To be, or not to be

1. INDUSTRY

Literature industry is assigned.

2. DATA SETS

2.1. SOURCE: The dataset is from Kaggle (https://www.kaggle.com/datasets) in this link (https://www.kaggle.com/kingburrito666/shakespeare-plays).

DESCRIPTION: The dataset contains about one hundred thousand data with attributes related to shakespeare's plays. The following attributes from the dataset will be used for analysis.

Attribute	Datatype
Play	object
PlayerLinenumber	float64
ActSceneLine	object
Player	object
PlayerLine	object

3. IDEAS

3.1. To predict the player for a given player line using top three words from all lines and word used maximum in that line.

3.2. To predict the player for a given player line from top three words from all lines and number of words in that line.

4. LOADING THE DATASETS

Load the libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Import the csv file of dataset

In [2]:
```
shake_data=pd.read_csv("Shakespeare_data.csv")
shake_data.head()
```

Out[2]:

	Dataline	Play	PlayerLinenumber	ActSceneLine	Player	PlayerLine
0	1	Henry IV	NaN	NaN	NaN	ACT I
1	2	Henry IV	NaN	NaN	NaN	SCENE I. London. The palace.
2	3	Henry IV	NaN	NaN	NaN	Enter KING HENRY, LORD JOHN OF LANCASTER, the ...
3	4	Henry IV	1.0	1.1.1	KING HENRY IV	So shaken as we are, so wan with care,
4	5	Henry IV	1.0	1.1.2	KING HENRY IV	Find we a time for frighted peace to pant,

5. DATA PREPARATION

5.1 DATA CLEANING

Drop the NaN rows

In [3]:
```
shake_data=shake_data.dropna()
shake_data.head()
```

Out[3]:

	Dataline	Play	PlayerLinenumber	ActSceneLine	Player	PlayerLine
3	4	Henry IV	1.0	1.1.1	KING HENRY IV	So shaken as we are, so wan with care,
4	5	Henry IV	1.0	1.1.2	KING HENRY IV	Find we a time for frighted peace to pant,
5	6	Henry IV	1.0	1.1.3	KING HENRY IV	And breathe short-winded accents of new broils
6	7	Henry IV	1.0	1.1.4	KING HENRY IV	To be commenced in strands afar remote.
7	8	Henry IV	1.0	1.1.5	KING HENRY IV	No more the thirsty entrance of this soil

Reset the index and drop the old index column

In [4]:
```
shake_data=shake_data.reset_index()
del shake_data['index']
shake_data.head()
```

Out[4]:

	Dataline	Play	PlayerLinenumber	ActSceneLine	Player	PlayerLine
0	4	Henry IV	1.0	1.1.1	KING HENRY IV	So shaken as we are, so wan with care,
1	5	Henry IV	1.0	1.1.2	KING HENRY IV	Find we a time for frighted peace to pant,
2	6	Henry IV	1.0	1.1.3	KING HENRY IV	And breathe short-winded accents of new broils
3	7	Henry IV	1.0	1.1.4	KING HENRY IV	To be commenced in strands afar remote.
4	8	Henry IV	1.0	1.1.5	KING HENRY IV	No more the thirsty entrance of this soil

Printing the dimension of the dataset

In [5]:
```
print(shake_data.shape)
```

```
(105152, 6)
```

Deleting the dataline and actsceneline column

In [6]:
```
del shake_data['Dataline']
del shake_data['ActSceneLine']
shake_data.head()
```

Out[6]:

	Play	PlayerLinenumber	Player	PlayerLine
0	Henry IV	1.0	KING HENRY IV	So shaken as we are, so wan with care,
1	Henry IV	1.0	KING HENRY IV	Find we a time for frighted peace to pant,
2	Henry IV	1.0	KING HENRY IV	And breathe short-winded accents of new broils
3	Henry IV	1.0	KING HENRY IV	To be commenced in strands afar remote.
4	Henry IV	1.0	KING HENRY IV	No more the thirsty entrance of this soil

Printing the dimension of the dataset

In [7]:
```
print(shake_data.shape)
```

```
(105152, 4)
```

5.2 FORMATTING

Attributes and datatypes of the dataset

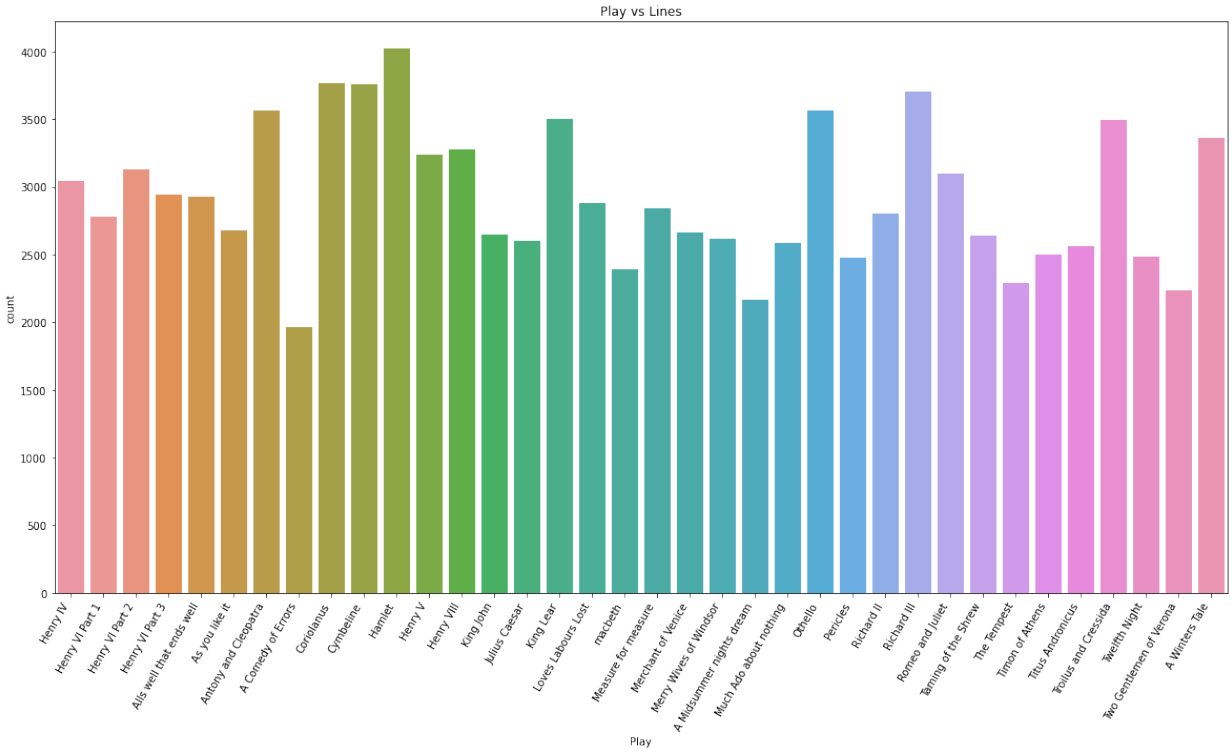
In [8]:
```
for column in shake_data.columns:
    print(column, " is ", shake_data[column].dtype.name)
```

```
Play  is  object
PlayerLinenumber  is  float64
Player  is  object
PlayerLine  is  object
```

5.3 VISUALIZATION

Barplot for number of lines in each play

In [9]:
```
shake_data.Play.value_counts()
plt.figure(figsize=(20,10))
g = sns.countplot(x=shake_data['Play'], data=shake_data)
g.set_xticklabels(g.get_xticklabels(), rotation=60, ha="right");
g.set_title('Play vs Lines');
```



Barplot for Player vs number of lines for each play

In [10]:
```
play_data=shake_data.Play.unique()
list1 = []
list2 =[]
for i in play_data:
    i_bar=shake_data.groupby(['Play']).get_group(i)
    player_data=i_bar.Player.unique()
    for j in player_data:
        j_bar=i_bar.groupby(['Player']).get_group(j)
        list1.append(j_bar.Player.unique()[0])
        list2.append(j_bar.PlayerLinenumber.max())
    df2 = pd.DataFrame(list(zip(list1, list2)), columns=['Player', 'Li
nes'])
    plt.figure(figsize=(20,5))
    i = sns.barplot(x=df2.Player, y=df2.Lines, data=df2)
    i.set_xticklabels(i.get_xticklabels(), rotation=60, ha="right");
    i.set_title(str(i_bar.Play.unique()[0])+" Players vs Lines");
    plt.savefig(str(i_bar.Play.unique()[0])+".png",dpi=250)
    plt.close()
    list1.clear()
    list2.clear()
    df2=df2.sort_values(['Lines'], ascending=[False])
    df2 = df2[df2['Lines'] <= (df2['Lines'].max()/4)]
    df2=df2.reset_index()
    df2.drop(['index'], inplace=True, axis=1)
    for k in range(len(df2)):
        shake_data.drop(shake_data.Player[shake_data['Player']==str(df
2['Player'][k])].index, inplace=True)
```

In all the plays, the players with less than one-fourth of the player with maximum number of lines for each play is removed from the original dataset.

Deleting PlayerLinernumber to release memory

In [11]:
```
del shake_data['PlayerLinenumber']
print(shake_data.shape)
```

```
(85171, 3)
```

5.4 FEATURE ENGINEERING

Three highly used words for each player

In [12]:
```
# list for storing the player
player_count = []
# list for storing three most used words
words_used =[]
# new column for storing three most used words
shake_data['Words Count'] = ''
# assigning three most words in word count column for each row with re
spect to the player
for i in play_data:
    i_bar=shake_data.groupby(['Play']).get_group(i)
    player_data=i_bar.Player.unique()
    for j in player_data:
        j_bar=i_bar.groupby(['Player']).get_group(j)
        player_count.append(j_bar.Player.unique()[0])
        j_bar=j_bar.PlayerLine.str.split(expand=True).stack().value_co
unts().to_frame()
        j_bar=j_bar.reset_index()
        j_bar.drop(j_bar.index[0])
        j_bar=j_bar.reset_index()
        j_bar.drop(['level_0'], inplace=True, axis=1)
        j_bar.rename(columns={0: "Counts", "index": "Words"}, inplace=
True)
        words_array=str(j_bar.Words.iloc[:3].values)[1:-1]
        words_array=words_array.replace("'","")
        words_used.append(words_array)
        j_bar = pd.DataFrame(list(zip(player_count, words_used)), colu
mns=['Player', 'Lines'])
        shake_data.loc[(shake_data['Player'] == j) & (shake_data['Play
']==i), ['Words Count']] = words_array
shake_data.head()
```

Out[12]:

	Play	Player	PlayerLine	Words Count
108	Henry IV	FALSTAFF	Now, Hal, what time of day is it, lad?	I the a
120	Henry IV	FALSTAFF	Indeed, you come near me now, Hal, for we that...	I the a
121	Henry IV	FALSTAFF	purses go by the moon and the seven stars, and...	I the a
122	Henry IV	FALSTAFF	by Phoebus, he,'that wandering knight so fair....	I the a
123	Henry IV	FALSTAFF	I prithee, sweet wag, when thou art king, as, God	I the a

Counting number of words for each player from the respective playerline

In [13]:
```
# create number column to count number of words in playerline for all
rows
shake_data['Number'] = ''
# assinging number of words in playerline in number column
for i in range(len(shake_data)):
            x=shake_data.iloc[i].PlayerLine.lower()
            words = len(x.split())
            shake_data.loc[(shake_data['PlayerLine'] == shake_data.ilo
c[i].PlayerLine), ['Number']] = words
shake_data.head()
```

Out[13]:

	Play	Player	PlayerLine	Words Count	Number
108	Henry IV	FALSTAFF	Now, Hal, what time of day is it, lad?	I the a	9
120	Henry IV	FALSTAFF	Indeed, you come near me now, Hal, for we that...	I the a	11
121	Henry IV	FALSTAFF	purses go by the moon and the seven stars, and...	I the a	11
122	Henry IV	FALSTAFF	by Phoebus, he,'that wandering knight so fair....	I the a	8
123	Henry IV	FALSTAFF	I prithee, sweet wag, when thou art king, as, God	I the a	10

Finding the highest repeated word of a player speaks for each line of the player

In [14]:
```
# create maxword column to count number of words in playerline for tha
t rows
shake_data['Maxword'] = ''
# assigning maximum used word of a playline in the row
for i in range(len(shake_data)):
            x=shake_data.iloc[i].PlayerLine.lower()
            word_list=[]
            count_list=[]
            def word_count(str):
                counts = dict()
                words = str.split()
                for word in words:
                    word_list.append(word)
                    if word in counts:
                        counts[word] += 1
                    else:
                        counts[word] = 1
                    count_list.append(counts[word])
                return counts
            word_count(x)
            words_bar = pd.DataFrame(list(zip(word_list, count_list)),
columns=['Word', 'Count'])
            words_bar=words_bar.sort_values(['Count', 'Word'], ascendi
ng=[False, True])
            words_bar=words_bar.reset_index()
            words_bar.drop(['index'], inplace=True, axis=1)
            words_bar=str(words_bar['Word'][0])
            shake_data.loc[(shake_data['PlayerLine'] == shake_data.ilo
c[i].PlayerLine), ['Maxword']] = str(words_bar)
shake_data.head()
```

Out[14]:

	Play	Player	PlayerLine	Words Count	Number	Maxword
108	Henry IV	FALSTAFF	Now, Hal, what time of day is it, lad?	I the a	9	day
120	Henry IV	FALSTAFF	Indeed, you come near me now, Hal, for we that...	I the a	11	come
121	Henry IV	FALSTAFF	purses go by the moon and the seven stars, and...	I the a	11	and
122	Henry IV	FALSTAFF	by Phoebus, he,'that wandering knight so fair....	I the a	8	and,
123	Henry IV	FALSTAFF	I prithee, sweet wag, when thou art king, as, God	I the a	10	art

Dropping columns play and playerline to free memory

In [15]:
```
del shake_data['Play']
del shake_data['PlayerLine']
shake_data.head()
```

Out[15]:

	Player	Words Count	Number	Maxword
108	FALSTAFF	I the a	9	day
120	FALSTAFF	I the a	11	come
121	FALSTAFF	I the a	11	and
122	FALSTAFF	I the a	8	and,
123	FALSTAFF	I the a	10	art

5.5 CLASSIFICATION

5.5.1 To predict the player for a given player line using top three words from all lines and word used maximum in that line.

Train, test and validation dataset for finding players from overall top three words and top word of each line

In [30]:
```
from numpy import mean
from numpy import std
from pandas import read_csv
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import OrdinalEncoder
from sklearn.metrics import accuracy_score
from sklearn.model_selection import train_test_split
train_ratio = 0.8
validation_ratio = 0.1
test_ratio = 0.1
# define one hot encoding for the categorical independent variables
encoder = OneHotEncoder(sparse=False)
# transform data
x = encoder.fit_transform(shaken_data[['Words Count','Maxword']])

label_encoder = LabelEncoder()
y = label_encoder.fit_transform(shaken_data['Player'])

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=1
- train_ratio)

# test = 10% of the initial data set
# validation = 10% of the initial data set
x_val, x_test, y_val, y_test = train_test_split(x_test, y_test, test_s
ize=test_ratio/(test_ratio + validation_ratio))
```

Logistic regression for finding the player from overall top three words and top word of each line

In [31]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
clf = LogisticRegression(max_iter=61000).fit(x_train, y_train)
y_pred=clf.predict(x_test)
# Model Accuracy for test dataset
print("Testing Accuracy:",accuracy_score(y_test, y_pred)*100)

y_pred = clf.predict(x_val)
# Model Accuracy for validation dataset
print("Validation Accuracy:",accuracy_score(y_val, y_pred)*100)
```

```
Testing Accuracy: 87.1
Validation Accuracy: 86.4
```

Decision tree classifier for finding the player from overall top three words and top word of each line

In [32]:
```
from sklearn import tree
from sklearn.datasets import load_iris
clf = tree.DecisionTreeClassifier()
clf = clf.fit(x_train, y_train)
y_pred = clf.predict(x_test)
# Model Accuracy for test dataset
print("Testing Accuracy:",accuracy_score(y_test, y_pred)*100)

y_pred = clf.predict(x_val)
# Model Accuracy for validation dataset
print("Validation Accuracy:",accuracy_score(y_val, y_pred)*100)
```

```
Testing Accuracy: 87.0
Validation Accuracy: 86.2
```

The player predicted using the overall top three words and top word of each line has higher accuracy in logistic regression than in decision tree.

5.5.2 To predict the player for a given player line from top three words from all lines and number of words in that line.

Train, test and validation dataset for finding players from overall top three words and number of words in each line

In [33]:
```
train_ratio = 0.8
validation_ratio = 0.1
test_ratio = 0.1

# define one hot encoding and transformation
encoder = OneHotEncoder(sparse=False)
x = encoder.fit_transform(shake_data[['Number','Words Count']])

# define label encoding and transformation
label_encoder = LabelEncoder()
y = label_encoder.fit_transform(shake_data['Player'])

# train = 80% of the entire data set
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=1
- train_ratio)

# test = 10% of the initial data set
# validation = 10% of the initial data set
x_val, x_test, y_val, y_test = train_test_split(x_test, y_test, test_s
ize=test_ratio/(test_ratio + validation_ratio))
```

Logistic regression for finding the player from overall top three words and number of words in each line

In [37]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
clf = LogisticRegression(max_iter=61000).fit(x_train, y_train)
y_pred=clf.predict(x_test)
# Model Accuracy for test dataset
print("Testing Accuracy:",accuracy_score(y_test, y_pred)*100)

y_pred = clf.predict(x_val)
# Model Accuracy for validation dataset
print("Validation Accuracy:",accuracy_score(y_val, y_pred)*100)
```

```
Testing Accuracy: 46.47804648978634
Validation Accuracy: 46.44827991076671
```

Decision trees classifier for finding the player from overall top three words and number of words in each line

In [40]:
```
from sklearn import tree
from sklearn.datasets import load_iris
clf_d = tree.DecisionTreeClassifier()
clf_d= clf_d.fit(x_train, y_train)
y_pred = clf_d.predict(x_test)
# Model Accuracy for test set
print("Testing Accuracy:",accuracy_score(y_test, y_pred)*100)
y_pred = clf.predict(x_val)
# Model Accuracy for validation set
print("Validation Accuracy:",accuracy_score(y_val, y_pred)*100)
```

```
Testing Accuracy: 46.43108710965016
Validation Accuracy: 46.43653868733122
```

The player predicted using the overall top three words and top word of each line has higher accuracy in logistic regression than in decision tree.

6. Results

Predicting the player using overall top three words and most used word in each line gives more accuracy than predicting using overall top three words and number of words in each line.