StarZam

Machine Learning Prediction of Stellar Properties from Light Curves

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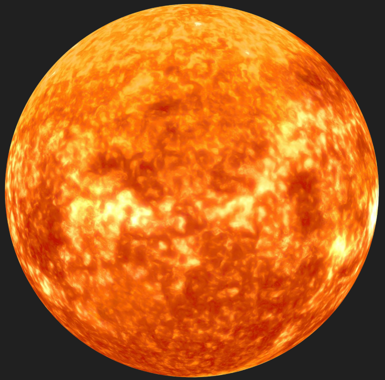
Research Question



Stellar Properties

Image: https://bit.ly/3Gjh77Z

- Surface Gravity (Log G)
- Surface Temperature (Teff)
- Metallicity

Current Methods in Measuring Stellar Properties

Method	Log G	Teff	Metallicity
Spectroscopy	Limited by Data Quality		
StarZam (light curve)	Data Efficient, Robust to Noise		

205,512
Total Stars

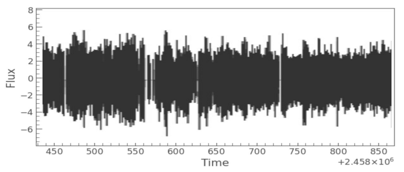
191,449
Labeled by Spectroscopy

14,063
Spectroscopy Unavailable

Can we extract stellar properties directly from light curves?

Methodology

Kepler Light Curve



StarZam ML Algorithm

- Fourier Transformation
- Deep Neural Network

StarZam

Star Properties

KIC Red Giants Dataset

Type	Samples (#)
Training	171,599
Testing	42,900
Total	214,499

Music Waveform

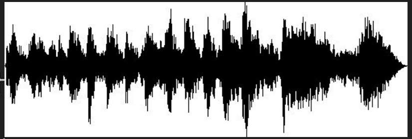


Image: https://bit.ly/3nz9hka

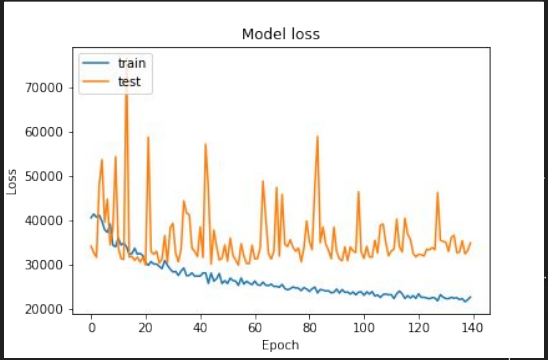
Shazam ML Algorithm

(Wang, 2003)

SHAZAM

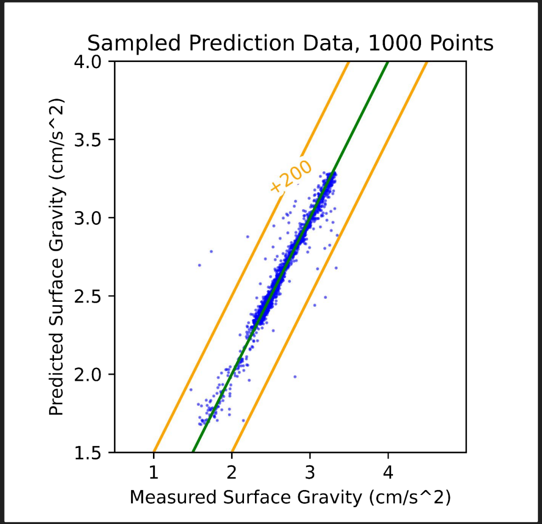
Image: https://bit.ly/3FxMz1X

Song Title

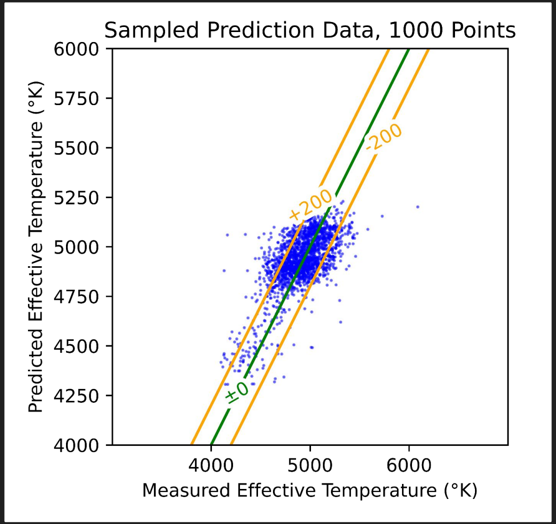


Results

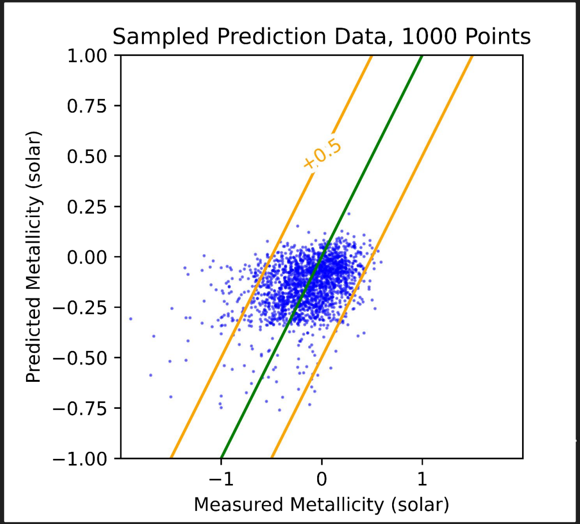
Surface Gravity



Effective Temperature



Metallicity



Model Accuracy

Log G	Teff	Metallicity
99.7%	76.9%	92.7%

Implications & Future Work

01 Novel Method

Extract stellar properties directly from light curves

02 Efficient and Robust

Reduces observation time by 10x, high noise acceptance

03 Future Photometry Missions

Validation for Kepler & future photometry missions (TESS)

Future Work

- Improving model accuracy
- Fine tuning hyperparameters

References

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Thank You. Questions?