Introduction

When will the Earth be destroyed? How do stars form? These are all fundamental questions that the study of astronomy and stellar evolution and formation can answer.

Problem Statement

There is an obstacle; there is a significant lack of research about stars with masses below around 0.8 solar masses, with inconsistencies as large as 30%.

Procedure

In this research, stellar parameters of low-mass eclipsing binaries were extracted using the space Kepler data and ground-based MARVELS radial velocity data from the Sloan Digital Sky Survey III program. Eight eclipsing binaries (radial velocities already extracted) were selected and their transits were fitted using Python code to derive the primary and secondary radii along with their periods.

Results

Through my findings, stellar masses and orbital parameters such as the period eccentricity were extracted through the MCMC solver and cross-correlation fitting to MARVELS RV data. For targets unable to fit as a double-line spectroscopic binary, their single-line spectroscopic binary radial velocities were still extracted and plotted. My measurements are the first report of data to further investigate the fundamental stellar mass-radius relation at low stellar masses (< 0.8 solar masses) and their dependence on other physical parameters such as age, mass, stellar magnetic activity, and orbital period.

Conclusions

The mass-radius relation of stars is the fundamental law of the universe to understand the universe's building block: stars. The method developed in this research will have significant implementations in stellar evolution and formation, enhancing our ability to answer important questions about our universe.