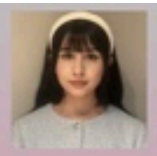
Combining LADUMA with Galaxy Zoo: The Relationship between Neutral Hydrogen and Galaxy Morphology

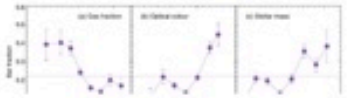
Alexia Palao

Contact Information: alexia.palao@louisville.edu



Introduction

The formation of structures in spiral galaxies remains an unanswered question. It is well known that most stars and gas in spiral galaxies are concentrated within their spiral arms. Recent data has provided new insights into the distribution and behavior of gas within these galaxies, particularly regarding the relationship between neutral hydrogen content, the presence of bars, and the number of spiral arms. The goal of my research is to determine whether this information can provide new insights into the underlying mechanisms shaping spiral galaxies.



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Methodology

Three datasets were used in my research, Galaxy Zoo, LADUMA, and the Zou catalog. The Galaxy Zoo dataset offers insights into the morphological characteristics of galaxies, providing classifications based on properties such as shape, structure, and the presence of features like bars and spiral arms. In contrast, LADUMA (Looking at the Distant Universe with the MeerKAT Array.) offers data on the amount of HI gas found within these galaxies. The Zou catalog was used for its stellar mass data to help find the trends between HI and stellar mass. When cross-matching these three data sets we found 28 cross-matches to examine how neutral hydrogen mass impacts morphology.

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Comparison

(Images from NASA)

Barred and unbarred spiral galaxies differ primarily in the presence of the central bar structure. Barred spiral galaxies feature a prominent bar composed of stars extending from the center, while unbarred spiral galaxies lack this feature.

Oaks

OAKS, short for explOration of Astronomy by Kentucky Students, is a new program aimed at making astronomy research more accessible to students from rural and minority backgrounds across Kentucky. The program is designed to help undergraduate students by providing mentoring, academic and financial support, as well as the tools they need to succeed in astrophysical research.

Personally, OAKS has provided me with an outlet to connect with other students, mentors, and opportunities to participate in research and engage with the broader astronomical community.

Funded by The National Science Foundation.

LADUMA

The LADUMA catalog uses data collected by MeerKAT, a radio telescope located in South Africa. This telescope provides unprecedented data and insights into the characteristics of neutral hydrogen (HI) gas. This offers us a deeper understanding of the morphology and properties in distant galaxies.

What's the next step?

The future of LADUMA data will allow us to see the evolution of neutral hydrogen over a larger distance than ever before. Currently, this project is comparing current LADUMA data to preexisting data in nearby galaxies. The next step for this project will be to study how HI gas affects spiral structure in galaxies further away.

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