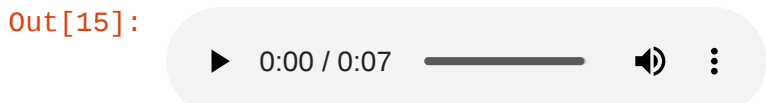


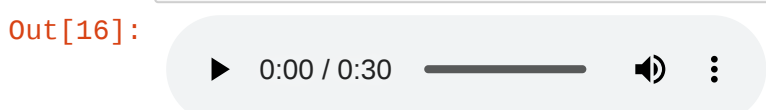
```
In [4]: import numpy as np
import os
import IPython.display as ipd
import librosa
import matplotlib.pyplot as plt
import librosa.display
```

```
In [14]: scale_file = 'scale.wav'
debussy_file = 'debussy.wav'
redhot_file = 'redhot.wav'
duke_file = 'duke.wav'
```

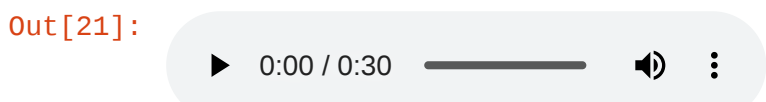
```
In [15]: ipd.Audio(scale_file)
```



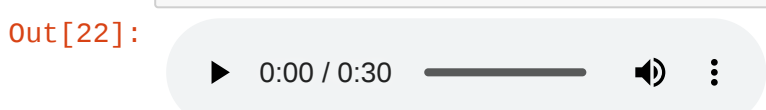
```
In [16]: ipd.Audio(debussy_file)
```



```
In [21]: ipd.Audio('redhot.wav')
```



```
In [22]: ipd.Audio('duke.wav')
```



```
In [24]: scale, sr = librosa.load(scale_file)
debussy, _ = librosa.load(debussy_file)
```

```
In [25]: FRAME_SIZE = 2048
HOP_LENGTH = 512
```

```
In [26]: S_scale = librosa.stft(scale, n_fft=FRAME_SIZE, hop_length=HOP_LENGTH)
```

```
In [27]: S_scale.shape
```

Out[27]: (1025, 342)

```
In [28]: Y_scale = np.abs(S_scale)**2
```

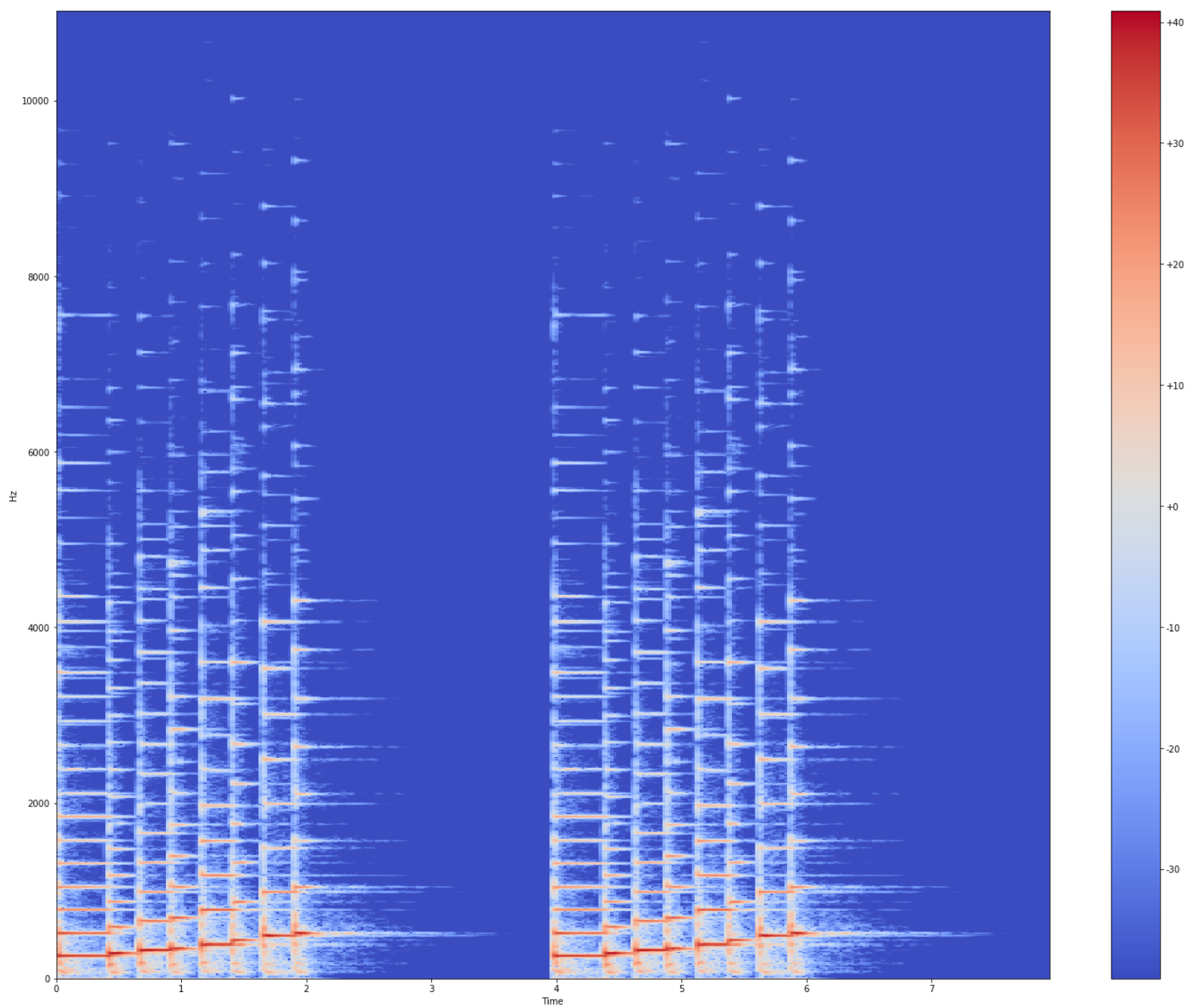
```
In [29]: def plot_spect(Y, sr, hop_length, y_axis='linear'):
plt.figure(figsize=(25,20))
librosa.display.specshow(Y,
                        sr=sr,
                        hop_length=hop_length,
                        x_axis='time',
                        y_axis=y_axis)
plt.colorbar(format="%+2.f")
```

```
In [31]: plot_spect(Y_scale, sr, HOP_LENGTH)
```

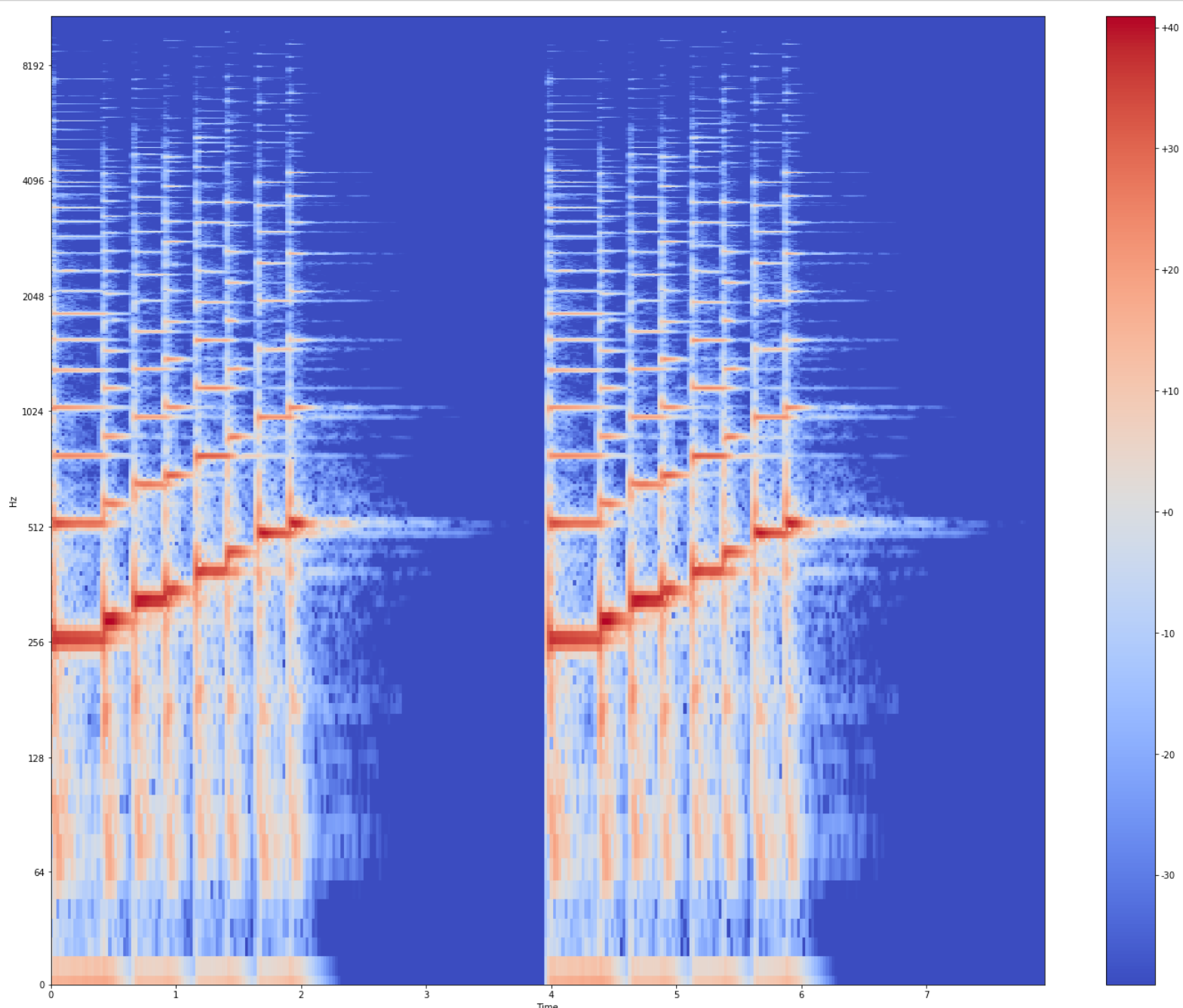


```
In [32]: Y_log_scale = librosa.power_to_db(Y_scale)
```

```
In [34]: plot_spect(Y_log_scale, sr, HOP_LENGTH)
```



```
In [37]: plot_spect(Y_log_scale, sr, HOP_LENGTH, y_axis='log') #log frequency spectrogram
```



```
In [ ]: #mel filter banks
filter_banks = librosa.filters.mel(n_fft=2048,)
```