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RadVel: The Radial Velocity Fitting Toolkit, its applications to transiting planet characterization, and to blind searches in RV data

We show how to use the Python package RadVel to characterize Keplerian orbits of planetary systems with radial velocity (RV) data. RadVel can model multi-planet, multi-instrument datasets, while incorporating constraints such as transit ephemerides and secondary eclipse times. It includes several built-in Gaussian process kernels for the treatment of stellar activity, and employs MCMC and Bayesian modeling techniques to precisely determine the posterior distributions of planetary properties. We show how to use RadVel in conjunction with RV, Kepler, and K2 data, to better characterize the masses and orbits of transiting planets. We also introduce an associated software package, RVSearch, which is currently under development and can be used for blind RV planet detection in conjunction with RadVel. RVSearch combines the Bayesian methods and Keplerian fitting tools of RadVel with a periodogram-based algorithm to search for planets in RV datasets, iteratively accepting potential planetary signals until they fail to surpass an empirically calculated threshold for goodness-of-fit. To learn more about RadVel and RVSearch, visit radvel.readthedocs.io.

Author: ROSENTHAL, Lee (California Institute of Technology)

Co-authors: HOWARD, Andrew (California Institute of Technology); PETIGURA, Erik (California Institute of Technology); MILLS, Sean (California Institute of Technology); FULTON, Benjamin (California Institute of Technology); BLUNT, Sarah (Harvard University); SINUKOFF, Evan (California Institute of Technology)

Presenter: ROSENTHAL, Lee (California Institute of Technology)

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