

This Too Shall Pass: Predicting Offensive Play-Calling in the NFL



Metis Classification Module Presentation
Andrei Levin • 8/06/21

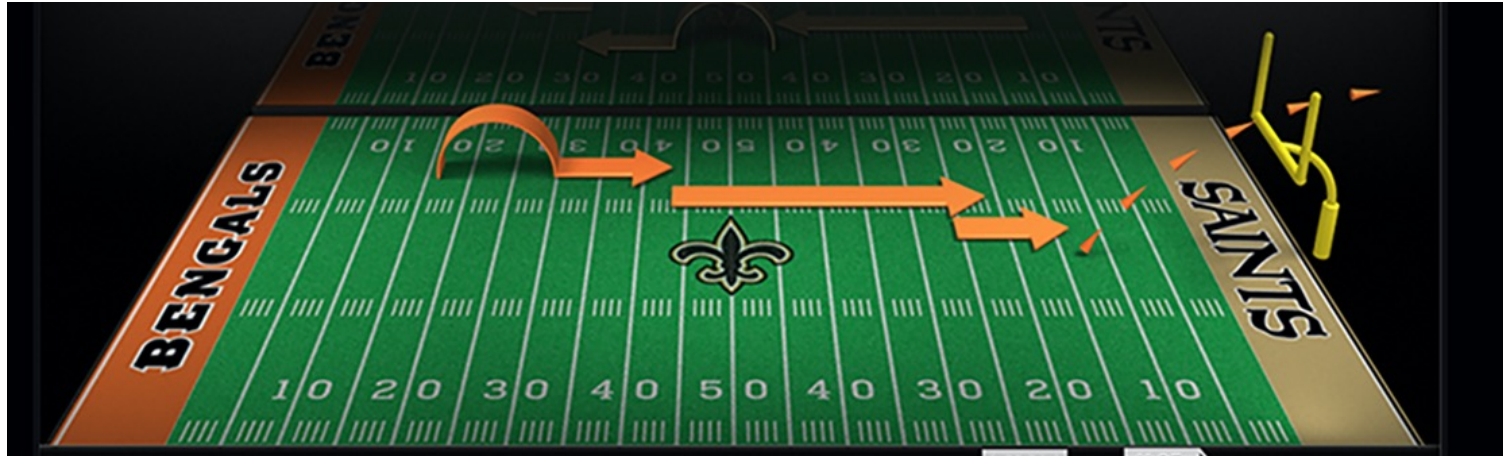
Super Bowl XLIX: Patriots-Seahawks



Super Bowl XLIX: Patriots-Seahawks



Project Goal: Predicting Run vs Pass Plays



Why

- **Defense** (Anticipatory): Guess in advance what opponent will do
- **Offense** (Introspective): Increase your own unpredictability

Dataset

- **Observations:** all NFL plays for the 2017 season (~32,000 rows)
- **Target:** Pass attempt or Run attempt
- **Features:** Down, Distance, Time, Field Position, etc. (~15 columns)

Project Goal: Predicting Run vs Pass Plays

Prediction Metric

- **Accuracy:** The most boring of all metrics 🤔
- Baseline is **60.4%** (just naively predict 'Pass' on every play)



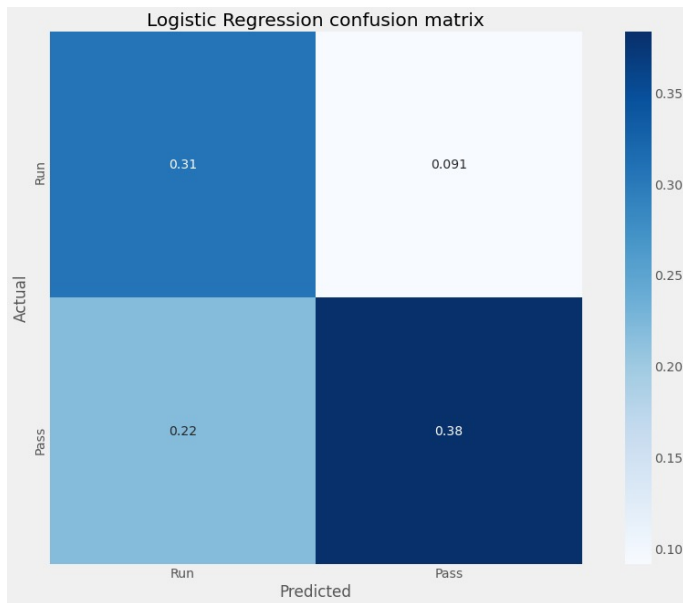
Run



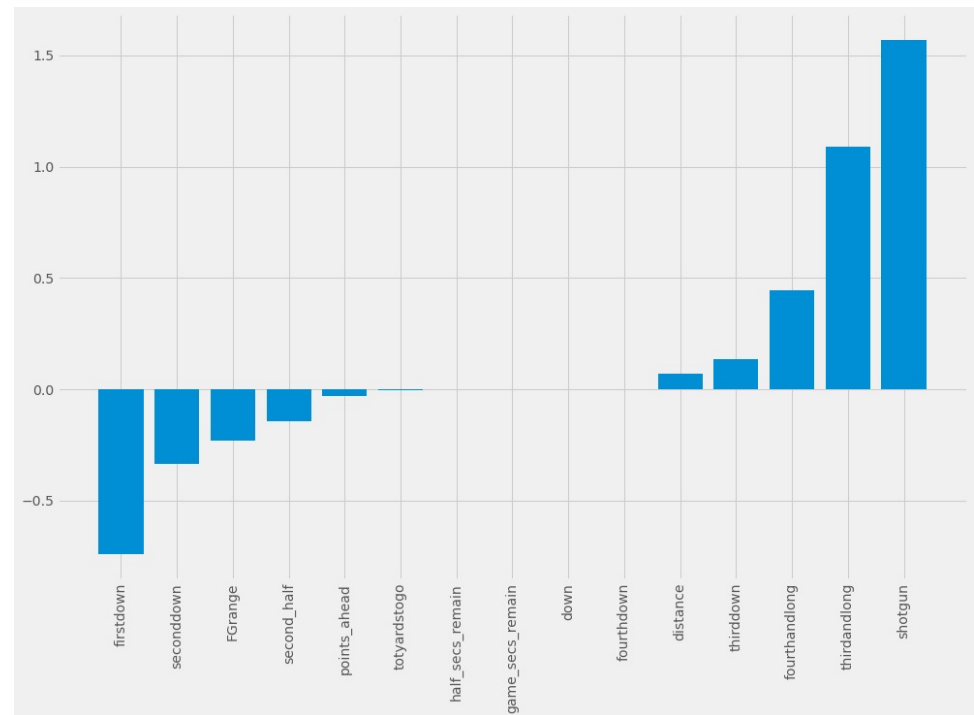
Pass

Logistic Regression Classifier

Accuracy: **68.5%**



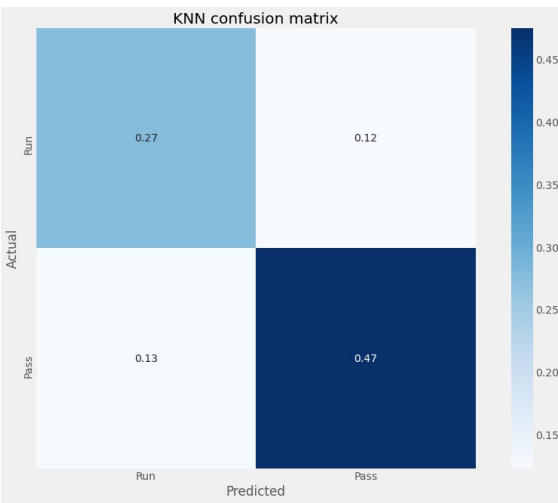
Feature Weights (LASSO)



(Baseline Accuracy: **60.4%**)

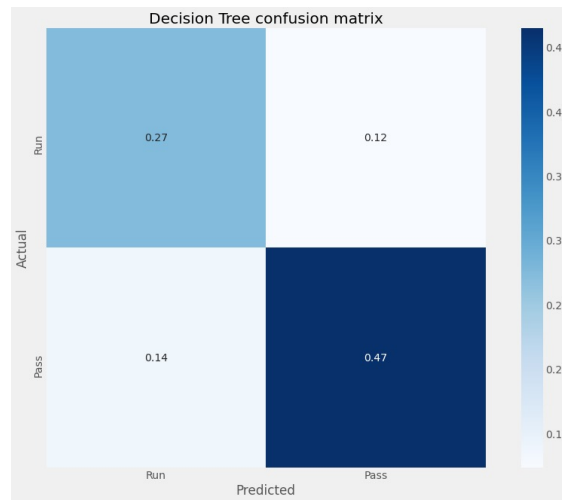
Logistic Regression Classifier

K-Nearest Neighbors



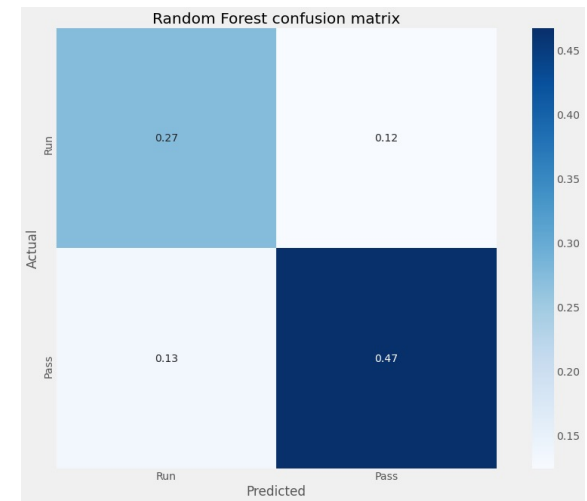
Accuracy: **73.2%**

Decision Tree



Accuracy: **73.8%**

Random Forest

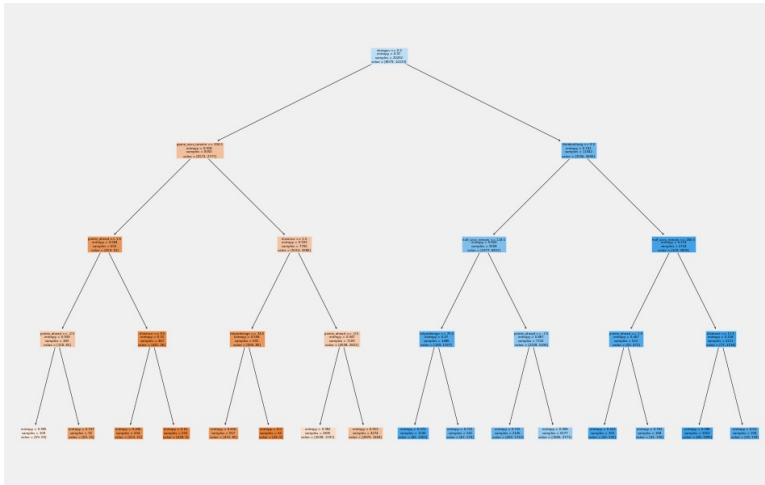


Accuracy: **73.9%**

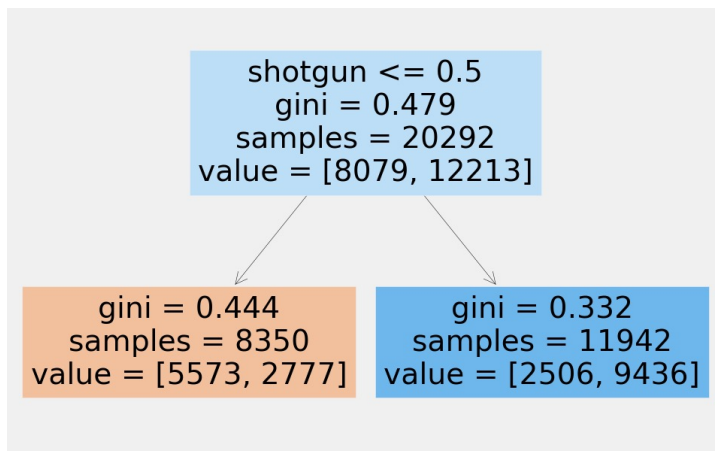
(Baseline Accuracy: **60.4%**)

What Is Going On?

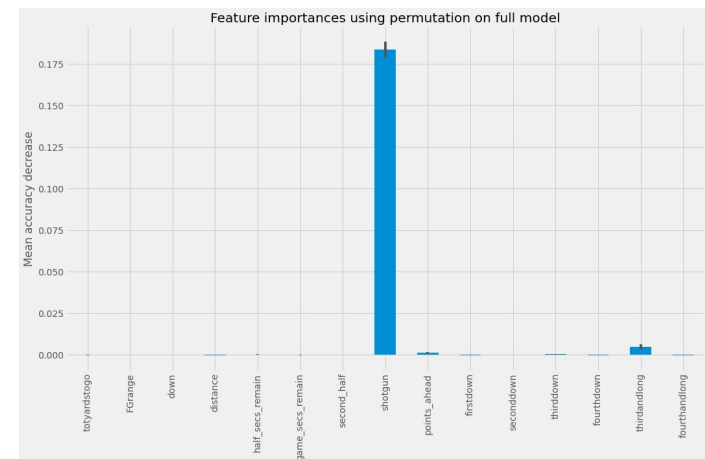
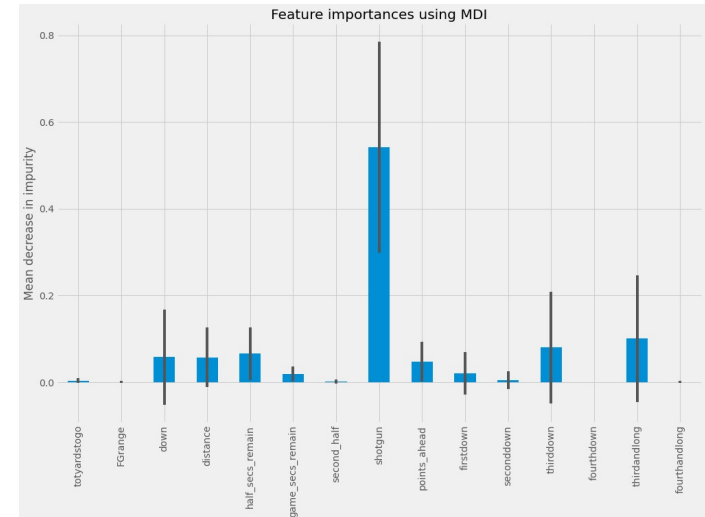
Decision Tree, max_depth = 4



Decision Tree, max_depth = 1



Random Forest: Feature Weights

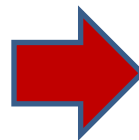


A New Classifier is Born

	Shotgun Formation or Not Shotgun Formation
	Literally any other feature

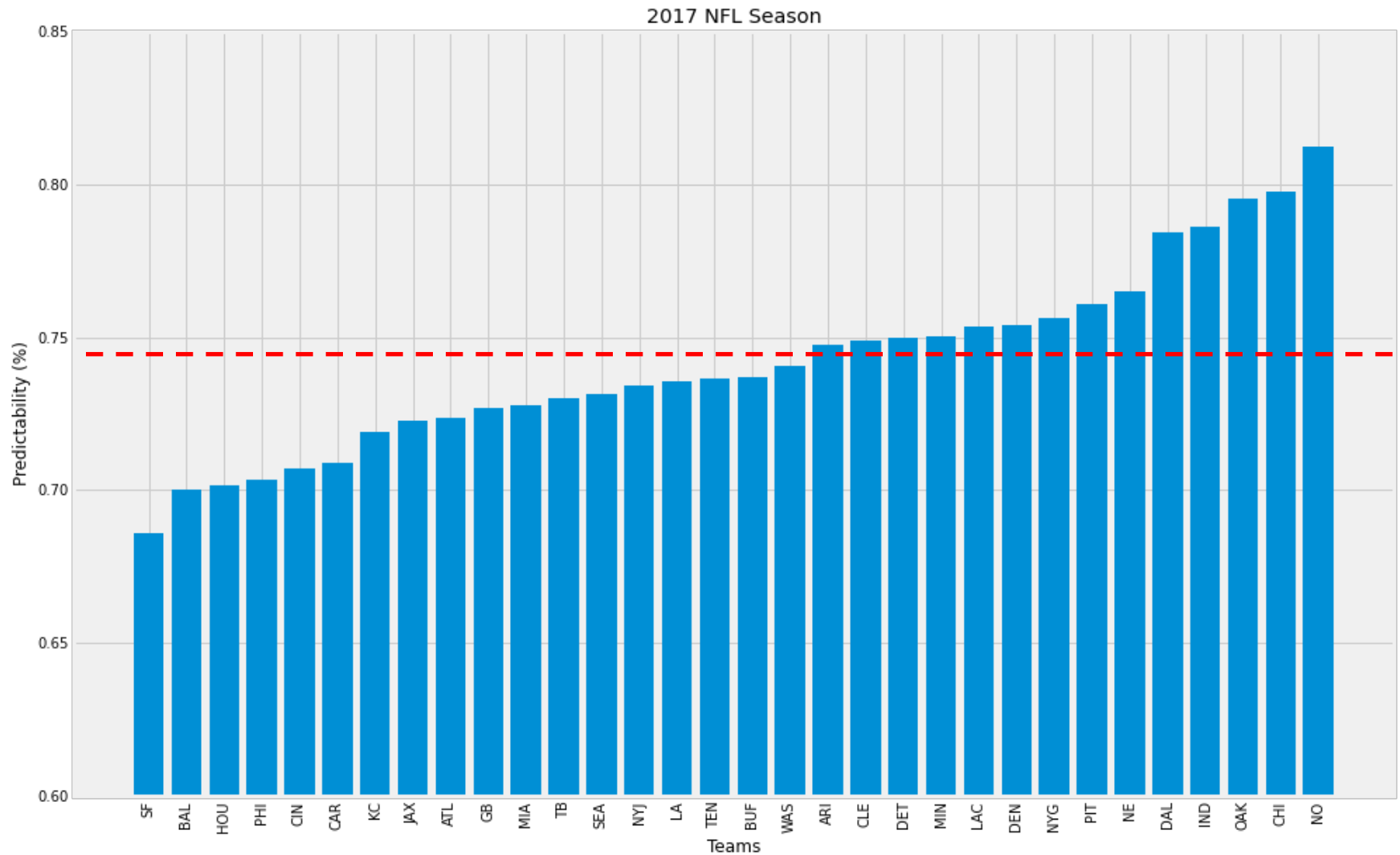
Naive Belichick Classifier:

- **If Shotgun:** Predict Pass
- **If Not Shotgun:** Predict Run

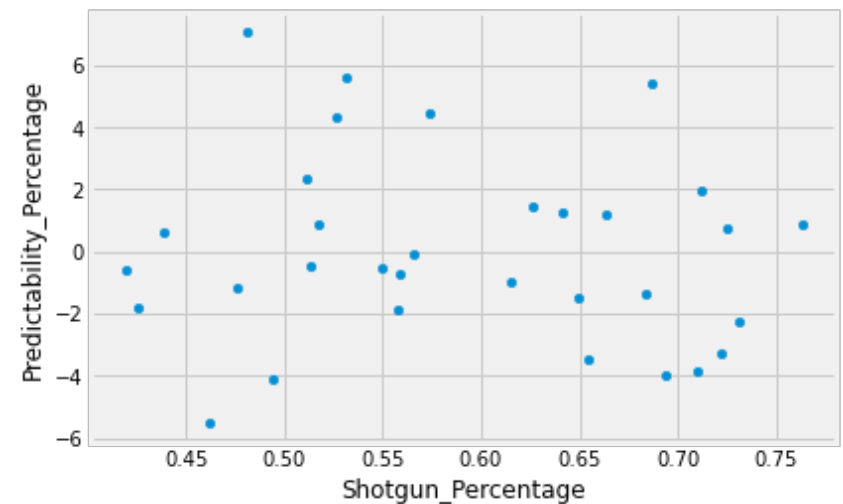
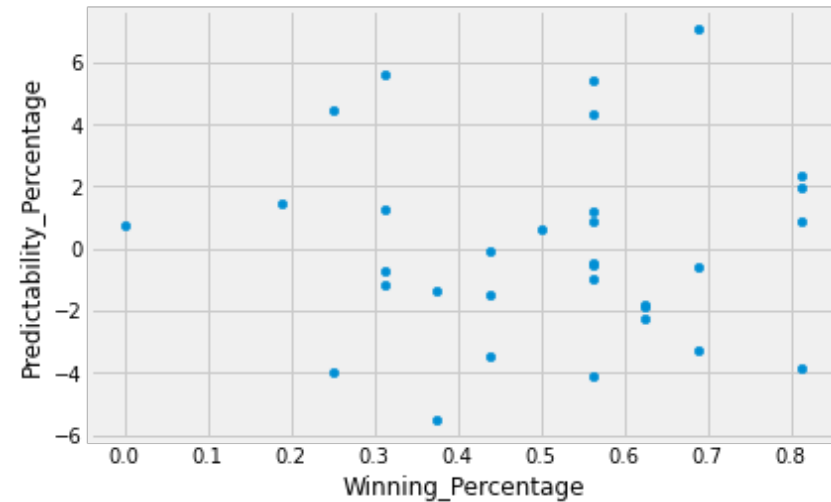
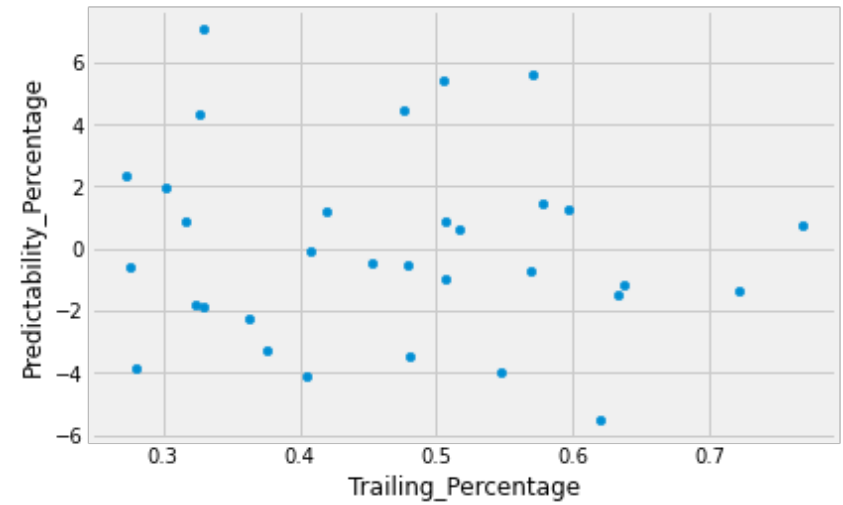
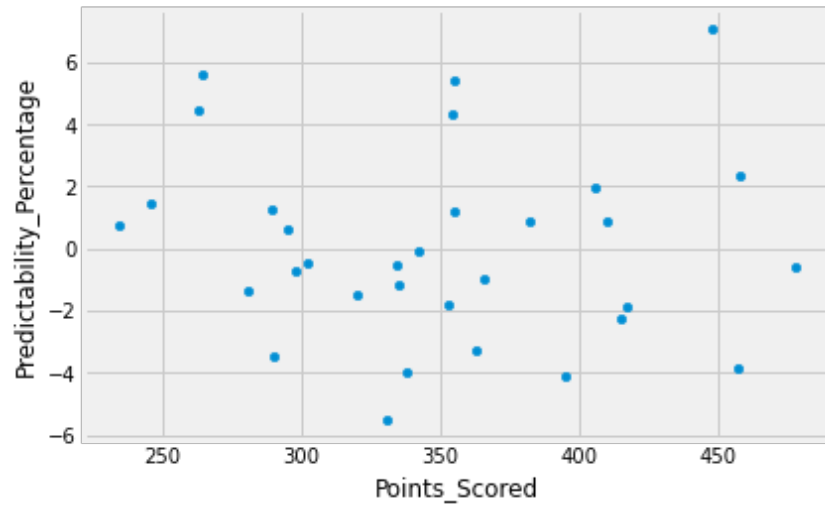


Accuracy: 74.2%
(Full Dataset)

Team Predictability Scores



Team Predictability Scores



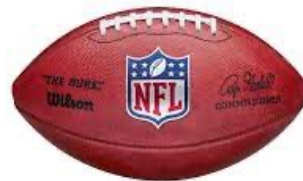
How Do We Beat the Naive Belichick Classifier?

Modeling

- **Two separate models:** one each for shotgun and not shotgun
- **Leverage probas:** adjust thresholds, roc_auc curves
- **Train new models:** ensembles, boosting, neural nets

Data

- **Feature engineering:** split shotgun feature into sub-categories
- **New features:** personnel, formation, previous history, matchups...



Thank You!



SIPRESS
"I no longer can tell the difference between what's
real football and what's fantasy football."