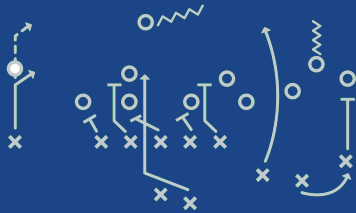# A Better Way to Evaluate a Football Team's Performance

By Sam Ouimet

Goal

Use regression analysis to identify what team statistics contribute to most to most and least to a teams win total, and then predict what a team's current win total "should" be based on in-season and historical team based statistics.

What the product is:

- A tool for NFL team personnel to leverage in order to quantitatively identify WHY they are winning or losing, rather than leaving it up to gut feel or hours reviewing tape.

- A tool for bettors to identify under and over performing teams in order to profit from reversion.

Data
(2002-2018)

NFL.com

- Standard offensive and defensive statistics including:
  - Average points per game (PTS/G)
  - Average time of play per game (TOP/G)
  - Average rushing attempts per game (RUSH_ATT/G)

Footballoutsiders.com

- More advanced and propriety team based metrics including:
  - Defense-adjusted Value Over Average (DVOA)
  - Turnovers per play (TO/P)
  - Average number of 1st downs per game (1ST/G)

First Look at the Data

Cumulative Regular Season Wins (2002-2018)
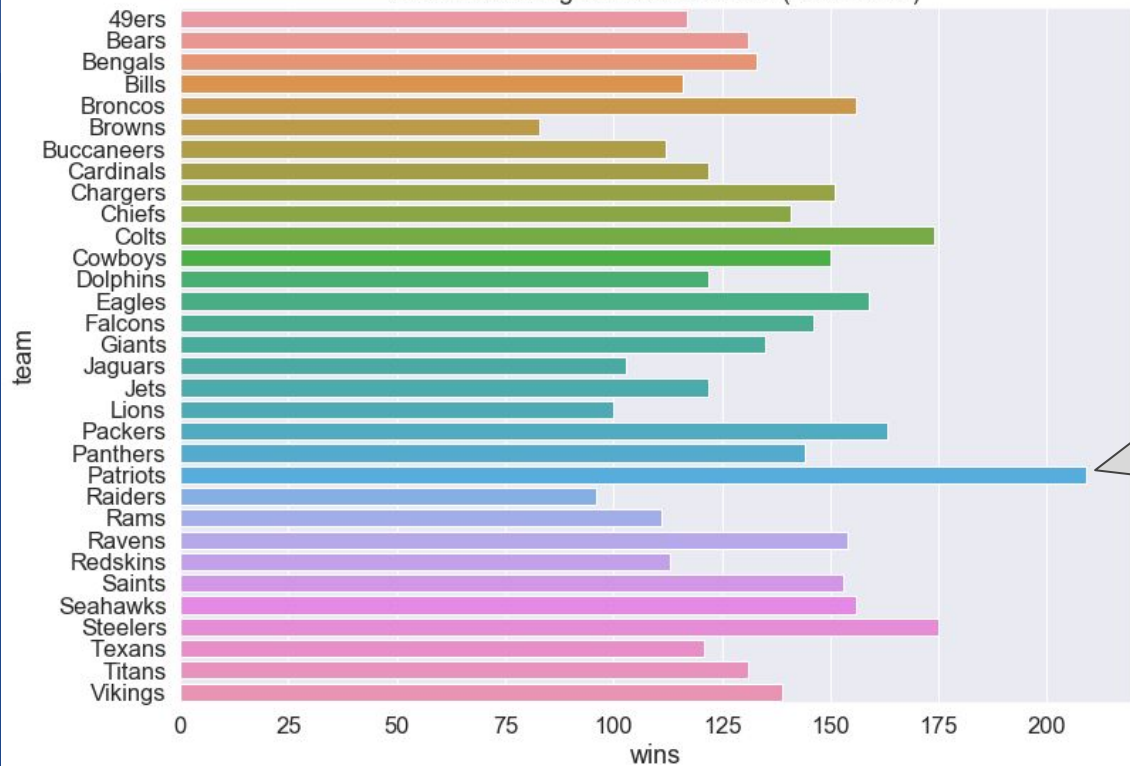
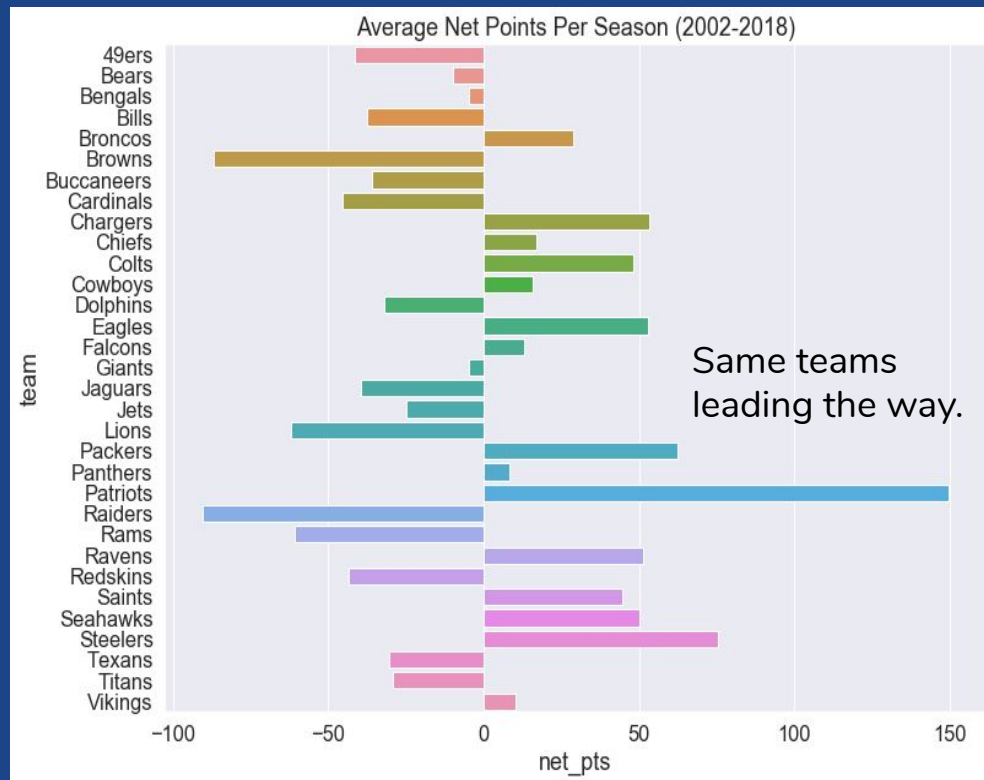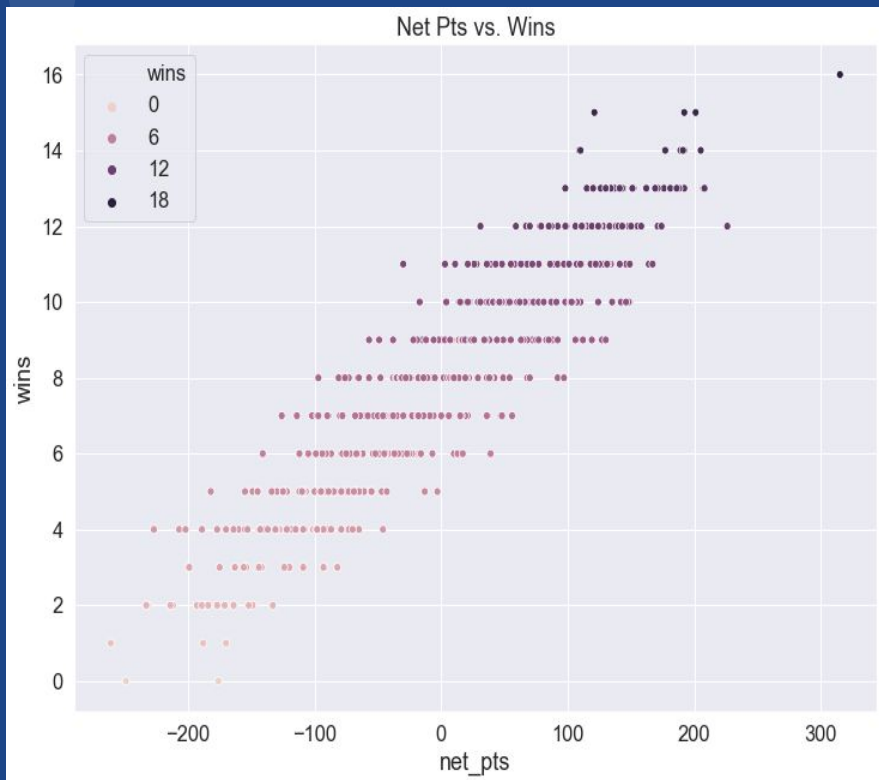Patriots are clearly the best team since 2002 with 209 wins.

Average = 135 wins

Worst = Browns, 83 wins

But why?

A Closer Look

Net Points = total points scored - total points allowed


Same teams leading the way.

Model Building

- ○ **Can't rely just on net wins - it is not uncommon for games to be decided by a single point**

- ○ **Incorporated statistics from three core aspects the game:**
    - ■ Offense, defense & special teams

- ○ Engineered interaction features including:
    - ■ Points per minute with offense on the field to measure offensive potency
    - ■ Sack to tackle ratio to measure aggressiveness and effectiveness of a defense
    - ■ 1st downs/g multiplied by 3rd down percentage to show ability to continue drives and not give the ball to the other team

Results

- ○ **Cross validation (KFold) revealed the Ridge regression model provided the highest score on validation data with all 54 features. (r^2 = 0.847)**
- ○ **After tuning the model more and finding the best alpha, r^2 rose to 0.87.**

- ○ **Final Test Results:**
  - ■ **r^2 = 0.797**
  - ■ **MAE = 1.12 wins**

Predicted vs. Observed Win Totals
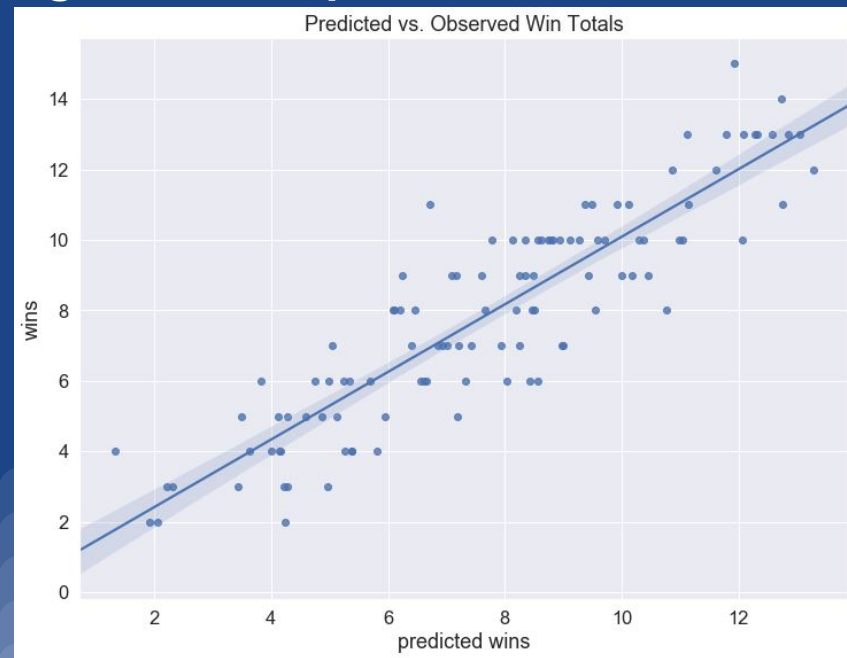
How this can help today!

Contributes most to wins	Contributes least to wins
Net Points (0.705)	Total points allowed (-0.899)
Points per minute offense (0.283)	4th down attempts (-0.299)
Yards per drive (0.241)	Turnovers per drive (-0.148)

(numbers represent model coefficients after standardizing)

NFL Personnel:

- Do not neglect 1 side of the ball (offense or defense)
- Sustained success is achieved through the ability to outscore opponents with a high margin
- Focus on ball security - turnovers are win killers

Bettors:

- Bet **against** a team with an actual win total more than the MAE above predicted total
- Bet **on** a team with an actual win total more than the MAE less predicted total

Future Work

1. Expand analysis to predict how a team should perform the following year
2. Scrape more data (player stats & individual game data)
3. Research more NFL trends and metrics
4. Injuries, personnel changes, team ownership, team valuations, weather and more

Thank you for listening!

Go Giants!