SRIPTask - Develop SpiroMask end-to-end.

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IMPORTING AUDIO

```
import librosa
import numpy as np
import matplotlib.pyplot as plt
import librosa.display
from IPython.display import Audio
from scipy.signal import butter, sosfreqz, sosfilt

## Importing Audio
breathing = "/Users/vanshya/Documents/WhatsApp Ptt 2024-02-21 at 5.29.08 PM.wav"
Audio(data = breathing, autoplay = False)
```

```
<IPython.lib.display.Audio object>
```

CALCULATING SAMPLING RATE

```
y, sr = librosa. load( breathing)
print("Sampling Rate:", sr, "Hz")
print("Sampling Rate:", sr/1000, "kHz")
```

```
Sampling Rate: 22050 Hz
Sampling Rate: 22.05 kHz
```

FILTERING OUT HIGH FREQUENCIES USING A LOW-PASS FILTER

```
y, sr = librosa. load( breathing)
def butter_lowpass(cutoff, fs, order=4):
    nyquist = 0.5 * fs
    normal_cutoff = cutoff / nyquist
    sos = butter(order, normal_cutoff, btype='low', analog=False, output='sos')
    return sos

# Apply the low-pass filter
cutoff_frequency = 1000
order = 4
sos = butter_lowpass(cutoff_frequency, sr, order)
y_filtered = sosfilt(sos, y)
```

MAKING THE ORIGINAL WAVEFORM

```
plt.figure(figsize=(12, 4))
librosa.display.waveshow(y, sr=sr)
plt.title(' Original Waveform')
plt.xlabel('Time (s)')
plt.ylabel('Amplitude')
plt.show
```

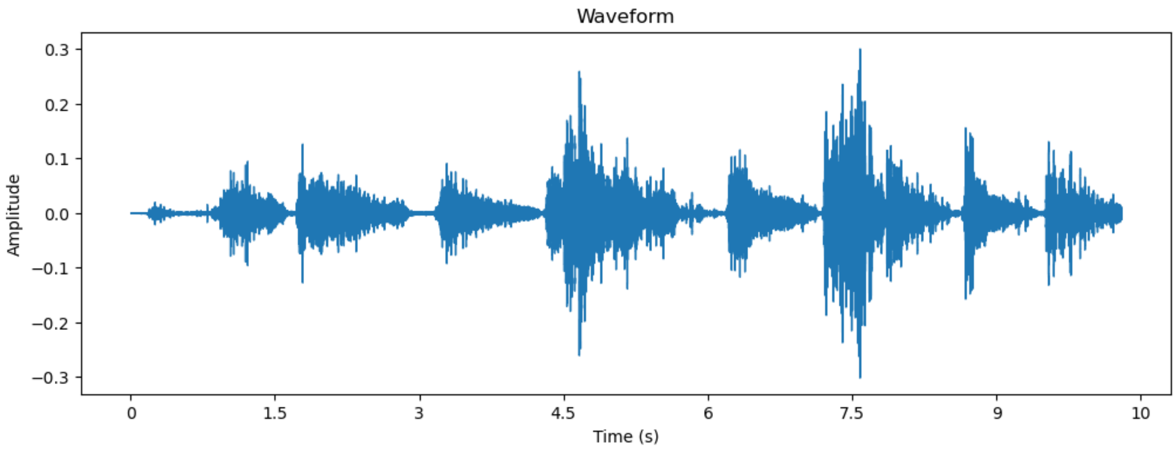


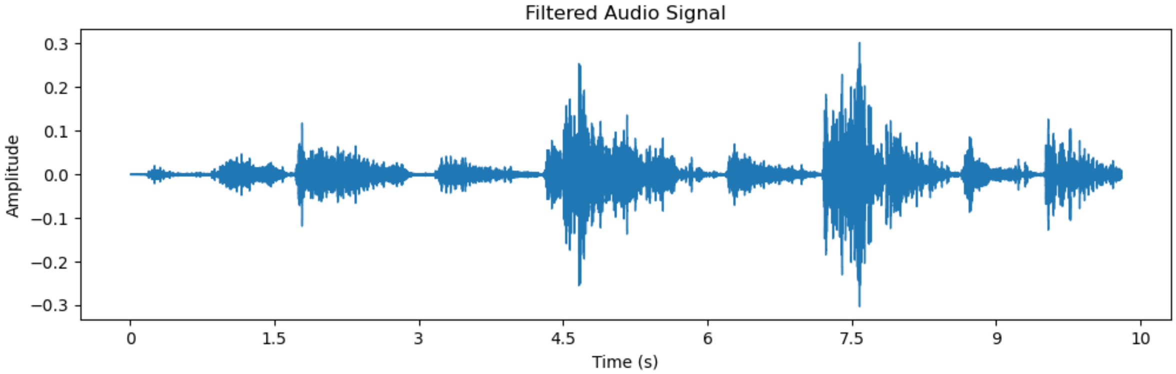
Figure 1

MAKING FILTERED WAVEFORM

```
# Plot original and filtered signals
plt.figure(figsize=(10, 6))

plt.subplot(2, 1, 2)
librosa.display.waveshow(y_filtered, sr=sr)
plt.title('Filtered Audio Signal')

plt.tight_layout()
plt.xlabel('Time (s)')
plt.ylabel('Amplitude')
plt.show()
```



MAKING A SPECTOGRAM

```
D = librosa.amplitude_to_db(np.abs(librosa.stft(y)), ref=np.max)
plt.figure(figsize=(12, 8))

librosa.display.specshow(D, sr=sr, x_axis='time', y_axis='log')

plt.colorbar(format='%+2.0f dB')
plt.title('Spectrogram')
plt.show()
```

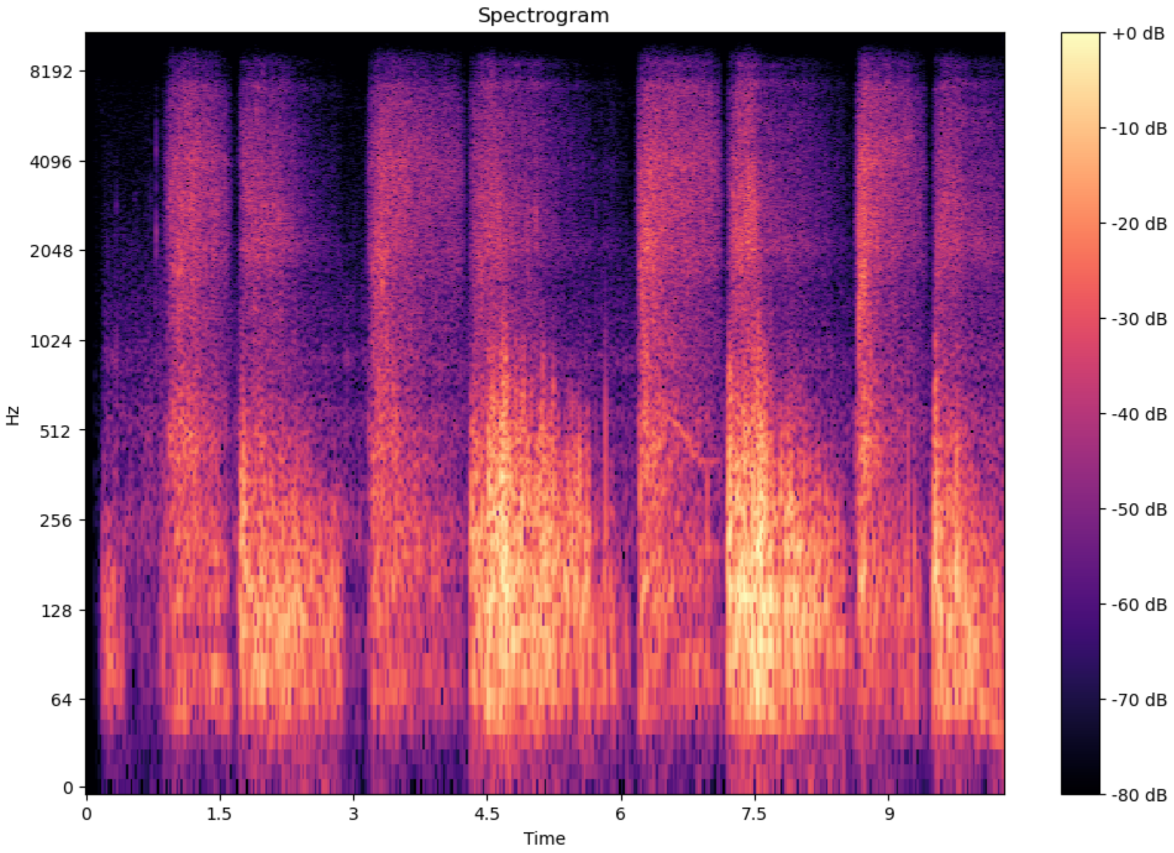
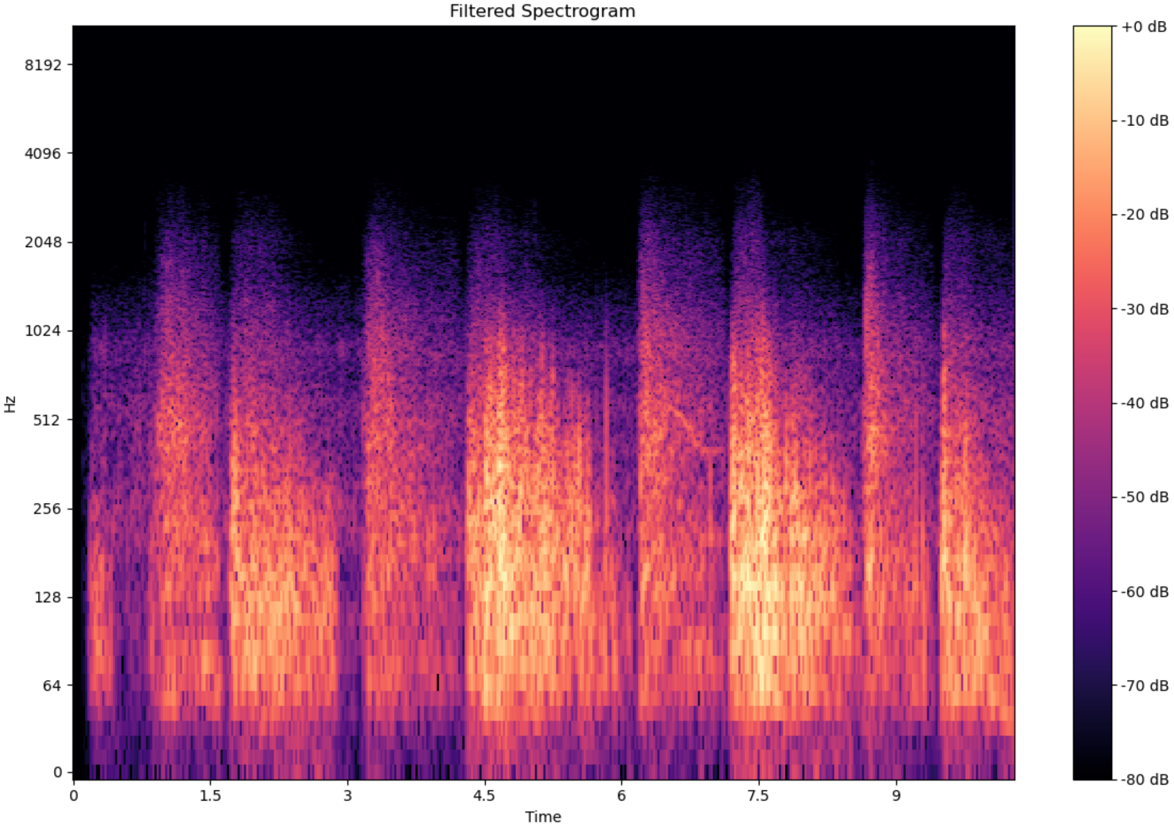


Figure 2

MAKING FILTERED SPECTOGRAM

```
D_filtered = librosa.amplitude_to_db(np.abs(librosa.stft(y_filtered)), ref=np.max)
plt.figure(figsize=(12, 8))
librosa.display.specshow(D_filtered, sr=sr, x_axis='time', y_axis='log')
plt.colorbar(format='%+2.0f dB')
plt.title('Filtered Spectrogram')

plt.tight_layout()
plt.show()
```


Filtered Spectrogram
Hz
8192
4096
2048
1024
512
256
128
64
0
Time
0
1.5
3
4.5
6
7.5
9
+0 dB
-10 dB
-20 dB
-30 dB
-40 dB
-50 dB
-60 dB
-70 dB
-80 dB