

Detecting Sources in Fermi Gamma-ray All Sky Maps Using Neural Networks

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The Fermi Large Area Telescope (LAT) has been in orbit of Earth since 2008 collecting gamma rays. One challenge in analyzing LAT data is detecting sources to know the various classes of gamma-ray sources and how many they are. Neural networks show impressive accuracy in many fields. Application of these networks to Fermi LAT data can potentially be more successful than traditional statistical methods of source detection. Here we present our first attempt to use a region-based convolutional neural network (Faster R-CNN) and then a Mask R-CNN, which has built-in instance segmentation, something that networks previously applied to data lack. We have generated three training and test datasets of simulated Fermi LAT images with different parameters such as noise and photon counts. These were used to separately train Facebook AI's Mask R-CNN model with a ResNet-50 backbone and feature pyramid network for instance segmentation of sources. We found this method to be promising and we present here our preliminary results.

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