In the last two decades, astronomers have gained massive knowledge of how galaxies form and evolve. This advancement in the field of extragalactic astronomy was coupled with the rapid development of the instrumentation aspect of astronomy, which led to accumulating a large amount of observations of galaxies at different epochs of the lifetime of the Universe. With giant multiwavelength datasets, we realized that galaxies are not just entities in space and time. They are more like living organisms: They are born, they get old and then they die! Such evolution of a lifetime of galaxies is governed by the amount by which they form stars.

The vital organ of galaxies is their interstellar medium, where the building blocks of future stars are found. In the interstellar medium, dust plays a major role in the life cycle of galaxies, it shields the molecular clouds from hot radiations, promoting new stars to be formed. However, dust absorbs a big amount of the ultraviolet photons that originate in the young stars, and emits them in the infrared thermally. This effect is known as dust attenuation.

Galaxies emit across the full electromagnetic spectrum, and every wavelength range reveals to us information about underlying physical and chemical mechanisms. Ultraviolet photons give us information about the rate at which galaxies are forming stars, since newly-born stars emit predominantly in the ultraviolet range. Older stars shine their light in the visible range, and interstellar dust grains emit in the infrared. Detected fluxes across these wavelengths help us to construct spectral models of these galaxies. To model galaxies' emission, it is essential to account for dust attenuation, by using an attenuation law.
Different attenuation laws exist, but they are not universal and we still lack the knowledge of how to correctly attenuate the stars in different types of galaxies to reproduce their observed spectra. Not knowing the exact shape of the attenuation restricts us from correctly interpreting fundamental properties of galaxies, such as their age, mass and the rate at which they are forming stars.

Years worth of observations provided us with unprecedented high quality detections of millions of galaxies at different epochs of the Universe. With telescopes that observe across all the wavelength ranges, we are now able to study and analyze galaxies' spectra to better constrain the properties of interstellar dust, and therefore understand the nature of dust attenuation laws and how they vary in galaxies with different spectral properties, various morphologies and that are located in different environments. The various wavelengths through which these galaxies are detected will help us in modeling the total spectrum coming from them. This in turn will allow us to constrain the physical properties of these galaxies, and to understand what is the role of dust in their interstellar medium.

In this project, I will statistically investigate dust attenuation in galaxies at different epochs of the Universe, to better understand the role of dust attenuation in the context of galaxy evolution, and to better estimate physical properties of galaxies. This motivates the quest to understand how galaxies form, and what is the role of dust in converting interstellar gas efficiently into stars.