

# Data Triage of Astronomical Transients: A Machine Learning Approach

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## Abstract

This talk presents real-time machine learning systems for triage of big data streams generated by photometric and image-differencing pipelines. Our first system is a transient event detection system in development for the Palomar Transient Factory (PTF), a fully-automated synoptic sky survey that has demonstrated real-time discovery of optical transient events. The system is tasked with discriminating between real astronomical objects and bogus objects, which are usually artifacts of the image differencing pipeline. We performed a machine learning forensics investigation on PTF's initial system that led to training data improvements that decreased both false positive and negative rates. The second machine learning system is a real-time classification engine of transients and variables in development for the Australian Square Kilometre Array Pathfinder (ASKAP), an upcoming wide-field radio survey with unprecedented ability to investigate the radio transient sky. The goal of our system is to classify light curves into known classes with as few observations as possible in order to trigger follow-up on costlier assets. We discuss the violation of standard machine learning assumptions incurred by this task, and propose the use of ensemble and hierarchical machine learning classifiers that make predictions most robustly.