

Pick'em Predictions



An algorithm for wins & losses

Sports Betting

- According to the American Gaming Association 150\$ billion is wagered on sports each year, 95\$ billion on NFL and college football. (1)
- 85% of people admit to having gambled at least once
- 6\$ billion dollars were spent on the Super Bowl in 2019

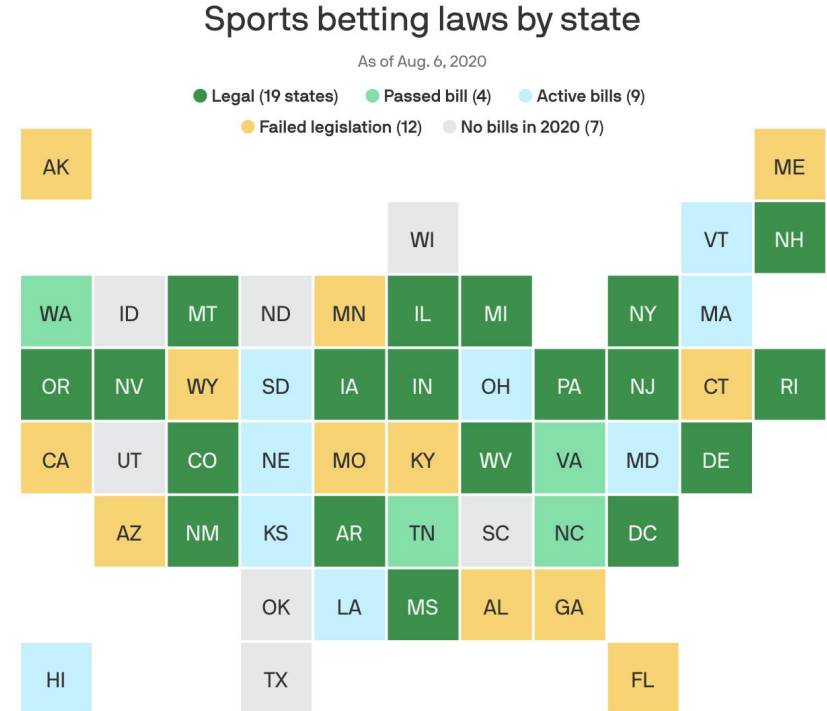
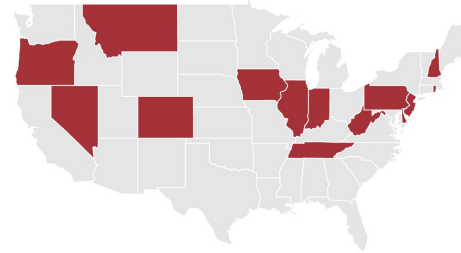


Fig. 1: from axios.com, reproduced from the American Gaming Association

Online Sports Betting

- Online sports betting is becoming increasingly popular and is also up to state regulation
- Common online sports betting sites include: DraftKings, BetRivers, BetMGM, WilliamHill, and FanDuel

STATES THAT OFFER LEGAL ONLINE GAMBLING



| State | Online Casino | Online Poker | Online Sports Betting |
|---------------|---------------|--------------|-----------------------|
| New Jersey | Yes | Yes | Yes |
| Pennsylvania | Yes | Yes | Yes |
| Illinois | No | No | Yes |
| Tennessee | No | No | Yes |
| Indiana | No | No | Yes |
| West Virginia | Yes | Yes | Yes |
| Iowa | No | No | Yes |
| New Hampshire | No | No | Yes |

Fig. 2: <https://www.playusa.com/us/>

Pick'em

- Even if you don't want to gamble on your picking skills, maybe you're just playing for bragging rights
- These leagues are often between friends but most sites offer a pay to play league that have cash "prizes".

| Favorite | | vs | Underdog | Mon | Tue | Wed | Final |
|---------------------|-----------------------|----|------------------|---------|---------|------|-------|
| Green Bay | <input type="radio"/> | vs | @ San Francisco | Off (0) | Off (0) | 5.5 | 5.5 |
| @ Atlanta | <input type="radio"/> | vs | Denver | 4.0 | 4.0 | 4.0 | 4.0 |
| Seattle | <input type="radio"/> | vs | @ Buffalo | 2.5 | 3.0 | 3.0 | 3.0 |
| @ Tennessee | <input type="radio"/> | vs | Chicago | 5.5 | 5.5 | 5.5 | 5.5 |
| Baltimore | <input type="radio"/> | vs | @ Indianapolis | 3.5 | Off (0) | 2.5 | 2.5 |
| @ Kansas City | <input type="radio"/> | vs | Carolina | 12.0 | 10.5 | 10.5 | 10.5 |
| @ Minnesota | <input type="radio"/> | vs | Detroit | 3.5 | 4.0 | 4.0 | 4.0 |
| @ Washington | <input type="radio"/> | vs | New York (NYG) | Off (0) | Off (0) | 3.0 | 3.0 |
| Houston | <input type="radio"/> | vs | @ Jacksonville | 6.5 | 6.5 | 6.5 | 6.5 |
| @ Los Angeles (LAC) | <input type="radio"/> | vs | Las Vegas | 2.0 | 1.5 | 1.0 | 1.0 |
| Pittsburgh | <input type="radio"/> | vs | @ Dallas | Off (0) | Off (0) | 13.5 | 13.5 |
| @ Arizona | <input type="radio"/> | vs | Miami | 4.0 | Off (0) | 5.0 | 5.0 |
| @ Tampa Bay | <input type="radio"/> | vs | New Orleans | Off (0) | Off (0) | 5.5 | 5.5 |
| New England | <input type="radio"/> | vs | @ New York (NYJ) | 7.0 | 7.0 | 7.0 | 7.0 |

| Pick Distribution - Week 9 | |
|---|-------------------|
| Game | Pick Distribution |
| Green Bay (-5.5) @ San Francisco | 84% 16% |
| @ Atlanta (-4.0) Denver | 61% 39% |
| Seattle (-3.0) @ Buffalo | 70% 30% |
| @ Tennessee (-5.5) Chicago | 57% 43% |
| Baltimore (-2.5) @ Indianapolis | 79% 21% |
| @ Kansas City (-10.5) Carolina | 76% 24% |
| @ Minnesota (-4.0) Detroit | 68% 32% |
| @ Washington (-3.0) New York (NYG) | 50% 50% |
| Houston (-6.5) @ Jacksonville | 65% 35% |
| @ Los Angeles (LAC) (-1.0) Las Vegas | 38% 62% |
| Pittsburgh (-13.5) @ Dallas | 90% 10% |
| @ Arizona (-5.0) Miami | 72% 28% |
| @ Tampa Bay (-5.5) New Orleans | 57% 43% |
| New England (-7.0) @ New York (NYJ) | 75% 25% |

The Dataset

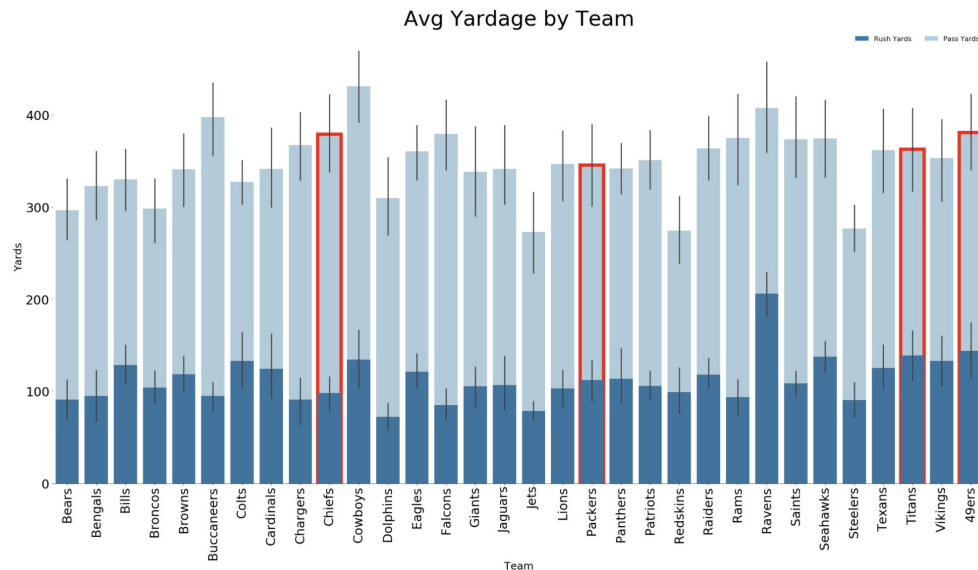
- Custom built dataset including 74 unique datapoints per team per game.
- Datapoints available from 2018 to current but could be customized to reach further back.
- Easily customizable for specific teams or league-wide information depending on specific needs.

The Data

- What makes a team successful?
- We've decided to define success as making the playoffs, so the following analysis is information from the 2019 season.
- You'll notice many of the visualizations include a red outline over four teams - these are the four teams who made it to the conference championships last year: Packers, 49ers, Chiefs, & Titans.

The Data - Yardage

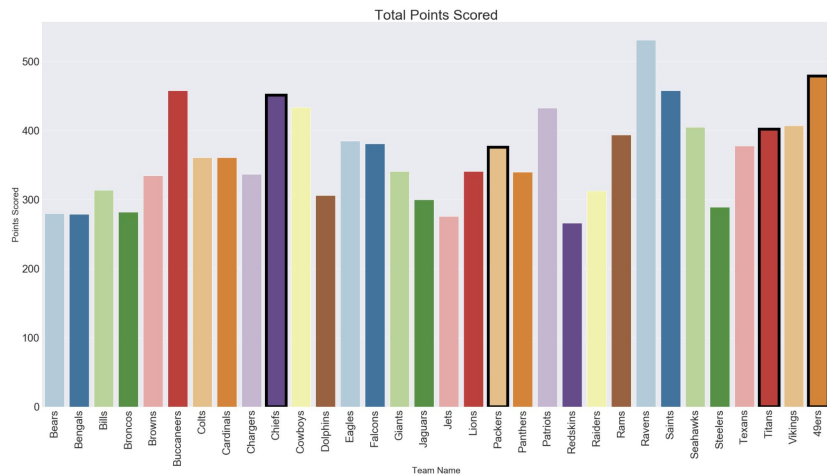
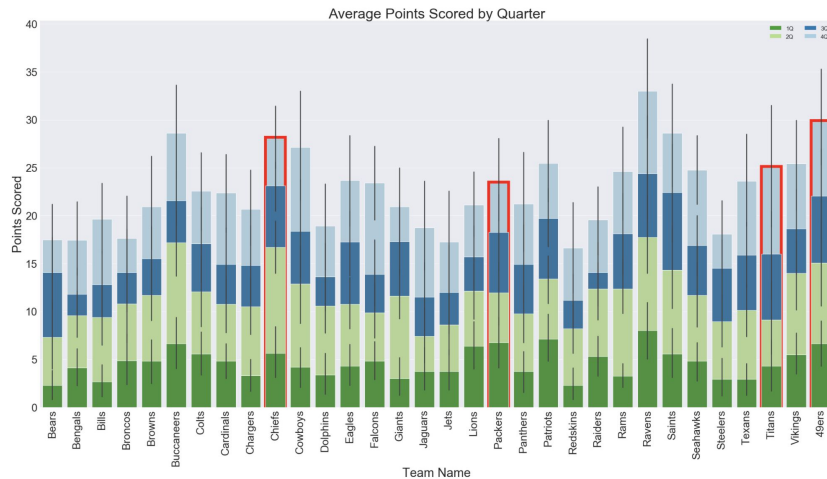
- Although average yardage didn't exactly predict success, it certainly holds a positive correlation
- Top four teams by average yardage:
 - Cowboys
 - Ravens
 - Buccaneers
 - 49ers



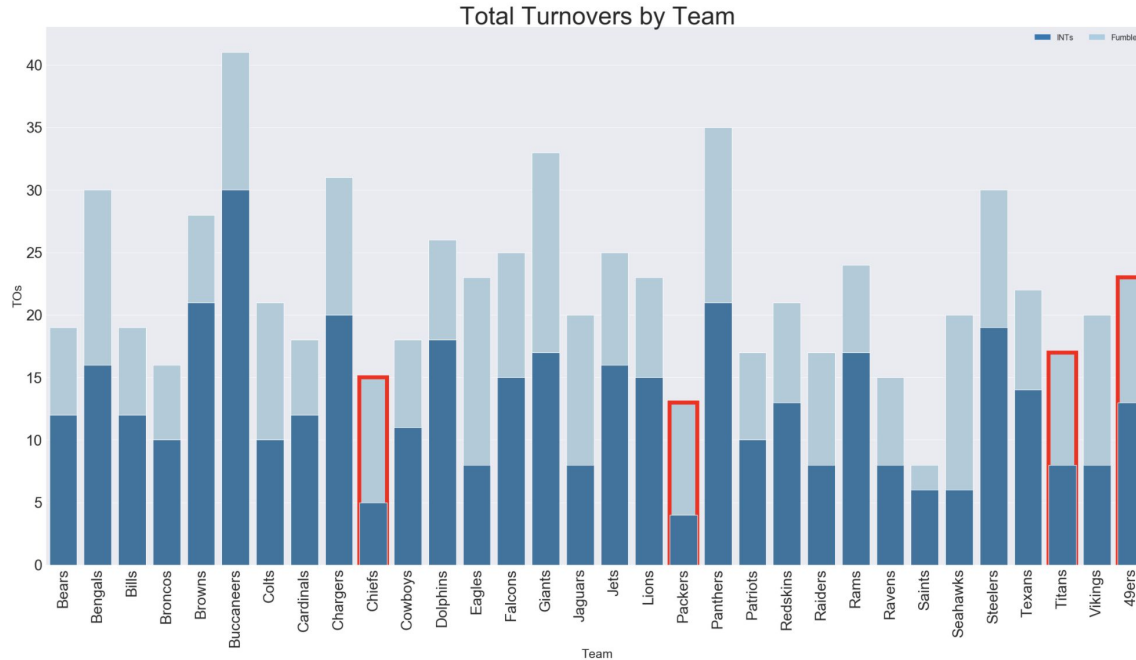
The Data - Scoring

- Much like yardage points scored didn't predict success but did hold a positive correlation

- Top teams by scoring:
 - Ravens
 - 49ers
 - Buccaneers
 - Saints



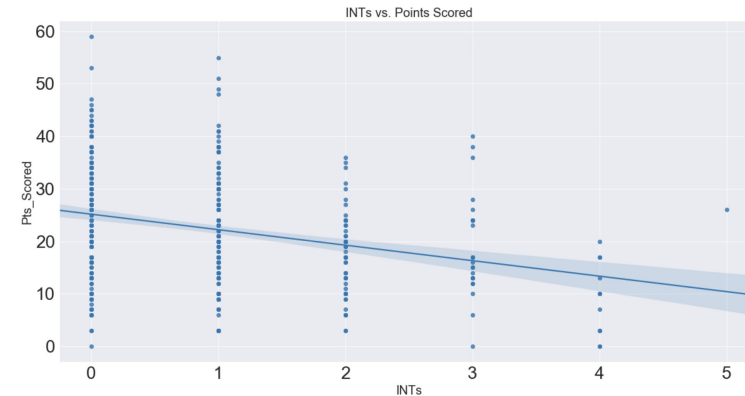
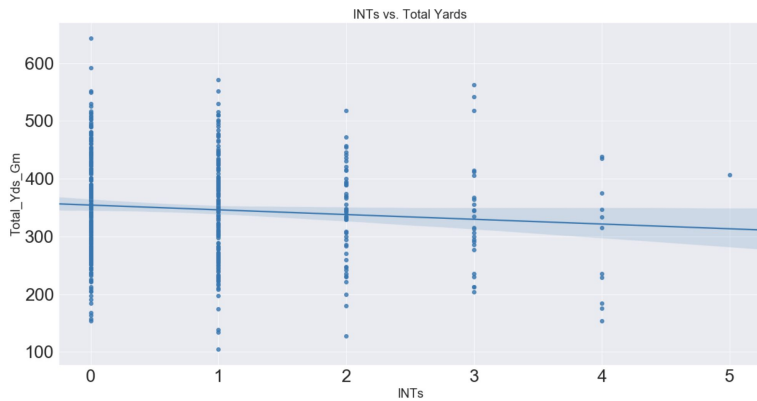
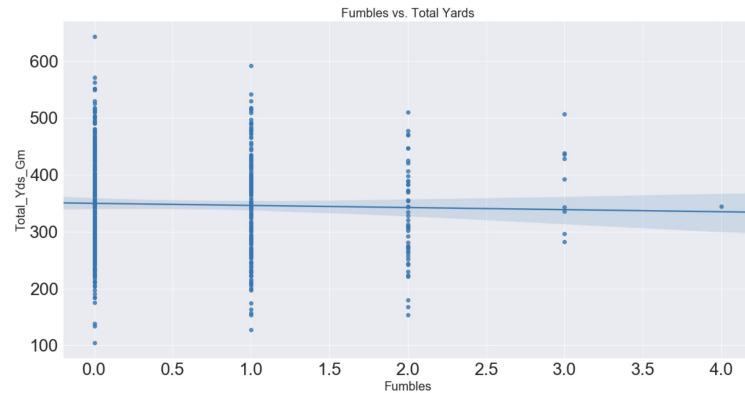
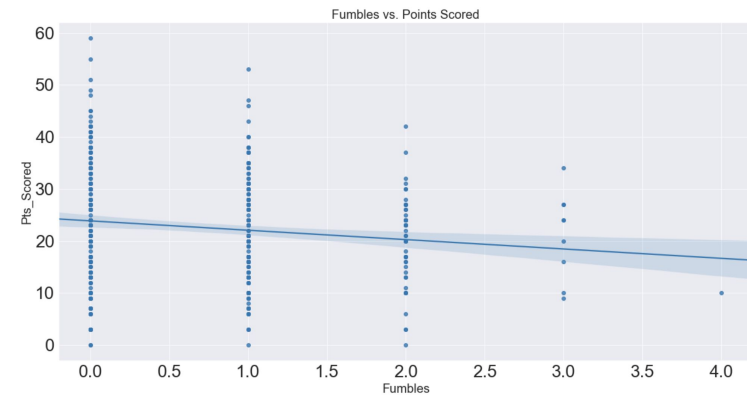
The Data - Turnovers



- Lowest total turnovers by team:

- Saints
- Packers
- Chiefs
- Ravens

The Data - Turnovers



The Data - Offensive Trends

- During the analysis we found four important trends that corresponded to winning games (85%).
 - > 28 Points Scored
 - > 376 Total Yards
 - > 25 First Downs
 - > 50% Third Down Conversion Rate
- Of the 10 teams who most often achieved these benchmarks, 7 went to the playoffs.

| | |
|------------|---|
| Saints | 6 |
| Ravens | 5 |
| Seahawks | 4 |
| Buccaneers | 4 |
| Cowboys | 4 |
| Rams | 4 |
| 49ers | 3 |
| Chiefs | 3 |
| Vikings | 2 |
| Titans | 2 |
| Lions | 2 |
| Texans | 2 |
| Eagles | 2 |
| Chargers | 2 |
| Dolphins | 2 |
| Patriots | 2 |
| Browns | 1 |
| Falcons | 1 |
| Giants | 1 |
| Raiders | 1 |
| Bengals | 1 |
| Cardinals | 1 |

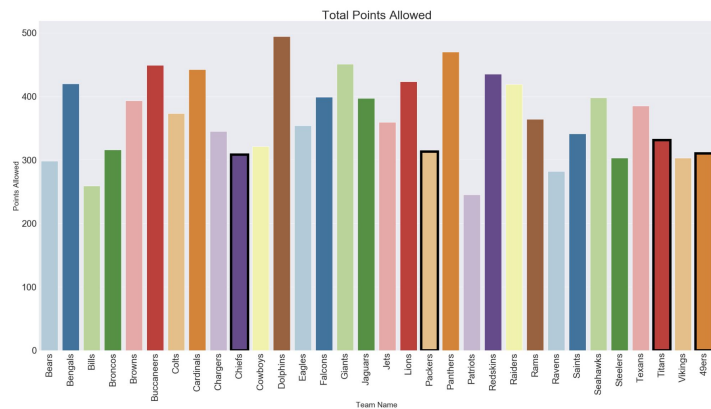
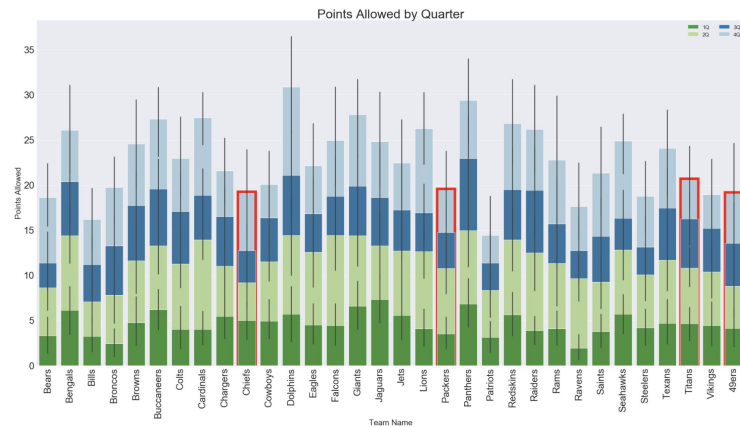
The Data - Offensive Summary

After doing an analysis of offensive statistics it appears that:

1. Yardage, TDs, and Scoring are common factors in teams that make the playoffs, but not an exact predictor
2. There seems to be some ideal number of Rush and Pass plays/percentage, somewhere near 40 & 60 percent respectively, for optimal scoring and yardage
3. Sacks and interception both correspond to an decrease in scoring and total yardage, while fumbles only show a negative correlation with scoring but not total yardage.
4. Neither number of penalties nor penalty yards seem to affect yardage or scoring
5. Turnovers do correspond with teams making the playoffs (teams making the playoffs tend to have less).
6. Reaching a minimum of 25 first downs, 28 points scored, 50% third down conversion rate, and 376 yards of offense are reasonable benchmarks which correlate with winning games

The Data - Points Allowed

- Least points allowed by team:
 - Patriots
 - Bills
 - Ravens
 - Bears

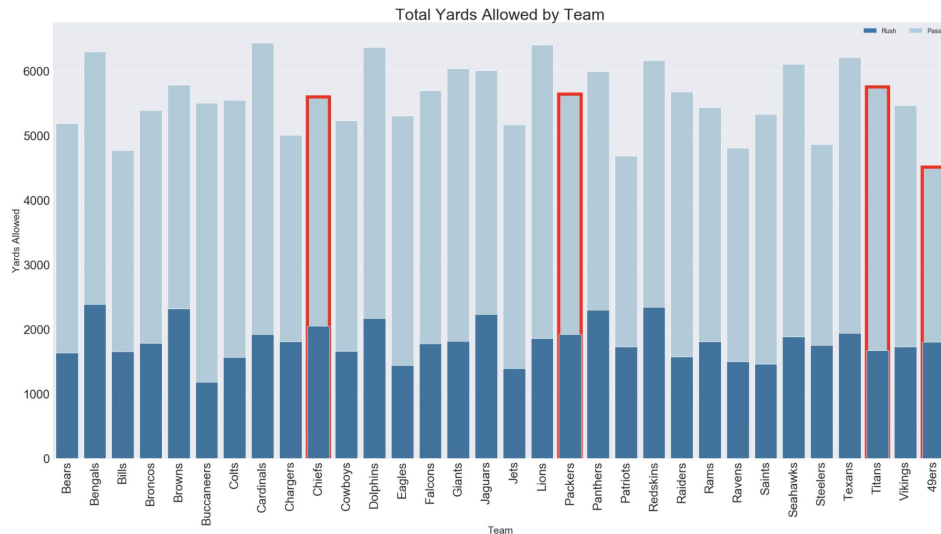


The Data - Yards Allowed

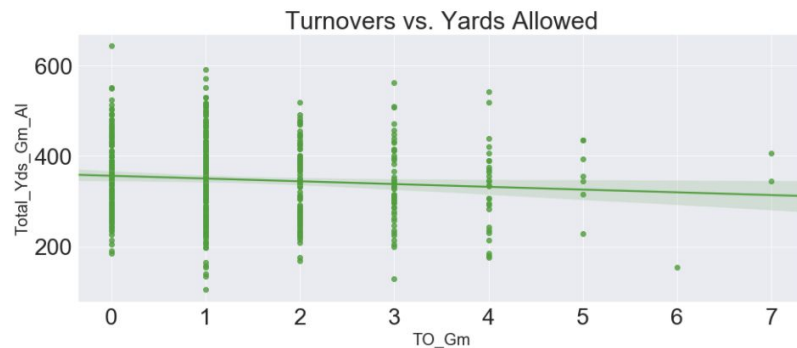
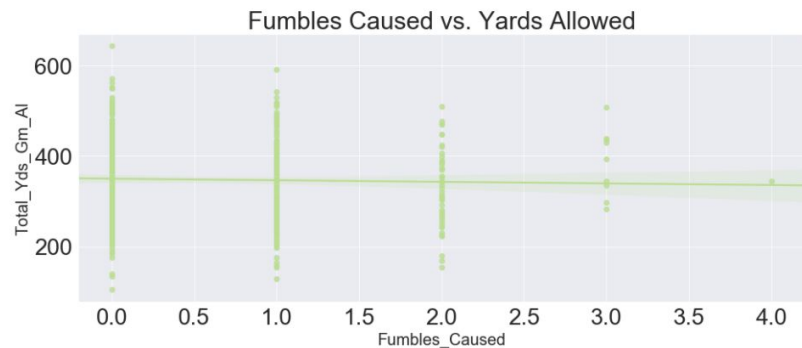
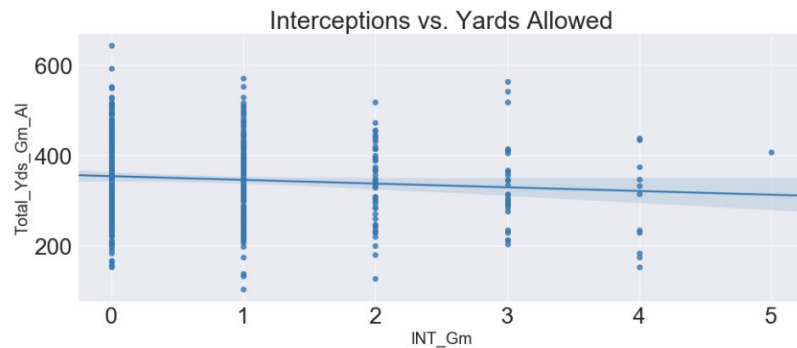
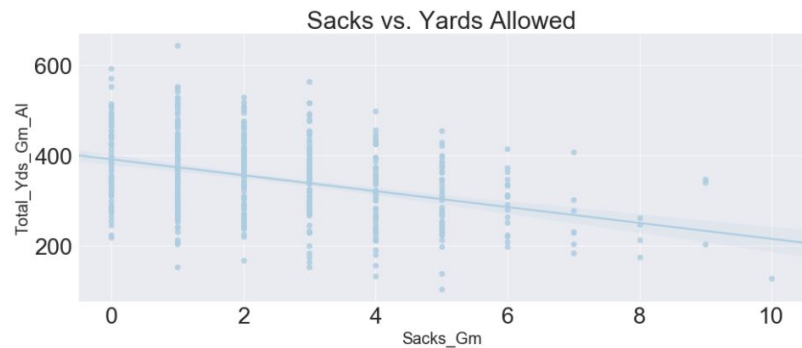
- Least points allowed by team:

- 49ers
- Patriots
- Bills
- Ravens

- Thus far we continue to see a similar trend with common defensive statistics. Not perfect predictors alone but positive correlations exist.



The Data - Turnovers & Sacks



The Data - Defensive Trends

- During the analysis we found four important defensive trends that corresponded to winning games (90%).
 - < 18 Points Allowed
 - > 3 Sacks
- Of the 10 teams who most often achieved these benchmarks, 6 went to the playoffs.

| | |
|------------|---|
| Rams | 7 |
| Patriots | 7 |
| 49ers | 7 |
| Vikings | 6 |
| Steelers | 6 |
| Packers | 6 |
| Bills | 6 |
| Jaguars | 5 |
| Colts | 5 |
| Eagles | 5 |
| Titans | 5 |
| Ravens | 4 |
| Chiefs | 4 |
| Cowboys | 4 |
| Broncos | 3 |
| Falcons | 3 |
| Bengals | 3 |
| Texans | 3 |
| Bears | 3 |
| Chargers | 3 |
| Buccaneers | 2 |
| Redskins | 2 |
| Saints | 2 |
| Seahawks | 2 |
| Browns | 2 |
| Raiders | 2 |
| Jets | 2 |
| Dolphins | 1 |
| Giants | 1 |
| Panthers | 1 |
| Cardinals | 1 |

The Data - Defensive Summary

After performing an analysis of the defensive statistics we found:

1. Points allowed appears to have a much stronger correlation with success than yardage allowed (which didn't seem to matter much at all)
2. Turnovers did appear to have a negative correlation with both points scored and yardage allowed.
3. Sacks had a strong negative correlation with both points scored and yardage allowed.
4. Like offense, penalties seemed to have very little effect on success
5. Defenses that held opponents to 18 points or less and leveled at least 3 sacks won 90% of the time.

The Data - Special Teams & Misc.

- We did perform analysis on special teams and other miscellaneous information however in summary we did not find anything highly significant
- Please see the analysis notebook for more visualizations regarding this.

The Data - Conclusions

- The factors leading to “success” are somewhat elusive.
- As is the case in so many statistical problems, this analysis proves that even a long-time informed knowledge of football isn't great at dictating what does and doesn't matter in regards to performance

Our Model

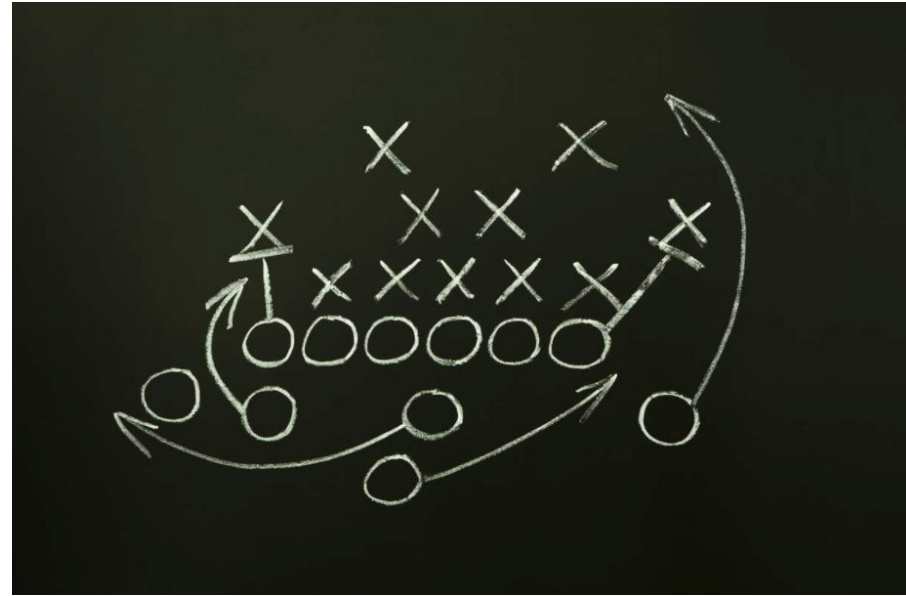
- The original model run on 2019 data had 74% accuracy, a 24% improvement over random guessing.
- Any football fan knows these things change week to week, so our model updates weekly and has demonstrated between 74%-78% accuracy
- The model inputs data from the current and previous years and updates the features used custom to the specific dataset

Live Predictions

- All you'll do is input the home and away team, the year, and the week of the season and you'll get a win probability for the home team.
- Let's try it out!

Limitations & Improvements

- Although the data used in this model is extensive, it could be improved by adding:
 - Defensive and offensive scheme stats
 - Player specific data
 - Coach specific data
 - Injury data
- It would be prudent that would create a model that would spit out points scored for betters who are using the spread.



Future Projects

- Improve the current model
- Tailor current model specifically to betting
- Apply current model to college football

**Thank You &
Happy Betting**

References

1. <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2018/09/10/show-me-the-money-sports-betting-off-and-running>