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Accelerating Femtoscopic Studies with Machine Learning for Source Function Modeling

Femtoscopy probes the strong interaction between hadrons via two-particle correlation functions. The ALICE collaboration has recently measured these functions with unprecedented precision, including those involving strange (Λ, Ξ, Ω) and charm (D±) quarks. Extracting the final-state interactions requires solving the Schrödinger equation, with the accurate modeling of the source function—describing particles'relative emission distances—posing a key challenge. Advanced models like CECA (Common Emission in CATS) improve our understanding of emission processes but are computationally intensive, limiting simultaneous fits. For the first time, we propose leveraging machine learning (ML) to model the source. The ML model will emulate CECA, providing fast, accurate source modeling and efficient computation of correlation functions, by significantly expediting the analysis of correlation data.

AI keywords

Normalizing Flow; simulated-based inference

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