urbansound8k dataset + librosa package

- https://urbansounddataset.weebly.com/urbansound8k.html (https://urbansounddataset.weebly.com/urbansound8k.html)
- 8732 audio files of urban sounds (see description above) in WAV format

In [4]:
```
import numpy as np
import pandas as pd

import librosa as lb
import librosa.display as display
import matplotlib.pyplot as plt
%matplotlib inline
```

In [9]:
```
metadata = pd.read_csv('UrbanSound8K/metadata/UrbanSound8K.csv')
```

In [15]:
```
metadata.head(2)
```

Out[15]:

	slice_file_name	fsID	start	end	salience	fold	classID	class
0	100032-3-0-0.wav	100032	0.0	0.317551	1	5	3	dog_bark
1	100263-2-0-117.wav	100263	58.5	62.500000	1	5	2	children_playing

In [27]:
```
classes = metadata['class'].unique()
classes
```

Out[27]:
```
array(['dog_bark', 'children_playing', 'car_horn', 'air_conditioner',
       'street_music', 'gun_shot', 'siren', 'engine_idling', 'jackhammer',
       'drilling'], dtype=object)
```

In [39]:
```
print('records number for each class:')
for idx,class_name in enumerate(classes):
    count = metadata[metadata['class']==class_name].shape[0]
    print('class %i %s: %i'%(idx, class_name, count))
```

```
records number for each class:
class 0 dog_bark: 1000
class 1 children_playing: 1000
class 2 car_horn: 429
class 3 air_conditioner: 1000
class 4 street_music: 1000
class 5 gun_shot: 374
class 6 siren: 929
class 7 engine_idling: 1000
class 8 jackhammer: 1000
class 9 drilling: 1000
```

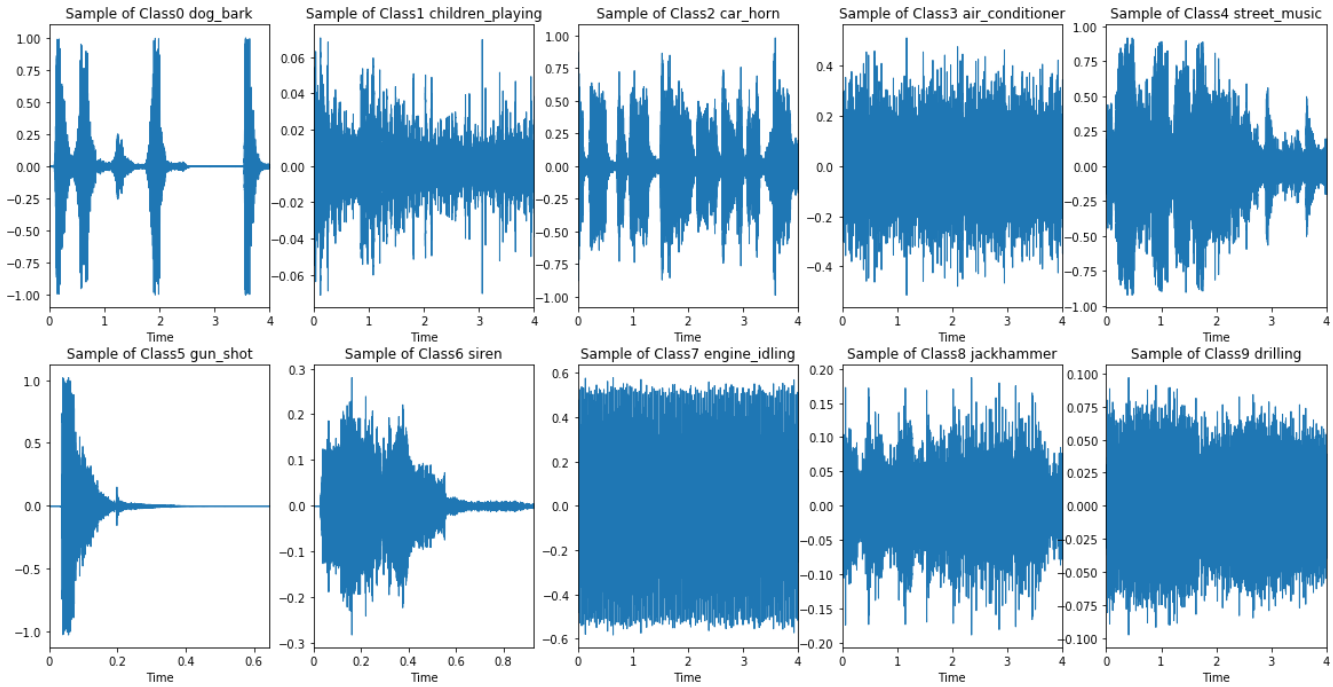
In [16]:
```
import os
def getpath(directory,fold_num,file_name):
    foldpath = os.path.join(directory,'fold')+str(fold_num)
    return(os.path.join(foldpath,file_name))
```

In [100]:
```
pwd = %pwd
directory = os.path.join(pwd, 'UrbanSound8K/audio/')
getpath(directory,fold_num=5,file_name='100032-3-0-0.wav')
```

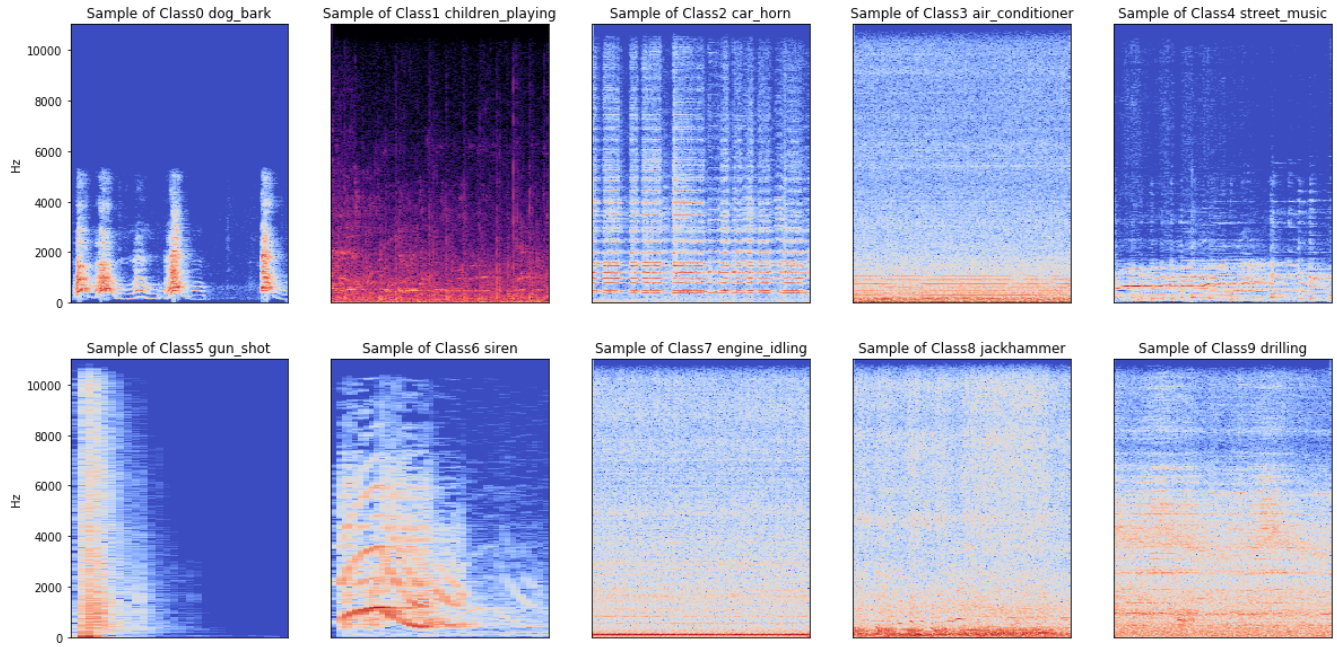
Out[100]:
```
'/Users/jr/Desktop/1003_ML/hw/hw6/hw6-trees/UrbanSound8K/audio/fold5/100032-3-0
-0.wav'
```

5.1 load audio file and plot

In [78]:
```
# load random audio file from each class,plot waves and linear-frequency power sp
import random
rand = random.randint(0, 374)
plt.figure(figsize=(20,10))

for idx,class_name in enumerate(classes):
    df1 = metadata[metadata['class']==class_name].iloc[rand]
    file_name = df1['slice_file_name']
    fold_num = df1['fold']

    #get path for each random file
    path = getpath(directory,fold_num,file_name)
    sound = lb.load(path)[0]

    #generate subplot for each random sample
    plt.subplot(2,5,idx+1)
    display.waveplot(sound)  #Plot the amplitude envelope of a waveform
    plt.title('Sample of Class%s %s'%(idx,class_name))
```



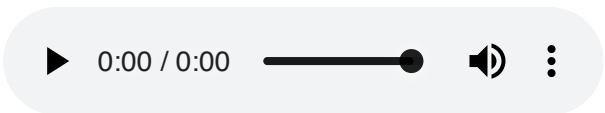
In [93]:
```
plt.figure(figsize=(20,10))
for idx,class_name in enumerate(classes):
    df1 = metadata[metadata['class']==class_name].iloc[rand]
    file_name = df1['slice_file_name']
    fold_num = df1['fold']
    #get path for each random file
    path = getpath(directory,fold_num,file_name)
    sound = lb.load(path)[0]
    # Compute Short-time Fourier transform (STFT) and convert the amplitude to dB
    s = lb.stft(sound)
    s_dB = lb.amplitude_to_db(np.abs(s))
    #generate subplot for each random sample
    plt.subplot(2,5,idx+1)
    if idx in [0,5]:
        display.specshow(s_dB,y_axis='linear')
    else:
        display.specshow(s_dB)

    plt.title('Sample of Class%s %s'%(idx,class_name))
```



In [96]:
```
sample = lb.load('/Users/jr/Desktop/1003_ML/hw/hw6/hw6-trees/UrbanSound8K/audio/f
x, sampling_rate = sample
```

In [101]:
```
#play the audio
from IPython.display import display, Audio
Audio(x,rate=sampling_rate)
```

Out[101]:



7.2 MFCC

In [102]:
```
from librosa.feature import mfcc
from librosa.feature import delta
from sklearn.preprocessing import normalize
```

In [ ]: