Synthetic planetary detection rates using simulated radial velocity observations

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The search for exoplanets, planets orbiting stars outside our Solar System, has become a major focus in modern astronomy. One of the most effective techniques for detecting exoplanets is the radial velocity (RV) method, which tracks tiny shifts in a star's RV caused by the gravitational pull of orbiting planets. The goal of this project is to compute planetary detection rates, by developing a Python code that injects RV signals of synthetic planets created using the Generation III Bern model, into pre-simulated stellar RV signals. The code attempts to recover these planetary signals to compute the detection rates based on various parameters such as planetary mass, orbital period, distance from Earth, orbital phase, and inclination. These detection rates are subsequently compared to those derived in Emsenhuber et al. (in prep.) revealing differences in sensitivity, particularly for smaller planets and shorter orbital periods, and highlighting the advantages of the simulation-based approach in capturing nuanced detection probabilities.

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