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Who is In, and Who is Not? Determining the Gaia Survey Selection Function

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What is the probability that an astronomical object of certain properties enters the Gaia catalogue (or not)? The GaiaUnlimited project aims to enable the full potential of Gaia by characterising its survey selection function, as well as for different subsamples of the data, which are key ingredients in most statistical studies of the Milky Way. By comparing Gaia with deeper imaging from the Dark Energy Camera Plane Survey (DECaPS), we have developed an empirical model of the completeness in the Gaia pipeline, as a function only of the observed G magnitude and position over the sky, which accounts for both the effects of crowding and the complex Gaia scanning law. We also demonstrate the recipe to estimate the selection function of the stars present in a subsample of Gaia data, given that the subsample is completely contained in the Gaia parent catalogue, and how it can be extended to include the selection functions of other surveys (e.g. WEAVE, GALAH). Finally, we demonstrate the use of these selection functions by showing that the asymmetry in the Gaia-Sausage/Enceladus debris is merely due to selection effects.

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