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Exploring the Clustering and Diversity of Low Surface Brightness Galaxies in Dark Energy Survey Data

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Low surface brightness galaxies (LSBs) are estimated to account for 30% to 60% of the total number density of galaxies. In this work, we analyze a dataset of LSBs identified by Thuruthipilly et al. in the Dark Energy Survey (DES) Data Release 1. The aim is to organize these galaxies into categories more detailed than the traditional blue and red classifications.

To achieve this, we apply embedding methods such as T-SNE and UMAP to visualize the distribution of galaxies in a two-dimensional parameter space derived from morphology fitting results. This approach enables us to systematically organize the galaxies and observe the broad range of properties present in the dataset. Our analysis reveals distinct subgroups of LSBs, with notable correlations between their embedding positions and the presence of galactic nuclei.

Moreover, we identify a subgroup of LSBs that stands out from the broader population due to unique characteristics. By implementing a more detailed morphology fitting process compared to previous studies, we recover additional LSBs that were previously excluded, enriching the overall sample.

Primary author: VRÁBEL, Michal (Nuclear Centre for Nuclear Research)

Co-authors: POLLO, Agnieszka (NCBJ & UJ); Dr THURUTHIPILLY, Hareesh (National Centre for Nuclear Research, Poland); Dr JUNAIS (Instituto de Astrofísica de Canarias); MAŁEK, Katarzyna (National Centre for Nuclear Research)

Presenter: VRÁBEL, Michal (Nuclear Centre for Nuclear Research)

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