

# Predicting Offensive Play Types in the NFL

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# Overview

Predicting  
Offensive Play  
Types in the  
NFL

Peter Lee,  
Ryan Chen,  
and Vihan  
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# Introduction

# Related Work & Opportunities for Improvement

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- Related Work
  - Burton & Dickey 2015
  - Booz Allen Hamilton 2016
- Opportunities for Improvement
  - Personnel groupings on the field
  - Player quality

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# Sources

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- Football Outsiders play-by-play and snap counts data
- Madden ratings from [maddenratings.weebly.com](http://maddenratings.weebly.com)

# Raw Features

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- 1 Score Difference
- 2 Current Quarter
- 3 Time Left in Quarter
- 4 Current Down
- 5 Distance to First Down
- 6 Count of Offensive Players per Position
- 7 Count of Defensive Players per Position
- 8 Formation (e.g. shotgun, no huddle)
- 9 Indicator of an offensive player out of position
- 10 Turnovers
- 11 Indicator of whether offense is at home
- 12 Indicator of whether a QB run is a scramble

# Derived Features

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- 13** Proportion of pass plays called over week, season, last 50 plays
- 14** Proportion of pass plays faced by defense over week, season, last 50 plays
- 15** Indicator of score difference greater than 7
- 16** Quarterback pass completion rate over week, season, last 25 plays
- 17** Weighted Madden rating of each offensive/defensive position group.



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# Models

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- Logistic Regression
- Linear Discriminant Analysis
- Gradient Boosting
- Random Forest
- Mixed Model

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# Prediction Accuracy

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<b>Model</b>	<b>Training Accuracy</b>	<b>Test Accuracy</b>
Logistic Regression	0.738	0.737
Linear Discriminant Analysis	0.731	0.727
Random Forest	0.758	0.751
Gradient Boosting Machine	0.764	0.757
<b>Mixed</b>	<b>0.763</b>	<b>0.759</b>

# Prediction Accuracy by Down

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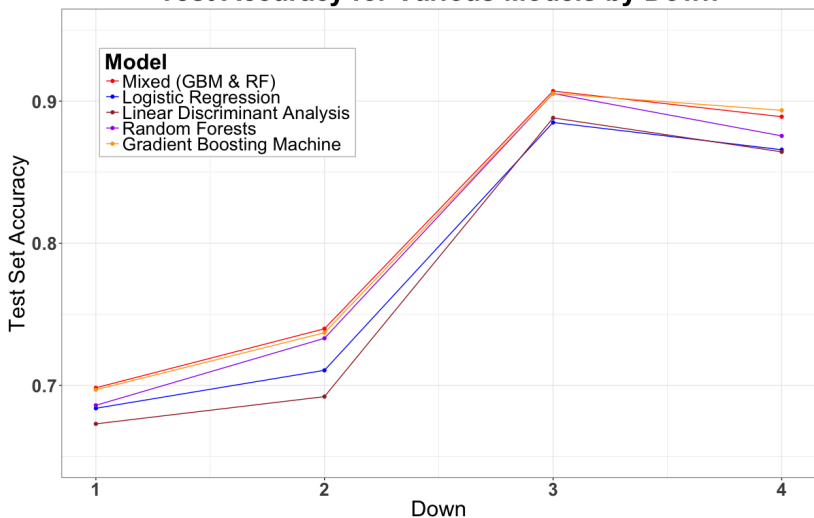
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## Test Accuracy for Various Models by Down



# Prediction Accuracy by Quarter

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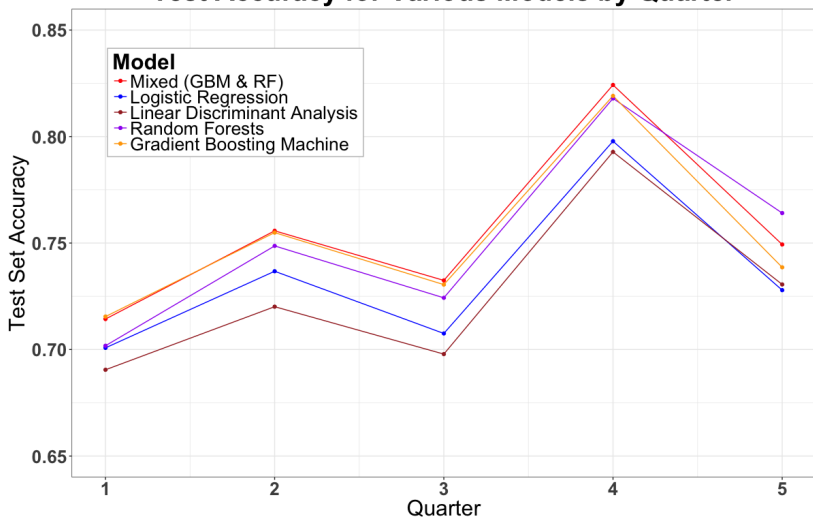
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## Test Accuracy for Various Models by Quarter



# Best & Worst Predicted Games

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<b>Year</b>	<b>Week</b>	<b>Team</b>	<b>Accuracy</b>
2013	11	Tennessee	0.946
2013	8	Tampa Bay	0.943
2014	7	Dallas	0.934
⋮	⋮	⋮	⋮
2012	12	Philadelphia	0.551
2013	14	San Francisco	0.522
2013	6	Denver	0.472

# Best & Worst Predicted Team-Seasons

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<b>Year</b>	<b>Offense</b>	<b>Accuracy</b>
2014	Dallas	0.860
2014	San Diego	0.830
2012	Arizona	0.823
⋮	⋮	⋮
2014	Seattle	0.685
2013	Seattle	0.680
2014	Miami	0.676



# Confusion Matrix

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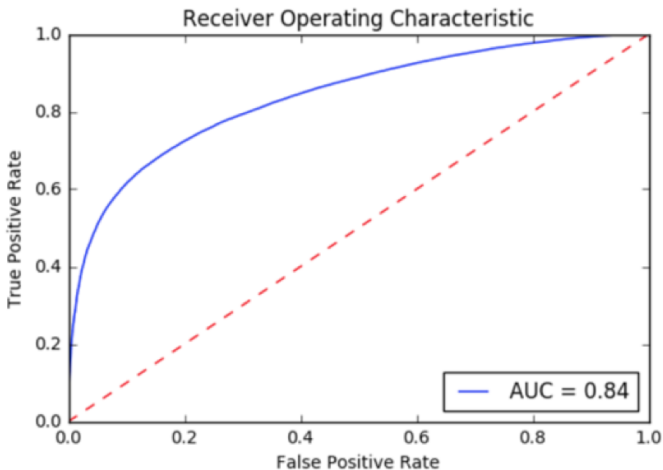
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		Predicted		Total
		Run	Pass	
Actual	Run	28,174	10,598	38,772
	Pass	13,937	49,044	62,981
Total		42,111	59,642	

# Precision and Test Recall & ROC Curve

Play Type	Precision	Test Recall
Run	0.670	0.727
Pass	0.822	0.779



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## Conclusions & Future Work

# Conclusions & Future Work

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- Conclusions
- Future Work
  - Play direction
  - Specific play types
  - Features: weather and timeouts
  - Web/mobile application for real-time prediction

# Thank you!

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## Questions?

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