"Sub-Classification of Type Ia Supernovae in the SDSS Supernova Survey"

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Ia supernovae play an important role in research due to their frequent use as standard candles. This makes it important to understand variations in the physical processes that can affect the observations used on light curves.

In this study, 81 supernova light curves in the SDSS-II survey data are divided into observationally distinct subsets of light curves using similarity analysis, a machine learning classification algorithm. As this method uses unsupervised learning to classify time series by their pattern over time, it is ideal for identifying previously unobserved subsets in the data. The analysis finds two subsets, one presenting a reversal of the decline in brightness in the near-infrared z filter about 30 days after the maximum, resulting in a secondary peak followed by another decline, and also greater brightness in the ultraviolet u filter. The other group of light curves does not show these features.

The observed differences between the two light curve subsets in the light curves are presumed to be driven by different physical processes. One subset shows increases in two of the filters, possibly indicated a difference in their physical properties relevant to their use as standard candles.