Bill Yerkes

CS5542 Big Data Apps and Analytics

In Class Programming –4
17th September 2020

Submit ICP Feedback in Class. : Lnik to Feed back Form

NLP:

Use the same data (that we obtained by in source code in ICP3 `Data = pd.read_csv('https://raw.githubusercontent.com/dD2405/Twitter_Sentiment_Analysis/master/train.csv')`**) and perform the sentiment analysis task on this data using one of the Deep Learning Classifier (Keras Sequantial model) for text.**

ICP Requirements:

1) Data cleaning and preprocessing (at minimum have the following: Removing unnecessary columns or data, Removing Twitter Handles(@user), Removing punctuation, numbers, special characters, Removing stop words, Tokenization, and Stemming, TFIDF vectors, POS tagging, checking for missing values , train/test split of data). (40 points)
2) Deep Learning Model building, adding right combination of layers, and successfully executing the model to make prediction. (50 points)
3) Code quality, Pdf Report quality, video explanation (10 points)

Submission Guidelines:

Same as ICP 2.

ICP Report:

What I learned in the ICP:

I am in the beginning phases of learning about Deep Learning. I watched the class video several times and found other videos and websites to build on what we went over in class. It is safe to say I am not an expert after one lab. I learned that the data has to be in a certain shape to perform each step. I learned more about other libraries which can help with the process and make coding these task easier.

Description of what task I was performing:

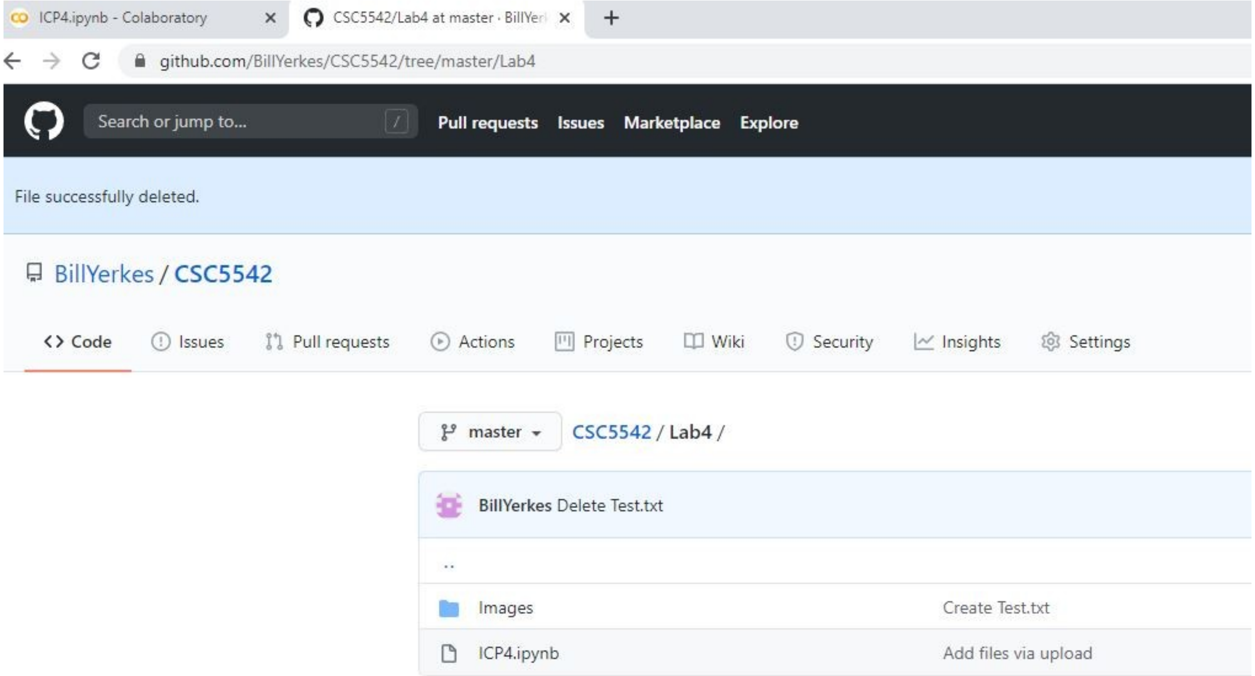
Use the given input file and perform tasks for cleaning analyzing the data using Deep Learning.

Challenges I faced:

I had to figure out how to convert the sentences/words into numbers/vectors so that I could perform Deep Learning on the data. Figured out how change the shape of the Data Frame.

Screen Shots

GitHub Repository



github.com/BillYerkes/CSC5542/tree/master/Lab4

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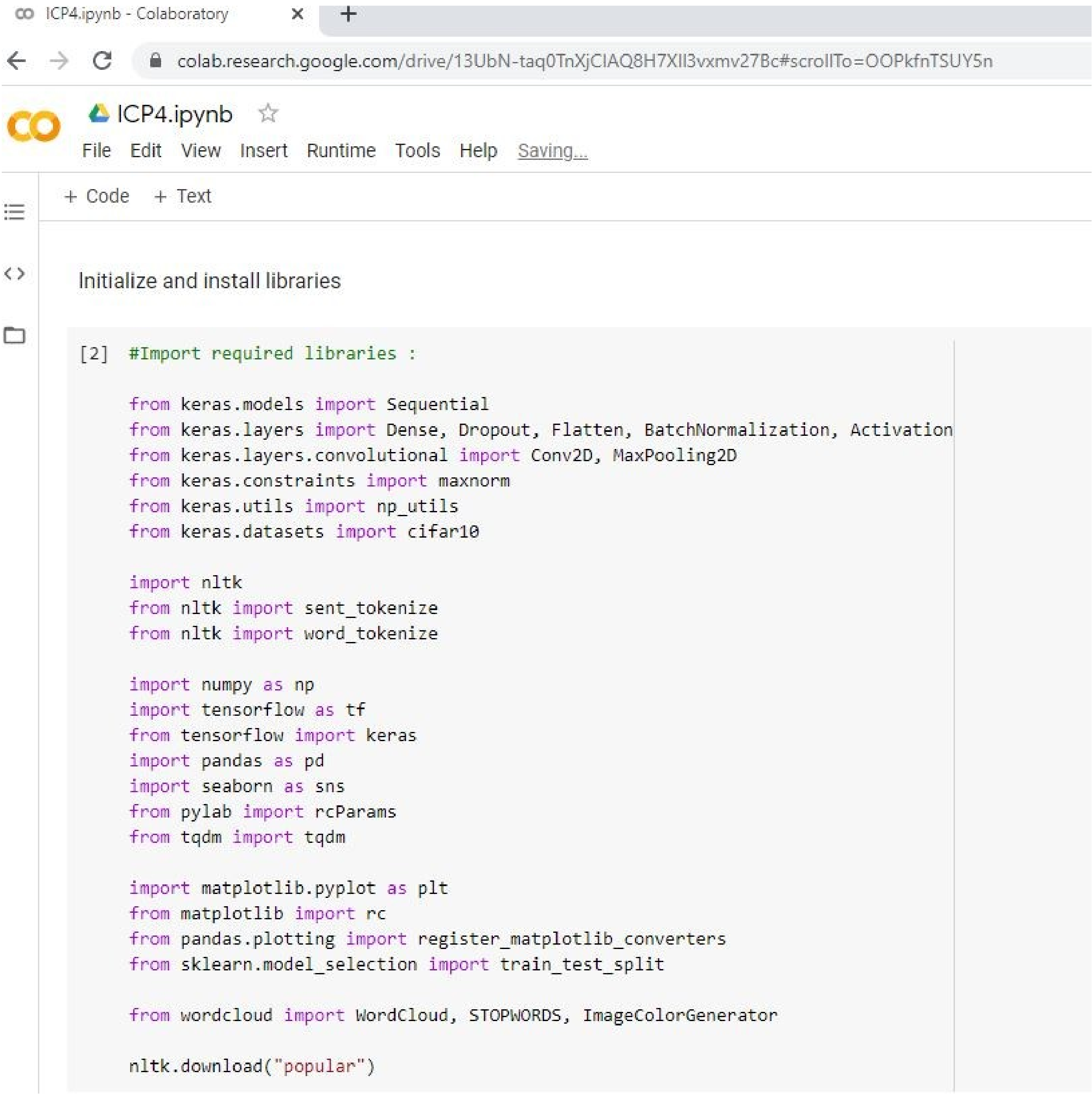
BillYerkes / CSC5542

CSC5542 / Lab4 /

BillYerkes Delete Test.txt

..	
Images	Create Test.txt
ICP4.ipynb	Add files via upload

Initialize and Install Libraries



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ICP4.ipynb
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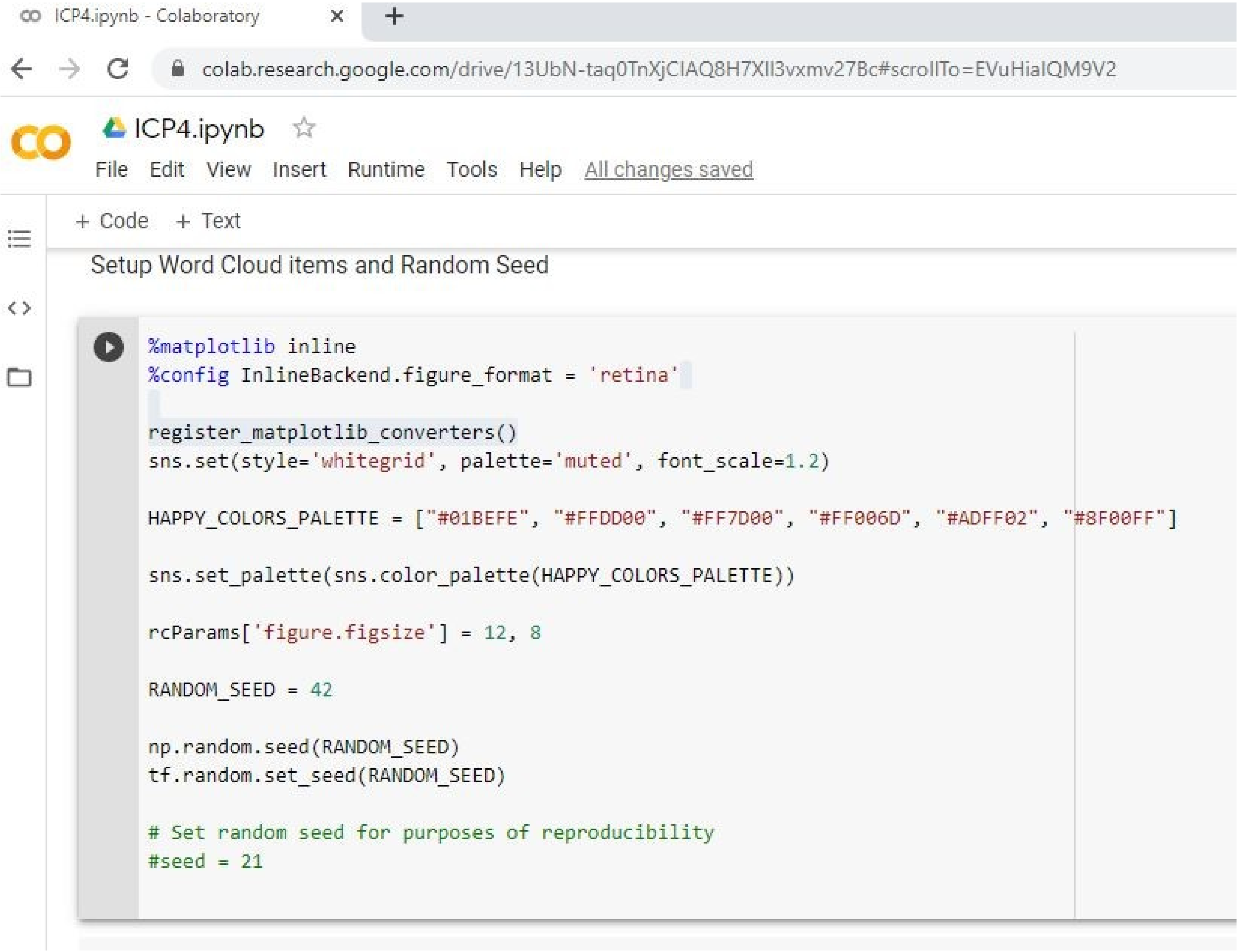
Initialize and install libraries

```
[2] #Import required libraries :

    from keras.models import Sequential
    from keras.layers import Dense, Dropout, Flatten, BatchNormalization, Activation
    from keras.layers.convolutional import Conv2D, MaxPooling2D
    from keras.constraints import maxnorm
    from keras.utils import np_utils
    from keras.datasets import cifar10

    import nltk
    from nltk import sent_tokenize
    from nltk import word_tokenize

    import numpy as np
    import tensorflow as tf
    from tensorflow import keras
    import pandas as pd
    import seaborn as sns
    from pylab import rcParams
    from tqdm import tqdm

    import matplotlib.pyplot as plt
    from matplotlib import rc
    from pandas.plotting import register_matplotlib_converters
    from sklearn.model_selection import train_test_split

    from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator

    nltk.download("popular")
```

Setup Word Cloud items and Random Seed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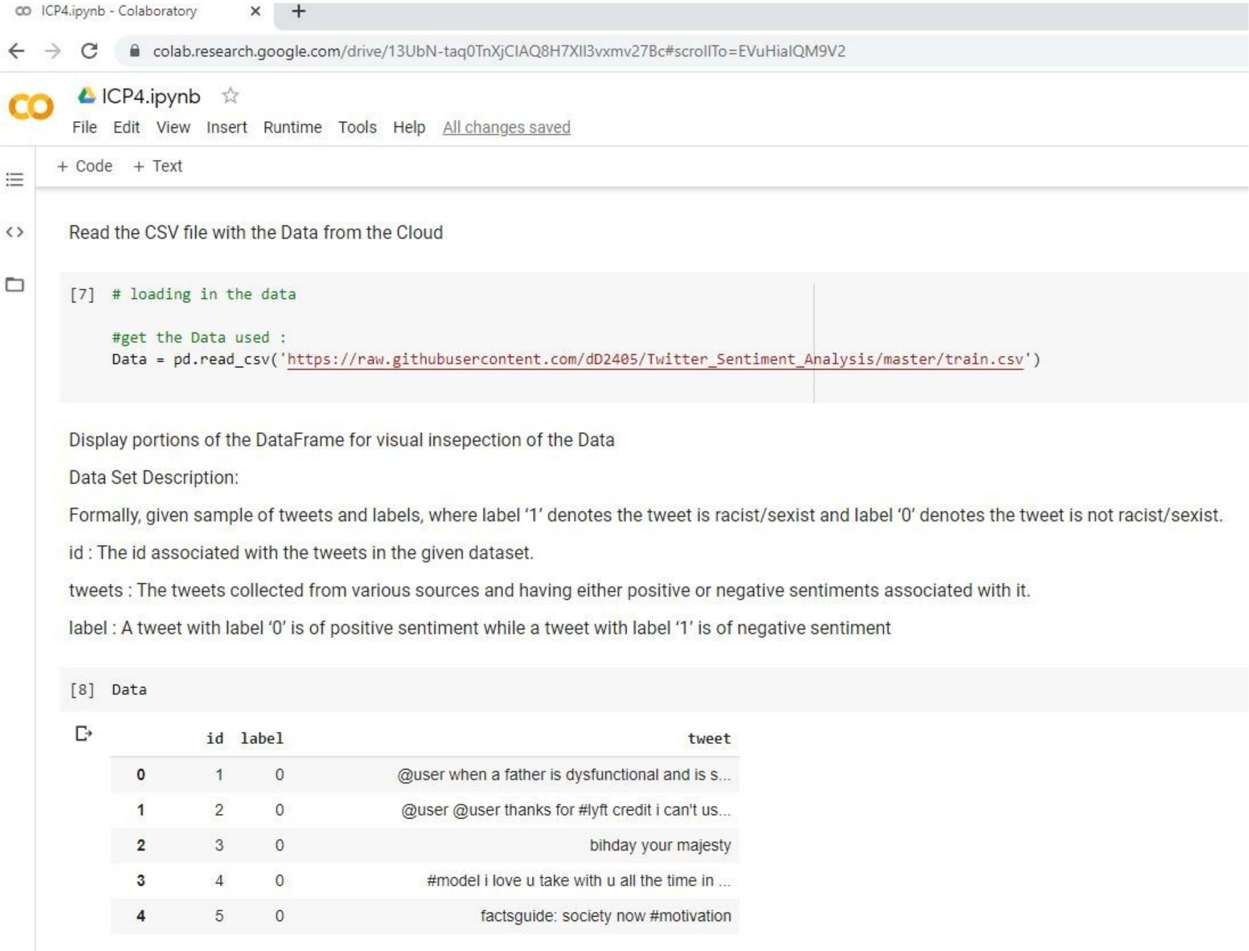
Setup Word Cloud items and Random Seed

```
%matplotlib inline
%config InlineBackend.figure_format = 'retina'

register_matplotlib_converters()
sns.set(style='whitegrid', palette='muted', font_scale=1.2)

HAPPY_COLORS_PALETTE = ["#01BEFE", "#FFDD00", "#FF7D00", "#FF006D", "#ADFF02", "#8F00FF"]

sns.set_palette(sns.color_palette(HAPPY_COLORS_PALETTE))

rcParams['figure.figsize'] = 12, 8

RANDOM_SEED = 42

np.random.seed(RANDOM_SEED)
tf.random.set_seed(RANDOM_SEED)

# Set random seed for purposes of reproducibility
#seed = 21
```

Read the Data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Read the CSV file with the Data from the Cloud

```
[7]  # loading in the data

     #get the Data used :
     Data = pd.read_csv('https://raw.githubusercontent.com/dD2405/Twitter_Sentiment_Analysis/master/train.csv')
```

Display portions of the DataFrame for visual insepection of the Data

Data Set Description:

Formally, given sample of tweets and labels, where label ‘1’ denotes the tweet is racist/sexist and label ‘0’ denotes the tweet is not racist/sexist.

id : The id associated with the tweets in the given dataset.

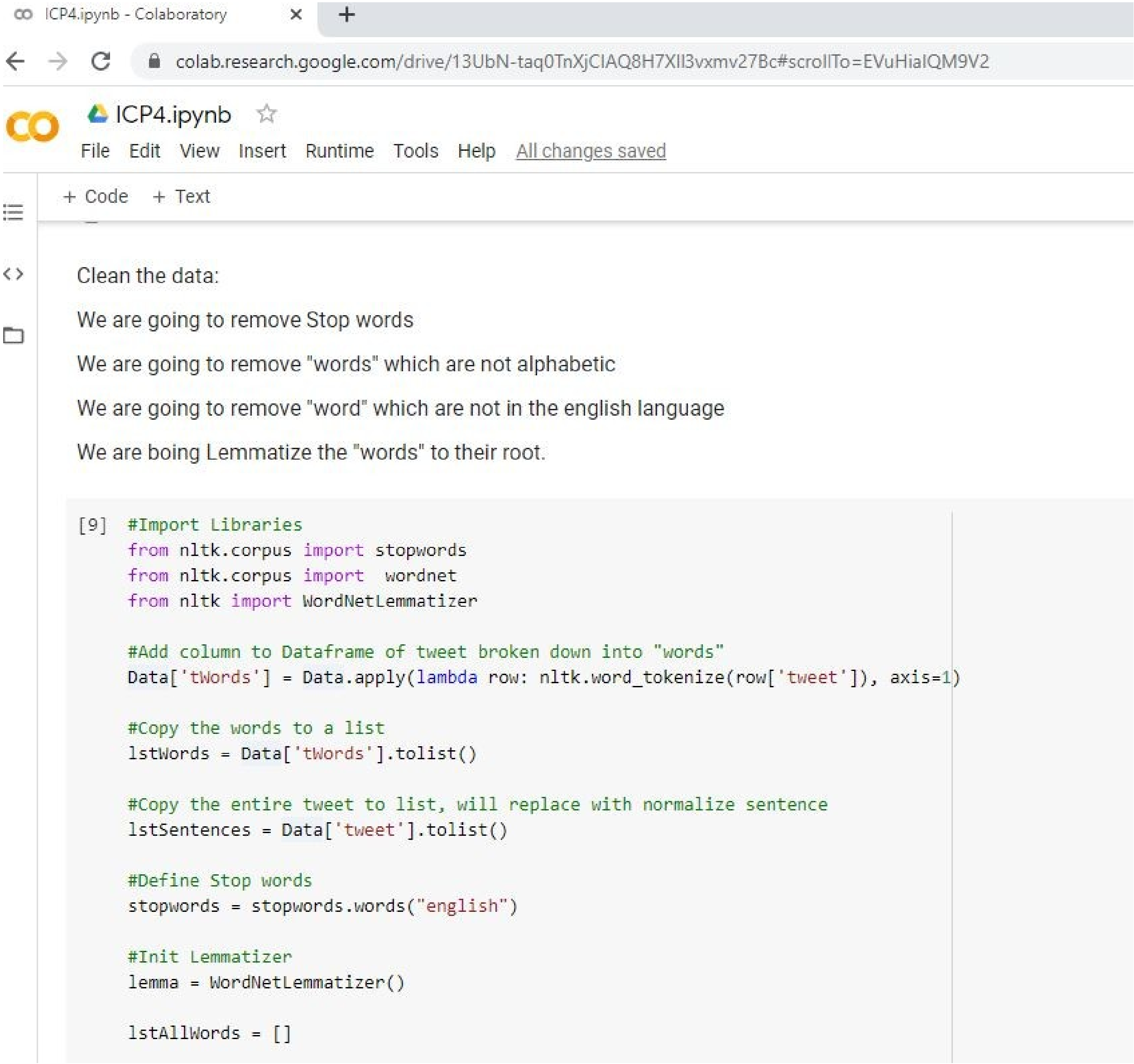
tweets : The tweets collected from various sources and having either positive or negative sentiments associated with it.

label : A tweet with label ‘0’ is of positive sentiment while a tweet with label ‘1’ is of negative sentiment

```
[8]  Data
```

	id	label	tweet
0	1	0	@user when a father is dysfunctional and is s...
1	2	0	@user @user thanks for #lyft credit i can't us...
2	3	0	bihday your majesty
3	4	0	#model i love u take with u all the time in ...
4	5	0	factsguide: society now #motivation

Clean the Data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Clean the data:

We are going to remove Stop words

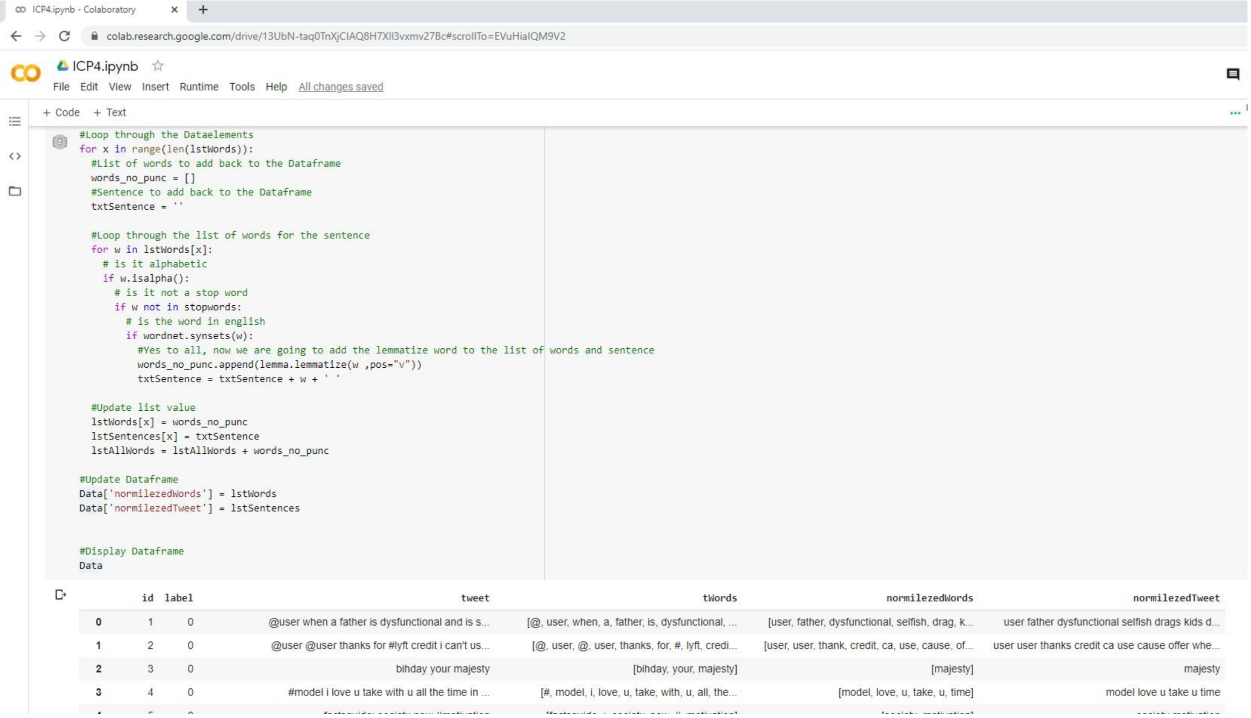
We are going to remove "words" which are not alphabetic

We are going to remove "word" which are not in the english language

We are boing Lemmatize the "words" to their root.

```
[9] #Import Libraries
    from nltk.corpus import stopwords
    from nltk.corpus import  wordnet
    from nltk import WordNetLemmatizer

    #Add column to Dataframe of tweet broken down into "words"
    Data['tWords'] = Data.apply(lambda row: nltk.word_tokenize(row['tweet']), axis=1)

    #Copy the words to a list
    lstWords = Data['tWords'].tolist()

    #Copy the entire tweet to list, will replace with normalize sentence
    lstSentences = Data['tweet'].tolist()

    #Define Stop words
    stopwords = stopwords.words("english")

    #Init Lemmatizer
    lemma = WordNetLemmatizer()

    lstAllWords = []
```

Clean Data Continued



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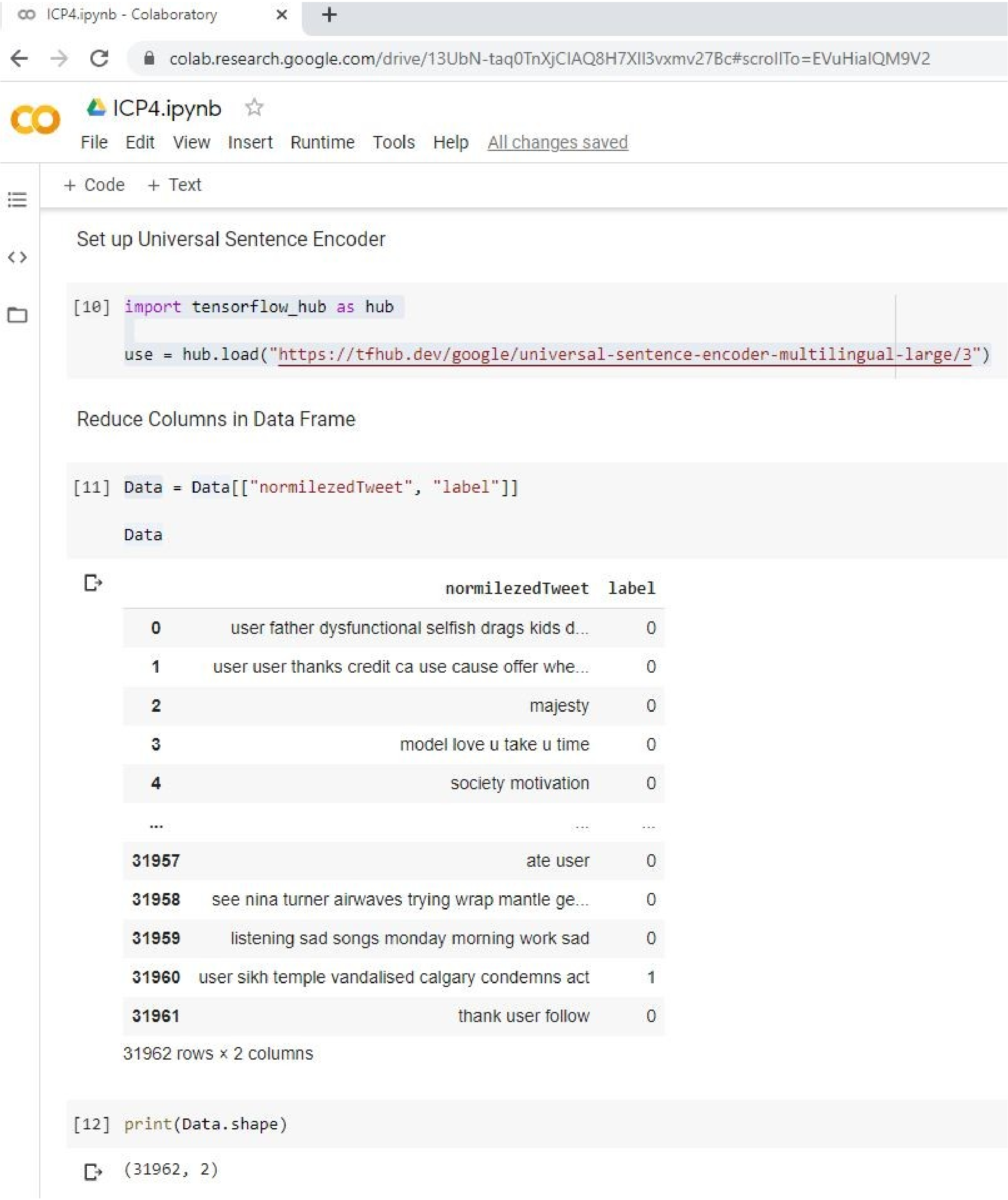
```
#Loop through the Dataelements
for x in range(len(lstWords)):
  #List of words to add back to the Dataframe
  words_no_punc = []
  #Sentence to add back to the Dataframe
  txtSentence = ''

  #Loop through the list of words for the sentence
  for w in lstWords[x]:
    # is it alphabetic
    if w.isalpha():
      # is it not a stop word
      if w not in stopwords:
        # is the word in english
        if wordnet.synsets(w):
          #Yes to all, now we are going to add the lemmatize word to the list of words and sentence
          words_no_punc.append(lemma.lemmatize(w ,pos="v"))
          txtSentence = txtSentence + w + ' '

  #Update list value
  lstWords[x] = words_no_punc
  lstSentences[x] = txtSentence
  lstAllWords = lstAllWords + words_no_punc

#Update Dataframe
Data['normilezedWords'] = lstWords
Data['normilezedTweet'] = lstSentences


#Display Dataframe
Data
```

	id	label	tweet	tWords	normilezedWords	normilezedTweet
0	1	0	@user when a father is dysfunctional and is s...	[@, user, when, a, father, is, dysfunctional, ...	[user, father, dysfunctional, selfish, drag, k...	user father dysfunctional selfish drags kids d...
1	2	0	@user @user thanks for #lyft credit i can't us...	[@, user, @, user, thanks, for, #, lyft, credi...	[user, user, thank, credit, ca, use, cause, of...	user user thanks credit ca use cause offer whe...
2	3	0	bihday your majesty	[bihday, your, majesty]	[majesty]	majesty
3	4	0	#model i love u take with u all the time in ...	[#, model, i, love, u, take, with, u, all, the...	[model, love, u, take, u, time]	model love u take u time

Setup Universal Sentence Encoder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ICP4.ipynb
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Set up Universal Sentence Encoder

```
[10] import tensorflow_hub as hub

     use = hub.load("https://tfhub.dev/google/universal-sentence-encoder-multilingual-large/3")
```

Reduce Columns in Data Frame

```
[11] Data = Data[["normilezedTweet", "label"]]

     Data
```

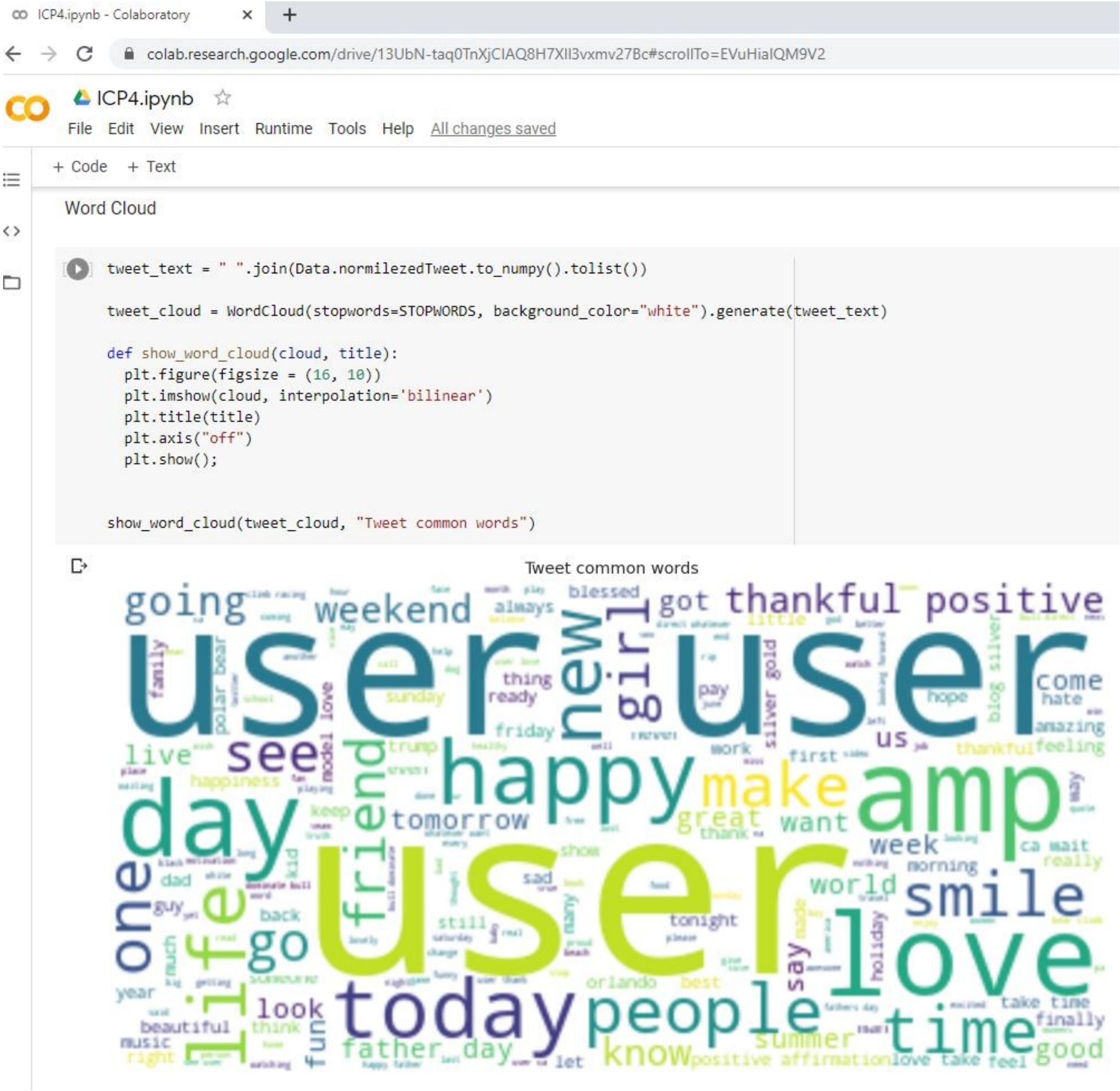
	normilezedTweet	label
0	user father dysfunctional selfish drags kids d...	0
1	user user thanks credit ca use cause offer whe...	0
2	majesty	0
3	model love u take u time	0
4	society motivation	0
...	...	...
31957	ate user	0
31958	see nina turner airwaves trying wrap mantle ge...	0
31959	listening sad songs monday morning work sad	0
31960	user sikh temple vandalised calgary condemns act	1
31961	thank user follow	0

31962 rows × 2 columns

```
[12] print(Data.shape)
```

```
(31962, 2)
```

Word Cloud



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Word Cloud

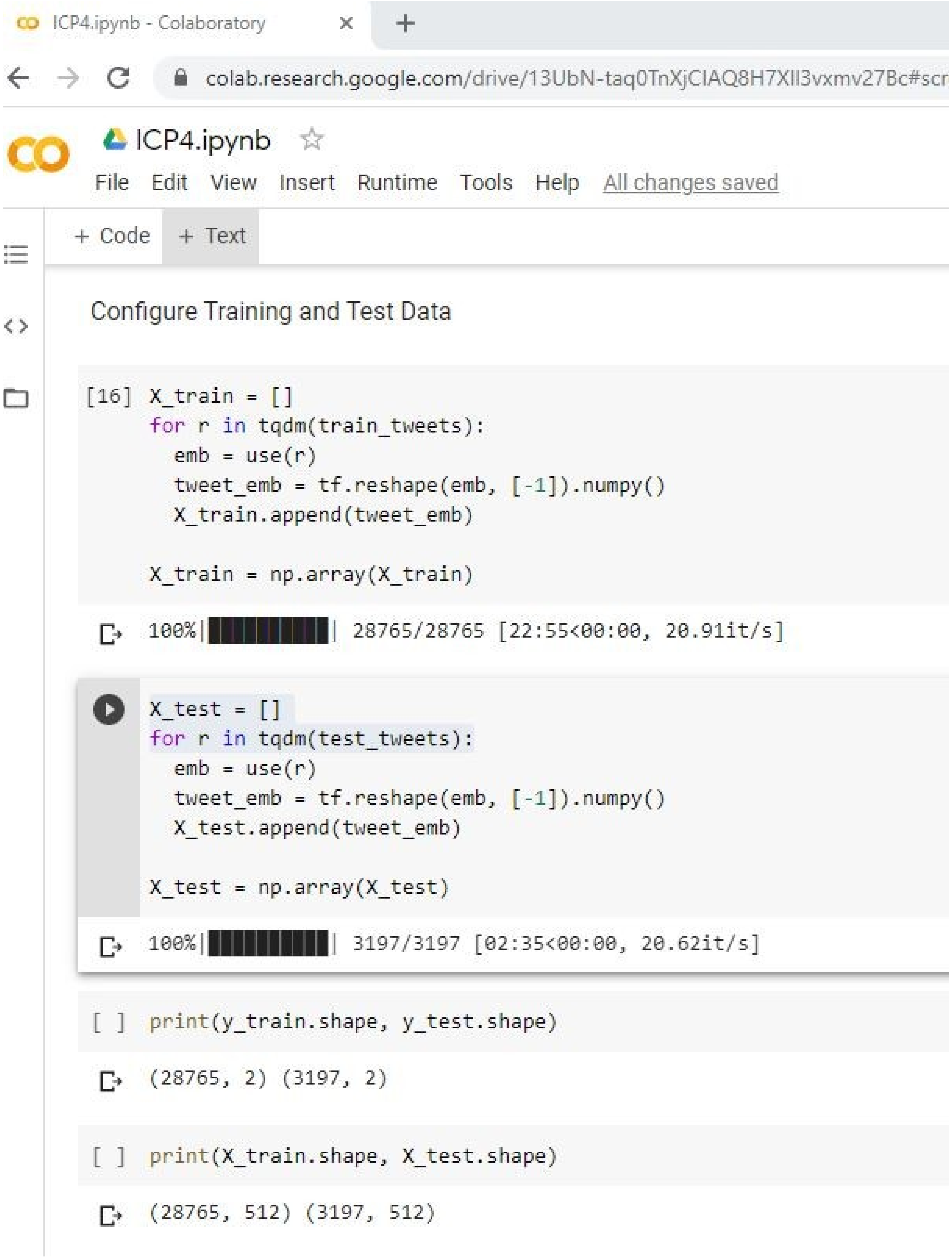
```
tweet_text = " ".join(Data.normilezedTweet.to_numpy().tolist())

tweet_cloud = WordCloud(stopwords=STOPWORDS, background_color="white").generate(tweet_text)

def show_word_cloud(cloud, title):
  plt.figure(figsize = (16, 10))
  plt.imshow(cloud, interpolation='bilinear')
  plt.title(title)
  plt.axis("off")
  plt.show();


show_word_cloud(tweet_cloud, "Tweet common words")
```

Configure Training and Test Data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Configure Training and Test Data

```
[16] X_train = []
     for r in tqdm(train_tweets):
       emb = use(r)
       tweet_emb = tf.reshape(emb, [-1]).numpy()
       X_train.append(tweet_emb)

     X_train = np.array(X_train)
```

```
100%|██████████| 28765/28765 [22:55<00:00, 20.91it/s]
```

```
X_test = []
for r in tqdm(test_tweets):
  emb = use(r)
  tweet_emb = tf.reshape(emb, [-1]).numpy()
  X_test.append(tweet_emb)

X_test = np.array(X_test)
```

```
100%|██████████| 3197/3197 [02:35<00:00, 20.62it/s]
```

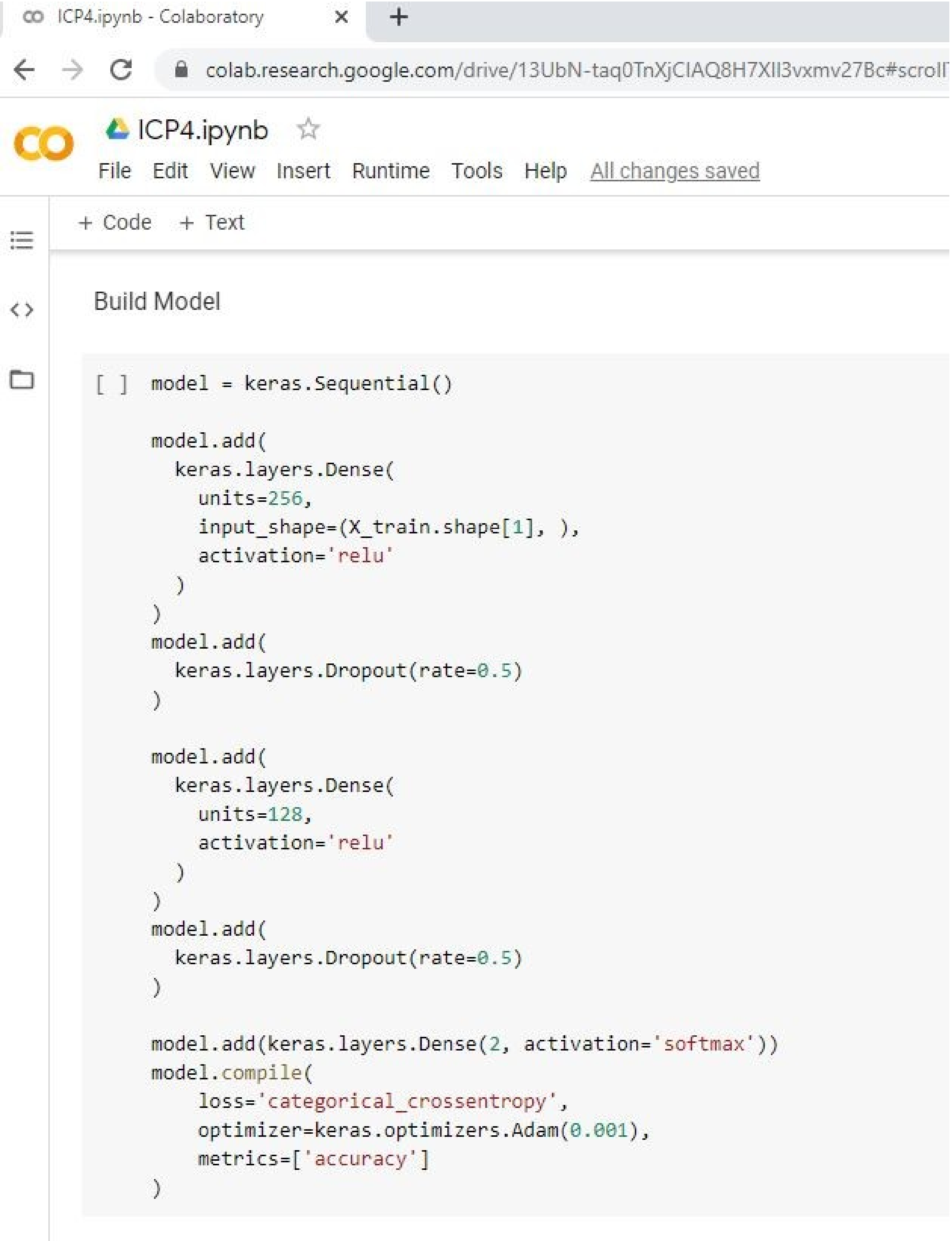
```
[ ] print(y_train.shape, y_test.shape)
```

```
(28765, 2) (3197, 2)
```

```
[ ] print(X_train.shape, X_test.shape)
```

```
(28765, 512) (3197, 512)
```

Build Model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ICP4.ipynb
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Build Model

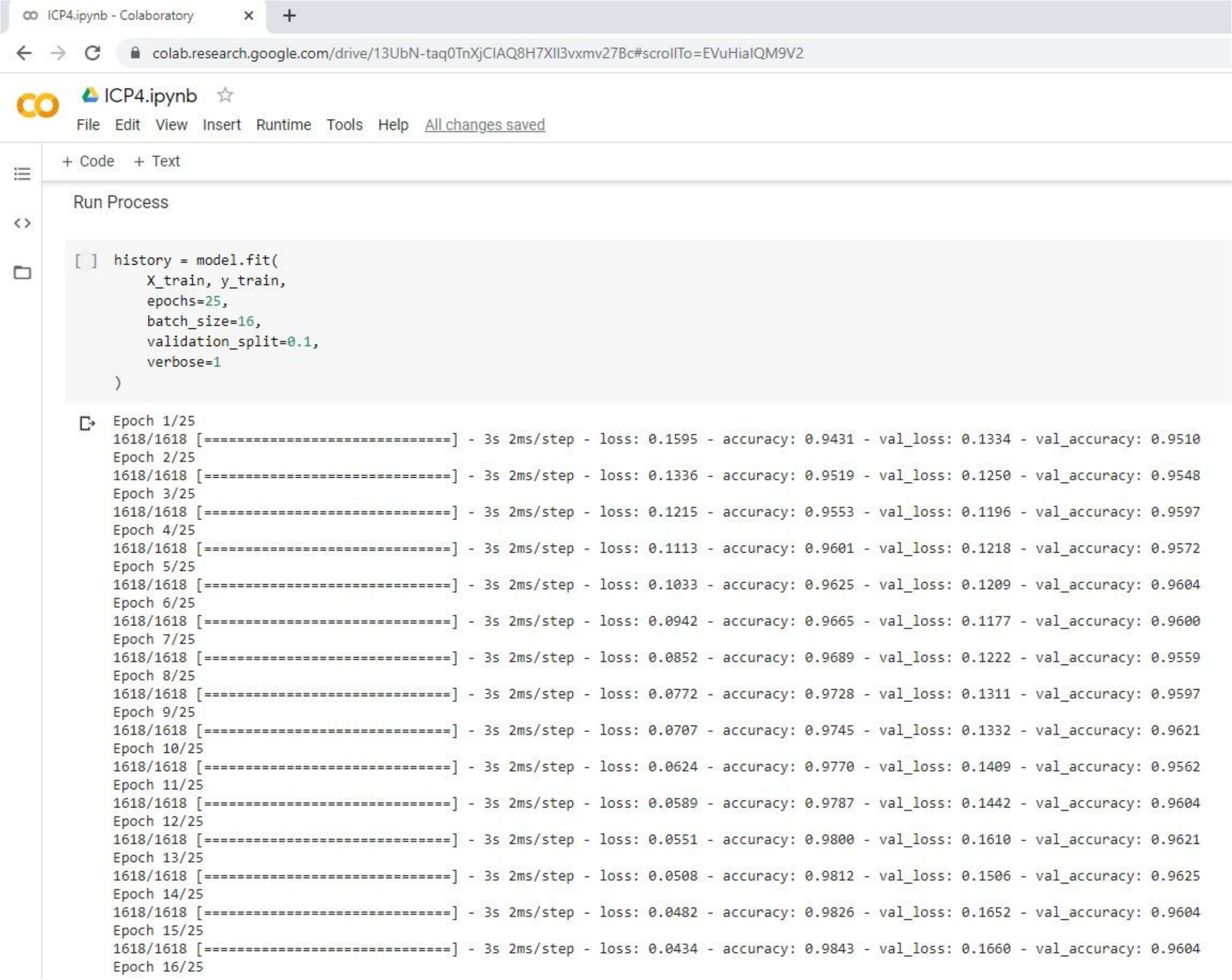
```
model = keras.Sequential()

model.add(
  keras.layers.Dense(
    units=256,
    input_shape=(X_train.shape[1], ),
    activation='relu'
  )
)
model.add(
  keras.layers.Dropout(rate=0.5)
)

model.add(
  keras.layers.Dense(
    units=128,
    activation='relu'
  )
)
model.add(
  keras.layers.Dropout(rate=0.5)
)

model.add(keras.layers.Dense(2, activation='softmax'))
model.compile(
    loss='categorical_crossentropy',
    optimizer=keras.optimizers.Adam(0.001),
    metrics=['accuracy']
)
```

Run Process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colab.research.google.com/drive/13UbN-taq0TnXjCIAQ8H7XIl3vxmv27Bc#scrollTo=EVuHiaIQM9V2
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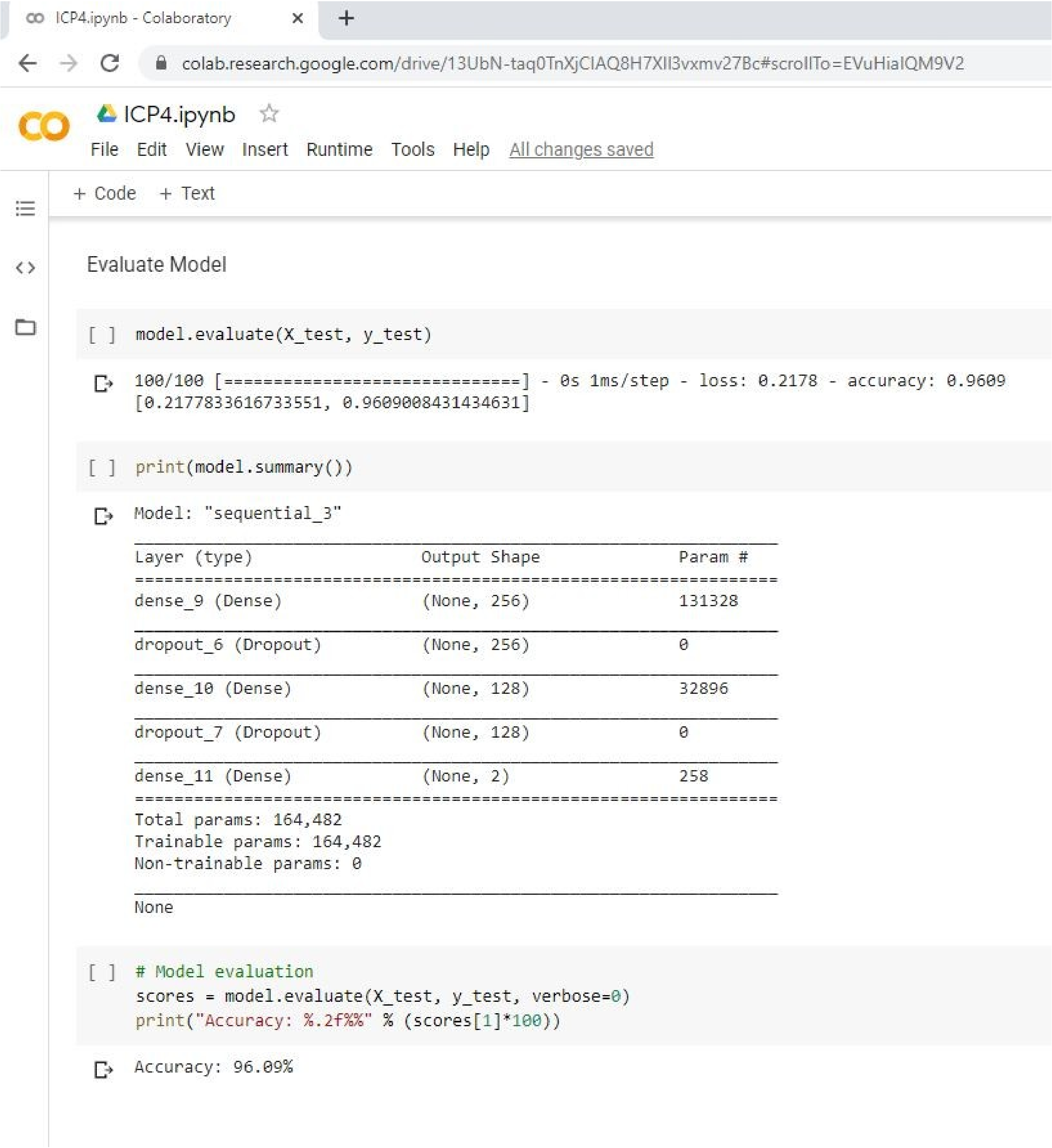
Run Process

```
history = model.fit(
    X_train, y_train,
    epochs=25,
    batch_size=16,
    validation_split=0.1,
    verbose=1
)
```

```
Epoch 1/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.1595 - accuracy: 0.9431 - val_loss: 0.1334 - val_accuracy: 0.9510
Epoch 2/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.1336 - accuracy: 0.9519 - val_loss: 0.1250 - val_accuracy: 0.9548
Epoch 3/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.1215 - accuracy: 0.9553 - val_loss: 0.1196 - val_accuracy: 0.9597
Epoch 4/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.1113 - accuracy: 0.9601 - val_loss: 0.1218 - val_accuracy: 0.9572
Epoch 5/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.1033 - accuracy: 0.9625 - val_loss: 0.1209 - val_accuracy: 0.9604
Epoch 6/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0942 - accuracy: 0.9665 - val_loss: 0.1177 - val_accuracy: 0.9600
Epoch 7/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0852 - accuracy: 0.9689 - val_loss: 0.1222 - val_accuracy: 0.9559
Epoch 8/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0772 - accuracy: 0.9728 - val_loss: 0.1311 - val_accuracy: 0.9597
Epoch 9/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0707 - accuracy: 0.9745 - val_loss: 0.1332 - val_accuracy: 0.9621
Epoch 10/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0624 - accuracy: 0.9770 - val_loss: 0.1409 - val_accuracy: 0.9562
Epoch 11/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0589 - accuracy: 0.9787 - val_loss: 0.1442 - val_accuracy: 0.9604
Epoch 12/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0551 - accuracy: 0.9800 - val_loss: 0.1610 - val_accuracy: 0.9621
Epoch 13/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0508 - accuracy: 0.9812 - val_loss: 0.1506 - val_accuracy: 0.9625
Epoch 14/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0482 - accuracy: 0.9826 - val_loss: 0.1652 - val_accuracy: 0.9604
Epoch 15/25
1618/1618 [==============================] - 3s 2ms/step - loss: 0.0434 - accuracy: 0.9843 - val_loss: 0.1660 - val_accuracy: 0.9604
Epoch 16/25
```

Evaluate Model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colab.research.google.com/drive/13UbN-taq0TnXjCIAQ8H7XIl3vxmv27Bc#scrollTo=EVuHiaIQM9V2
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Evaluate Model

```
[ ] model.evaluate(X_test, y_test)
```

```
100/100 [==============================] - 0s 1ms/step - loss: 0.2178 - accuracy: 0.9609
[0.2177833616733551, 0.9609008431434631]
```

```
[ ] print(model.summary())
```

```
Model: "sequential_3"
_________________________________________________________________
Layer (type)                 Output Shape              Param #   
=================================================================
dense_9 (Dense)              (None, 256)               131328    
_________________________________________________________________
dropout_6 (Dropout)          (None, 256)               0         
_________________________________________________________________
dense_10 (Dense)             (None, 128)               32896     
_________________________________________________________________
dropout_7 (Dropout)          (None, 128)               0         
_________________________________________________________________
dense_11 (Dense)             (None, 2)                 258       
=================================================================
Total params: 164,482
Trainable params: 164,482
Non-trainable params: 0
_________________________________________________________________
None
```

```
[ ] # Model evaluation
    scores = model.evaluate(X_test, y_test, verbose=0)
    print("Accuracy: %.2f%%" % (scores[1]*100))
```

```
Accuracy: 96.09%
```

Video Link

Any in site about the data or the ICP in general

Data consisted of Tweet text, with the text being categorized as racist or not racist. I am loving CoLab more and more. The number of Python libraries for this area of computer science is amazing. The code this time ran faster then expect and I did not run into memory issues this time.