GW Parameter Estimation

Group ...

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Abstract

The multi-messenger follow-up of gravitational waves (GW) requires rapidly estimating source parameters like component masses, distance, and sky-localization. Deep learning based pipelines provide an efficient method to carry out this task due to reduced computational power. This project aims to develop one such pipeline that uses a normalizing flow model. The pipeline uses LIGO O3 MDC data along with IMRPhenomD waveforms. Computationally expensive parameters like time-of-arrival are marginalized using a similarity embedding network. Finally, the model is trained using a normalizing flow model, which is a generative deep learning algorithm. This pipeline demonstrates the key features of a more developed AMPLFI pipeline.

Timeline

Week1

Everyone- Set up Delta accounts
Shrey - Get LIGO O3 Data, create container and environment
Steven - Work with BILBY pipeline
Yiwen and Calvin - Data Preprocessing (whitening and FFT)

Week2

Everyone - Presentation
Shrey and Steven - Set up Normalizing flow architecture
Yiwen and Calvin - Similarity embedding network

Week3

Everyone - Hyper-parameter tuning and Write-up