Importing Dataset:

https://www.kaggle.com/datasets/arashnic/game-review-dataset

In this dataset, under train_gt there exists a csv file called train.csv. Columns are review_id, title, year, user_review, user_suggestion. The "X" value will be user_review. This will be a user's review of a game in text. The "y" value will be user_suggestion. This will be if the review of the game is positive or negative (1 or 0). The other columns are discarded. The purpose is to determine a review's score from some review text.

In [3]:
```
import pandas as pd
df = pd.read_csv('train.csv', header=0, usecols=[3, 4], encoding='latin-1')
print('rows and columns:', df.shape)
print(df.head())
```

```
rows and columns: (17494, 2)
                                        user_review  user_suggestion
0  I'm scared and hearing creepy voices.  So I'll...                1
1  Best game, more better than Sam Pepper's YouTu...                1
2  A littly iffy on the controls, but once you kn...                1
3  Great game, fun and colorful and all that.A si...                1
4  Not many games have the cute tag right next to...                1
```

Text Preprocessing:

In [4]:
```
import nltk
from nltk.corpus import stopwords
from sklearn.feature_extraction.text import TfidfVectorizer

nltk.download('stopwords')
```

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

Out[4]:
```
True
```

In [5]:
```
# # Initialize the TF-IDF vectorizer with stop word out
vectorizer = TfidfVectorizer(stop_words='english')
```

In [6]:
```
X = df.user_review
y = df.user_suggestion
```

In [7]:
```
X.head()
```

Out[7]:
```
0    I'm scared and hearing creepy voices.  So I'll...
1    Best game, more better than Sam Pepper's YouTu...
2    A littly iffy on the controls, but once you kn...
3    Great game, fun and colorful and all that.A si...
4    Not many games have the cute tag right next to...
Name: user_review, dtype: object
```

In [8]:
```
print(y[:10])
```

```
0    1
1    1
2    1
3    1
4    1
5    1
6    1
7    1
8    0
9    1
Name: user_suggestion, dtype: int64
```

Spliting the data

Split the data into train and test sets. 20% of the data going to the test set.

In [9]:
```
from sklearn.model_selection import train_test_split
# Split 80% train and 20% test.
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)
print(X_train.shape)
print(X_test.shape)
```

```
(13995,)
(3499,)
```

In [10]:
```
# apply tfidf vectorizer
X_train = vectorizer.fit_transform(X_train)  # fit and transform the train data
X_test = vectorizer.transform(X_test)        # transform only the test data
```

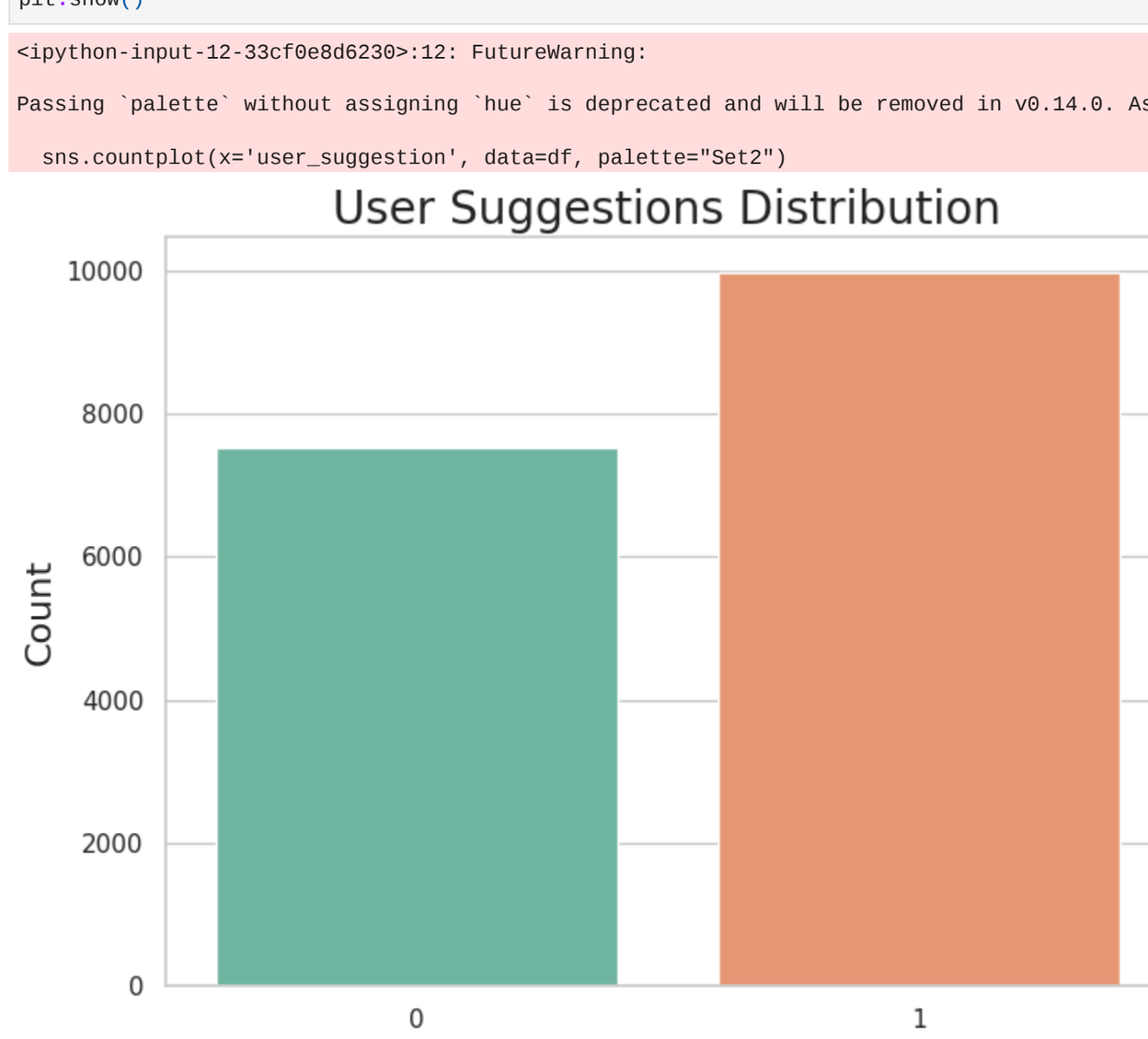
In [11]:
```
print('train size:', X_train.shape)
print('test size:', X_test.shape)
```

```
train size: (13995, 47176)
test size: (3499, 47176)
```

Step 0. Graph

In [12]:
```
import seaborn as sns
import matplotlib.pyplot as plt

# Set the style of the seaborn plot
sns.set(style="whitegrid")


# Adjust the figure size
plt.figure(figsize=(8, 6))

# Adjust the color palette
sns.countplot(x='user_suggestion', data=df, palette="Set2")

# Change font size for x-axis and label
plt.xlabel('User Suggestion', fontsize=16)
# Change font size for y-axis and label
plt.ylabel('Count', fontsize=16)

# Increase font size for title
plt.title('User Suggestions Distribution', fontsize=20)

plt.show()
```

```
<ipython-input-12-33cf0e8d6230>:12: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  sns.countplot(x='user_suggestion', data=df, palette="Set2")
```



Step 1. Naive Bayes

First Try

In [13]:
```
from sklearn.naive_bayes import MultinomialNB
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix

naive_bayes = MultinomialNB()
naive_bayes.fit(X_train, y_train)
```

Out[13]:
```
▾ MultinomialNB
MultinomialNB()
```

In [14]:
```
MultinomialNB(alpha=1.0, class_prior=None, fit_prior=True)
```

Out[14]:
```
▾ MultinomialNB
MultinomialNB()
```

In [15]:
```
# make predictions on the test data
pred = naive_bayes.predict(X_test)

# print confusion matrix
print(confusion_matrix(y_test, pred))
```

```
[[ 870  608]
 [ 103 1918]]
```

Confusion matrix has this form

TruePositive FalsePositive

FalseNegative TrueNegative

In [16]:
```
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.7967990854529866
```

Accuracy of 79.7% which is pretty good, but lets examine our negative cases a bit more.

In [17]:
```
from sklearn.metrics import classification_report
print(classification_report(y_test, pred))
```

```
              precision    recall  f1-score   support

           0       0.89      0.59      0.71      1478
           1       0.76      0.95      0.84      2021

    accuracy                           0.80      3499
   macro avg       0.83      0.77      0.78      3499
weighted avg       0.82      0.80      0.79      3499
```

In [18]:
```
print('negative review size in test data:',y_test[y_test==1].shape[0])
print('test size: ', len(y_test))
baseline = y_test[y_test==1].shape[0] / y_test.shape[0]
print(baseline)
```

```
negative review size in test data: 2021
test size:  3499
0.5775935981709059
```

The positive review are 57% of the test data, which indicates that the NaiveBayes method did learn.

Let's examine some falsely classified data.

In [19]:
```
y_test[y_test != pred]
```

Out[19]:
```
1458     1
10913    0
3041     0
9005     0
15471    0
        ..
15694    0
8426     0
7466     0
8501     0
3750     1
Name: user_suggestion, Length: 711, dtype: int64
```

In [20]:
```
for i in [1458, 10913, 3041, 9005, 15471, 15694, 8426]:
  print(df.loc[i, 'user_review'])
  print()
```

```
Early Access ReviewMostly its a good game however in my last 2 games ive had a rather annoying bug where my cannons refuse to fire at all until i die, other then that a very interesting game.Edit: Sometimes mt abilities dont work
now and i cannot connect to a game anymore, wtf?2nd edit: And i believe the game has a hacker problem as well from what ive witnessed and heard.Edit 3: Fix the damn game now, ITS KEEPS F****** CRASHING

Early Access ReviewDevelopers pushing stuff that could've been designed by their little cousin, because they can sell a mini campaign with a buy-in super pushed creature removable mostly by its own colors. Makes the ladder, which
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to be a straight up a better card game.

What's not to love in this game? Modelisation is good, physics and damage are really close to reality, graphics are good, plus the game itself is free to play.Unfortunately, hit detection is completely random. I can play 30 minut
es destroying everything in my path with short burst, and then suddenly play for 3 days during which only 5% of my hits are recorded.

Hello, I have played planetside 2 for appx 4 years since it was in Beta (2902 Hours played).  About two year ago I would have recommended this game, however due to multiple patches since then I do not.  There is no reason to beco
me good at Planetside 2.  Wasting your time learning and perfecting the skills necessary to being a successful player is met with nothing but blanket nerfs and changes to any playstyle that, with time and effort, are better than
others.  This game is the antithesis to a competitive game and for the last 5 years the company that produces it has done nothing but remove fun and competitive gameplay.  There was a time when I would have rated this game an 8/1
0 must have, but that time is long gone and we are left with the remains of an old rotten bannana.  I hope you do not decide to waste your time with this pile of garbage since it will end up being a waste of both time and money a
thing that is precious in our day and age.  If you do not decide to play this game due to my review I would appreciate that you rate my review accordingly since I do not know any other way to show my displeasure with the current
state of the game.  I appreciate your time reading and wish you luck in finding a fun and exciting multiplayer experience elsewhere.Daniel WebsterFormer Liberator Pilot, Gunner and LIBZ Outfit Leader (emerald server),Playstyle of
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w player, why ? You start off with no buff, no item, no special crusader, etc. And if you wanna get some of those things (Buff,Item,etc) you need to spend a lot of money to get those things in the treasure. Secondly, it take a lo
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ly pay to win but paying can give you a big big boost giving you a big advantage against other players definitely BIG advantage. The game is not really that great for me i mean i choose the class  ----- Trickster Rogue -----  wors
t class ever i don't even know why there is a class like this i wanted to role play or feel like a rogue/assassin/ninja squish but massive damage that piles damage quick and is a fast class i was completely WAY WAY WAY WAY off th
e class is more of the squish looks like a ninja/assassin/rogue that does above average damage with 2 second stealth and is a very slow moving character the TANK class actually moves faster then the rogue class runs faster moves
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```

Second Try: using re.sub to get rid/change some text

In [21]:
```
df['user_review'].replace(r'^Early Access Review', '', regex=True, inplace=True)
```

In [22]:
```
for i in [1458, 10913, 3041, 9005, 15471, 15694, 8426]:
  print(df.loc[i, 'user_review'])
  print()
```

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Mostly its a good game however in my last 2 games ive had a rather annoying bug where my cannons refuse to fire at all until i die, other then that a very interesting game.Edit: Sometimes mt abilities dont work now and i cannot c
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```

In [23]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)
# apply tfidf vectorizer
X_train = vectorizer.fit_transform(X_train)  # fit and transform the train data
X_test = vectorizer.transform(X_test)        # transform only the test data

naive_bayes = MultinomialNB()
naive_bayes.fit(X_train, y_train)
```

Out[23]:
```
▾ MultinomialNB
MultinomialNB()
```

In [24]:
```
# make predictions on the test data
pred = naive_bayes.predict(X_test)

# print confusion matrix
print(confusion_matrix(y_test, pred))
```

```
[[ 879  599]
 [ 108 1913]]
```

This didn't change anything, lets do some more substitution.

In [25]:
```
df['user_review'].replace(r'[\d][\d]+', ' num ', regex=True, inplace=True)
df['user_review'].replace(r'[!@#*][!@#*]+', ' punct ', regex=True, inplace=True)
df['user_review'].replace(r'[A-Z][A-Z]+', ' caps ', regex=True, inplace=True)

for i in [1458, 10913, 3041, 9005, 15471, 15694, 8426]:
  print(df.loc[i, 'user_review'])
  print()
```

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se  caps  are fast with high def and fast attack,  caps  fast attack fast movement high def,  caps  average movement average attack speed   caps  damage output high def,  caps  class low def average movement speed a little bit ab
ove attack speed a little bit above average damage ouput. This game is designed poorly on classes but incredibly on story. You can't immerse yourself into it it's just not that good
```

In [26]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)
# apply tfidf vectorizer
X_train = vectorizer.fit_transform(X_train)  # fit and transform the train data
X_test = vectorizer.transform(X_test)        # transform only the test data

naive_bayes = MultinomialNB()
naive_bayes.fit(X_train, y_train)
```

Out[26]:
```
▾ MultinomialNB
MultinomialNB()
```

In [27]:
```
# make predictions on the test data
pred = naive_bayes.predict(X_test)

# print confusion matrix
print(confusion_matrix(y_test, pred))
```

```
[[ 858  620]
 [ 106 1915]]
```

Previous:

[[879 599]

[108 1913]]

Increase False Positive by 21 but increase false negative by 2. Overall slight decrease in accuracy. Lets scrap this idea and move on to a different approach.

In [28]:
```
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.7925121463275222
```

Third Try: Using Binomial

In [29]:
```
# Reset the data from the second try
df = pd.read_csv('train.csv', header=0, usecols=[3, 4], encoding='latin-1')
```

In [30]:
```
# binary=True gives binary data instead of counts
vectorizer_b = TfidfVectorizer(stop_words='english', binary=True)

# set up X and y
X = vectorizer_b.fit_transform(df.user_review)
y = df.user_suggestion

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, train_size=0.8, random_state=49)
```

In [31]:
```
from sklearn.naive_bayes import BernoulliNB

naive_bayes2 = BernoulliNB()
naive_bayes2.fit(X_train, y_train)
```

Out[31]:
```
▾ BernoulliNB
BernoulliNB()
```

In [32]:
```
# make predictions on the test data
pred = naive_bayes2.predict(X_test)

# print confusion matrix
from sklearn.metrics import confusion_matrix
confusion_matrix(y_test, pred)
```

Out[32]:
```
array([[ 945,  533],
       [ 181, 1840]])
```

In [33]:
```
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.7959416976278937
```

This actually decreased the accuracy. Decrease FP, but increase FN.

In [34]:
```
naive_bayes3 = BernoulliNB(alpha=1, binarize=0.05, fit_prior=False)
naive_bayes3.fit(X_train, y_train)
```

Out[34]:
```
▾ BernoulliNB
BernoulliNB(alpha=1, binarize=0.05, fit_prior=False)
```

In [35]:
```
# make predictions on the test data
pred = naive_bayes3.predict(X_test)

# print confusion matrix
confusion_matrix(y_test, pred)

print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8093741068876822
```

After playing with the parameters for a little bit, I got the accuracy to above 80 percent.

Step 2. Logistic Regression

In [36]:
```
df = pd.read_csv('train.csv', header=0, usecols=[3, 4], encoding='latin-1')
X = df.user_review
y = df.user_suggestion

# Split 80% train and 20% test.
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)
from sklearn.feature_extraction.text import TfidfVectorizer

vectorizer = TfidfVectorizer(binary=True)
X_train = vectorizer.fit_transform(X_train)  # fit and transform the train data
X_test = vectorizer.transform(X_test)        # transform only the test data
```

In [37]:
```
from sklearn.linear_model import LogisticRegression

#training the regression
classifier = LogisticRegression(solver='lbfgs', class_weight='balanced')
classifier.fit(X_train, y_train)
```

Out[37]:
```
▾ LogisticRegression
LogisticRegression(class_weight='balanced')
```

In [38]:
```
# evaluate
pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))

# print confusion matrix
print(confusion_matrix(y_test, pred))
```

```
accuracy score:  0.8588168048013718
[[1277  201]
 [ 293 1728]]
```

Trying Pipelines

In [39]:
```
from sklearn.pipeline import Pipeline

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)

pipe1 = Pipeline([
  ('tfidf', TfidfVectorizer(binary=True)),
  ('logreg', LogisticRegression(solver='lbfgs', class_weight='balanced')),
])

pipe1.fit(X_train, y_train)
```

Out[39]:
```
▸ Pipeline
  ▸ TfidfVectorizer
  ▸ LogisticRegression
```

In [40]:
```
prediction = pipe1.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, prediction))
```

```
accuracy score:  0.8588168048013718
```

In [41]:
```
# to check all the parameters of the pipeline, do this:
pipe1.get_params()
```

Out[41]:
```
{'memory': None,
 'steps': [('tfidf', TfidfVectorizer(binary=True)),
  ('logreg', LogisticRegression(class_weight='balanced'))],
 'verbose': False,
 'tfidf': TfidfVectorizer(binary=True),
 'logreg': LogisticRegression(class_weight='balanced'),
 'tfidf__analyzer': 'word',
 'tfidf__binary': True,
 'tfidf__decode_error': 'strict',
 'tfidf__dtype': numpy.float64,
 'tfidf__encoding': 'utf-8',
 'tfidf__input': 'content',
 'tfidf__lowercase': True,
 'tfidf__max_df': 1.0,
 'tfidf__max_features': None,
 'tfidf__min_df': 1,
 'tfidf__ngram_range': (1, 1),
 'tfidf__norm': 'l2',
 'tfidf__preprocessor': None,
 'tfidf__smooth_idf': True,
 'tfidf__stop_words': None,
 'tfidf__strip_accents': None,
 'tfidf__sublinear_tf': False,
 'tfidf__token_pattern': '(?u)\\b\\w\\w+\\b',
 'tfidf__tokenizer': None,
 'tfidf__use_idf': True,
 'tfidf__vocabulary': None,
 'logreg__C': 1.0,
 'logreg__class_weight': 'balanced',
 'logreg__dual': False,
 'logreg__fit_intercept': True,
 'logreg__intercept_scaling': 1,
 'logreg__l1_ratio': None,
 'logreg__max_iter': 100,
 'logreg__multi_class': 'auto',
 'logreg__n_jobs': None,
 'logreg__penalty': 'l2',
 'logreg__random_state': None,
 'logreg__solver': 'lbfgs',
 'logreg__tol': 0.0001,
 'logreg__verbose': 0,
 'logreg__warm_start': False}
```

Trying some parameters

In [42]:
```
pipe1.set_params(tfidf__min_df=3, logreg__C=2.0).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.86024578450986
```

In [43]:
```
pipe1.set_params(tfidf__min_df=4, logreg__C=3.0, tfidf__smooth_idf = False).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8628179479851386
```

In [44]:
```
pipe1.set_params(tfidf__min_df=4, logreg__C=3.0).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8628179479851386
```

In [45]:
```
pipe1.set_params(tfidf__min_df=4, logreg__C=3.0, logreg__intercept_scaling=2).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8628179479851386
```

In [46]:
```
pipe1.set_params(tfidf__min_df=4, logreg__C=3.0, logreg__intercept_scaling=10).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8628179479851386
```

In [47]:
```
pipe1.set_params(tfidf__min_df=10, logreg__C=3.0, logreg__intercept_scaling=2).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8593883966847671
```

In [48]:
```
pipe1.set_params(tfidf__min_df=5, logreg__C=3.0, logreg__intercept_scaling=2).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8613889682766505
```

In [49]:
```
pipe1.set_params(tfidf__min_df=4, logreg__C=4.0, logreg__intercept_scaling=2).fit(X_train, y_train)
pred = pipe1.predict(X_test)
print("accuracy: ", accuracy_score(y_test, pred))
```

```
accuracy:  0.8619605601600457
```

After some light testing, These parameters [tfidf**min_df=4, logreg**C=3.0, tfidf__smooth_idf = False] had the highest accuracy. However the increase in accuracy was minimal

Step 3. Neural Network

In [50]:
```
from sklearn.neural_network import MLPClassifier
df = pd.read_csv('train.csv', header=0, usecols=[3, 4], encoding='latin-1')
X = df.user_review
y = df.user_suggestion

# Split 80% train and 20% test.
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=49)
from sklearn.feature_extraction.text import TfidfVectorizer

vectorizer = TfidfVectorizer(binary=True)
X_train = vectorizer.fit_transform(X_train)  # fit and transform the train data
X_test = vectorizer.transform(X_test)        # transform only the test data
```

In [51]:
```
classifier = MLPClassifier(solver='lbfgs', alpha=1e-5, hidden_layer_sizes=(15, 2), random_state=1)
classifier.fit(X_train, y_train)
```

Out[51]:
```
▾ MLPClassifier
MLPClassifier(alpha=1e-05, hidden_layer_sizes=(15, 2), random_state=1,
              solver='lbfgs')
```

In [52]:
```
pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.5775935981709059
```

Trying other parameters

In [60]:
```
# Change the activation function
classifier = MLPClassifier(solver='lbfgs', alpha=0.01, hidden_layer_sizes=(50, 2), random_state=1, activation='tanh')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8336667619319805
```

In [63]:
```
# Change the activation function
classifier = MLPClassifier(solver='lbfgs', alpha=0.01, hidden_layer_sizes=(50, 2), random_state=1, activation='logistic')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.5775935981709059
```

In [64]:
```
# Change the activation function
classifier = MLPClassifier(solver='lbfgs', alpha=0.01, hidden_layer_sizes=(50, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8399542726493284
```

In [67]:
```
# Lets choose activation function = identity
# Change alpha
classifier = MLPClassifier(solver='lbfgs', alpha=0.001, hidden_layer_sizes=(50, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.837953701057449
```

In [69]:
```
# Change alpha
classifier = MLPClassifier(solver='lbfgs', alpha=0.0001, hidden_layer_sizes=(50, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8396684767076308
```

In [72]:
```
# Change solver
classifier = MLPClassifier(solver='adam', alpha=0.001, hidden_layer_sizes=(50, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.817947985138611
```

This takes too long, lets abandon this solver

In [73]:
```
# Change solver
classifier = MLPClassifier(solver='sgd', alpha=0.001, hidden_layer_sizes=(50, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8611031723349528
/usr/local/lib/python3.10/dist-packages/sklearn/neural_network/_multilayer_perceptron.py:686: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200) reached and the optimization hasn't converged yet.
  warnings.warn(
```

This takes even LONGER (more than 10 mins to run to completion). Will stick to 'lbfgs'

In [75]:
```
# Change solver
classifier = MLPClassifier(solver='lbfgs', alpha=0.001, hidden_layer_sizes=(40, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8405258645327236
```

In [76]:
```
# Change solver
classifier = MLPClassifier(solver='lbfgs', alpha=0.001, hidden_layer_sizes=(30, 2), random_state=1, activation='identity')
classifier.fit(X_train, y_train)

pred = classifier.predict(X_test)
print('accuracy score: ', accuracy_score(y_test, pred))
```

```
accuracy score:  0.8382394969991426
```

Conclusion

Overall, the best performing metric was Logistic Regression, followed by the best performing Neural Network, and the worst performing metric was Naive Bayes.

For Naive Bayes, I tested Multinomial and Binomial parameters. Surprisingly, the Multinomial parameter was more accurate which defied the initial hypothesis that the Binomial would produce higher accuracy. Cleaning the data did not help the performance at all.

Using logistic regression, we used pipeline to find the most accurate parameters. After some testing, these parameters, (tfidf**min_df=4, logreg**C=4.0, logreg__intercept_scaling=2), were the most accurate ones.

For the neural network, while the most accurate solver was sgd, there was a massive tradeoff in execution time. It took sgd a little over 14 minutes to train! The 'adam' solver wasn't too much better since it took around 10 minutes to train. That's a lot of time compared to 'lbfgs' which took around 1 minute. For activation, relu and logistic did not work well, with subpar accuracy. The activation functions that works well were identity and tanh, where identity is slightly more accurate. Testing alpha, it seems that alpha = 0.01 was the best performing one.