Data Sciences Initiative
Physics 105
Project 9a: Real-time audio data acquisition, processing and display

In this project we do real-time audio data acquisition via laptop microphone. Then we Fourier transform the data and display plots real-time in a manner that is useful for tuning a guitar. Currently this project is coded in Matlab.

Reasons why this project is useful:

(1) Real-time data acquisition via computer is central throughout experimental physics.

(2) Gain experience with Fast Fourier Transforms.

(3) Motivate students by creating a piece of software that can be used in daily life and shared with non-physicists.
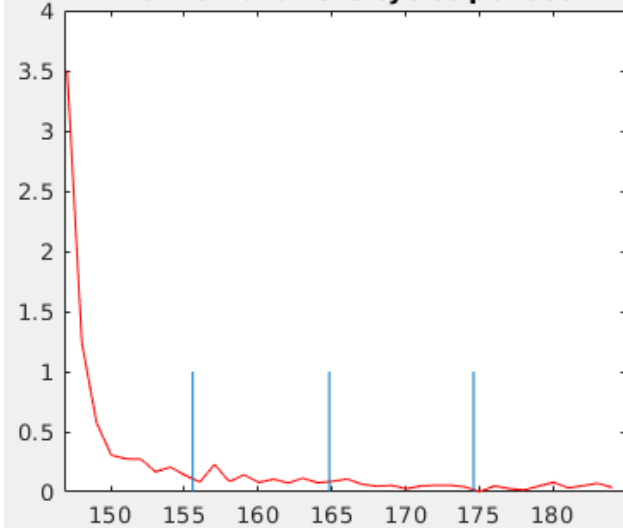
Keywords include

- Data Acquisition
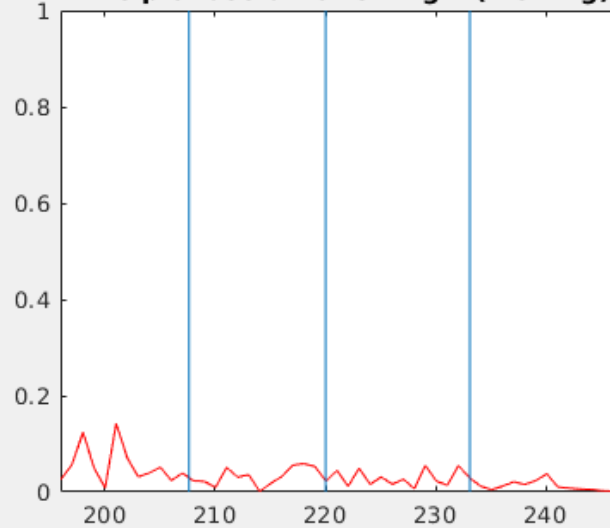- Discrete Fourier Transform
- Signal to Noise Ratio
- Sample Rate

Sample Output

All six plots are updated real-time. In this example, the D string on a guitar has been plucked. The plot in the upper right is useful to look at. We see the D string is slightly flat.
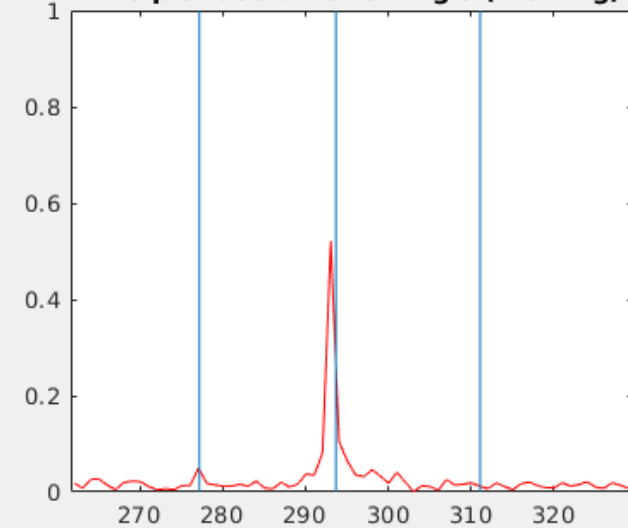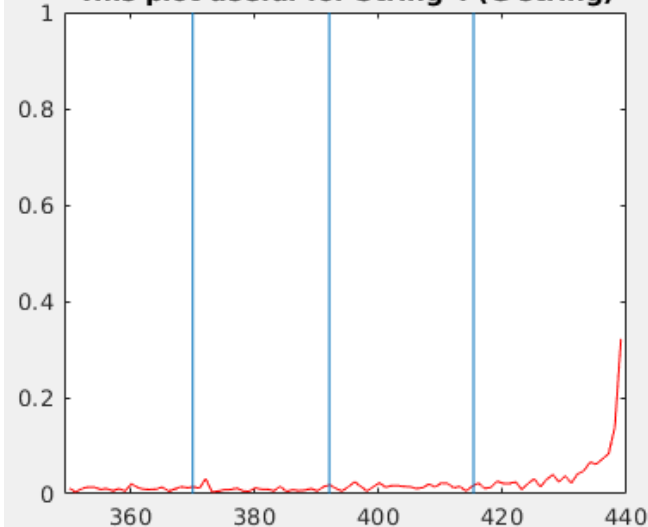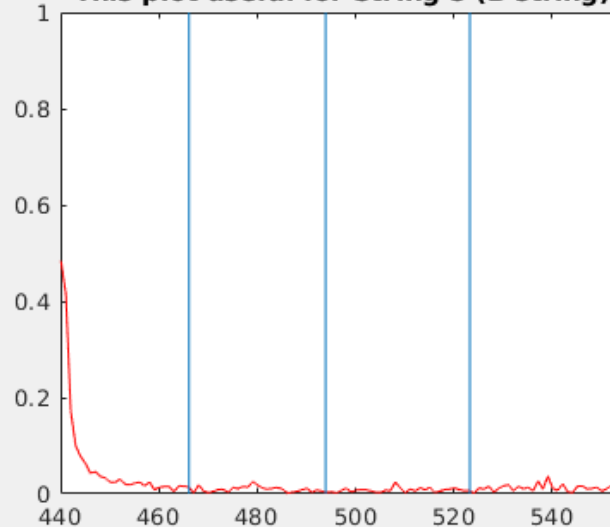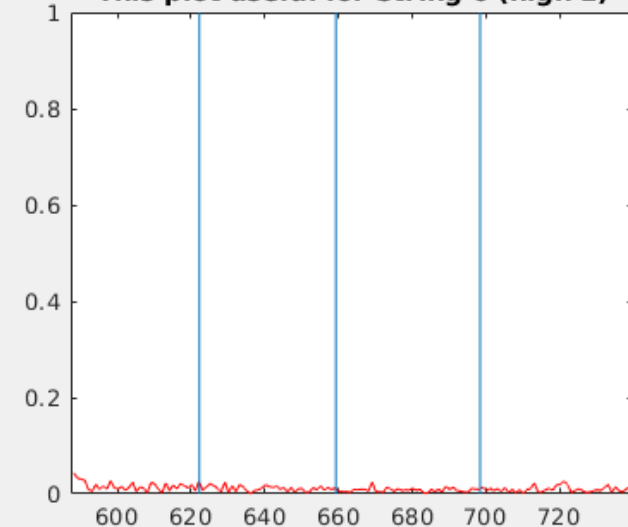
Sample Output
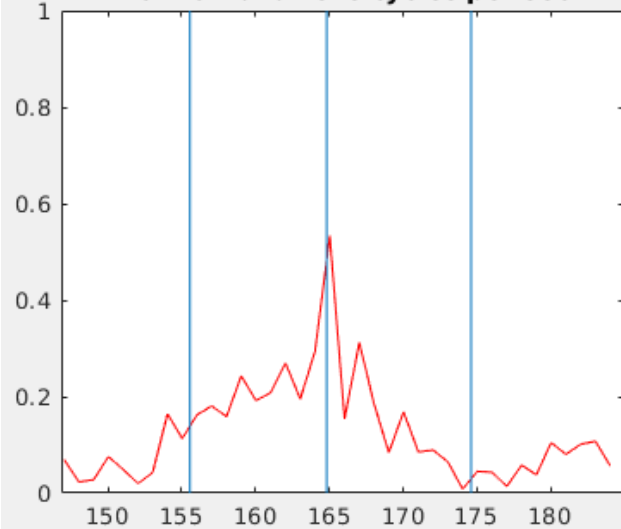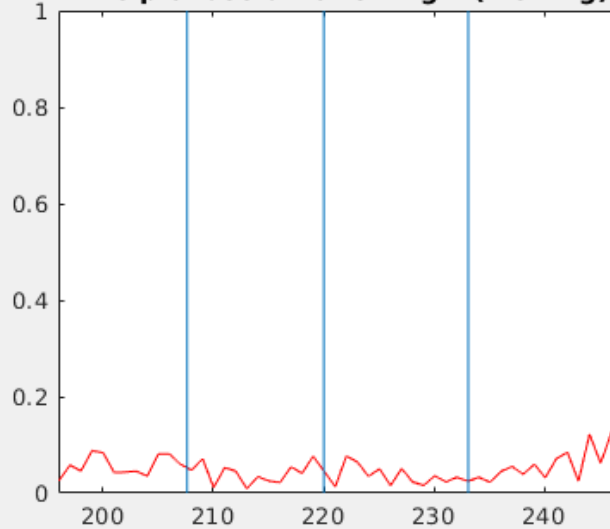
In this example, the low E string on a guitar has been plucked. The plot in the upper left is useful to look at for tuning this string. Also note the plot in the lower right, showing a harmonic that is two octaves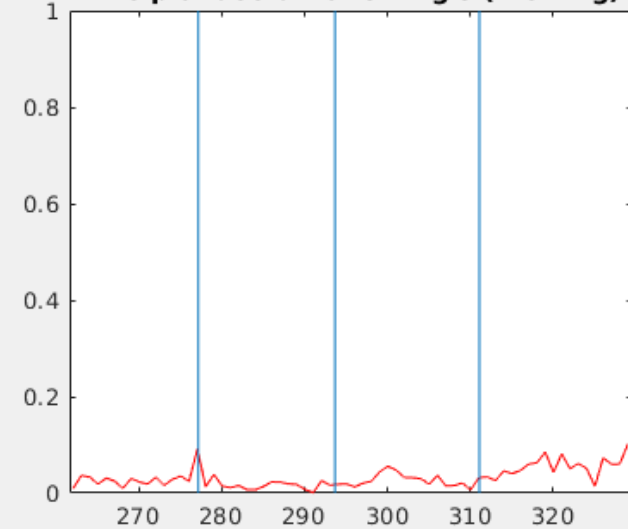 higher. Other resonances are visible in other plots.