```
from google.colab import drive
```

```
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mour
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```
import pandas as pd
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import nltk
nltk.download('punkt')

from nltk.tokenize import word_tokenize
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Embedding, LSTM, Dense, Dropout
from sklearn.preprocessing import LabelEncoder

import warnings
warnings.filterwarnings('ignore')
sns.set()
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

```
imdb = pd.read_csv('/content/drive/MyDrive/data/IMDB Dataset.csv')
```

```
imdb.head()
```

	review	sentiment
0	One of the other reviewers has mentioned that ...	positive
1	A wonderful little production. The...	positive
2	I thought this was a wonderful way to spend ti...	positive

```
imdb.sentiment.value_counts()
```

```
positive    25000
negative    25000
Name: sentiment, dtype: int64
```

```
text = imdb['review'][0]
print(text)
print("<==========>")
print(word_tokenize(text))
```

```
One of the other reviewers has mentioned that after watching just 1 Oz episode you'll be
<==========>
['One', 'of', 'the', 'other', 'reviewers', 'has', 'mentioned', 'that', 'after', 'watchir
```

```
corpus = []
for text in imdb['review']:
  words = [word.lower() for word in word_tokenize(text)]
  corpus.append(words)
```

```
num_words = len(corpus)
print(num_words)
```

```
50000
```

```
imdb.shape
```

```
(50000, 2)
```

```
train_size = int(imdb.shape[0]*0.8)
x_train = imdb.review[:train_size]
y_train = imdb.sentiment[:train_size]

x_test = imdb.review[train_size:]
y_test = imdb.sentiment[train_size:]
```

```
tokenizer = Tokenizer(num_words)
tokenizer.fit_on_texts(x_train)
```

```
x_train = tokenizer.texts_to_sequences(x_train)
x_train = pad_sequences(x_train, maxlen=128, truncating='post', padding='post')
```

```
x_train[0], len(x_train[0])
```

```
(array([   27,     4,     1,    80,  2102,    45,  1073,    12,   100,
          147,    39,   316,  2968,   409,   459,    26,  3173,    33,
           23,   200,    14,    11,     6,   614,    48,   606,    16,
           68,     7,     7,     1,    87,   148,    12,  3256,    68,
           41,  2968,    13,    92,  5626,     2, 16202,   134,     4,
          569,    60,   271,     8,   200,    36,     1,   673,   139,
         1712,    68,    11,     6,    21,     3,   118,    15,     1,
         7870,  2257,    38, 11540,    11,   118,  2495,    54,  5662,
           16,  5182,     5,  1438,   377,    38,   569,    92,     6,
         3730,     8,     1,   360,   353,     4,     1,   673,     7,
            7,     9,     6,   431,  2968,    14,    12,     6,     1,
        11736,   356,     5,     1, 14689,  6526,  2594,  1087,     9,
         2661,  1432,    20, 22583,   534,    32,  4795,  2451,     4,
            1,  1193,   117,    29,     1,  6893,    25,  2874, 12191,
            2,   392], dtype=int32), 128)
```

```
x_test = tokenizer.texts_to_sequences(x_test)
x_test = pad_sequences(x_test, maxlen=128, truncating='post', padding='post')
```

```
x_test[0], len(x_test[0])
```

```
(array([   87,   122,    10,   180,     5,   132,    12,    10,  7131,
         3717,    20,     1,  1001,  2285,     2,    10,   255,     1,
           17,  2431,    10,  1311,     5,   103,     1,   222,  6349,
            4,     3,    19,    11,    17,   974,     3,   351,     5,
          215,  1011,   415,     9,    13,   215,  1380,    56,   235,
          402,   300,     4,   316,    23,   257,    19,   961,    12,
        22250,    12,    33,    66,    61,   212,    53,    16,    11,
          113,    13,   497,     2,     1,   102,    70,  5358,    15,
            1,    88,   172,     1,   473,   824,     8,     1,    64,
           67,    54,    49,  2406,    30,    29,    33,    90,    40,
        35787,    83,    46,   438,     4,     3,    74,   220,     2,
           10,   115,    21,    63,    12,    30,    29,   268,    10,
         1059,   137,    10,    78,    21,   119,    28,    13,     1,
           88,   175,     5,   728,  3423,   108,     8,     1,    17,
           10,   115], dtype=int32), 128)
```

```
print(x_train.shape, y_train.shape)
print(x_test.shape, y_test.shape)
```

```
(40000, 128) (40000,)
(10000, 128) (10000,)
```

```
le = LabelEncoder()
```

```
y_train = le.fit_transform(y_train)
y_test = le.transform(y_test)

model = Sequential()

model.add(Embedding(input_dim=num_words, output_dim=100, input_length=128, trainable=True))
model.add(LSTM(100, dropout=0.1, return_sequences=True))
model.add(LSTM(100, dropout=0.1))
model.add(Dense(1, activation='sigmoid'))

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

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, 128, 100)          5000000

 lstm (LSTM)                 (None, 128, 100)          80400

 lstm_1 (LSTM)               (None, 100)               80400

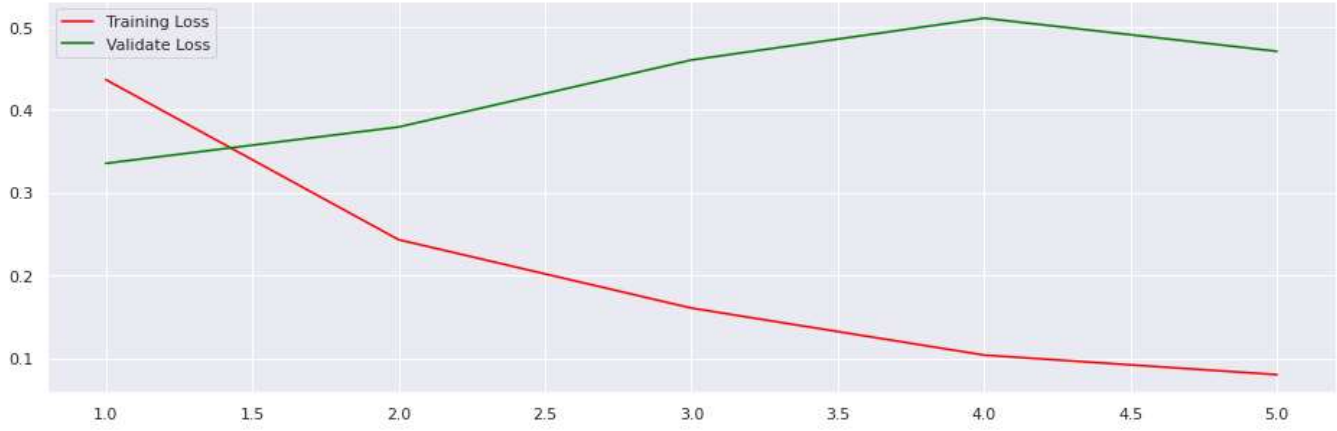
 dense (Dense)               (None, 1)                 101

=================================================================
Total params: 5,160,901
Trainable params: 5,160,901
Non-trainable params: 0
_________________________________________________________________
```

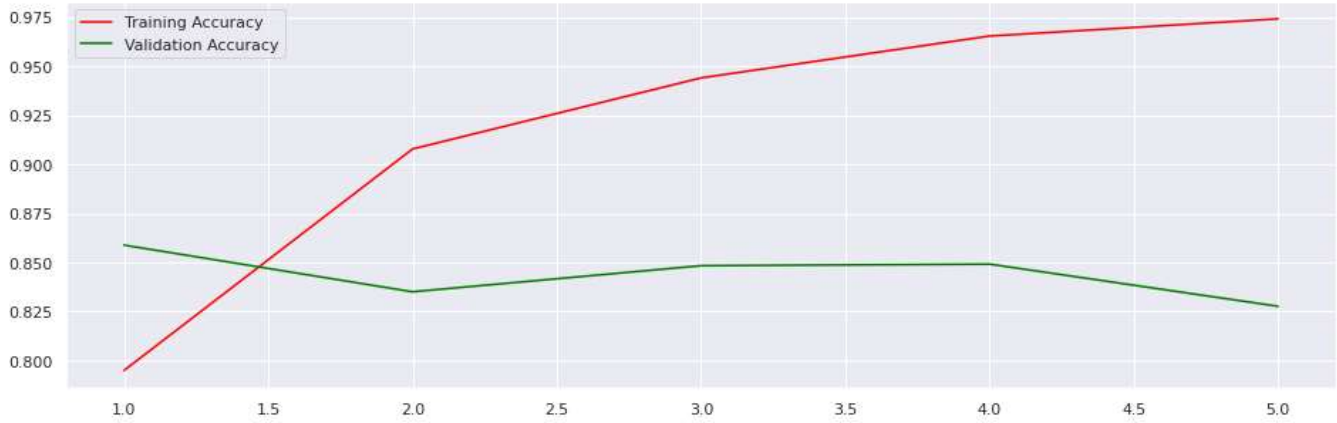
```
history = model.fit(x_train, y_train, epochs=5, batch_size=64, validation_data=[x_test, y_tes
```

```
Epoch 1/5
625/625 [==============================] - 285s 450ms/step - loss: 0.4363 - accuracy: 0
Epoch 2/5
625/625 [==============================] - 265s 424ms/step - loss: 0.2431 - accuracy: 0
Epoch 3/5
625/625 [==============================] - 265s 423ms/step - loss: 0.1605 - accuracy: 0
Epoch 4/5
625/625 [==============================] - 268s 428ms/step - loss: 0.1038 - accuracy: 0
Epoch 5/5
625/625 [==============================] - 266s 425ms/step - loss: 0.0801 - accuracy: 0
```

```
plt.figure(figsize=(16,5))
epochs = range(1, len(history.history['accuracy'])+1)
plt.plot(epochs, history.history['loss'], 'b', label='Training Loss', color='red')
plt.plot(epochs, history.history['val_loss'], 'b', label='Validate Loss', color='green')
plt.legend()
plt.show()
```




```
plt.figure(figsize=(16,5))
epochs = range(1, len(history.history['accuracy'])+1)
plt.plot(epochs, history.history['accuracy'], 'b', label='Training Accuracy', color='red')
plt.plot(epochs, history.history['val_accuracy'], 'b', label='Validation Accuracy', color='gr
plt.legend()
plt.show()
```




```
validation_sentence = ['This movie is wonderful, I Love it.']
validation_sentence_tokened = tokenizer.texts_to_sequences(validation_sentence)
validation_sentence_padded = pad_sequences(validation_sentence_tokened, maxlen=128, truncatin

print(validation_sentence[0])
print("Probability of Positive: {}" .format(model.predict(validation_sentence_padded)[0]))
```

```
This movie is wonderful, I Love it.
```

```
Probability of Positive: [0.98574543]
```

```
validation_sentence = ['Waste of time and money. Not at all a good movie.']
validation_sentence_tokened = tokenizer.texts_to_sequences(validation_sentence)
validation_sentence_padded = pad_sequences(validation_sentence_tokened, maxlen=128, truncatin

print(validation_sentence[0])
print("Probability of Positive: {}" .format(model.predict(validation_sentence_padded)[0]))
```

```
Waste of time and money. Not at all a good movie.
Probability of Positive: [0.02356273]
```