



# **Predicting Future NFL Player Performance and Team Success: A Data-Driven Study in Fantasy Football**

David Weir  
Balakrishna Bhoomani  
Sai Gopal Mediseti  
Data 606 Group 1



# Team Roles

David

- Background Research, Gathering Datasets, Data Analysis

Sai

- Data Cleansing, Model Training, Research Question 1

Balakrishna

- Data Visualization, Research Question 2

\*Everybody stepped in to each role a bit as the project progressed, excellent teamwork between teammates



# Background



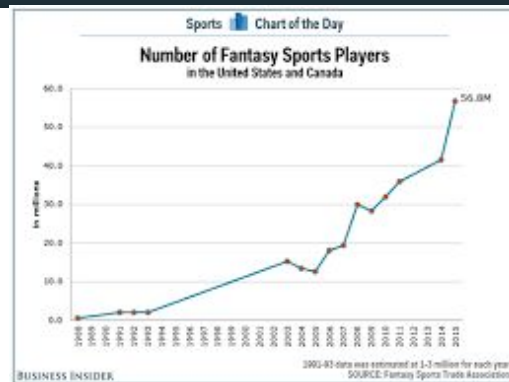
# Setting the Stage

- A new frontier—the world of fantasy football—emerges as sports betting becomes legal in more and more states.
- Casual fans and armchair quarterbacks can become master strategists, building dream teams out of National Football League players.
- The NFL offers a wealth of opportunities and interest, especially with online sports betting expected to soar to an astounding \$9.65 billion annual revenue by 2024.
- Predicting player performance and team success is crucial in this dynamic arena.



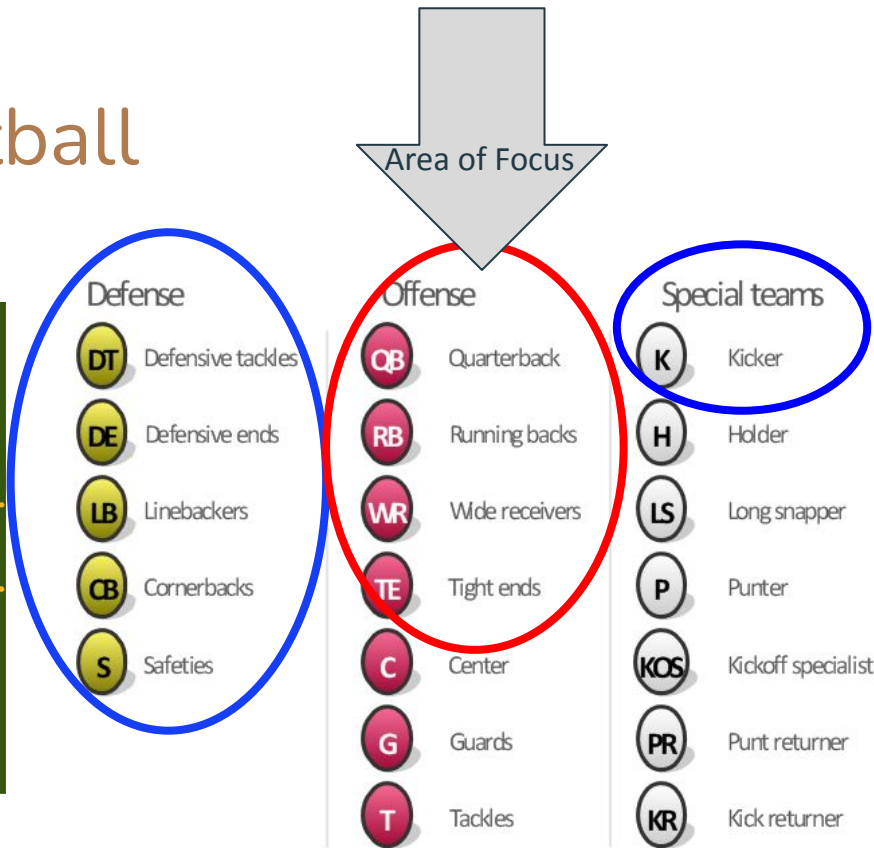
# Implications

- Considering the rapid growth and expansion of the sports gambling industry, more studies to be done into sports betting to examine the efficacy and further assist in educating the population about how they can best enjoy this new entertainment avenue.
- The patterns, trends, and analyses established in this paper can greatly affect strategies used by new and seasoned fantasy football managers alike, as managers are constantly trying to establish a competitive edge over one another.
- Given that the scoring methods for traditional football and fantasy football are inherently different, combining the two scoring standards has seldom been done. This project aims to do exactly that in an attempt to establish new patterns and trends for predicting a team's on-field performance.



PLAYERS	QUEUE	TEAM	CHAT
ALL 0/25	QB 0/1	RB 0/2	WR 0/3
DRAFT 1	C. McCaffrey RB - CAR	ADP 1.6	PTS 363.3
DRAFT 2	D. Cook RB - MIN	ADP 2.9	PTS 326.3
DRAFT 3	A. Kamara RB - NO	ADP 3.4	PTS 317.7
DRAFT 4	D. Henry RB - TEN	ADP 4.8	PTS 277.1
DRAFT 5	S. Barkley RB - NYG	ADP 5.5	PTS 277.8
DRAFT 6	J. Taylor RB - IND	ADP 6.8	PTS 316.4
DRAFT 7	D. Adams WR - GB	ADP 6.9	PTS 302.6
DRAFT 8	N. Chubb RB - CLE	ADP 8.3	PTS 278.9
DRAFT 9	T. Hill WR - KC	ADP 9.1	PTS 324.3
DRAFT 10	E. Elliott RB - DAL	ADP 10.4	PTS 270.9
DRAFT 11	T. Kelce	ADP	PTS

# NFL vs. Fantasy Football



# Differing Scoring Methods

San Francisco 49ers



22

12-5

Final/OT

	1	2	3	4	OT	T
SF	0	10	0	9	3	22
KC	0	3	10	6	6	25

25



Kansas City Chiefs

11-6

## San Francisco Passing

	C/ATT	YDS	AVG	TD	INT	SACKS	QBR	RTG
Brock Purdy	23/38	255	6.7	1	0	1-4	69.8	89.3
Jauan Jennings	1/1	21	21.0	1	0	0-0	99.2	158.3
TEAM	24/39	272	7.1	2	0	1-4	--	99.9

## San Francisco Rushing

	CAR	YDS	AVG	TD	LONG
Christian McCaffrey	22	80	3.6	0	11
Brock Purdy	3	12	4.0	0	9
Elijah Mitchell	2	8	4.0	0	7
Deebo Samuel	3	8	2.7	0	9
Kyle Juszczyk	1	2	2.0	0	2
TEAM	31	110	3.5	0	11

## San Francisco Receiving

	REC	YDS	AVG	TD	LONG	TGTS
Christian McCaffrey	8	80	10.0	1	24	8
Brandon Aiyuk	3	49	16.3	0	20	6
Jauan Jennings	4	42	10.5	1	23	5
Deebo Samuel	3	33	11.0	0	12	11
Kyle Juszczyk	2	31	15.5	0	18	2
Ray-Ray McCloud III	1	19	19.0	0	19	1
Chris Conley	1	18	18.0	0	18	1
George Kittle	2	4	2.0	0	4	3
TEAM	24	276	11.5	2	24	37

## Kansas City Passing

	C/ATT	YDS	AVG	TD	INT	SACKS	QBR	RTG
Patrick Mahomes	34/46	333	7.2	2	1	3-8	75.8	99.3
TEAM	34/46	325	7.2	2	1	3-8	--	99.3

## Kansas City Rushing

	CAR	YDS	AVG	TD	LONG
Patrick Mahomes	9	66	7.3	0	22
Isiah Pacheco	18	59	3.3	0	10
Rashee Rice	2	5	2.5	0	3
Clyde Edwards-Helaire	1	0	0.0	0	0
TEAM	30	130	4.3	0	22

## Kansas City Receiving

	REC	YDS	AVG	TD	LONG	TGTS
Travis Kelce	9	93	10.3	0	22	10
Mecole Hardman	3	57	19.0	1	52	3
Justin Watson	3	54	18.0	0	25	5
Rashee Rice	6	39	6.5	0	13	8
Isiah Pacheco	6	33	5.5	0	8	6
Noah Gray	2	22	11.0	0	12	2
Marquez Valdes-Scantling	3	20	6.7	1	16	5
Jerick McKinnon	2	15	7.5	0	8	2
Richie James	0	0	0.0	0	0	1
TEAM	34	333	9.8	2	52	42

# Research Questions

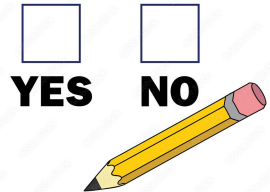
This study sets out on a data-driven expedition, exploring two crucial questions:

- Can the NFL's future stars be accurately predicted, and can a player's individual performance predict the destiny of his team as a whole?
- 
- Do aggregated individual fantasy football performances serve as a good indicator of real-life NFL team success?



The whole is greater than  
the sum of its parts.

Aristotle







# Research Question 1



# Research Question 1

Looking back at the last 20 years of top-200 player fantasy football data, can we predict which players are most likely to be the highest performing players (in both standard and points-per-reception formats) in the next year?

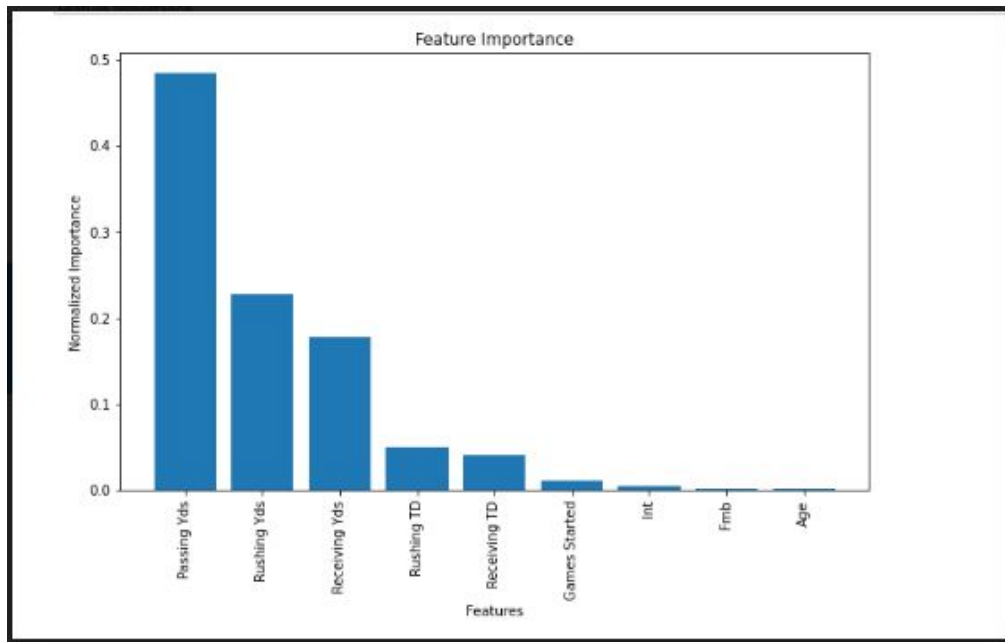
Standard Fantasy Football Scoring

QB	<b>1</b> 25 Passing Yards	<b>4</b> Passing Touchdown	<b>-1</b> Interceptions
RB	<b>1</b> 10 Rushing Yards	<b>6</b> Touchdowns	<b>0.5</b> Receptions
WR	<b>1</b> 10 Receiving Yards	<b>6</b> Touchdowns	<b>0.5</b> Receptions
TE	<b>1</b> 10 Receiving Yards	<b>6</b> Touchdown	<b>0.5</b> Receptions

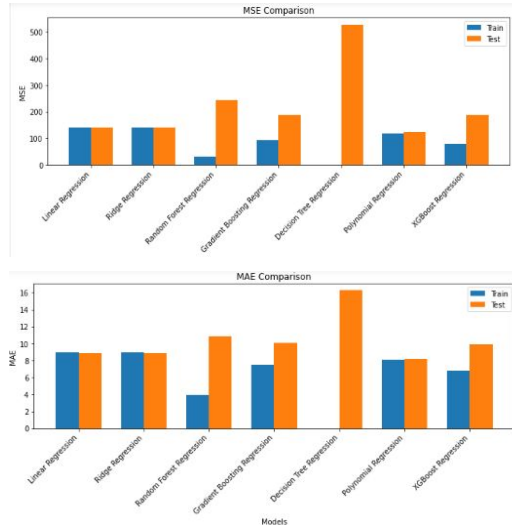
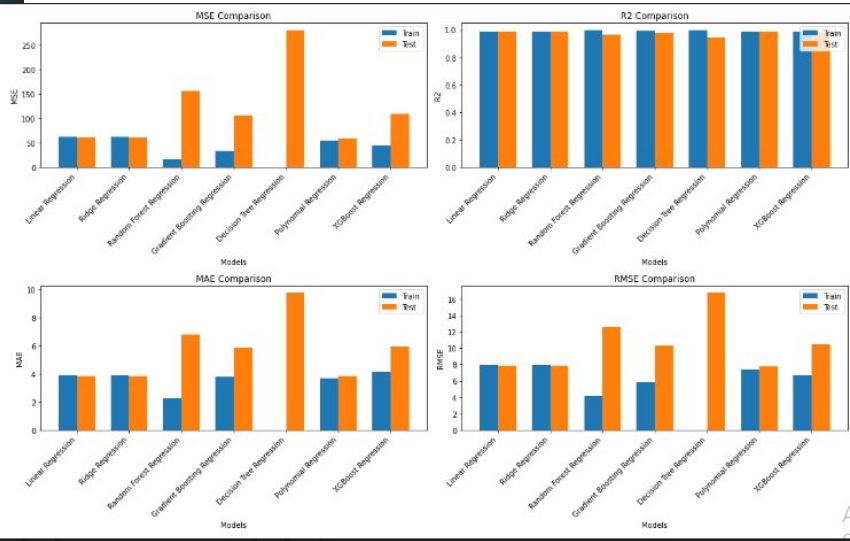
Points Per  
Reception

# Feature Importance

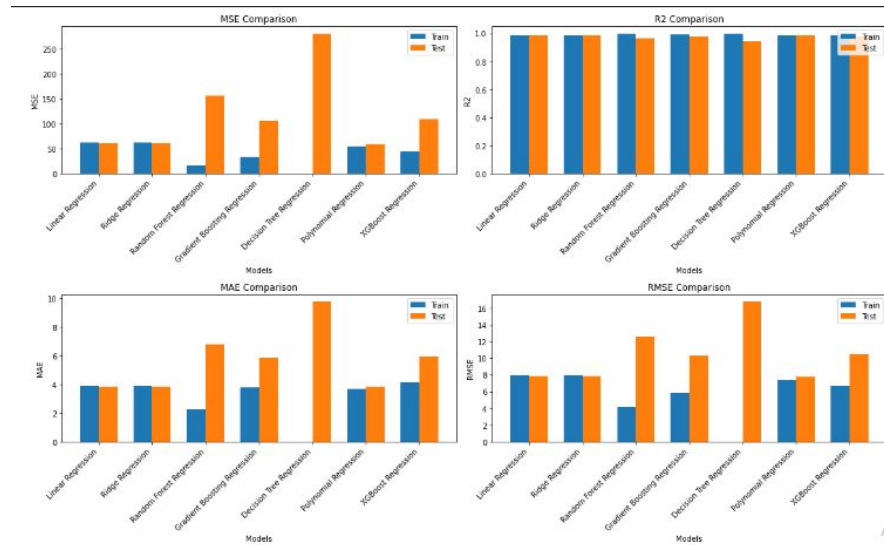
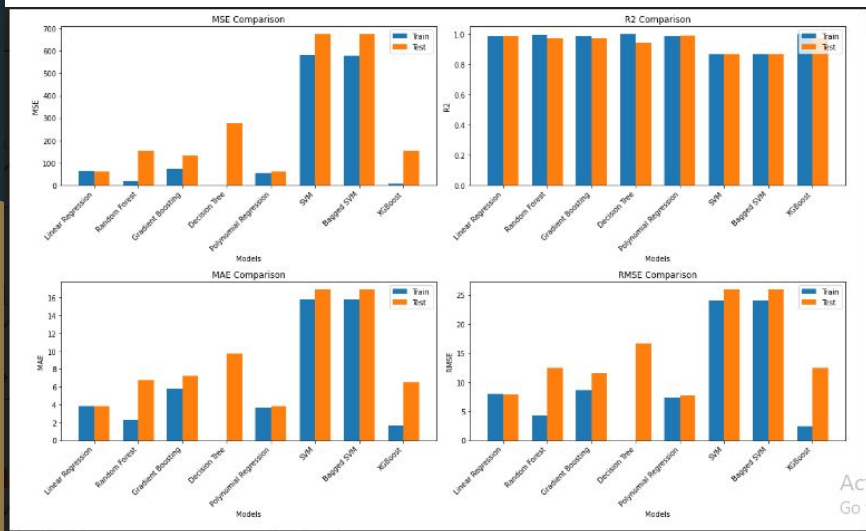
Feature set decreased slightly  
by eliminating collinear  
variables to enhance model  
accuracy



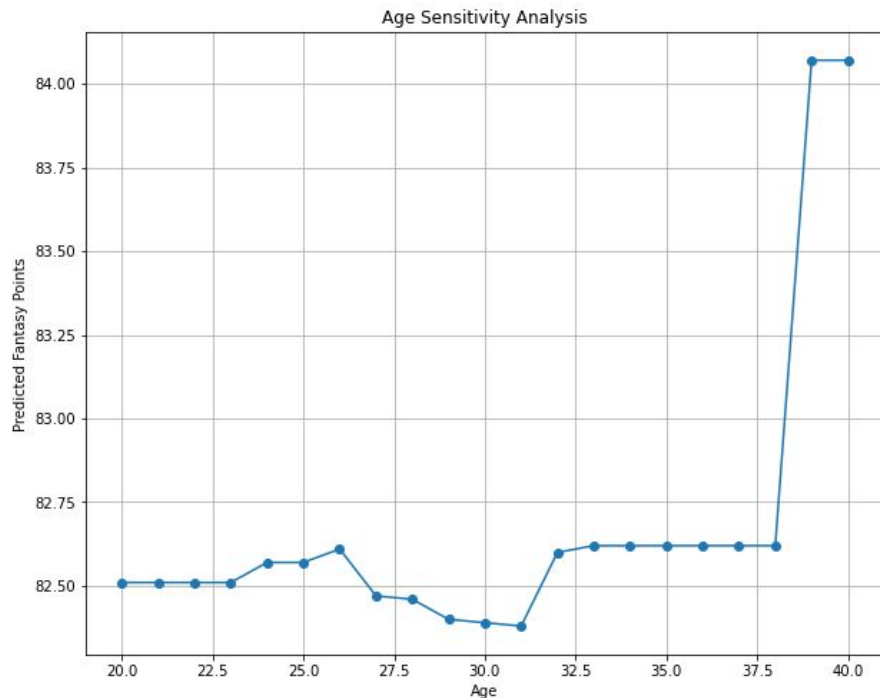
# Standard Scoring vs. Points per Reception (with Hyperparameter Tuning)



# Models Before Tuning vs. Models After Tuning (Standard Scoring Method)



# Why Linear and Polynomial Regressions are Effective



## Age Sensitivity Analysis

- Majority of players improve until age 27, then dip until age 30 when they retire
- Those with the talent to remain players past age 30 sustain a higher level of success, often until age 37
- Those players that make it past age 37 and make the top 200 players list tend to do exceptionally well relative to the average player

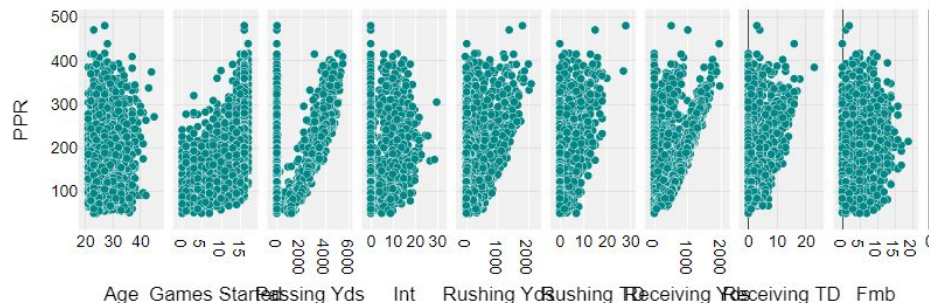
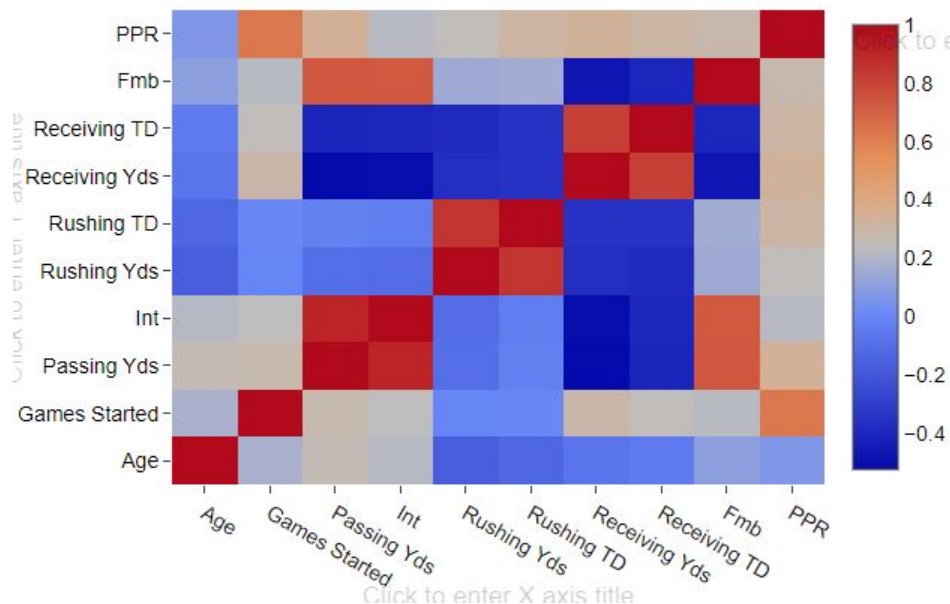
\*Divided dataset into players less than 37 and greater than 37 years of age and re-ran models, but no significant change occurred\*

# Challenges

## Alterations to Fix Regression Model Scores

- Simplified set of statistics
  - Removed passing TDs
  - Removed overall ranking
  - Used separate datasets for standard and points per reception target variables
- Narrowed focus on 2 stats per player type
- Correlations largely match initial hypotheses
  - Passing, rushing, and receiving features are slightly related to each other, but not enough to give collinearity issues
  - Exceptions: surprising age pattern discussed previously

Correlation Heatmap



# Conclusions for Research Question #1

## 1. Best performing models

- Linear, Polynomial, and Gradient Boosting

## 2. Standard vs. PPR

- Standard scoring models performed better before and after hyperparameter tuning

## 3. Age sensitivity analysis

- Considering the age trends, linear and polynomial models are able to predict results with great accuracy



# Next Steps For Research Question #1

1. Further explore trends, breaking up the dataset by features
2. Conduct sensitivity analyses with more features to better characterize relationships between features
3. Develop UI for easy interactivity in building feature sets to analyze
4. Widening scope of players studied to include more than 200 per year to get wider understanding of game trends



## Research Question 2



## Research Question 2

Furthermore, if we group the players together by team, can we use their fantasy football statistics to predict their team's record in a given year?

NFC SOUTH	NFC NORTH	NFC EAST	NFC WEST
 8-8	 11-5	 11-5	 12-4
 8-8	 8-8	 11-5	 9-7
 7-9	 7-9	 5-11	 8-8
 2-14	 7-9	 4-12	 4-12
AFC SOUTH	AFC NORTH	AFC EAST	AFC WEST
 9-7	 13-3	 11-5	 10-6
 9-7	 11-5	 10-6	 8-8
 9-7	 8-7	 8-10	 7-9
 5-11	 8-8	 4-12	 5-11

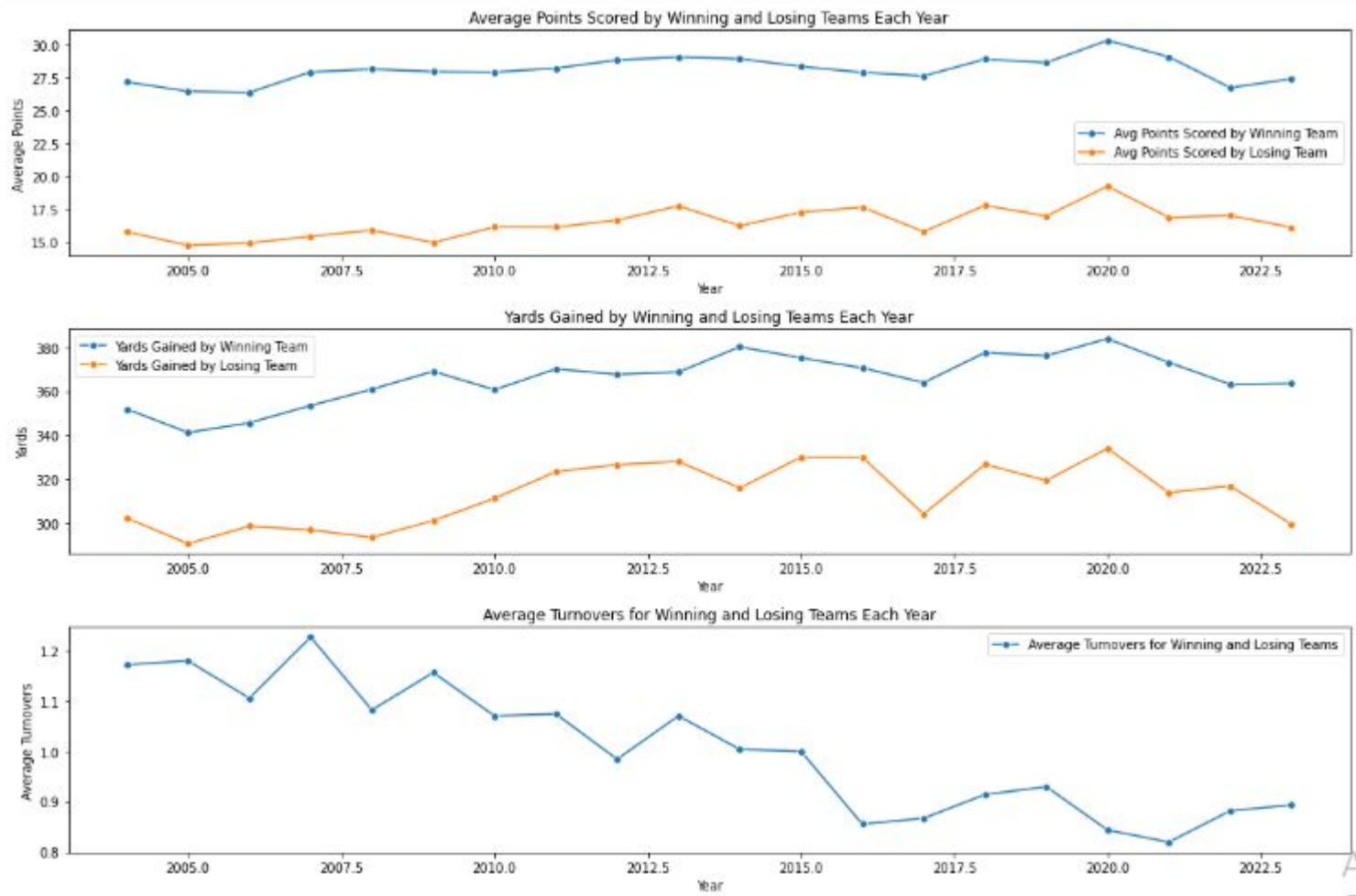
# Fantasy Points as an Indicator of Winning NFL Games

For the most part, fantasy points is a good indicator for real-life NFL team success, but there are definite exceptions to the rule.

Can indicate a general range of team success, but variance of individual games is too much to overcome.



# Additional Findings: Research Question 2



## Challenges Question #2

1. Teams labelled differently across datasets (by Name vs. by City)
2. Difficulties joining/combining datasets
3. Without combining datasets, not enough features to make a predictive model

# Conclusions for Research Question #2

1. Positive correlation between scoring fantasy points and winning NFL games
2. Over the last 20 years, offenses score the same amount of points, while defenses seem to be allowing more points
3. Over the years, the decrease in turnovers has led to more yards gained by winning teams because they possess the ball more often

# Next Steps For Research Question #2

1. Relabel both datasets individually to be able to union/combine the feature sets for additional analysis
2. Find out why defenses are letting more points through: Identify features that support trend of defenses allowing more points in recent years
3. Explore NFL rules changes that might have impacted scoring as well over length of the study (2004-2023)
4. Explore additional datasets related to NFL games, teams, and player statistics to enrich analysis and gain deeper insights into performance trends.
5. Conduct in-depth analyses on individual players' performance metrics, injury histories, and career trajectories to identify trends and predict future success or decline.



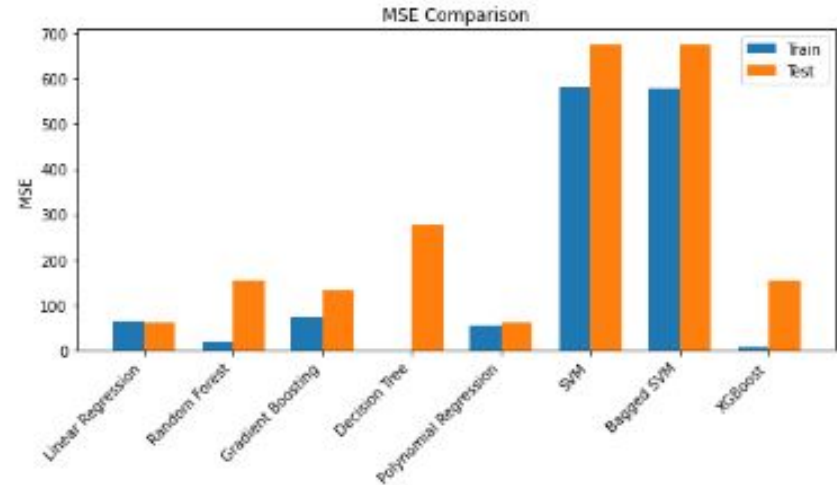


## Takeaways



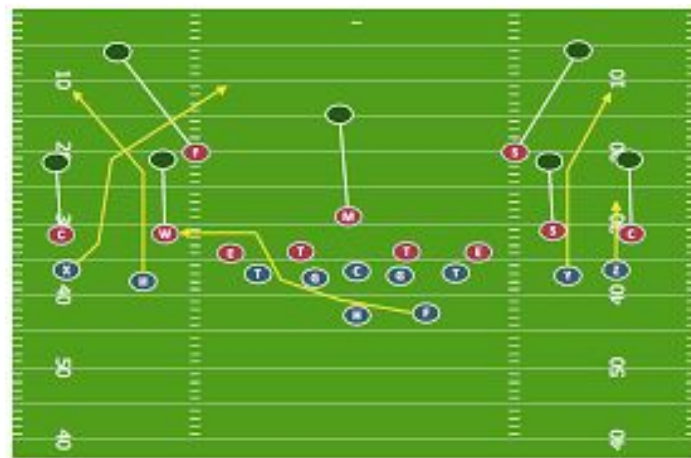
# Emerging Trends from Question 1 and 2

- Greater success predicting standard scoring model
  - Most success with linear, polynomial, and Gradient/XGBoost methods
- Slight overall uptick in yardage gained by both winning and losing teams
- Fantasy points scored by individuals on the virtual gridiron are generally a good indicator of overall real-life NFL team success



# Strategies to Consider Before Betting

- Positional importance matters
  - Quarterbacks > Running Backs
  - Running Backs > Wide Receivers
- Focus on young players with 3-4 years of experience in the league, or veterans with 7-8 years of experience to maximize point scoring potential
- Place less emphasis on turnover-induced statistics
  - League-wide decline in turnovers





Thank you!

Questions?

