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Deblending and photometry of faint sources using VAEs and multi-wavelength data

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The next generation of wide-field surveys is set to deliver an impressive amount of imaging data during the upcoming years when projects such as Euclid or the Rubin Observatory enter in their regular operation phases. The expected improvements on the depth and the magnitude limit of the images that will be acquired pose new challenges related to the increase in the number of blended sources. In this context, efficient mechanisms to deblend sources and then provide photometric estimates are crucial for the case of faint sources since they tend to be ignored by traditional algorithms when they are in the vicinity of brighter sources. To deal with this situation, we have trained several variational autoencoders using simulations that consider different scenarios (faint source located next to a bright star, a bright galaxy, another faint source, etc) which has allowed us to recover multiple faint sources that are typically lost in the processing of traditional pipelines. We will discuss the results derived from the testing of these VAEs, which have been designed to deblend and measure fluxes, for the case of Euclid and Rubin, based purely on simulated data, while, for the case of HST and JWST, we will discuss the results obtained using real observations. The analysis of these results has also allowed us to draw multiple conclusions regarding transfer learning and the use of a machine trained using the data and simulations from one survey to process data from another one.

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Session Classification: Past and future multiwavelength all-sky surveys