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Bridging the Gap between Spectra and Light-Curves: Exploring Multimodal Learning for the Identification of Broad Absorption Line Quasars

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Broad-absorption line quasars (BAL QSOs) are those that present strong absorption troughs in their spectra. These are associated with powerful winds and outflows that can reach widths of ≥2000 km/s and velocities of ≥0.1c. These outflows can trigger significant active galactic nuclei (AGN) feedback processes, which play a crucial role in the evolution of their host galaxies. So far, the identification of clean BAL QSO samples has involved visual inspection of their individual spectra. However, with forthcoming big data surveys such as the Legacy Survey of Space and Time (LSST), we must develop efficient data science algorithms that are able to identify sources of interest. In this work, we explore the use of multimodal machine learning to combine spectral and time-domain data, with the aim of bridging the gap between what has been needed so far to identify BAL QSOs, i.e. spectra, and what will be available in all-sky time-domain surveys like the LSST, i.e. photometry and light-curves. I will present our initial results obtained by ensembling two separate classifiers: one using time-domain features extracted from light-curves, and the other using a lower-dimensional representation of spectra. Finally, I will comment on some future prospects for multimodal learning applications in astronomy.

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