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Core collaApse Supernovae parameTers estimatOR: a novel software for data analysis

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Title:

Core collaApse Supernovae parameTers estimatOR: a novel software for data analysis

Abstract:

The future of time-domain optical astronomy relies on the development of techniques and software capable of handling a rising amount of data and gradually complementing, or replacing if necessary, real observations. Next generation's surveys, like the Large Synoptic Survey Telescope (LSST), will open the door to the new era of optical astrophysics, creating, at the same time, a deficiency in spectroscopic data necessary to confirm the nature of each event and to fully recover the parametric space. In this framework, we developed Core collApse Supernovae parameTers estimatOR (CASTOR), a novel software for data analysis. CASTOR combines Gaussian Process and other Machine Learning techniques to build time-series templates of synthetic spectra and to estimate parameters for core collapse supernovae for which only multi-band photometry is available. Techniques to build templates are fully data driven and non-parametric through empirical and robust models, and rely on the direct comparison with a training set of 111 core collapse supernovae from the literature. Furthermore, CASTOR employs the real photometric data and the reconstructed synthetic spectra of an event to estimate parameters that belong to the supernova ejecta, to the stellar progenitor and to the event itself, in a rapid and user-friendly flow. In this contribution we will present the development of CASTOR and a direct demonstration of its usage, as presented in Simongini et al. 2024 (submitted to MNRAS). We will also discuss the possible role of CASTOR in a multimessenger and multiwavelength context.

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