

Searching for needles in the cosmic haystack

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There is a shortage of multiwavelength and spectroscopic followup capabilities given the number of transient and variable astrophysics events discovered through wide-field, optical surveys. From the haystack of potential science targets, astronomers must pick the valuable needles to study. Given millions of events discovered annually, how does one find a one-in-a-million anomaly? Here we present an unsupervised method to search for out-of-distribution transient events in real time, multivariate, aperiodic data. In particular, we develop a novel variational recurrent autoencoder architecture, and search the resulting learned encoding space for anomalous events. Our pipeline is able to flag anomalous events well before their brightest point (at which point astronomer's want to trigger follow up resources). Our pipeline can be applied to similar multivariate, sparse time series.

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