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Preparing for the future of direct imaging exoplanets through combining other exoplanet detection techniques

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Very little is known about giant planets and brown dwarfs at an orbital separation great than 5 AU. And yet, these are important puzzle pieces needed for constraining the uncertainties that exist in giant planet formation and evolutionary models that are plagued by a lack of observational constraints. In order to observationally probe this mass-separation parameter space, direct imaging is necessary but faces the difficulty of low detection efficiency.

To utilise the power of direct imaging, pre-selecting companion candidates with long-period radial velocities, coupled with proper anomalies from Hipparcos and Gaia, provide a powerful tool to hunt for the most promising candidates for direct imaging. Not only does this increase the detection efficiency, but this wealth of information removes the degeneracy of unknown orbital parameters, like the inclination, leading to derived dynamical masses which can serve as benchmark objects to test models of formation and evolution.

With upcoming missions like JWST and Roman, as well as ground-based facilities like the ELT, observing time is valuable and the strategy of direct imaging needs to be re-defined to pre-select targets. Looking further ahead, perfecting these strategies will be necessary as we look toward HabEx and LUVOIR to pinpoint the location of terrestrial planets amenable to direct imaging.

I present the ongoing work towards creating a tool to use this information to select candidates for direct imaging with upcoming and future instruments. Ultimately this will lead us to a catalogue of benchmark objects that can be used to test models of planet formation and evolution.