Contribution ID: **78** Type: **Talk**

Scalable Bayesian Inference for 3G Gravitational Wave Observatories: Leveraging Normalizing Flows and Hardware Acceleration

Wednesday 28 May 2025 17:42 (12 minutes)

Third-generation (3G) gravitational wave (GW) observatories will unveil a cosmic orchestra, detecting thousands of sources annually. However, their increased detection rate poses a major challenge for data analysis. Existing, widely used techniques to obtain the source parameters are prohibitively expensive, creating a bottleneck for extracting scientific insights from 3G detector data. We present ongoing developments of an efficient data analysis pipeline that leverages normalizing flows and hardware accelerators. As an example, we demonstrate Bayesian inference of GW data from binary neutron star mergers, their electromagnetic counterparts, and their implications for nuclear physics, reducing the computational cost from months to a couple of hours. Moreover, our approach enables joint parameter estimation of overlapping GW signals within a few hours. Our methods hold strong promise in meeting the scalability demands of 3G GW detectors, enabling efficient and comprehensive data analysis for future observatories.

Primary author: WOUTERS, Thibeau (Utrecht University)

Presenter: WOUTERS, Thibeau (Utrecht University)

Session Classification: Observational Science (OSB)

Track Classification: Observational Science (OSB): Div10