Unlocking Galaxy Evolution with DESI – A Beginner's Guide to Spectral Analysis

Exploring Star Formation Histories of Massive Galaxies Using DESI DR1

We are living in a golden age of astronomical data. Millions of galaxy spectra are now publicly available, yet most remain only superficially explored. This project places you at the forefront of a paradigm shift: moving from a world of scarce data to one of abundance, where the limiting factor is no longer telescope time but expertise.

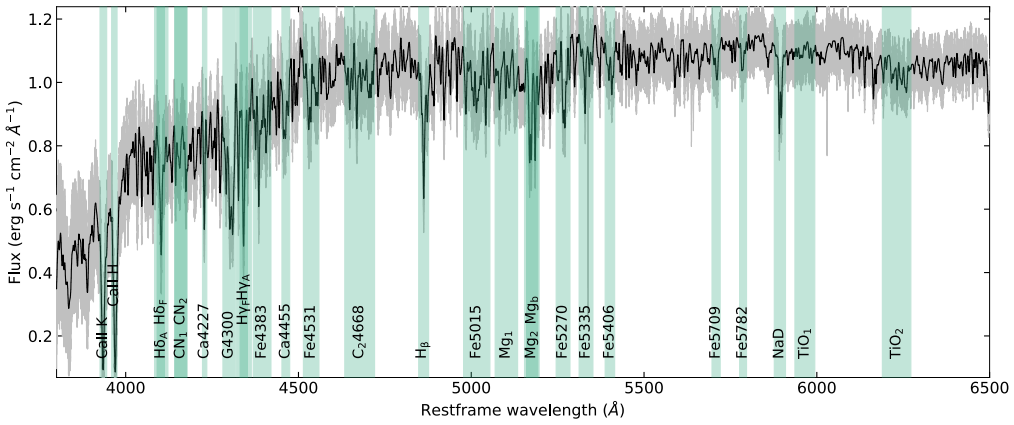
The Dark Energy Spectroscopic Instrument (DESI) has recently released its first major data set (DR1), containing high-quality optical spectra for over 360,000 of the most massive galaxies. This represents an unprecedented scientific opportunity. Your goal will be to learn how to "mine" this data treasure—to extract not just redshifts, but the **physical histories** encoded in the light: when stars formed, how the galaxy quenched its star formation, and what chemical elements enrich its stars.

This project is the perfect starting point for a student beginning in optical spectral analysis. By the end, you will have the practical skills to analyse spectra independently, positioning you to use DESI, 4MOST, and future surveys.

Project Objectives:

By the end of this project, you will:

1. Learn to query and retrieve spectra from the DESI DR1.
2. Understand the fundamental stellar population indicators (e.g., Dn4000, Hδ, Balmer lines) and what they reveal about galaxy ages and star formation histories.
3. Use existing analysis tools to measure these spectral indices from DESI spectra.
4. Assemble a clean sample of massive galaxies.
5. **Anticipated Scientific Outcome:** Produce a scientific result, e.g., constraining the fraction of massive galaxies that have experienced star formation within the last giga-year (as a function of redshift).



The project requires a basic background in coding in python, and can continue into a M.Sc project.

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