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Recognizing Trends and Patterns in DESI Data using Unsupervised Machine Learning[1] MADALYN JOHNSON, California State University, East Bay, J. XAVIER PROCHASKA, University of California, Santa Cruz, DARK ENERGY SPECTROSCOPIC INSTRUMENT (DESI) COLLABORATION — Astronomical sky surveys have made a great contribution to astronomy by gathering larger datasets in yet shorter amounts of time than ever before. The Dark Energy Spectroscopic Instrument (DESI) produces sky surveys of distant astronomical objects, such as galaxies, stars, and quasars, and is designed to take tens of millions of observations within its five-year lifetime. With such a large amount of data, it would be impossible for observers to examine and interpret each spectrum DESI will produce. For this reason, we are developing a portal that will use unsupervised machine learning techniques to recognize trends and patterns and allow scientists to efficiently examine these DESI data. This portal will use a dimension reduction algorithm called UMAP (Uniform Manifold Approximation and Projection) to create a two-dimensional embedding of the data that allows objects to be interactively selected and inspected. In addition, this will allow searches for objects that are anomalous and even classes of objects that have never been discovered before.

[1]Dark Energy Spectroscopic Instrument (DESI), University of California, Santa Cruz, Physics and Astronomy Dept., the Lamat Summer Research Program on High Performance Computing in Astrophysics (NSF 1852393)

Madalyn Johnson
California State University, East Bay

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