Unfolding Techniques for Pion-in-Jet Multiplicity Measurements at STAR

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27 July, 2020

Abstract

The process by which scattered quarks and gluons “fragment”, or convert into hadrons, remains one of the more mysterious phenomena in modern physics. In particular, the gluon fragmentation function is not well constrained. Measurements of hadrons in jets are a promising tool to shed new light on this phenomenon. The STAR experiment at Brookhaven National Laboratory has measured spin asymmetries of pions in jets to investigate the Collins effect. The spin-averaged multiplicities of pions in jets contribute to the denominator of the Collins asymmetry. Consequently, spin-averaged pion-in-jet multiplicities measured at STAR can provide new information on gluon fragmentation functions and also information useful to global analyses of the Collins effect. Measuring these multiplicities accurately requires a multi-dimensional unfolding, e.g. to correct for bin migration due to detector efficiency and smearing of jet and pion momentum from finite detector resolution. New data analysis tools such as machine learning and neural networks may provide opportunities to improve these unfolding corrections and reduce systematic uncertainties associated with these analyses. This poster presents the status of comparing several ways to perform these unfolding corrections.