

Final Project 1: Brainstorming

Topic: Analysing Gravitational Wave Data Using Machine Learning

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In 1916, Albert Einstein postulated the existence of gravitational waves. These waves are considered to be fluctuations in the fabric of space-time that emanate from massive celestial bodies. The detection of these ripples is a challenging task due to their microscopic size. Black hole collisions, supernovae, and neutron star collisions generate the most robust gravitational waves. The tremendous energy these phenomena release highlights their significant impact on the universe's structure and the complexity of their effects on the space-time continuum.

I have been reading about exciting research on detecting gravitational waves using an interferometer. Researchers are working hard to navigate the high-noise data to identify this wave. My plan for this project is to use the data from the Laser Interferometer Gravitational-Wave Observatory (LIGO) and collaborations and implement machine learning techniques to identify and classify good signals. I am still working on the details, but I found a great resource to guide me [1]. I also came across a fascinating paper [2] that used unsupervised learning to classify the transient noise of gravitational-wave detectors. I am eager to learn more about their technique and results.

[1] <https://iphysresearch.github.io/Survey4GWML/>

[2] Sakai, Y., Itoh, Y., Jung, P., (2022). Unsupervised learning architecture for classifying the transient noise of interferometric gravitational-wave detectors. *Scientific Reports*, 12(1), 1-14. <https://doi.org/10.1038/s41598-022-13329-4>