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Near Earth Object Detection Using Artificial Intelligence

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ABSTRACT

- The NASA Near Earth Object (NEO) Observations Program funds ground-based observatories such as Catalina Sky Survey (CSS) at the University of Arizona to find and track NEOs with sufficient precision to allow accurate predictions of the objects' future trajectories. The current NEO detection process relies on human observers looking at thousands of images per night to validate moving object candidates generated by an automated detection algorithm. This study applied modern machine learning techniques to improve the NEO detection rate. A neural network model in Tensorflow was developed to classify images and an xgboost model was used to classify objects using metadata generated during observations. The models were trained on approximately 250,000 objects detected from a single telescope between March and June of 2018. The two models were then combined into a hybrid model for testing on a holdout set. Changes to the NEO detection

process based on these results are expected to significantly increase the NEO detection rate at the CSS observatory.