**Documentaion**

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**2103130**

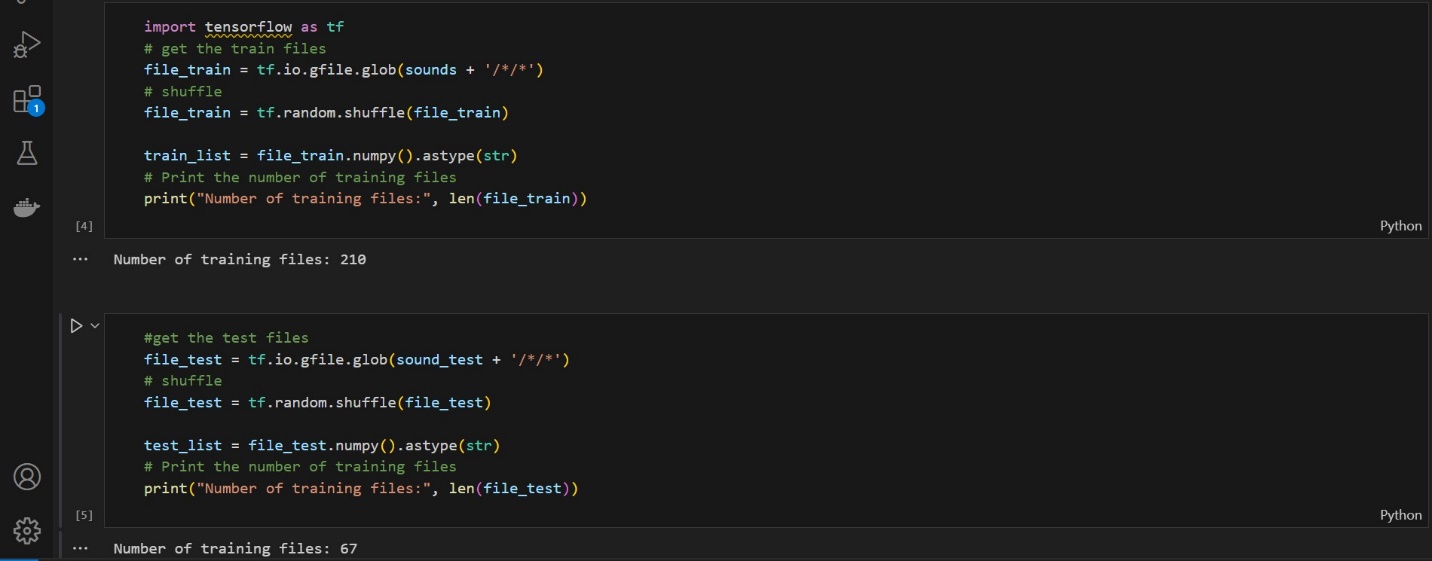
**Introduction**

* **Objective:** This notebook aims to classify audio files into two categories: cats and dogs, using machine learning techniques
* **Dataset:** The training and test datasets are located in specified directories.

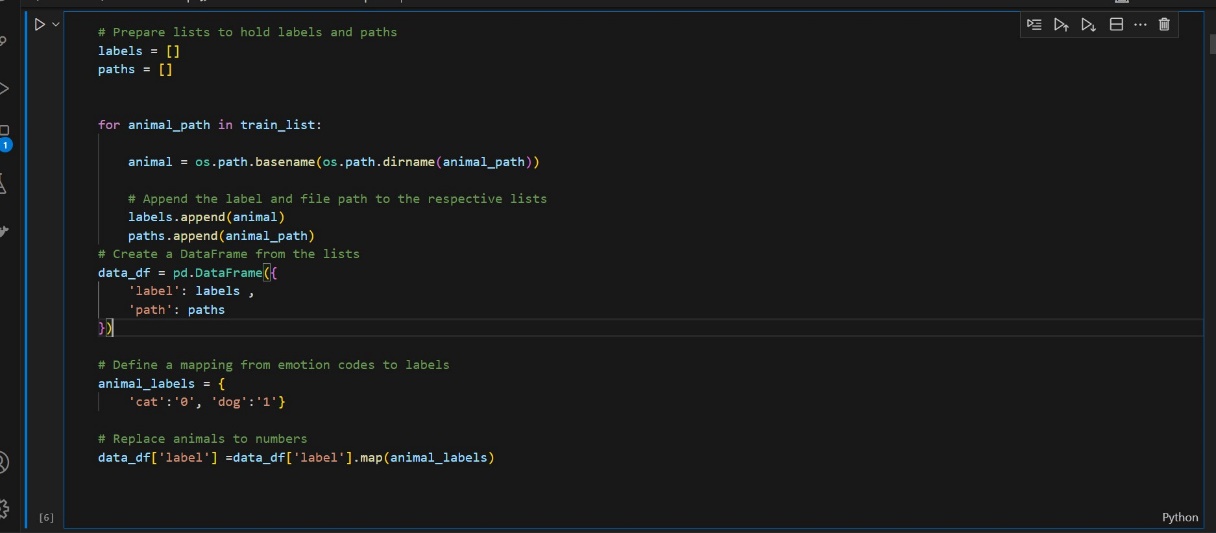
**Importing Necessary Libraries:**

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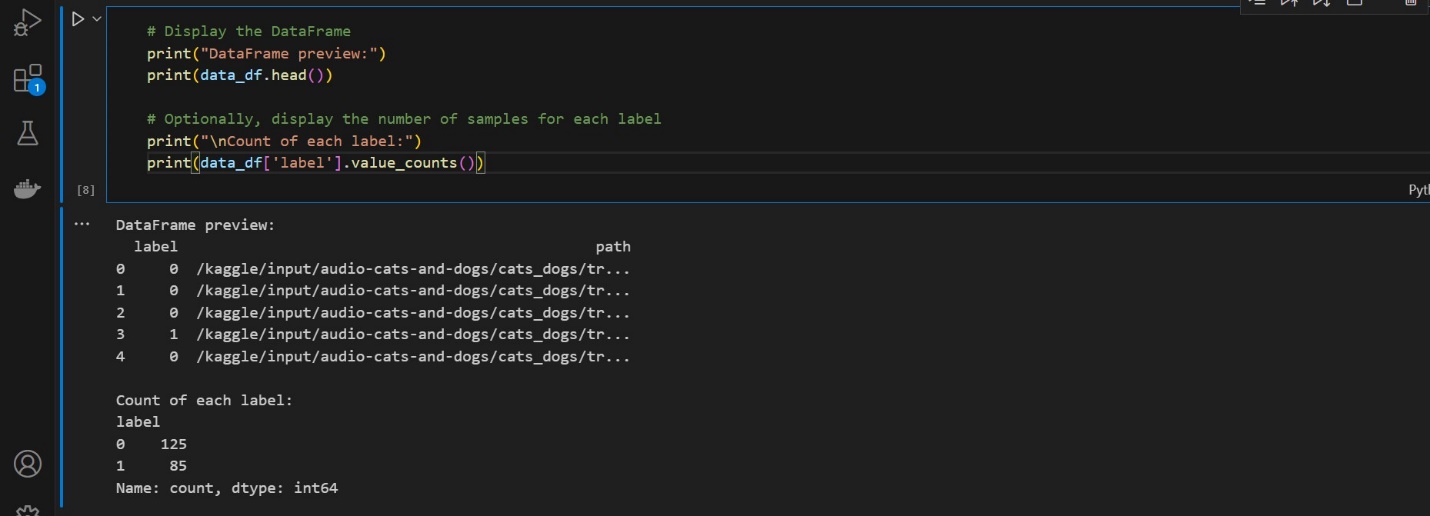
**Loading and Shuffling Training and testing Data:**

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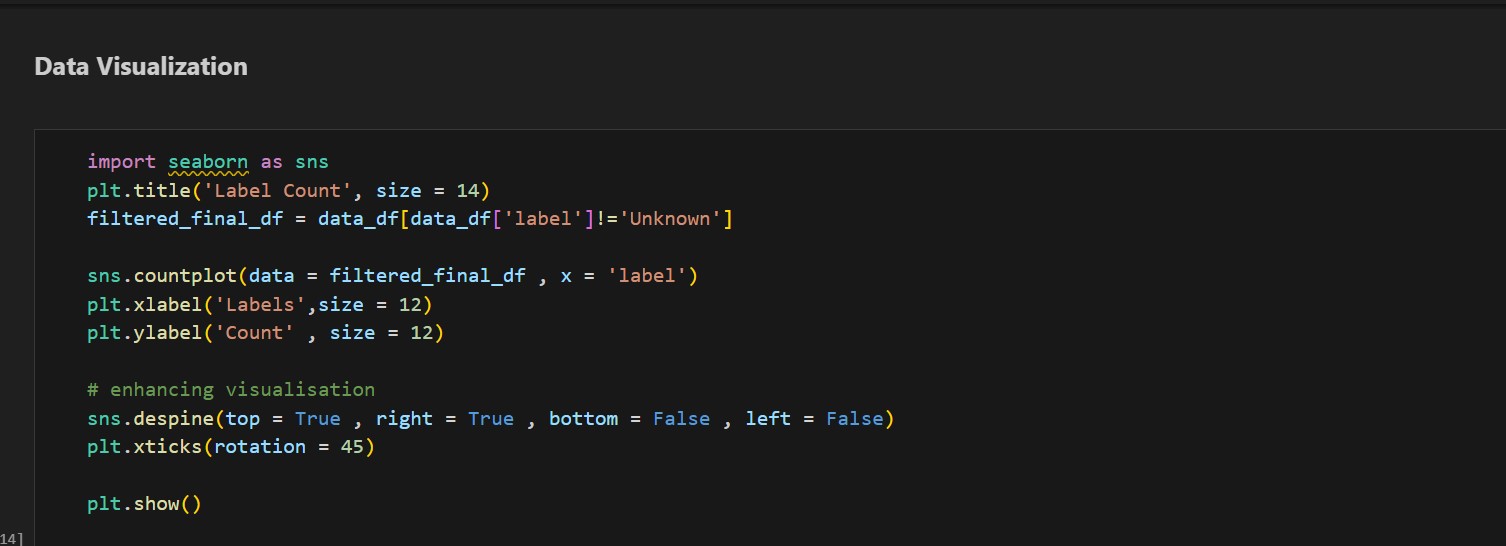
In this code snippet there’s we initialize lists for Labels and Paths and convert labels to numerical values so that the data becomes suitable for feeding into a model

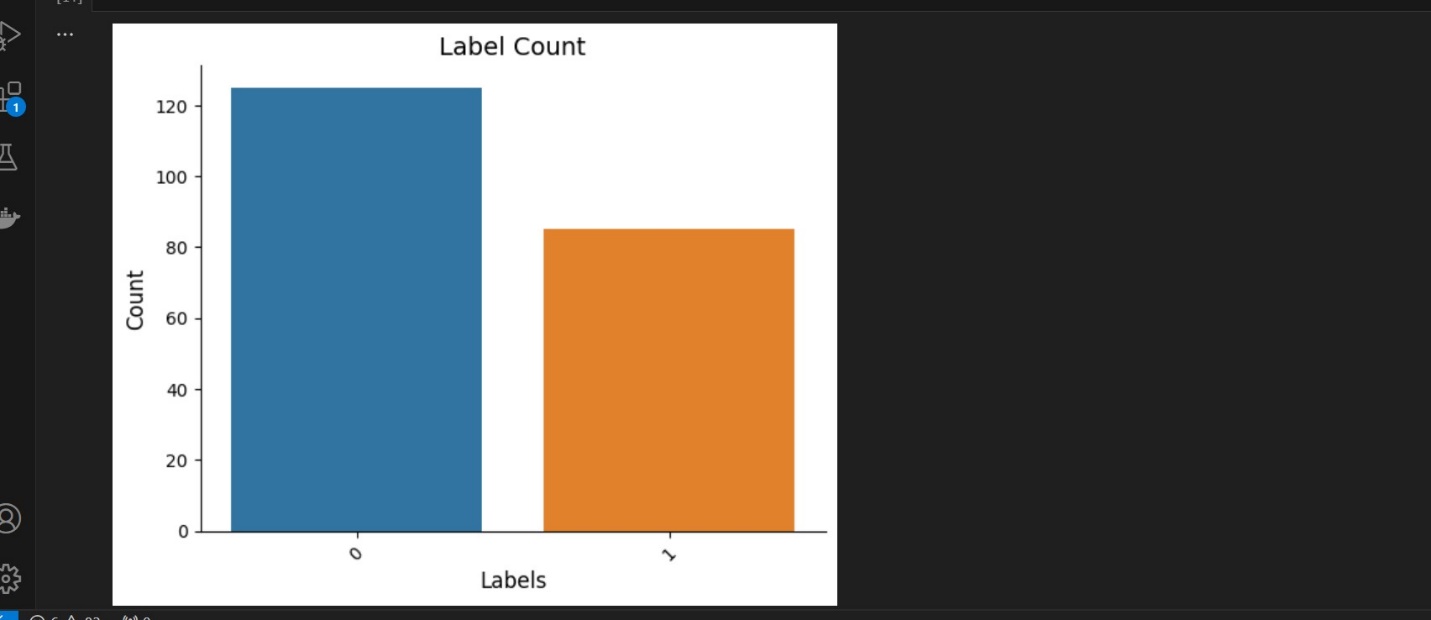


Displaying the Dataframe :

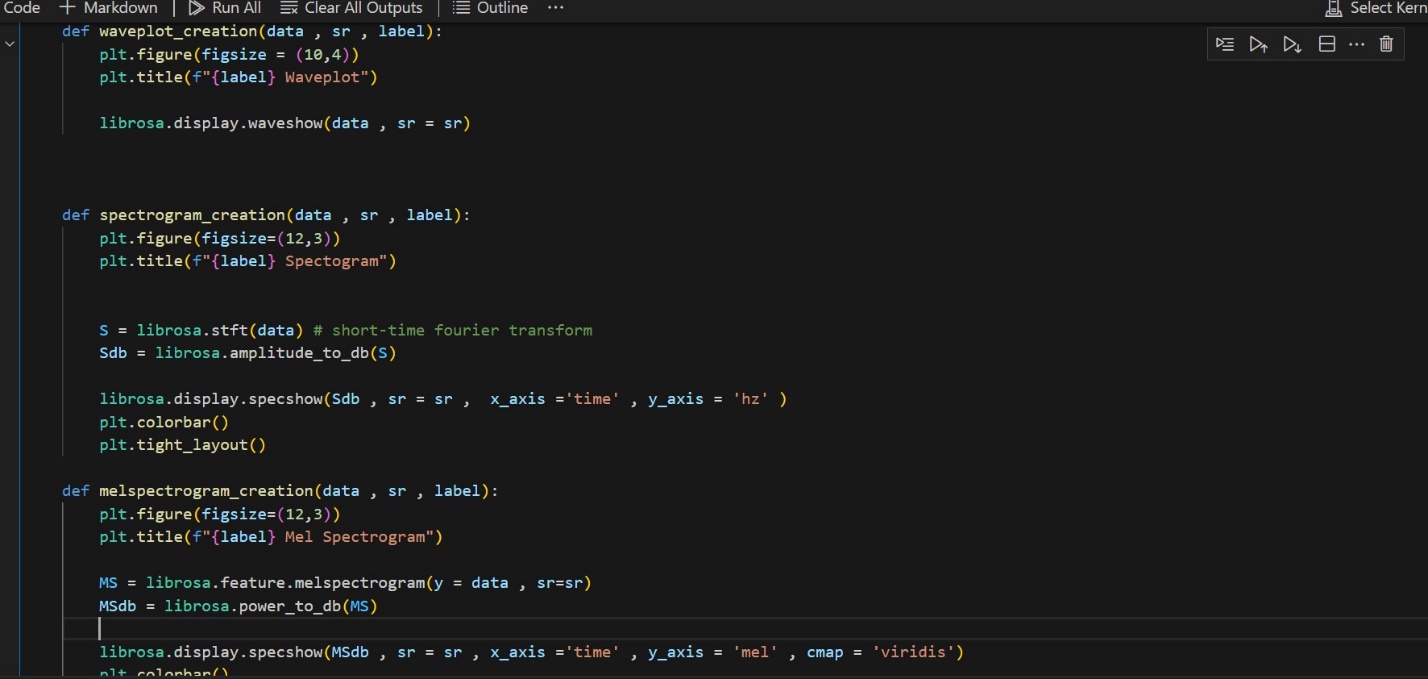


Data Visualization:

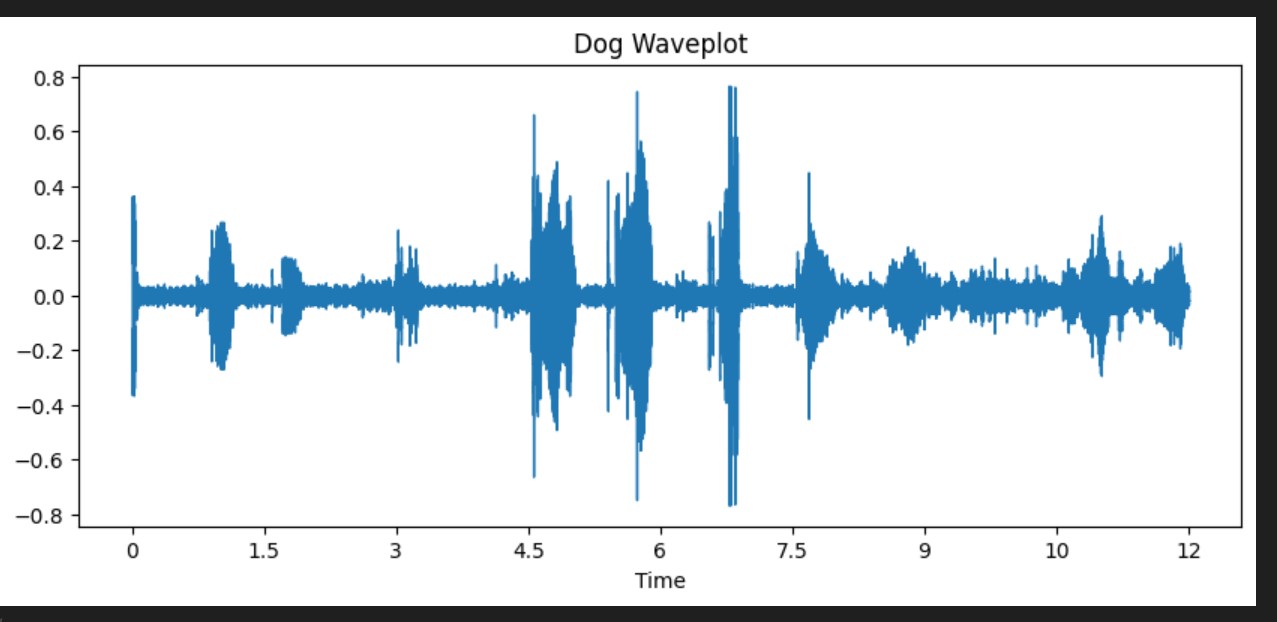




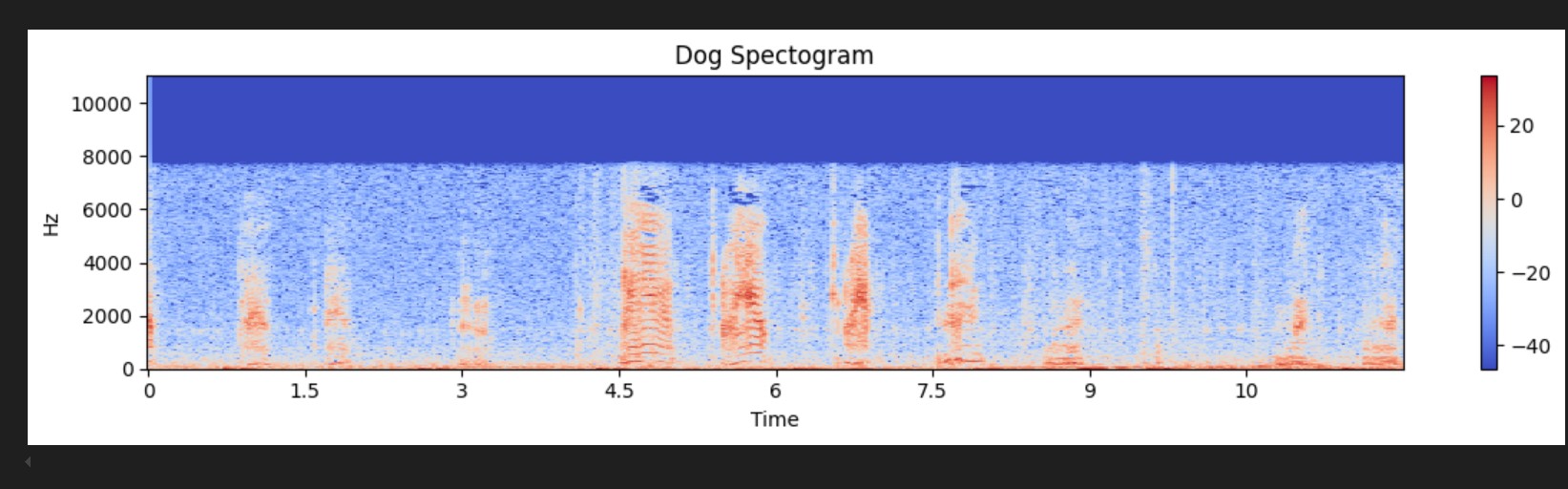
The code snippet defines three functions to visualize different audio representations.



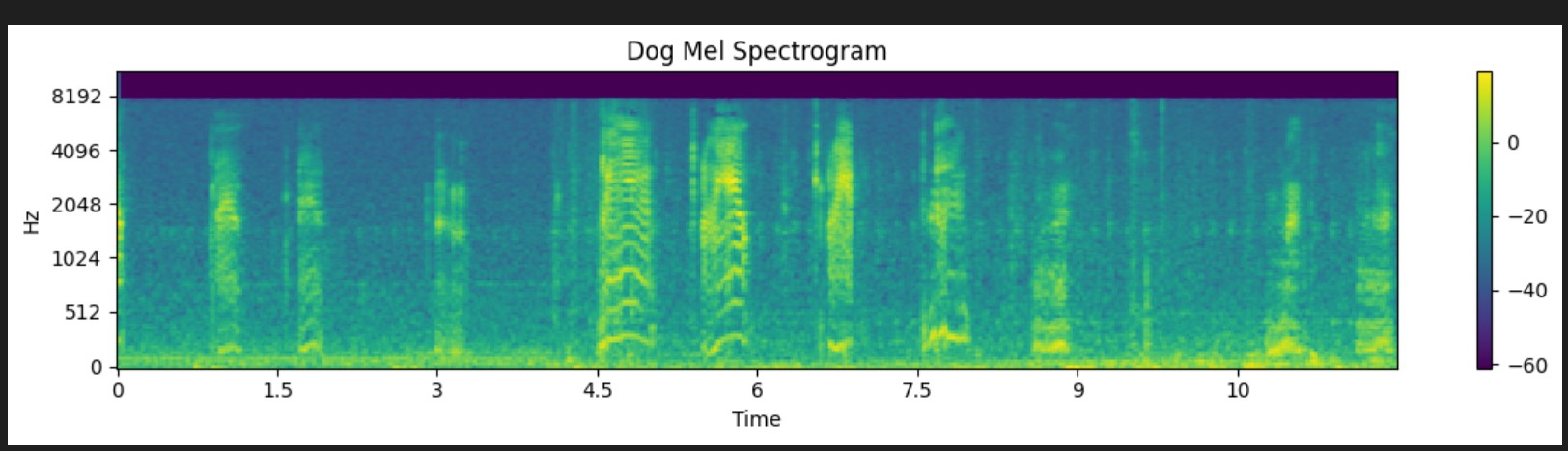
**Waveform**: shows how the amplitude of the signal changes over time



**Spectrogram:** visual representation of the spectrum of frequencies

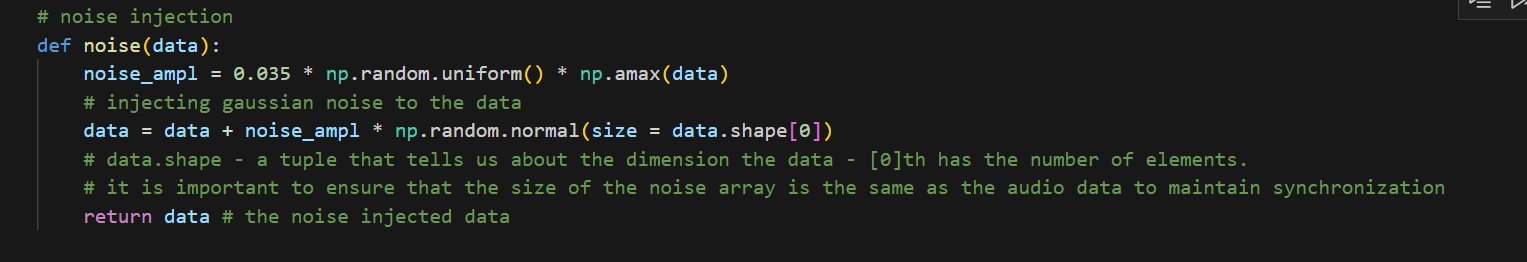


**Mel spectrogram:** the frequency axis is converted to the mel scale, which more closely approximates the human ear's response to different frequencies.

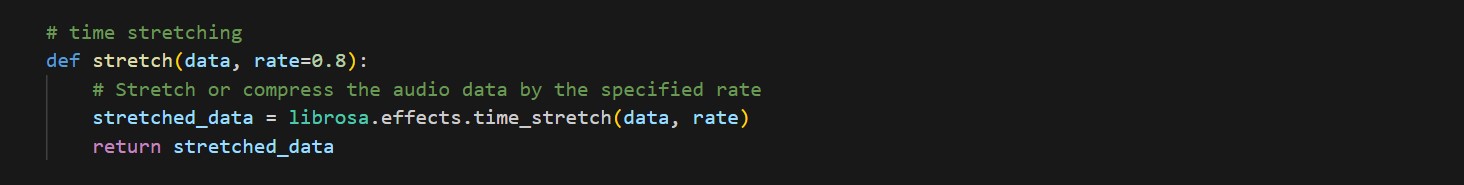


**Data augmentation:**

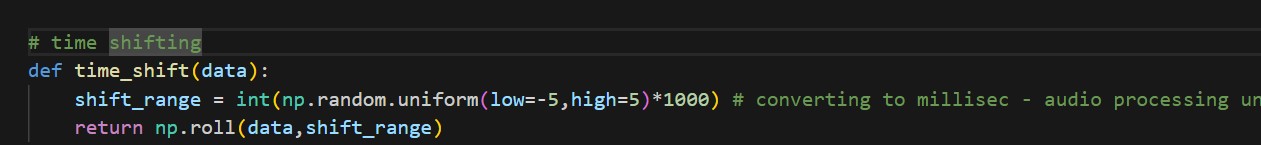
**Noise Injection**: is a common data augmentation technique that simulates real-world noise, making the model more robust to such variations.



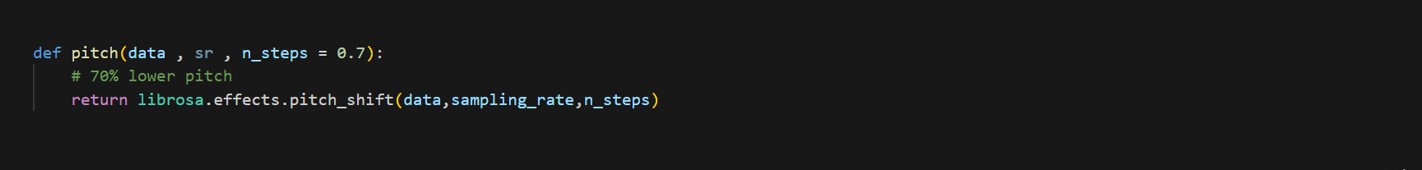
**Time Stretching:** Time stretching can simulate variations in the speed at which the sounds are produced**.**

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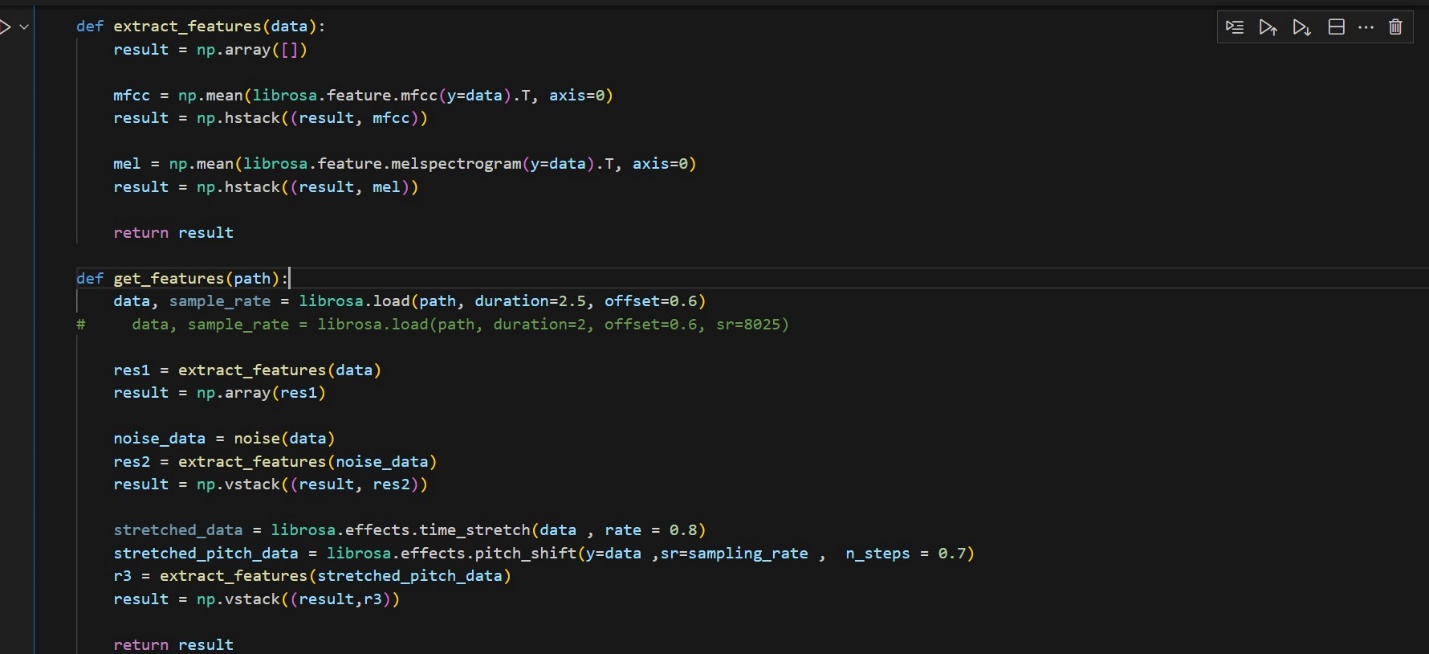
**Time Shifting:** This function shifts the audio signal in time, simulating a situation where the sound starts slightly earlier or later. It helps the model become less sensitive to the timing of features.



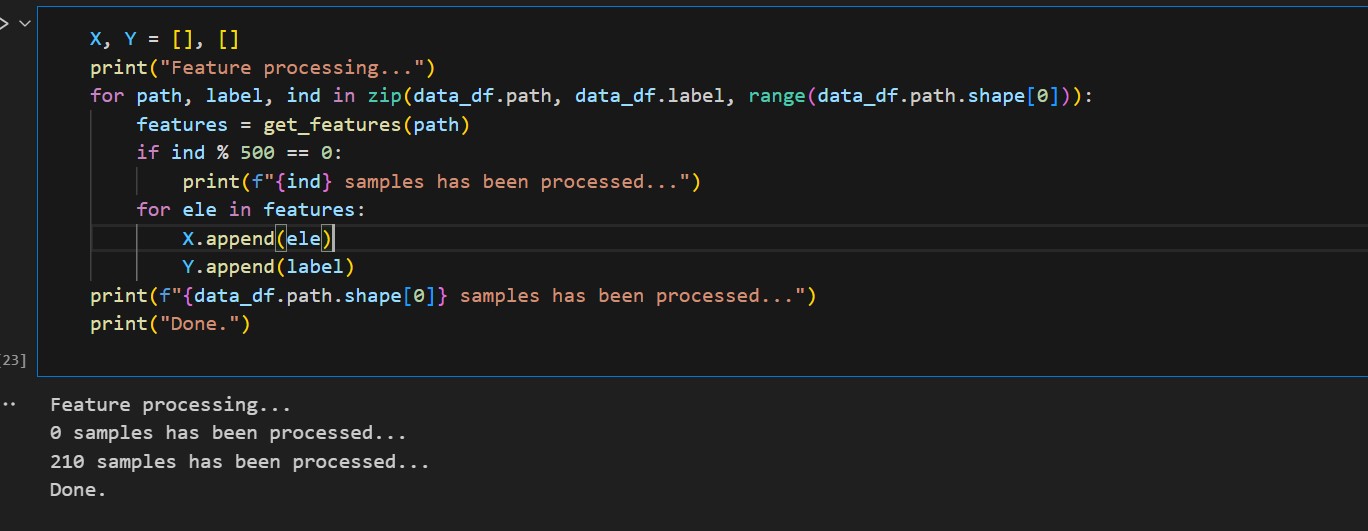
**Pitch Shifting:** simulates variations in the tone of the sound, which could represent different speakers, instruments, or vocal pitches.

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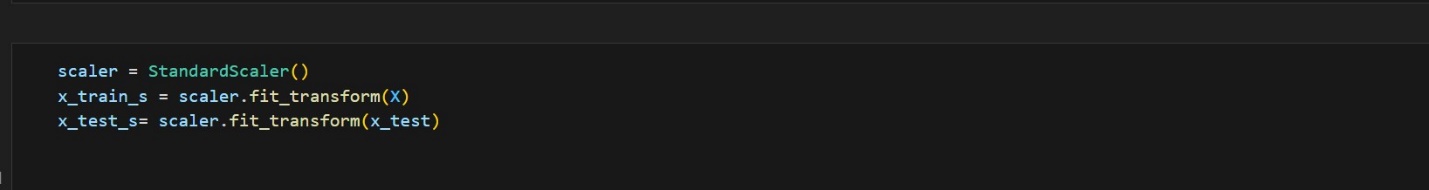
**Feature extraction:**

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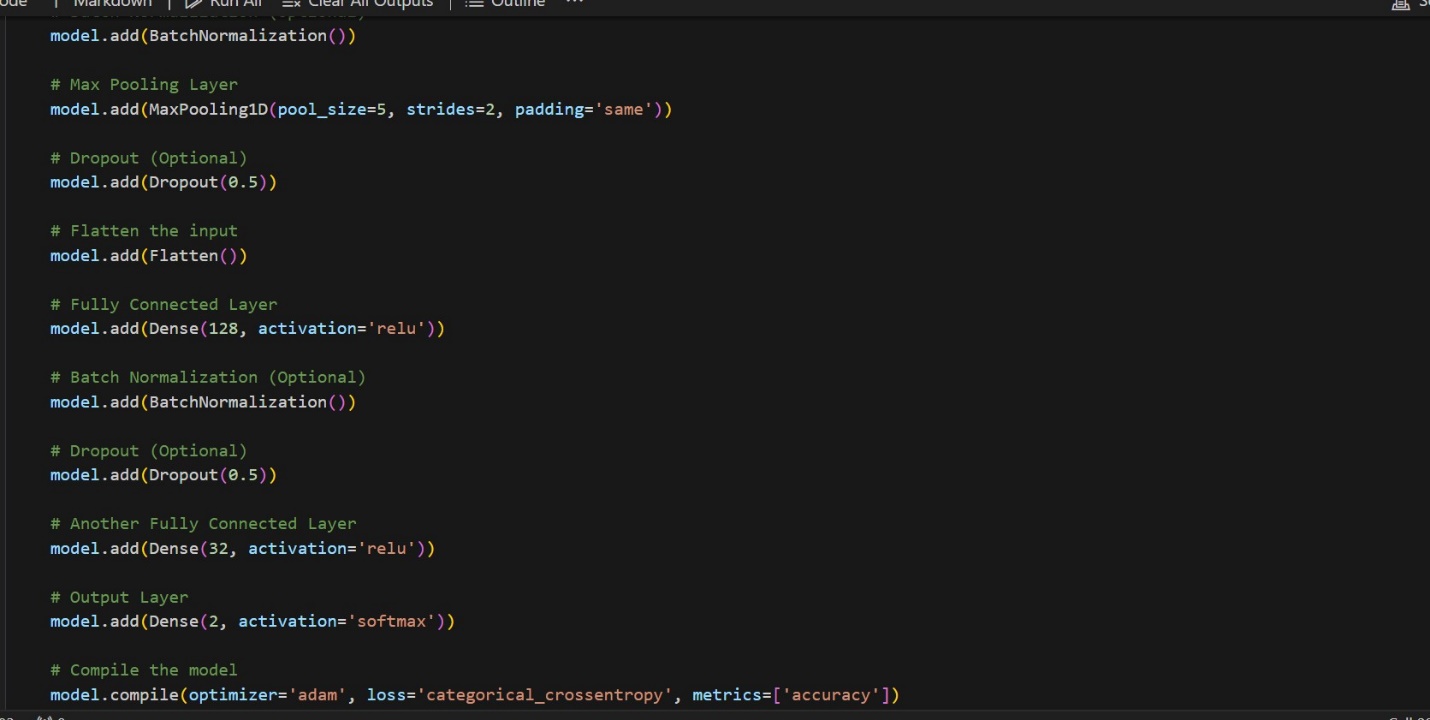
**This code snippet processes a dataset of audio files to extract features and prepare them for a machine learning model.**

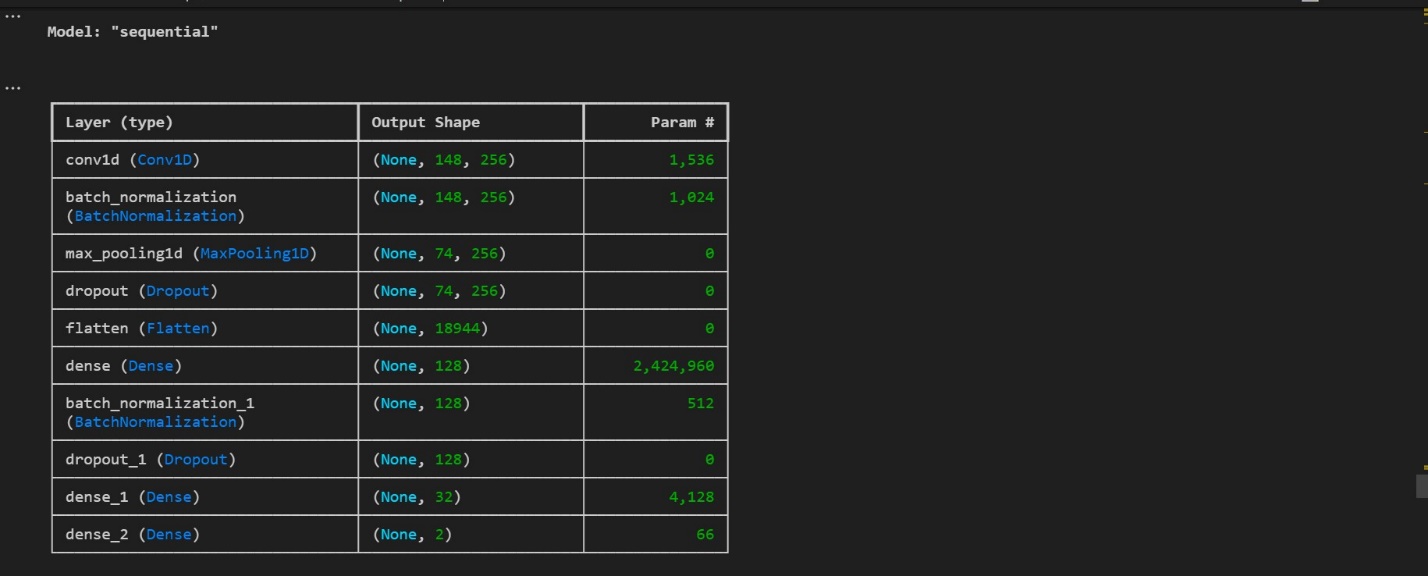
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**Normalizing the dataset:**

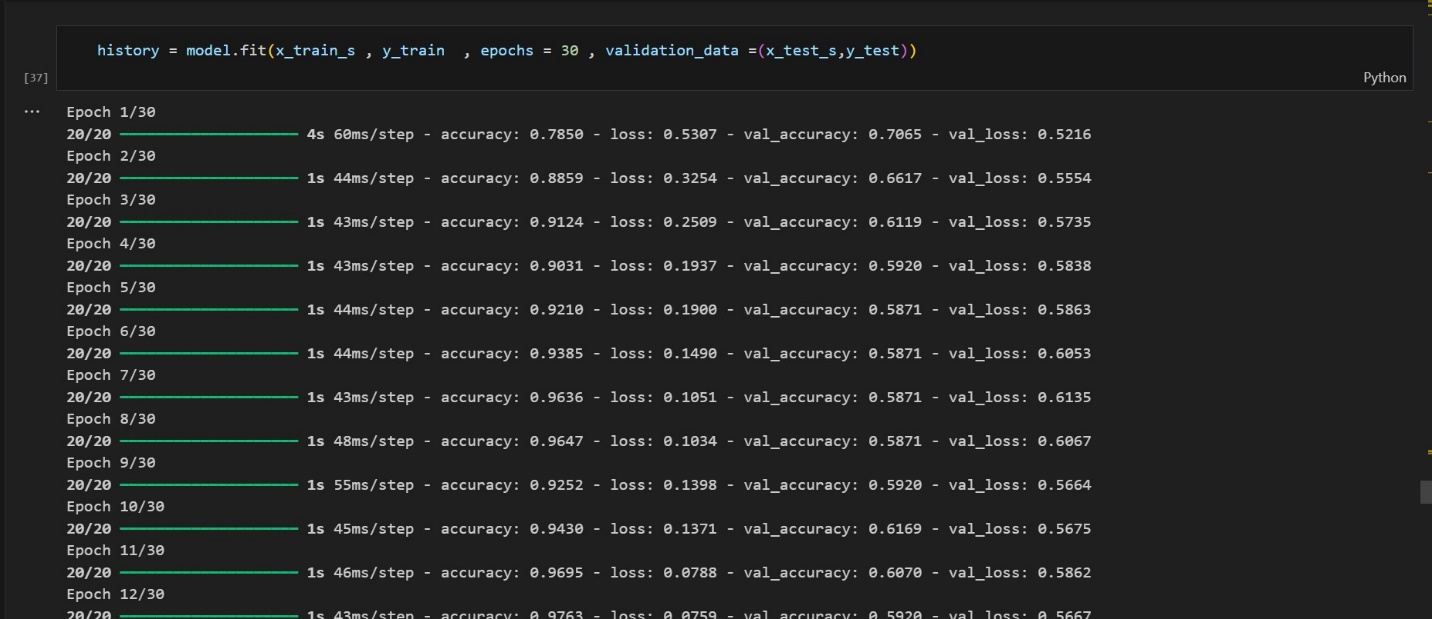
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**CNN MODEL:**

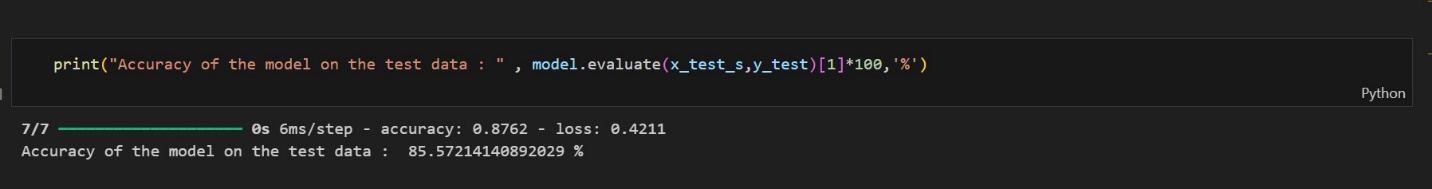
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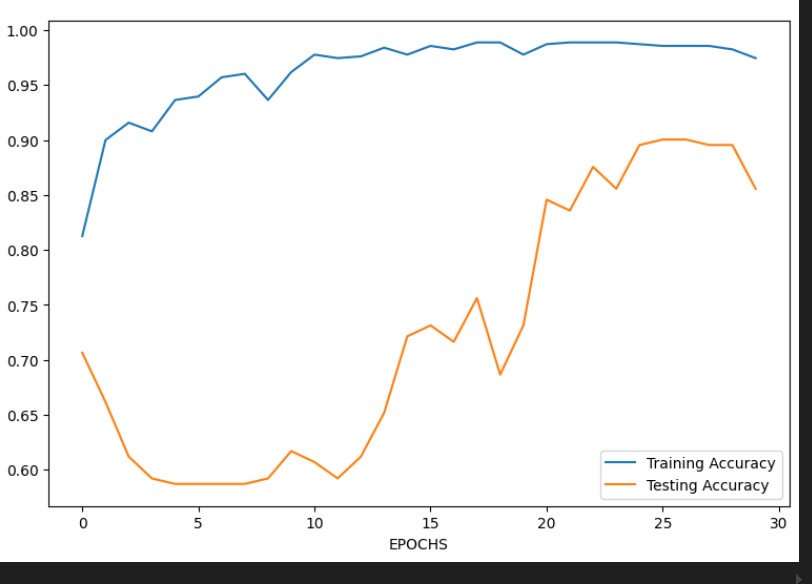
**Fitting the model:**

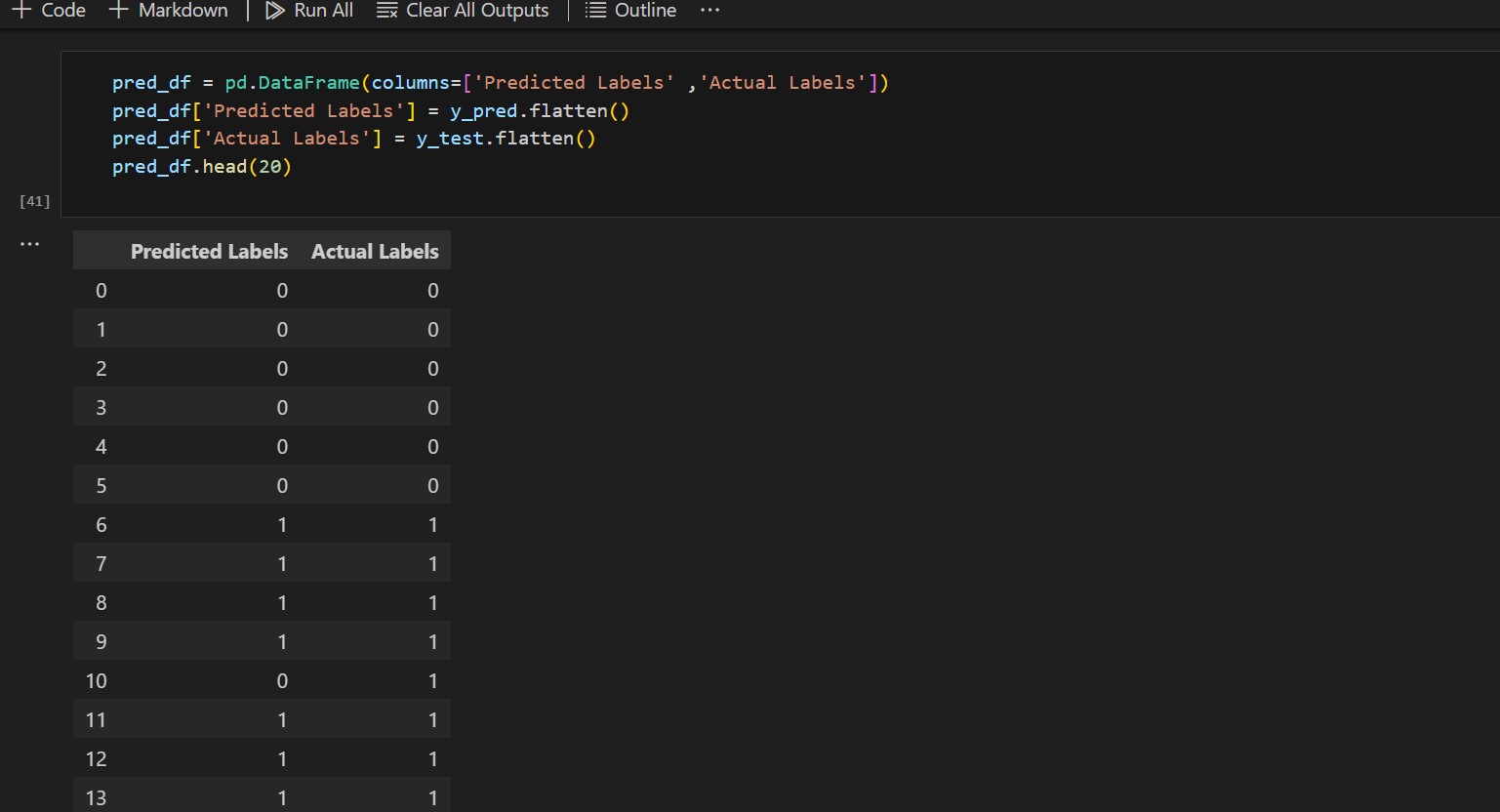
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**The testing data accuracy is 85%**

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**Visualizing the training and testing accuracy**

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**The Confusion Matrix :**

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