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Finding Transient Artifacts with Deep Learning in the Dark Energy Survey PAVANI JAIRAM, JIAYUE XU, REBECCA BELL, KEVIN LIANG, MICHAEL TROXEL, BRUNO SANCHEZ, DANIEL SCOLNIC, CHRISTOPHER WALTER, Duke University — Cosmological surveys increasingly rely on deeper astronomical imaging, including tens to hundreds of single-epoch images in coadds. These images contain many non-cosmological transient artifacts, such as cosmic rays, satellites, and asteroids, which can hinder astronomers' ability to accurately infer a representative cosmological object sample. The Dark Energy Survey (DES) Year 3 results relied on manual visual inspection by volunteers of all deep field coadd images to detect and mask residual transient artifacts. As the quantity of data of cosmological surveys increase, machine learning techniques provide an opportunity to supplement and assist these time-consuming stages of data processing. Through the utilization of deep learning architectures trained on DES deep field image data masked by volunteers, we develop methods for both patch-based classification and direct localized detection of transient artifacts. We find the artifact detection labels by volunteers to have a number of errors, so we introduce a human-in-the-loop relabeling step to correct these mislabels. The models reach high levels of precision and recall and show promising use for automated artifact detection in DES Year 6 deep coadd image stacks and other cosmological surveys.

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