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Supernova Light Curves Approximation based on Neural Network Models

Monday, 29 November 2021 18:00 (20 minutes)

Photometric data-driven classification of supernovae is one of the fundamental problems in astronomy. Recent studies have demonstrated the superior quality of solutions based on various machine learning models. These models learn to classify supernova types using their light curves as inputs. Preprocessing of these curves is a crucial step that significantly affects the final quality. In this talk, we study the application of shallow neural networks, bayesian neural networks, and normalizing flows to approximate observations for a single light curve. We use these approximations as inputs for supernovae classification models and demonstrate that the proposed methods outperform the state-of-the-art based on gaussian processes applying to the PLAsTiCC synthetic dataset. As an additional experiment, we perform intensity peak estimation. We use different approximations of light curves and fit a convolutional neural network to predict an intensity peak position. Results demonstrate that proposed algorithms help to improve the accuracy of the peak estimation compared to the gaussian processes model. We also apply the algorithms to the Bright Transient Survey ZTF light curves. Shallow neural networks demonstrate similar results as gaussian processes showing factor 5 increased speed. Normalizing Flows exceeds gaussian processes in terms of approximation quality as well.

Significance

References

Speaker time zone

Compatible with Europe

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