

UNCOVERING THE HIDDEN POPULATION OF SYMBIOTIC STARS

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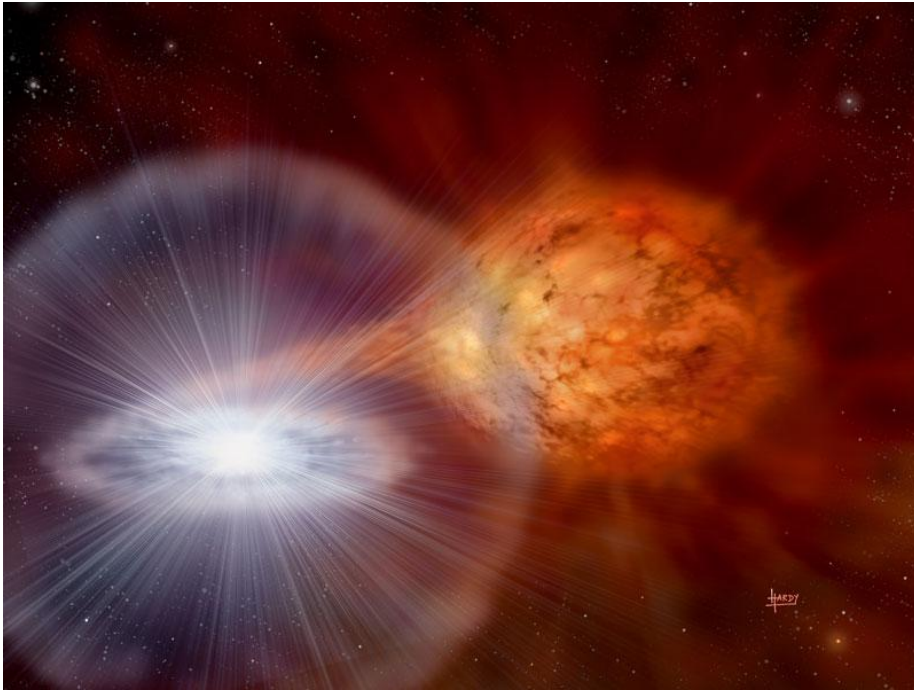
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SYMBIOTIC STARS



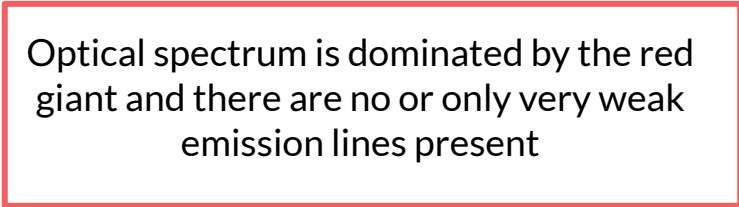
- ★ Interacting binaries
- ★ Red giant + white dwarf

Why are they important?

- Promising Type Ia supernova progenitor
- Enrichment of the interstellar medium with lithium

SYMBIOTIC STARS

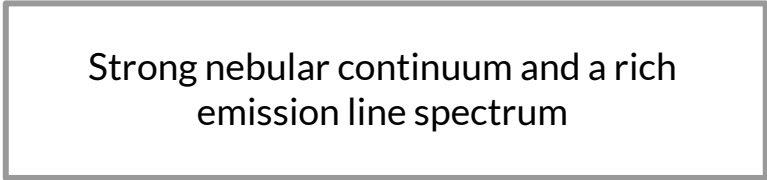
- Two phases of symbiotic stars: *accreting-only* and *burning-type*



Optical spectrum is dominated by the red giant and there are no or only very weak emission lines present

How can we distinguish them from single giants?

- Observed excess light in the UV and X-rays
- Faint emission lines like H α and H β
- Flickering
- The IR excess



Strong nebular continuum and a rich emission line spectrum

GOALS AND METHODS

- To characterize the entire population and quantify the number of burning versus accreting-only systems
- Separating symbiotic stars which contain AGB or RGB giant as a primary star.

RANDOM FOREST

- Supervised machine learning technique
- Builds decision trees on different samples and takes their majority vote for classification

ADVANTAGES

- Highly accurate, robust, does not suffer the overfitting problem
- Can be used in classification problems
- Provides feature importance

DATA AND SAMPLES

Two groups: **AGB/RGB** and **AGB/RGB/SYST**

Color indices
(WISE, 2MASS)

- W1-W4
- Ks-W3
- H-W2
- W1-W2
- W3-W4
- J-W1
- J-H
- H-Ks

Color indices + lightcurves

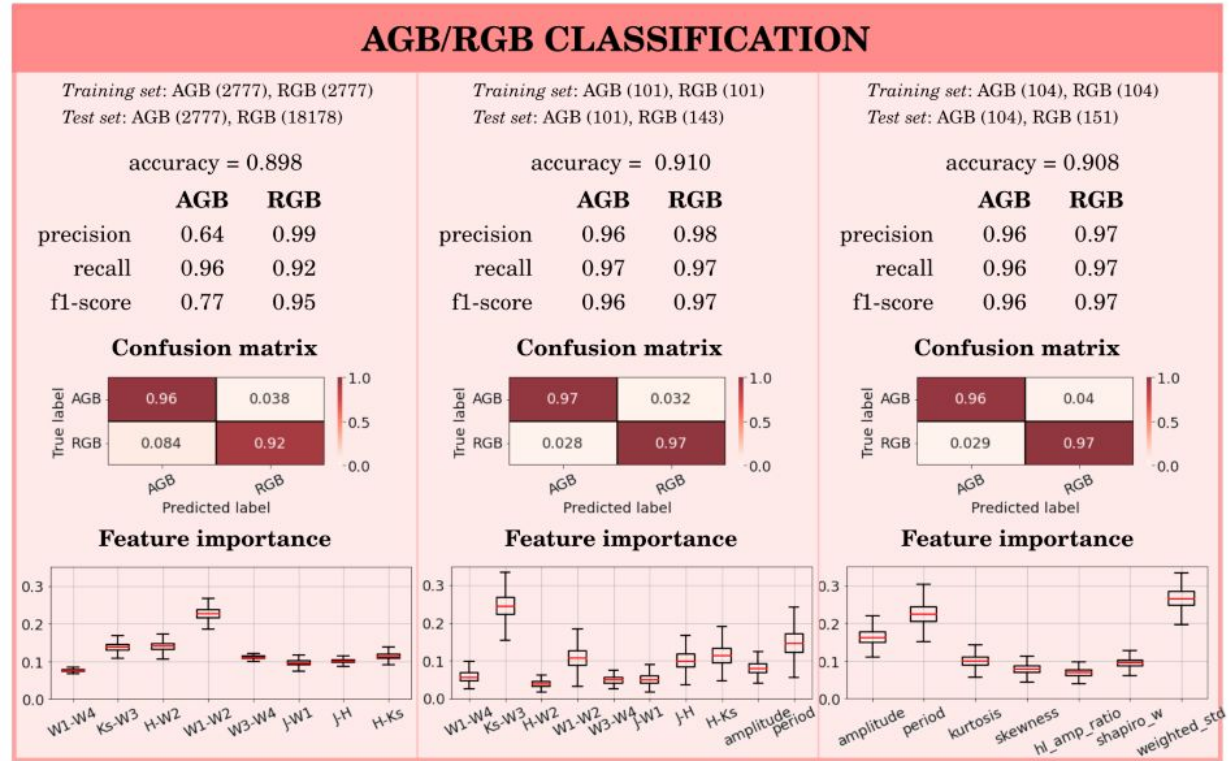
- W1-W4
- Ks-W3
- H-W2
- W1-W2
- W3-W4
- J-W1
- J-H
- H-Ks
- Period
- Amplitude

Lightcurves
(ASAS-SN)

- Amplitude
- Period
- Kurtosis
- Skewness
- HI_ampl_ratio
- Shapiro_w
- Weighted_std

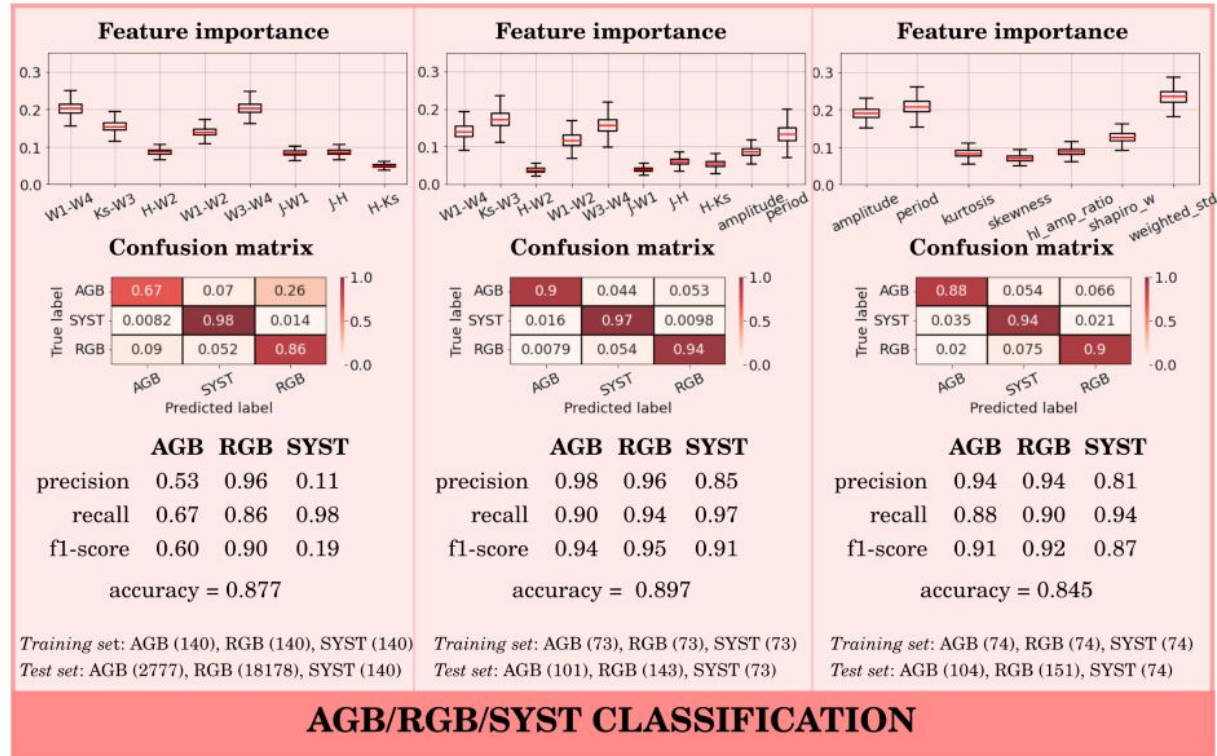
FIRST RESULTS: AGB/RGB

- Best results when using color indices, amplitude and period
- Accuracy around 0.91
- Most important features:
 - Ks-W3
 - Period
 - H-Ks
 - W1-W2
 - J-H



FIRST RESULTS: AGB/RGB/SYST

- Best results when using color indices, amplitude and period
- Accuracy around 0.897
- Most important features:
 - Ks-W3
 - W3-W4
 - W1-W4
 - Period
 - W1-W2



FUTURE

We are exploring ways of connecting photometric detection of AGB stars with their spectra. If we are successful we will be able to search for AGB and RGB distinction based on their spectra from large surveys such as GALAH, Gaia-ESO and in the future 4MOST.



GALAH
GALactic Archaeology
with HERMES

