Non-parametric Partial Wave Analysis

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Typical partial wave analysis (PWA) occurs in two regimes: one where the data is kinematically binned to remove assumptions about the dynamics and another regime where parameterized models, that could encode physical dynamics like a Breit-Wigner, are used. The ability to bridge these regimes can provide additional flexibility in describing the underlying physics.

NIFTy[1], a probabilistic programming framework developed for astrophysics, has recently been adapted to be used for PWA at COMPASS [2]. A non-parametric model, described as a correlated field, is used to characterize kinematically smooth complex binned amplitudes. Parametric models can also be mixed in. This technique is being explored for the analysis of the GlueX polarized photoproduction data. Preliminary studies will be shown along with a highlight on the future direction.

References

[1] G. Edenhofer, P. Frank, J. Roth, R. H. Leike, M. Guerdi, L. I. Scheel-Platz, M. Guardiani, V. Eberle, M. Westerkamp, and T. A. Enßlin. Re-Envisioning Numerical Information Field Theory (NIFTy.re): A Library for Gaussian Processes and Variational Inference, 2024.

[2] F. M. Kaspar, J. Beckers, and J. Knollmüller. Progress in the Partial-Wave Analysis Methods at COMPASS. *EPJ Web Conf.*, 291:02014, 2024.