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A Study On Machine Learning In Muon Tomography

CLIVE BINU, SADMAN AHMED SHANTO, GABRIEL CHISELENCO, VICTOR BRADELY, SAMUEL CANO, MOHAMMED MOOSAJEE, CRISTOBAL MORENO, MADISON HOWARD, KATRINA WEBB, Texas Tech University, Department of Physics and Astronomy, Advanced Particle Detector Laboratory, Lubbock, Texas — Machine learning (ML) has been used in almost all aspects of our lives, but Muon Tomography has been rather slow embracing the full capabilities offered by ML. In this paper, we report on the implementation of ML concepts to depth reconstruction by two neural networks (NN) models. The first NN is the image classification model which is used to classify the tomograms to in- and out-of-focus. The training dataset has around 20 thousand tomograms and is used to obtain the best in-focus image. The second model is the object detection model coupled with k-means clustering for shape extraction. The dataset used in this training is unique and has to be annotated. By using k-means clustering, the shape of the detected objects in the tomograms is extracted to generate the 3D reconstruction. The image classification showed an accuracy of 84% and the object detection model resulted in 80% accuracy.

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