

Advancements in Multi-Wavelength Data Analysis: The ThreeML Framework for High-Energy Astronomy

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The Multi Mission Maximum Likelihood framework (ThreeML) is a Python-based software package designed for multi-wavelength data analysis in high-energy astronomy. Integrating X-ray and gamma-ray data from various instruments, along with measurements at lower wavelengths, is essential for unlocking the full potential of observational data. However, the lack of standardization and unique challenges posed by each instrument often complicate the process of combining data from multiple sources. ThreeML addresses these challenges with its flexible, plugin-based structure, allowing for the seamless inclusion of data from diverse observatories in their native formats. Leveraging astromodels, a versatile modeling framework, ThreeML enables separate handling of source modeling and data access from likelihood optimization, facilitating a flexible combination of both aspects. Moreover, in addition to frequentist maximum likelihood analysis, ThreeML supports Bayesian analysis through posterior distribution sampling.

We will provide an overview of the current status of ThreeML and we will introduce new plugins developed for the Imaging X-ray Polarimeter Explorer (IXPE) and the gammapy plugin. The gammapy plugin serves to bridge the gap between space-based GeV and ground-based TeV gamma-ray astronomy, enhancing the software's capabilities in accommodating a wide range of data sources for comprehensive high-energy astrophysical studies.

Collaboration

ThreeML team

Role of Submitter

I am the presenter

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