

Title: **Identifying Heartbeat Stars in the Tess Data**
Deadline: **February 8th, 2022**
Sponsor: **Kelly Hambleton**
Solicitation Funding: **Not Secured**

Solicitation Summary

Kelly Hambleton is seeking to employ a Villanova University undergraduate student to identify and analyze heartbeat stars in the TESS data set. Heartbeat stars are eccentric ellipsoidal variable stars that have light curves that look like cardiograms, hence the name. The selected student will explore the TESS data to identify all unknown heartbeat stars using grouping and visualization techniques such as t-distributed stochastic neighbor embedding, a dimensionality reduction technique. With the catalogue of new and previously identified heartbeat stars, the student will perform analysis including amplitude and period determination. Approximately 20% of known heartbeat stars pulsate with tidally induced pulsations, pulsations that occur a precise number of times per orbit. The selected student will identify these objects and analyze their pulsation frequencies, amplitudes and phases to look for correlations between the pulsations and orbital parameters.

Solicitation Requirements

The research position is open to all Villanova undergraduates that are majoring in astronomy or a closely related field. Applicants need to provide:

- A current CV that highlights commitment to excellence in the applicant's current field of study;
- A 3-page proposal that discusses the scientific background and proposed work timeline;
- A 1-page narrative on expected outcomes and procedures;
- A 1-page personal statement that conveys the suitability and interest of the applicant.

To apply for this position, interested students need to submit their applications by the deadline in the form of a single pdf document. Only electronic submissions are accepted; email your applications to kelly.hambleton@villanova.edu. Any applications received after the deadline will be returned without review.

Solicitation Documents

In order to prepare a strong proposal, the following documents might be useful:

- Thompson et al., 2012, A Class of Eccentric Binaries with Dynamic Tidal Distortions Discovered with Kepler, ApJ, 753, 86.
- Matijevec et al., 2012, Kepler Eclipsing Binary Stars. III. Classification of Kepler Eclipsing Binary Light Curves with Locally Linear Embedding, AJ, 143, 123
- Prsa et al., 2021, TESS Eclipsing Binary Stars. I. Short-cadence Observations of 4584 Eclipsing Binaries in Sectors 1-26, ApJS, 258, 16.

Solicitation Outcome Announcement

The review of solicitation material will begin on Feb 9th, 2020 and a short-list will be assembled by Feb 14, 2020. The highest-ranking candidate will be informed and offered a position. In the event that the highest-ranking candidate accepts the position, the solicitation will be closed. Otherwise, the position will be offered to the next highest ranking applicant until the position is filled.