```
# importing required primary packages
import numpy as np import pandas as
pd import seaborn as sns import
matplotlib.pyplot as plt
```

```
# reading the csv file df =
pd.read_csv('/content/Restaurant_Reviews.tsv',sep='\t')

df
```

```
                                                 Review Liked

0 Wow... Loved this place ............................................................ 1

2 Not tasty and the texture was just nasty. 03 Stopped by during the late May bank holiday of ........ 1

4 The selection on the menu was great and so wer ............................................. 1

      1                              Crust is not good.      0

     ...                                            ...    ...

995             I think food should have flavor and texture an... 0

996             Appetite instantly gone. 0

997             Overall I was not impressed and would not go b...        0

998             The whole experience was underwhelming, and I ...        0

999             Then, as if I hadn't wasted enough of my life ... 0

1000            rows × 2 columns
```

```
# getting info of the data set
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Review  1000 non-null   object
1   Liked   1000 non-null   int64
dtypes: int64(1), object(1) memory
usage: 15.8+ KB
```

```
# removing the repeated or duplicate values
df = df.drop_duplicates(keep = 'last') df
```

```
                                             Review Liked

  0                          Wow... Loved this place.     1

  1                               Crust is not good.      0

  2               Not tasty and the texture was just nasty.      0

  3      Stopped by during the late May bank holiday of...      1

  4   The selection on the menu was great and so wer...      1

 ...                                               ...     ...

995             I think food should have flavor and texture an... 0

996             Appetite instantly gone. 0

997             Overall I was not impressed and would not go b...        0

998             The whole experience was underwhelming, and I ...        0

999             Then, as if I hadn't wasted enough of my life ... 0

  996 rows × 2 columns
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 996 entries, 0 to 999
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Review  996 non-null    object
1   Liked   996 non-null    int64
dtypes: int64(1), object(1) memory
usage: 23.3+ KB
```

```
df['Review'][900]
```

```
'Spend your money elsewhere.'
```

```
df['Liked'][900]
```

```
0
```

```
df['Review'][500]
```

```
'I also had to taste my Mom's multi-grain pumpkin pancakes with pecan butter and they were
amazing, fluffy, and delicious!'
```

```
df['Liked'][500]
```

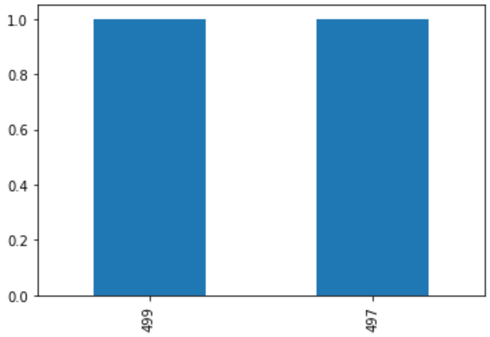
```
1
```

```
# finding number of unique values
data_frame=df['Liked'].value_counts().to_frame()
data_frame
```

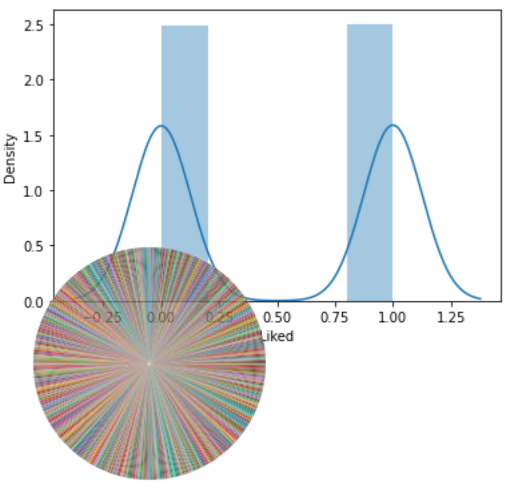
	Liked
1	499
0	497

```
# pandas plotting
data_frame['Liked'].value_counts().plot(kind='bar')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f44857cd2d0>
```



```
# data visualization using seaborn distplot
sns.distplot(df['Liked']) /usr/local/lib/python3.7/dist-
packages/seaborn/distributions.py:2619: FutureWarning: `distpl
warnings.warn(msg, FutureWarning)
<matplotlib.axes._subplots.AxesSubplot at 0x7f4485713050>
```



```
#
```

```
data visualization using matplotlib
# this piechart is showing the all 997 values with their
respective values (0&1) import matplotlib.pyplot as plt x
= df['Review'].values y = df['Liked'].values plt.pie(y)
plt.show()
```

```
# rows - 996  and  columns - 2
df.shape
```

```
     (996, 2)
```

```
# splitting the date into training data and testing data from
sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,random_state=0)
```

```
x_train.shape
```

```
     (747,)
```

```
x_test.shape
```

```
     (249,)
```

```
# using countvectorizer coverting the text data to numerical values
# that is it involves removing of stop words and counting the occurence of each useful word and storing them

from sklearn.feature_extraction.text import CountVectorizer
vect = CountVectorizer(stop_words='english') x_train_vect =
vect.fit_transform(x_train) x_test_vect =
vect.transform(x_test)
```

```
x_train_vect.toarray()
```

```
     array([[0, 0, 0, ..., 0, 0, 0],
     [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0],
     ...,
            [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0]])
```

```
x_test_vect.toarray()
```

```
     array([[0, 0, 0, ..., 0, 0, 0],
     [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0],
            ...,
            [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0]])
```

```
x_train_vect.shape
```

```
     (747, 1531)
```

```
x_test_vect.shape
```

```
     (249, 1531)
```

```
#METHOD 1 # using support vector
classifier from sklearn.svm
import SVC model1 = SVC()
model1.fit(x_train_vect,y_train)
```

```
     SVC()
```

```
# predicted values y_pred1 =
model1.predict(x_test_vect) y_pred1
```

```
      array([0, 0, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1,
              1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1,
             1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1,
             0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1,
             0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0,
             0, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 1,
             1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0,
             1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 0, 1,
             0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0,
             1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 0, 1, 0, 1,
             0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1,
     1, 0, 1, 0, 1, 0, 1])
```

```
# finding accuracy of the model from
sklearn.metrics import accuracy_score
accuracy_score(y_pred1,y_test)
```

```
     0.7269076305220884
```

```
# METHOD 2
# combining countvectorizer and support vector
classifier using pipeline from sklearn.pipeline import
make_pipeline model2 =
make_pipeline(CountVectorizer(),SVC())
model2.fit(x_train,y_train)
```

```
     Pipeline(steps=[('countvectorizer', CountVectorizer()), ('svc', SVC())])
```

```
# predicted values y_pred2 =
model2.predict(x_test) y_pred2
```

```
      array([0, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1,
              1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1,
             1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1,
             0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1,
             1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0,
             0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1,
             1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0,
             1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0,
             0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1,
             1, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0,
             1, 1, 0, 1, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1,
     1, 0, 1, 1, 0, 0, 1])
```

```
# finding accuracy of the model
accuracy_score(y_pred2,y_test)
```

```
     0.8152610441767069
```

```
# METHOD 3 # using Naive Bayes from
sklearn.naive_bayes import MultinomialNB
model3 = MultinomialNB()
model3.fit(x_train_vect,y_train)
```

```
     MultinomialNB()
```

```
# predicted values y_pred3 =
model3.predict(x_test_vect) y_pred3
```

```
      array([0, 1, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 1,
             1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1,
             1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1,
             1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1,
             1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0,
             0, 1, 0, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 1,
             1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0,
             1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1,
             0, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1,
             1, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 0, 1,
             1, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1,
     1, 0, 1, 1, 0, 0, 1])
```

```
# finding accuracy of the model
accuracy_score(y_pred3,y_test)
```

```
     0.7469879518072289
```

```
# METHOD 4
# combining count vectorizer and Naive Bayes
using pipeline from sklearn.pipeline import
make_pipeline model4 =
make_pipeline(CountVectorizer(),MultinomialNB())
model4.fit(x_train,y_train)
```

```
     Pipeline(steps=[('countvectorizer', CountVectorizer()),
                     ('multinomialnb', MultinomialNB())])
```

```
# predicted values y_pred4 =
model4.predict(x_test) y_pred4
```

```
      array([0, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 1,
             1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1,
             1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1,
             0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1,
             1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0,
             0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1,
             1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0,
             1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1,
             0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1,
             1, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0,
             1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1,
     1, 0, 1, 1, 0, 0, 1])
```

```
# finding accuracy of the model
accuracy_score(y_pred4,y_test)
```

```
     0.7791164658634538
```

```
# THE ACCURACIES OF ALL MODELS CREATED import

pandas as pd

accuracy = [['SVC',0.7269076305220884],['SVC Pipeline',0.8152610441767069]
               ,['MultinomialNB',0.7469879518072289],['MultinomialNB Pipeline',0.7791164658634538]]

accuracy_df = pd.DataFrame(accuracy,columns = ['Model','Accuracy']) accuracy_df =
accuracy_df.style.set_properties(**{'text-align':'left'}) accuracy_df =
accuracy_df.set_table_styles([dict(selector = 'th',props=[('text-align','center')])]) accuracy_df
```

	Model	**Accuracy**
0	SVC	0.726908
1	SVC Pipeline	0.815261

```
# pickling
```

2	MultinomialNB	0.746988
3	MultinomialNB Pipeline	0.779116

```
# pickling
# using joblib for saving the model having highest accuracy
import joblib joblib.dump(model2,'restaurant_reviews')
```

```
    ['restaurant_reviews']
```

```
# loading the model import joblib reload_model =
joblib.load('restaurant_reviews')
```

```
# predicting the values with highest accuracy model after pickling
reload_model.predict(['good'])
```

```
    array([1])
```

```
reload_model.predict(['not so good'])
```

```
    array([0])
```

```
reload_model.predict(['thankyou'])
```

```
    array([1])
```

```
reload_model.predict(['not worth'])
```

```
    array([0])
```

```
# creating the webapp using streamlit
# installing streamlit
!pip install streamlit --quiet
```

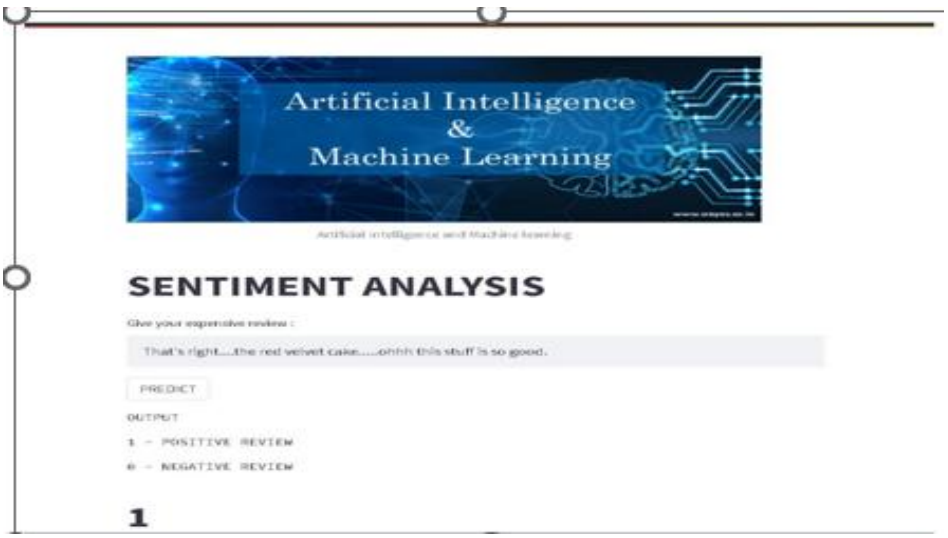
```
         |████████████████████████████████| 10.1 MB 27.1 MB/s
         |████████████████████████████████| 111 kB 64.3 MB/s
         |████████████████████████████████| 181 kB 66.5 MB/s
         |████████████████████████████████| 77 kB 5.6 MB/s
         |████████████████████████████████| 4.3 MB 68.2 MB/s
         |████████████████████████████████| 164 kB 66.6 MB/s
         |████████████████████████████████| 63 kB 1.7 MB/s
         |████████████████████████████████| 131 kB 60.7 MB/s
         |████████████████████████████████| 130 kB 61.3 MB/s
         |████████████████████████████████| 793 kB 56.2 MB/s
         |████████████████████████████████| 428 kB 60.3 MB/s
         |████████████████████████████████| 381 kB 61.2 MB/s
      Building wheel for blinker (setup.py) ... done
      Building wheel for validators (setup.py) ... done
    ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source
    jupyter-console 5.2.0 requires prompt-toolkit<2.0.0,>=1.0.0, but you have prompt-toolkit 3.0.29 which is incompatible.
    google-colab 1.0.0 requires ipykernel~=4.10, but you have ipykernel 6.13.0 which is incompatible. google-colab 1.0.0
    requires ipython~=5.5.0, but you have ipython 7.33.0 which is incompatible. google-colab 1.0.0 requires
    tornado~=5.1.0; python_version >= "3.0", but you have tornado 6.1 which is incompatible.
```

```
# using file handiling in python
# write mode for writing the reviews
# button - on click displays the output as 0 or 1 %%writefile
reviews.py import streamlit as st import joblib from PIL import Image
image = Image.open('/content/photo.jpg') st.image(image,
caption='Artificial Intelligence and Machine learning') print()

st.title('SENTIMENT ANALYSIS') reload_model =
joblib.load('restaurant_reviews')

ip = st.text_input("Give your expensive review : ")
op = reload_model.predict([ip])

if st.button('PREDICT'):
  st.text('OUTPUT ')
st.text('1 - POSITIVE REVIEW')
st.text('0 - NEGATIVE REVIEW')


  st.title(op[0])
```

```
Overwriting reviews.py
```

```
# using local tunnel tool for creating a URL to webapp
!streamlit run reviews.py & npx localtunnel --port 8501
```

```
2022-05-28 12:32:11.460 INFO    numexpr.utils: NumExpr defaulting to 2 threads.
npx: installed 22 in 2.593s

  You can now view your Streamlit app in your browser.

  Network URL: http://172.28.0.2:8501
  External URL: http://34.85.226.213:8501

your url is: https://fair-turtles-stop-34-85-226-213.loca.lt



  Stopping...
^C
```



Artificial intelligence and Machine learning

SENTIMENT ANALYSIS

Give your expensive review :

That's right....the red velvet cake.....ohhh this stuff is so good.

```
OUTPUT

1 - POSITIVE REVIEW

0 - NEGATIVE REVIEW
```

1