

Bayesian Model Comparison and Analysis of the Galactic Disk Population of Gamma-Ray Millisecond Pulsars

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Abstract content

Global properties of the almost one hundred millisecond pulsars (MSPs) detected in gamma-rays by the Fermi Large-Area Telescope remain relatively unknown due to multiple large uncertainties. I present here a extensive Bayesian analysis of both the spatial distribution and luminosity function simultaneously. Distance uncertainties, arising from errors in the parallax measurement or Galactic electron-density model, are marginalized over. We provide a public Python package for calculating distance uncertainties to pulsars derived using the dispersion measure by accounting for the uncertainties in Galactic electron-density model YMW16. We use multiple parameterizations for the MSP population and perform Bayesian model comparison, finding that a broken power law luminosity function with Lorimer spatial profile are preferred over multiple other parameterizations used in the past. Finally, I show how these results impact the MSP interpretation of the Galactic Centre Excess.

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