

# Passing vs Rushing in Today's NFL

**NFL Play by Play Data Analysis**  
**By: Kellen Potocsnak**

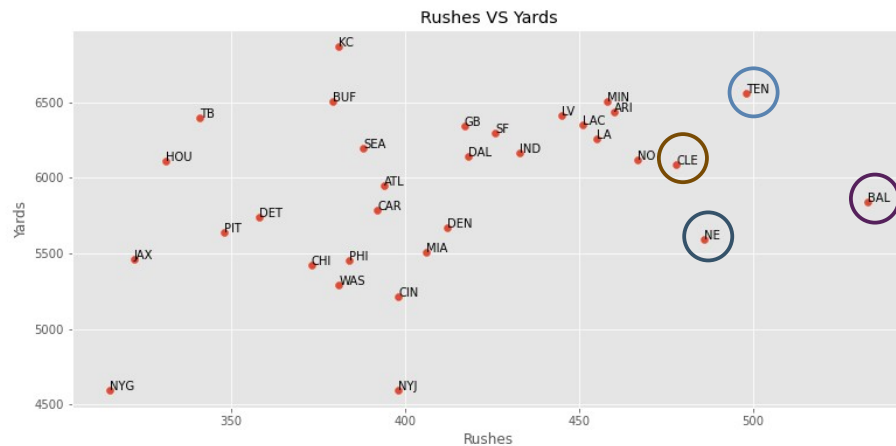
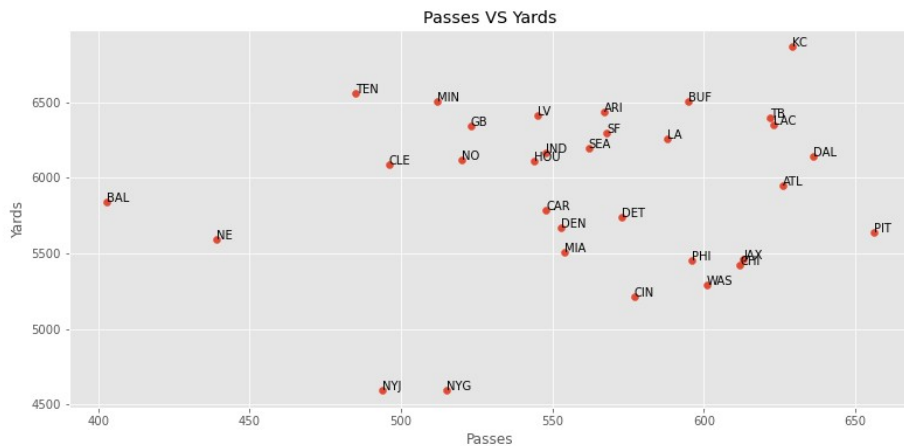
# Questions and Goals

- This project will analyze play by play data from the 2020 NFL season.
- The primary goal is to determine what type of play is the most successful.
  - Can we demonstrate that it is better to pass the ball than run it?



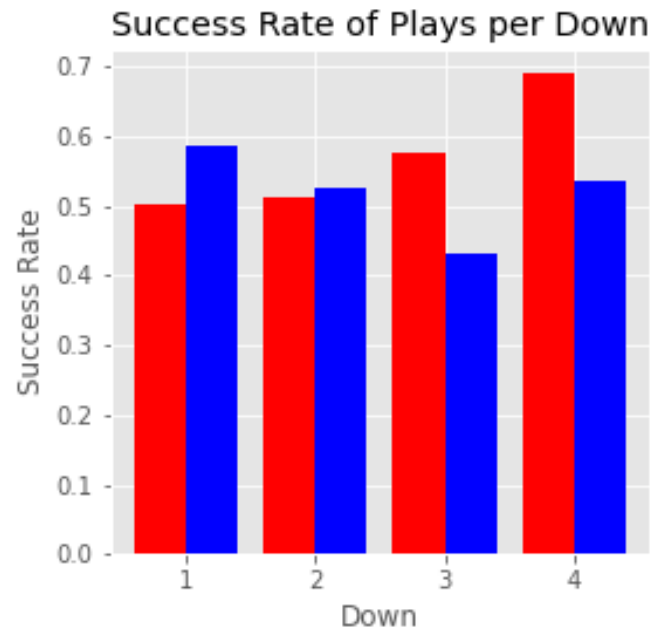
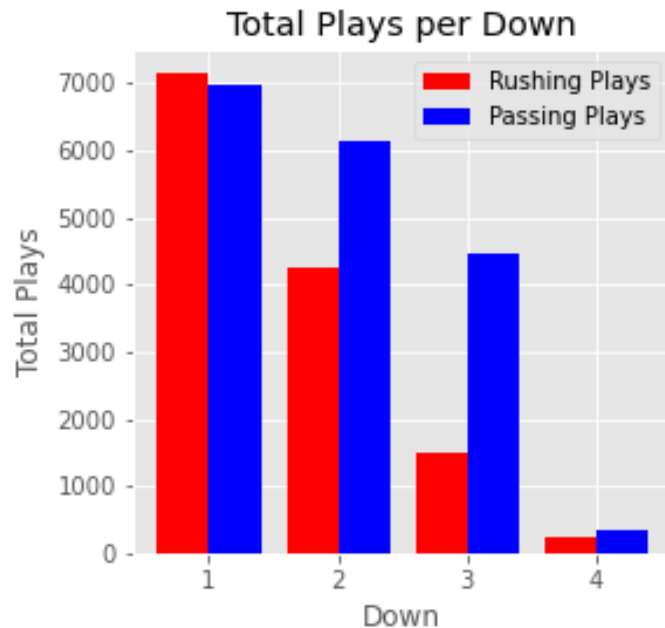
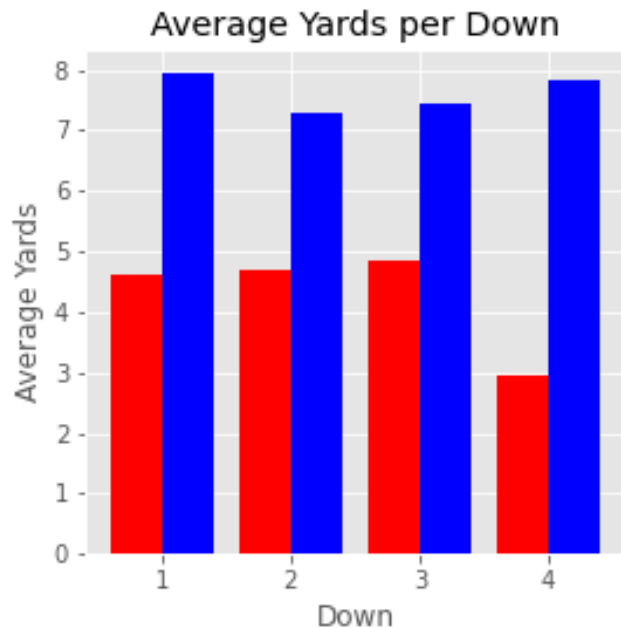
# The Data

- Data can be found at [NFLSavant.com](https://nflsavant.com) under 2020 play by play data.
- Roughly 40,000 regular season plays stored in as CSV data
- 40 descriptive fields including:
  - Yards, (Yards) ToGo, Formation, Down, and Team



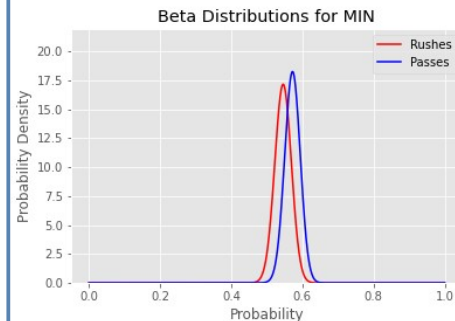
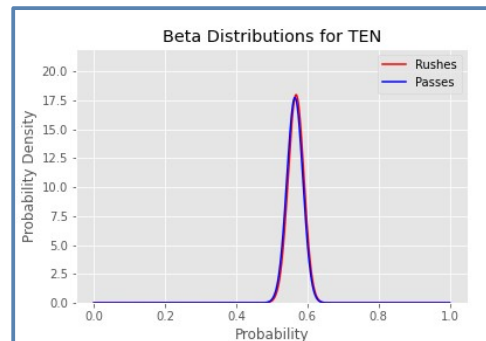
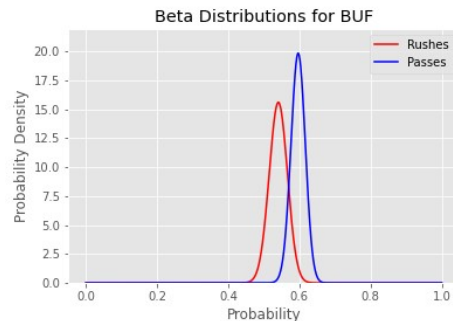
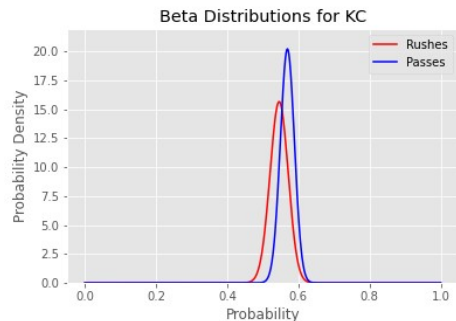
# Data Exploration

- Success can be measured using average yards or the newer success rate statistic

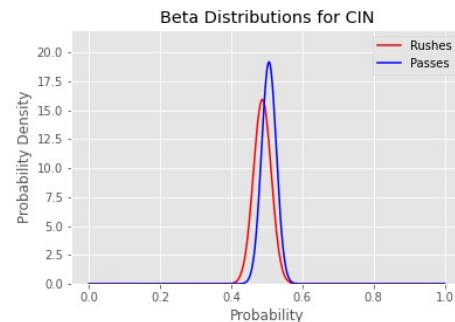
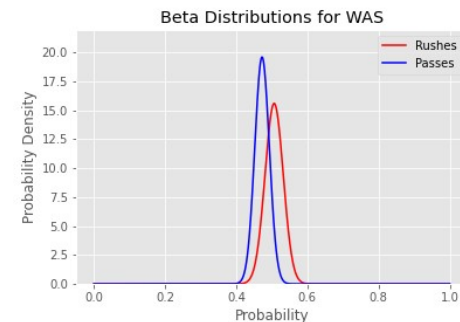
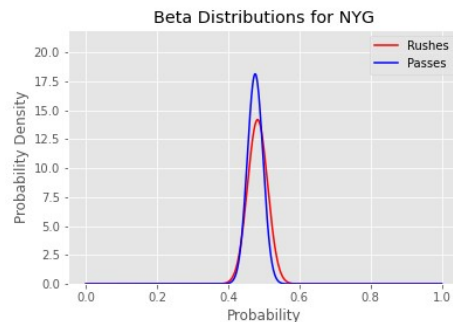
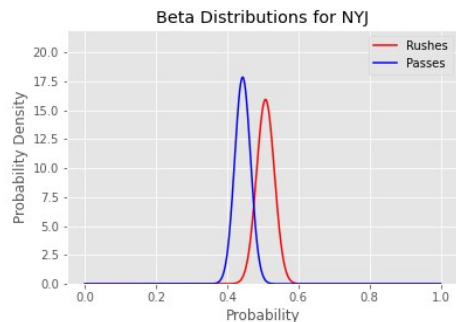


# Data Exploration

## Top Four Offenses

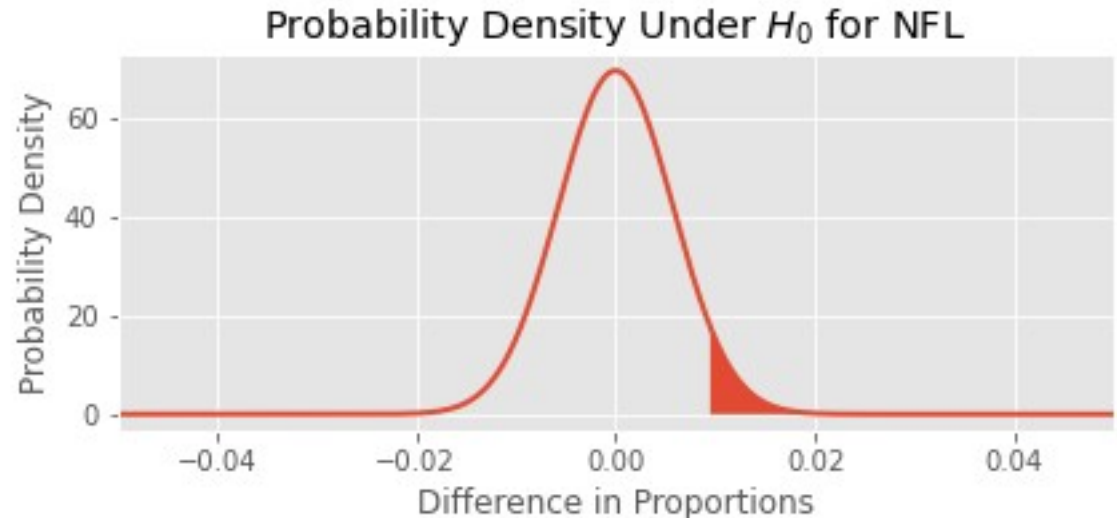


## Bottom Four Offenses



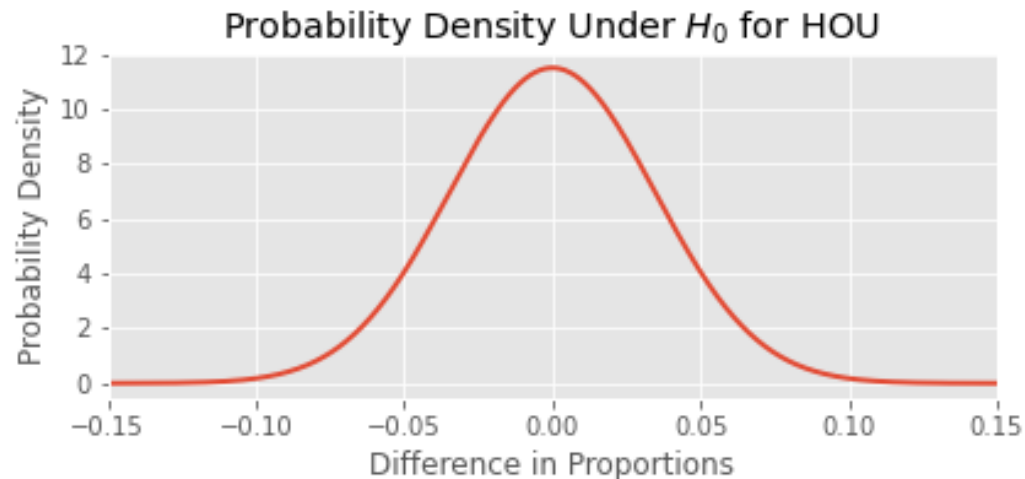
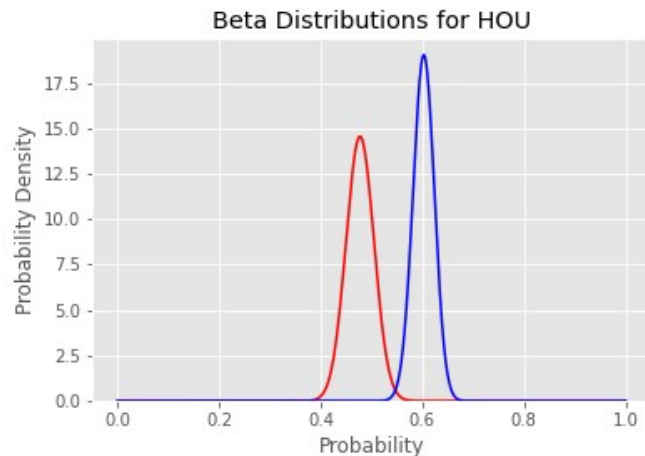
# Hypothesis

- Null Hypothesis: The rate of success for rush plays is less than or equal to the rate of success for pass plays
- Alpha = .02 We want to be very certain (98%) of our advice here since we are advising professional coaches
- P-Value .1002 > Alpha .02



# Hypothesis

- The Houston Texans
  - P-Value  $0.00028 < \alpha_{\text{Bonferroni}(33)} 0.00061$
  - Difference in Proportions = .1256
  - Our P value is 0.00028 so we reject that the rate of success for rush plays is less than or equal to the rate of success for pass plays at a 98% significance level.





# Conclusion

- For 31 of the 32 teams in the NFL, we had insufficient evidence to reject our null hypothesis
- Houston is a special case with a special quarterback and an awful run game





# Next Steps

- Investigate the bias in the success statistic towards rushing on third down and passing on first down
- Stratify success by formation, rush direction, and receiving target for each team.
- Apply the success statistic to defenses to rate teams on how often they can prevent the offense from making a successful play.

# Contact Me

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<https://github.com/Kellenpoto/NFL-Plays-Analysis>

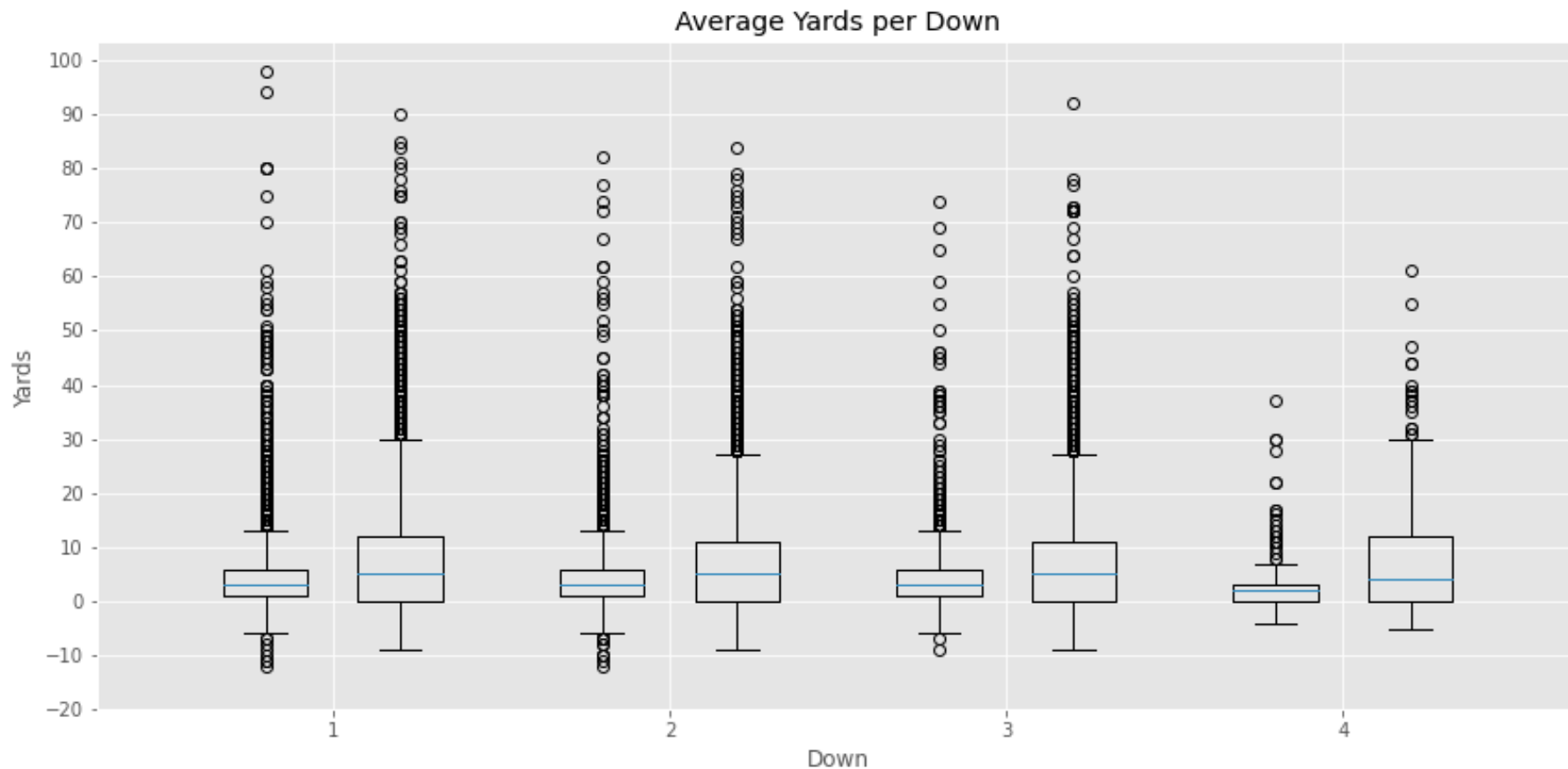
# Appendix

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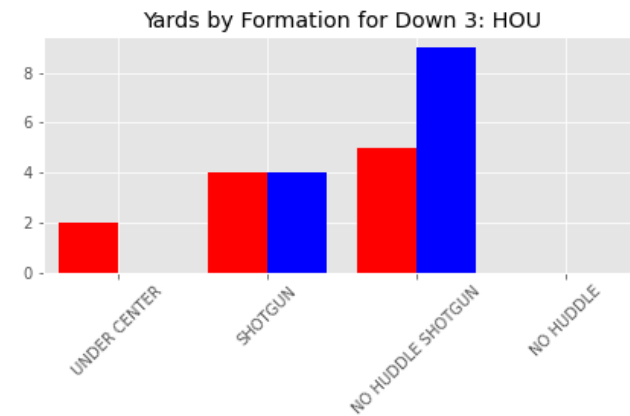
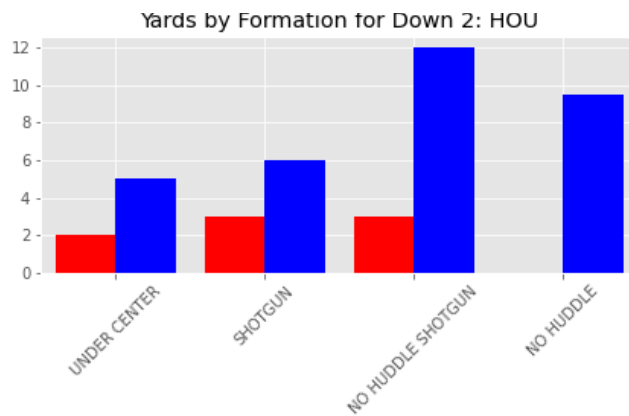
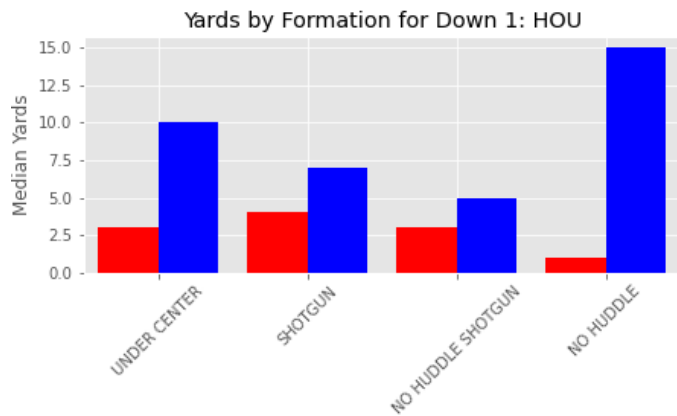
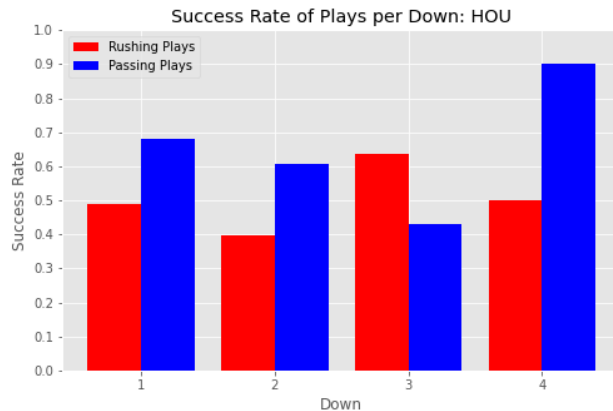
# Success Rate

- How do we define success?
  - Gaining 40% of yards to gain on first down → Success
  - Gaining 60% of yards to gain on second down → Success
  - Gaining a first down on third or fourth down → Success
- Why define success this way instead of by average yards per play?
  - The statistic above gives us a better look at what an actual success looks like on the field.
  - Example: On third down and one the primary goal of the team is to get a first down, not the most yards.

# Yards per Down Independence



# Closer Look at Houston



# P-Values vs Bayesian Probabilities

HOU	0.000279
PHI	0.002509
PIT	0.051309
NYJ	0.056250
BAL	0.070303
BUF	0.086382
IND	0.165643
CHI	0.168962
DAL	0.231202
ATL	0.239217
SF	0.288368
LV	0.297913
WAS	0.299157
CLE	0.319678
NE	0.347783
CAR	0.349338
NO	0.381624
MIA	0.397405
MIN	0.408576
GB	0.461426
LAC	0.464627
KC	0.471523
LA	0.507754
CIN	0.567925
ARI	0.596785
DET	0.600964
TB	0.640362
DEN	0.722842
JAX	0.834853
NYG	0.849035
TEN	0.916350
SEA	0.961317



HOU	0.99987
PIT	0.97498
BUF	0.95716
IND	0.91689
CHI	0.91591
DAL	0.88408
ATL	0.88075
SF	0.85451
LV	0.85177
CLE	0.83985
MIA	0.80211
MIN	0.79788
GB	0.77057
LAC	0.76826
KC	0.76609
LA	0.74651
CIN	0.71908
ARI	0.69968
DET	0.69888
TB	0.68153
JAX	0.58574
SEA	0.52009
TEN	0.45824
NYG	0.42435
DEN	0.35948
NO	0.19005
CAR	0.17665
NE	0.17220
WAS	0.14770
BAL	0.03496
NYJ	0.02905
PHI	0.00118