**Título/Title:**
Development of a new method for the determination of the ages of stars (part II: lifting the mass-helium degeneracy)

**Orientador/Supervisor:**
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**Descrição/Description:**
The determination of the stellar ages is of fundamental importance in a diversity of areas of astrophysics, including the formation and evolution of exoplanetary systems, the history of our Galaxy, and the theory of stellar evolution. With the development and launch of space missions from NASA and ESA dedicated to the detection of exoplanets and the study of their host stars, the determination of stellar ages became even more important.

One of the common difficulties in determining stellar ages arises from the mass-helium degeneracy. The helium abundance in stars like our sun cannot be determined directly from observations. Because the helium abundance influences the rate at which the star produces energy, the uncertainty in the helium abundance leads to an uncertainty in stellar mass (stars with lower mass and higher helium can produce the same energy as stars with higher mass and lower helium). Finally, since the rate at which stars evolve depends most strongly on their mass, the uncertainty in mass leads to a large uncertainty in age.

In this project the student will address specifically the age uncertainties that are associated to the mass-helium degeneracy and test a way to overcome this problem. In particular, the student will:

1) Starting from a sample of stellar models, compute diagnostics based on the frequency of oscillations that relate directly with the helium abundance.

2) Analyse, in a systematic manner, the dependence on stellar age of the helium diagnostics computed by the student combined with diagnostics that are elated to the stellar core (that will be provided to the student for the same models).

3) Time allowing, apply the method to real data of stars.