Report on Scraping YouTube Video

Scraping YouTube (or similar websites like Dailymotion) to collect data for classifying videos (based on description) in following 6 categories –

- Travel Blogs
- Science and Technology
- Food
- Manufacturing
- History
- Art and Music

Step 1: -

- First, I Imported Necessary Libraries

{

```
from selenium import webdriver

import pandas as pd
from selenium.webdriver.common.by import By
from selenium.webdriver.support.ui import WebDriverWait
from selenium.webdriver.support import expected_conditions as EC
```

}

- Then I called Chrome Web driver i.e, (driver = webdriver.Chrome())
- Then I Fetching all the links of a particular category on a page
- Then created dataframe for each categories.

```
{(columns = ['link', 'title', 'description', 'catagory'])}
```

- Scraping the video id, title, description and storing them into the dataframe
- Then, concatenated dataframe together.

```
frames = [df_travel, df_science, df_food, df_manufacturing, df_history, df_artndance]
```

- Lastly stored the data in csv file.

Example:-

4	N6wv6r8KLk	It's SNOWING in INDIA | SOLANG VALLEY, MANALI	It's snowing in India??? Seriously though... We ...	Travel
5	RHON79UmBXY	VIETNAM : INDIAN Solo Travel Journey just 6000...	Business query:- mithileshblacky0@gmail.com\n\...	Travel
6	kTuDFngiLE	Remote Cabin life in Indian Himalayas	Backpacking India World Trip Vlog 461.\nDon't ...	Travel
7	dDiEcXXulmY	THE TRUTH ABOUT INDIA: Expectation vs Reality ...	Time to bash some misconceptions and myths abo...	Travel
8	2YbsFSOV	I BOUGHT A ROYAL ENFIELD in INDIA!! (FINALLY!!)	Travel Vlogger, Conner Sullivan, looks to buy ...	Travel

Step 2: -

i) I have chosen **SVM**s cause it giving more accuracy then other two.

ii) Chosen **Random Forest** for **Bagging and Boosting** i.e., Ensemble learning is a machine learning paradigm where multiple models (often called "weak learners") are trained to solve the same problem and combined to get better results. The main hypothesis is that when weak models are correctly combined, we can obtain more accurate and/or robust models.

Bagging (Bootstrap Aggregation) is used when our goal is to reduce the variance of a decision tree. Bagging (Bootstrap Aggregation) is used when our goal is to reduce the variance of a decision tree.

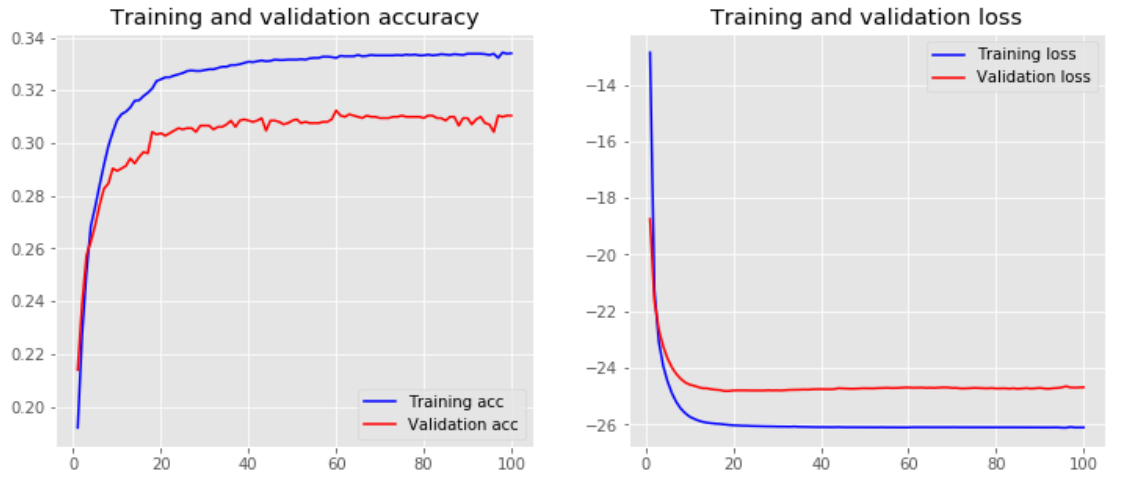
iii) I have chosen **Convolutional Neural Network** to solve this **NLP** problem. The most natural fit for CNNs seem to be classifications tasks, such as **Sentiment Analysis, Spam Detection or Topic Categorization**. Convolutions and pooling operations lose information about the local order of words, so that sequence tagging as in PoS Tagging or Entity Extraction is a bit harder to fit into a pure **CNN** architecture

```
from keras.models import Sequential
from keras import layers

input_dim = X_train.shape[1]  # Number of features

model = Sequential()
model.add(layers.Dense(10, input_dim=input_dim, activation='relu'))
model.add(layers.Dense(1, activation='sigmoid'))
```

```
model.compile(loss='binary_crossentropy',
              optimizer='adam', metrics=['accuracy'])
model.summary()
```

Crucial cornerstone in natural language processing which you can use for text classification of all sorts. **Sentiment analysis** is the most prominent example for this.

```
In [33]: plot_history(history)
```




```
In [42]: loss, accuracy = model.evaluate(X_train, y_train, verbose=False)
         print("Training Accuracy: {:.4f}".format(accuracy))

         Training Accuracy: 0.3343
```

Step 3: -

i) The data I scrapped is in excel sheet format named "**yt_dataset.csv**"

ii) First, I Gathered data
Data pre-processing
Researching the model that will be best for the type of data
Training and testing the model
Evaluation

Library and Framework used: -
(**Selenium, Chrome Web, NLTK**)

My first step is to gather data from YouTube like video link, description, title and lastly category. And then I used to preprocess the data cause the data isn't structured, as the data is **unstructured**, I have structured the data using many methods by splitting with the help of **Selenium**, the best framework to scrap web contents like images, link, paragraph and many contents.

Then, after the **preprocessing step**, next step is to remove missing data and checking the outliers. Also I have **removed stop words** and unnecessary words from description.
Now performing label encoder as we have many categories and they are used to convert categorical data, or text data, into numbers, which our predictive models can better understand.

Lastly, I have **splitted the data into 80:20 where 80% is Training data and 20%** is Test Data. Now I have used multiple Machine Learning model to predict which model perform best on this dataset and after evaluation the result as follow.

- **Support Vector Machine** : - 95.64% Accuracy
- **Random Forest** :- 96.05% Accuracy
- **Naïve Bayes** :- 81.07% Accuracy

So, Support Vector Machine is the best Model for this dataset.

iii) The reason behind I have chosen **Support Vector Machine** i.e., Machine Learning Model because it was giving more accuracy than other two (Linear Classifier and Naïve Bayes Classifier)

The biggest difference between the models you're building from a **"features" point of view is that Naive Bayes treats them as independent, whereas SVM looks at the interactions between them to a certain degree**, as long as you're using a non-linear kernel (Gaussian, rbf, poly etc.)

iv) Precision, Recall and F1 Score as follow: -
F1 Score is the weighted average of Precision and Recall. Therefore, this score takes both false positives and false negatives into account. Intuitively it is not as easy to understand as accuracy, but F1 is usually more useful than accuracy, especially if you have an uneven class distribution.

Naive Bayes

```
In [464]: classifier.score(X_test, y_test)
```

```
Out[464]: 0.9605970149253731
```

```
In [485]: print(classification_report(y_test, y_pred))
```

```
                precision    recall  f1-score   support

  Art & Dance       0.95      0.97      0.96       313
         Food       0.96      0.99      0.98       272
      History       0.96      0.98      0.97       287
Manufacturing       0.95      0.94      0.94       241
      Science       0.97      0.94      0.96       289
       Travel       0.98      0.93      0.96       273

    micro avg       0.96      0.96      0.96      1675
    macro avg       0.96      0.96      0.96      1675
 weighted avg       0.96      0.96      0.96      1675
```

Random Forest

```
In [474]: classifier2.score(X_test, y_test)
```

```
Out[474]: 0.8107462686567164
```

```
In [475]: # Making the Confusion Matrix
          cm2 = confusion_matrix(y_test, y_pred2)
```

```
In [476]: cm2
```

```
Out[476]: array([[289,   4,  10,   2,   0,   8],
                 [  0, 253,   1,   0,   0,  18],
                 [ 40,   4, 194,  16,  10,  23],
                 [  1,   7,   4, 219,   4,   6],
                 [  4,   6,  59,  15, 199,   6],
                 [  3,  55,   4,   0,   7, 204]])
```

Support Vector Machine

```
In [469]: classifier1.score(X_test, y_test)
```

```
Out[469]: 0.9564179104477611
```

```
In [470]: # Making the Confusion Matrix
          cm1 = confusion_matrix(y_test, y_pred1)
```

```
In [471]: cm1
```

```
Out[471]: array([[301,   0,   4,   6,   0,   2],
                 [  0, 266,   0,   1,   0,   5],
                 [  2,   1, 278,   3,   2,   1],
                 [  0,   1,   4, 229,   4,   3],
                 [  1,   0,   9,   9, 270,   0],
                 [  2,   4,   1,   6,   2, 258]])
```

v) In ML, there is no specific model or an algorithm which can give 100% result to every single dataset. We need to understand the data before we apply any algorithm and build our model depending on the desired result. This dataset gives us 100% accuracy, which is nearly impossible. From the above models, Random Forest and SVMs gives optimal accuracy compared to other algorithms because it works best with continuous data and it also applies a nonlinear relationship to the features. By using this algorithm, you reduce the chances of overfitting and the variance in the data which thus leads to better accuracy.

---------- Thank You ----------