In [ ]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

VISUALIZING DATA && PRE-PROCESSING

In [ ]:
```
df=pd.read_csv('drive/MyDrive/Colab Notebooks/mbti_1.csv')
```

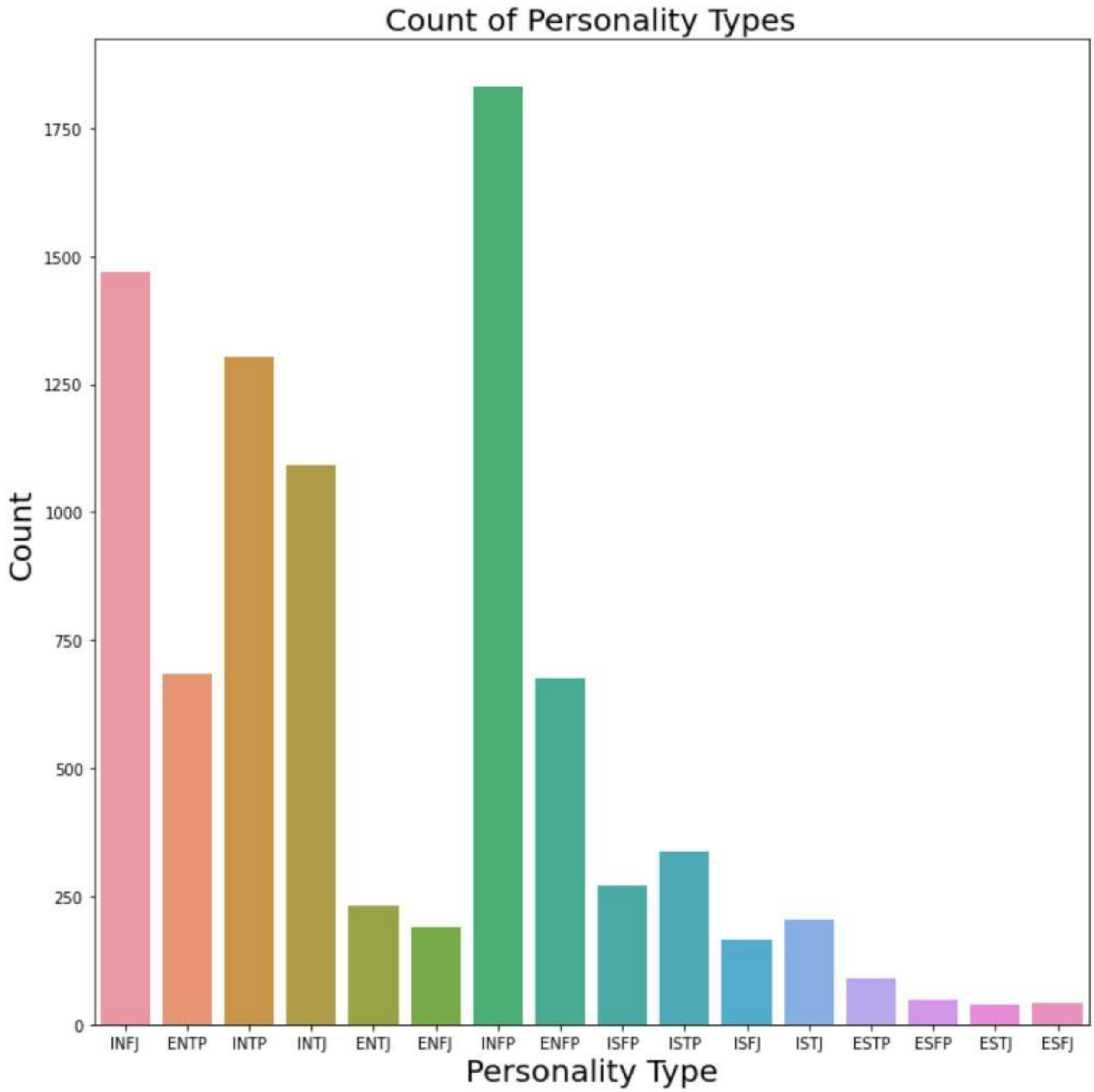
In [ ]:
```
df
```

Out[ ]:

	type	posts
0	INFJ	'http://www.youtube.com/watch?v=qsXHcwe3krw|||...
1	ENTP	'I'm finding the lack of me in these posts ver...
2	INTP	'Good one ____ https://www.youtube.com/wat...
3	INTJ	'Dear INTP, I enjoyed our conversation the o...
4	ENTJ	'You're fired.|||That's another silly misconce...
...	...	...
8670	ISFP	'https://www.youtube.com/watch?v=t8edHB_h908||...
8671	ENFP	'So...if this thread already exists someplace ...
8672	INTP	'So many questions when i do these things. I ...
8673	INFP	'I am very conflicted right now when it comes ...
8674	INFP	'It has been too long since I have been on per...

8675 rows × 2 columns

In [ ]:
```
fig,subaxes=plt.subplots(figsize=(10,10))
sns.countplot(df['type'])
plt.title("Count of Personality Types",size=20)
plt.xlabel("Personality Type",size=20)
plt.ylabel("Count",size=20)
plt.tight_layout(pad=1.08)
```



CONVERTING TEXT LABEL TO INTEGER LABELS

In [ ]:

```
df['E/I']=df['type'].apply(lambda x: x[0]=='E').astype('int')
df['S/N']=df['type'].apply(lambda x: x[1]=='N').astype('int')
df['T/F']=df['type'].apply(lambda x: x[2]=='T').astype('int')
df['J/P']=df['type'].apply(lambda x: x[3]=='J').astype('int')
df.head()
```

Out[ ]:

	type	posts	E/I	S/N	T/F	J/P
0	INFJ	'http://www.youtube.com/watch?v=qsXHcwe3krw|||...	0	1	0	1
1	ENTP	'I'm finding the lack of me in these posts ver...	1	1	1	0
2	INTP	'Good one _____ https://www.youtube.com/wat...	0	1	1	0
3	INTJ	'Dear INTP, I enjoyed our conversation the o...	0	1	1	1
4	ENTJ	'You're fired.|||That's another silly misconce...	1	1	1	1

In [ ]:
```
y=df.iloc[:,2:]
y.head()
```

Out[ ]:

	E/I	S/N	T/F	J/P
0	0	1	0	1
1	1	1	1	0
2	0	1	1	0
3	0	1	1	1
4	1	1	1	1

CLEANING POSTS

In [ ]:
```
df['split_posts']=df['posts'].str.split('\|\|\|')
df['split_posts']=df['split_posts'].apply(', '.join)
df['split_posts']=df['split_posts'].str.lower()
pattern_url = r'http[s]?://(?:[A-Za-z]|[0-9]|[$-_@.&+]|[!*\(\),]|(?:%[0-9A-Fa-f][0-9A-F
subs_url = r'url-web'
df['split_posts']=df['split_posts'].replace(to_replace=pattern_url,value=subs_url,regex
```

In [ ]:
```
import string
def remove_punctuation(post):
   return ''.join([l for l in post if l not in string.punctuation])
```

In [ ]:
```
df['posts_no_punct']=df['split_posts'].apply(remove_punctuation)
```

In [ ]:
```
# Tokenise into individual words
import nltk
nltk.download('punkt')
from nltk.tokenize import word_tokenize

df['words'] = df['posts_no_punct'].apply(word_tokenize)
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
```

In [ ]:
```
df.head()
```

Out[ ]:

	type	posts	E/I	S/N	T/F	J/P	split_posts	posts_no_punct	words
0	INFJ	'http://www.youtube.com/watch?v=qsXHcwe3krw|||...	0	1	0	1	'url-web url-web enfp and intj moments url-we...	urlweb urlweb enfp and intj moments urlweb s...	[urlweb, urlweb, enfp, and, intj, moments, url...
1	ENTP	'I'm finding the lack of me in these posts ver...	1	1	1	0	'i'm finding the lack of me in these posts ver...	im finding the lack of me in these posts very ...	[im, finding, the, lack, of, me, in, these, po...

	type	posts	E/I	S/N	T/F	J/P	split_posts	posts_no_punct	words
2	INTP	'Good one _____ https://www.youtube.com/wat...	0	1	1	0	'good one _____ url-web of course, to which...	good one urlweb of course to which i say i...	[good, one, urlweb, of, course, to, which, i, ...
3	INTJ	'Dear INTP, I enjoyed our conversation the o...	0	1	1	1	'dear intp, i enjoyed our conversation the o...	dear intp i enjoyed our conversation the oth...	[dear, intp, i, enjoyed, our, conversation, th...
4	ENTJ	'You're fired.|||That's another silly misconce...	1	1	1	1	'you're fired., that's another silly misconcep...	youre fired thats another silly misconception ...	[youre, fired, thats, another, silly, misconce...

In [ ]:

```
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
train_worldclouds=df.iloc[:,:]
group_worldclouds=train_worldclouds[['type','words']]
group_worldclouds=group_worldclouds.groupby('type').sum()
group_worldclouds=group_worldclouds.reset_index()
group_worldclouds
```

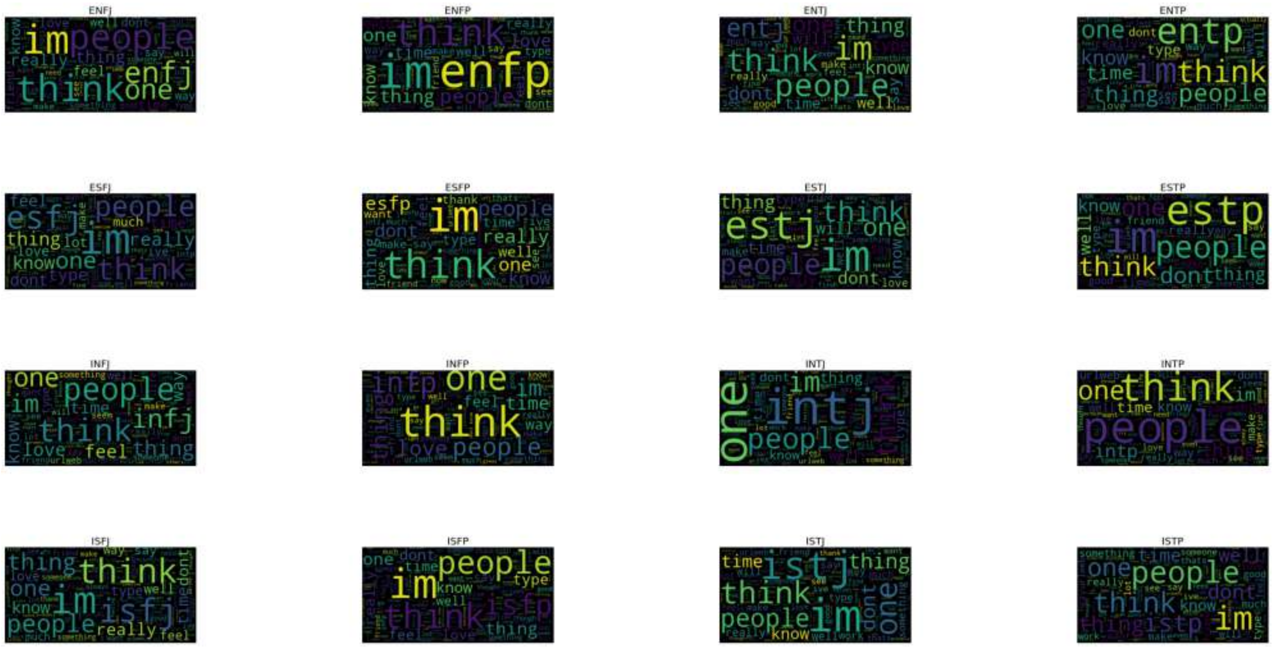
Out[ ]:

	type	words
0	ENFJ	[urlweb, 51, o, i, went, through, a, break, up...
1	ENFP	[he, doesnt, want, to, go, on, the, trip, with...
2	ENTJ	[youre, fired, thats, another, silly, misconce...
3	ENTP	[im, finding, the, lack, of, me, in, these, po...
4	ESFJ	[why, not, any, other, esfjs, originally, mist...
5	ESFP	[edit, i, forgot, what, board, this, was, on, ...
6	ESTJ	[this, is, such, a, catch, 22, im, here, altho...
7	ESTP	[splinter, cell, blacklist, for, xbox, 360, es...
8	INFJ	[urlweb, urlweb, enfp, and, intj, moments, url...
9	INFP	[i, think, we, do, agree, i, personally, dont,...
10	INTJ	[dear, intp, i, enjoyed, our, conversation, th...
11	INTP	[good, one, urlweb, of, course, to, which, i, ...
12	ISFJ	[i, love, feeling, affectionate, for, the, one...
13	ISFP	[they, paint, without, numbers, id, guess, at,...
14	ISTJ	[newtons, universal, gravity, law, i, mean, se...
15	ISTP	[i, got, 593, from, what, ive, read, about, th...

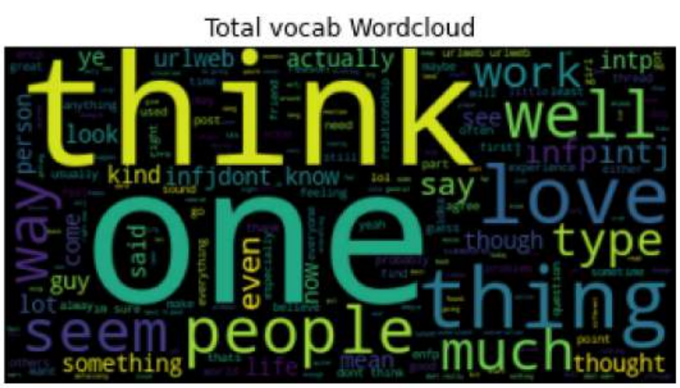
In [ ]:

```
fig,subaxes=plt.subplots(4,4)
fig.tight_layout()
fig.set_size_inches(40,20)
random=group_worldclouds['words']
```

```
for i,j in group_worldclouds.iterrows():
  text=', '.join(random[i])
  wordcloud=WordCloud().generate(text)
  plt.subplot(4,4,(i+1))
  plt.imshow(wordcloud, interpolation='bilinear')
  plt.axis("off")
  plt.title(str(group_worldclouds['type'].iloc[i]),size=20)
```



In [ ]:
```
random=group_worldclouds['words']
vocab=[]
for i in random:
  vocab.append(i)
vocab
flat_vocab=[]
for i in vocab:
  for word in  i:
    flat_vocab.append(word)
text=', '.join(word for word in flat_vocab)
wordcloud=WordCloud().generate(text)
fig.set_size_inches(40,20)
plt.imshow(wordcloud,interpolation='bilinear')
plt.axis("off")
plt.title('Total vocab Wordcloud')
plt.show()
```



In [ ]:
```
print('Extroversion (1) - Introversion (0)', '\n',df['E/I'].value_counts(), '\n')
```

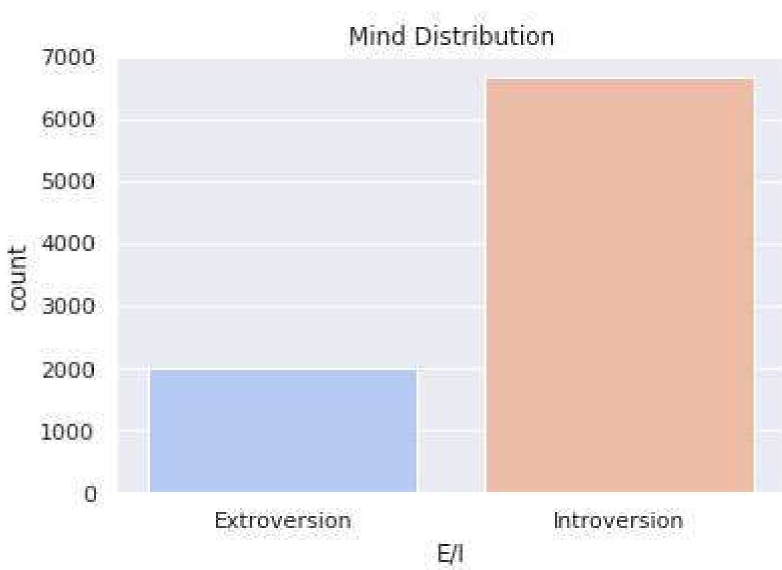
```
print('Intuition (1) - Sensing (0)', '\n', df['S/N'].value_counts(), '\n')
print('Thinking (1) - Feeling (0)', '\n', df['T/F'].value_counts(), '\n')
print('Judging (1) - Perceiving (0)', '\n', df['J/P'].value_counts(), '\n')
```

```
Extroversion (1) - Introversion (0)
 0    6676
1    1999
Name: E/I, dtype: int64

Intuition (1) - Sensing (0)
 1    7478
0    1197
Name: S/N, dtype: int64

Thinking (1) - Feeling (0)
 0    4694
1    3981
Name: T/F, dtype: int64

Judging (1) - Perceiving (0)
 0    5241
1    3434
Name: J/P, dtype: int64
```

In [ ]:

```
sns.set_theme(style='darkgrid')
sns.countplot(x="E/I", data=df, order=[1,0],palette="coolwarm")
plt.ylim(0,7000)
plt.xticks([0,1],['Extroversion','Introversion'])
plt.title("Mind Distribution")
```

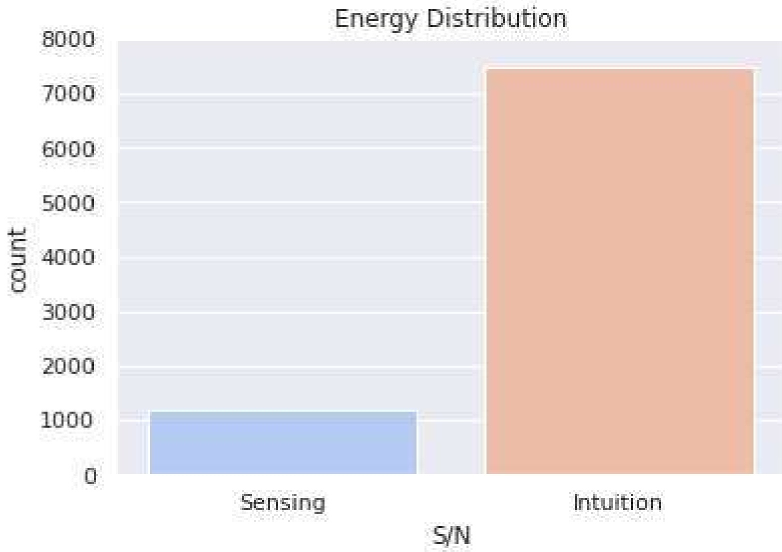
Out[ ]: Text(0.5, 1.0, 'Mind Distribution')



In [ ]:

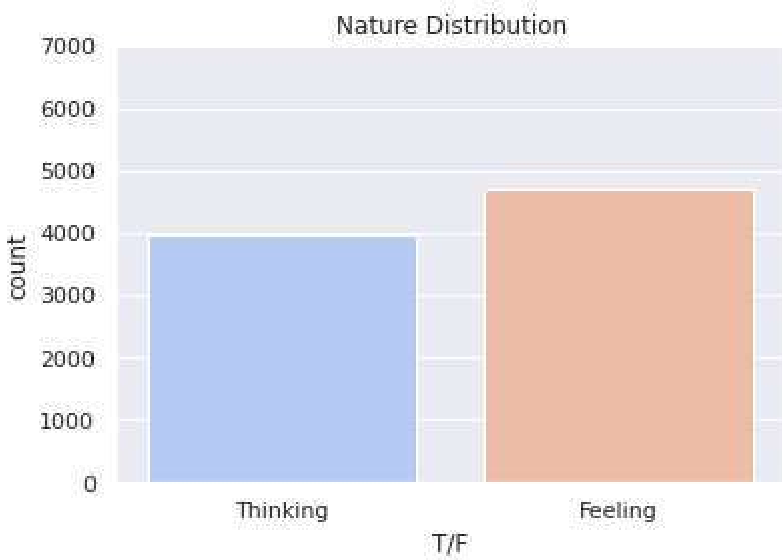
```
sns.set_theme(style='darkgrid')
sns.countplot(x="S/N", data=df, order=[0,1],palette="coolwarm")
plt.ylim(0,8000)
plt.xticks([0,1],['Sensing','Intuition'])
plt.title("Energy Distribution")
```

Out[ ]: Text(0.5, 1.0, 'Energy Distribution')



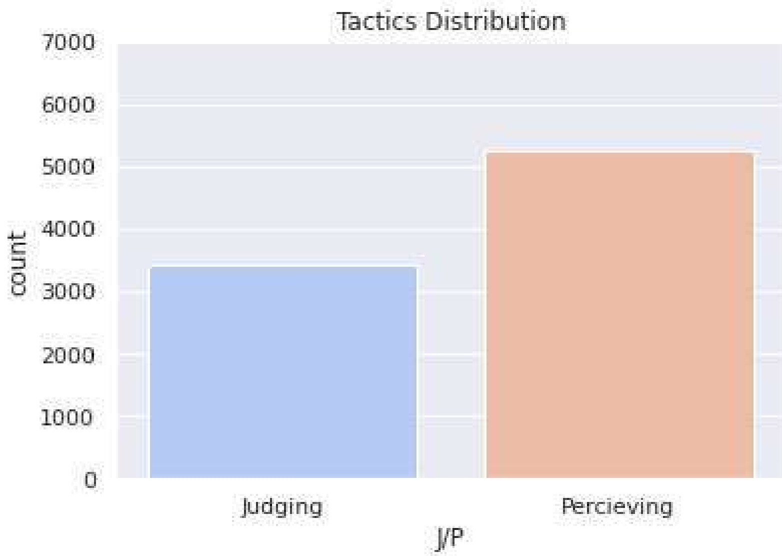
In [ ]:
```
sns.set_theme(style='darkgrid')
sns.countplot(x="T/F", data=df, order=[1,0],palette="coolwarm")
plt.ylim(0,7000)
plt.xticks([0,1],['Thinking','Feeling'])
plt.title("Nature Distribution")
```

Out[ ]: `Text(0.5, 1.0, 'Nature Distribution')`



In [ ]:
```
sns.set_theme(style='darkgrid')
sns.countplot(x="J/P", data=df, order=[1,0],palette="coolwarm")
plt.ylim(0,7000)
plt.xticks([0,1],['Judging','Percieving'])
plt.title("Tactics Distribution")
```

Out[ ]: `Text(0.5, 1.0, 'Tactics Distribution')`



FURTHER CLEANING OF DATA

In [ ]:

```
from nltk.stem.wordnet import WordNetLemmatizer
import nltk
from nltk.corpus import stopwords
nltk.download('wordnet')
nltk.download('stopwords')
corpus=[]
wnl=WordNetLemmatizer()
for i in range(0,len(df['posts_no_punct'])):
  text=df['posts_no_punct'][i]
  text=text.split()
  stop_wrds = set(stopwords.words('english'))
  text= [wnl.lemmatize(word, "v") for word in text if not word in stop_wrds]
  text = ' '.join(text)
  corpus.append(text)
df['clean_data']=corpus
```

```
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Unzipping corpora/wordnet.zip.
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
```

APPLYING TFIDVECTORIZER FOR FEATURE EXTRACTION OF GIVEN TEXT

In [ ]:

```
from sklearn.feature_extraction.text import TfidfVectorizer
TFIDF_vect = TfidfVectorizer(lowercase=True, stop_words='english', max_df=0.5, min_df=0
all_data_TFIDF = TFIDF_vect.fit_transform(df['clean_data'])

# Check the new TfidfVectorizer shape
print(all_data_TFIDF.shape)
```

```
(8675, 4126)
```

In [ ]:

```
df.head()
```

Out[ ]:

type	posts	E/I	S/N	T/F	J/P	split_posts	posts_no_punct	words

	type	posts	E/I	S/N	T/F	J/P	split_posts	posts_no_punct	words
0	INFJ	'http://www.youtube.com/watch?v=qsXHcwe3krw|||...	0	1	0	1	'url-web url-web enfp and intj moments url-we...	urlweb urlweb enfp and intj moments urlweb s...	[urlweb, urlweb, enfp, and, intj, moments, url...
1	ENTP	'I'm finding the lack of me in these posts ver...	1	1	1	0	'i'm finding the lack of me in these posts ver...	im finding the lack of me in these posts very ...	[im, finding, the, lack, of, me, in, these, po...
2	INTP	'Good one _____ https://www.youtube.com/wat...	0	1	1	0	'good one _____ url-web of course, to which...	good one urlweb of course to which i say i...	[good, one, urlweb, of, course, to, which, i, ...
3	INTJ	'Dear INTP, I enjoyed our conversation the o...	0	1	1	1	'dear intp, i enjoyed our conversation the o...	dear intp i enjoyed our conversation the oth...	[dear, intp, i, enjoyed, our, conversation, th...
4	ENTJ	'You're fired.|||That's another silly misconce...	1	1	1	1	'you're fired., that's another silly misconcep...	youre fired thats another silly misconception ...	[youre, fired, thats, another, silly, misconce...

In [ ]:

```
# print(all_data_TFIDF.head())
print(y.head())
print(all_data_TFIDF.shape,'\n',y.shape)
```

```
   E/I  S/N  T/F  J/P
0    0    1    0    1
1    1    1    1    0
2    0    1    1    0
3    0    1    1    1
4    1    1    1    1
(8675, 4126)
 (8675, 4)
```

MODELLING

LOGESTIC REGRESSION

In [ ]:

```
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import cross_val_score
from sklearn.pipeline import make_pipeline
```

In [ ]:

```
logreg_EI = make_pipeline(LogisticRegression())
logreg_SN = make_pipeline(LogisticRegression())
logreg_TF = make_pipeline(LogisticRegression())
logreg_JP = make_pipeline(LogisticRegression())
b=LogisticRegression()
```

```
EI_score =cross_val_score(b,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
SN_score =cross_val_score(b,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=10)
TF_score =cross_val_score(b,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=10)
JP_score =cross_val_score(b,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EI_score),np.mean(SN_score),np.mean(TF_score),np.mean(JP_score))
```

```
0.8472629279415751 0.8884141512392434 0.8614394144754677 0.8019574623018089
```

PARAMETER TUNING (LR)

E/I (LR)

In [ ]:

```
from sklearn.model_selection import GridSearchCV
grid_values={'C':[0.1,1,2,2.5,3,4,5,6,100]}
a=LogisticRegression()
grid_clf_acc=GridSearchCV(a,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y['E/I'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'C': 2}
0.8560230733659688
```

In [ ]:

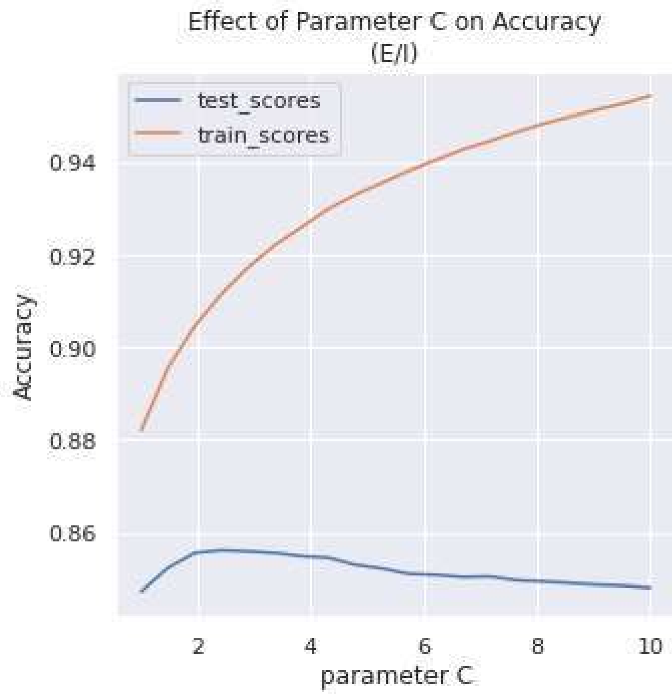
```
from sklearn.model_selection import validation_curve
param_range=np.linspace(0,5,20)
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(a,all_data_TFIDF, y['E/I'],
                                             param_name='C',
                                             param_range=param_range, cv=10)
```

In [ ]:

```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter C')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter C on Accuracy\n(E/I)")
plt.tight_layout
```

Out[ ]:

```
<function matplotlib.pyplot.tight_layout>
```



S/N (LR)

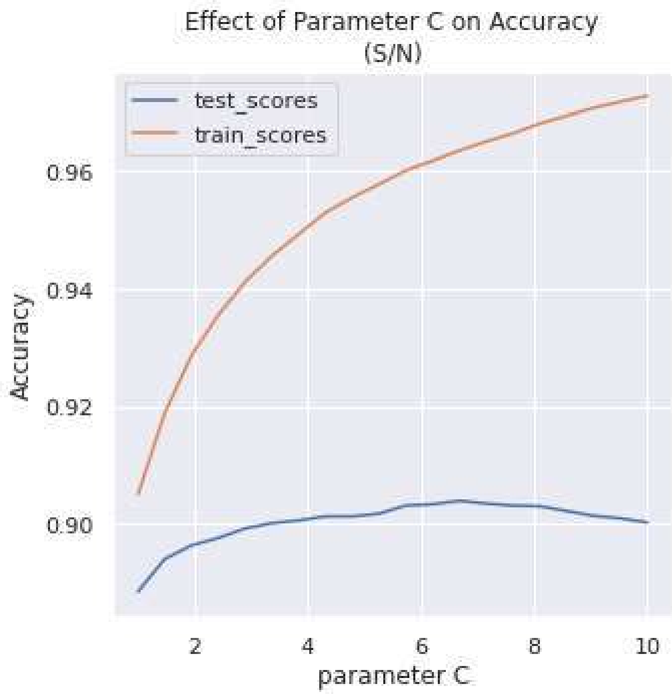
In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'C':[0.1,1,2,3,4,5,6,6.1,6.2,6.5,6.6,7,8,9,10]}
a=LogisticRegression()
grid_clf_acc=GridSearchCV(a,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y['S/N'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'C': 6.5}
0.9037449704739581
```

In [ ]:
```
from sklearn.model_selection import validation_curve
param_range=np.linspace(1,10,20)
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(a,all_data_TFIDF, y['S/N'],
                                             param_name='C',
                                             param_range=param_range, cv=10)
```

In [ ]:
```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter C')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter C on Accuracy\n(S/N)")
plt.tight_layout
```

Out[ ]:
```
<function matplotlib.pyplot.tight_layout>
```



T/F (LR)

In [ ]:

```
from sklearn.model_selection import GridSearchCV
grid_values={'C':[0.1,0.1,0.2,0.3,0.4,0.5,0.6,0.7,1,2,4,5,10]}
a=LogisticRegression()
grid_clf_acc=GridSearchCV(a,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y['T/F'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'C': 0.4}
0.8631688538793124
```

In [ ]:

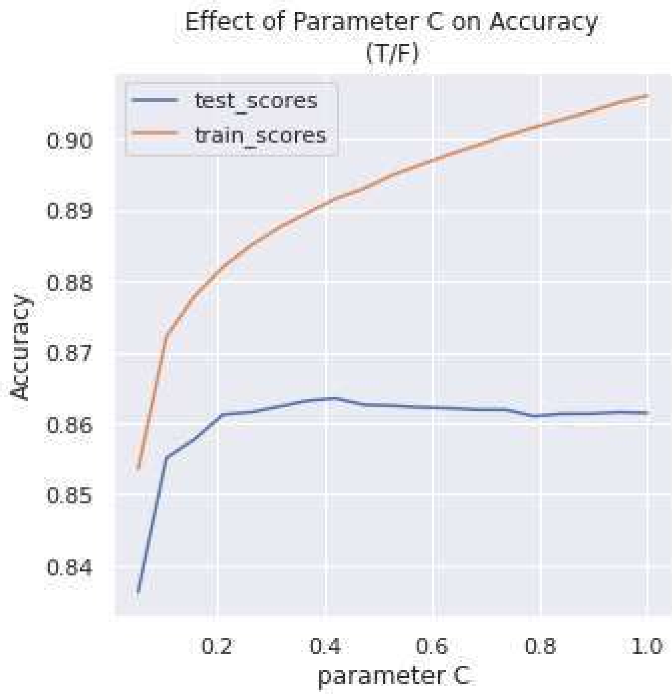
```
from sklearn.model_selection import validation_curve
param_range=np.linspace(0,1,20)
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(a,all_data_TFIDF, y['T/F'],
                                            param_name='C',
                                            param_range=param_range, cv=10)
```

In [ ]:

```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter C')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter C on Accuracy\n(T/F)")
plt.tight_layout
```

Out[ ]:

```
<function matplotlib.pyplot.tight_layout>
```



J/P (LR)

In [ ]:

```
from sklearn.model_selection import GridSearchCV
grid_values={'C':[0.1,0.2,0.3,0.4,0.5,0.6,1,2,3]}
a=LogisticRegression()
grid_clf_acc=GridSearchCV(a,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y['J/P'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'C': 1}
0.8019574623018089
```

In [ ]:

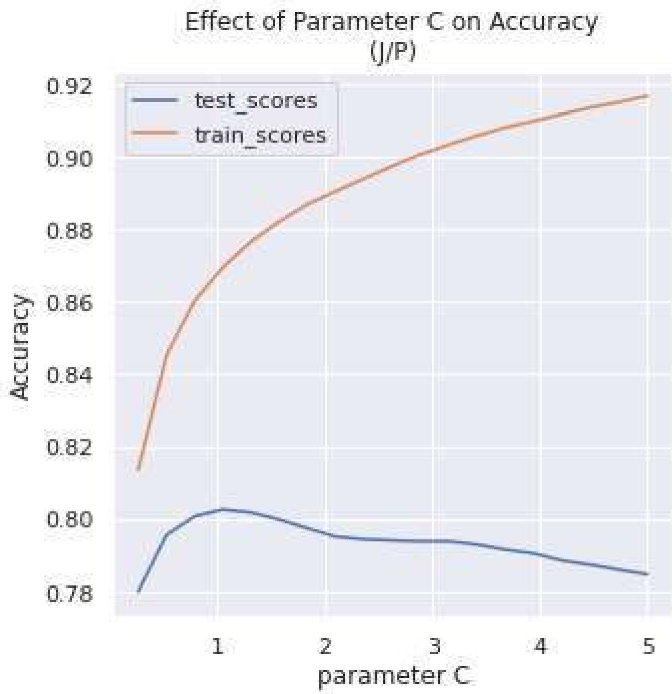
```
from sklearn.model_selection import validation_curve
param_range=np.linspace(0,5,20)
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(a,all_data_TFIDF, y['J/P'],
                                             param_name='C',
                                             param_range=param_range, cv=10)
```

In [ ]:

```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter C')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter C on Accuracy\n(J/P)")
plt.tight_layout
```

Out[ ]:

```
<function matplotlib.pyplot.tight_layout>
```



Knn-classifier

In [ ]:

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import cross_val_score
Knn=KNeighborsClassifier()
```

In [ ]:

```
EI_score=cross_val_score(Knn,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
SN_score=cross_val_score(Knn,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=10)
TF_score=cross_val_score(Knn,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=10)
JP_score=cross_val_score(Knn,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EI_score),np.mean(SN_score),np.mean(TF_score),np.mean(JP_score))
```

```
0.8089920218561808 0.874811442603607 0.7084707317462089 0.7004038237685967
```

In [ ]:

```
# MaxAbsScaler
# This estimator scales and translates each feature individually such that the maximal
# It does not shift/center the data, and thus does not destroy any sparsity.
from sklearn.preprocessing import MaxAbsScaler
scaler=MaxAbsScaler()
all_data_scaled=scaler.fit_transform(all_data_TFIDF)
EIscaled_score=cross_val_score(Knn,all_data_scaled,y['E/I'],scoring='accuracy',cv=10)
SNscaled_score=cross_val_score(Knn,all_data_scaled,y['S/N'],scoring='accuracy',cv=10)
TFscaled_score=cross_val_score(Knn,all_data_scaled,y['T/F'],scoring='accuracy',cv=10)
JPscaled_score=cross_val_score(Knn,all_data_scaled,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EIscaled_score),np.mean(SNscaled_score),np.mean(TFscaled_score),np.mean(J
### no need of scaling since scaled data is not improving the accuracy.
```

```
0.7697981279798447 0.7868609113474612 0.5317586996848075 0.570958041660687
```

PARAMETER TUINING (KNN)

E/I (KNN)

In [ ]:

```
from sklearn.model_selection import GridSearchCV
grid_values={'n_neighbors':[10,20,30,35,36,37,38,39,40]}
grid_clf_acc=GridSearchCV(Knn,param_grid=grid_values,cv=10,scoring='accuracy')
```

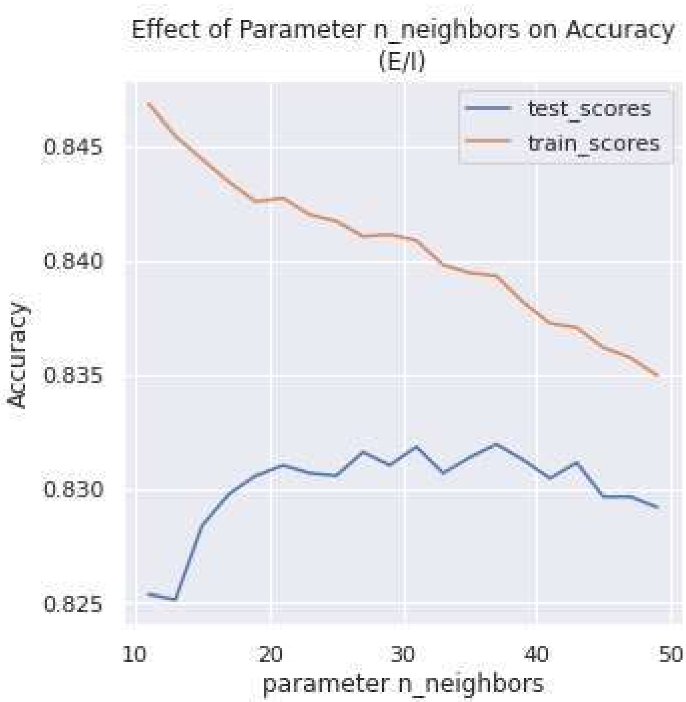
```
grid_clf_acc.fit(all_data_TFIDF,y['E/I'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'n_neighbors': 37}
0.8319330388701971
```

In [ ]:
```
from sklearn.model_selection import validation_curve
param_range=list(range(11,50,2))
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(Knn,all_data_TFIDF, y['E/I'],
                                             param_name='n_neighbors',
                                             param_range=param_range, cv=10)
```

In [ ]:
```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter n_neighbors')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter n_neighbors on Accuracy\n(E/I)")
plt.tight_layout
```

Out[ ]:
```
<function matplotlib.pyplot.tight_layout>
```



S/N (KNN)

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'n_neighbors':[10,20,21,22,23,24,25,30,50,60]}
grid_clf_acc=GridSearchCV(Knn,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['S/N'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'n_neighbors': 22}
0.8899147704622645
```

In [ ]:
```
from sklearn.model_selection import validation_curve
param_range=list(range(1,30,6))
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(Knn,all_data_TFIDF, y['S/N'],
                                             param_name='n_neighbors',
                                             param_range=param_range, cv=10)
```

In [ ]:
```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter n_neighbors')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter n_neighbors on Accuracy\n(S/N)")
plt.tight_layout
```

Out[ ]:
```
<function matplotlib.pyplot.tight_layout>
```

T/F (KNN)

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'n_neighbors':[1,117,119,120,121,123,125,200]}
grid_clf_acc=GridSearchCV(Knn,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['T/F'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'n_neighbors': 121}
0.797462780178485
```

In [ ]:
```
from sklearn.model_selection import validation_curve
param_range=[1,117,119,120,121,122,150,180,200]
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
train_scores, test_scores = validation_curve(Knn,all_data_TFIDF, y['T/F'],
                                             param_name='n_neighbors',
                                             param_range=param_range, cv=10)
```

In [ ]:
```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter n_neighbors')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter n_neighbors on Accuracy\n(T/F)")
plt.tight_layout
```

Out[ ]:
```
<function matplotlib.pyplot.tight_layout>
```

J/P (KNN)

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'n_neighbors':[10,20,30,50,60,85,100]}
grid_clf_acc=GridSearchCV(Knn,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['J/P'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'n_neighbors': 85}
0.7702594889948389
```

In [ ]:
```
from sklearn.model_selection import validation_curve
param_range=list(range(51,100,6))
# EI_score =cross_val_score(logreg_EI,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
```

```
train_scores, test_scores = validation_curve(Knn,all_data_TFIDF, y['J/P'],
                                             param_name='n_neighbors',
                                             param_range=param_range, cv=10)
```

In [ ]:
```
test=[]
train=[]
for i in range(0,len(test_scores)):
  test.append(np.mean(test_scores[i]))
  train.append(np.mean(train_scores[i]))
plt.figure(figsize=(5,5))
plt.plot(param_range,test)
plt.plot(param_range,train)
plt.xlabel('parameter n_neighbors')
plt.ylabel('Accuracy')
plt.legend(['test_scores','train_scores'])
plt.title("Effect of Parameter n_neighbors on Accuracy\n(J/P)")
plt.tight_layout
```

MULTINOMIAL Naive Bayes

In [ ]:
```
from sklearn.model_selection import cross_val_score
from sklearn.naive_bayes import MultinomialNB
MNB=MultinomialNB()
```

In [ ]:
```
EI_score=cross_val_score(MNB,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
SN_score=cross_val_score(MNB,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=10)
TF_score=cross_val_score(MNB,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=10)
JP_score=cross_val_score(MNB,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EI_score),np.mean(SN_score),np.mean(TF_score),np.mean(JP_score))
```

```
0.7749852502670898 0.862017444548977 0.7997694523729795 0.6836863967598424
```

PARAMETER TUINING (MNB)

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'alpha':[0,0.1,0.2,0.3,0.4,1,2,3]}
grid_clf_acc=GridSearchCV(MNB,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['E/I'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'alpha': 0}
0.7783283901796013
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'alpha':[0,0.1,0.2,0.3,0.4,1,2,3]}
grid_clf_acc=GridSearchCV(MNB,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['S/N'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'alpha': 0}
0.8622479921759976
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'alpha':[0,0.1,0.2,0.3,0.4,1,2,3]}
grid_clf_acc=GridSearchCV(MNB,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['T/F'])
```

```
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'alpha': 0}
0.803111795002631
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'alpha':[0,0.1,0.2,0.3,0.4,1,2,3]}
grid_clf_acc=GridSearchCV(MNB,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['J/P'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'alpha': 0}
0.6923313348109642
```

CONCLUSION: best accuracy occurs at alpha=0 (ie.Additive (Laplace/Lidstone) smoothing parameter (0 for no smoothing).)

DECISION TREES

decision tree code

In [ ]:
```
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import cross_val_score
dclf=DecisionTreeClassifier()
from sklearn.model_selection import train_test_split
```

In [ ]:
```
EI_score =cross_val_score(dclf,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
SN_score =cross_val_score(dclf,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=10)
TF_score =cross_val_score(dclf,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=10)
JP_score =cross_val_score(dclf,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EI_score),np.mean(SN_score),np.mean(TF_score),np.mean(JP_score))
```

```
0.7875532186309059 0.8442646128660194 0.7138902619871478 0.7045498275211413
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'max_depth':[2,3,4,5,10,15]}
grid_clf_acc=GridSearchCV(dclf,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['E/I'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'max_depth': 5}
0.8190230361594353
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'max_depth':[2,3,4,5,10,15,20,30,50]}
grid_clf_acc=GridSearchCV(dclf,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['S/N'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'max_depth': 5}
0.87561948878223
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'max_depth':[2,3,4,5,10,15,20,30,50]}
grid_clf_acc=GridSearchCV(dclf,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['T/F'])
```

```
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'max_depth': 5}
0.7477842180515469
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'max_depth':[2,3,4,5,10,15,20,30,50]}
grid_clf_acc=GridSearchCV(dclf,param_grid=grid_values,cv=10,scoring='accuracy')
grid_clf_acc.fit(all_data_TFIDF,y['S/N'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'max_depth': 5}
0.8756194887822302
```

RANDOM FOREST

In [ ]:
```
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import cross_val_score
clf=RandomForestClassifier()
```

In [ ]:
```
EI_score =cross_val_score(clf,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=10)
SN_score =cross_val_score(clf,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=10)
TF_score =cross_val_score(clf,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=10)
JP_score =cross_val_score(clf,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=10)
print(np.mean(EI_score),np.mean(SN_score),np.mean(TF_score),np.mean(JP_score))
```

```
0.7911241156804277 0.8717005777643125 0.8132527014600907 0.7465108244436294
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'n_estimators':[10,30,40,50,70,100,120]}

grid_clf_acc=GridSearchCV(clf,param_grid=grid_values,cv=5)
grid_clf_acc.fit(all_data_TFIDF,y['E/I'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'n_estimators': 40}
0.7978097982708934
```

In [ ]:

Gradient boosted Decision trees

In [ ]:
```
from sklearn.ensemble import GradientBoostingClassifier
from sklearn.model_selection import cross_val_score
clfgbc=GradientBoostingClassifier()
```

In [ ]:
```
EI_score =cross_val_score(clfgbc,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=5)
SN_score =cross_val_score(clfgbc,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=5)
TF_score =cross_val_score(clfgbc,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=5)
JP_score =cross_val_score(clfgbc,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=5)
print("Extrovert/Introvert Score:",np.mean(EI_score),'\nSensing/Intuition Score:'np.mea
```

```
0.8493371757925072 0.8936023054755043 0.8270893371757925 0.79342939481268
```

In [ ]:

SVM

In [ ]:
```
from sklearn.svm import SVC
from sklearn.model_selection import cross_val_score
clf=SVC(kernel='linear')
```

In [ ]:
```
EI_score =cross_val_score(clf,all_data_TFIDF,y['E/I'],scoring='accuracy',cv=5)
SN_score =cross_val_score(clf,all_data_TFIDF,y['S/N'],scoring='accuracy',cv=5)
TF_score =cross_val_score(clf,all_data_TFIDF,y['T/F'],scoring='accuracy',cv=5)
JP_score =cross_val_score(clf,all_data_TFIDF,y['J/P'],scoring='accuracy',cv=5)
print("Extrovert/Introvert Score:",np.mean(EI_score))
print('Sensing/Intuition Score:',np.mean(SN_score))
print('Thinking/Feeling Score:',np.mean(TF_score))
print('Judging/Percieving Score:',np.mean(JP_score))
```

```
Extrovert/Introvert Score: 0.8540634005763689
Sensing/Intuition Score: 0.8993659942363113
Thinking/Feeling Score: 0.8476080691642652
Judging/Percieving Score: 0.7863976945244956
```

In [ ]:
```
from sklearn.model_selection import GridSearchCV
grid_values={'C':[5,10,15,20,25,30,35,40]}
grid_clf_acc=GridSearchCV(clf,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y['J/P'])
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
{'C': 5}
0.7568836073328763
```

In [ ]:

In [ ]:

NEURAL NETWORKS

In [ ]:
```
from sklearn.neural_network import MLPClassifier
from sklearn.model_selection import train_test_split
```

In [ ]:
```
train_score=np.zeros((5,1))
test_score=np.zeros((5,1))
for i in range(0,5):
  x_train,x_test,y_train,y_test=train_test_split(all_data_TFIDF,y,test_size=0.20)
  clf=MLPClassifier(hidden_layer_sizes=[150],activation='logistic',solver='sgd',max_ite
  clf.fit(x_train,y_train)
  train_score[i]=clf.score(x_train,y_train)
  test_score[i]=clf.score(x_test,y_test)
print('train accuracy:',np.mean(train_score))
print('test accuracy:',np.mean(test_score))
```

```
Iteration 1, loss = 2.32314181
Iteration 2, loss = 2.29861280
Iteration 3, loss = 2.29876625
Iteration 4, loss = 2.29777078
Iteration 5, loss = 2.29805200
Iteration 6, loss = 2.29791931
Iteration 7, loss = 2.29616902
Iteration 8, loss = 2.29822672
Iteration 9, loss = 2.29652817
```

```
Iteration 10, loss = 2.29622972
Iteration 11, loss = 2.29698485
Iteration 12, loss = 2.29581760
Iteration 13, loss = 2.29523962
Iteration 14, loss = 2.29554017
Iteration 15, loss = 2.29473181
Iteration 16, loss = 2.29609091
Iteration 17, loss = 2.29556310
Iteration 18, loss = 2.29476980
Iteration 19, loss = 2.29415794
Iteration 20, loss = 2.29492737
Iteration 21, loss = 2.29319645
Iteration 22, loss = 2.29315546
Iteration 23, loss = 2.29294115
Iteration 24, loss = 2.29372887
Iteration 25, loss = 2.29269415
Iteration 26, loss = 2.29264749
Iteration 27, loss = 2.29205659
Iteration 28, loss = 2.29151480
Iteration 29, loss = 2.29117852
Iteration 30, loss = 2.29163282
Iteration 31, loss = 2.29053153
Iteration 32, loss = 2.29056444
Iteration 33, loss = 2.29076968
Iteration 34, loss = 2.29274609
Iteration 35, loss = 2.29056830
Iteration 36, loss = 2.28874542
Iteration 37, loss = 2.28865027
Iteration 38, loss = 2.28913412
Iteration 39, loss = 2.28839846
Iteration 40, loss = 2.28835946
Iteration 41, loss = 2.28750961
Iteration 42, loss = 2.28693933
Iteration 43, loss = 2.28631626
Iteration 44, loss = 2.28579829
Iteration 45, loss = 2.28522004
Iteration 46, loss = 2.28449837
Iteration 47, loss = 2.28473916
Iteration 48, loss = 2.28269591
Iteration 49, loss = 2.28314451
Iteration 50, loss = 2.28200892
Iteration 51, loss = 2.28233012
Iteration 52, loss = 2.28169015
Iteration 53, loss = 2.28161382
Iteration 54, loss = 2.28005211
Iteration 55, loss = 2.27883171
Iteration 56, loss = 2.28012501
Iteration 57, loss = 2.27854902
Iteration 58, loss = 2.27683438
Iteration 59, loss = 2.27576443
Iteration 60, loss = 2.27636871
Iteration 61, loss = 2.27411637
Iteration 62, loss = 2.27380694
Iteration 63, loss = 2.27227314
Iteration 64, loss = 2.27185068
Iteration 65, loss = 2.27092225
Iteration 66, loss = 2.26900631
Iteration 67, loss = 2.26816958
Iteration 68, loss = 2.26761967
Iteration 69, loss = 2.26583133
Iteration 70, loss = 2.26509663
Iteration 71, loss = 2.26365779
Iteration 72, loss = 2.26220671
Iteration 73, loss = 2.26000827
Iteration 74, loss = 2.26035335
```

```
Iteration 75, loss = 2.25798098
Iteration 76, loss = 2.25696844
Iteration 77, loss = 2.25515671
Iteration 78, loss = 2.25423736
Iteration 79, loss = 2.25188278
Iteration 80, loss = 2.25086429
Iteration 81, loss = 2.24833309
Iteration 82, loss = 2.24608787
Iteration 83, loss = 2.24557336
Iteration 84, loss = 2.24329166
Iteration 85, loss = 2.24216903
Iteration 86, loss = 2.23813982
Iteration 87, loss = 2.23642675
Iteration 88, loss = 2.23469155
Iteration 89, loss = 2.23276030
Iteration 90, loss = 2.22969113
Iteration 91, loss = 2.22739961
Iteration 92, loss = 2.22453802
Iteration 93, loss = 2.22212677
Iteration 94, loss = 2.21976153
Iteration 95, loss = 2.21680530
Iteration 96, loss = 2.21407577
Iteration 97, loss = 2.21093772
Iteration 98, loss = 2.20840891
Iteration 99, loss = 2.20549212
Iteration 100, loss = 2.20278071
Iteration 101, loss = 2.19875928
Iteration 102, loss = 2.19496544
Iteration 103, loss = 2.19087452
Iteration 104, loss = 2.18798767
Iteration 105, loss = 2.18448822
Iteration 106, loss = 2.18082347
Iteration 107, loss = 2.17764646
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Iteration 284, loss = 1.36321658
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Iteration 500, loss = 0.95128243
train accuracy: 0.734121037463977
test accuracy: 0.5854755043227666
```

In [ ]:

```
 from sklearn.model_selection import GridSearchCV
grid_values={'alpha':[0,0.1,0.3,0.5,0.7,0.9,1],'learning_rate_init':[0.001,0.01,0.005,0
clf=MLPClassifier(hidden_layer_sizes=[75],activation='logistic',solver='sgd',max_iter=5
grid_clf_acc=GridSearchCV(clf,param_grid=grid_values,cv=10)
grid_clf_acc.fit(all_data_TFIDF,y)
print(grid_clf_acc.best_params_)
print(grid_clf_acc.best_score_)
```

```
Iteration 1, loss = 2.47268463
Iteration 2, loss = 2.30990602
Iteration 3, loss = 2.30649787
Iteration 4, loss = 2.30634242
Iteration 5, loss = 2.30632876
Iteration 6, loss = 2.30669190
Iteration 7, loss = 2.30627535
Iteration 8, loss = 2.30630465
Iteration 9, loss = 2.30641203
Iteration 10, loss = 2.30657285
Iteration 11, loss = 2.30612910
Iteration 12, loss = 2.30620749
Iteration 13, loss = 2.30629929
Iteration 14, loss = 2.30619539
Iteration 1, loss = 2.46492149
Iteration 1, loss = 2.60928010
Iteration 2, loss = 2.30944479
Iteration 3, loss = 2.30320204
Iteration 4, loss = 2.30312697
Iteration 5, loss = 2.30281994
Iteration 6, loss = 2.30297692
Iteration 7, loss = 2.30291151
Iteration 8, loss = 2.30310978
Iteration 9, loss = 2.30303459
Iteration 10, loss = 2.30291523
Iteration 11, loss = 2.30283684
Iteration 12, loss = 2.30270633
Iteration 1, loss = 2.52575810
Iteration 1, loss = 2.50077573
Iteration 2, loss = 2.30841582
Iteration 3, loss = 2.30435461
Iteration 4, loss = 2.30397528
Iteration 5, loss = 2.30409098
```

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Iteration 6, loss = 2.30407574
Iteration 7, loss = 2.30427674
Iteration 8, loss = 2.30423933
Iteration 9, loss = 2.30431028
Iteration 10, loss = 2.30395602
Iteration 11, loss = 2.30407862
Iteration 12, loss = 2.30402947
Iteration 13, loss = 2.30408199
Iteration 14, loss = 2.30405637
Iteration 15, loss = 2.30393740
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.44643166
Iteration 2, loss = 2.30576669
Iteration 3, loss = 2.30291123
Iteration 4, loss = 2.30260261
Iteration 5, loss = 2.30261613
Iteration 6, loss = 2.30261935
Iteration 7, loss = 2.30266271
Iteration 8, loss = 2.30261006
Iteration 9, loss = 2.30264974
Iteration 10, loss = 2.30265442
Iteration 11, loss = 2.30262102
Iteration 12, loss = 2.30281091
Iteration 13, loss = 2.30255700
Iteration 14, loss = 2.30263348
Iteration 15, loss = 2.30274525
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.45066007
Iteration 2, loss = 2.30130349
Iteration 3, loss = 2.29846443
Iteration 4, loss = 2.29793442
Iteration 5, loss = 2.29791226
Iteration 6, loss = 2.29803056
Iteration 7, loss = 2.29782212
Iteration 8, loss = 2.29789250
Iteration 9, loss = 2.29781668
Iteration 10, loss = 2.29786331
Iteration 11, loss = 2.29778425
Iteration 12, loss = 2.29776637
Iteration 13, loss = 2.29798907
Iteration 14, loss = 2.29771847
Iteration 15, loss = 2.29770425
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.61608512
Iteration 2, loss = 2.31075911
Iteration 3, loss = 2.30543162
Iteration 4, loss = 2.30509610
Iteration 5, loss = 2.30522026
Iteration 6, loss = 2.30504754
Iteration 7, loss = 2.30513965
Iteration 8, loss = 2.30491864
Iteration 9, loss = 2.30495504
Iteration 10, loss = 2.30486859
Iteration 11, loss = 2.30503588
Iteration 12, loss = 2.30506129
Iteration 13, loss = 2.30523768
Iteration 14, loss = 2.30501766
Iteration 15, loss = 2.30502661
Iteration 16, loss = 2.30492555
Iteration 17, loss = 2.30505888
Iteration 18, loss = 2.30479740
Iteration 19, loss = 2.30470748
```

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Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.34404192
Iteration 2, loss = 2.30896601
Iteration 3, loss = 2.31162620
Iteration 4, loss = 2.30780050
Iteration 5, loss = 2.30683048
Iteration 6, loss = 2.30720786
Iteration 7, loss = 2.30748883
Iteration 8, loss = 2.30708075
Iteration 9, loss = 2.30724341
Iteration 10, loss = 2.30630566
Iteration 11, loss = 2.30771644
Iteration 12, loss = 2.30821699
Iteration 13, loss = 2.30636078
Iteration 14, loss = 2.30565213
Iteration 15, loss = 2.30453728
Iteration 16, loss = 2.30395785
Iteration 17, loss = 2.30626902
Iteration 18, loss = 2.30600989
Iteration 19, loss = 2.30552272
Iteration 20, loss = 2.30665883
Iteration 21, loss = 2.30337322
Iteration 22, loss = 2.30461191
Iteration 23, loss = 2.30286859
Iteration 24, loss = 2.30419338
Iteration 25, loss = 2.30391378
Iteration 26, loss = 2.30234257
Iteration 27, loss = 2.30247275
Iteration 28, loss = 2.30190775
Iteration 29, loss = 2.30205108
Iteration 30, loss = 2.29955022
Iteration 31, loss = 2.30145664
Iteration 32, loss = 2.30131391
Iteration 33, loss = 2.29868597
Iteration 34, loss = 2.29880114
Iteration 35, loss = 2.29796520
Iteration 36, loss = 2.29796933
Iteration 37, loss = 2.29759482
Iteration 38, loss = 2.29750938
Iteration 39, loss = 2.29545301
Iteration 40, loss = 2.29885071
Iteration 41, loss = 2.29547907
Iteration 42, loss = 2.29640758
Iteration 43, loss = 2.29311135
Iteration 44, loss = 2.29198751
Iteration 45, loss = 2.29261373
Iteration 46, loss = 2.29215129
Iteration 47, loss = 2.29104869
Iteration 48, loss = 2.29336314
Iteration 49, loss = 2.29024405
Iteration 50, loss = 2.28880582
Iteration 51, loss = 2.28711992
Iteration 52, loss = 2.28621706
Iteration 53, loss = 2.28494260
Iteration 54, loss = 2.28384956
Iteration 55, loss = 2.28391231
Iteration 56, loss = 2.28209436
Iteration 57, loss = 2.28068609
Iteration 58, loss = 2.28025527
Iteration 59, loss = 2.28035844
Iteration 60, loss = 2.27684189
Iteration 61, loss = 2.27586777
Iteration 62, loss = 2.27452418
Iteration 63, loss = 2.27367524
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Iteration 65, loss = 2.27179459
Iteration 66, loss = 2.26984262
Iteration 67, loss = 2.26579202
Iteration 68, loss = 2.26476544
Iteration 69, loss = 2.26350282
Iteration 70, loss = 2.26086138
Iteration 71, loss = 2.25874564
Iteration 72, loss = 2.25807765
Iteration 73, loss = 2.25580338
Iteration 74, loss = 2.25365223
Iteration 75, loss = 2.25138437
Iteration 76, loss = 2.24821131
Iteration 77, loss = 2.24640277
Iteration 78, loss = 2.24167376
Iteration 79, loss = 2.24242801
Iteration 80, loss = 2.24016739
Iteration 81, loss = 2.23797991
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Iteration 83, loss = 2.22921598
Iteration 84, loss = 2.22661583
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Iteration 86, loss = 2.21947148
Iteration 87, loss = 2.21430283
Iteration 88, loss = 2.21432267
Iteration 89, loss = 2.20861058
Iteration 90, loss = 2.20446268
Iteration 91, loss = 2.20066565
Iteration 92, loss = 2.19752864
Iteration 93, loss = 2.19349463
Iteration 94, loss = 2.19003298
Iteration 95, loss = 2.18420135
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Iteration 98, loss = 2.17448052
Iteration 99, loss = 2.16628030
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Iteration 101, loss = 2.15499827
Iteration 102, loss = 2.15123627
Iteration 103, loss = 2.14724969
Iteration 104, loss = 2.14203213
Iteration 105, loss = 2.13581346
Iteration 106, loss = 2.12996965
Iteration 107, loss = 2.12316996
Iteration 108, loss = 2.12004221
Iteration 109, loss = 2.11225709
Iteration 110, loss = 2.10709392
Iteration 111, loss = 2.10182796
Iteration 112, loss = 2.09549926
Iteration 113, loss = 2.09202742
Iteration 114, loss = 2.08510408
Iteration 115, loss = 2.07718553
Iteration 116, loss = 2.07115360
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Iteration 120, loss = 2.04686726
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Iteration 123, loss = 2.03016895
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Iteration 125, loss = 2.01589467
Iteration 126, loss = 2.01155273
Iteration 127, loss = 2.00283918
Iteration 128, loss = 1.99616022
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Iteration 131, loss = 1.97806154
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Iteration 135, loss = 1.95162946
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Iteration 137, loss = 1.93872171
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Iteration 139, loss = 1.92795447
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Iteration 169, loss = 1.74291047
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Iteration 192, loss = 1.62061211
Iteration 193, loss = 1.61540690
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Iteration 16, loss = 2.30099304
Iteration 17, loss = 2.30069476
Iteration 18, loss = 2.29997137
Iteration 19, loss = 2.30181904
Iteration 20, loss = 2.29987908
Iteration 21, loss = 2.29944126
Iteration 22, loss = 2.29835834
Iteration 23, loss = 2.29827610
Iteration 24, loss = 2.29955539
Iteration 25, loss = 2.29902425
Iteration 26, loss = 2.29799044
Iteration 27, loss = 2.29758640
Iteration 28, loss = 2.29705132
Iteration 29, loss = 2.29735326
Iteration 30, loss = 2.29584237
Iteration 31, loss = 2.29498587
Iteration 32, loss = 2.29476382
Iteration 33, loss = 2.29565071
Iteration 34, loss = 2.29416231
Iteration 35, loss = 2.29527494
Iteration 36, loss = 2.29666252
Iteration 37, loss = 2.29260840
Iteration 38, loss = 2.29379267
Iteration 39, loss = 2.29187302
Iteration 40, loss = 2.29105578
Iteration 41, loss = 2.28978249
```

In [ ]:

```
train_score=np.zeros((5,1))
test_score=np.zeros((5,1))
for i in range(0,5):
  x_train,x_test,y_train,y_test=train_test_split(all_data_TFIDF,y,test_size=0.20)
  clf=MLPClassifier(hidden_layer_sizes=[75,50],activation='logistic',solver='sgd',max_i
  clf.fit(x_train,y_train)
  train_score[i]=clf.score(x_train,y_train)
  test_score[i]=clf.score(x_test,y_test)
print('train accuracy:',np.mean(train_score))
print('test accuracy:',np.mean(test_score))
```

```
Iteration 1, loss = 2.37026248
Iteration 2, loss = 2.30251765
Iteration 3, loss = 2.30235243
Iteration 4, loss = 2.30259620
Iteration 5, loss = 2.30278123
Iteration 6, loss = 2.30236872
Iteration 7, loss = 2.30252158
Iteration 8, loss = 2.30254510
Iteration 9, loss = 2.30261959
Iteration 10, loss = 2.30245473
Iteration 11, loss = 2.30258778
Iteration 12, loss = 2.30247306
Iteration 13, loss = 2.30175941
Iteration 14, loss = 2.30239041
Iteration 15, loss = 2.30251799
Iteration 16, loss = 2.30202935
Iteration 17, loss = 2.30199332
Iteration 18, loss = 2.30193889
Iteration 19, loss = 2.30204798
```

```
Iteration 20, loss = 2.30222367
Iteration 21, loss = 2.30210145
Iteration 22, loss = 2.30222161
Iteration 23, loss = 2.30200363
Iteration 24, loss = 2.30162018
Iteration 25, loss = 2.30198447
Iteration 26, loss = 2.30229272
Iteration 27, loss = 2.30169705
Iteration 28, loss = 2.30198508
Iteration 29, loss = 2.30202187
Iteration 30, loss = 2.30210616
Iteration 31, loss = 2.30189156
Iteration 32, loss = 2.30212940
Iteration 33, loss = 2.30269326
Iteration 34, loss = 2.30256858
Iteration 35, loss = 2.30188883
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.39245788
Iteration 2, loss = 2.30580936
Iteration 3, loss = 2.30472900
Iteration 4, loss = 2.30497347
Iteration 5, loss = 2.30515342
Iteration 6, loss = 2.30494706
Iteration 7, loss = 2.30500302
Iteration 8, loss = 2.30506863
Iteration 9, loss = 2.30495419
Iteration 10, loss = 2.30458736
Iteration 11, loss = 2.30471434
Iteration 12, loss = 2.30563215
Iteration 13, loss = 2.30515231
Iteration 14, loss = 2.30470158
Iteration 15, loss = 2.30486451
Iteration 16, loss = 2.30470286
Iteration 17, loss = 2.30462136
Iteration 18, loss = 2.30516924
Iteration 19, loss = 2.30486569
Iteration 20, loss = 2.30454629
Iteration 21, loss = 2.30506560
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.36973191
Iteration 2, loss = 2.29360040
Iteration 3, loss = 2.29233340
Iteration 4, loss = 2.29253534
Iteration 5, loss = 2.29164219
Iteration 6, loss = 2.29263575
Iteration 7, loss = 2.29224455
Iteration 8, loss = 2.29217992
Iteration 9, loss = 2.29208489
Iteration 10, loss = 2.29227462
Iteration 11, loss = 2.29210116
Iteration 12, loss = 2.29209168
Iteration 13, loss = 2.29193402
Iteration 14, loss = 2.29204609
Iteration 15, loss = 2.29232894
Iteration 16, loss = 2.29230504
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.39392942
Iteration 2, loss = 2.30295155
Iteration 3, loss = 2.30306335
Iteration 4, loss = 2.30320305
Iteration 5, loss = 2.30271968
Iteration 6, loss = 2.30263863
```

```
Iteration 7, loss = 2.30352583
Iteration 8, loss = 2.30279520
Iteration 9, loss = 2.30303536
Iteration 10, loss = 2.30305295
Iteration 11, loss = 2.30328616
Iteration 12, loss = 2.30295283
Iteration 13, loss = 2.30303026
Iteration 14, loss = 2.30315518
Iteration 15, loss = 2.30306818
Iteration 16, loss = 2.30331776
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
Iteration 1, loss = 2.39083260
Iteration 2, loss = 2.31382719
Iteration 3, loss = 2.31253512
Iteration 4, loss = 2.31305965
Iteration 5, loss = 2.31305071
Iteration 6, loss = 2.31284272
Iteration 7, loss = 2.31326673
Iteration 8, loss = 2.31326185
Iteration 9, loss = 2.31251460
Iteration 10, loss = 2.31387748
Iteration 11, loss = 2.31322117
Iteration 12, loss = 2.31241607
Iteration 13, loss = 2.31263031
Iteration 14, loss = 2.31359255
Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stoppin
g.
train accuracy: 0.2096829971181556
test accuracy: 0.2171757925072046
```

Conclusion

The aim of this project was to predict a person's MBTI personality type according to their online social media posts.To tackle this challenge we used Machine Learning Classification and NLP techniques.Classification of each MBTI type is based on four categories, each of which have two classes that an individual can be classified as. Each category was created as a target variable with binary labels assigned to each class. The data was preprocessed to remove punctuation and stopwords,followed by using WordNetLemmatizer and TfidVectorizer for making a sparse matrix of the data. Eight classification models were tested for best output and hyperparameter tuning was done to optimize the models to yield the best results.We used accuracy as the model evaluation metric. Using the cross validation scoring function, we concluded that the Logistic Regression model performed the best in comparison to the others. We have concluded that Logistic Regression performed better due to performing binary classification on each category rather than using multiclass classification. In future, use of resampling methods may be employed to balance the data for the categories to get potentially better results.

PREDICTION OF NEW DATA;

>>for prediction of new data follow these steps:

1>first clean the input data;

2>add the input data to the clean data coloumn;

3>apply tfid vectorizer to the entire clean data coloumn;

3>train the model only using the previous data;

4>predict the test data on the above trained model;