Stellar light distribution in nearby, low-mass dwarf galaxies

Level: Honours

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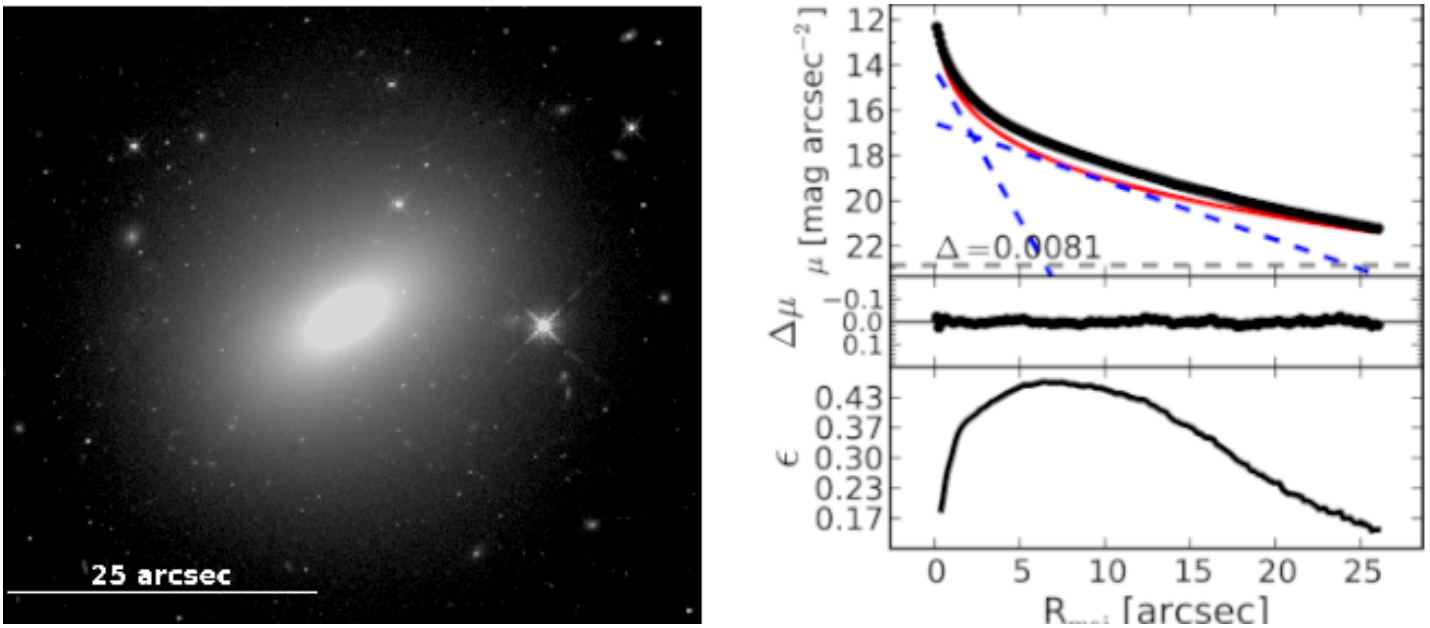
Project Description, Data and Prospects

This project aims to study the distribution of stellar light in a sample of low-mass (dwarf) galaxies in galaxy groups. The student will learn how to perform structural decomposition of the galaxy light in these galaxies with archival HST imaging data using state-of-the-art image analysis tools such as `GALFIT` or `IMFIT`. The results from this exercise will form part of a much larger project which will be published in a journal article.

Dwarf galaxies are the most abundant galaxies in the Universe, and within the framework of the ΛCDM galaxy formation paradigm, they are the building blocks of more massive galaxies. The presence/significance of various structural components, e.g., central bulge, disc, bars, spiral arms, rings, etc. in galaxies provide clues about their evolutionary history across cosmic times. Physical processes such as galaxy interactions, harassment, ram-pressure stripping, etc. are well-known to be dominant in galaxy group environments. Dwarf galaxies are more vulnerable to the effects of these processes since they typically reside in halos with shallow gravitational potential. A careful decomposition of these galaxies' stellar light will unveil hidden stellar substructures, providing clues about their formation and evolution.



HST image of a galaxy (left) and structural components obtained from the image decomposition (right) with `GALFIT`. The colour lines represent the model components: red solid = central bulge, blue dashed = exponential (nuclear and intermediate-scale disc), the black solid = surface brightness profile.

Required Skill(s): Willingness to learn and work hard. Knowledge of Python programming, basic bash scripting and statistics are desirable.

This project can easily expanded into an MSc project where the interested student will explore in more detail, the relations between the structural components and some fundamental galaxy parameters, e.g., mass of the central black hole, central velocity dispersion, etc., in low-mass galaxies.