4. Presentation

March 20, 2019

1 Analysis of the NFL

```
In [1]: from IPython.display import Image
        Image("NFL.jpg")

   Out[1]:
```

1.1 Research Questions

- How has the NFL changed in the last decade as a result of new rules regarding player safety and a new style of play?

- What are the major differences between a SuperBowl Winning Team and that year's Worst Team?
- Can we accurately predict a SuperBowl Winner based on season statistics?

1.2 Step 1 - Getting the Data

- Game Statistics (Scraped from NFL)
- Passing Statistics (Scraped from NFL)
- Rushing Statistics (Scraped from NFL)
- Iterated over 10 Years and Combined the DataFrames
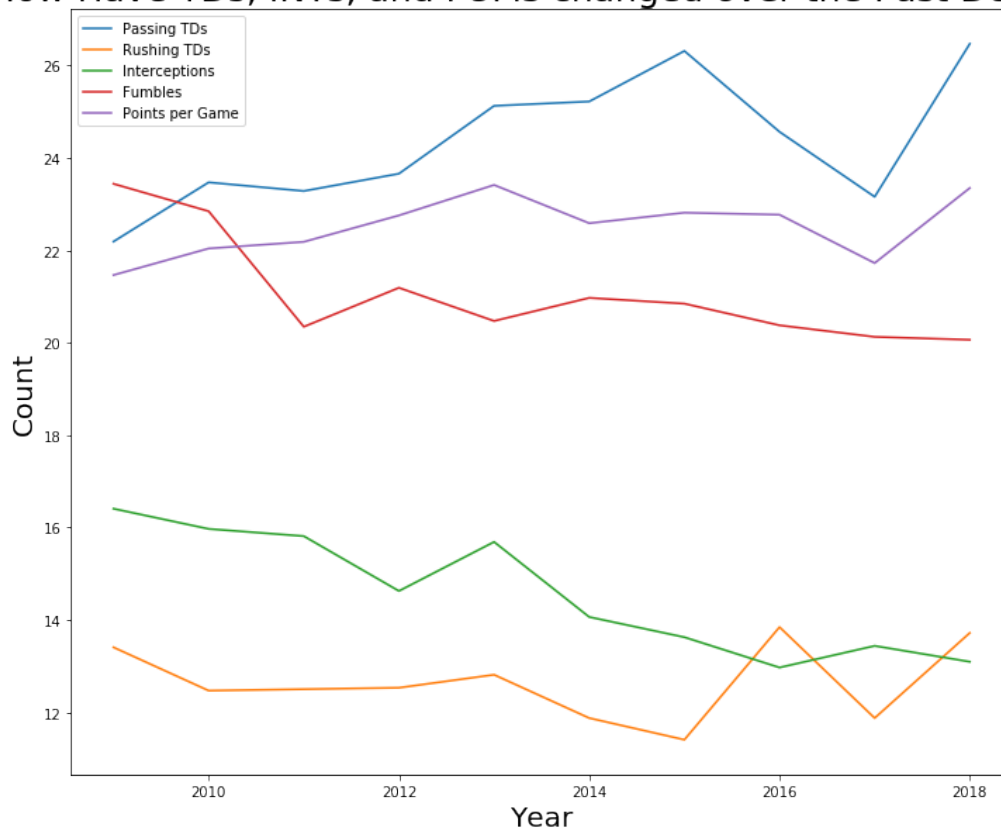
1.3 Step 2 - Cleaning the Data

- Naming the Columns
- Adding the SuperBowl Winners
- Subsetted the Data into 2 new DataFrames

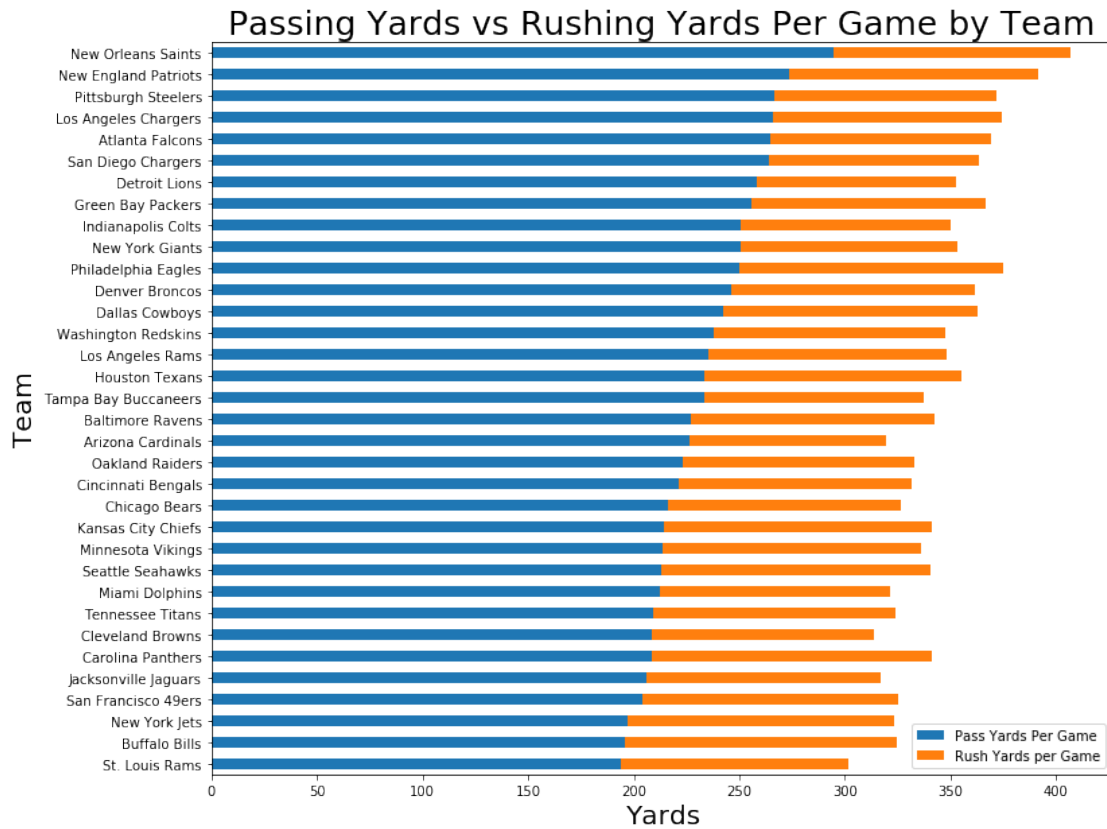## 1.4 Step 3 - Exploring the Data

`In [2]: Image("TDsINTsFUMs.png")`

`Out[2]:`

In [3]: Image("PassingRushing.png")

Out[3]:

Passing Yards vs Rushing Yards Per Game by Team

In [4]: Image("ThirdDown.png")

Out[4]:

3rd Down Conversion Rate for SuperBowl Teams vs the Worst Teams

Number of 3rd Down Attempts

% of 3rd Downs Converted

Legend:
- SuperBowl Winning Teams
- Worst Teams
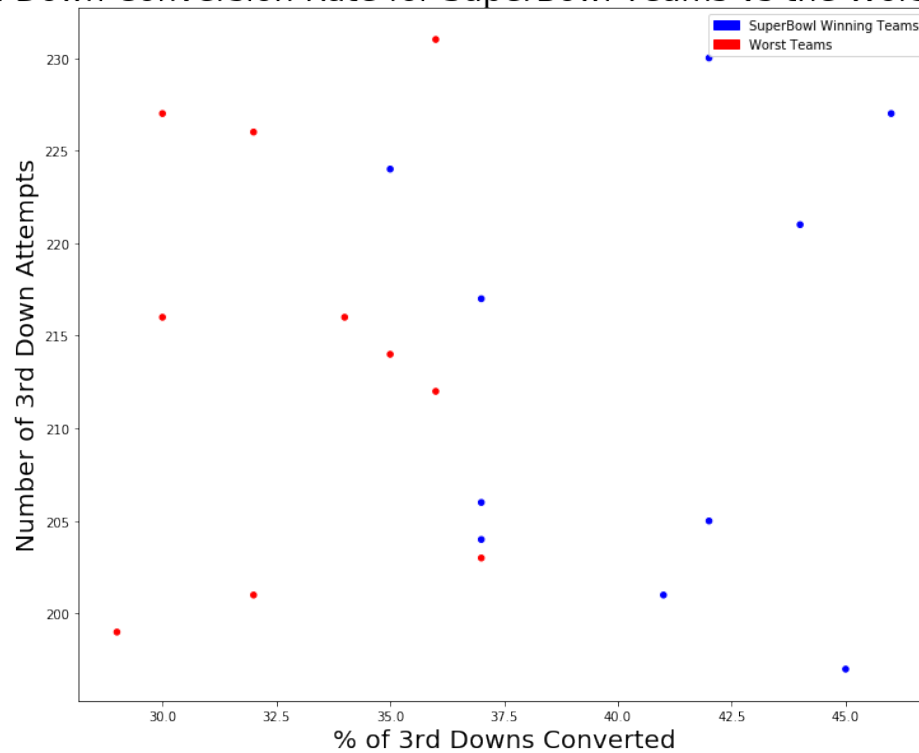
1.5 Step 4 - Machine Learning

- K-Nearest Neighbors Classification Model
- Random Foresting Classification Model
- K-Means Clustering
- Features: "% 3rd Downs Converted", "% 4th Downs Converted", "3rd Downs Attempted", "4th Downs Attempted", "Avg Yards Gained on 1st Down", "Fumbles Lost", "Penalties", "Total Points", "Yards per Play", "Completed Passes Greater than 40 Yards", "Interceptions", "Pass Attempts per Game", "Pass Completion Percentage", "Passing TDs", "Sacks", "Rush Attempts per Game", "Rush Yards per Carry", "Rushing TDs"

In [5]: Image("KNearestNeighbors.jpg")

Out[5]:

```
2 Nearest Neighbors Classification Model
Training Accuracy :  0.597222222222
Test Accuracy :  0.28125
Training F1 Score :  0.597222222222
Test F1 Score :  0.28125

Training Prediction
New England Patriots      2.0
Baltimore Ravens          2.0
Denver Broncos            2.0
Green Bay Packers         1.0
New Orleans Saints        1.0
New York Giants           1.0
Philadelphia Eagles       0.0
Seattle Seahawks          0.0
dtype: float64

Test Prediction
Denver Broncos

Actual Counts of Super Bowl Winners
New England Patriots      3.0
Green Bay Packers         1.0
New York Giants           1.0
Baltimore Ravens          1.0
New Orleans Saints        1.0
Denver Broncos            1.0
Philadelphia Eagles       1.0
Seattle Seahawks          1.0
Name: SuperBowl Winner, dtype: float64
```

In [6]: Image("RandomForesting.jpg")

Out[6]:

```
Minimum Samples Split:  10 and  N Estimators:  610
Training Accuracy :  0.996527777778
Test Accuracy :  0.8125
Training F1 Score :  0.996527777778
Test F1 Score :  0.8125

Training Prediction:
New England Patriots      2.0
New Orleans Saints        1.0
New York Giants           1.0
Baltimore Ravens          1.0
Denver Broncos            1.0
Philadelphia Eagles       1.0
Seattle Seahawks          1.0
Green Bay Packers         1.0
dtype: float64

Test Prediction
New England Patriots

Actual Counts of Super Bowl Winners
New England Patriots      3.0
Green Bay Packers         1.0
New York Giants           1.0
Baltimore Ravens          1.0
New Orleans Saints        1.0
Denver Broncos            1.0
Philadelphia Eagles       1.0
Seattle Seahawks          1.0
Name: SuperBowl Winner, dtype: float64
```