Predicting Quarterback Success in the NFL

Why is it so hard to draft quarterbacks?

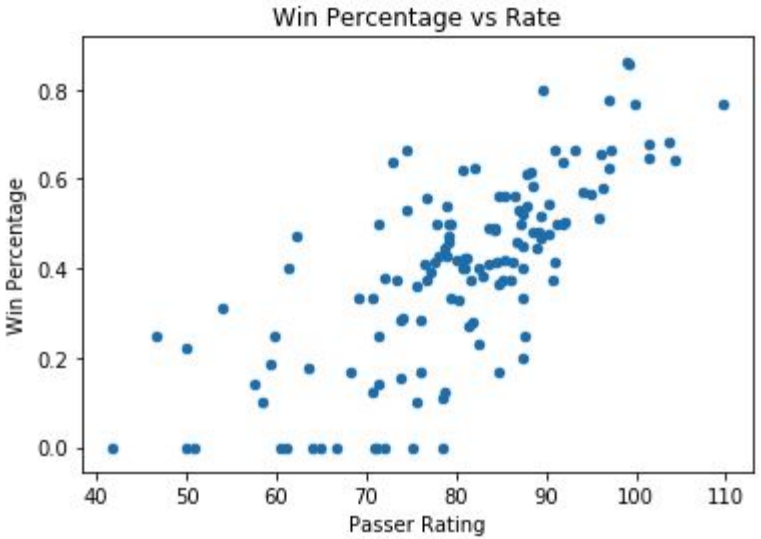
Ryen Russillo's analysis was the inspiration for this study.

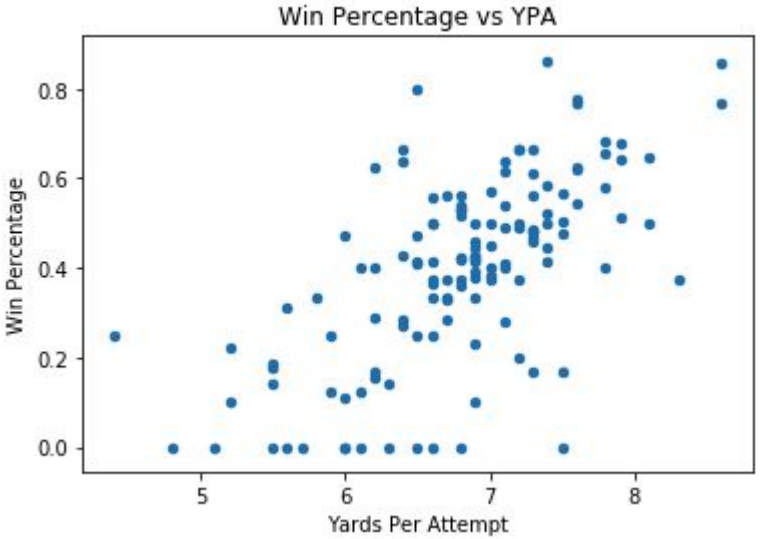
The Goal: Build a model that aids in decision making during the draft process and on draft day by using college passing statistics to predict a QB's success.

Potential Clients: NFL Teams, NFL Media, NFL Fans

Jamarcus Russell is considered on of the biggest QB busts in NFL history. Drafted #1 overall and only played in 31 games.

Defining Threshold For Success





Passer Rating correlated to QB Win Percentage : 0.73

YPA correlated to QB Win Percentage : 0.64

For the scope of this project, two target variables were explored: Passer Rating and Yards Per Attempt. The threshold of success for each was above or below the 20 year NFL average.

Machine Learning

Training Data: Quarterbacks with at least 100 NFL Attempts drafted from 1998 to 2015

Testing Data: Quarterbacks with at least 100 NFL Attempts drafted from 2016 to 2019

Notable QBs tested: Patrick Mahomes, Lamar Jackson, Baker Mayfield, Jared Goff, Kyler Murray

Features: AY/A, Attempts, Completions, Passing Yards, Passer Rating, Completion Percentage, Y/A, Touchdowns, Interceptions

Modeling Thresholds:
Yards Per Attempt = 6.89
Passer Rating = 81.91

Machine Learning

Binary classification model with 1 as above the NFL average and 0 as below the NFL average. To begin, a Dummy Classifier was created as the baseline. Since the dataset was relatively small(129 training data points, 22 test data points), simpler models like Logistic Regression and Decision Trees were used.

YPA Modeling Scores on test data:

Dummy Classifier = 0.6
Logistic Regression = 0.5
Decision Tree = 0.59

Passer Rating Scores:

Dummy Classifier = 0.67
Logistic Regression = 0.5
Decision Tree = 0.77

Machine Learning

The Decision Tree model with Passer Rating as the target variable yielded the best results. The model was then run 100 times and the mean score for each quarterback was calculated. Rounding > 0.5 to 1, or above the average, and <0.5 to 0, or below the average.

Player	predict	actual	NFL Pass Rating	True / False	Player	predict	actual	NFL Pass Rating	True / False
Patrick Mahomes	0	1	109.6	False	**Jacoby Brissett**	0	1	84.8	False
Deshaun Watson	1	1	101.4	True	**Cody Kessler**	1	1	84.8	True
Lamar Jackson	1	1	98.9	True	**Mason Rudolph**	1	1	82.0	True
Dak Prescott	1	1	97.0	True	**Sam Darnold**	0	0	80.9	True
Gardner Minshew	0	1	91.2	False	**Kyle Allen**	0	0	80.0	True
Nick Mullens	1	1	90.8	True	**Jeff Driskel**	0	0	78.8	True
Drew Lock	1	1	89.7	True	**Josh Allen**	0	0	76.6	True
Jared Goff	1	1	87.9	True	**Dwayne Haskins**	0	0	76.1	True
Daniel Jones	0	1	87.7	False	**C. J. Beathard**	0	0	75.5	True
Kyler Murray	1	1	87.4	True	**David Blough**	0	0	64.0	True
Baker Mayfield	1	1	86.2	True	**Josh Rosen**	0	0	59.4	True

Conclusion

Results:

- 81% Accuracy on Quarterbacks Drafted between 2016-2019.
- Zero False Positives - All QBs predicted to be above threshold were actually above.
- Four False Negatives - Patrick Mahomes, Gardner Minshew, Daniel Jones and Jacoby Brissett
- Passer Rating not always best indicator. Ex. Josh Allen would largely be considered better than Nick Mullens.

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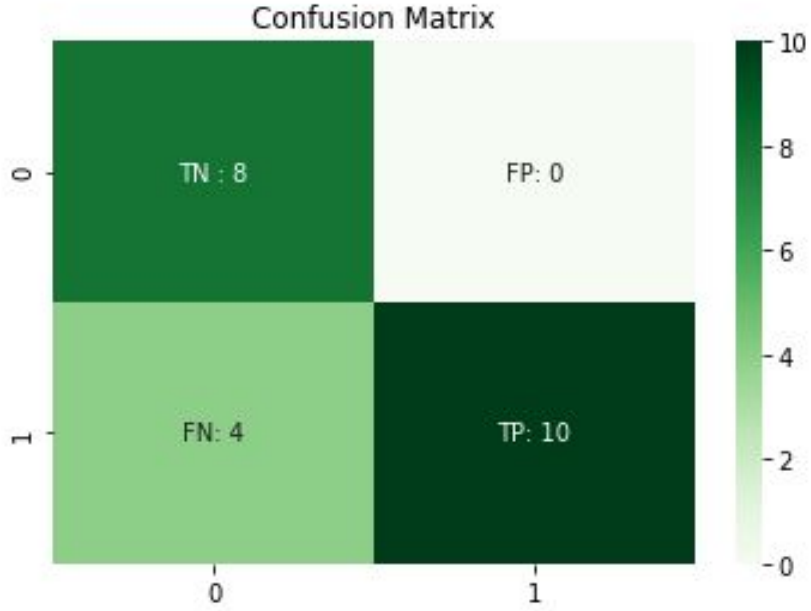
Conclusion

Results:

- Confusion Matrix and Classification Report provide further analysis of modeling.

- Feature Importance:
  Completions : 0.41
  Completion Percentage : 0.35
  Yards Per Attempt : 0.24

  These features can be said to reflect the importance of experience, accuracy and efficiency when evaluating a quarterback.



	precision	recall	f1-score	support
0	0.67	1.00	0.80	8
1	1.00	0.71	0.83	14
accuracy			0.82	22
macro avg	0.83	0.86	0.82	22
weighted avg	0.88	0.82	0.82	22

Recommendations / Further Study

- The model incorrectly predicting Patrick Mahomes to not be successful is unforgivable, but this is a great time to reference the famous quote by George Box. “All models are wrong, some are useful.”
- This study provides a simple model for predicting whether or not a draft prospect will be good. To improve its ability, advanced passing metrics should be considered as features. These would include Average Depth or Target, Passer Rating/Completion Percentage on Deep throws and Passer Rating on tight window throws and other metrics captured in the NFL.
- Additional external features should be considered for use by media and fans as the team a quarterback goes to is a huge factor. The offensive line, the coaching staff, the front office of a team and several other factors all affect the success of a quarterback once they get to the NFL.