Contribution ID: **11** Type: **not specified**

Frequentist Uncertainties on Density Ratios with Ensembles

Wednesday 6 November 2024 10:50 (20 minutes)

We propose a novel framework to obtain asymptotic frequentist uncertainties on machine learned classifier outputs by using model ensembles. With the well-known likelihood trick, this framework can then be applied to the task of density ratio estimation to obtain statistically rigorous frequentist uncertainties on estimated likelihood ratios. As a toy example, we demonstrate that the framework can recover known likelihood ratios for simple Gaussian distributions, and that the resulting estimates and uncertainties for the likelihood ratios satisfy the desired coverage properties. We then apply this framework in a collider physics context, estimating the likelihood ratio between generated quark and gluon jets. Finally, we examine the use of the learned likelihood ratio and uncertainties for downstream statistical inference.

Track

Uncertainties

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Session Classification: Uncertainties & Interpretability