

Leveraging machine learning to discover variable stars in space surveys

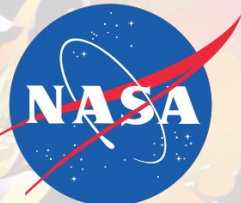
Debating the potential of Machine Learning in Astronomical Surveys
Center for Computation Astrophysics, Flatiron Institute, New York

Dec 1, 2023

Jeroen Audenaert¹

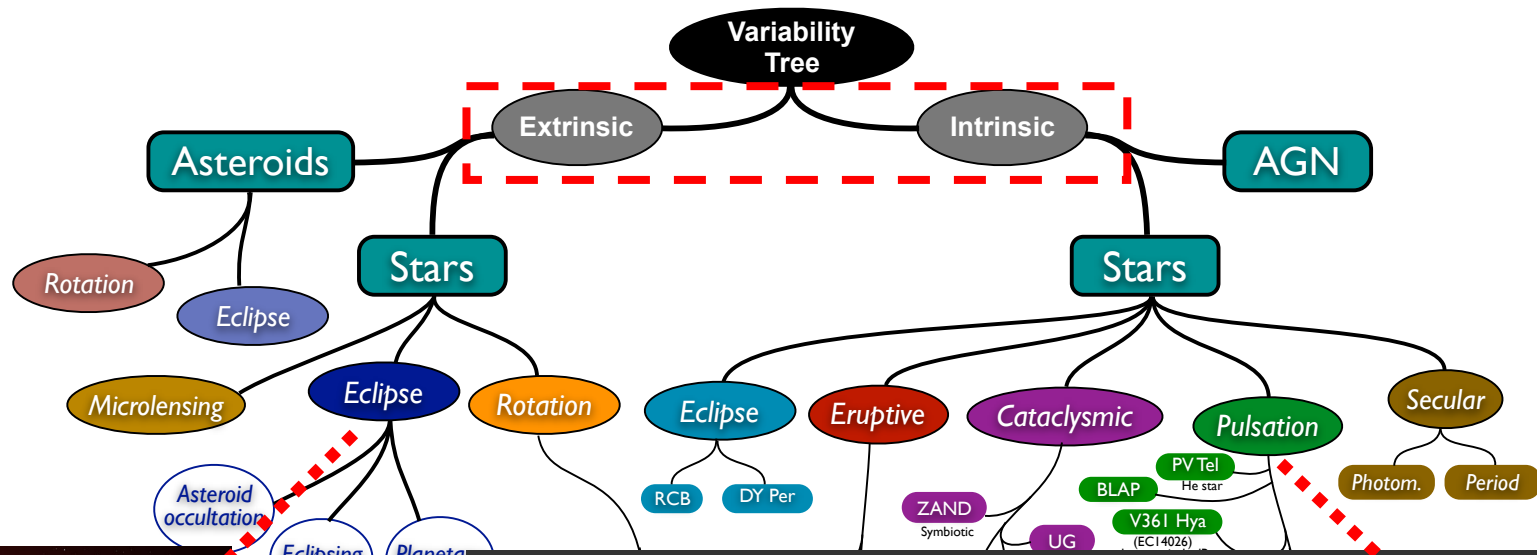
¹ Kavli Institute for Astrophysics & Space Research, MIT, USA

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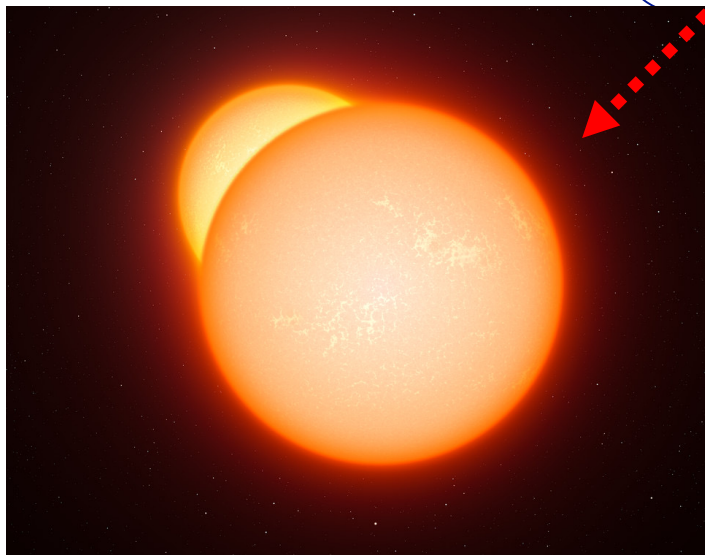
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Stellar variability



Credit: ESO

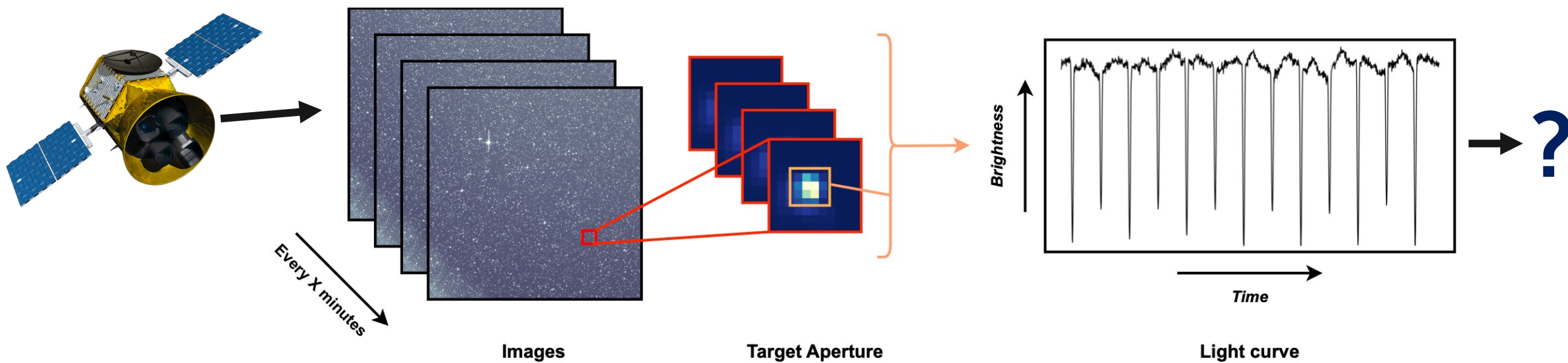
Credit: Joey Mombarg

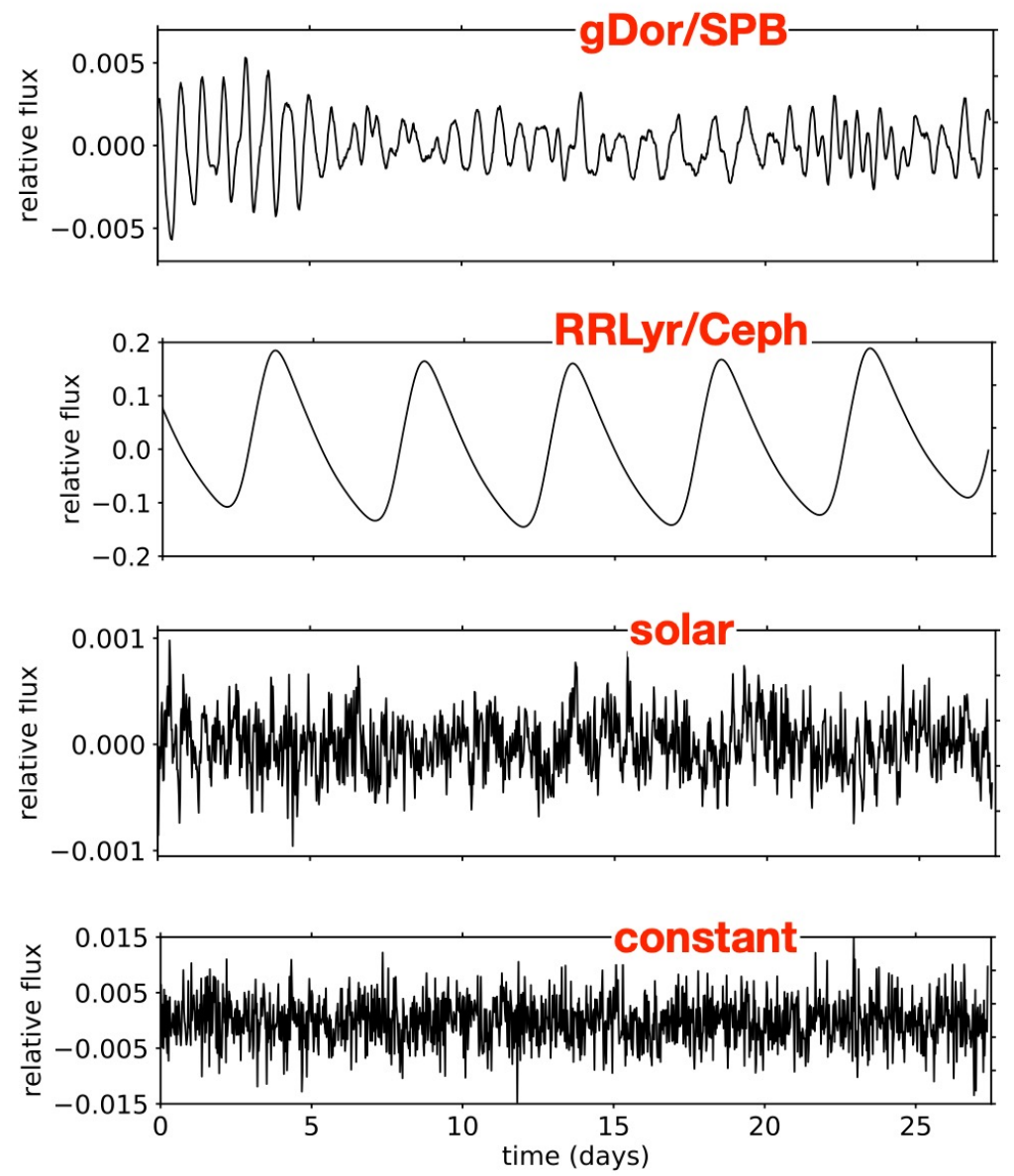
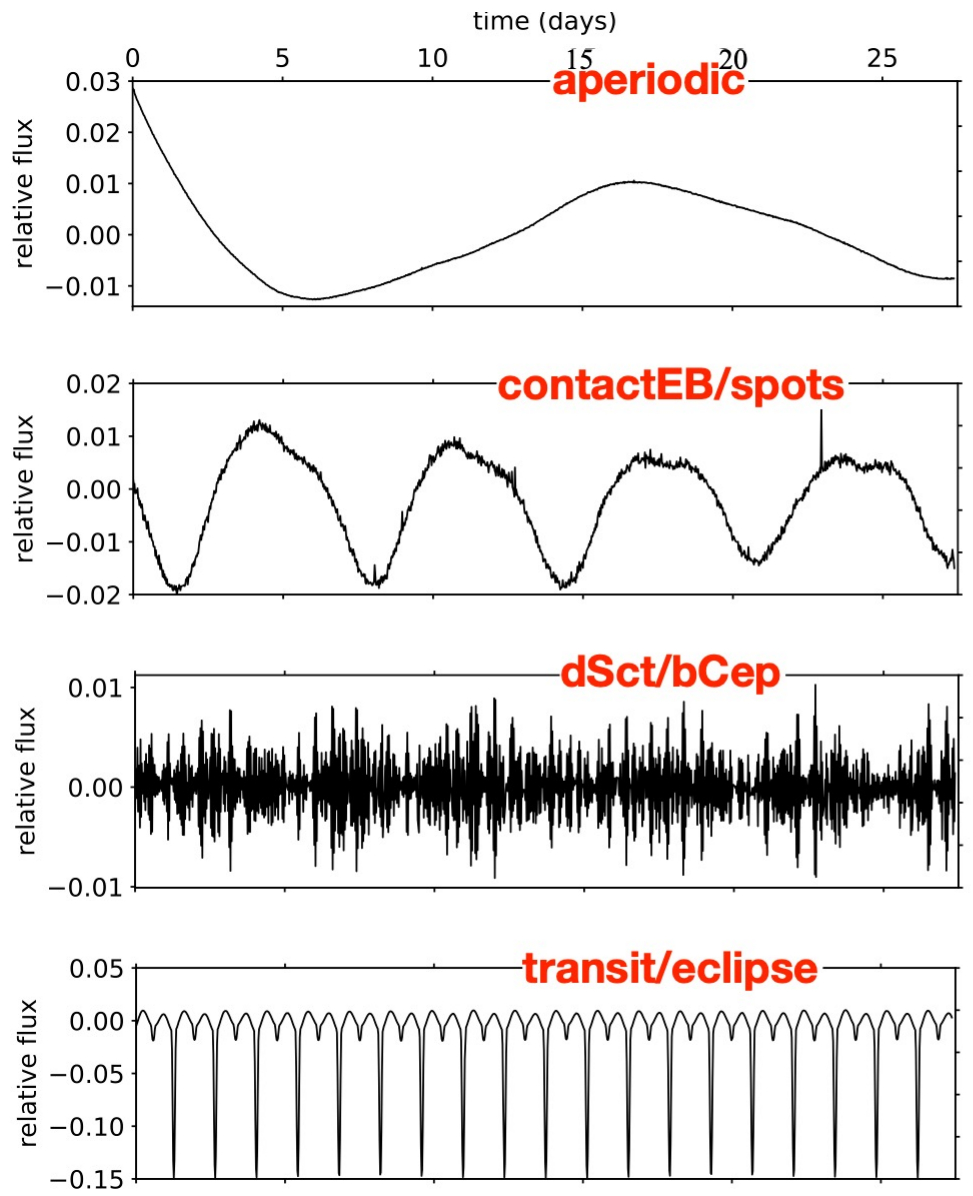


al. (2018)
Eyer & Mowlavi (2008)

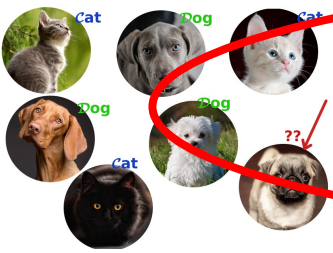
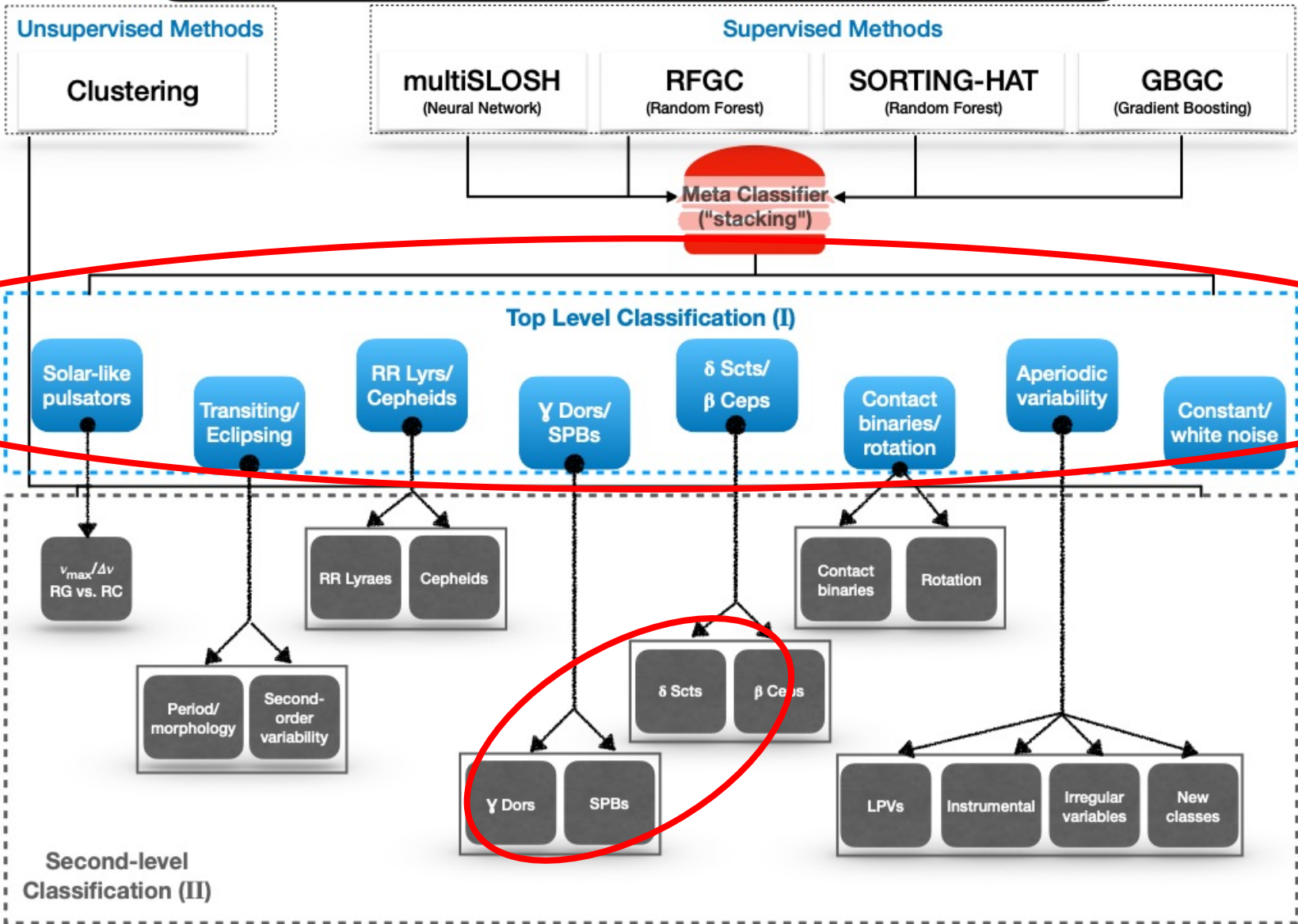


From images to light curves



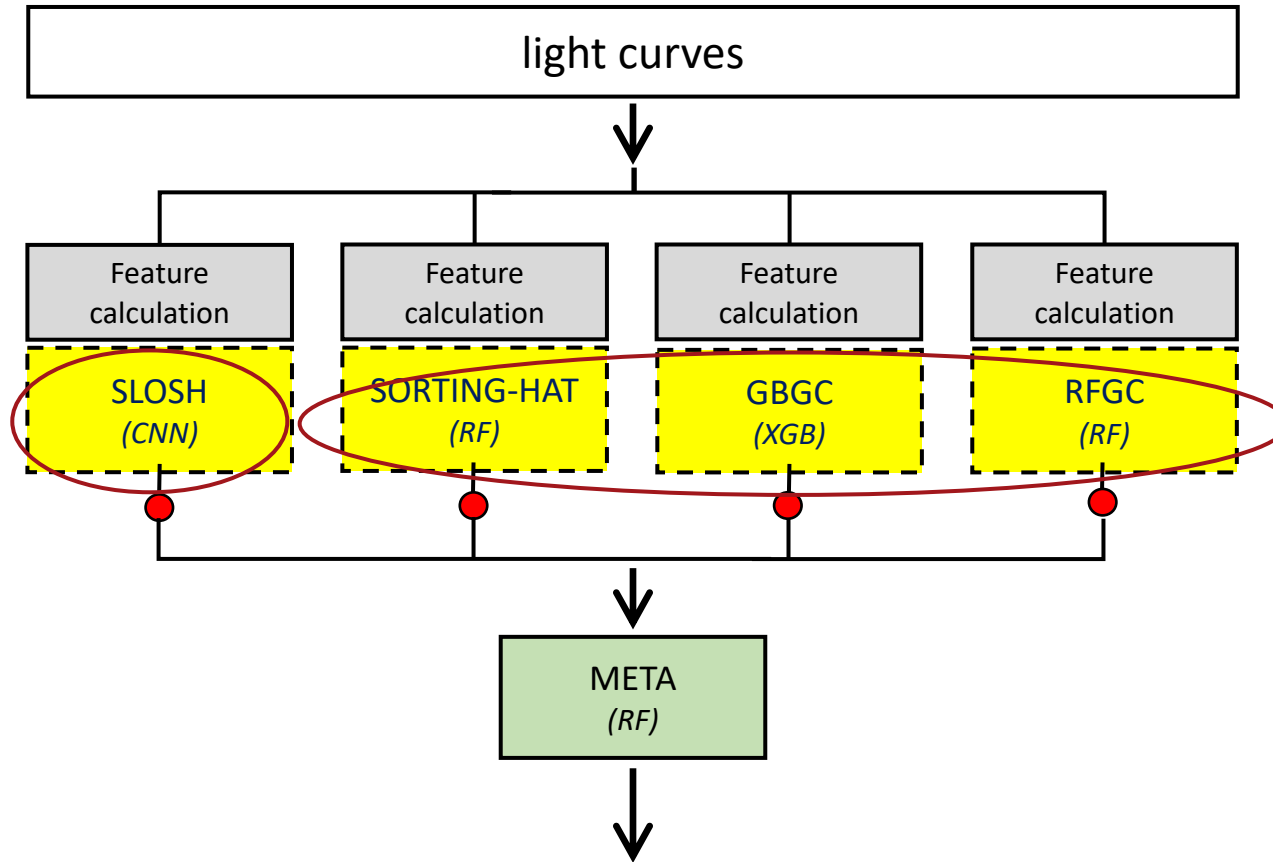
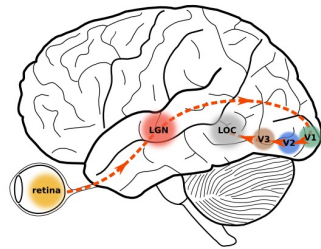


Stellar Variability Classification

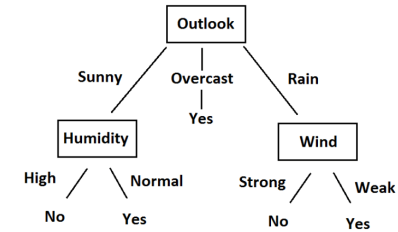


Classification scheme

Different feature sets per classifier



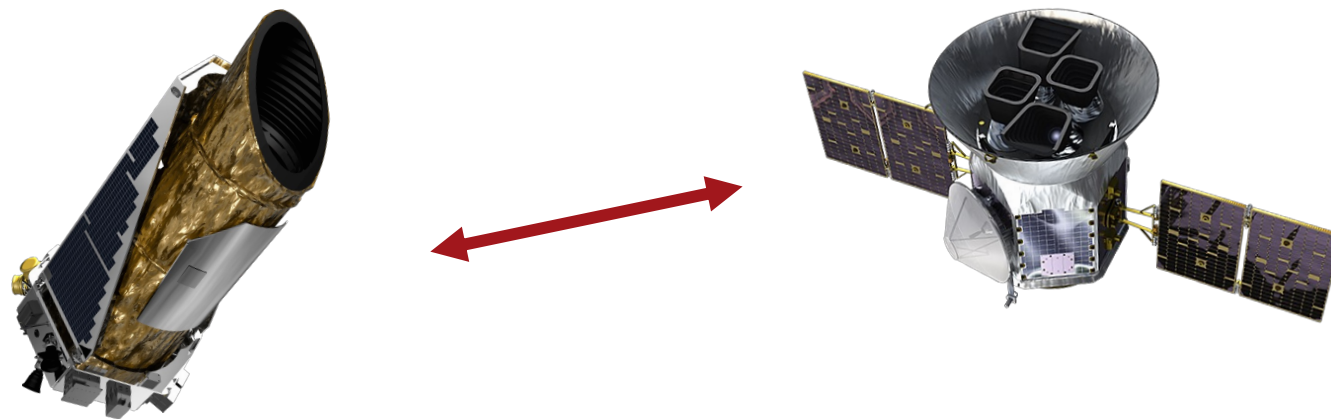
General variability classification





Challenges

- Changing survey characteristics
 - over the lifetime of one survey (e.g., cadence, downlink gaps...)
 - across surveys (e.g., precision, pixel size...)
- Domain adaptation/transfer learning





Conclusions

- Classify millions of light curves from space
 - Supervised learning for top-level "*human-informed*" classification
 - Unsupervised learning for detailed "*unbiased*" classification
 - Classifications will serve as input for asteroseismic modelling efforts
- First step toward automated physical discovery



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