Gravitational Geometry and Dynamics Group Seminar

Wed. 8th February '23 Online at 11h00 (PT)

Machine Learning for Gravitational Wave Astronomy

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Zoom meeting ID 962 2413 8340

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Since 2015, the LIGO-Virgo-KAGRA Collaboration has detected 90 signals from merging compact objects such as black holes and neutron stars. Each of these is analyzed using Bayesian inference, employing a stochastic algorithm such as Markov Chain Monte Carlo to compare data against models—thereby characterizing the source. However, this is becoming extremely costly as event rates grow with improved detector sensitivity. In this talk I will describe a powerful alternative using probabilistic deep learning to analyze each event in orders of magnitude less time while maintaining strict accuracy requirements. This uses simulated data to train a normalizing flow to model the posterior distribution over source parameters given the data—amortizing training costs over all future detections. I will also describe the use of importance sampling to establish complete confidence in these deep learning results. Finally I will describe prospects going forward for simulation-based inference to enable improved accuracy in the face of non-stationary or non-Gaussian noise.

https://videoconfcolibri.zoom.us/j/96224138340?pwd=YkZUM GlLb0dqVjcxOVpXMTFVMTBXQT09

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