Phenomenology 2025 Symposium



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Frequentist Uncertainties on Neural Density Ratios with wifi Ensembles

Monday 19 May 2025 15:00 (15 minutes)

We propose $w_i f_i$ ensembles, a novel framework to obtain asymptotic frequentist uncertainties on density ratios in the context of neural ratio estimation. In the case where the density ratio of interest is a likelihood ratio conditioned on parameters, for example a likelihood ratio of collider events conditioned on parameters of nature, it can be used to perform simulation-based inference on those parameters. We show how uncertainties on a density ratio can be estimated with $w_i f_i$ ensembles and propagated to determine the resultant uncertainty on the estimated parameters. We then turn to an application in quantum chromodynamics (QCD), using $w_i f_i$ ensembles to estimate the likelihood ratio between generated quark and gluon jets. We use this learned likelihood ratio to estimate the quark fraction in a mixed quark/gluon sample, showing that the resultant uncertainties empirically satisfy the desired coverage properties.

Mini Symposia (Invited Talks Only)

Plenary (Invited talks only)

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Track Classification: Machine Learning and Artificial Intelligence in Particle Physics