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A machine learning method based on the extraction of essential features for multimodal EAS data analysis.

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Two main types of ground-based experimental facilities are used to register EAS: atmospheric Cherenkov telescopes and arrays of Cherenkov detectors. The unique TAIGA scientific facility includes both types of installations. The joint analysis of the data coming from these installations should improve the quality of the reconstructed EAS parameters compared to traditional methods that analyze the data separately.

For such a combined multimodal analysis, it is proposed to use a method based on extracting essential features from experimental data using autoencoder type neural networks that do not require pre-marking the data for training. The main advantage of the proposed method over the traditional one is that data from various installations are naturally and easily aggregated at the level of essential features and further analyzed using classical deep neural networks to extract the physical parameters of the EAS.

Using the example of simulated Monte Carlo data for atmospheric Cherenkov telescopes and the Cherenkov detector array HiSCORE of the TAIGA installation, it is shown that this approach allows obtaining the parameters of the EAS in some cases significantly better than traditional analysis methods.

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