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GammaBayes

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This presentation introduces GammaBayes, https://github.com/lpin0002/GammaBayes, a Bayesian Python package designed for dark matter detection using the Cherenkov Telescope Array Observatory (CTAO). GammaBayes processes CTAO gamma-ray measurements alongside user-defined dark matter particle models, providing the posterior distribution for dark matter parameters such as the dark matter mass and its velocity-averaged annihilation cross-section. Additionally, it calculates Bayesian evidence for model selection.

This talk showcases GammaBayes with 525 hours of simulated data, capturing 10⁸ gamma-rays, 10⁵ of which originate from the self-annihilation of a 1 TeV mass dark matter particle. The no-signal hypothesis is excluded with nearly 5 sigma credibility. Exclusion limits for the dark matter mass vs. annihilation cross-section are derived as well. We will also discuss potential extensions of GammaBayes to incorporate advanced signal and background models, alongside the computational challenges that accompany these enhancements.

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