

Variable Stars in SuperWASP

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What am I doing?

Variable stars and citizen science

Looking for interesting things in the SuperWASP photometry archive



What is SuperWASP?

The Wide Angle Search for Planets – a ground-based exoplanet search Two telescopes (North and South)

SuperWASP

The most successful groundbased exoplanet search



Two telescopes: North in La Palma, South in South Africa

Operated from 2004 - 2016

Photometric lightcurves of ~31 million stars

The data can be used for other things. We're looking for variable stars.

What are variable stars?

Stars whose magnitude changes



Variable Stars

Intrinsic (e.g. pulsators)



Extrinsic (e.g. eclipsing binaries)



Source: NASA (public domain)

Variable Stars

Intrinsic (e.g. pulsators)



Extrinsic (e.g. eclipsing binaries)







A platform for building and running crowdsourcing projects



The Zooniverse

Crowdsourcing classification and labelling of data

zooniverse.org

Web-based projects where volunteers perform classification of data "subjects" (images, videos, graphs, etc.)

Each subject is shown to multiple people and the results are aggregated

Anyone can classify and anyone can build projects

P Variable Stars 🥏

ABOUT CLASSIFY TALK COLLECT RECE

lion classifications: 4.5% pulsating stars, 5.3% detached eclipsing binary stars, 6.4% contact eclipsing binary stars, 9.9% role unknown & 66.6% junk.

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TASK	TUTORI
What type of lightcurve is	this?
Pulsator	
EA/EB type	
EW type	
Rotator	
Unknown	
Junk	N
NEED SOME HELP	WITH THIS TAS
Next -	→

The SuperWASP Variable Stars Zooniverse project

Human volunteers classifying variable stars in SuperWASP data

zooniverse.org/projects/ajnorton/superwasp-variable-stars

How the project works

~1.6 million lightcurves ~700,000 sources

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Volunteers see a light curve, which has been folded on a candidate period

They choose one of: Pulsator, EA/EB, EW, Rotator, Unknown, or Junk

They indicate whether they think the folding period is correct

We combine answers from multiple volunteers to derive a final classification

Results so far

From the first million human classifications



4.5% pulsating stars
5.3% detached eclipsing binary stars
6.4% contact eclipsing binary stars
9.9% rotating stars
7.3% unknown
66.6% junk

568,739 lightcurves classified as of Sept 2020

See Thiemann et al. (2021) for details



VeSPA: The SuperWASP Variable Star Photometry Archive

A place to publish our results and let people download the catalogue

- A way of engaging the volunteers
- A tool for ourselves to use

Browsing the catalogue

Results at a glance



Filtering results

Finding the types of star you're interested in

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Exporting results

Downloading a copy of your search

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Viewing source details

See the classifications for a given source

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Coming soon

VeSPA will be online this summer

To be updated every six months with new data

Will allow browsing, filtering, and downloading Zooniverse classification results

What else am I working on?

Speeding up citizen science results

Looking for known variables with unexpected periods

Ideas for long-period variables

Speeding up citizen science results



Quickly filtering out junk

Clustering lightcurves to reduce required human classifications

Looking for unexpected periods

Known variables which aren't as expected

Period can change over time (e.g. mass loss)

Cross-reference SuperWASP with known variables

Anything "missing" might be interesting

Ideas for long-period pulsators

Mass loss of Miras in eclipsing binaries

Mode switching between Mira and semi-regular

Period-luminosity relation of new Miras

Summary

I've been building VeSPA, the SuperWASP Variable Star Photometry Archive

It'll be online this summer

After that I'll be investigating periodicity changes and long-period pulsators



