Contribution ID: **26** Type: **Poster**

Flexible and Fast Estimation of Binary Merger Population Distributions with Adaptive KDE

Tuesday, 7 June 2022 10:45 (5 minutes)

The LIGO Scientific, Virgo and KAGRA Collaborations recently released the third gravitational-wave transient catalog or GWTC-3, significantly expanding the number of gravitational wave (GW) signals. There are various models proposed to describe the underlying mass distribution of these compact objects using computational extensive Bayesian hierarchical models and use them to predict the formation channels of these compact objects. In this work we are proposing a fast and flexible Kernel density estimator (KDE), to reconstruct the mass distribution of LIGO-Virgo binary mergers from parameter estimation outputs of the observation of gravitational waves from publicly available data from GWTC-2 including O1, O2, and O3a observing runs. Under some conditions (sufficiently high statistics, sufficiently low individual event measurement error relative to width of population features) a simple kernel density estimator reconstruction of the mass distribution from parameter estimation median masses will be sufficiently accurate. We propose this in combination with a fast polynomial fit (to injection results) of the mass-dependent sensitivity as a simple non-parametric method for comparison with established Bayesian hierarchical models. We also propose a method to identify significant features such as peaks in the underlying distribution.

Primary authors: Dr WYSCOKI, Daniel (University of Wisconsin Milwaukee, Milwaukee, Wisconsin, USA); Dr SADIQ, Jam (University of Santiago de Compostela, Spain); Dr DENT, Thomas (University of Santiago de Compostela, Spain)

Presenter: Dr SADIQ, Jam (University of Santiago de Compostela, Spain)

Session Classification: Poster session

Track Classification: Data analysis