

2025 Sagan Summer Workshop

Exoplanet Demographics

Hands-on Session I: Exoplanet Occurrence Rates

Group Projects

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Group Project 1: How do occurrence measurements change with different combinations of surveys?

(SSW2025_EOR_group_01_different_survey_combinations.ipynb)

One of `bardic`'s strengths is that it can combine data from many different exoplanet surveys. But it's always worth checking how the inclusion (or exclusion) of different surveys can affect your results.

In this exercise, you'll try fitting the same model with different combinations of surveys, and evaluate how that affects your occurrence rates.

Group Project 2: How does fitting a different type of model change your occurrence rates?

(SSW2025_EOR_group_02_different_models.ipynb)

In Tuesday's session, we modeled the giant planet occurrence distribution with a power law in planet mass, and a broken power law in semimajor axis. But what if you tried out other types of functional forms?

One example would be a normal (Gaussian) distribution, like the one used in [Meyer et al. 2018](#). In this exercise, you can try fitting this kind of distribution (or any other shape you want) to giant planet occurrence rates, and compare it to the model from Tuesday's session.

Group Project 3: How does the giant planet distribution depend on stellar mass?

(SSW2025_EOR_group_03_stellar_mass_dependence.ipynb)

In Tuesday's session, we included all stars with masses between 0.56 and 1.63 Solar masses. But there are plenty of demographic trends that depend on stellar mass. For example:

- Giant planets seem to be more common around F stars than M dwarfs (see e.g., [Reffert et al. 2015](#); [Bryant et al. 2023](#)).
- Conversely, less massive stars may host more small close-in planets (e.g., [Mulders et al. 2015](#); [He et al. 2021](#))
- Stellar mass affects the location and properties of the planet radius gap (e.g., [Petigura et al. 2022](#)) & planet radius cliff (e.g., [Dattilo & Batalha 2024](#))

In this exercise, you can test if there are any features of the giant planet distribution that depend on stellar mass.