YOU_a5q6

December 2, 2021

1 A5-Q6: Audio Enhancing

[35]:
```
import numpy as np
import matplotlib.pyplot as plt
import scipy.io.wavfile
from IPython.display import Audio
import math
```

[ ]:
```
```

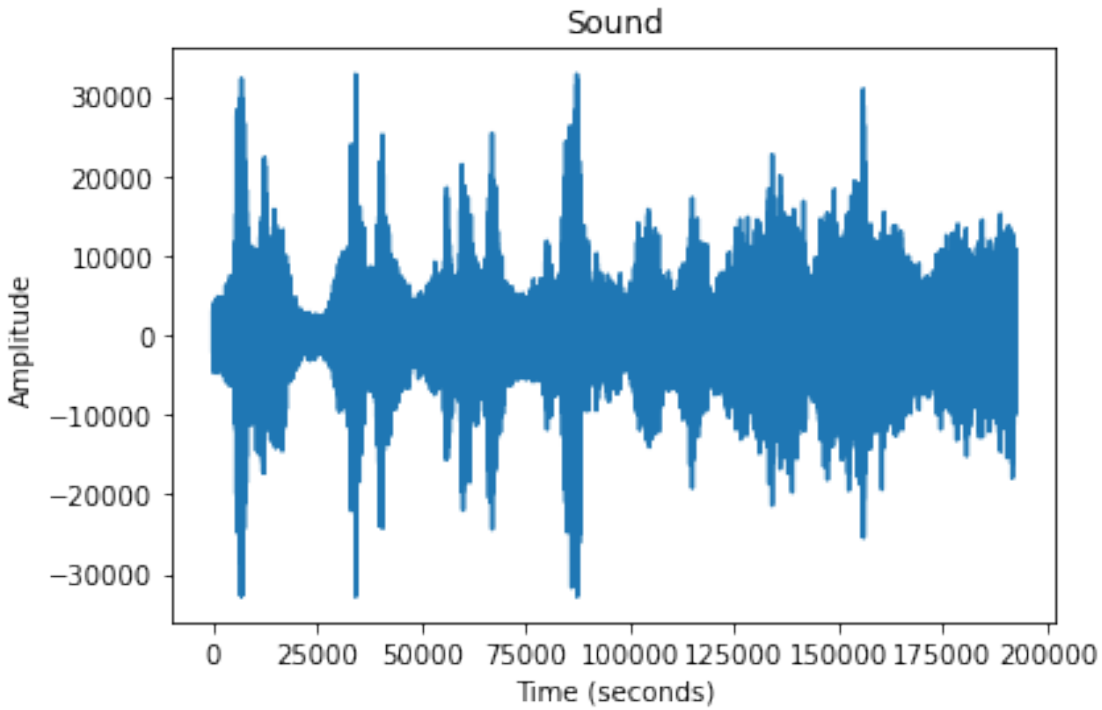
[25]:
```
# Load the audio recording
Omega, f = scipy.io.wavfile.read('recording.wav')
Audio(f, rate=Omega)
```

[25]:
```
<IPython.lib.display.Audio object>
```

[26]:
```
# Some useful values
N = len(f)    # total number of samples
L = N / Omega # length of sound clip (in seconds)
t = np.arange(0,N-1) * L/N  # array of time stamps for samples
```

[27]:
```
# Corresponding array of sampled frequencies
omega = np.fft.fftshift(np.arange(-N/2, N/2)) / L
```

[28]:
```
plt.plot(f)
plt.title('Sound')
plt.xlabel('Time (seconds)')
plt.ylabel('Amplitude');
```

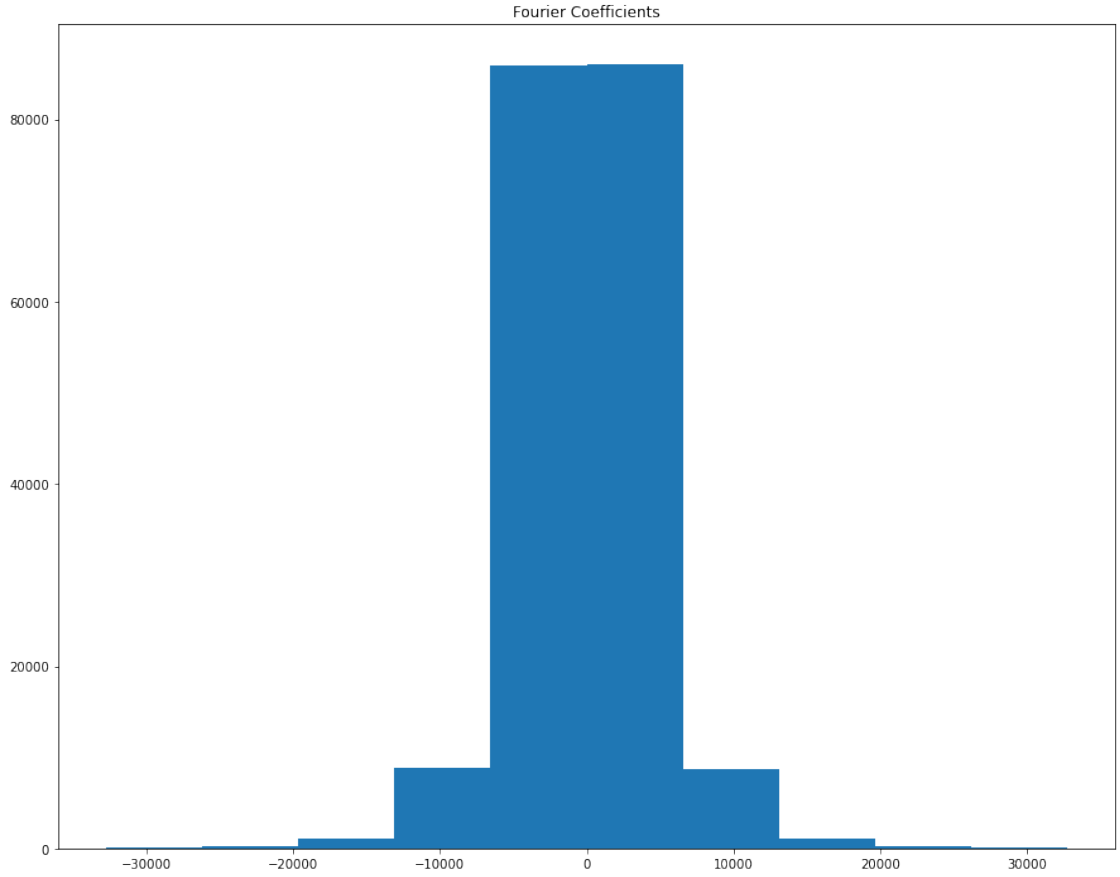


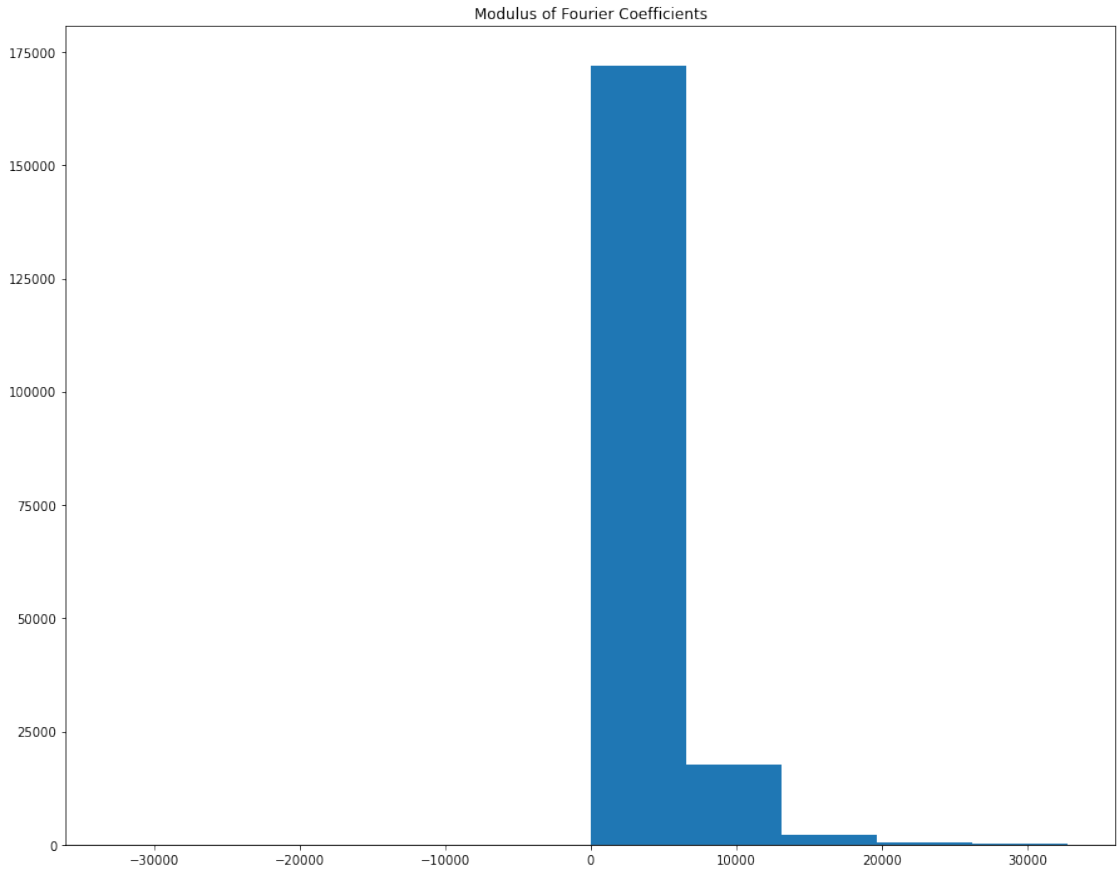
1.1 (a)

[141]:
```
# === YOUR CODE HERE ===
print(omega)
print(f)
ffour = np.fft.fftshift(f)
print(ffour)
mod = np.zeros_like(ffour)
for i in range(len(ffour)):
    a = ffour[i].real
    b = ffour[i].imag
    mod[i] = math.sqrt(a**2+b**2)
plt.figure(figsize=(15,12))
plt.hist(ffour)
plt.title('Fourier Coefficients')
plt.figure(figsize=(15,12))
plt.hist(mod)
plt.title('Modulus of Fourier Coefficients')
```

```
[ 0.          0.22909567  0.45819134 … -0.68728701 -0.45819134
 -0.22909567]
[-1938   630   645 … -3324   993  4026]
[-2580 -1790  -741 …  4531  5023   174]
```

[141]: Text(0.5, 1.0, 'Modulus of Fourier Coefficients')





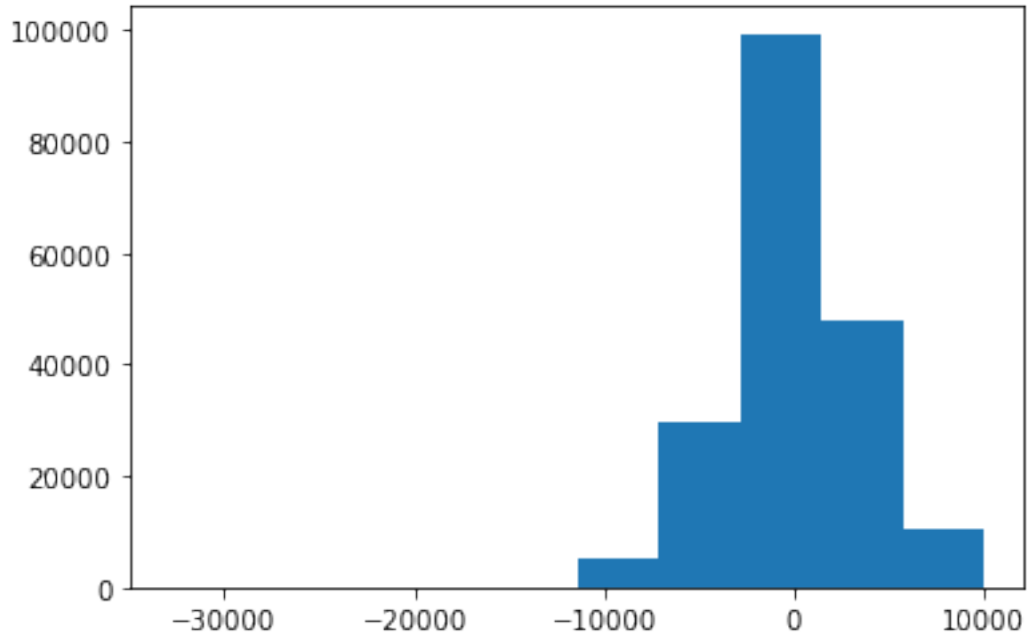
1.2 (b)

[142]:
```
# === YOUR CODE HERE ===
print(ffour)
for i in range(len(ffour)):
    #a = ffour[i].real
    #b = ffour[i].imag
    #z = math.sqrt(a**2+b**2)
    if (abs(ffour[i]) > 10000):
        ffour[i] = 0
print(ffour)
plt.hist(ffour)
```

```
[-2580 -1790  -741 …  4531  5023   174]
[-2580 -1790  -741 …  4531  5023   174]
```

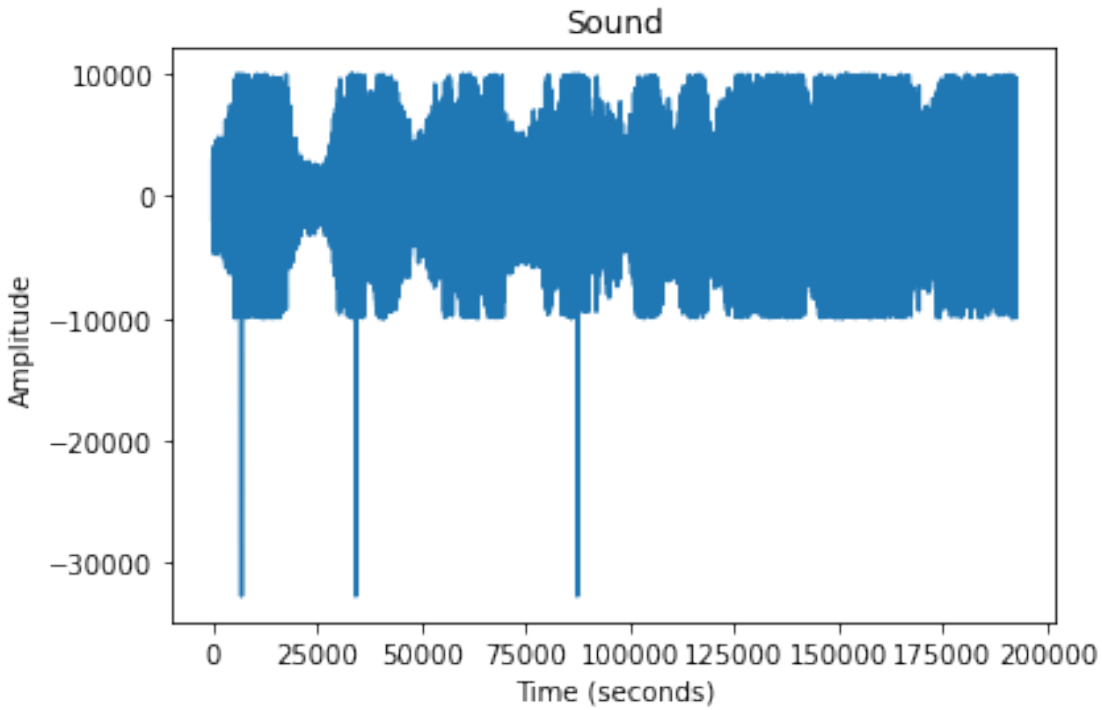
[142]:
```
(array([1.0000e+01, 0.0000e+00, 0.0000e+00, 0.0000e+00, 0.0000e+00,
        5.1370e+03, 2.9628e+04, 9.9412e+04, 4.7774e+04, 1.0535e+04]),
 array([-32768. , -28491.2, -24214.4, -19937.6, -15660.8, -11384. ,
```

```
        -7107.2,  -2830.4,   1446.4,   5723.2,  10000. ]),
<BarContainer object of 10 artists>)
```



1.3 (c)

[143]:
```
# === YOUR CODE HERE ===
fnew = np.fft.ifftshift(ffour)
plt.plot(fnew)
plt.title('Sound')
plt.xlabel('Time (seconds)')
plt.ylabel('Amplitude');
```



[144]:
```
# === YOUR CODE HERE ===
```

[145]:
```
# Play the audio clip
# === YOUR CODE HERE ===
Audio(fnew, rate=Omega)
```

[145]:
```
<IPython.lib.display.Audio object>
```

1.4 (d)

"Robert. He's dead. I killed him."

[ ]:
```

```