In this third project, we want to examine a gravitational wave event to find its timing and strain. With this data, we will be able to find the masses and distance of the two black holes that had merged together to create the gravitational waves. We will also be able to find how much energy was lost. This process allows us to find things that we could've never seen with a simple telescope pointed at the sky.

To start with the project, we first imported the data into our code and graphed it. We also filter out any unwanted data in this step so the strain graphs don't end up looking too crazy, and it would be easier to find the exact moment the event happened. Once we made the filtered event, we found that there was a spike exactly when the event happened, so we narrowed down the x axis to zoom in on this moment.

When graphing this data, we started with the information given by the LIGO center at Hanford. To make sure the reading at Hanford is accurate, we also have to check the signals found at the LIGO center at Livingston. To do this, we have to shift the center of the signal by 6.9 seconds to account for the different times the gravitational waves hit them. We also have to invert it because of the different way the LIGO center at Livingston is oriented compared to the one in Hanford. After graphing these two signals together, we found that the event did get captured at both Hanford and Livingston, which confirms the signal found to be from gravitational waves.

As part of this project, we also had to find the sound made by the gravitational waves, which sounds very similar to a bird's chirp. We are unable to hear it when the actual event happens because the audio frequency is outside of the range that our human ears can detect, so we can recreate the noise with the code to hear it.

Finally, we have to calculate the masses of the two merging black holes, the distance, and the energy lost in this event. To find the mass, we used the formula $Tc^3/4\sqrt{2}\pi G$, which ended up being around 65 solar masses for each black hole. To find distance, we used the formula $D = Tc/16\pi S$ where S is the strain that equals 1e-21, and we found the distance to be around 1102 Mpc. Lastly, we found the energy lost to be 6*10^47 J with the formula $(M_{total} - M_{actual})c^2$. These results seem pretty reasonable since they are not very far off from the actual masses found on the website.

Our team members are Ainsley, Maggie, and Lisa. Our team members are Ainsley, Maggie, and Lisa. Though we didn't work together while coding, we did share a Google slideshow with each other to create our presentation. I helped with the slide about the sound of the gravitational wave and wrote up our conclusion. Maggie was the one who did the calculations at the end of our project since Ainsley and I were having trouble with them. We also did not use GenAI for this project.