Contribution ID: **1** Type: **not specified**

Tuning neural posterior estimation for gravitational waves

Friday, 8 December 2023 13:45 (20 minutes)

Modern simulation-based inference techniques leverage neural networks to solve inverse problems efficiently. One notable strategy is neural posterior estimation (NPE), wherein a neural network parameterizes a distribution to approximate the posterior. This approach is particularly advantageous for tackling low-latency or high-volume inverse problems. However, the accuracy of NPE varies significantly within the learned parameter space. This variability is observed even in seemingly straightforward systems like coupled-harmonic oscillators. This paper emphasizes the critical role of prior selection in ensuring the consistency of NPE outcomes. Our findings indicate a clear relationship between NPE performance across the parameter space and the number of similar samples processed by the model. Thus, the prior should match the sample diversity across the parameter space to promote strong, uniform performance. Furthermore, we introduce a novel procedure specifically designed to swiftly refine NPE predictions for individual events. This method substantially improves sample efficiency, transforming it from nearly zero to double-digit percentages within a matter of minutes. Notably, our research demonstrates its real-world applicability by achieving a significant milestone: we accurately infer posteriors for low-mass binary black hole (BBH) events with NPE.

Primary author: KOLMUS, Alex (Radboud University)

Co-authors: JANQUART, Justin (Utrecht University/Nikhef); BAKA, Tomek (Utrecht University, Nikhef)

Presenter: KOLMUS, Alex (Radboud University)

Session Classification: ML4GWNL