PERSONALITY DETECTION FROM TEXT

A PROJECT REPORT



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# Introduction

Written documents often capture the heart and soul of our thought process. Hence, written texts are preferred over oral contracts. Text messaging, like email and instant messaging, is an emerging means of electronic communication with important implications for our understanding of communication processes. With the developing social media, people are now pouring their hearts out through blogs and write ups.

The spark that ignites here lies the basic domain of linguistics and vocabulary.

It has been observed through various research domains that the linguistic style, textual tone, vocabulary and grammar of a person is consistent with his or her personality.

The purpose of this project was to undertake some analyses of how the language used in text varies as a function of personality traits and the interpersonal context.

We have opted for multiple models for taking the average of the outcomes for a better accuracy. We use both supervised machine learning as well as deep learning approach.

# Motivation

**Personality** is a combination of an individual’s behaviour, emotion, motivation, and thought pattern. Our personality has a great impact on our mind, our behaviour our course of. Knowing one’s personality can be very helpful in order to analyse one’s mental health.

Sentiment analysis plays a key role here.

This project has far-reaching real-world applications like:

* Product Recommendations by e-stores
* Mental health check-ups
* Forensic application to understand criminal psychology
* To detect criminal tendency
* To detect depression and suicidal tendencies.

# Objective

In the 1970s two research teams led by Paul Costa and Robert R. McCrae of the National Institutes of Health and Warren Norman and Lewis Goldberg of the University of Michigan at Ann Arbor and the University of Oregon, respectively, discovered that most human character traits can be described using five dimensions. Surveys of thousands of people yielded these largely independent traits.

The objective of this model is to detect the absence/presence of five different personality attributes based on texts gathered from various personalities.

These personality attributes are:

* **Extroversion (EXT)**: - Is the person outgoing, talkative, and energetic versus reserved and solitary?
* **Neuroticism (NEU)**: - Is the person sensitive and nervous versus secure and confident?
* **Agreeableness (AGR**): - Is the person trustworthy, straightforward, generous, and modest versus unreliable, complicated, meagre, and boastful?
* **Conscientiousness (CON):** - Is the person efficient and organized versus sloppy and careless?
* **Openness (OPN)**: - Is the person inventive and curious versus dogmatic and

cautious.

Methodology

* Data Preprocessing
* Date Cleaning.
* Text Preprocessing – coversion to lowercase, removing special characters.
* Document Level Feature Extraction.
* Data Filtering – removing stop words.
* Feature Extraction with Count Vectorizer.
* Classification Model Creation – Using both Naïve and Deep Learning Approach.
* Training
* Testing

Algorithm and Approach

We took **two different approaches** to implement our project, the first one is naive

based on Machine Learning and the other approach deals with Neural Networks

which is based on Deep Learning.

**I. Machine Learning Approach:** In this approach we first clean the gathered

data and store it in a dataframe, after that we remove the unwanted characters and

words and pick-up the words which are then used to create the bag of words, then

we convert the text in the form of vectors and then we build Bayes classifier

model to train and test on our data and then finally we predict the output using the

model built.

**II. Deep Learning Approach:** In this approach we first clean the gathered data

and store it in a dataframe. We fed sentences from the essays to convolution filters to obtain the sentence. We represented each individual essay by aggregating the vectors of its sentences. We concatenated the obtained vectors with the Mairesse features,4 which were extracted from the texts directly at the preprocessing stage;

this improved the method’s performance. then we merge five target attributes into a single target attribute, after that we create the deep learning model of 4 layers using ANN, then we split the data into train and test dataset. After that we measure the accuracy based on the test data of the model built.

Application Code

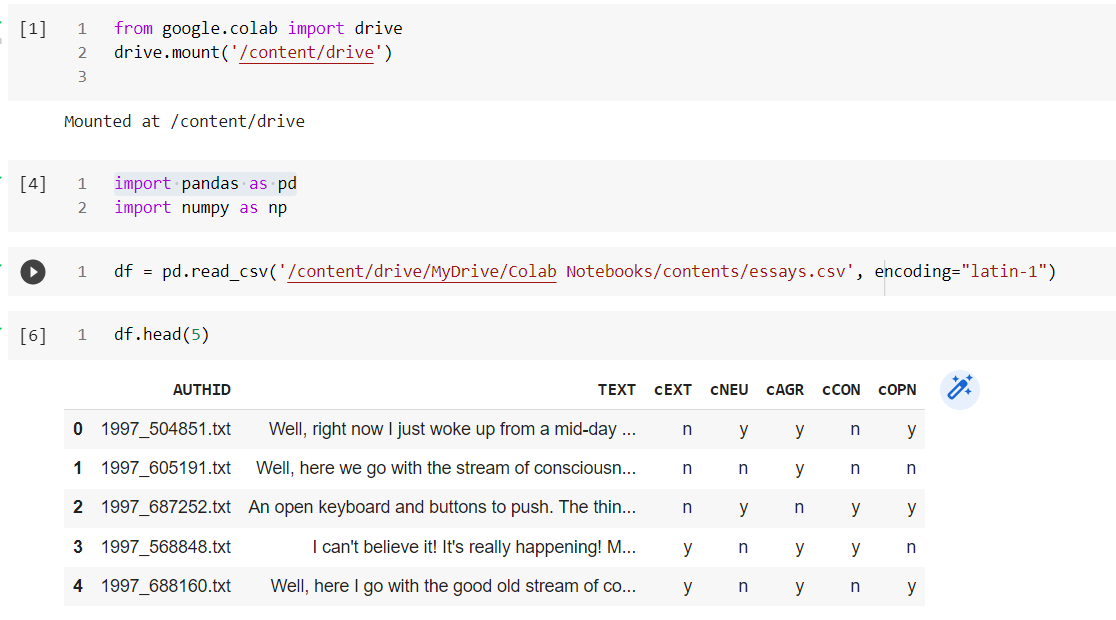
1. **Naïve Approach – Machine Learning Approach**

We first import the data set that has 7 columns:

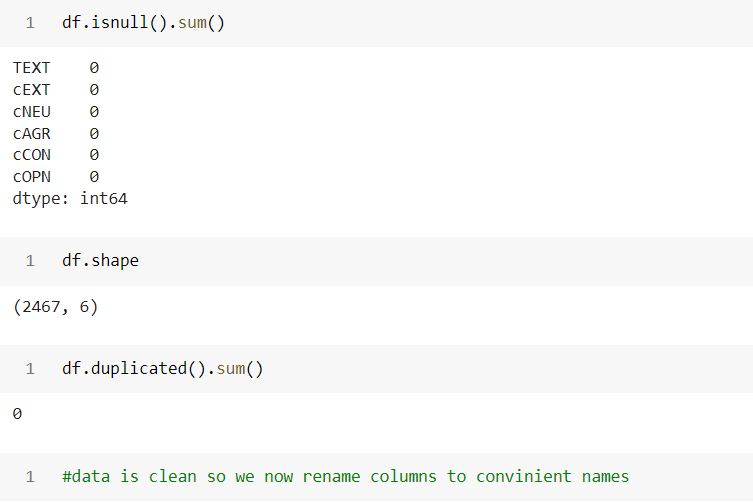
User Id (unique id of the is user who has typed the specimen text)

Text (the domain we will work on)

5 columns for 5 personality traits – Extroversion, Neuroticism, Agreeableness, Conscientiousness and Openness.



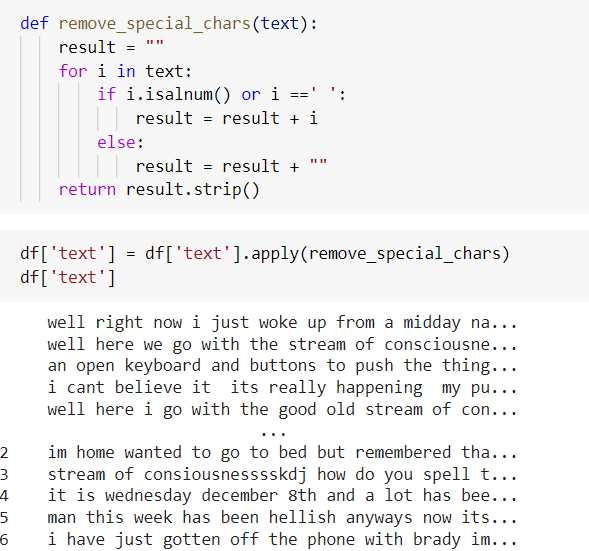
We next clean the data given.



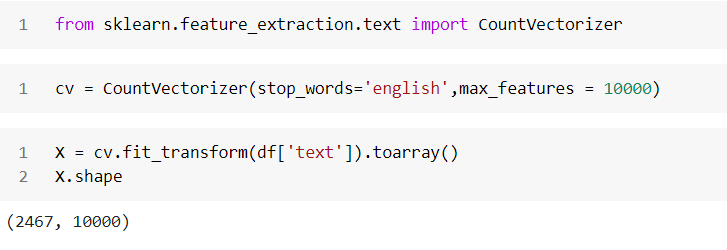
We next pre-process the data- renaming columns and changing the data type to integer.



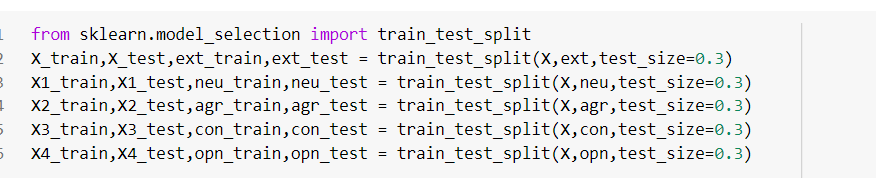
We next hop to text preprocessing – like changing text to small letters entirely, removing special characters, removing stop words.



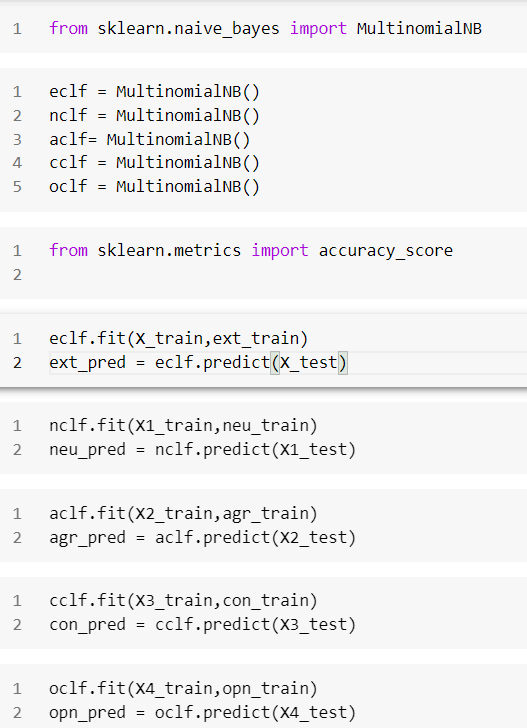
We next convert the text to sentence vectors. This set of vectors is known as Bag of Words. (We have chosen 10000 words here, absence and presence of which will determine the personality trait presence).



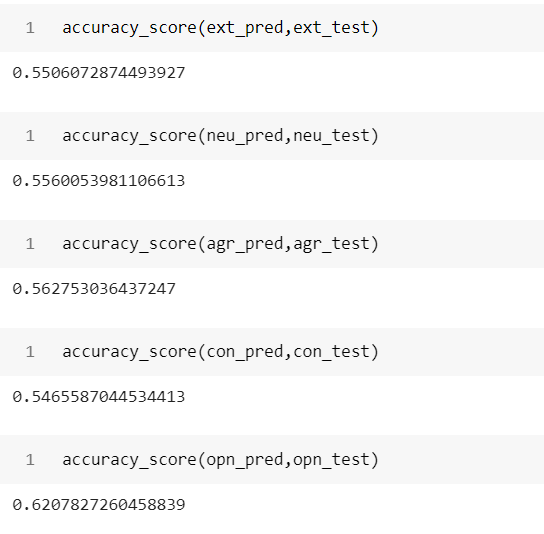
We split the Array into training and testing set.



We create five Multinomial Naïve Bayes Model for the five traits.



We finally determine the accuracy score.



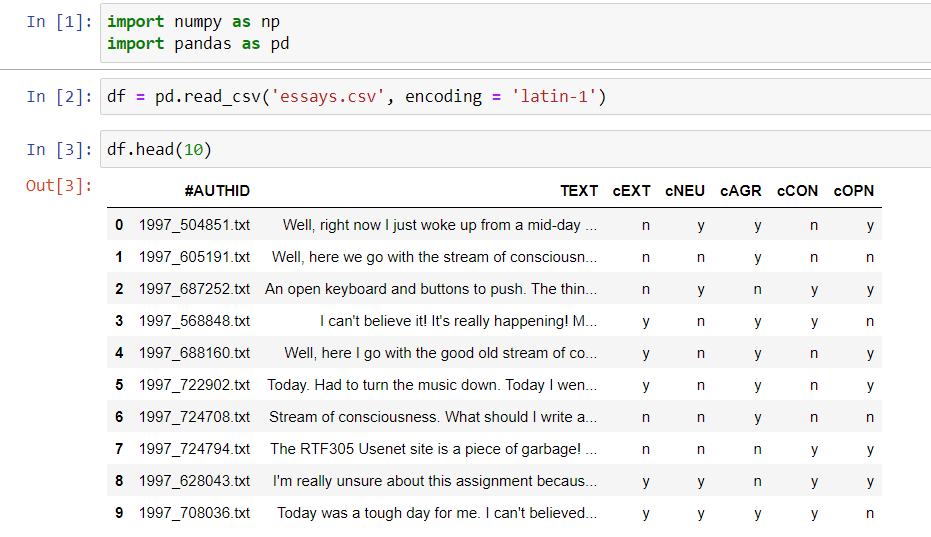
1. **Deep Learning Approach – Artificial Neural Networks**

We first import the data set that has 7 columns:

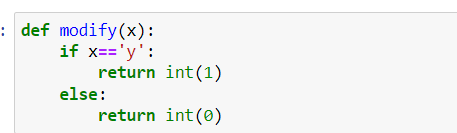
User Id (unique id of the is user who has typed the specimen text)

Text (the domain we will work on)

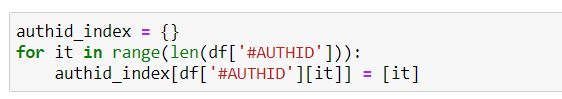
5 columns for 5 personality traits – Extroversion, Neuroticism, Agreeableness, Conscientiousness and Openness.



We preprocess the data.



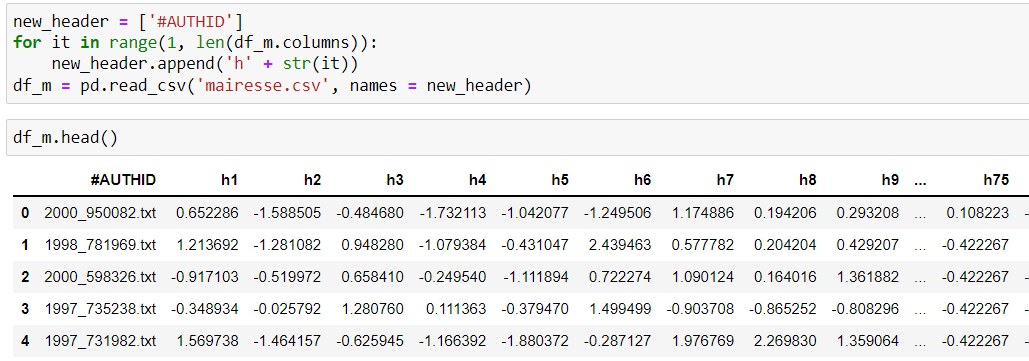
We then extract the author id column.

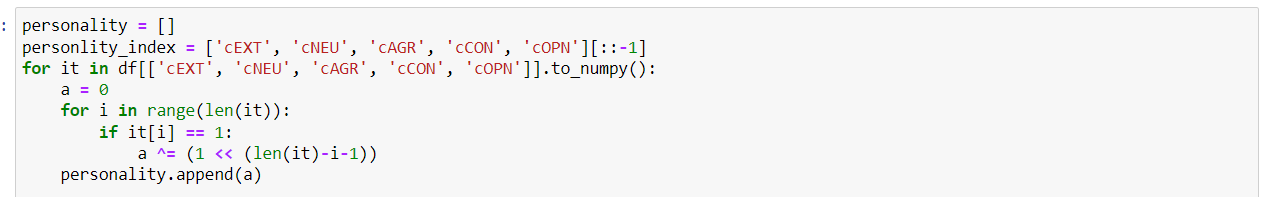


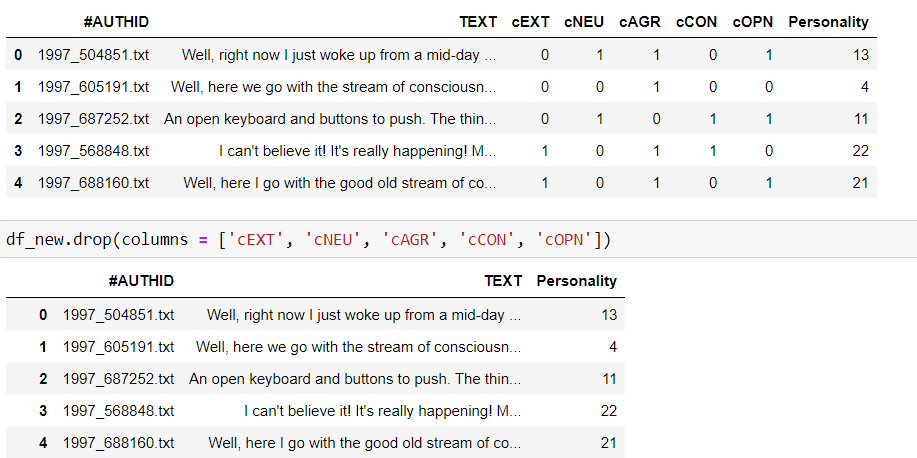
Next, we move on to Document Level Feature Extraction.

We used the Mairesse baseline feature set (10\*85) , which includes such global

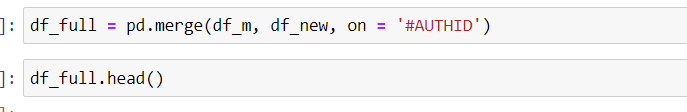
features as the word count and average sentence length. We append the author id with this set to uniquely identify the columns. We rename the columns for better understanding.



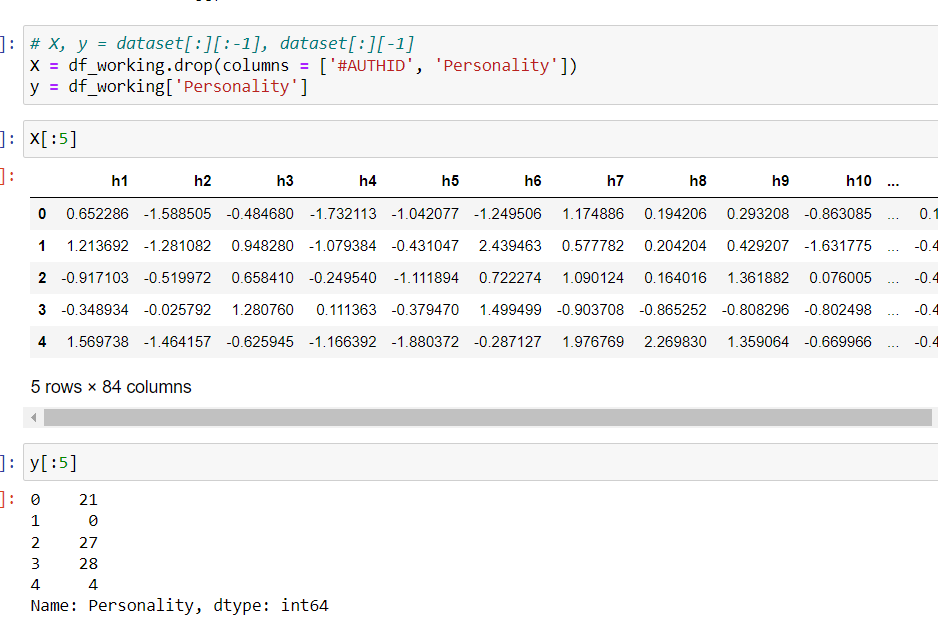
We next combine the five personality traits as a single trait. Here we view the yes(1) and no(0) as a 5 bit number. Hence we can identify this as a decimal number from 0 to 31( 2^5 -1).  




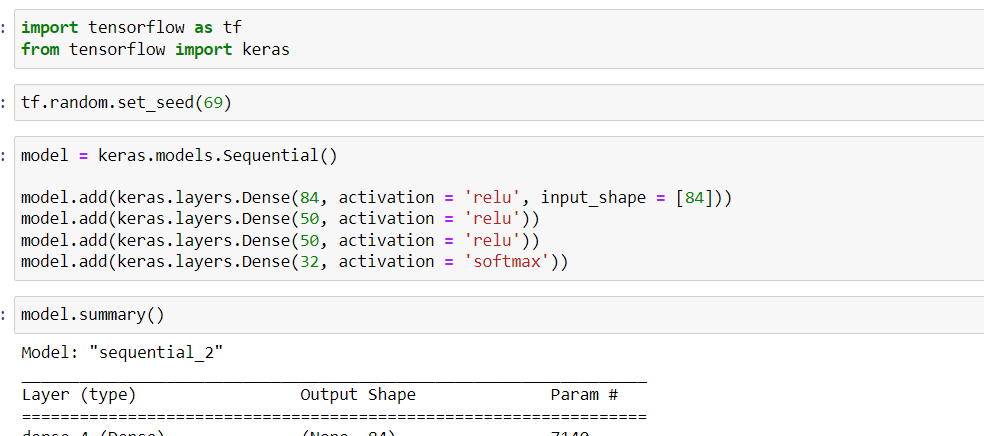
We combine the two datasets.

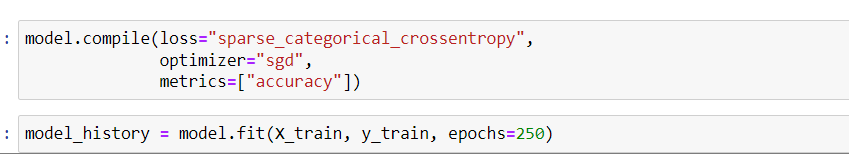


We split the set into training and testing.

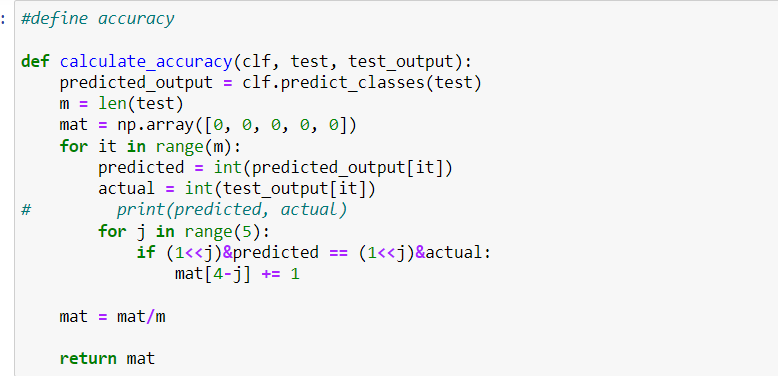


We use ANN model with Keras from Tensorflow. Here we create a 84-50-50-32 Model.

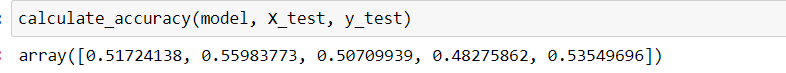




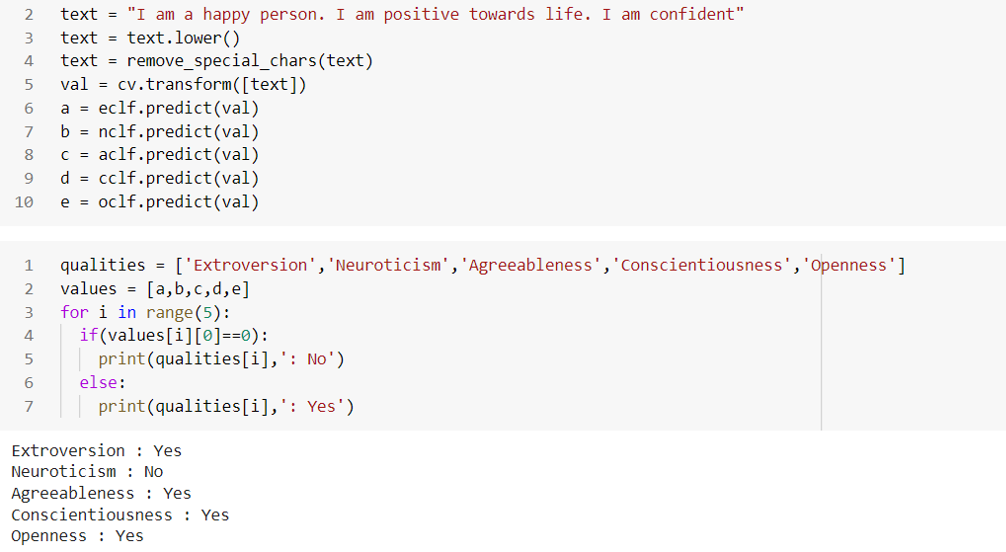
We finally define the accuracy.



We find the accuracy Score.



Result



Here, the text and the output is consistent. We have used an example which was not present in the given dataset.

Future Prospects and Plans

* To further improve the accuracy.
* To incorporate new technology.
* A depression detection tool may be created by comparing the texts of the same person over a period of time.
* Trying out better deep learning approaches.
* Using NLTK (Natural Language Toolkit)
* Creating a front end for a better user interface and an accessible website.

Conclusion

So here we are using both deep learning as well as machine-learning approach where we found almost similar accuracy for both scenarios.

Some minor improvement scopes in Deep Learning approach: In the model training part we could have used “callbacks” (it checks if there is any improvement in the accuracy if so, the training continues otherwise the code stops executing) so that the computations could have been lesser.

Purpose of this whole project was to find an effective solution for prediction of personality and mental health behaviour of human beings. And the strategies used, turned out to be quite effective in doing so. Future development of this project will lead to further increase in accuracy of the outcomes.