

```
In [1]: import pandas as pd
import numpy as np
import os
import seaborn as sns
import matplotlib.pyplot as plt
import librosa
import librosa.display
from IPython.display import Audio
import warnings
warnings.filterwarnings('ignore')
```

```
In [2]: paths = []
labels = []
for dirname, _, filenames in os.walk('Heartbeat Dataset'):
    for filename in filenames:
        paths.append(os.path.join(dirname, filename))
        label = filename.split('_')[0]
        label = label.split('.')[0]
        labels.append(label.lower())
    if len(paths) == 832:
        break
print('Dataset is Loaded')
```

Dataset is Loaded

```
In [3]: len(paths)
```

```
Out[3]: 832
```

```
In [4]: paths[:5]
```

```
Out[4]: ['Heartbeat Dataset\\set_a\\artifact__201012172012.wav',
'Heartbeat Dataset\\set_a\\artifact__201105040918.wav',
'Heartbeat Dataset\\set_a\\artifact__201105041959.wav',
'Heartbeat Dataset\\set_a\\artifact__201105051017.wav',
'Heartbeat Dataset\\set_a\\artifact__201105060108.wav']
```

```
In [5]: labels[:5]
```

```
Out[5]: ['artifact', 'artifact', 'artifact', 'artifact', 'artifact']
```

```
In [6]: df = pd.DataFrame()
df['sound'] = paths
df['label'] = labels
```

```
In [7]: df.head()
```

```
Out[7]:
```

	sound	label
0	Heartbeat Dataset\set_a\artifact__201012172012...	artifact
1	Heartbeat Dataset\set_a\artifact__201105040918...	artifact
2	Heartbeat Dataset\set_a\artifact__201105041959...	artifact
3	Heartbeat Dataset\set_a\artifact__201105051017...	artifact
4	Heartbeat Dataset\set_a\artifact__201105060108...	artifact

```
In [8]: df.tail()
```

```
Out[8]:
```

	sound	label
827	Heartbeat Dataset\set_b\normal__296_1311682952...	normal
828	Heartbeat Dataset\set_b\normal__296_1311682952...	normal
829	Heartbeat Dataset\set_b\normal__298_1311685888...	normal
830	Heartbeat Dataset\set_b\normal__299_1311770522...	normal
831	Heartbeat Dataset\set_b\normal__300_1311772096...	normal

```
In [9]: df.sample(10)
```

Out[9]:

	sound	label
690	Heartbeat Dataset\set_b\normal__150_1306776340...	normal
667	Heartbeat Dataset\set_b\normal__139_1306519274...	normal
691	Heartbeat Dataset\set_b\normal__151_1306779785...	normal
75	Heartbeat Dataset\set_a\murmur__201101051114.wav	murmur
226	Heartbeat Dataset\set_b\Bunlabelledtest__139_1...	bunlabelledtest
479	Heartbeat Dataset\set_b\murmur__197_1308141235...	murmur
388	Heartbeat Dataset\set_b\extrastole__194_130813...	extrastole
158	Heartbeat Dataset\set_a\unlabelledtest__201108...	unlabelledtest
125	Heartbeat Dataset\set_a\normal__201105021654.wav	normal
826	Heartbeat Dataset\set_b\normal__295_1311682673...	normal

In [10]: df.sample(30)

Out[10]:

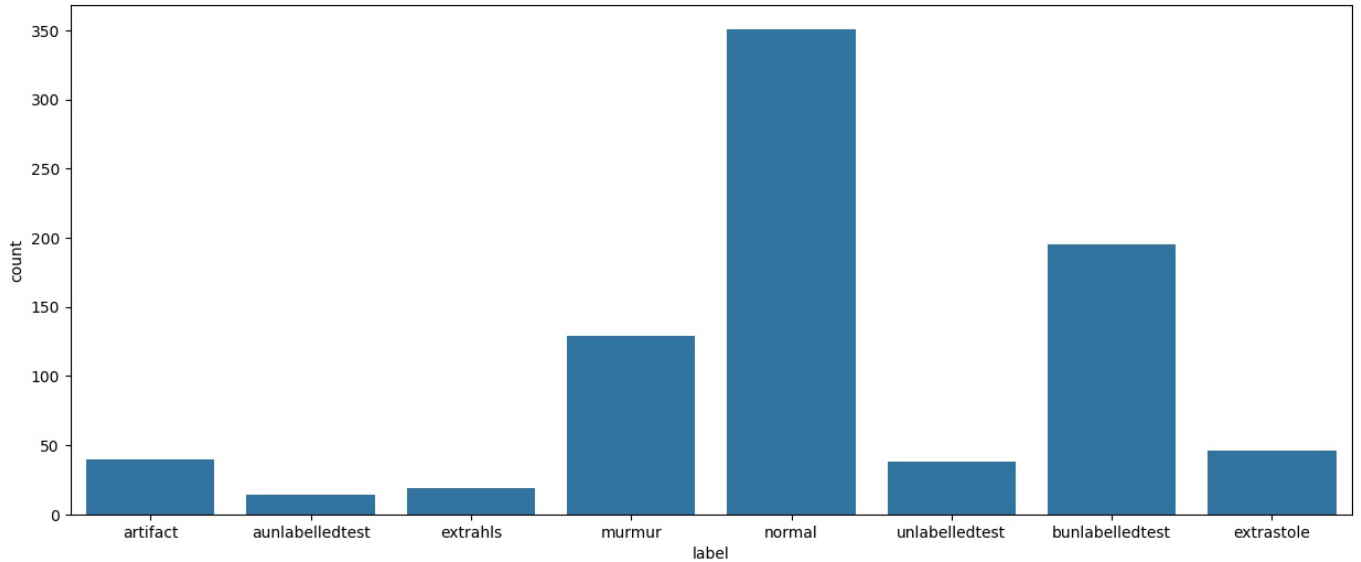
	sound	label
200	Heartbeat Dataset\set_b\Bunlabelledtest__118_1...	bunlabelledtest
519	Heartbeat Dataset\set_b\normal_noisynormal_108...	normal
663	Heartbeat Dataset\set_b\normal__134_1306428161...	normal
271	Heartbeat Dataset\set_b\Bunlabelledtest__169_1...	bunlabelledtest
806	Heartbeat Dataset\set_b\normal__270_1309369533...	normal
51	Heartbeat Dataset\set_a\Aunlabelledtest__20110...	aunlabelledtest
669	Heartbeat Dataset\set_b\normal__140_1306519735...	normal
381	Heartbeat Dataset\set_b\extrastole__153_130684...	extrastole
286	Heartbeat Dataset\set_b\Bunlabelledtest__180_1...	bunlabelledtest
9	Heartbeat Dataset\set_a\artifact__201106010602...	artifact
679	Heartbeat Dataset\set_b\normal__146_1306778707...	normal
736	Heartbeat Dataset\set_b\normal__179_1307990076...	normal
495	Heartbeat Dataset\set_b\murmur__244_1309198148...	murmur
183	Heartbeat Dataset\set_b\Bunlabelledtest__106_1...	bunlabelledtest
258	Heartbeat Dataset\set_b\Bunlabelledtest__159_1...	bunlabelledtest
788	Heartbeat Dataset\set_b\normal__232_1308748524...	normal
489	Heartbeat Dataset\set_b\murmur__239_1309195730...	murmur
86	Heartbeat Dataset\set_a\murmur__201108222224.wav	murmur
462	Heartbeat Dataset\set_b\murmur__165_1307109069...	murmur
143	Heartbeat Dataset\set_a\unlabelledtest__201106...	unlabelledtest
530	Heartbeat Dataset\set_b\normal_noisynormal_115...	normal
410	Heartbeat Dataset\set_b\extrastole__261_130935...	extrastole
331	Heartbeat Dataset\set_b\Bunlabelledtest__237_1...	bunlabelledtest
700	Heartbeat Dataset\set_b\normal__154_1306935608...	normal
641	Heartbeat Dataset\set_b\normal__107_1305654946...	normal
78	Heartbeat Dataset\set_a\murmur__201102052338.wav	murmur
195	Heartbeat Dataset\set_b\Bunlabelledtest__115_1...	bunlabelledtest
742	Heartbeat Dataset\set_b\normal__183_1308072703...	normal
603	Heartbeat Dataset\set_b\normal_noisynormal_173...	normal
142	Heartbeat Dataset\set_a\unlabelledtest__201106...	unlabelledtest

In [11]: df['label'].value_counts()

```
Out[11]: label
normal                351
bunlabelledtest       195
murmur                129
extrastole            46
artifact              40
unlabelledtest        38
extrahls              19
aunlabelledtest       14
Name: count, dtype: int64
```

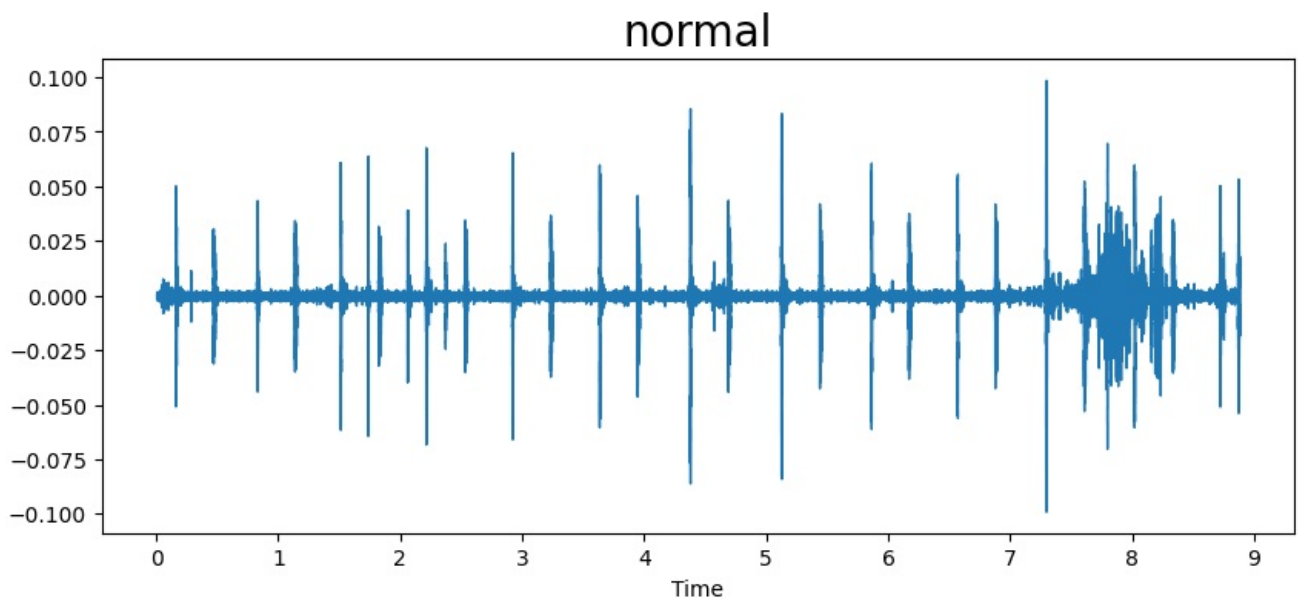
```
In [12]: plt.figure(figsize=(15, 6))
sns.countplot(data=df, x='label')
```

```
Out[12]: <Axes: xlabel='label', ylabel='count'>
```

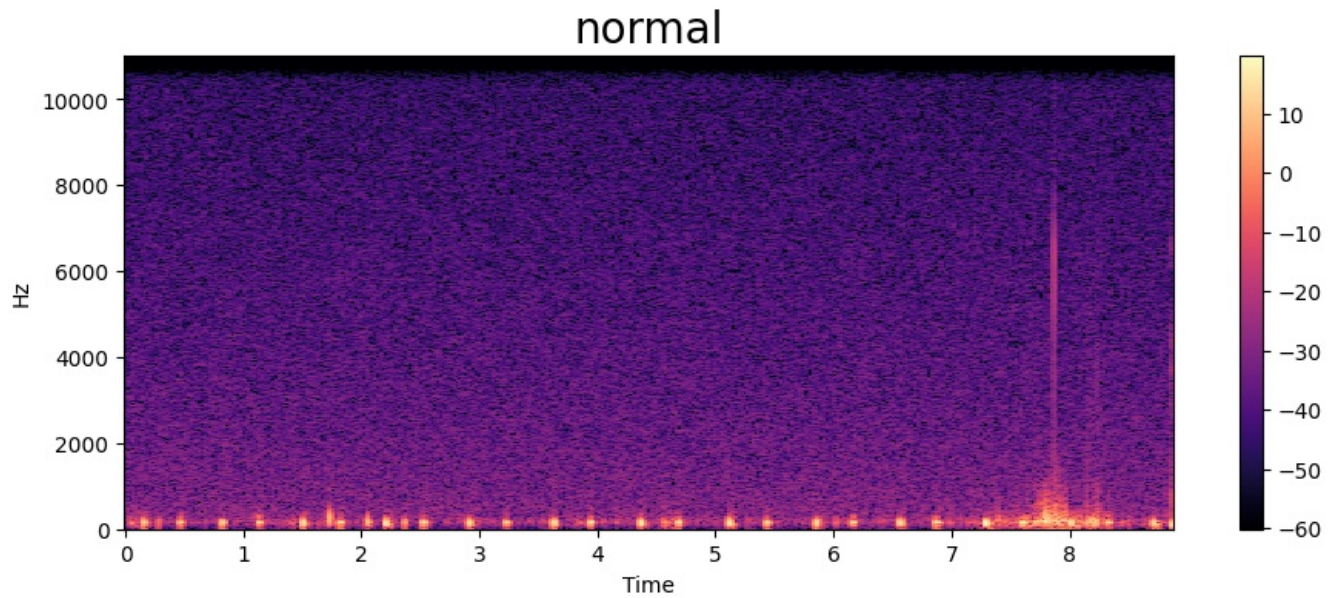


```
In [13]: def waveplot(data, sr, audio):
plt.figure(figsize=(10,4))
plt.title(audio, size=20)
librosa.display.waveshow(data, sr=sr)
plt.show()
def spectrogram(data, sr, audio):
x = librosa.stft(data)
xdb = librosa.amplitude_to_db(abs(x))
plt.figure(figsize=(11,4))
plt.title(audio, size=20)
librosa.display.specshow(xdb, sr=sr, x_axis='time', y_axis='hz')
plt.colorbar()
```

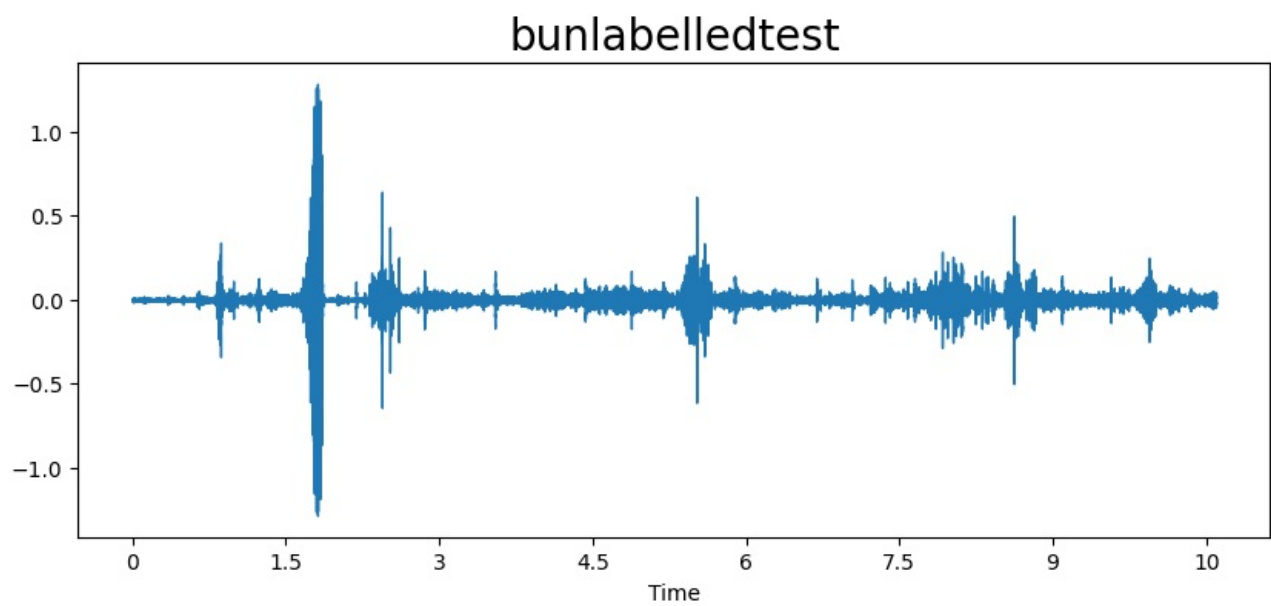
```
In [14]: audio = 'normal'
path = np.array(df['sound'])[df['label']==audio][0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```



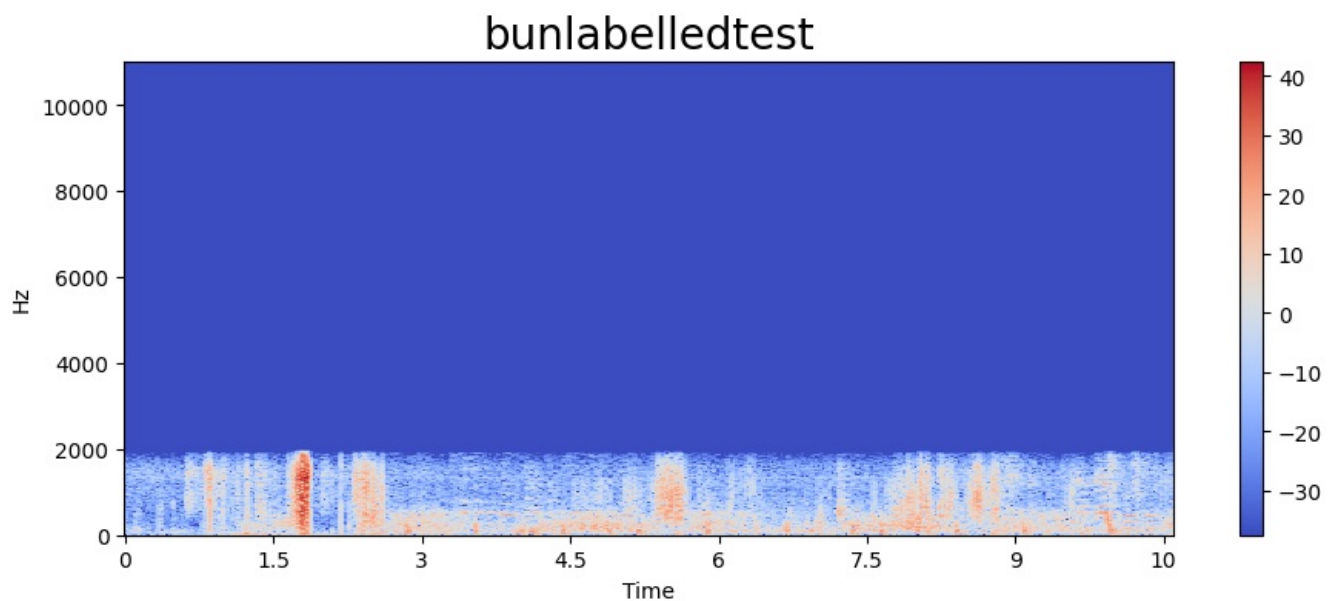
Out[14]: Your browser does not support the audio element.



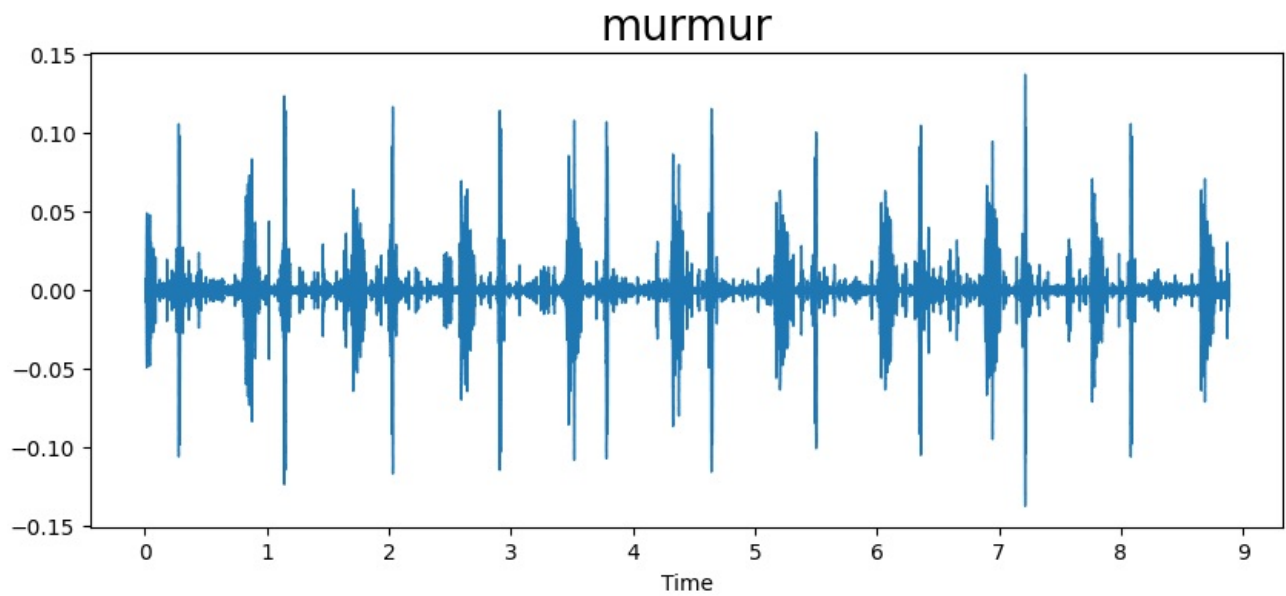
```
In [15]: audio = 'bunlabelledtest'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```



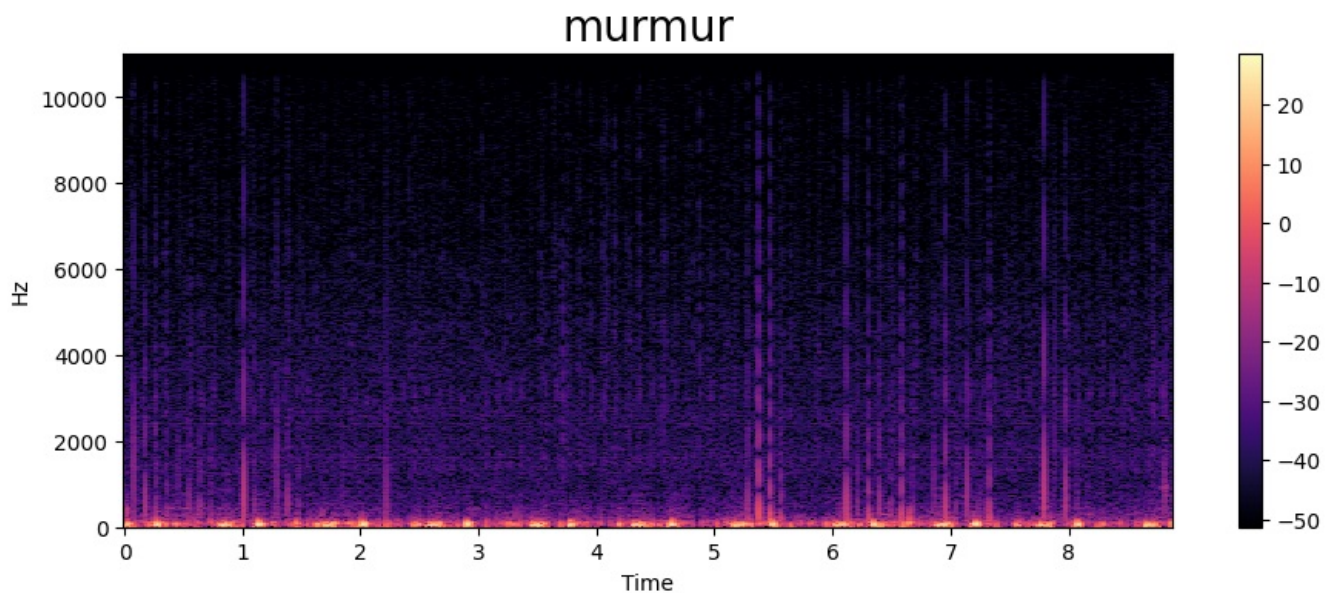
Out[15]: Your browser does not support the audio element.



```
In [16]: audio = 'murmur'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```

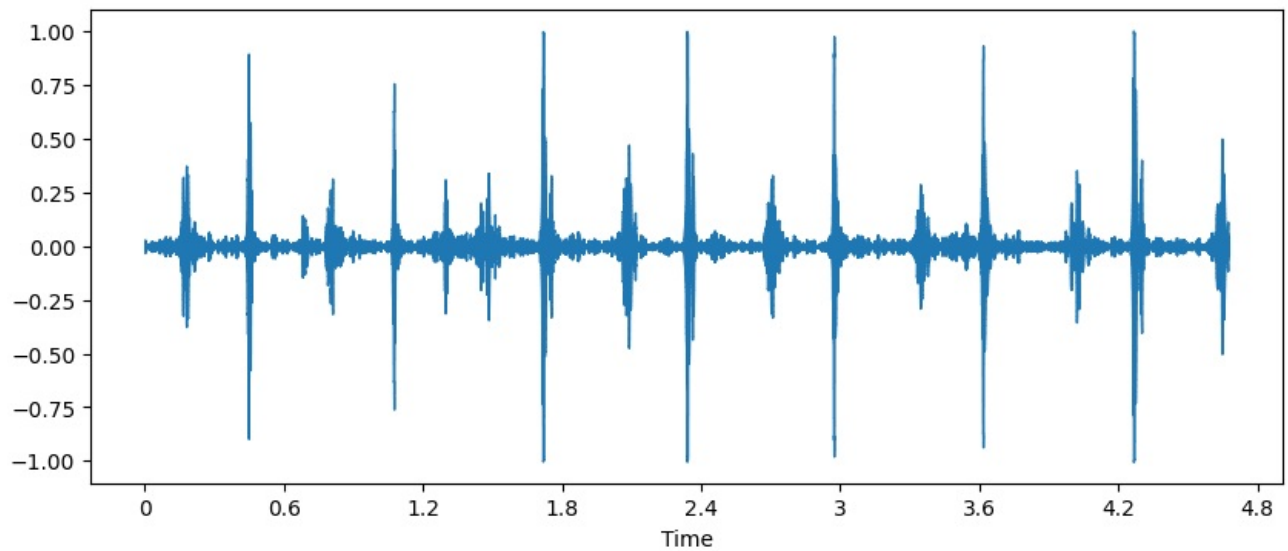


Out[16]: Your browser does not support the audio element.



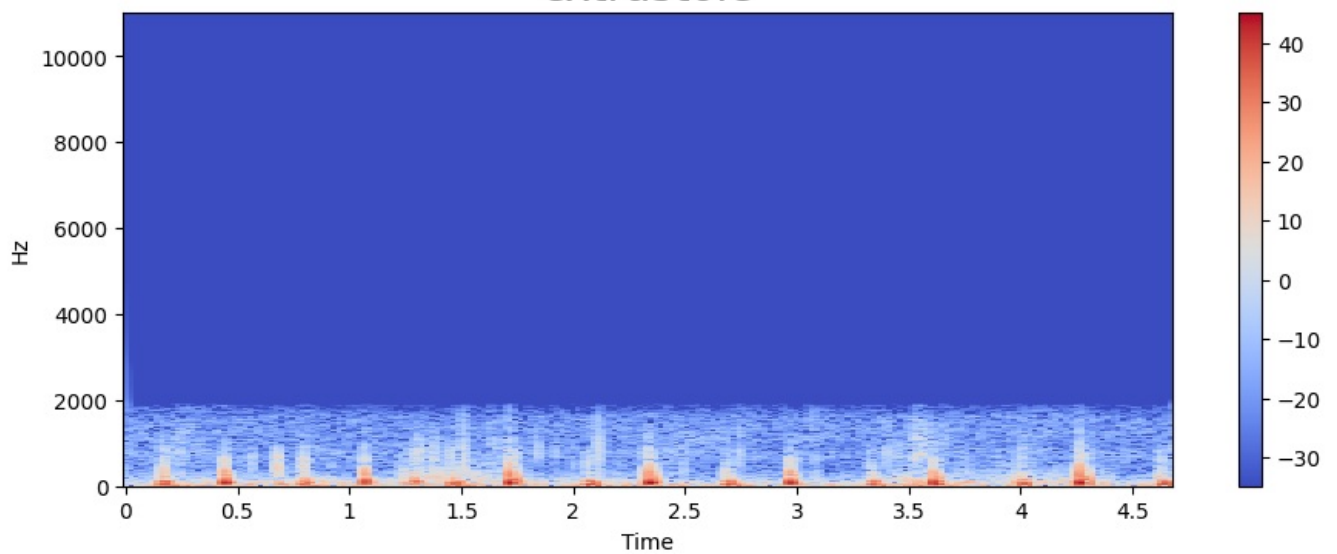
```
In [17]: audio = 'extrastole'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```


extrastole



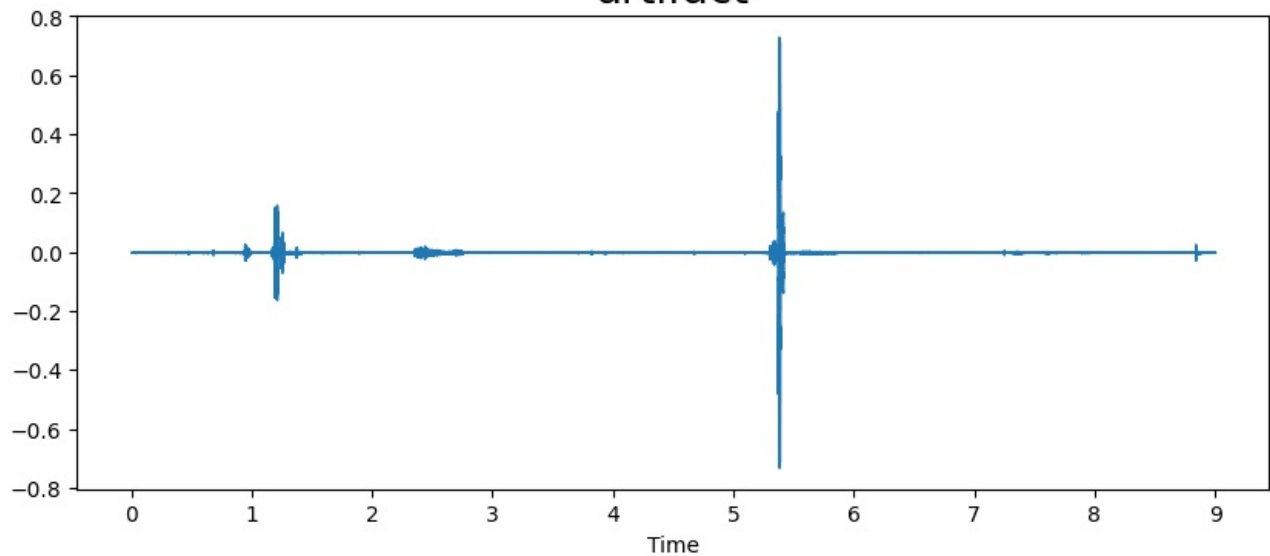
Out[17]: Your browser does not support the audio element.

extrastole

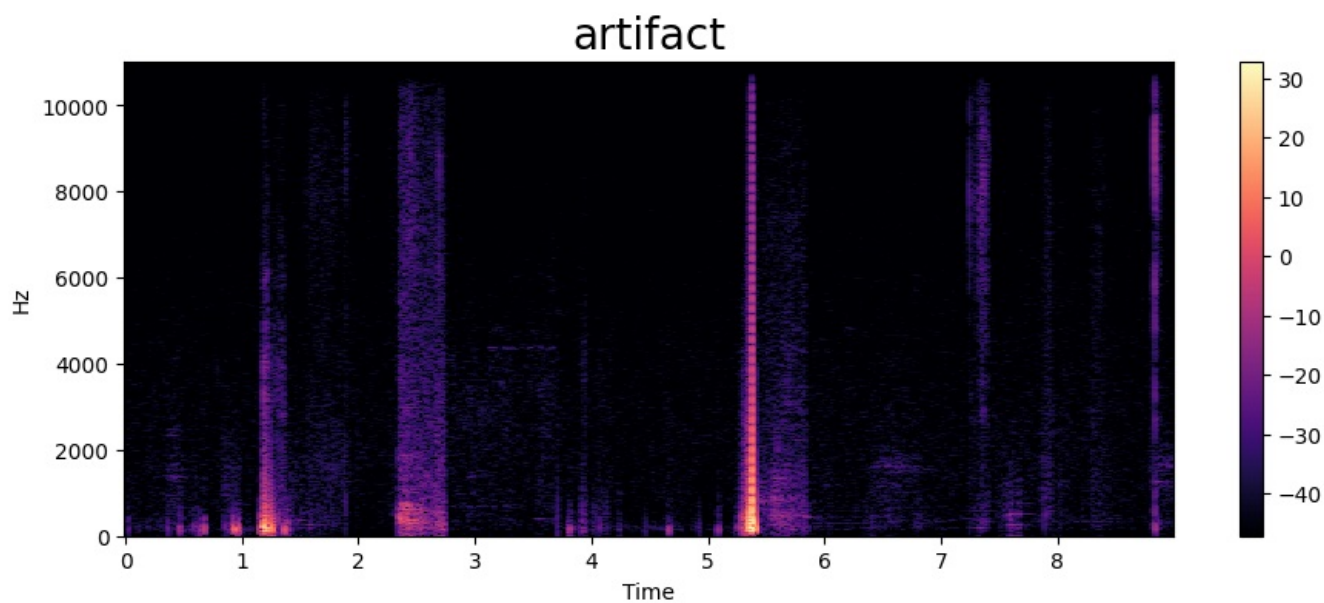


```
In [18]: audio = 'artifact'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```

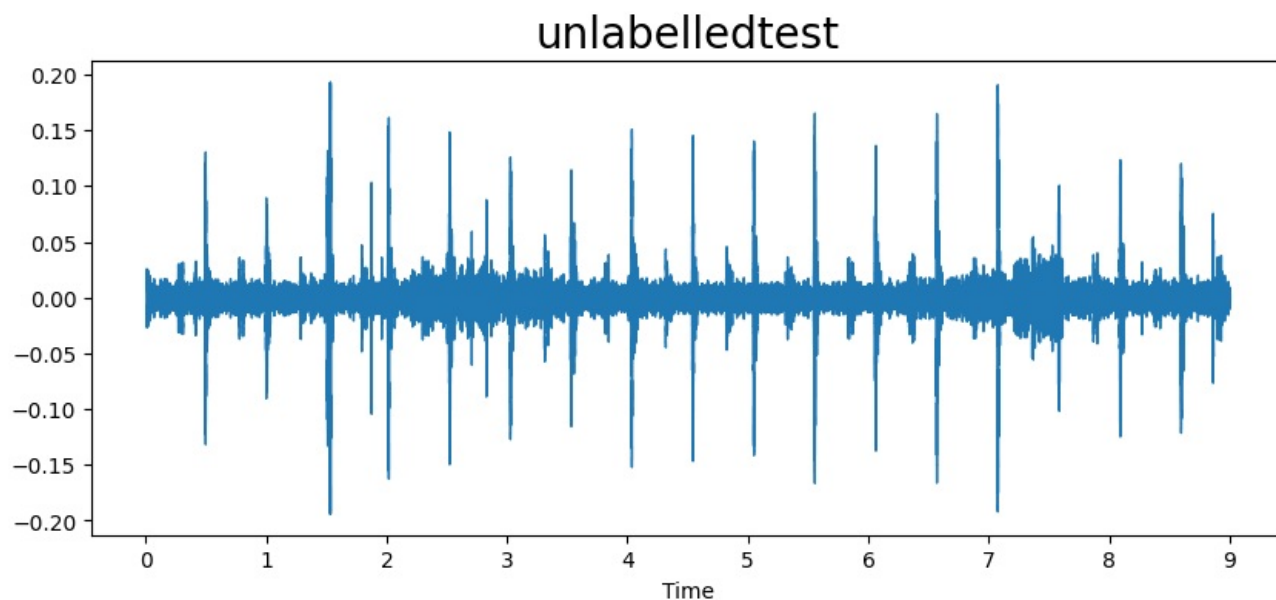
artifact



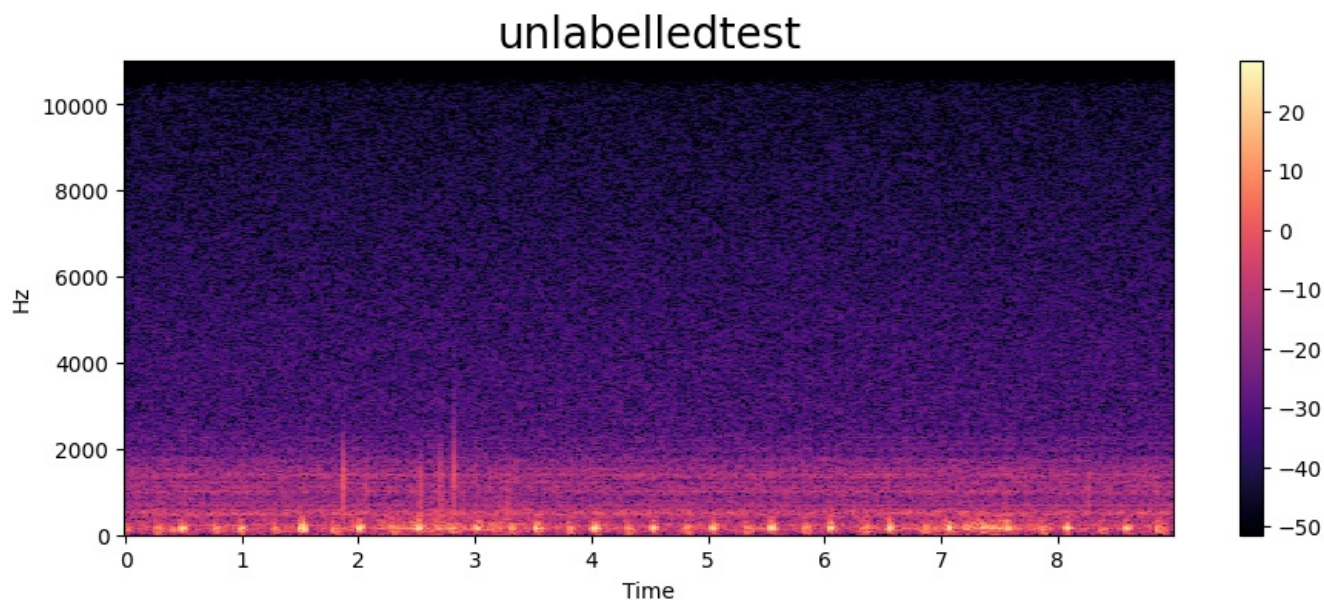
Out[18]: Your browser does not support the audio element.



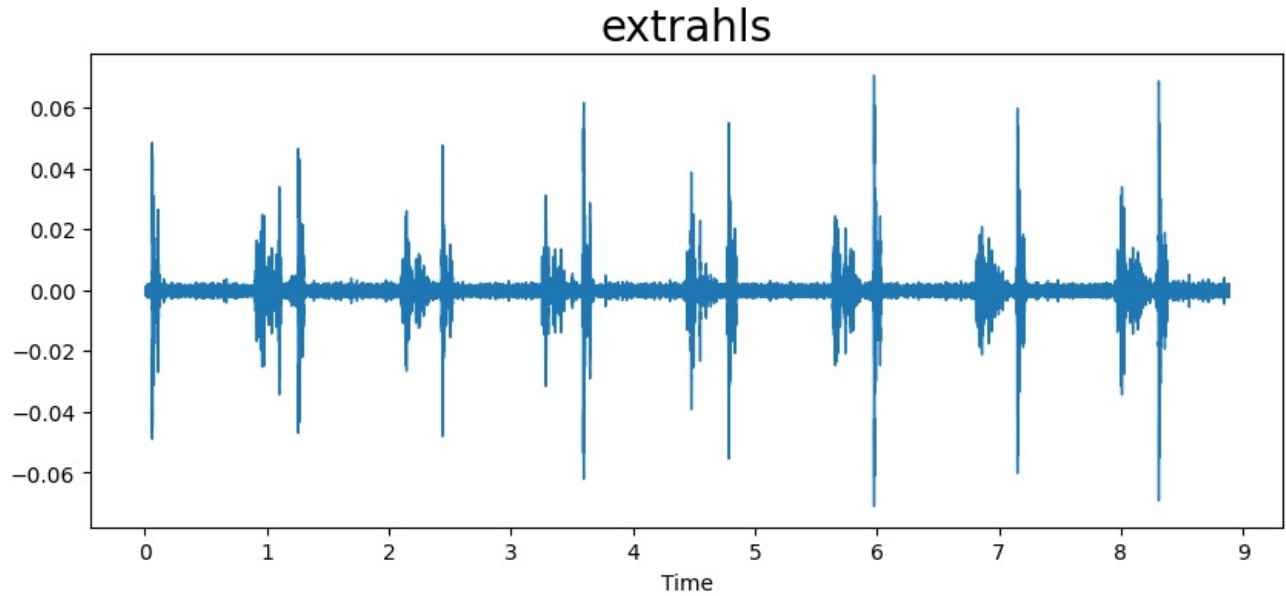
```
In [19]: audio = 'unlabelledtest'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```



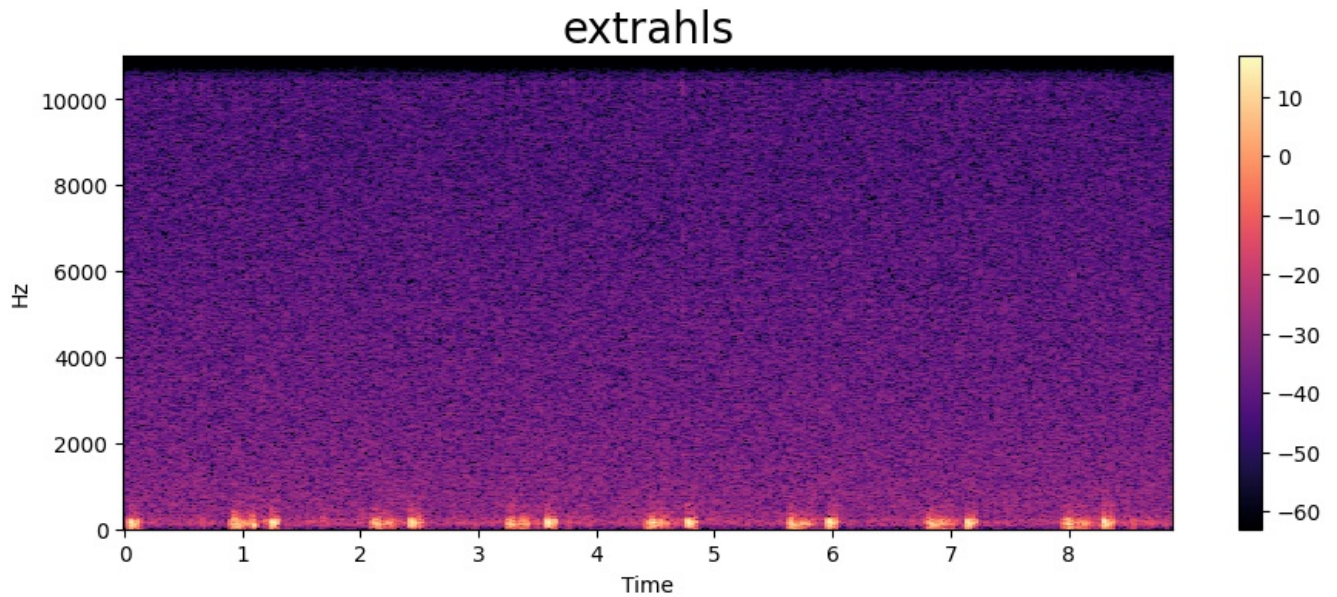
Out[19]: Your browser does not support the audio element.



```
In [20]: audio = 'extrahls'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```

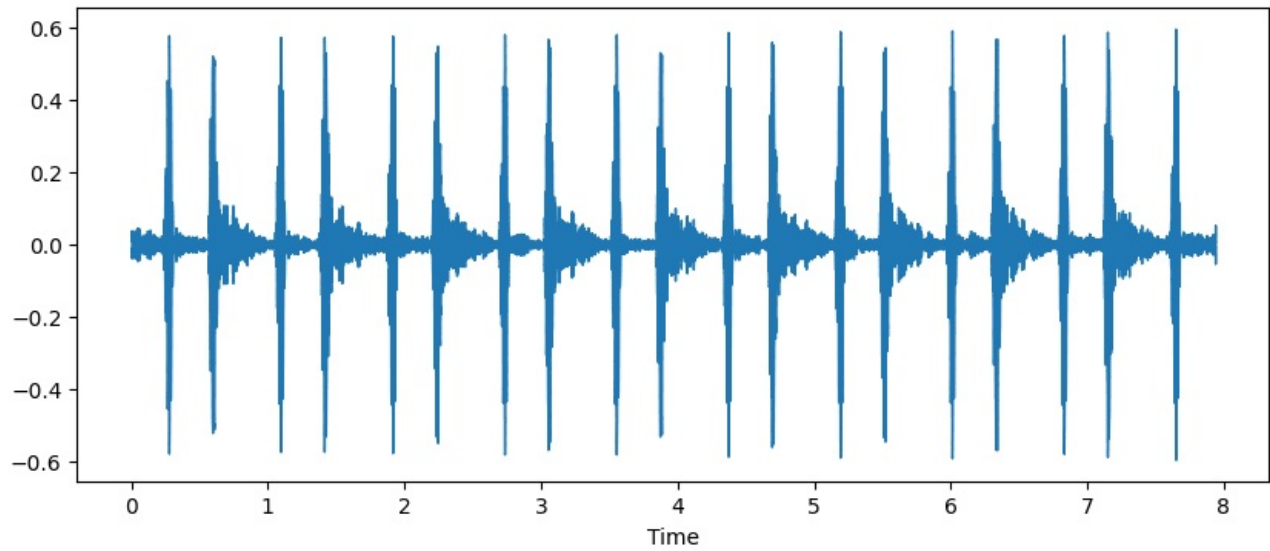


Out[20]: Your browser does not support the audio element.



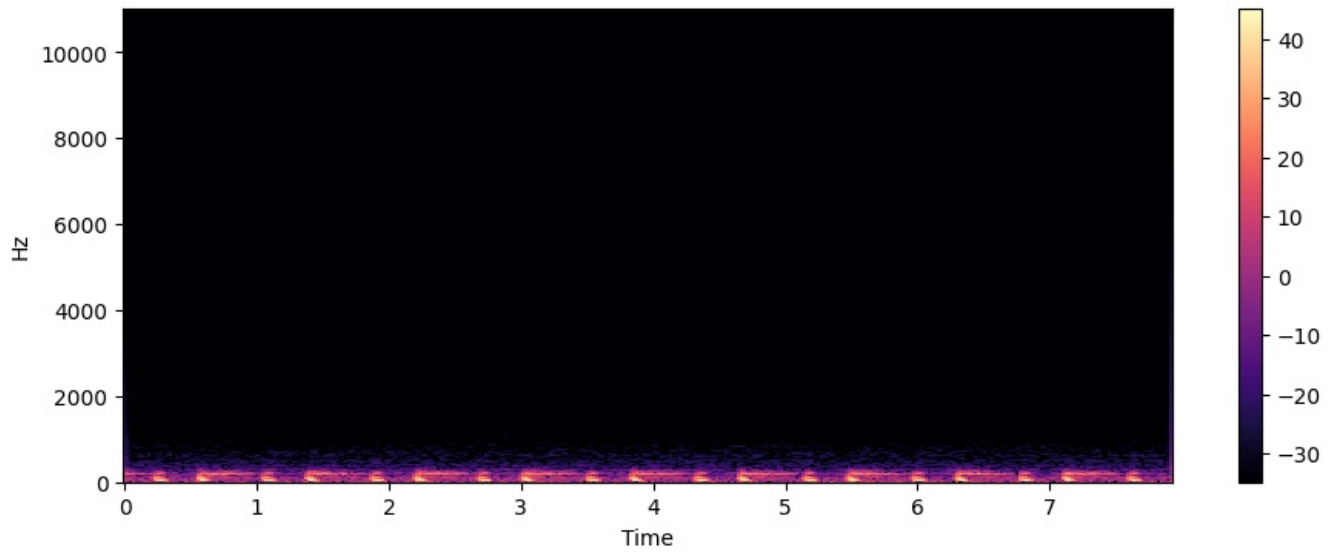
```
In [21]: audio = 'aunlabelledtest'
path = np.array(df['sound'][df['label']==audio])[0]
data, sampling_rate = librosa.load(path)
waveplot(data, sampling_rate, audio)
spectrogram(data, sampling_rate, audio)
Audio(path)
```


aunlabelledtest



Out[21]: Your browser does not support the audio element.

aunlabelledtest



```
In [22]: def extract_mfcc(filename):
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
return mfcc
```

```
In [23]: extract_mfcc(df['sound'][0])
```

```
Out[23]: array([-5.85283630e+02,  5.56701469e+01, -7.24515021e-01,  1.50119190e+01,
  1.75972569e+00,  2.19967937e+00, -2.02384305e+00, -2.34956288e+00,
 -4.39944601e+00, -2.17103615e-01, -4.16689587e+00, -1.63007605e+00,
 -3.96164560e+00, -2.05026293e+00, -3.65577054e+00, -2.19951773e+00,
 -3.70075583e+00, -1.33221853e+00, -2.68523312e+00, -2.57662255e-02,
 -9.20592546e-01, -2.27826983e-01, -1.46834219e+00, -1.94950771e+00,
 -2.09880733e+00, -4.63438272e-01, -7.09993839e-01,  1.75362483e-01,
 -1.19550204e+00, -1.02317445e-01, -4.48382139e-01,  3.47552374e-02,
 -1.33745682e+00, -5.71278930e-02, -6.83265507e-01, -1.78354472e-01,
  3.01413909e-02,  1.04834044e+00,  1.63522601e-01,  9.82816160e-01],
 dtype=float32)
```

```
In [24]: X_mfcc = df['sound'].apply(lambda x: extract_mfcc(x))
```

```
In [25]: X_mfcc
```


[illegible]


```
Out[34]: array([[ -5.8528363e+02,  5.5670147e+01, -7.2451502e-01, ...,
        1.0483404e+00,  1.6352260e-01,  9.8281616e-01],
       [-1.0750514e+03, -3.8902035e+01,  3.3933731e+01, ...,
        1.4417102e+00, -1.6433789e+00,  1.5237134e+00],
       [-5.8181055e+02,  2.3360502e+01, -7.9562116e+00, ...,
        1.8785828e+00, -6.2905496e-01,  1.9005616e+00],
       ...,
       [-3.5293704e+02,  1.2330083e+02, -1.0489901e+01, ...,
        1.3410777e+00, -5.2157515e-01,  7.5064605e-01],
       [-4.5838062e+02,  9.2542114e+01,  1.9514034e+01, ...,
        1.0219886e+00, -8.4467131e-01,  1.1574057e+00],
       [-5.6035736e+02,  8.5959351e+01,  6.3303204e+00, ...,
        8.1416225e-01, -1.1299469e+00,  7.3431641e-01]], dtype=float32)
```

```
In [35]: y_resampled
```

```
Out[35]: array(['artifact', 'artifact', 'artifact', ..., 'unlabelledtest',
        'unlabelledtest', 'unlabelledtest'], dtype='<U15')
```

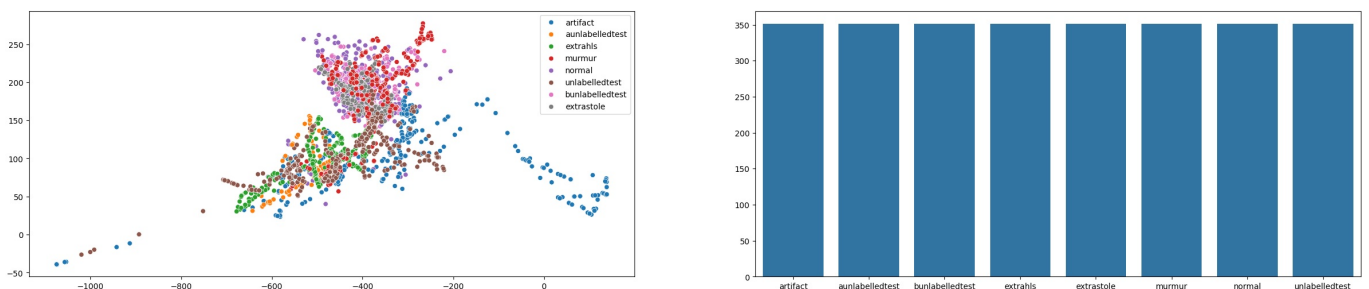
```
In [36]: np.unique(y, return_counts=True)
```

```
Out[36]: (array(['artifact', 'aunlabelledtest', 'bunlabelledtest', 'extrahls',
        'extrastole', 'murmur', 'normal', 'unlabelledtest'], dtype='<U15'),
        array([ 40, 14, 195, 19, 46, 129, 351, 38], dtype=int64))
```

```
In [37]: np.unique(y_resampled, return_counts=True)
```

```
Out[37]: (array(['artifact', 'aunlabelledtest', 'bunlabelledtest', 'extrahls',
        'extrastole', 'murmur', 'normal', 'unlabelledtest'], dtype='<U15'),
        array([351, 351, 351, 351, 351, 351, 351, 351], dtype=int64))
```

```
In [38]: fig, ax=plt.subplots(nrows=1, ncols=2, figsize=(30,6))
        sns.scatterplot(x=X_resampled[:,0], y=X_resampled[:,1], hue=y_resampled, ax=ax[0])
        idx, c=np.unique(y_resampled, return_counts=True)
        sns.barplot(x=idx, y=c, ax=ax[1])
        plt.show()
```



```
In [39]: from tensorflow.keras.utils import to_categorical
        from sklearn.preprocessing import LabelEncoder
        labelencoder=LabelEncoder()
        y_resampled=to_categorical(labelencoder.fit_transform(y_resampled))
```

```
In [40]: y_resampled.shape
```

```
Out[40]: (2808, 8)
```

```
In [41]: X_resampled
```

```
Out[41]: array([[ -5.8528363e+02,  5.5670147e+01, -7.2451502e-01, ...,
        1.0483404e+00,  1.6352260e-01,  9.8281616e-01],
       [-1.0750514e+03, -3.8902035e+01,  3.3933731e+01, ...,
        1.4417102e+00, -1.6433789e+00,  1.5237134e+00],
       [-5.8181055e+02,  2.3360502e+01, -7.9562116e+00, ...,
        1.8785828e+00, -6.2905496e-01,  1.9005616e+00],
       ...,
       [-3.5293704e+02,  1.2330083e+02, -1.0489901e+01, ...,
        1.3410777e+00, -5.2157515e-01,  7.5064605e-01],
       [-4.5838062e+02,  9.2542114e+01,  1.9514034e+01, ...,
        1.0219886e+00, -8.4467131e-01,  1.1574057e+00],
       [-5.6035736e+02,  8.5959351e+01,  6.3303204e+00, ...,
        8.1416225e-01, -1.1299469e+00,  7.3431641e-01]], dtype=float32)
```

```
In [42]: y_resampled
```

```
Out[42]: array([[1., 0., 0., ..., 0., 0., 0.],
       [1., 0., 0., ..., 0., 0., 0.],
       [1., 0., 0., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 0., 0., 1.],
       [0., 0., 0., ..., 0., 0., 1.],
       [0., 0., 0., ..., 0., 0., 1.]])
```

```
In [43]: X_resampled.shape
```

```
Out[43]: (2808, 40)
```

```
In [44]: y_resampled.shape
```

```
Out[44]: (2808, 8)
```

```
In [45]: from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X_resampled,y_resampled,test_size=0.2,random_state=0)
```

```
In [46]: X_train
```

```
Out[46]: array([[ -4.75535356e+02,  7.5909378e+01,  6.5173653e+01, ...,
         1.6922212e+00,  1.2152947e+00,  9.1867626e-01],
        [ -4.7184357e+02,  1.9643465e+02,  4.4209164e+01, ...,
         5.7708186e-01,  5.2006274e-01, -1.4540715e+00],
        [ -6.4406537e+02,  4.6004311e+01, -6.2038856e+00, ...,
         1.2961484e+00, -1.1473655e+00,  2.0036392e+00],
        ...,
        [ -3.8539792e+02,  1.3660495e+02,  3.5177731e+01, ...,
         6.2870282e-01, -8.4494460e-01, -1.2311556e+00],
        [ -4.7279822e+02,  7.5075638e+01,  5.1776310e+01, ...,
         7.6823246e-01,  3.5750189e-01,  4.5483130e-01],
        [ -4.7650192e+02,  7.0280426e+01,  6.0680061e+01, ...,
         6.2891299e-01,  3.5766396e-01,  3.4400424e-01]], dtype=float32)
```

```
In [47]: print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(2246, 40)
```

```
(562, 40)
```

```
(2246, 8)
```

```
(562, 8)
```

```
In [48]: import tensorflow as tf
```

```
In [49]: from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Activation,Dropout,BatchNormalization,Flatten
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import ModelCheckpoint, EarlyStopping, ReduceLR0nPlateau
from datetime import datetime
from sklearn import metrics
```

```
In [86]: model=Sequential()

###first layer
model.add(Dense(100, input_shape=(40,)))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.2))

###second layer
model.add(Dense(200))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.2))

###third layer
model.add(Dense(100))
model.add(BatchNormalization())
model.add(Activation('relu'))
model.add(Dropout(0.2))

###final layer
model.add(Dense(8))
model.add(Activation('softmax'))
```

```
In [87]: model.summary()
```

Model: "sequential_6"

Layer (type)	Output Shape	Param #
dense_29 (Dense)	(None, 100)	4,100
batch_normalization_23 (BatchNormalization)	(None, 100)	400
activation_29 (Activation)	(None, 100)	0
dropout_23 (Dropout)	(None, 100)	0
dense_30 (Dense)	(None, 200)	20,200
batch_normalization_24 (BatchNormalization)	(None, 200)	800
activation_30 (Activation)	(None, 200)	0
dropout_24 (Dropout)	(None, 200)	0
dense_31 (Dense)	(None, 100)	20,100
batch_normalization_25 (BatchNormalization)	(None, 100)	400
activation_31 (Activation)	(None, 100)	0
dropout_25 (Dropout)	(None, 100)	0
dense_32 (Dense)	(None, 8)	808
activation_32 (Activation)	(None, 8)	0

Total params: 46,808 (182.84 KB)

Trainable params: 46,008 (179.72 KB)

Non-trainable params: 800 (3.12 KB)

```
In [88]: model.compile(loss='categorical_crossentropy', metrics=['accuracy'], optimizer='adam')
```

```
In [89]: ## Training my model
from tensorflow.keras.callbacks import ModelCheckpoint
from datetime import datetime

num_epochs = 250
num_batch_size = 32

checkpointer = ModelCheckpoint(filepath='saved_models/Heartbeat_audioclassification.keras',
                               verbose=1, save_best_only=True)

start = datetime.now()

history = model.fit(X_train, y_train, batch_size=num_batch_size, epochs=num_epochs, validation_data=(X_test, y_test))

duration = datetime.now() - start
print("Training time", duration)
```

Epoch 1/250

70/71 ————— 0s 5ms/step - accuracy: 0.3643 - loss: 1.7433

Epoch 1: val_loss improved from inf to 1.50909, saving model to saved_models/Heartbeat_audioclassification.keras

71/71 ————— 7s 17ms/step - accuracy: 0.3663 - loss: 1.7358 - val_accuracy: 0.4591 - val_loss: 1.5091

Epoch 2/250

63/71 ————— 0s 5ms/step - accuracy: 0.5213 - loss: 1.1559

Epoch 2: val_loss improved from 1.50909 to 1.23261, saving model to saved_models/Heartbeat_audioclassification.keras

71/71 ————— 1s 8ms/step - accuracy: 0.5217 - loss: 1.1559 - val_accuracy: 0.4662 - val_loss: 1.2326

Epoch 3/250

69/71 ————— 0s 5ms/step - accuracy: 0.5278 - loss: 1.1398

Epoch 3: val_loss improved from 1.23261 to 1.05185, saving model to saved_models/Heartbeat_audioclassification.keras

71/71 ————— 1s 9ms/step - accuracy: 0.5280 - loss: 1.1382 - val_accuracy: 0.5107 - val_loss: 1.0519

Epoch 4/250


62/71 ————— 0s 5ms/step - accuracy: 0.5305 - loss: 1.0997


Epoch 4: val_loss improved from 1.05185 to 1.03542, saving model to saved_models/Heartbeat_audioclassification.keras


71/71 ————— 1s 8ms/step - accuracy: 0.5318 - loss: 1.0976 - val_accuracy: 0.5498 - val_loss: 1.0354


Epoch 5/250


67/71 ————— 0s 6ms/step - accuracy: 0.5417 - loss: 1.0607


Epoch 5: val_loss improved from 1.03542 to 1.00309, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 9ms/step - accuracy: 0.5425 - loss: 1.0592 - val_accuracy: 0.5480 - val_loss: 1.0031


Epoch 6/250
62/71  0s 5ms/step - accuracy: 0.5876 - loss: 0.9787


Epoch 6: val_loss improved from 1.00309 to 0.96634, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.5881 - loss: 0.9798 - val_accuracy: 0.5925 - val_loss: 0.9663


Epoch 7/250
62/71  0s 5ms/step - accuracy: 0.5800 - loss: 0.9759

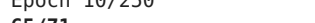
Epoch 7: val_loss improved from 0.96634 to 0.93674, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.5800 - loss: 0.9768 - val_accuracy: 0.5943 - val_loss: 0.9367


Epoch 8/250
63/71  0s 5ms/step - accuracy: 0.6039 - loss: 0.9653


Epoch 8: val_loss improved from 0.93674 to 0.89241, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.6032 - loss: 0.9668 - val_accuracy: 0.6388 - val_loss: 0.8924


Epoch 9/250
69/71  0s 5ms/step - accuracy: 0.5886 - loss: 0.9560


Epoch 9: val_loss improved from 0.89241 to 0.87627, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 9ms/step - accuracy: 0.5890 - loss: 0.9556 - val_accuracy: 0.6246 - val_loss: 0.8763


Epoch 10/250
65/71  0s 5ms/step - accuracy: 0.6224 - loss: 0.8900


Epoch 10: val_loss did not improve from 0.87627
71/71  1s 7ms/step - accuracy: 0.6226 - loss: 0.8911 - val_accuracy: 0.5943 - val_loss: 0.8974


Epoch 11/250
64/71  0s 5ms/step - accuracy: 0.6475 - loss: 0.8563


Epoch 11: val_loss improved from 0.87627 to 0.86884, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.6439 - loss: 0.8613 - val_accuracy: 0.6174 - val_loss: 0.8688


Epoch 12/250
65/71  0s 5ms/step - accuracy: 0.6055 - loss: 0.9110


Epoch 12: val_loss improved from 0.86884 to 0.84057, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 9ms/step - accuracy: 0.6080 - loss: 0.9087 - val_accuracy: 0.6317 - val_loss: 0.8406


Epoch 13/250
63/71  0s 5ms/step - accuracy: 0.6199 - loss: 0.8833

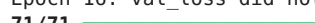
Epoch 13: val_loss did not improve from 0.84057
71/71  1s 7ms/step - accuracy: 0.6198 - loss: 0.8838 - val_accuracy: 0.6263 - val_loss: 0.8511

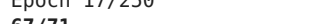
Epoch 14/250
67/71  0s 5ms/step - accuracy: 0.6241 - loss: 0.8856


Epoch 14: val_loss improved from 0.84057 to 0.81205, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.6245 - loss: 0.8841 - val_accuracy: 0.6335 - val_loss: 0.8120


Epoch 15/250
64/71  0s 5ms/step - accuracy: 0.6374 - loss: 0.8853


Epoch 15: val_loss did not improve from 0.81205
71/71  1s 7ms/step - accuracy: 0.6376 - loss: 0.8819 - val_accuracy: 0.6210 - val_loss: 0.8519

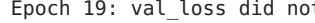
Epoch 16/250
61/71  0s 6ms/step - accuracy: 0.6360 - loss: 0.8621

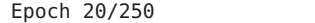
Epoch 16: val_loss did not improve from 0.81205
71/71  1s 7ms/step - accuracy: 0.6373 - loss: 0.8598 - val_accuracy: 0.5819 - val_loss: 0.8921


Epoch 17/250
67/71  0s 5ms/step - accuracy: 0.6544 - loss: 0.8473

Epoch 17: val_loss did not improve from 0.81205
71/71  0s 6ms/step - accuracy: 0.6541 - loss: 0.8471 - val_accuracy: 0.6619 - val_loss: 0.8382
























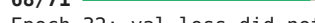






Epoch 18/250
67/71  0s 5ms/step - accuracy: 0.6644 - loss: 0.8000

Epoch 18: val_loss did not improve from 0.81205
71/71  1s 6ms/step - accuracy: 0.6639 - loss: 0.8011 - val_accuracy: 0.6495 - val_loss: 0.8120


Epoch 19/250
66/71  0s 5ms/step - accuracy: 0.6483 - loss: 0.8138


Epoch 19: val_loss did not improve from 0.81205
71/71  0s 6ms/step - accuracy: 0.6490 - loss: 0.8130 - val_accuracy: 0.6281 - val_loss: 0.8500


Epoch 20/250
70/71 0s 5ms/step - accuracy: 0.6695 - loss: 0.8075


Epoch 20: val_loss improved from 0.81205 to 0.77848, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6693 - loss: 0.8075 - val_accuracy: 0.6690 - val_loss: 0.7785
Epoch 21/250
65/71  0s 5ms/step - accuracy: 0.6390 - loss: 0.8392
Epoch 21: val_loss improved from 0.77848 to 0.76554, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6402 - loss: 0.8374 - val_accuracy: 0.6886 - val_loss: 0.7655
Epoch 22/250
65/71  0s 5ms/step - accuracy: 0.6555 - loss: 0.7827
Epoch 22: val_loss improved from 0.76554 to 0.76342, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6581 - loss: 0.7807 - val_accuracy: 0.6530 - val_loss: 0.7634
Epoch 23/250
71/71  0s 6ms/step - accuracy: 0.6745 - loss: 0.7767
Epoch 23: val_loss did not improve from 0.76342
71/71  1s 7ms/step - accuracy: 0.6745 - loss: 0.7769 - val_accuracy: 0.6815 - val_loss: 0.7640
Epoch 24/250
68/71  0s 5ms/step - accuracy: 0.6761 - loss: 0.7809
Epoch 24: val_loss improved from 0.76342 to 0.75755, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6764 - loss: 0.7803 - val_accuracy: 0.6637 - val_loss: 0.7575
Epoch 25/250
65/71  0s 5ms/step - accuracy: 0.6807 - loss: 0.7930
Epoch 25: val_loss did not improve from 0.75755
71/71  1s 7ms/step - accuracy: 0.6818 - loss: 0.7900 - val_accuracy: 0.6601 - val_loss: 0.7831
Epoch 26/250
65/71  0s 5ms/step - accuracy: 0.6940 - loss: 0.7654
Epoch 26: val_loss improved from 0.75755 to 0.73800, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6926 - loss: 0.7664 - val_accuracy: 0.6797 - val_loss: 0.7380
Epoch 27/250
64/71  0s 5ms/step - accuracy: 0.6991 - loss: 0.7210
Epoch 27: val_loss improved from 0.73800 to 0.71258, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6972 - loss: 0.7230 - val_accuracy: 0.7082 - val_loss: 0.7126
Epoch 28/250
68/71  0s 5ms/step - accuracy: 0.6944 - loss: 0.7175
Epoch 28: val_loss did not improve from 0.71258
71/71  1s 6ms/step - accuracy: 0.6940 - loss: 0.7193 - val_accuracy: 0.6904 - val_loss: 0.7293
Epoch 29/250
60/71  0s 5ms/step - accuracy: 0.6946 - loss: 0.7461
Epoch 29: val_loss did not improve from 0.71258
71/71  0s 6ms/step - accuracy: 0.6933 - loss: 0.7467 - val_accuracy: 0.6868 - val_loss: 0.7301
Epoch 30/250
66/71  0s 5ms/step - accuracy: 0.6695 - loss: 0.7549
Epoch 30: val_loss improved from 0.71258 to 0.70179, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6704 - loss: 0.7540 - val_accuracy: 0.7135 - val_loss: 0.7018
Epoch 31/250
68/71  0s 5ms/step - accuracy: 0.6954 - loss: 0.7313
Epoch 31: val_loss improved from 0.70179 to 0.68830, saving model to saved_models/Heartbeat_audioclassification.
keras
71/71  1s 8ms/step - accuracy: 0.6963 - loss: 0.7301 - val_accuracy: 0.6993 - val_loss: 0.6883
Epoch 32/250
68/71  0s 6ms/step - accuracy: 0.6783 - loss: 0.7720
Epoch 32: val_loss did not improve from 0.68830
71/71  1s 7ms/step - accuracy: 0.6790 - loss: 0.7702 - val_accuracy: 0.6512 - val_loss: 0.8246
Epoch 33/250
68/71  0s 5ms/step - accuracy: 0.7185 - loss: 0.6881
Epoch 33: val_loss did not improve from 0.68830
71/71  0s 6ms/step - accuracy: 0.7176 - loss: 0.6900 - val_accuracy: 0.6655 - val_loss: 0.7944
Epoch 34/250
71/71  0s 5ms/step - accuracy: 0.7208 - loss: 0.6843
Epoch 34: val_loss did not improve from 0.68830
71/71  1s 7ms/step - accuracy: 0.7207 - loss: 0.6844 - val_accuracy: 0.6726 - val_loss: 0.8115
Epoch 35/250
69/71  0s 5ms/step - accuracy: 0.6958 - loss: 0.7252


Epoch 35: val_loss did not improve from 0.68830
71/71 ————— 0s 6ms/step - accuracy: 0.6959 - loss: 0.7249 - val_accuracy: 0.6904 - val_loss: 0.7185
Epoch 36/250
68/71 ————— 0s 5ms/step - accuracy: 0.7022 - loss: 0.6982
Epoch 36: val_loss did not improve from 0.68830
71/71 ————— 1s 7ms/step - accuracy: 0.7026 - loss: 0.6978 - val_accuracy: 0.6833 - val_loss: 0.7739
Epoch 37/250
69/71 ————— 0s 5ms/step - accuracy: 0.7107 - loss: 0.6839
Epoch 37: val_loss did not improve from 0.68830
71/71 ————— 0s 6ms/step - accuracy: 0.7106 - loss: 0.6844 - val_accuracy: 0.7100 - val_loss: 0.7011
Epoch 38/250
68/71 ————— 0s 5ms/step - accuracy: 0.7065 - loss: 0.6932
Epoch 38: val_loss did not improve from 0.68830
71/71 ————— 1s 6ms/step - accuracy: 0.7069 - loss: 0.6924 - val_accuracy: 0.6957 - val_loss: 0.6903
Epoch 39/250
71/71 ————— 0s 4ms/step - accuracy: 0.7142 - loss: 0.7000
Epoch 39: val_loss did not improve from 0.68830
71/71 ————— 1s 6ms/step - accuracy: 0.7142 - loss: 0.6998 - val_accuracy: 0.6779 - val_loss: 0.7773
Epoch 40/250
67/71 ————— 0s 5ms/step - accuracy: 0.7211 - loss: 0.6748
Epoch 40: val_loss improved from 0.68830 to 0.66999, saving model to saved_models/Heartbeat_audioclassification.keras
71/71 ————— 1s 8ms/step - accuracy: 0.7215 - loss: 0.6747 - val_accuracy: 0.7224 - val_loss: 0.6700
Epoch 41/250
67/71 ————— 0s 5ms/step - accuracy: 0.7216 - loss: 0.6751
Epoch 41: val_loss did not improve from 0.66999
71/71 ————— 1s 7ms/step - accuracy: 0.7214 - loss: 0.6756 - val_accuracy: 0.7117 - val_loss: 0.6894
Epoch 42/250
69/71 ————— 0s 5ms/step - accuracy: 0.7301 - loss: 0.6529
Epoch 42: val_loss did not improve from 0.66999
71/71 ————— 0s 6ms/step - accuracy: 0.7304 - loss: 0.6523 - val_accuracy: 0.6993 - val_loss: 0.7610
Epoch 43/250
62/71 ————— 0s 6ms/step - accuracy: 0.7234 - loss: 0.6724
Epoch 43: val_loss did not improve from 0.66999
71/71 ————— 1s 7ms/step - accuracy: 0.7234 - loss: 0.6725 - val_accuracy: 0.7224 - val_loss: 0.6956
Epoch 44/250
71/71 ————— 0s 4ms/step - accuracy: 0.7110 - loss: 0.6867
Epoch 44: val_loss did not improve from 0.66999
71/71 ————— 0s 6ms/step - accuracy: 0.7112 - loss: 0.6864 - val_accuracy: 0.7117 - val_loss: 0.6967
Epoch 45/250
69/71 ————— 0s 5ms/step - accuracy: 0.7383 - loss: 0.6509
Epoch 45: val_loss did not improve from 0.66999
71/71 ————— 1s 7ms/step - accuracy: 0.7382 - loss: 0.6514 - val_accuracy: 0.6388 - val_loss: 0.8305
Epoch 46/250
66/71 ————— 0s 5ms/step - accuracy: 0.7630 - loss: 0.5994
Epoch 46: val_loss improved from 0.66999 to 0.62597, saving model to saved_models/Heartbeat_audioclassification.keras
71/71 ————— 1s 9ms/step - accuracy: 0.7622 - loss: 0.6012 - val_accuracy: 0.7438 - val_loss: 0.6260
Epoch 47/250
70/71 ————— 0s 5ms/step - accuracy: 0.7312 - loss: 0.6361
Epoch 47: val_loss did not improve from 0.62597
71/71 ————— 0s 6ms/step - accuracy: 0.7311 - loss: 0.6364 - val_accuracy: 0.6868 - val_loss: 0.7189
Epoch 48/250
71/71 ————— 0s 5ms/step - accuracy: 0.7319 - loss: 0.6583
Epoch 48: val_loss did not improve from 0.62597
71/71 ————— 1s 7ms/step - accuracy: 0.7319 - loss: 0.6580 - val_accuracy: 0.6993 - val_loss: 0.7005
Epoch 49/250
62/71 ————— 0s 4ms/step - accuracy: 0.7300 - loss: 0.6392
Epoch 49: val_loss did not improve from 0.62597
71/71 ————— 1s 6ms/step - accuracy: 0.7300 - loss: 0.6419 - val_accuracy: 0.7171 - val_loss: 0.7017
Epoch 50/250
63/71 ————— 0s 5ms/step - accuracy: 0.7388 - loss: 0.6382
Epoch 50: val_loss improved from 0.62597 to 0.61942, saving model to saved_models/Heartbeat_audioclassification.keras
71/71 ————— 1s 8ms/step - accuracy: 0.7397 - loss: 0.6371 - val_accuracy: 0.7349 - val_loss: 0.6194
Epoch 51/250
67/71 ————— 0s 5ms/step - accuracy: 0.7459 - loss: 0.6321


Epoch 51: val_loss did not improve from 0.61942
71/71  1s 7ms/step - accuracy: 0.7458 - loss: 0.6314 - val_accuracy: 0.7473 - val_loss: 0.6312


Epoch 52/250
68/71  0s 5ms/step - accuracy: 0.7418 - loss: 0.6292


Epoch 52: val_loss did not improve from 0.61942
71/71  1s 6ms/step - accuracy: 0.7423 - loss: 0.6283 - val_accuracy: 0.6868 - val_loss: 0.7485


Epoch 53/250
71/71  0s 5ms/step - accuracy: 0.7609 - loss: 0.6044


Epoch 53: val_loss did not improve from 0.61942
71/71  0s 6ms/step - accuracy: 0.7610 - loss: 0.6044 - val_accuracy: 0.6975 - val_loss: 0.6863


Epoch 54/250
62/71  0s 6ms/step - accuracy: 0.7458 - loss: 0.6040


Epoch 54: val_loss did not improve from 0.61942
71/71  1s 7ms/step - accuracy: 0.7471 - loss: 0.6025 - val_accuracy: 0.6957 - val_loss: 0.6880

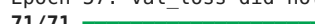
Epoch 55/250
61/71  0s 4ms/step - accuracy: 0.7576 - loss: 0.6136


Epoch 55: val_loss improved from 0.61942 to 0.61864, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.7569 - loss: 0.6139 - val_accuracy: 0.7278 - val_loss: 0.6186

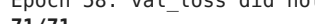
Epoch 56/250
59/71  0s 4ms/step - accuracy: 0.7567 - loss: 0.5770

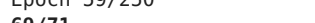
Epoch 56: val_loss did not improve from 0.61864
71/71  1s 6ms/step - accuracy: 0.7578 - loss: 0.5764 - val_accuracy: 0.6940 - val_loss: 0.6619

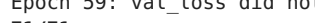
Epoch 57/250
67/71  0s 5ms/step - accuracy: 0.7480 - loss: 0.6294

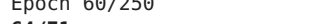
Epoch 57: val_loss did not improve from 0.61864
71/71  0s 6ms/step - accuracy: 0.7485 - loss: 0.6276 - val_accuracy: 0.7242 - val_loss: 0.6398


Epoch 58/250
61/71  0s 4ms/step - accuracy: 0.7624 - loss: 0.5885

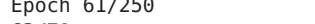
Epoch 58: val_loss did not improve from 0.61864
71/71  1s 6ms/step - accuracy: 0.7603 - loss: 0.5923 - val_accuracy: 0.7082 - val_loss: 0.6705

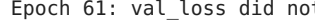
Epoch 59/250
69/71  0s 5ms/step - accuracy: 0.7473 - loss: 0.6253

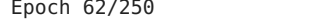
Epoch 59: val_loss did not improve from 0.61864
71/71  1s 6ms/step - accuracy: 0.7475 - loss: 0.6247 - val_accuracy: 0.7331 - val_loss: 0.6285

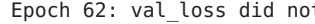
Epoch 60/250
64/71  0s 6ms/step - accuracy: 0.7432 - loss: 0.6039

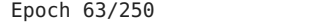
Epoch 60: val_loss did not improve from 0.61864
71/71  1s 7ms/step - accuracy: 0.7454 - loss: 0.6015 - val_accuracy: 0.7064 - val_loss: 0.6768


Epoch 61/250
63/71  0s 4ms/step - accuracy: 0.7715 - loss: 0.5746

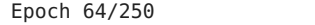
Epoch 61: val_loss did not improve from 0.61864
71/71  0s 6ms/step - accuracy: 0.7710 - loss: 0.5744 - val_accuracy: 0.6904 - val_loss: 0.7122


Epoch 62/250
61/71  0s 4ms/step - accuracy: 0.7735 - loss: 0.5864


Epoch 62: val_loss did not improve from 0.61864
71/71  1s 6ms/step - accuracy: 0.7721 - loss: 0.5858 - val_accuracy: 0.7456 - val_loss: 0.6789


Epoch 63/250
65/71  0s 5ms/step - accuracy: 0.7668 - loss: 0.6041


Epoch 63: val_loss improved from 0.61864 to 0.59118, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.7668 - loss: 0.6028 - val_accuracy: 0.7438 - val_loss: 0.5912


Epoch 64/250
66/71  0s 6ms/step - accuracy: 0.7712 - loss: 0.5589


Epoch 64: val_loss did not improve from 0.59118
71/71  1s 7ms/step - accuracy: 0.7708 - loss: 0.5607 - val_accuracy: 0.6833 - val_loss: 0.7369

Epoch 65/250
64/71  0s 5ms/step - accuracy: 0.7542 - loss: 0.5963


































Epoch 65: val_loss did not improve from 0.59118
71/71  1s 7ms/step - accuracy: 0.7547 - loss: 0.5956 - val_accuracy: 0.7598 - val_loss: 0.6030




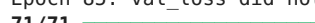

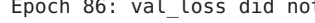
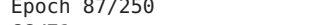

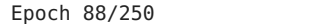










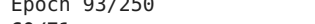


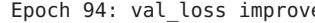


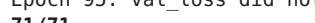

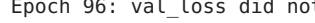
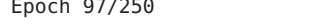



Epoch 66/250
60/71  0s 4ms/step - accuracy: 0.7761 - loss: 0.5567





















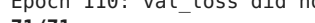

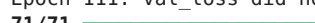










Epoch 66: val_loss did not improve from 0.59118
71/71  0s 6ms/step - accuracy: 0.7755 - loss: 0.5578 - val_accuracy: 0.7544 - val_loss: 0.6115




























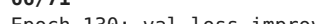




Epoch 67/250
63/71  0s 6ms/step - accuracy: 0.7716 - loss: 0.5618



















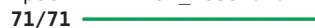

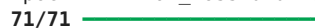

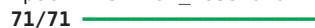
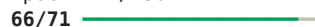






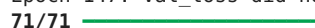


Epoch 67: val_loss did not improve from 0.59118


































71/71  1s 7ms/step - accuracy: 0.7726 - loss: 0.5604 - val_accuracy: 0.7260 - val_loss: 0.6467
Epoch 68/250
68/71  0s 6ms/step - accuracy: 0.7723 - loss: 0.5565
Epoch 68: val_loss did not improve from 0.59118
71/71  1s 7ms/step - accuracy: 0.7723 - loss: 0.5571 - val_accuracy: 0.7153 - val_loss: 0.6765
Epoch 69/250
64/71  0s 4ms/step - accuracy: 0.7711 - loss: 0.5587
Epoch 69: val_loss did not improve from 0.59118
71/71  1s 6ms/step - accuracy: 0.7724 - loss: 0.5575 - val_accuracy: 0.7402 - val_loss: 0.6001
Epoch 70/250
70/71  0s 4ms/step - accuracy: 0.7599 - loss: 0.5701
Epoch 70: val_loss did not improve from 0.59118
71/71  1s 6ms/step - accuracy: 0.7604 - loss: 0.5700 - val_accuracy: 0.7544 - val_loss: 0.6183
Epoch 71/250
64/71  0s 5ms/step - accuracy: 0.7902 - loss: 0.5277
Epoch 71: val_loss improved from 0.59118 to 0.57655, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.7908 - loss: 0.5271 - val_accuracy: 0.7705 - val_loss: 0.5765
Epoch 72/250
66/71  0s 5ms/step - accuracy: 0.7956 - loss: 0.5097
Epoch 72: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.7941 - loss: 0.5132 - val_accuracy: 0.7367 - val_loss: 0.6358
Epoch 73/250
68/71  0s 5ms/step - accuracy: 0.7989 - loss: 0.5253
Epoch 73: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.7988 - loss: 0.5256 - val_accuracy: 0.7669 - val_loss: 0.5828
Epoch 74/250
64/71  0s 4ms/step - accuracy: 0.7765 - loss: 0.5668
Epoch 74: val_loss did not improve from 0.57655
71/71  0s 5ms/step - accuracy: 0.7768 - loss: 0.5647 - val_accuracy: 0.7491 - val_loss: 0.6204
Epoch 75/250
61/71  0s 4ms/step - accuracy: 0.7775 - loss: 0.5427
Epoch 75: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.7781 - loss: 0.5426 - val_accuracy: 0.7473 - val_loss: 0.5999
Epoch 76/250
64/71  0s 6ms/step - accuracy: 0.7715 - loss: 0.5819
Epoch 76: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.7722 - loss: 0.5813 - val_accuracy: 0.7384 - val_loss: 0.6237
Epoch 77/250
64/71  0s 6ms/step - accuracy: 0.7742 - loss: 0.5629
Epoch 77: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.7752 - loss: 0.5603 - val_accuracy: 0.7011 - val_loss: 0.6904
Epoch 78/250
69/71  0s 5ms/step - accuracy: 0.8058 - loss: 0.5095
Epoch 78: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.8055 - loss: 0.5104 - val_accuracy: 0.7456 - val_loss: 0.6211
Epoch 79/250
68/71  0s 5ms/step - accuracy: 0.8025 - loss: 0.5075
Epoch 79: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.8020 - loss: 0.5080 - val_accuracy: 0.7384 - val_loss: 0.5975
Epoch 80/250
63/71  0s 5ms/step - accuracy: 0.7976 - loss: 0.4911
Epoch 80: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.7966 - loss: 0.4951 - val_accuracy: 0.7509 - val_loss: 0.6035
Epoch 81/250
70/71  0s 4ms/step - accuracy: 0.7860 - loss: 0.5371
Epoch 81: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.7862 - loss: 0.5371 - val_accuracy: 0.7384 - val_loss: 0.6329
Epoch 82/250
71/71  0s 4ms/step - accuracy: 0.7900 - loss: 0.5107
Epoch 82: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.7900 - loss: 0.5109 - val_accuracy: 0.7509 - val_loss: 0.6061
Epoch 83/250
65/71  0s 4ms/step - accuracy: 0.7971 - loss: 0.5141
Epoch 83: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.7965 - loss: 0.5154 - val_accuracy: 0.7616 - val_loss: 0.5910

























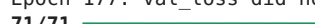

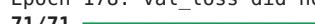

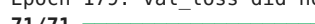

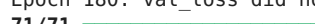
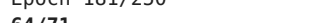

Epoch 84/250
67/71  0s 6ms/step - accuracy: 0.8051 - loss: 0.4794
Epoch 84: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.8044 - loss: 0.4808 - val_accuracy: 0.7384 - val_loss: 0.6326
Epoch 85/250
68/71  0s 4ms/step - accuracy: 0.7889 - loss: 0.5282
Epoch 85: val_loss did not improve from 0.57655
71/71  0s 5ms/step - accuracy: 0.7882 - loss: 0.5292 - val_accuracy: 0.7331 - val_loss: 0.6185
Epoch 86/250
62/71  0s 4ms/step - accuracy: 0.8024 - loss: 0.5232
Epoch 86: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.8016 - loss: 0.5204 - val_accuracy: 0.7367 - val_loss: 0.6584
Epoch 87/250
66/71  0s 5ms/step - accuracy: 0.8112 - loss: 0.4944
Epoch 87: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.8108 - loss: 0.4945 - val_accuracy: 0.7153 - val_loss: 0.6867
Epoch 88/250
65/71  0s 5ms/step - accuracy: 0.7929 - loss: 0.5216
Epoch 88: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.7936 - loss: 0.5204 - val_accuracy: 0.7331 - val_loss: 0.6739
Epoch 89/250
61/71  0s 4ms/step - accuracy: 0.7927 - loss: 0.5300
Epoch 89: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.7936 - loss: 0.5261 - val_accuracy: 0.7491 - val_loss: 0.6191
Epoch 90/250
60/71  0s 4ms/step - accuracy: 0.7772 - loss: 0.5159
Epoch 90: val_loss did not improve from 0.57655
71/71  1s 6ms/step - accuracy: 0.7791 - loss: 0.5149 - val_accuracy: 0.7473 - val_loss: 0.6498
Epoch 91/250
68/71  0s 4ms/step - accuracy: 0.8025 - loss: 0.4760
Epoch 91: val_loss did not improve from 0.57655
71/71  0s 6ms/step - accuracy: 0.8024 - loss: 0.4775 - val_accuracy: 0.7509 - val_loss: 0.6105
Epoch 92/250
69/71  0s 5ms/step - accuracy: 0.8126 - loss: 0.4884
Epoch 92: val_loss did not improve from 0.57655
71/71  1s 7ms/step - accuracy: 0.8125 - loss: 0.4883 - val_accuracy: 0.7687 - val_loss: 0.5862
Epoch 93/250
60/71  0s 4ms/step - accuracy: 0.8029 - loss: 0.5148
Epoch 93: val_loss improved from 0.57655 to 0.56117, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8045 - loss: 0.5126 - val_accuracy: 0.7776 - val_loss: 0.5612
Epoch 94/250
62/71  0s 4ms/step - accuracy: 0.8031 - loss: 0.4890
Epoch 94: val_loss improved from 0.56117 to 0.55929, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8031 - loss: 0.4885 - val_accuracy: 0.7776 - val_loss: 0.5593
Epoch 95/250
65/71  0s 4ms/step - accuracy: 0.8111 - loss: 0.4818
Epoch 95: val_loss did not improve from 0.55929
71/71  1s 6ms/step - accuracy: 0.8108 - loss: 0.4831 - val_accuracy: 0.7776 - val_loss: 0.5642
Epoch 96/250
71/71  0s 5ms/step - accuracy: 0.8157 - loss: 0.4734
Epoch 96: val_loss did not improve from 0.55929
71/71  1s 7ms/step - accuracy: 0.8155 - loss: 0.4738 - val_accuracy: 0.7936 - val_loss: 0.5650
Epoch 97/250
65/71  0s 5ms/step - accuracy: 0.8051 - loss: 0.4829
Epoch 97: val_loss did not improve from 0.55929
71/71  0s 6ms/step - accuracy: 0.8052 - loss: 0.4848 - val_accuracy: 0.7438 - val_loss: 0.5870
Epoch 98/250
60/71  0s 4ms/step - accuracy: 0.8102 - loss: 0.4578
Epoch 98: val_loss did not improve from 0.55929
71/71  1s 6ms/step - accuracy: 0.8097 - loss: 0.4606 - val_accuracy: 0.7509 - val_loss: 0.6106
Epoch 99/250
67/71  0s 4ms/step - accuracy: 0.8193 - loss: 0.4555
Epoch 99: val_loss improved from 0.55929 to 0.54220, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8194 - loss: 0.4557 - val_accuracy: 0.7900 - val_loss: 0.5422












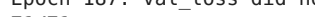
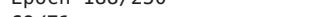
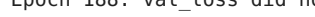
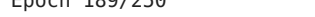
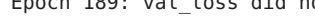


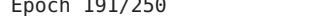














Epoch 100/250
64/71  0s 4ms/step - accuracy: 0.8282 - loss: 0.4461
Epoch 100: val_loss did not improve from 0.54220
71/71  1s 6ms/step - accuracy: 0.8275 - loss: 0.4474 - val_accuracy: 0.7722 - val_loss: 0.5870
Epoch 101/250
62/71  0s 5ms/step - accuracy: 0.7890 - loss: 0.5025
Epoch 101: val_loss improved from 0.54220 to 0.51531, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.7918 - loss: 0.4989 - val_accuracy: 0.8114 - val_loss: 0.5153
Epoch 102/250
64/71  0s 6ms/step - accuracy: 0.8005 - loss: 0.5044
Epoch 102: val_loss did not improve from 0.51531
71/71  1s 7ms/step - accuracy: 0.8007 - loss: 0.5031 - val_accuracy: 0.7794 - val_loss: 0.5679
Epoch 103/250
65/71  0s 6ms/step - accuracy: 0.8399 - loss: 0.4290
Epoch 103: val_loss did not improve from 0.51531
71/71  1s 7ms/step - accuracy: 0.8388 - loss: 0.4305 - val_accuracy: 0.7758 - val_loss: 0.5658
Epoch 104/250
66/71  0s 5ms/step - accuracy: 0.8356 - loss: 0.4170
Epoch 104: val_loss did not improve from 0.51531
71/71  0s 6ms/step - accuracy: 0.8348 - loss: 0.4190 - val_accuracy: 0.7687 - val_loss: 0.5710
Epoch 105/250
66/71  0s 4ms/step - accuracy: 0.7946 - loss: 0.5036
Epoch 105: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.7949 - loss: 0.5037 - val_accuracy: 0.7705 - val_loss: 0.5973
Epoch 106/250
60/71  0s 4ms/step - accuracy: 0.8246 - loss: 0.4651
Epoch 106: val_loss did not improve from 0.51531
71/71  1s 5ms/step - accuracy: 0.8238 - loss: 0.4655 - val_accuracy: 0.7847 - val_loss: 0.5602
Epoch 107/250
68/71  0s 4ms/step - accuracy: 0.8163 - loss: 0.4606
Epoch 107: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.8164 - loss: 0.4605 - val_accuracy: 0.7758 - val_loss: 0.5625
Epoch 108/250
71/71  0s 4ms/step - accuracy: 0.8270 - loss: 0.4502
Epoch 108: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.8268 - loss: 0.4506 - val_accuracy: 0.8132 - val_loss: 0.5247
Epoch 109/250
67/71  0s 5ms/step - accuracy: 0.8056 - loss: 0.4801
Epoch 109: val_loss did not improve from 0.51531
71/71  1s 6ms/step - accuracy: 0.8075 - loss: 0.4769 - val_accuracy: 0.7687 - val_loss: 0.5463
Epoch 110/250
60/71  0s 4ms/step - accuracy: 0.8009 - loss: 0.4851
Epoch 110: val_loss did not improve from 0.51531
71/71  1s 5ms/step - accuracy: 0.8033 - loss: 0.4825 - val_accuracy: 0.7811 - val_loss: 0.5357
Epoch 111/250
67/71  0s 4ms/step - accuracy: 0.8126 - loss: 0.4643
Epoch 111: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.8132 - loss: 0.4635 - val_accuracy: 0.7758 - val_loss: 0.5491
Epoch 112/250
70/71  0s 4ms/step - accuracy: 0.8261 - loss: 0.4371
Epoch 112: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.8261 - loss: 0.4373 - val_accuracy: 0.7598 - val_loss: 0.6144
Epoch 113/250
66/71  0s 5ms/step - accuracy: 0.8309 - loss: 0.4391
Epoch 113: val_loss did not improve from 0.51531
71/71  0s 6ms/step - accuracy: 0.8304 - loss: 0.4409 - val_accuracy: 0.7367 - val_loss: 0.6270
Epoch 114/250
61/71  0s 5ms/step - accuracy: 0.8184 - loss: 0.4409
Epoch 114: val_loss did not improve from 0.51531
71/71  1s 6ms/step - accuracy: 0.8190 - loss: 0.4402 - val_accuracy: 0.7242 - val_loss: 0.6984
Epoch 115/250
68/71  0s 5ms/step - accuracy: 0.8249 - loss: 0.4379
Epoch 115: val_loss did not improve from 0.51531
71/71  0s 6ms/step - accuracy: 0.8245 - loss: 0.4387 - val_accuracy: 0.7651 - val_loss: 0.6079
Epoch 116/250
64/71  0s 4ms/step - accuracy: 0.8316 - loss: 0.4274


Epoch 116: val_loss did not improve from 0.51531
71/71  1s 5ms/step - accuracy: 0.8315 - loss: 0.4271 - val_accuracy: 0.7776 - val_loss: 0.5757
Epoch 117/250
62/71  0s 5ms/step - accuracy: 0.8255 - loss: 0.4374
Epoch 117: val_loss did not improve from 0.51531
71/71  0s 6ms/step - accuracy: 0.8256 - loss: 0.4386 - val_accuracy: 0.7651 - val_loss: 0.5604
Epoch 118/250
69/71  0s 4ms/step - accuracy: 0.8409 - loss: 0.4350
Epoch 118: val_loss did not improve from 0.51531
71/71  0s 6ms/step - accuracy: 0.8405 - loss: 0.4352 - val_accuracy: 0.7989 - val_loss: 0.5359
Epoch 119/250
69/71  0s 4ms/step - accuracy: 0.8285 - loss: 0.4239
Epoch 119: val_loss did not improve from 0.51531
71/71  0s 5ms/step - accuracy: 0.8282 - loss: 0.4244 - val_accuracy: 0.7918 - val_loss: 0.5418
Epoch 120/250
67/71  0s 5ms/step - accuracy: 0.8285 - loss: 0.4417
Epoch 120: val_loss did not improve from 0.51531
71/71  1s 6ms/step - accuracy: 0.8293 - loss: 0.4409 - val_accuracy: 0.7776 - val_loss: 0.5447
Epoch 121/250
69/71  0s 4ms/step - accuracy: 0.8331 - loss: 0.4054
Epoch 121: val_loss improved from 0.51531 to 0.51293, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8330 - loss: 0.4060 - val_accuracy: 0.7900 - val_loss: 0.5129
Epoch 122/250
65/71  0s 4ms/step - accuracy: 0.8426 - loss: 0.4263
Epoch 122: val_loss did not improve from 0.51293
71/71  0s 5ms/step - accuracy: 0.8412 - loss: 0.4281 - val_accuracy: 0.8025 - val_loss: 0.5304
Epoch 123/250
62/71  0s 6ms/step - accuracy: 0.8407 - loss: 0.4334
Epoch 123: val_loss did not improve from 0.51293
71/71  1s 6ms/step - accuracy: 0.8398 - loss: 0.4323 - val_accuracy: 0.7758 - val_loss: 0.5604
Epoch 124/250
66/71  0s 4ms/step - accuracy: 0.8424 - loss: 0.4125
Epoch 124: val_loss improved from 0.51293 to 0.51125, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 8ms/step - accuracy: 0.8420 - loss: 0.4137 - val_accuracy: 0.7900 - val_loss: 0.5113
Epoch 125/250
60/71  0s 4ms/step - accuracy: 0.8555 - loss: 0.4044
Epoch 125: val_loss did not improve from 0.51125
71/71  1s 6ms/step - accuracy: 0.8554 - loss: 0.4051 - val_accuracy: 0.7758 - val_loss: 0.5418
Epoch 126/250
67/71  0s 5ms/step - accuracy: 0.8204 - loss: 0.4250
Epoch 126: val_loss did not improve from 0.51125
71/71  1s 6ms/step - accuracy: 0.8208 - loss: 0.4251 - val_accuracy: 0.7206 - val_loss: 0.7444
Epoch 127/250
70/71  0s 4ms/step - accuracy: 0.8541 - loss: 0.3928
Epoch 127: val_loss did not improve from 0.51125
71/71  1s 6ms/step - accuracy: 0.8540 - loss: 0.3934 - val_accuracy: 0.7954 - val_loss: 0.5228
Epoch 128/250
69/71  0s 4ms/step - accuracy: 0.8450 - loss: 0.4055
Epoch 128: val_loss did not improve from 0.51125
71/71  0s 5ms/step - accuracy: 0.8445 - loss: 0.4063 - val_accuracy: 0.7580 - val_loss: 0.6405
Epoch 129/250
63/71  0s 4ms/step - accuracy: 0.8096 - loss: 0.4539
Epoch 129: val_loss did not improve from 0.51125
71/71  0s 5ms/step - accuracy: 0.8110 - loss: 0.4526 - val_accuracy: 0.7811 - val_loss: 0.5795
Epoch 130/250
66/71  0s 4ms/step - accuracy: 0.8260 - loss: 0.4159
Epoch 130: val_loss improved from 0.51125 to 0.48658, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8262 - loss: 0.4173 - val_accuracy: 0.8096 - val_loss: 0.4866
Epoch 131/250
61/71  0s 3ms/step - accuracy: 0.8434 - loss: 0.4232
Epoch 131: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8421 - loss: 0.4263 - val_accuracy: 0.7527 - val_loss: 0.6268
Epoch 132/250
65/71  0s 4ms/step - accuracy: 0.8338 - loss: 0.4391


Epoch 132: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8337 - loss: 0.4389 - val_accuracy: 0.7829 - val_loss: 0.5579
Epoch 133/250
64/71  0s 4ms/step - accuracy: 0.8291 - loss: 0.4169
Epoch 133: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8291 - loss: 0.4186 - val_accuracy: 0.7972 - val_loss: 0.5369
Epoch 134/250
65/71  0s 4ms/step - accuracy: 0.8294 - loss: 0.4459
Epoch 134: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8302 - loss: 0.4446 - val_accuracy: 0.7989 - val_loss: 0.5216
Epoch 135/250
67/71  0s 4ms/step - accuracy: 0.8422 - loss: 0.4080
Epoch 135: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8413 - loss: 0.4096 - val_accuracy: 0.7847 - val_loss: 0.5202
Epoch 136/250
63/71  0s 4ms/step - accuracy: 0.8328 - loss: 0.3941
Epoch 136: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8341 - loss: 0.3958 - val_accuracy: 0.7544 - val_loss: 0.6510
Epoch 137/250
66/71  0s 4ms/step - accuracy: 0.8459 - loss: 0.3827
Epoch 137: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8461 - loss: 0.3837 - val_accuracy: 0.8060 - val_loss: 0.5160
Epoch 138/250
65/71  0s 4ms/step - accuracy: 0.8638 - loss: 0.3761
Epoch 138: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8622 - loss: 0.3789 - val_accuracy: 0.7527 - val_loss: 0.6004
Epoch 139/250
61/71  0s 4ms/step - accuracy: 0.8348 - loss: 0.3994
Epoch 139: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8349 - loss: 0.4004 - val_accuracy: 0.7829 - val_loss: 0.5443
Epoch 140/250
65/71  0s 4ms/step - accuracy: 0.8494 - loss: 0.3936
Epoch 140: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8491 - loss: 0.3947 - val_accuracy: 0.7936 - val_loss: 0.5063
Epoch 141/250
67/71  0s 4ms/step - accuracy: 0.8510 - loss: 0.3904
Epoch 141: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8510 - loss: 0.3904 - val_accuracy: 0.7847 - val_loss: 0.5292
Epoch 142/250
65/71  0s 4ms/step - accuracy: 0.8391 - loss: 0.4068
Epoch 142: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8390 - loss: 0.4069 - val_accuracy: 0.7900 - val_loss: 0.5712
Epoch 143/250
65/71  0s 4ms/step - accuracy: 0.8328 - loss: 0.4118
Epoch 143: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8333 - loss: 0.4103 - val_accuracy: 0.7758 - val_loss: 0.6072
Epoch 144/250
66/71  0s 4ms/step - accuracy: 0.8337 - loss: 0.4119
Epoch 144: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8341 - loss: 0.4110 - val_accuracy: 0.7633 - val_loss: 0.6051
Epoch 145/250
63/71  0s 4ms/step - accuracy: 0.8414 - loss: 0.4163
Epoch 145: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8409 - loss: 0.4168 - val_accuracy: 0.7473 - val_loss: 0.6964
Epoch 146/250
62/71  0s 4ms/step - accuracy: 0.8365 - loss: 0.4429
Epoch 146: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8372 - loss: 0.4383 - val_accuracy: 0.7972 - val_loss: 0.5444
Epoch 147/250
67/71  0s 4ms/step - accuracy: 0.8413 - loss: 0.3825
Epoch 147: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8408 - loss: 0.3835 - val_accuracy: 0.7883 - val_loss: 0.5736
Epoch 148/250
62/71  0s 4ms/step - accuracy: 0.8437 - loss: 0.3887
Epoch 148: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8441 - loss: 0.3899 - val_accuracy: 0.7651 - val_loss: 0.5694


Epoch 149/250
68/71  0s 4ms/step - accuracy: 0.8339 - loss: 0.4219
Epoch 149: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8344 - loss: 0.4207 - val_accuracy: 0.7900 - val_loss: 0.5308
Epoch 150/250
62/71  0s 3ms/step - accuracy: 0.8465 - loss: 0.3889
Epoch 150: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8453 - loss: 0.3915 - val_accuracy: 0.7705 - val_loss: 0.6368
Epoch 151/250
67/71  0s 4ms/step - accuracy: 0.8661 - loss: 0.3951
Epoch 151: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8655 - loss: 0.3948 - val_accuracy: 0.7544 - val_loss: 0.5828
Epoch 152/250
67/71  0s 4ms/step - accuracy: 0.8587 - loss: 0.3720
Epoch 152: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8583 - loss: 0.3730 - val_accuracy: 0.8238 - val_loss: 0.4949
Epoch 153/250
68/71  0s 4ms/step - accuracy: 0.8522 - loss: 0.3721
Epoch 153: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8522 - loss: 0.3727 - val_accuracy: 0.7883 - val_loss: 0.5948
Epoch 154/250
63/71  0s 4ms/step - accuracy: 0.8376 - loss: 0.4108
Epoch 154: val_loss did not improve from 0.48658
71/71  0s 6ms/step - accuracy: 0.8375 - loss: 0.4117 - val_accuracy: 0.8114 - val_loss: 0.5583
Epoch 155/250
57/71  0s 4ms/step - accuracy: 0.8284 - loss: 0.4106
Epoch 155: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8299 - loss: 0.4091 - val_accuracy: 0.8025 - val_loss: 0.5319
Epoch 156/250
62/71  0s 4ms/step - accuracy: 0.8598 - loss: 0.3510
Epoch 156: val_loss did not improve from 0.48658
71/71  0s 6ms/step - accuracy: 0.8580 - loss: 0.3545 - val_accuracy: 0.7900 - val_loss: 0.5356
Epoch 157/250
68/71  0s 4ms/step - accuracy: 0.8359 - loss: 0.4115
Epoch 157: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8360 - loss: 0.4119 - val_accuracy: 0.7544 - val_loss: 0.6261
Epoch 158/250
65/71  0s 4ms/step - accuracy: 0.8546 - loss: 0.3593
Epoch 158: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8547 - loss: 0.3597 - val_accuracy: 0.8043 - val_loss: 0.4891
Epoch 159/250
64/71  0s 4ms/step - accuracy: 0.8546 - loss: 0.3866
Epoch 159: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8538 - loss: 0.3872 - val_accuracy: 0.7527 - val_loss: 0.5871
Epoch 160/250
69/71  0s 4ms/step - accuracy: 0.8417 - loss: 0.3963
Epoch 160: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8416 - loss: 0.3968 - val_accuracy: 0.8060 - val_loss: 0.5113
Epoch 161/250
66/71  0s 4ms/step - accuracy: 0.8523 - loss: 0.3702
Epoch 161: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8521 - loss: 0.3706 - val_accuracy: 0.8043 - val_loss: 0.5337
Epoch 162/250
71/71  0s 4ms/step - accuracy: 0.8611 - loss: 0.3583
Epoch 162: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8611 - loss: 0.3586 - val_accuracy: 0.8096 - val_loss: 0.5317
Epoch 163/250
69/71  0s 4ms/step - accuracy: 0.8491 - loss: 0.3722
Epoch 163: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8489 - loss: 0.3725 - val_accuracy: 0.7865 - val_loss: 0.5673
Epoch 164/250
65/71  0s 4ms/step - accuracy: 0.8411 - loss: 0.3999
Epoch 164: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8415 - loss: 0.3999 - val_accuracy: 0.8060 - val_loss: 0.4902
Epoch 165/250
65/71  0s 4ms/step - accuracy: 0.8464 - loss: 0.3891
Epoch 165: val_loss did not improve from 0.48658


71/71  0s 5ms/step - accuracy: 0.8460 - loss: 0.3904 - val_accuracy: 0.8025 - val_loss: 0.5439
Epoch 166/250
66/71  0s 4ms/step - accuracy: 0.8413 - loss: 0.4048
Epoch 166: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8419 - loss: 0.4036 - val_accuracy: 0.8132 - val_loss: 0.5152
Epoch 167/250
67/71  0s 4ms/step - accuracy: 0.8400 - loss: 0.4057
Epoch 167: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8404 - loss: 0.4047 - val_accuracy: 0.7865 - val_loss: 0.5758
Epoch 168/250
70/71  0s 5ms/step - accuracy: 0.8562 - loss: 0.3819
Epoch 168: val_loss did not improve from 0.48658
71/71  0s 6ms/step - accuracy: 0.8562 - loss: 0.3818 - val_accuracy: 0.8025 - val_loss: 0.5184
Epoch 169/250
66/71  0s 4ms/step - accuracy: 0.8613 - loss: 0.3638
Epoch 169: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8606 - loss: 0.3653 - val_accuracy: 0.7758 - val_loss: 0.5488
Epoch 170/250
65/71  0s 4ms/step - accuracy: 0.8644 - loss: 0.3926
Epoch 170: val_loss did not improve from 0.48658
71/71  1s 5ms/step - accuracy: 0.8640 - loss: 0.3920 - val_accuracy: 0.7989 - val_loss: 0.5252
Epoch 171/250
67/71  0s 4ms/step - accuracy: 0.8755 - loss: 0.3360
Epoch 171: val_loss did not improve from 0.48658
71/71  0s 5ms/step - accuracy: 0.8744 - loss: 0.3380 - val_accuracy: 0.8256 - val_loss: 0.5058
Epoch 172/250
64/71  0s 4ms/step - accuracy: 0.8693 - loss: 0.3435
Epoch 172: val_loss improved from 0.48658 to 0.48588, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8683 - loss: 0.3453 - val_accuracy: 0.8132 - val_loss: 0.4859
Epoch 173/250
66/71  0s 4ms/step - accuracy: 0.8612 - loss: 0.3620
Epoch 173: val_loss improved from 0.48588 to 0.46830, saving model to saved_models/Heartbeat_audioclassification.keras
71/71  1s 7ms/step - accuracy: 0.8612 - loss: 0.3617 - val_accuracy: 0.8167 - val_loss: 0.4683
Epoch 174/250
70/71  0s 4ms/step - accuracy: 0.8609 - loss: 0.3658
Epoch 174: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8608 - loss: 0.3660 - val_accuracy: 0.8060 - val_loss: 0.5227
Epoch 175/250
66/71  0s 4ms/step - accuracy: 0.8497 - loss: 0.3728
Epoch 175: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8499 - loss: 0.3726 - val_accuracy: 0.8310 - val_loss: 0.4802
Epoch 176/250
65/71  0s 4ms/step - accuracy: 0.8626 - loss: 0.3524
Epoch 176: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8625 - loss: 0.3517 - val_accuracy: 0.7989 - val_loss: 0.5399
Epoch 177/250
67/71  0s 4ms/step - accuracy: 0.8551 - loss: 0.3533
Epoch 177: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8551 - loss: 0.3545 - val_accuracy: 0.8025 - val_loss: 0.5406
Epoch 178/250
64/71  0s 4ms/step - accuracy: 0.8731 - loss: 0.3226
Epoch 178: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8729 - loss: 0.3252 - val_accuracy: 0.8025 - val_loss: 0.5782
Epoch 179/250
69/71  0s 4ms/step - accuracy: 0.8516 - loss: 0.4020
Epoch 179: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8516 - loss: 0.4019 - val_accuracy: 0.8025 - val_loss: 0.5392
Epoch 180/250
66/71  0s 4ms/step - accuracy: 0.8607 - loss: 0.3666
Epoch 180: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8608 - loss: 0.3662 - val_accuracy: 0.8114 - val_loss: 0.5194
Epoch 181/250
64/71  0s 4ms/step - accuracy: 0.8477 - loss: 0.4161
Epoch 181: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8473 - loss: 0.4152 - val_accuracy: 0.8132 - val_loss: 0.48


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Epoch 182/250
70/71  0s 4ms/step - accuracy: 0.8600 - loss: 0.3678
Epoch 182: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8601 - loss: 0.3677 - val_accuracy: 0.7740 - val_loss: 0.5783
Epoch 183/250
67/71  0s 4ms/step - accuracy: 0.8688 - loss: 0.3608
Epoch 183: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8685 - loss: 0.3612 - val_accuracy: 0.8292 - val_loss: 0.4854
Epoch 184/250
66/71  0s 4ms/step - accuracy: 0.8661 - loss: 0.3367
Epoch 184: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8656 - loss: 0.3387 - val_accuracy: 0.8149 - val_loss: 0.5327
Epoch 185/250
66/71  0s 4ms/step - accuracy: 0.8687 - loss: 0.3498
Epoch 185: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8672 - loss: 0.3516 - val_accuracy: 0.7544 - val_loss: 0.5935
Epoch 186/250
63/71  0s 4ms/step - accuracy: 0.8484 - loss: 0.3931
Epoch 186: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8488 - loss: 0.3902 - val_accuracy: 0.7954 - val_loss: 0.5609
Epoch 187/250
66/71  0s 4ms/step - accuracy: 0.8484 - loss: 0.3864
Epoch 187: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8496 - loss: 0.3838 - val_accuracy: 0.8132 - val_loss: 0.4792
Epoch 188/250
69/71  0s 4ms/step - accuracy: 0.8592 - loss: 0.3267
Epoch 188: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8591 - loss: 0.3274 - val_accuracy: 0.8238 - val_loss: 0.4876
Epoch 189/250
67/71  0s 4ms/step - accuracy: 0.8596 - loss: 0.3348
Epoch 189: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8598 - loss: 0.3354 - val_accuracy: 0.8256 - val_loss: 0.5125
Epoch 190/250
61/71  0s 4ms/step - accuracy: 0.8841 - loss: 0.3144
Epoch 190: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8830 - loss: 0.3158 - val_accuracy: 0.8256 - val_loss: 0.4869
Epoch 191/250
62/71  0s 3ms/step - accuracy: 0.8481 - loss: 0.3646
Epoch 191: val_loss did not improve from 0.46830
71/71  0s 4ms/step - accuracy: 0.8490 - loss: 0.3655 - val_accuracy: 0.8043 - val_loss: 0.5443
Epoch 192/250
64/71  0s 4ms/step - accuracy: 0.8480 - loss: 0.3667
Epoch 192: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8489 - loss: 0.3670 - val_accuracy: 0.7989 - val_loss: 0.5168
Epoch 193/250
65/71  0s 4ms/step - accuracy: 0.8569 - loss: 0.3624
Epoch 193: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8574 - loss: 0.3620 - val_accuracy: 0.8025 - val_loss: 0.5094
Epoch 194/250
63/71  0s 5ms/step - accuracy: 0.8630 - loss: 0.3511
Epoch 194: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8628 - loss: 0.3518 - val_accuracy: 0.8114 - val_loss: 0.4793
Epoch 195/250
69/71  0s 4ms/step - accuracy: 0.8666 - loss: 0.3258
Epoch 195: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8666 - loss: 0.3266 - val_accuracy: 0.8096 - val_loss: 0.5041
Epoch 196/250
64/71  0s 4ms/step - accuracy: 0.8691 - loss: 0.3725
Epoch 196: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8686 - loss: 0.3722 - val_accuracy: 0.8078 - val_loss: 0.4981
Epoch 197/250
69/71  0s 4ms/step - accuracy: 0.8736 - loss: 0.3312
Epoch 197: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8728 - loss: 0.3326 - val_accuracy: 0.8025 - val_loss: 0.5741
Epoch 198/250
67/71  0s 4ms/step - accuracy: 0.8581 - loss: 0.3520


Epoch 198: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8585 - loss: 0.3513 - val_accuracy: 0.7829 - val_loss: 0.5981


Epoch 199/250
67/71  0s 4ms/step - accuracy: 0.8687 - loss: 0.3377


Epoch 199: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8684 - loss: 0.3384 - val_accuracy: 0.7722 - val_loss: 0.6179


Epoch 200/250
69/71  0s 4ms/step - accuracy: 0.8509 - loss: 0.3744


Epoch 200: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8515 - loss: 0.3737 - val_accuracy: 0.8060 - val_loss: 0.5691


Epoch 201/250
68/71  0s 4ms/step - accuracy: 0.8616 - loss: 0.3567


Epoch 201: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8616 - loss: 0.3567 - val_accuracy: 0.7972 - val_loss: 0.5293


Epoch 202/250
68/71  0s 4ms/step - accuracy: 0.8718 - loss: 0.3280


Epoch 202: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8716 - loss: 0.3285 - val_accuracy: 0.8078 - val_loss: 0.5130


Epoch 203/250
69/71  0s 4ms/step - accuracy: 0.8752 - loss: 0.3190


Epoch 203: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8753 - loss: 0.3185 - val_accuracy: 0.7972 - val_loss: 0.5030


Epoch 204/250
61/71  0s 6ms/step - accuracy: 0.8543 - loss: 0.3664


Epoch 204: val_loss did not improve from 0.46830
71/71  1s 7ms/step - accuracy: 0.8551 - loss: 0.3668 - val_accuracy: 0.7900 - val_loss: 0.5453


Epoch 205/250
67/71  0s 4ms/step - accuracy: 0.8766 - loss: 0.3107


Epoch 205: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8758 - loss: 0.3132 - val_accuracy: 0.8238 - val_loss: 0.5097


Epoch 206/250
69/71  0s 4ms/step - accuracy: 0.8813 - loss: 0.3482


Epoch 206: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8812 - loss: 0.3481 - val_accuracy: 0.8096 - val_loss: 0.4997


Epoch 207/250
67/71  0s 4ms/step - accuracy: 0.8792 - loss: 0.3175


Epoch 207: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8781 - loss: 0.3193 - val_accuracy: 0.8132 - val_loss: 0.5392


Epoch 208/250
66/71  0s 4ms/step - accuracy: 0.8469 - loss: 0.3959


Epoch 208: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8477 - loss: 0.3941 - val_accuracy: 0.8221 - val_loss: 0.4959


Epoch 209/250
68/71  0s 4ms/step - accuracy: 0.8731 - loss: 0.3321


Epoch 209: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8733 - loss: 0.3322 - val_accuracy: 0.8096 - val_loss: 0.5445


Epoch 210/250
68/71  0s 4ms/step - accuracy: 0.8716 - loss: 0.3177


Epoch 210: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8717 - loss: 0.3186 - val_accuracy: 0.8185 - val_loss: 0.5022


Epoch 211/250
66/71  0s 4ms/step - accuracy: 0.8695 - loss: 0.3158


Epoch 211: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8697 - loss: 0.3157 - val_accuracy: 0.8310 - val_loss: 0.4872


Epoch 212/250
61/71  0s 5ms/step - accuracy: 0.8600 - loss: 0.3621



Epoch 212: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8604 - loss: 0.3616 - val_accuracy: 0.8043 - val_loss: 0.5092



Epoch 213/250
64/71  0s 4ms/step - accuracy: 0.8676 - loss: 0.3479



Epoch 213: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8679 - loss: 0.3466 - val_accuracy: 0.8132 - val_loss: 0.5301



Epoch 214/250
68/71  0s 4ms/step - accuracy: 0.8747 - loss: 0.3214



Epoch 214: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8746 - loss: 0.3220 - val_accuracy: 0.8132 - val_loss: 0.5311



Epoch 215/250
71/71  0s 4ms/step - accuracy: 0.8600 - loss: 0.3578
Epoch 215: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8599 - loss: 0.3580 - val_accuracy: 0.8185 - val_loss: 0.5072



Epoch 216/250
67/71  0s 4ms/step - accuracy: 0.8762 - loss: 0.3074
Epoch 216: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8765 - loss: 0.3076 - val_accuracy: 0.8078 - val_loss: 0.5299



Epoch 217/250
66/71  0s 4ms/step - accuracy: 0.8799 - loss: 0.3201
Epoch 217: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8794 - loss: 0.3221 - val_accuracy: 0.7580 - val_loss: 0.6690


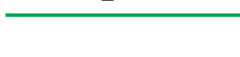
Epoch 218/250
67/71  0s 4ms/step - accuracy: 0.8798 - loss: 0.3180
Epoch 218: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8792 - loss: 0.3194 - val_accuracy: 0.8238 - val_loss: 0.5268


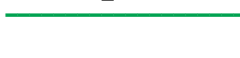
Epoch 219/250
67/71  0s 4ms/step - accuracy: 0.8744 - loss: 0.3536
Epoch 219: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8737 - loss: 0.3546 - val_accuracy: 0.8025 - val_loss: 0.5426


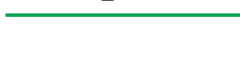
Epoch 220/250
69/71  0s 4ms/step - accuracy: 0.8596 - loss: 0.3394
Epoch 220: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8597 - loss: 0.3399 - val_accuracy: 0.7829 - val_loss: 0.5485



Epoch 221/250
67/71  0s 5ms/step - accuracy: 0.8667 - loss: 0.3672
Epoch 221: val_loss did not improve from 0.46830
71/71  0s 6ms/step - accuracy: 0.8665 - loss: 0.3670 - val_accuracy: 0.8132 - val_loss: 0.5148



Epoch 222/250
57/71  0s 4ms/step - accuracy: 0.8705 - loss: 0.3349
Epoch 222: val_loss did not improve from 0.46830
71/71  1s 4ms/step - accuracy: 0.8709 - loss: 0.3337 - val_accuracy: 0.7954 - val_loss: 0.6097



Epoch 223/250
63/71  0s 4ms/step - accuracy: 0.8573 - loss: 0.3362
Epoch 223: val_loss did not improve from 0.46830
71/71  1s 10ms/step - accuracy: 0.8586 - loss: 0.3361 - val_accuracy: 0.8327 - val_loss: 0.5148



Epoch 224/250
63/71  0s 7ms/step - accuracy: 0.8906 - loss: 0.3360
Epoch 224: val_loss did not improve from 0.46830
71/71  1s 7ms/step - accuracy: 0.8893 - loss: 0.3373 - val_accuracy: 0.8025 - val_loss: 0.5094



Epoch 225/250
67/71  0s 4ms/step - accuracy: 0.8929 - loss: 0.2866
Epoch 225: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8920 - loss: 0.2886 - val_accuracy: 0.8025 - val_loss: 0.4742


Epoch 226/250
64/71  0s 4ms/step - accuracy: 0.8747 - loss: 0.3212
Epoch 226: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8747 - loss: 0.3206 - val_accuracy: 0.8007 - val_loss: 0.5043


































Epoch 227/250
71/71  0s 4ms/step - accuracy: 0.8880 - loss: 0.3192
Epoch 227: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8878 - loss: 0.3193 - val_accuracy: 0.8132 - val_loss: 0.4991

Epoch 228/250
65/71  0s 4ms/step - accuracy: 0.8665 - loss: 0.3266
Epoch 228: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8678 - loss: 0.3257 - val_accuracy: 0.8043 - val_loss: 0.5519

Epoch 229/250
69/71  0s 4ms/step - accuracy: 0.8681 - loss: 0.3238
Epoch 229: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8684 - loss: 0.3232 - val_accuracy: 0.8256 - val_loss: 0.4952

Epoch 230/250
68/71  0s 4ms/step - accuracy: 0.8832 - loss: 0.3119
Epoch 230: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8826 - loss: 0.3128 - val_accuracy: 0.8043 - val_loss: 0.5159

Epoch 231/250
70/71  0s 4ms/step - accuracy: 0.8786 - loss: 0.3200
Epoch 231: val_loss did not improve from 0.46830

71/71  0s 5ms/step - accuracy: 0.8785 - loss: 0.3200 - val_accuracy: 0.7936 - val_loss: 0.5269
Epoch 232/250
67/71  0s 4ms/step - accuracy: 0.8799 - loss: 0.3426
Epoch 232: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8800 - loss: 0.3419 - val_accuracy: 0.7989 - val_loss: 0.4961
Epoch 233/250
68/71  0s 4ms/step - accuracy: 0.8878 - loss: 0.2998
Epoch 233: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8873 - loss: 0.3006 - val_accuracy: 0.8096 - val_loss: 0.4885
Epoch 234/250
70/71  0s 4ms/step - accuracy: 0.8923 - loss: 0.2999
Epoch 234: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8920 - loss: 0.3006 - val_accuracy: 0.8078 - val_loss: 0.5763
Epoch 235/250
68/71  0s 4ms/step - accuracy: 0.8737 - loss: 0.3430
Epoch 235: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8742 - loss: 0.3414 - val_accuracy: 0.8221 - val_loss: 0.5171
Epoch 236/250
63/71  0s 5ms/step - accuracy: 0.8714 - loss: 0.3284
Epoch 236: val_loss did not improve from 0.46830
71/71  1s 6ms/step - accuracy: 0.8715 - loss: 0.3281 - val_accuracy: 0.8452 - val_loss: 0.4786
Epoch 237/250
68/71  0s 4ms/step - accuracy: 0.8818 - loss: 0.3031
Epoch 237: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8818 - loss: 0.3034 - val_accuracy: 0.8185 - val_loss: 0.4925
Epoch 238/250
68/71  0s 4ms/step - accuracy: 0.8718 - loss: 0.3429
Epoch 238: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8720 - loss: 0.3427 - val_accuracy: 0.8292 - val_loss: 0.5238
Epoch 239/250
64/71  0s 4ms/step - accuracy: 0.8790 - loss: 0.3206
Epoch 239: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8775 - loss: 0.3256 - val_accuracy: 0.7651 - val_loss: 0.6126
Epoch 240/250
70/71  0s 4ms/step - accuracy: 0.8768 - loss: 0.3163
Epoch 240: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8766 - loss: 0.3167 - val_accuracy: 0.8007 - val_loss: 0.5273
Epoch 241/250
71/71  0s 4ms/step - accuracy: 0.8787 - loss: 0.3179
Epoch 241: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8787 - loss: 0.3180 - val_accuracy: 0.8203 - val_loss: 0.4839
Epoch 242/250
63/71  0s 5ms/step - accuracy: 0.8646 - loss: 0.3491
Epoch 242: val_loss did not improve from 0.46830
71/71  1s 6ms/step - accuracy: 0.8662 - loss: 0.3454 - val_accuracy: 0.8096 - val_loss: 0.5045
Epoch 243/250
58/71  0s 4ms/step - accuracy: 0.8694 - loss: 0.3354
Epoch 243: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8708 - loss: 0.3323 - val_accuracy: 0.8292 - val_loss: 0.5269
Epoch 244/250
58/71  0s 4ms/step - accuracy: 0.8873 - loss: 0.3182
Epoch 244: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8863 - loss: 0.3196 - val_accuracy: 0.8149 - val_loss: 0.4826
Epoch 245/250
67/71  0s 4ms/step - accuracy: 0.8699 - loss: 0.3378
Epoch 245: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8698 - loss: 0.3380 - val_accuracy: 0.8221 - val_loss: 0.5105
Epoch 246/250
70/71  0s 4ms/step - accuracy: 0.8727 - loss: 0.3418
Epoch 246: val_loss did not improve from 0.46830
71/71  0s 5ms/step - accuracy: 0.8728 - loss: 0.3416 - val_accuracy: 0.8149 - val_loss: 0.5043
Epoch 247/250
66/71  0s 4ms/step - accuracy: 0.8906 - loss: 0.3151
Epoch 247: val_loss did not improve from 0.46830
71/71  1s 5ms/step - accuracy: 0.8900 - loss: 0.3156 - val_accuracy: 0.7527 - val_loss: 0.6992
Epoch 248/250


```

67/71 ————— 0s 4ms/step - accuracy: 0.8754 - loss: 0.3208
Epoch 248: val_loss did not improve from 0.46830
71/71 ————— 0s 5ms/step - accuracy: 0.8752 - loss: 0.3212 - val_accuracy: 0.8025 - val_loss: 0.54
86
Epoch 249/250
69/71 ————— 0s 4ms/step - accuracy: 0.8793 - loss: 0.3147
Epoch 249: val_loss did not improve from 0.46830
71/71 ————— 1s 5ms/step - accuracy: 0.8791 - loss: 0.3152 - val_accuracy: 0.7135 - val_loss: 0.74
07
Epoch 250/250
70/71 ————— 0s 4ms/step - accuracy: 0.8703 - loss: 0.3327
Epoch 250: val_loss did not improve from 0.46830
71/71 ————— 1s 5ms/step - accuracy: 0.8704 - loss: 0.3326 - val_accuracy: 0.8452 - val_loss: 0.48
60
Training time 0:02:25.495120

```

```
In [90]: model.evaluate(X_test,y_test,verbose=0)
```

```
Out[90]: [0.4859813451766968, 0.8451957106590271]
```

```
In [97]: filename="Heartbeat Dataset\set_b\Bunlabelledtest_101_1305030823364_D.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class
```

```

[[-4.72171997e+02  1.93448792e+02  4.90768166e+01 -1.78982334e+01
  1.11785431e+01  4.31403961e+01  2.21669540e+01 -1.05643835e+01
 -7.80938768e+00  1.17523270e+01  1.01166258e+01 -6.37369204e+00
 -8.93072701e+00  2.18046641e+00  5.81360149e+00 -3.18505496e-01
 -1.43622494e+00  4.07235193e+00  4.40512609e+00 -1.51925290e+00
 -3.11547685e+00  1.44866109e+00  3.27636743e+00  9.09210071e-02
 -9.03025448e-01  2.47284818e+00  4.06059742e+00  1.40294707e+00
 -7.55656183e-01 -5.26913488e-03  7.25224912e-01  3.81900012e-01
  1.13817370e+00  2.29711437e+00  9.68096316e-01 -1.39059639e+00
 -8.88923645e-01  1.09255946e+00  1.20317824e-01 -2.34003210e+00]]
(1, 40)
1/1 ————— 0s 137ms/step
[2]

```

```
Out[97]: array(['bunlabelledtest'], dtype='<U15')
```

```
In [100.. filename="Heartbeat Dataset\set_b\murmur_116_1306258689913_A.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class
```

```

[[-4.08058594e+02  2.01761871e+02  6.38594131e+01 -6.57572794e+00
  1.09352846e+01  3.52841034e+01  1.60654697e+01 -1.14449387e+01
 -6.06688356e+00  1.44269686e+01  1.45341835e+01 -4.82056707e-01
 -3.35267901e+00  6.84454060e+00  1.00596075e+01  2.98184562e+00
  1.63947940e-01  5.10864878e+00  6.50065517e+00  9.64904785e-01
 -1.96506214e+00  1.75043011e+00  4.66146278e+00  2.39001441e+00
  6.76329210e-02  1.37266195e+00  2.67153144e+00  1.22739029e+00
 -1.63199723e-01  4.02117521e-01  7.01464713e-01 -1.11333996e-01
  3.11607599e-01  2.02929187e+00  1.90412188e+00 -3.11961591e-01
 -1.06366813e+00  5.17881215e-01  1.17593598e+00 -1.08988255e-01]]
(1, 40)
1/1 ————— 0s 28ms/step
[6]

```

```
Out[100.. array(['normal'], dtype='<U15')
```

```
In [101.. filename="Heartbeat Dataset\set_b\murmur_122_1306325762831_C.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class
```

```

[[-4.7184357e+02  1.9643465e+02  4.4209164e+01 -2.4082542e+01
  9.9344425e+00  4.5990501e+01  2.6021833e+01 -5.2401209e+00
  2.2768678e-01  2.0126656e+01  1.5615690e+01 -2.9413733e+00
 -4.5433645e+00  7.6120877e+00  9.6888285e+00  1.1696950e+00
 -5.7543504e-01  5.2865691e+00  4.9855323e+00 -2.1488054e+00
 -4.0574584e+00  8.3929211e-01  2.6751845e+00 -4.0220007e-01
 -5.6154013e-01  3.3772283e+00  4.2411795e+00  6.7304295e-01
 -1.1270964e+00  3.3678788e-01  3.8127568e-01 -1.2489485e+00
  7.1774818e-02  3.6828284e+00  3.8594384e+00  4.2218086e-01
 -9.9220532e-01  5.7708186e-01  5.2006274e-01 -1.4540715e+00]]

```

(1, 40)

1/1  0s 48ms/step

[5]

Out[101.. array(['murmur'], dtype='<U15')

```

In [102.. filename="Heartbeat Dataset\\set_b\\extrastole_229_1308594979317_B.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class

```

```

[[-404.43414  194.13982  42.57269  -27.270689  4.6255436
  40.54172   24.19878  -2.949049  2.1731234  17.322235
  9.6150465  -6.6588097  -3.8369799  9.298449  8.705506
 -1.8750418  -3.214086  3.58781  3.7819192  -1.9781964
 -1.9187363  2.8934672  2.270367  -2.202566  -0.7339806
  4.998844   4.6871815  -1.3142078  -2.8891075  1.6296976
  4.0012527  1.825914   1.0454751  2.88489   1.9765601
 -1.7684287  -1.9599338  2.1401534  3.7519255  0.6971175]]

```

(1, 40)

1/1  0s 26ms/step

[4]

Out[102.. array(['extrastole'], dtype='<U15')

```

In [107.. filename="Heartbeat Dataset\\set_b\\extrastole_229_1308594979317_B.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class

```

```

[[-404.43414  194.13982  42.57269  -27.270689  4.6255436
  40.54172   24.19878  -2.949049  2.1731234  17.322235
  9.6150465  -6.6588097  -3.8369799  9.298449  8.705506
 -1.8750418  -3.214086  3.58781  3.7819192  -1.9781964
 -1.9187363  2.8934672  2.270367  -2.202566  -0.7339806
  4.998844   4.6871815  -1.3142078  -2.8891075  1.6296976
  4.0012527  1.825914   1.0454751  2.88489   1.9765601
 -1.7684287  -1.9599338  2.1401534  3.7519255  0.6971175]]

```

(1, 40)

1/1  0s 27ms/step

[4]


Out[107.. array(['extrastole'], dtype='<U15')

```

In [110.. filename=r"Heartbeat Dataset\\set_a\\normal_201103090635.wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class

```

```


[[-5.09797882e+02  7.08408127e+01  1.19630499e+01  2.74177132e+01
  1.15755825e+01  1.58948374e+01  7.92479324e+00  1.03368149e+01
  4.93577147e+00  7.97080088e+00  2.84635520e+00  6.41060352e+00
  6.82819188e-01  4.19622087e+00 -6.98551059e-01  3.39644170e+00
 -1.90112829e+00  2.30596399e+00 -2.43092179e+00  2.10472560e+00
 -2.12544394e+00  2.38803482e+00 -1.45757627e+00  1.97666490e+00
 -2.01555777e+00  1.06961870e+00 -2.49541712e+00  4.97440517e-01
 -2.27936220e+00  9.52181756e-01 -2.51702118e+00  1.91041112e+00
 -1.57487869e+00  1.45918739e+00 -1.71771991e+00  1.33207750e+00
 -1.72990835e+00  9.96946454e-01 -2.02645493e+00  7.38050818e-01]]
(1, 40)
1/1  0s 58ms/step
[6]

```

Out[110]: array(['normal'], dtype='<U15')

```

In [111]: filename=r"Heartbeat Dataset\set_a\unlabelledtest_201108011113 (5).wav"
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class

[[-5.0076639e+02  1.4532770e+02  2.7105120e+01  2.8766676e+01
  8.5901146e+00  1.5802772e+01  5.3154168e+00  3.4781594e+00
 -1.6624154e+00 -2.4885347e+00 -4.6430507e+00 -3.7894268e+00
 -4.6004763e+00 -4.5238137e+00 -4.4420013e+00 -4.1617990e+00
 -4.8451834e+00 -5.1540828e+00 -5.0136709e+00 -4.7160878e+00
 -4.7612958e+00 -4.5231910e+00 -3.5370455e+00 -3.0437565e+00
 -2.0191531e+00 -2.4126432e+00 -2.3227208e+00 -1.5146524e+00
 -1.1254345e+00 -1.6902635e+00 -2.2307856e+00 -2.7554984e+00
 -1.9381588e+00 -1.4399330e-01  1.1037377e+00  1.0961738e+00
  1.3720644e-01 -1.0778202e+00 -7.5175381e-01  4.4598360e-02]]
(1, 40)
1/1  0s 34ms/step
[7]

```

Out[111]: array(['unlabelledtest'], dtype='<U15')

```

In [ ]: filename=
y, sr = librosa.load(filename, duration=3, offset=0.5)
mfcc = np.mean(librosa.feature.mfcc(y=y, sr=sr, n_mfcc=40).T, axis=0)
mfcc=mfcc.reshape(1,-1)
print(mfcc)
print(mfcc.shape)
predicted_label=np.argmax(model.predict(mfcc), axis=-1)
print(predicted_label)
prediction_class = labelencoder.inverse_transform(predicted_label)
prediction_class

```