```
from google.colab import files

# Upload the file
uploaded = files.upload()

# List the uploaded files
for filename in uploaded.keys():
    print(f"Uploaded file: {filename}")
```

```
Choose Files samples.zip
• samples.zip(application/x-zip-compressed) - 48000375 bytes, last modified: 2/27/2025 - 100% done
Saving samples.zip to samples.zip
```

```
import os

# List files in the current directory
print(os.listdir("/content/"))
```

```
['.config', 'samples.zip', 'sample_data']
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
import os

folder_path = "/content/drive/My Drive/jamshiad"  # Adjust if needed

if os.path.exists(folder_path):
    print("Files in the folder:", os.listdir(folder_path))
else:
    print(f"Error: The folder '{folder_path}' does not exist.")
```

```
Files in the folder: []
```

```
# List files in the extracted folder
print(os.listdir(extract_path))
```

```
[]
```

```
!pip install librosa pydub
```

```
Requirement already satisfied: librosa in /usr/local/lib/python3.11/dist-packages (0.10.2.post1)
Collecting pydub
  Downloading pydub-0.25.1-py2.py3-none-any.whl.metadata (1.4 kB)
Requirement already satisfied: audioread>=2.1.9 in /usr/local/lib/python3.11/dist-packages (from librosa) (3.0.1)
Requirement already satisfied: numpy!=1.22.0,!=1.22.1,!=1.22.2,>=1.20.3 in /usr/local/lib/python3.11/dist-packages (from librosa) (1
Requirement already satisfied: scipy>=1.2.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.14.1)
Requirement already satisfied: scikit-learn>=0.20.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.6.1)
Requirement already satisfied: joblib>=0.14 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.4.2)
Requirement already satisfied: decorator>=4.3.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (4.4.2)
Requirement already satisfied: numba>=0.51.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.60.0)
Requirement already satisfied: soundfile>=0.12.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.13.1)
Requirement already satisfied: pooch>=1.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.8.2)
Requirement already satisfied: soxr>=0.3.2 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.5.0.post1)
Requirement already satisfied: typing-extensions>=4.1.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (4.12.2)
Requirement already satisfied: lazy-loader>=0.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.4)
Requirement already satisfied: msgpack>=1.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.1.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.11/dist-packages (from lazy-loader>=0.1->librosa) (24.2)
Requirement already satisfied: llvmlite<0.44,>=0.43.0dev0 in /usr/local/lib/python3.11/dist-packages (from numba>=0.51.0->librosa)
Requirement already satisfied: platformdirs>=2.5.0 in /usr/local/lib/python3.11/dist-packages (from pooch>=1.1->librosa) (4.3.6)
Requirement already satisfied: requests>=2.19.0 in /usr/local/lib/python3.11/dist-packages (from pooch>=1.1->librosa) (2.32.3)
Requirement already satisfied: threadpoolctl>=3.1.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn>=0.20.0->librosa)
Requirement already satisfied: cffi>=1.0 in /usr/local/lib/python3.11/dist-packages (from soundfile>=0.12.1->librosa) (1.17.1)
Requirement already satisfied: pycparser in /usr/local/lib/python3.11/dist-packages (from cffi>=1.0->soundfile>=0.12.1->librosa) (2
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->librosa)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->lib
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->lib
Downloading pydub-0.25.1-py2.py3-none-any.whl (32 kB)
```

```
Installing collected packages: pydub
Successfully installed pydub-0.25.1
```

```
import zipfile

zip_path = "/content/samples.zip"  # Path to the uploaded ZIP file

# Open ZIP and list contents
with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    file_list = zip_ref.namelist()

# Filter audio files
audio_files = [f for f in file_list if f.endswith(('.wav', '.mp3', '.ogg', '.flac'))]

print("Audio files inside ZIP:", audio_files)
```

```
Audio files inside ZIP: ['samples/Tracking (8).wav', '__MACOSX/samples/._Tracking (8).wav', 'samples/Corona (16).wav', '__MACOSX/sam
```

```
import librosa
import numpy as np
from io import BytesIO
from IPython.display import Audio

with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    with zip_ref.open(audio_files[0]) as file:
        audio_data, sr = librosa.load(BytesIO(file.read()), sr=None)

print(f"Loaded {audio_files[0]} with Sample Rate: {sr}")

# Play audio
Audio(audio_data, rate=sr)
```

```
Loaded samples/Tracking (8).wav with Sample Rate: 44100
```

0:00 / 0:27

```
!pip install librosa matplotlib numpy
```

```
Requirement already satisfied: librosa in /usr/local/lib/python3.11/dist-packages (0.10.2.post1)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.11/dist-packages (3.10.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.11/dist-packages (1.26.4)
Requirement already satisfied: audioread>=2.1.9 in /usr/local/lib/python3.11/dist-packages (from librosa) (3.0.1)
Requirement already satisfied: scipy>=1.2.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.14.1)
Requirement already satisfied: scikit-learn>=0.20.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.6.1)
Requirement already satisfied: joblib>=0.14 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.4.2)
Requirement already satisfied: decorator>=4.3.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (4.4.2)
Requirement already satisfied: numba>=0.51.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.60.0)
Requirement already satisfied: soundfile>=0.12.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.13.1)
Requirement already satisfied: pooch>=1.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.8.2)
Requirement already satisfied: soxr>=0.3.2 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.5.0.post1)
Requirement already satisfied: typing-extensions>=4.1.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (4.12.2)
Requirement already satisfied: lazy-loader>=0.1 in /usr/local/lib/python3.11/dist-packages (from librosa) (0.4)
Requirement already satisfied: msgpack>=1.0 in /usr/local/lib/python3.11/dist-packages (from librosa) (1.1.0)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (1.3.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (4.56.0)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (1.4.8)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (24.2)
Requirement already satisfied: pillow>=8 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (11.1.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (3.2.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (2.8.2)
Requirement already satisfied: llvmlite<0.44,>=0.43.0dev0 in /usr/local/lib/python3.11/dist-packages (from numba>=0.51.0->librosa)
Requirement already satisfied: platformdirs>=2.5.0 in /usr/local/lib/python3.11/dist-packages (from pooch>=1.1->librosa) (4.3.6)
Requirement already satisfied: requests>=2.19.0 in /usr/local/lib/python3.11/dist-packages (from pooch>=1.1->librosa) (2.32.3)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
Requirement already satisfied: threadpoolctl>=3.1.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn>=0.20.0->librosa)
Requirement already satisfied: cffi>=1.0 in /usr/local/lib/python3.11/dist-packages (from soundfile>=0.12.1->librosa) (1.17.1)
Requirement already satisfied: pycparser in /usr/local/lib/python3.11/dist-packages (from cffi>=1.0->soundfile>=0.12.1->librosa) (2
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->librosa)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->lib
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.11/dist-packages (from requests>=2.19.0->pooch>=1.1->lib
```

```
import zipfile
import librosa
import numpy as np
from io import BytesIO
import matplotlib.pyplot as plt
import librosa.display

zip_path = "/content/samples.zip"  # Path to the ZIP file

# Open ZIP and list contents
with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    audio_files = [f for f in zip_ref.namelist() if f.endswith(('.wav', '.mp3', '.ogg', '.flac'))]

if not audio_files:
    print("No audio files found in ZIP.")
else:
    print("Processing:", audio_files[0])

    # Read the first audio file from ZIP
    with zipfile.ZipFile(zip_path, 'r') as zip_ref:
        with zip_ref.open(audio_files[0]) as file:
            y, sr = librosa.load(BytesIO(file.read()), sr=None)

print(f"Loaded {audio_files[0]} with Sample Rate: {sr}")
```

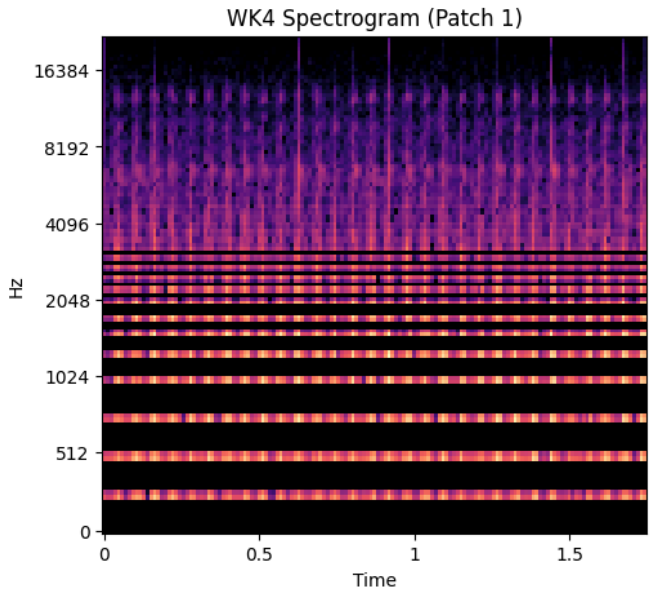
```
Processing: samples/Tracking (8).wav
Loaded samples/Tracking (8).wav with Sample Rate: 44100
```

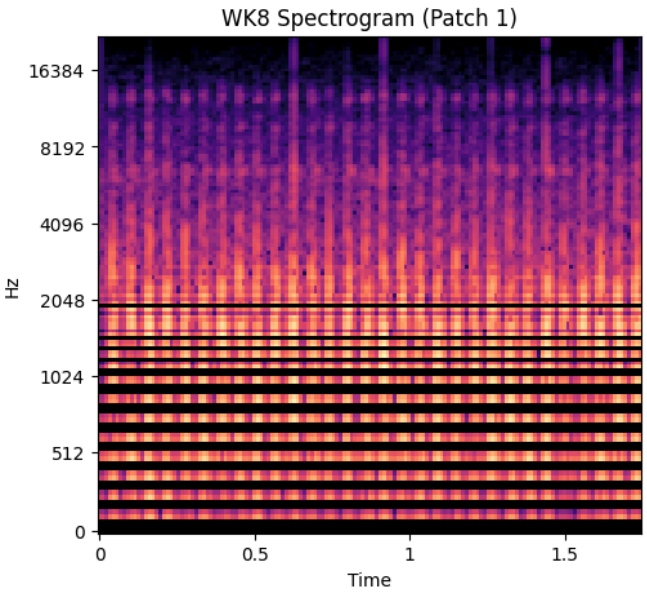
```
patch_duration = 0.3  # Patch length in seconds
overlap = 0.1  # Overlap in seconds
step_size = int(sr * (patch_duration - overlap))  # Step size with overlap
samples_per_patch = int(sr * patch_duration)  # Total samples per patch

# Split the audio into overlapping patches
patches = [y[i : i + samples_per_patch] for i in range(0, len(y) - samples_per_patch, step_size)]

print(f"Total patches created: {len(patches)}")
```

```
Total patches created: 135
```

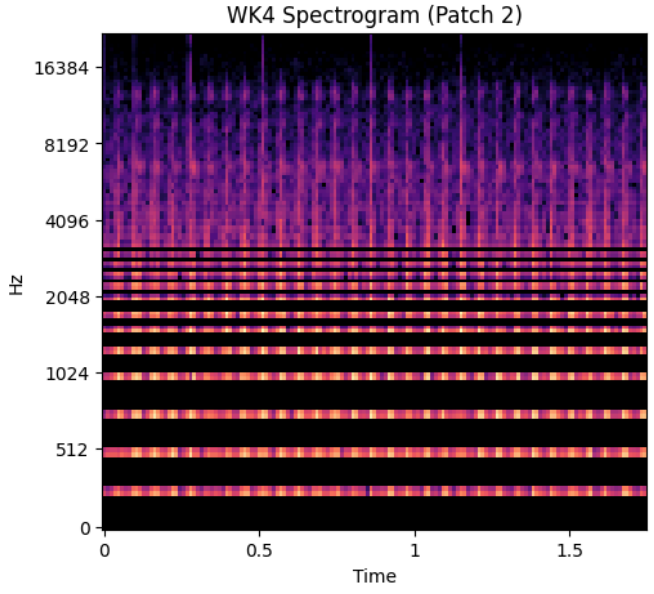
```
import librosa
import librosa.display
import numpy as np
import matplotlib.pyplot as plt

# 🎛️ Parameters
wk4 = int(0.004 * sr)  # 4ms window
wk8 = int(0.008 * sr)  # 8ms window
hop_length_stft = int(0.002 * sr)  # 2ms minor gap

# 🎨 Display Spectrogram Patches with WK4-WK8
for i, patch in enumerate(patches[:135]):  # Display first 135 patches
    plt.figure(figsize=(12, 5))

    # Compute Mel Spectrogram with WK4
    S_wk4 = librosa.feature.melspectrogram(y=patch, sr=sr, n_fft=wk4, hop_length=hop_length_stft)
    S_wk4_db = librosa.power_to_db(S_wk4, ref=np.max)

    # Compute Mel Spectrogram with WK8
    S_wk8 = librosa.feature.melspectrogram(y=patch, sr=sr, n_fft=wk8, hop_length=hop_length_stft)
    S_wk8_db = librosa.power_to_db(S_wk8, ref=np.max)

    # Plot WK4 & WK8 Spectrograms
    fig, ax = plt.subplots(1, 2, figsize=(12, 5))

    librosa.display.specshow(S_wk4_db, sr=sr, x_axis="time", y_axis="mel", ax=ax[0])
    ax[0].set_title(f"WK4 Spectrogram (Patch {i+1})")

    librosa.display.specshow(S_wk8_db, sr=sr, x_axis="time", y_axis="mel", ax=ax[1])
    ax[1].set_title(f"WK8 Spectrogram (Patch {i+1})")

    plt.show()

print(f"✅ Successfully displayed {len(patches[:135])} spectrogram patches with WK4-WK8!")
```

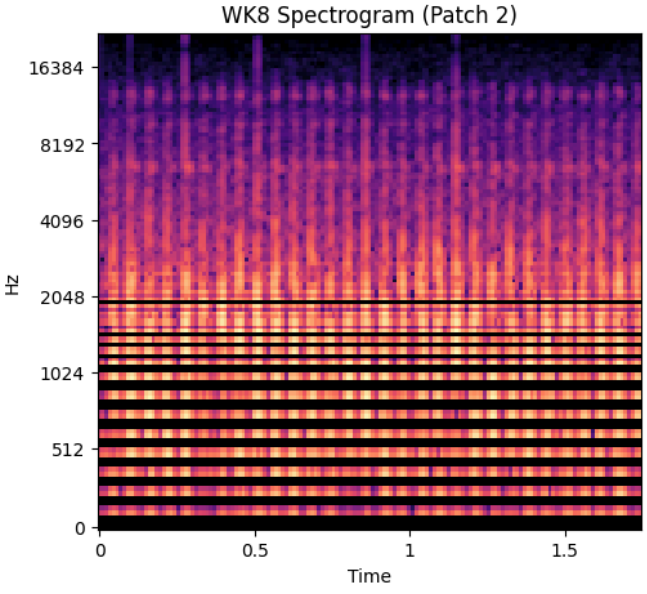
```
/usr/local/lib/python3.11/dist-packages/librosa/feature/spectral.py:2143: UserWarning: Empty filters detected in mel frequency ba
  mel_basis = filters.mel(sr=sr, n_fft=n_fft, **kwargs)
<Figure size 1200x500 with 0 Axes>
```



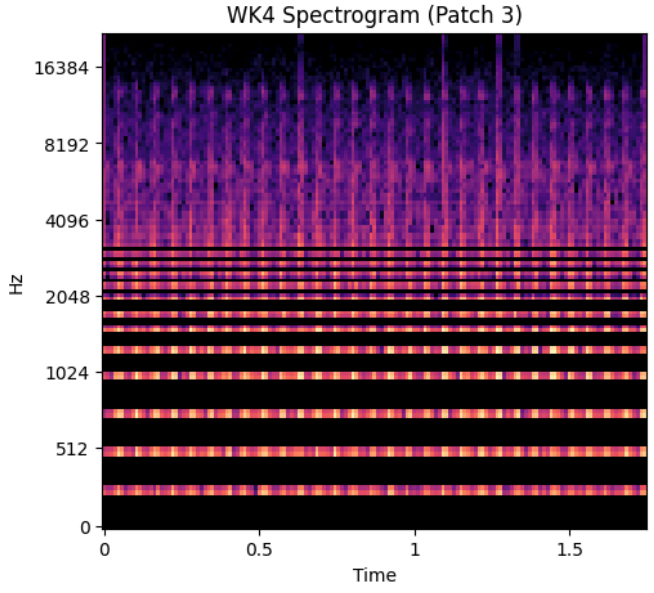


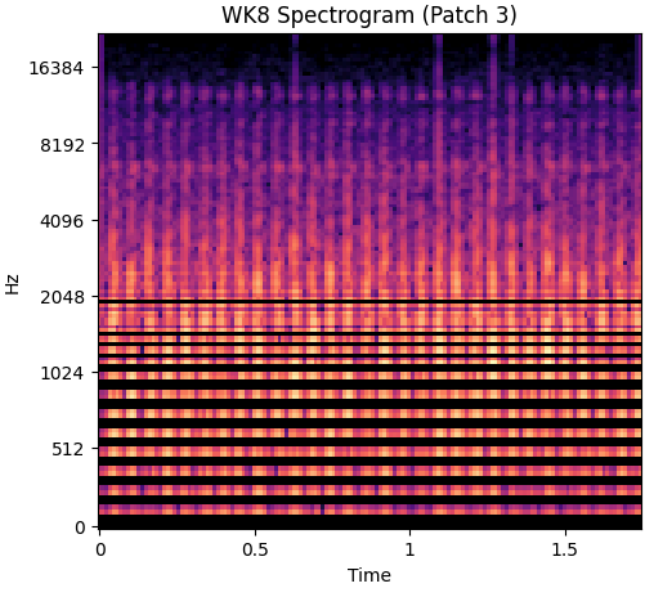

```
<Figure size 1200x500 with 0 Axes>
```



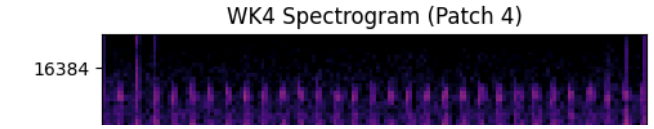


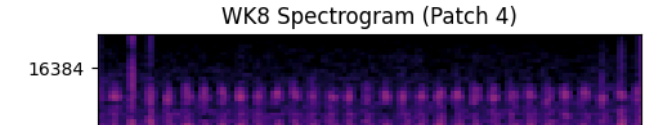

```
<Figure size 1200x500 with 0 Axes>
```

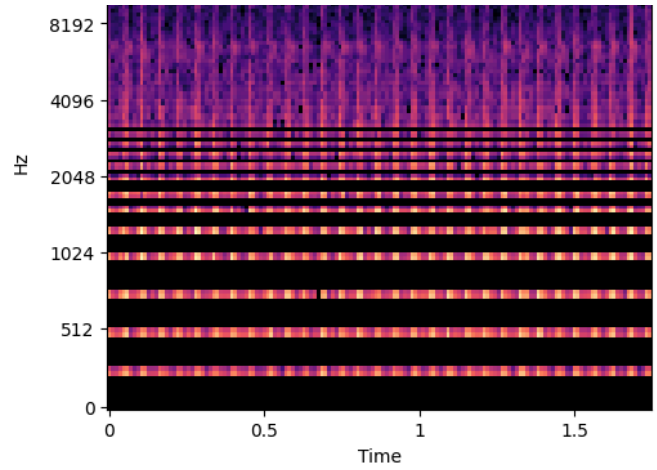


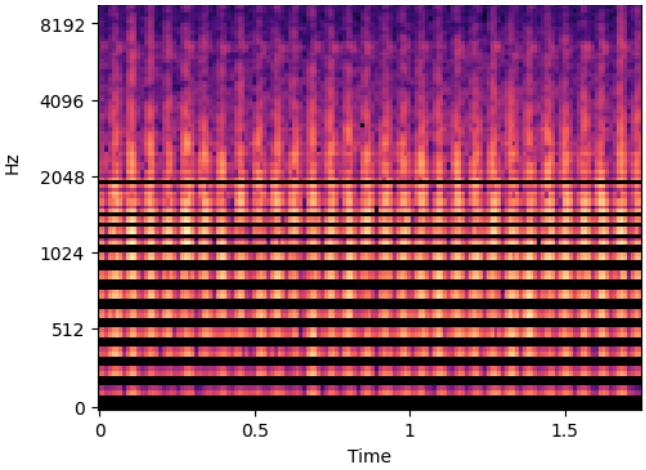



```
<Figure size 1200x500 with 0 Axes>
```

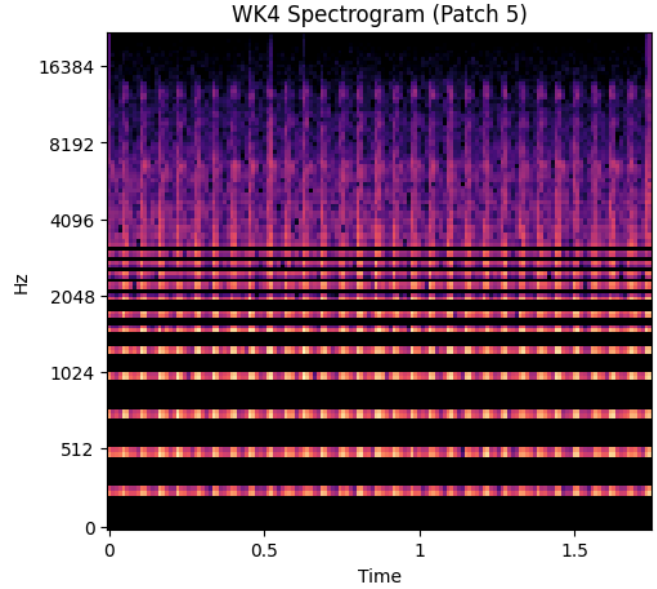


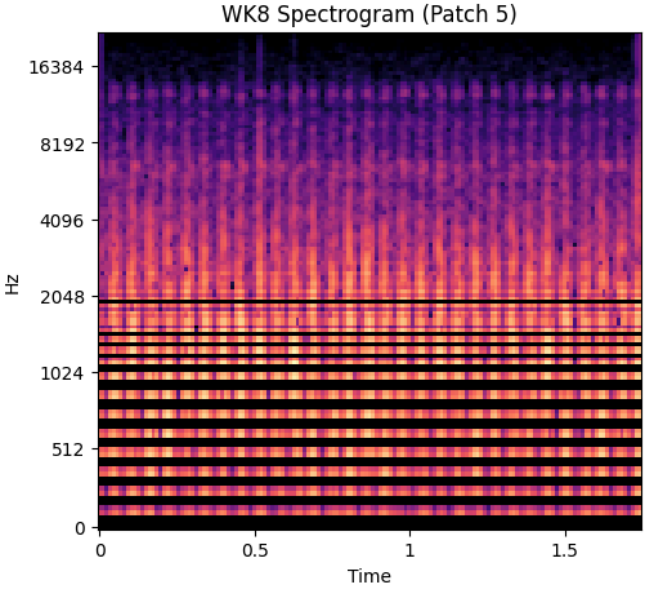




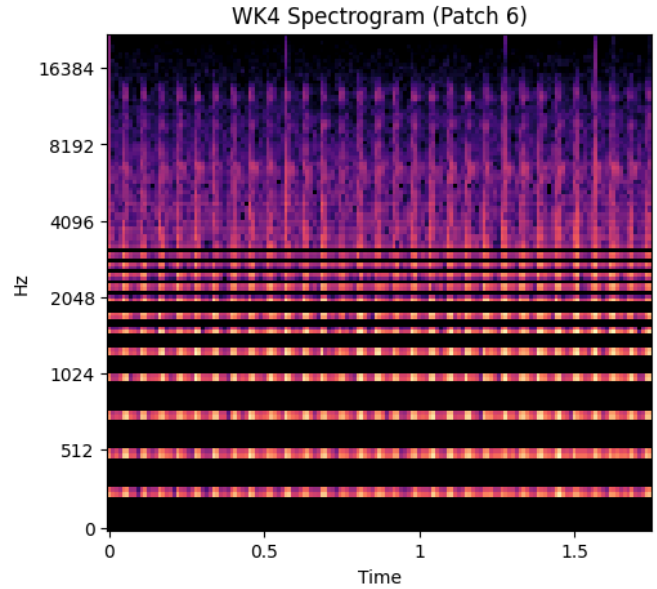


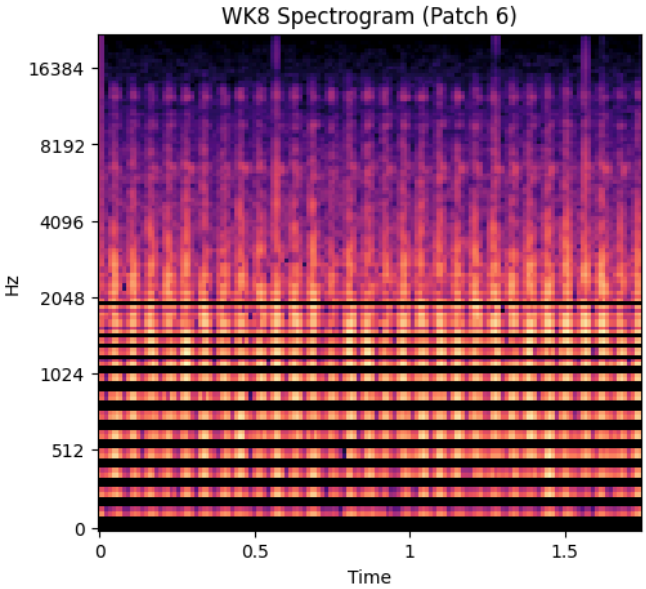
<Figure size 1200x500 with 0 Axes>



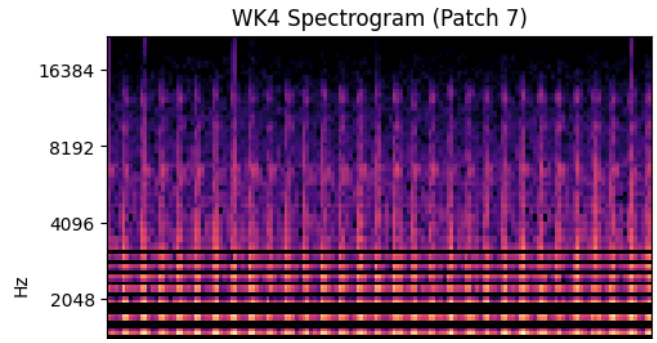


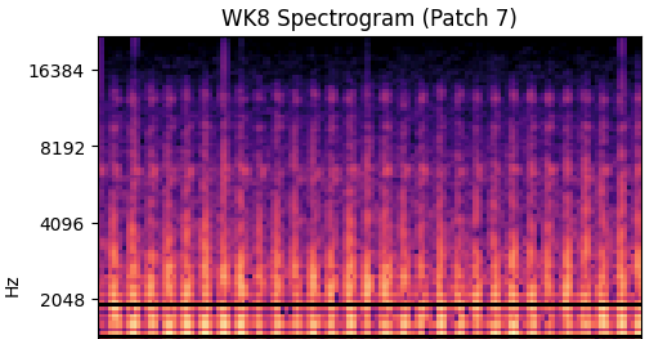
<Figure size 1200x500 with 0 Axes>

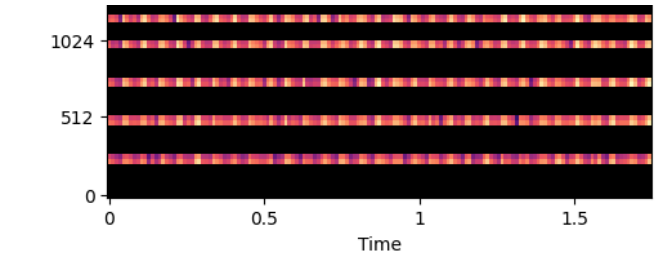


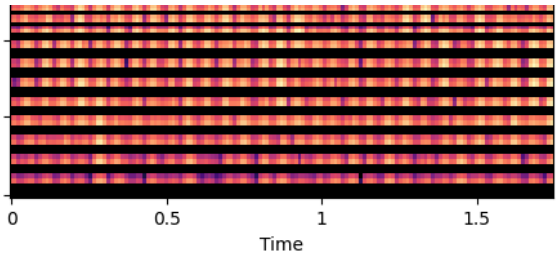


<Figure size 1200x500 with 0 Axes>

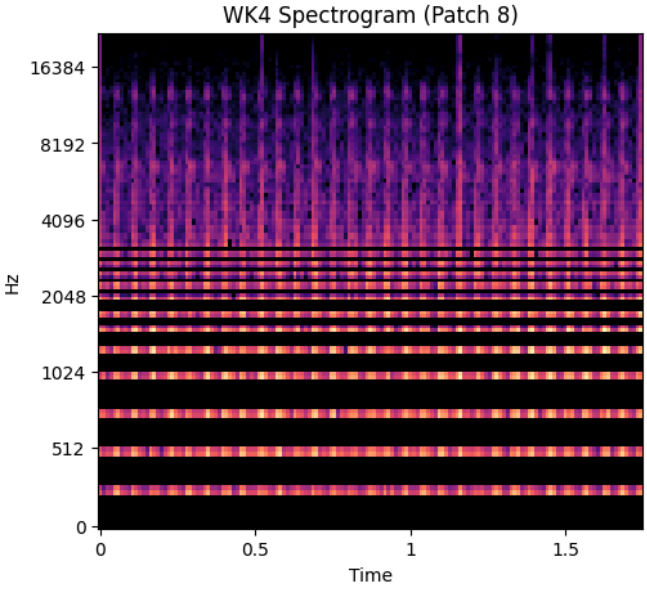


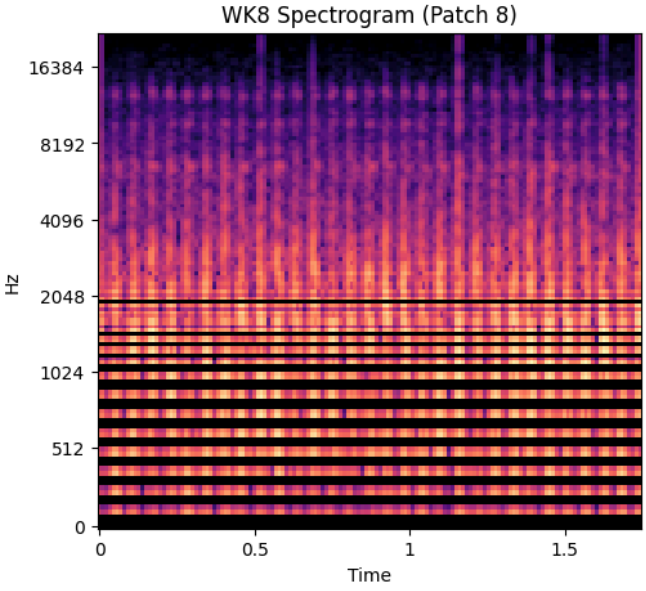




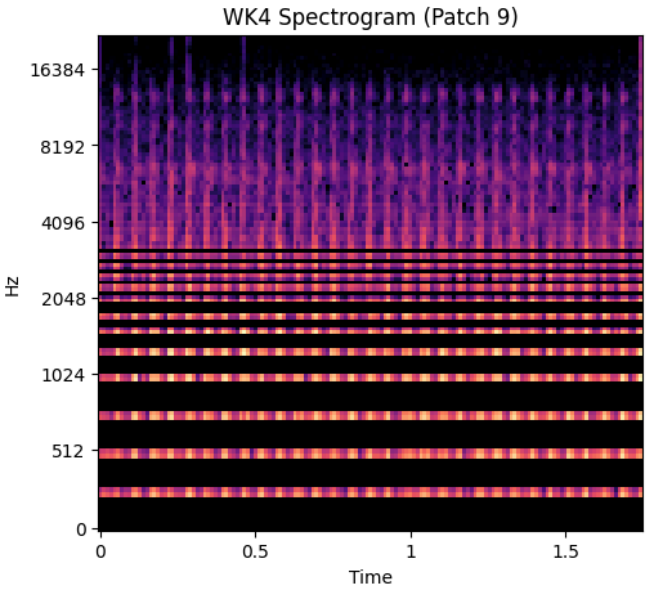


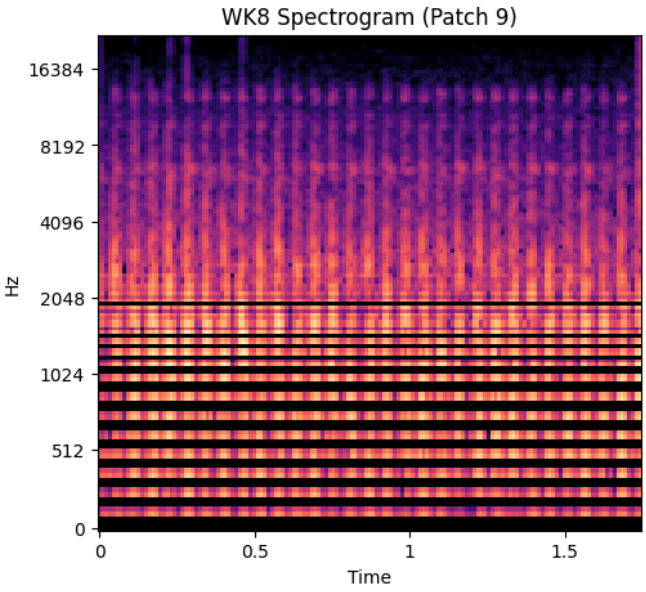
<Figure size 1200x500 with 0 Axes>



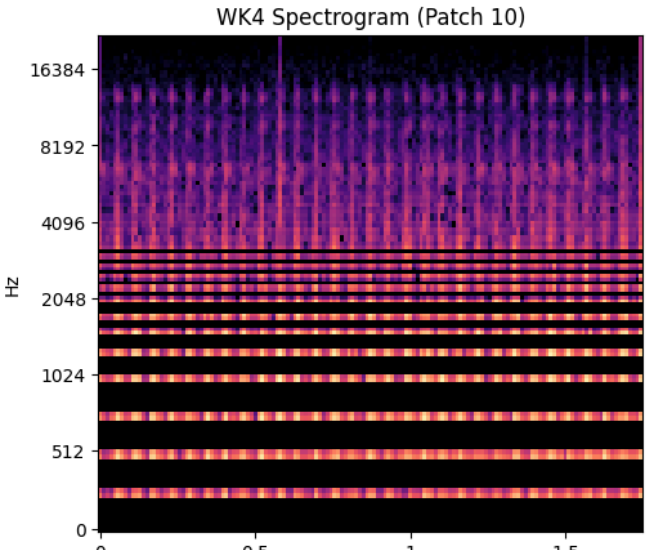


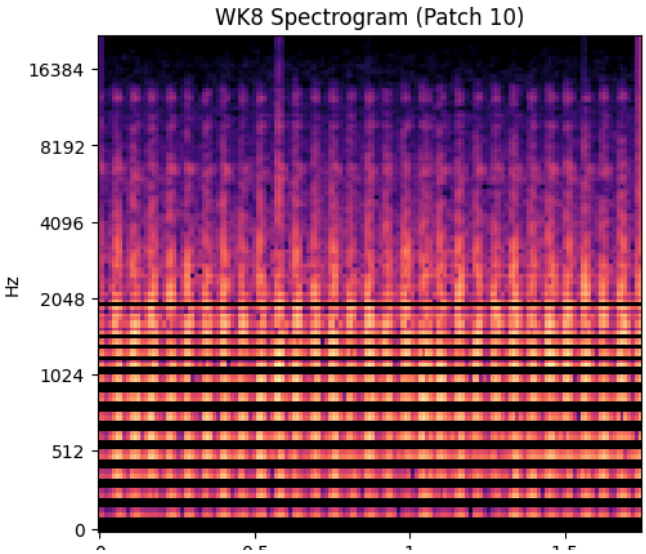
<Figure size 1200x500 with 0 Axes>

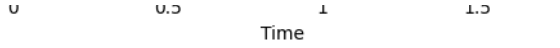




<Figure size 1200x500 with 0 Axes>







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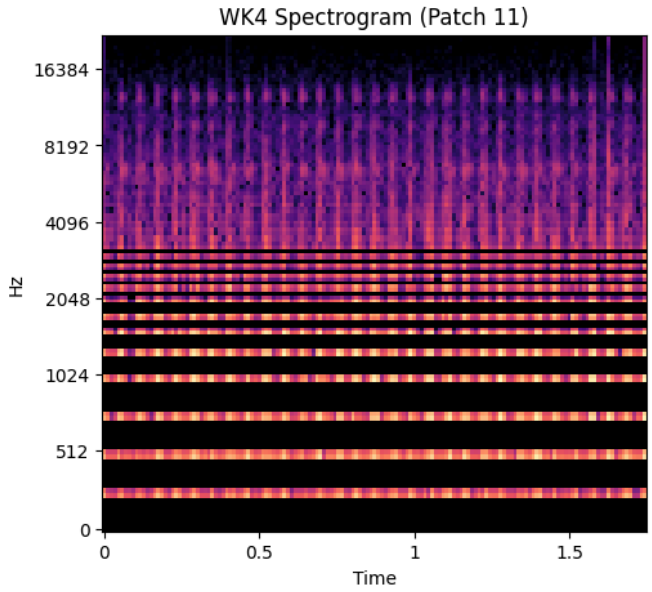

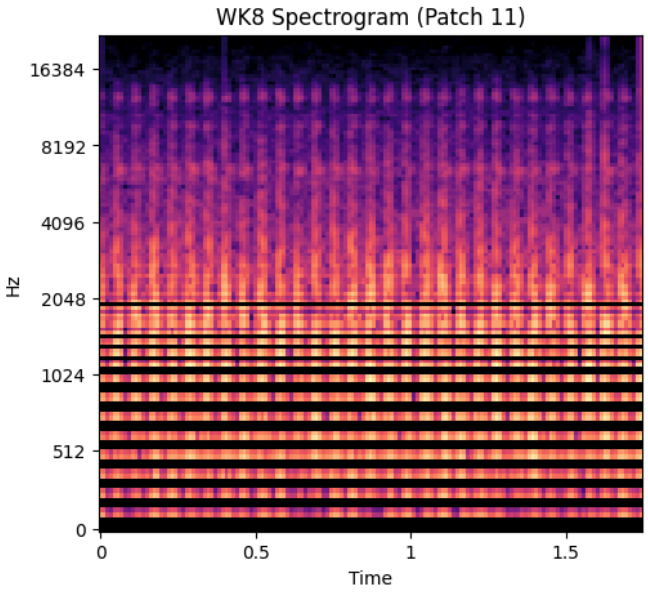

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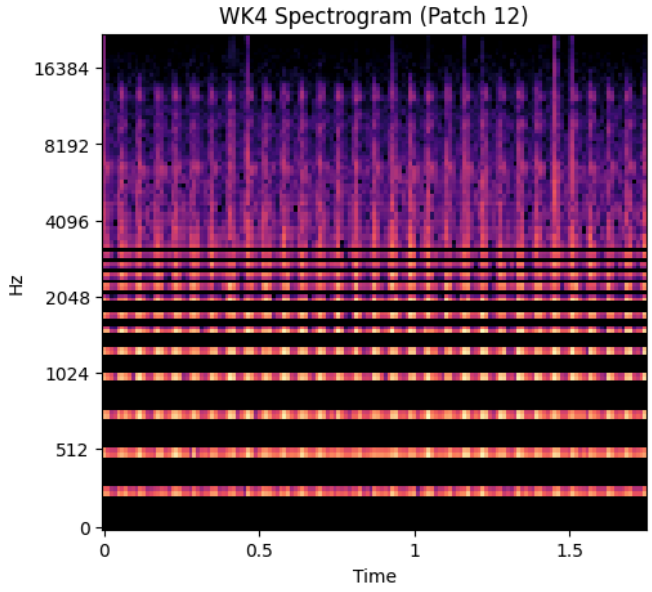

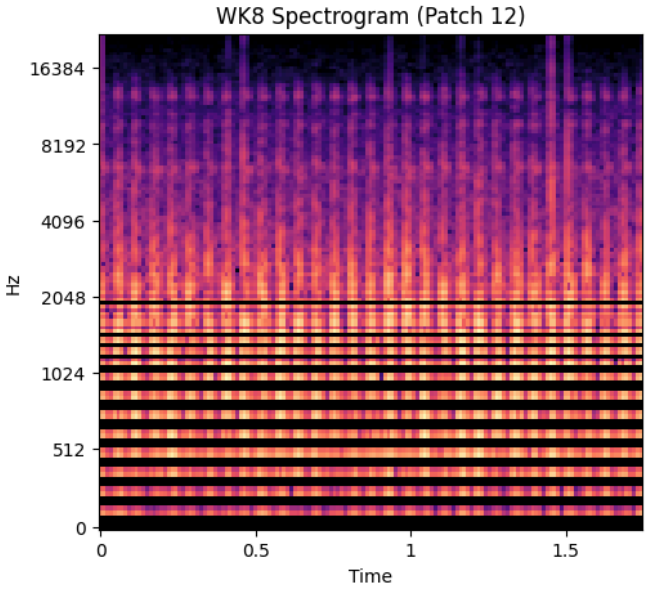

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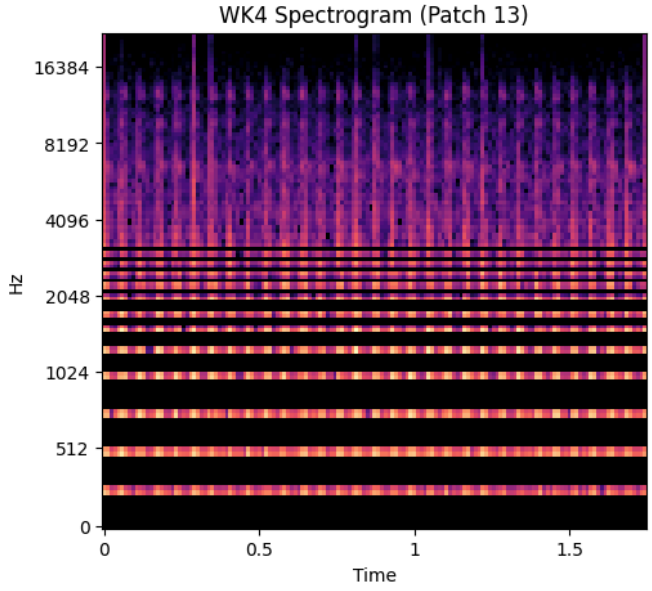

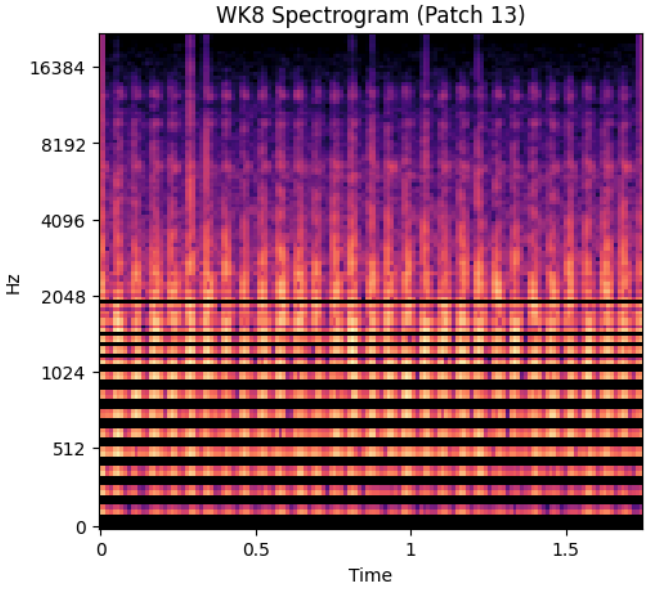

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