

# Computational Physics Homework 8

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## **1 Link to Github**

<https://github.com/danbateman01/phys-ga2000/tree/main>

## 2 Problem 1

This problem looked at likelihood maximisation by asking people whether or not they have heard the phrase "Be kind, rewind" and scoring their answer a 1 if they answer yes and a 0 if they answer no. I spent a lot of time looking into the statistics involved such as the beta values. From the graph you can see that age has a strong correlation to the likelihood of having heard the phrase, particularly at the endpoints and as expected the middle age range slowly rises to show the where the change occurs. I ended up using ChatGPT mainly to clean up code as the problem was quite intricate and I was spending a large amount of unnecessary time fixing small issues that ChatGPT would solve very quickly almost all the time.

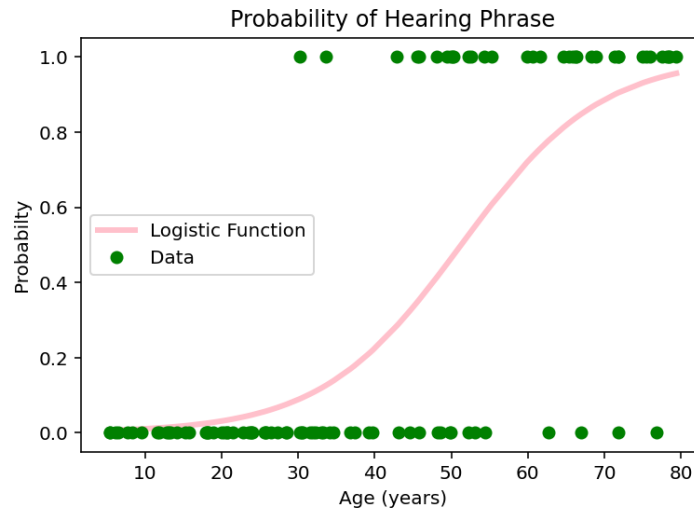


Figure 1: Probability of Hearing Phrase

### 3 Problem 2

This problem looks at a recording of a trumpet and piano note and uses a Fourier transform to find the frequency of the note. Further analysis shows that the pianos fundamental frequency is at about 520Hz, a C5, and the trumpets fundamental frequency is about 1045, a C6.

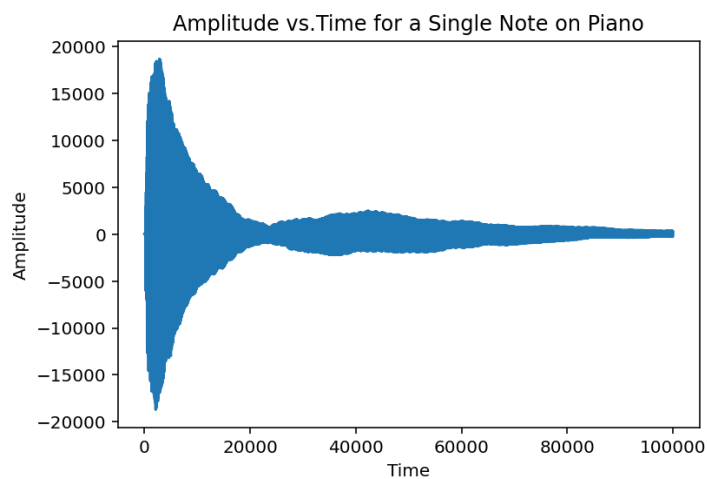


Figure 2: Piano Amplitude

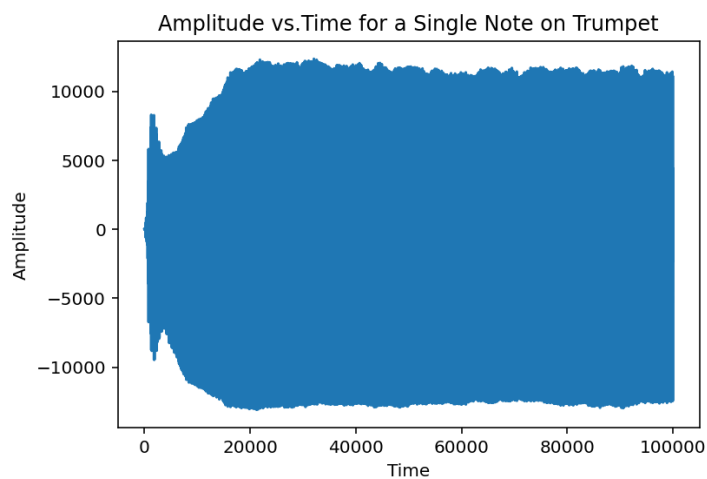


Figure 3: Trumpet Amplitude

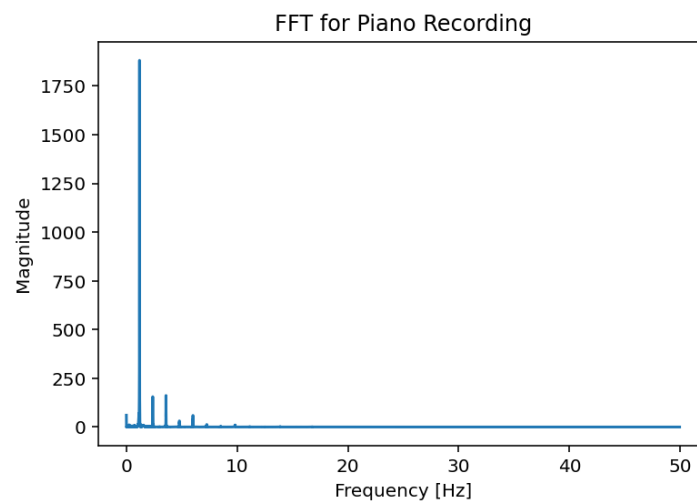


Figure 4: Piano Fundamental Frequency

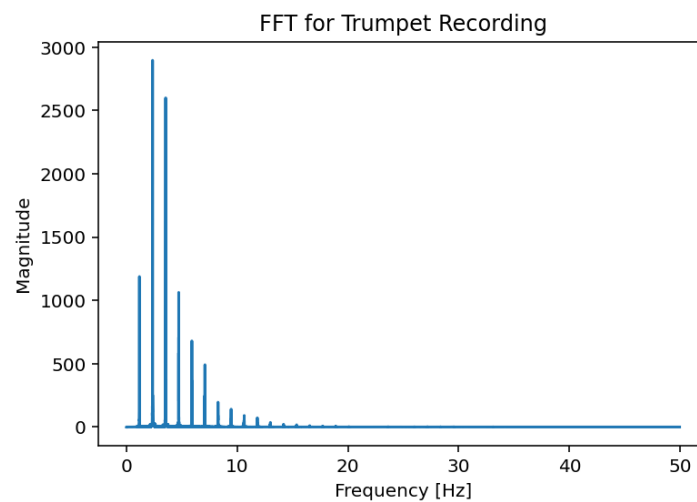


Figure 5: Trumpet Fundamental Frequency

## 4 Problem 3

Problem 3 continues to look at Fourier transforms, this time by looking at data collected from the DOW Jones market.

## 4.1 D

As you can see the inverse Fourier data does a good job of representing the real data even when 90% of the coefficients are set to 0, matching the graph particularly well. When you set the Fourier coefficients to 0 the graph cannot map the original data at all. When setting all but 2% of the coefficients to 0, the general shape of the graph is still mapped out quite well.

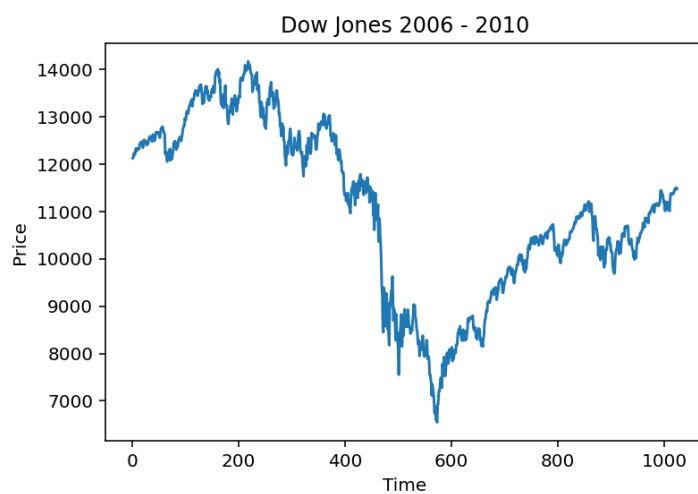


Figure 6: Dow Jones 2006 - 2010

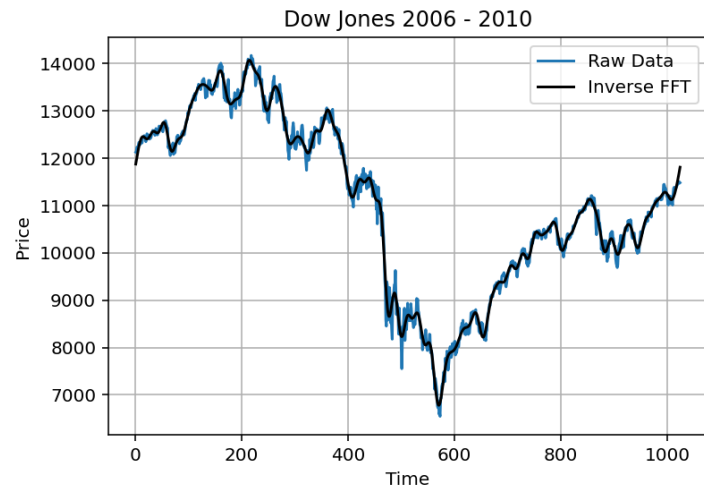


Figure 7: Raw Data V First 10% of Inverse Fourier Transform Data

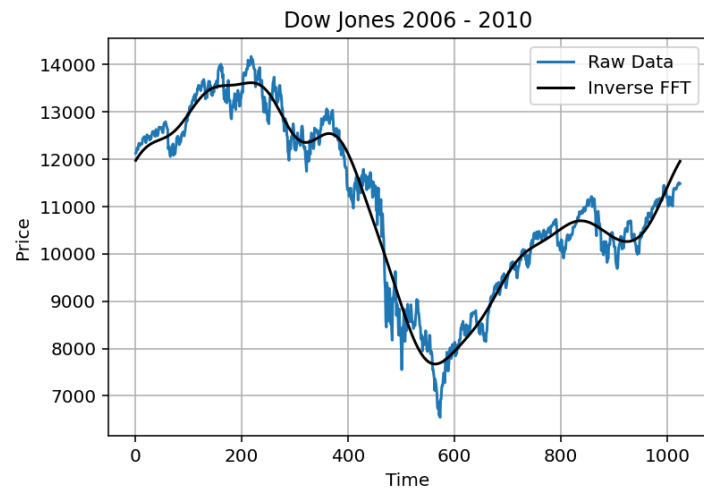


Figure 8: Raw Data V First 2% of Inverse Fourier Transform Data