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stardate: Combining dating methods for better stellar ages

Ruth Angus[1, 2], **Timothy D. Morton**[3, 2], **and Daniel Foreman-Mackey**[2]

1 Department of Astrophysics, American Museum of Natural History, New York, NY, 10024, USA **2** Center for Computational Astrophysics, Flatiron Institute, New York, NY, 10010, USA **3** Department of Astronomy, University of Florida, Gainesville, FL, 32611, USA

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Software

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Summary

Age is the most difficult fundamental stellar property to measure, particularly for stars on the main sequence. These stars change slowly in brightness and temperature, so measuring their ages via placement on the Hertzsprung-Russell or color-magnitude diagram can be imprecise. `stardate` combines alternative dating methods with isochrone placement to infer more precise and accurate ages than any one method alone. Users provide observable stellar properties that place stars on a Hertzsprung-Russell or color-magnitude diagram, such as apparent magnitudes, parallax, plus spectroscopic parameters and asteroseismic parameters (if available). They can also provide other information relating to stellar age, such as a rotation period. Based on these observables, `stardate` combines the different dating methods to estimate posterior probability density functions (PDFs) over stellar age, as well as other parameters such as distance, extinction, metallicity and mass or evolutionary stage. `stardate` uses the `emcee` Python package (Foreman-Mackey, Hogg, Lang, & Goodman, 2013) to perform Markov Chain Monte Carlo sampling in order to estimate the posterior PDFs of the stellar parameters. The paper describing the method in more detail is (Angus et al., 2019).

`stardate` is built on top of the `isochrones` Python package (Morton, 2015) and uses the MIST stellar evolution models (Dotter, 2016), (Choi et al., 2016). Development of `stardate` happens on GitHub and any issues can be raised there.

References

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