analysis - Algorithms and Tools