

# Filling in the Blanks: Inferring the Dynamics and Substructure Membership of 5D Gaia Stars

*Wednesday, 17 May 2023 13:15 (1 minute)*

The release of Gaia DR3 has substantially enriched our understanding of the current state of the Milky Way (MW), and its assembly history. A driving force behind this is the increase of stars with complete 6d phase space (positions and velocities) necessary for complex dynamical analysis, such as identifying stellar substructures in the MW's stellar halo. However, far more stars are still stuck in 5D, still lacking a line-of-sight velocity (vlos), severely limiting the scope of dynamical analysis and the possibility of attributing these stars to known substructures.

In this talk, I explore a novel method to predict the likely vlos of these 5d stars, using the density of the known 6d stars in action space. This technique also allows us to infer the probability that a 5d star is associated with known stellar substructures, potentially increasing the membership of poorly populated structures. The method is first tested and verified on both the Gaia DR3 6d sample and stars crossmatched from other surveys, allowing the method's limitations to be studied in detail. Furthermore, by robustly bringing stars from 5D to 6D, this method could enhance other dynamical studies of the MW.

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**Session Classification:** Poster Prizes & closing