

# “The Prediction of Fantasy Football”

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## Abstract

In this paper, we consider the game fantasy football, which allows people to simulate being a National Football League team owner. Imaginary owners select from the best players in the NFL and compete on weekly basis based upon player performances on the field. Fantasy football has become popular over the years. In 2011, according to the Fantasy Sports Trade Association there were 35 million people that played fantasy sports online in the United States and Canada. The most major companies that use fantasy football are Yahoo, ESPN, and NFL, even though there are more platforms. Many people use these platforms to view NFL reporting, preseason rankings, player statistics, fantasy points projections, and expert opinions on drafts. Even though fantasy sports have increased over time and there are various of platforms to view stats and predictions, but there is no method that provides a strategy to predict the entire fantasy football league. During this project we will predict NFL players performance on the field and calculate their fantasy points for the next season using the Auto Regression Integrated Moving Average (ARIMA) models using players historical data. We will use the data from these predictions and an algebraic equation to rank players by overall fantasy prediction points for the 2020 fantasy draft.

*Keywords:* fantasy football, players performances, fantasy points, ARIMA model, fantasy prediction points

## 1 Introduction

Fantasy football is a sport in which participants take a role of being a general manager or coach of their own fantasy team. All participant team roster are chosen from a draft with a list of players from a real football league and compete against other competitors’

fantasy football league. A real football league could consist of National Football League, Canadian Football League, or college football; however, in my project I will only keep my focus on the National Football League. Fantasy football was created in 1962 by Wilfred "Bill" Winkenbach, a partner in the Oakland Raiders. Over the years, fantasy football has expanded as stated in Britannica.com, "Fantasy sports have become big business, with the industry generating annual revenues in excess of one billion dollars by the early 2010s." Fantasy football is now more convenient for players with the use of technology. There are fantasy football apps designed just for fantasy football such as: NFL Fantasy Football, Yahoo Fantasy Sports, CBS Sports Fantasy, Rotowire Fantasy football Draft Kit, and Footballguys Fantasy Football Draft Dominator are known as the best fantasy football apps. (sports-management-degrees.com) In 2011, according to the Fantasy Sports Trade Association, there were 35 million people that played fantasy sports online in the United States and Canada. The most major companies that use fantasy football are Yahoo, ESPN, and NFL. Many people use these platforms to view NFL reporting, preseason rankings, player statistics, fantasy points projections, and expert opinions on drafts.

Even though fantasy sports have increased over time there is no method that provides a strategy to predict the entire fantasy football league. This paper will include a model that predicts player performances for the next season and fantasy football points for the next season from careers statistics. Players will be ranked based on position with predicted fantasy points. We used data from <http://www.nfl.com/stats/player> and used ARIMA model to forecast players prediction 16 games into the future.

## 2 Literature Review

This section is a review of the world of fantasy football. This study will look at the History of Fantasy Football and How Fantasy Football Work.

### 2.1 History of Fantasy Football

Fantasy football was originally created in March of 1962, at New York City's Plaza Hotel by Wilfred "Bill" Winkenbach. Wilfred was known because he had a stake in the Oakland Raiders. He also created fantasy golf in the late 1950s. The first official football league was created in 1963 with Scotty Stirling and George Ross. (Brown) They developed a system of organization and a rule book. The league was called Greater Oakland Professional Pigskin Prognosticators League (GOPPPL) which was created with a draft. (Newman) The league consisted of eight teams that were drafted by the three creators and friends.

During 1969, the creator 'Andy Mousalimas' of the GOPPPL introduced his league to a sports bar Kings X Sports Bar in Oakland but, the fantasy league did not work as plan. The first national football league was developed in 1989, Pigskin Playoff, created by Lee Marc, Robert Barbieri, and Brad Wendkos. Pigskin Playoff was then called Daily Fantasy

Sports (DFS). Fantasy sports was once played by "creating daily lineups and participate for cash prizes". (Militello) During, this time players used football statistics to use a simple scoring system. The participants created fantasy teams, earned points for plays based off performances, traded players, and competed to gain enough points to win prizes. Proper technology was not available at this time.

Twenty years later, over a million people in the United States are playing fantasy football. In 1997, CBS.com launched their first free version of their online fantasy game. It was the first start of making a multi-billion industry. Other sport sites notice and instantly started their own games. By September 2006, over 18 million people were playing fantasy football competing against their opponents weekly. Many years later, DirectTV introduced their first RedZone channel. (Adam) The RedZone channel is a special game day channel that showed every single touchdown and big play from all NFL games. Fantasy football has improved tremendously over the last 40 years. Today, "More than 59 million people played fantasy sports in 2017, according to the FSGA; 80% of those played fantasy football." (McCormick) A game that was created in 1962, has now become one of the richest multi-billion industries over time and is still growing and improving.

## 2.2 How Fantasy Football Works

There are several ways fantasy football can be played. Here we will cover the basics of the standard fantasy football league and the basics on how to play.

### Type of leagues

There are three main types of fantasy football leagues are traditional, dynasty league, and daily. A traditional league is when the competition can run for an entire season. Dynasty leagues are almost the same as traditional, however they continue indefinitely. There will be a follow up draft each year for players joining the league. Daily fantasy sports are when contest is conducted over a shorter period of time, daily or weekly.

### Draft

Each season, fantasy football holds a draft before the season where each player drafts National Football League players. Most of the time no players can be drafted more than once, although some leagues allow it. The major draft consists of two type of drafts snake draft and auction draft, snake draft which is for beginners and auction draft which is for advanced players. The snake draft works exactly like a snake each coach has one pick per round. Each team make a first-round pick based on order. When the first round is over the team that picked last place in first round gets to pick first in the second round and each round the picks snakes its self-back around. The auction pick works as a real-life auction. Each NFL player has a value, and every fantasy team have a budget each team fills it roster without going over budget. The owner with the highest bid receives the player, reducing their budget for each pick.

## **Team Roster**

A roster consists of starters and bench players. Starters are players that score points for you during the game, however bench players do not. Bench players are used for back-up in case of any injuries or players sitting out for a week. Bench players can be replaced to at any given time, but team roster is submitted before games are in progress. Each roster includes:

- 1 Quarterback
- 2 Running Backs
- 2 Wide Receivers
- 1 “Flex”
- 1 Tight End
- 1 Kicker
- 1 Defense/Special Teams
- 6 Bench players

## **Scoring System**

The league owners earn points based upon their starter’s actual performances each week. Players earn points from their statistical output. There are many scoring systems that leagues can use. The most common scoring systems are standard and custom. The custom system are half-point-per-reception (HPPR) and points-per-reception (PPR). During this study we used PPR scoring system. The PPR scoring system adds an extra point for each reception a player makes. The PPR were created to make wide receivers and tight ends a better chance to earn points. The ESPN adopted a PPR scoring system as the default scoring system for new leagues in 2018. (Smith) The PPR Scoring System consists of the following:

### Offensive Players

- Passing Yards: 1 point per 25 yards
- Passing Touchdowns: 4 points
- Interceptions: -2 points
- Rushing Yards: 1 point per 10 yards
- Rushing Touchdowns: 6 points
- Receptions: 1 point
- Recieving Yards: 1 point per 10 yards
- Recieving Touchdowns: 6 points
- Fumbles Lost: -2 points

## Kickers

- PAT Made: 1 point
- Field Goal (0-49 yards): 3 points
- Field Goal (50+ yards): 5 points

**How to play Fantasy Football**

The first step in fantasy football is join a league. Many fantasy players play for free and others for a cash prize. To play for a cash prize there is an entry fee. Many players participate through an app that generate player team and organize their points. The size of a league can range from 12-20 players. After you have joined a league you then draft players. Each manager drafts a player until their roster is filled. Then a player is all set to compete each week. Each week players compete and earn points based on starter actual performances. Each week managers can improve teams by switching players or benching players in case of injuries. The last player standing wins.

### 3 Data and Models

The data used in this study is the historical career statistics of each starting football player in the National Football League. The offense includes quarterbacks, running backs, tight ends, and wide receivers. Each of the following offensive players were measured by different performance stats listed below:

- \* Pass Attempts
- \* Pass Completions
- \* Pass Yards
- \* Quarterback Interceptions
- \* Passing Touchdowns
- \* Rushing Attempts
- \* Rushing Yards
- \* Rushing Touchdowns
- \* Targets
- \* Receptions
- \* Receiving Yards
- \* Receiving Touchdowns
- \* Fumbles Lost

Kickers, for which we used:

- \* Points after Touchdown(PAT)
- \* Short Field Goals (less than 40 yards)
- \* Medium Field Goals (40-49 Yards)
- \* Long Field Goals (50+ Yards)

All data came from NFL website which was organized by each stat per game in excel. The data was then processed using the time series analysis.

### 3.1 Arima Model

The study contained players careers who have played in 16(a season) or more games and at least one game in the 2019 football season. Fantasy football is based on NFL players performances during a season. During this study players needed 16 games to have enough data to be a reliable contestant of fantasy football. With players requirement, players career stat were used to predict players performances another season into the future. Using this data players were ranked by predicted fantasy football scores for 2020 fantasy football draft.

ARIMA, short for 'AutoRegressive Integrated Moving Average', is a forecasting algorithm based on the idea that the information in the past values of the time series can alone be used to predict the future values.

AR stands for 'autoregression' meaning the dependent relationship between an observation and some number of lagged observations

$$\text{AR terms } y_t = \mu + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} \dots + \alpha_p y_{t-p}$$

I stands for 'integrated' which is the differencing of raw observations

MA stands for 'moving average' meaning the dependency between an observation and residual error from a moving average model applied to lagged observation.

$$\text{MA terms } y_t = \mu - \beta_1 \epsilon_{t-1} - \beta_2 \epsilon_{t-2} \dots - \beta_q \epsilon_{t-q}$$

Thetwo equations combined you get the ARIMA model

$$y_t = \mu + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} \dots + \alpha_p y_{t-p} - \beta_1 \epsilon_{t-1} - \beta_2 \epsilon_{t-2} \dots - \beta_q \epsilon_{t-q}$$

$y_t$  = the variable that will be explained at t

$\mu$  = is the constant

$\alpha$  = coefficient of autoregressive parameters

$\beta$  = coefficient of errors/residuals

$\epsilon_t$  = errors/residuals in time t

### 3.2 Algebraic Expression

The algebraic expression is used to calculate the total fantasy score for each offensive player for the upcoming season using the PPR scoring system.

$$\text{Quarterbacks} = (0.4 \cdot \text{PassYards}) + (-2 \cdot \text{INTs}) + (4 \cdot \text{TDPass}) + (-2 \cdot \text{Fum})$$

$$\text{Running Back} = (0.1 \cdot \text{RushYards}) + (6 \cdot \text{RushTD}) + (1 \cdot \text{Rec}) + (-2 \cdot \text{Fum})$$

$$\text{Tight Ends} = (1 \cdot \text{Rec}) + (0.1 \cdot \text{Rec.Yards}) + (6 \cdot \text{RecTD}) + (-2 \cdot \text{Fum})$$

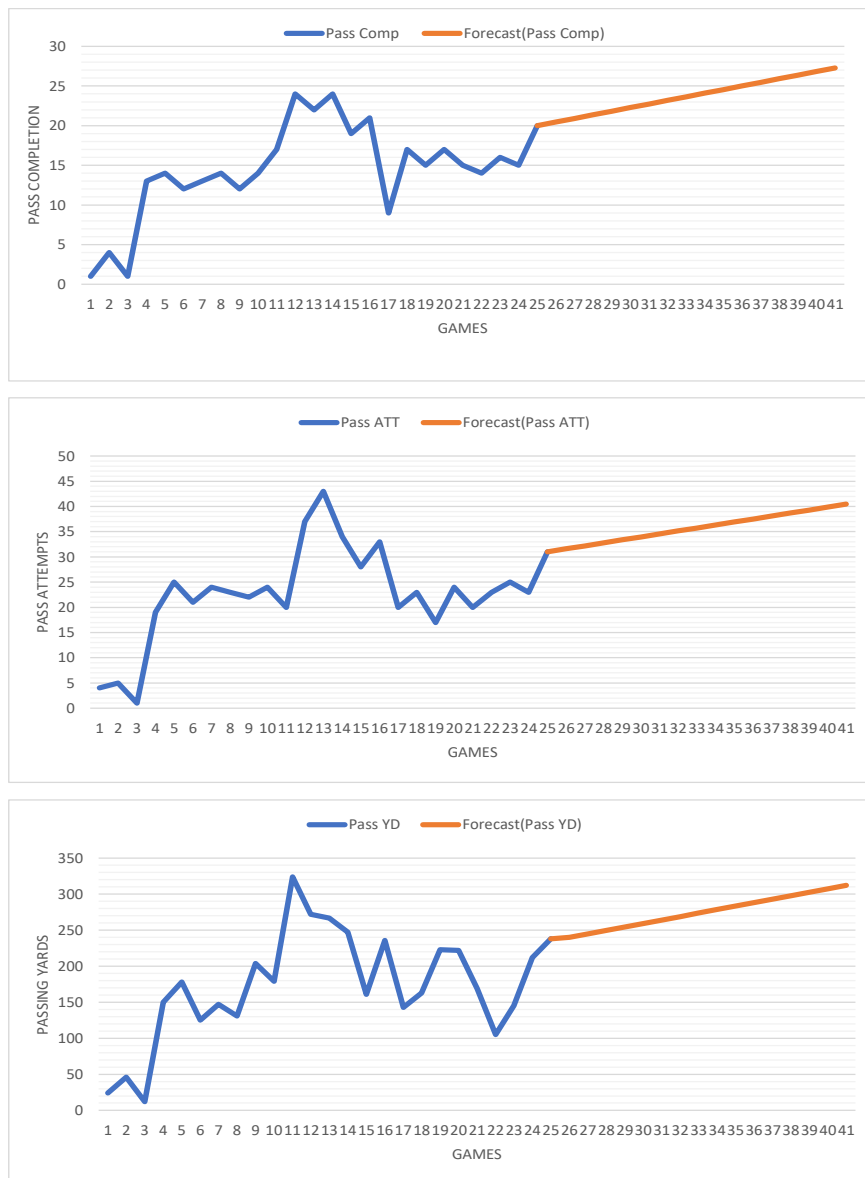
$$\text{Wide Receivers} = (1 \cdot \text{Rec}) + (0.1 \cdot \text{Rec.Yards}) + (6 \cdot \text{RecTD}) + (-2 \cdot \text{Fum})$$

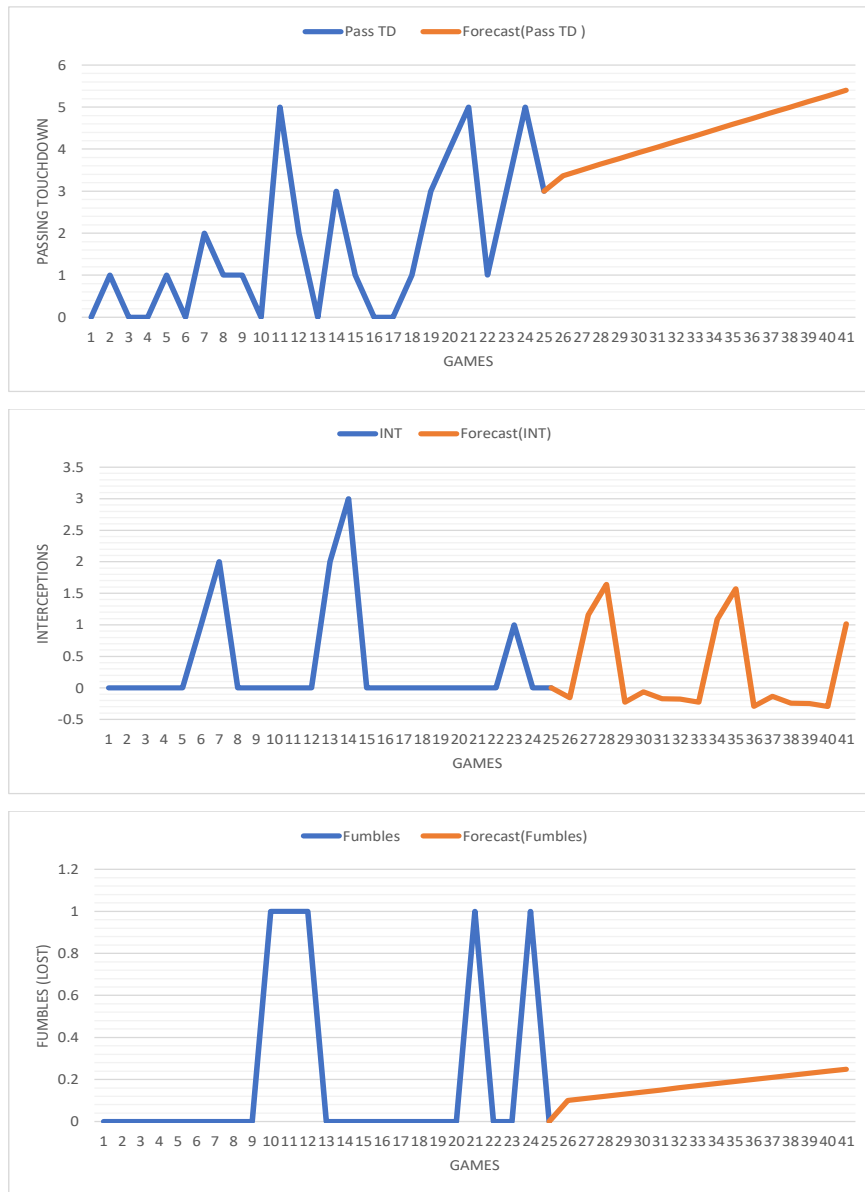
$$\text{Kickers Fantasy Points} = (1 \cdot \text{PAT}) + (3 \cdot \text{SFG}) + (5 \cdot \text{LFG})$$

The results were broken down by each metric that is measured to add up Quarterback-Lamar Jackson fantasy points. The results also show the prediction of the player the next football season(16 games).

### 4.1 Graphs

The results shown are as follow:





Each graph show the results of Lamar Jackson historical data and predicted stats.

## 4.2 Chart

The chart consists of the top 100 players in the 2020 fantasy draft.



Ranks	Players	Positions
1	Christian McCaffrey	RB
2	Saquon Barkley	RB
3	Michael Thomas	WR
4	DeAndre Hopkins	WR
5	Alvin Kamara	RB
6	Davante Adams	WR
7	Tyreek Hill	WR
8	Joe Mixon	RB
9	Julio Jones	WR
10	Ezekiel Elliot	RB
11	Josh Jacobs	RB
12	Nick Chubb	RB
13	Leonard Fournette	RB
14	Travis Kelce	TE
15	Chris Godwin	WR
16	Aaron Jones	RB
17	Derrick Henry	RB
18	George Kittle	TE
19	Lamar Jackson	QB
20	Dalvin Cook	RB
21	Patrick Mahomes	QB
22	Melvin Gordon	RB
23	Miles Sanders	RB
24	DJ Moore	WR
25	A.J. Brown	WR
26	Courtland Sutton	WR
27	DJ Clark Jr.	WR
28	Allen Robinson II	WR
29	Adam Thielen	WR
30	Clyde Edwards-Helaire	RB
31	Kenyan Drake	RB
32	Le'Veon Bell	RB
33	JuJu Smith-Schuster	WR
34	Chris Carson	RB
35	Kenny Golladay	WR
36	T.Y. Hilton	WR
37	Odell Beckham Jr.	WR
38	Devin Singletary	RB
39	Johnathan Taylor	RB
40	D'Andre Swift	RB
41	Todd Gurley II	RB
42	James Conner	RB
43	Robert Woods	WR
44	Tyler Lockett	WR
45	DK Metcalf	WR
49	Keenan Allen	WR
47	Copper Kupp	WR
48	Jarvis Landry	WR
49	Mark Andrews	TE
50	Tyler Boyd	WR

51	Darren Waller	TE
52	Zach Ertz	TE
53	Dak Prescott	QB
54	Kyler Murray	QB
55	Russell Wilson	QB
56	Cam Akers	RB
57	Deshaun Watson	QB
58	David Johnson	RB
59	Kareem Hunt	RB
60	Julian Edelman	WR
61	Raheem Mostert	RB
62	Calvin Ridley	WR
63	Davante Parker	WR
64	Stefon Diggs	WR
65	Terry McLaurin	WR
66	Deebo Samuel	WR
67	John Brown	WR
68	Michael Gallup	WR
69	J.K. Dobbins	RB
70	Mark Ingram II	RB
71	James White	RB
72	Damien Williams	RB
73	Derricus Guice	RB
74	Ke'Shawn Vaughn	RB
75	David Montgomery	RB
76	Latavious Murray	RB
77	Ronald Jones II	RB
78	Matt Ryan	QB
79	Tom Brady	QB
80	Drew Brees	QB
81	Breshad Perriman	WR
82	Emmanuel Sanders	WR
83	Justin Jefferson	WR
84	Marquise Brown	WR
85	Jerry Jeudy	WR
86	Marvin Jones Jr.	WR
87	Tyler Higbee	TE
88	Christian Kirk	WR
89	Boston Scott	RB
90	Kerryon Johnson	RB
91	Marlon Mack	RB
92	Jordan Howard	RB
93	Sony Michel	RB
94	Darius Slayton	WR
95	Brandin Slayton	WR
96	Will Fuller V	WR
97	Mike Williams	WR
98	Phillip Lindsay	RB
99	Tevin Coleman	RB
100	CeeDee Lamb	WR

## 5 Conclusion

To test the accuracy of the prediction we analyzed the predicted values of 2019 and players actual performances using the Mean Absolute Percentage Error (MAPE). Mean Absolute Percentage Error is the simple average of absolute percentage errors. It is a measure of accuracy of a method for constructing fitted time series values in statistics, specifically in trend estimation

$$\text{Mean Absolute Percentage Error} = \frac{100\%}{n} \sum \left| \frac{y - y_t}{y} \right|$$

$y$ =actual value

$y_t$ =forecast value

$n$ =number of observations

The MAPE of the 2019 fantasy year was 4.65%. We knew there would be errors because many players have injuries throughout the games leaving them to miss games and seasons. During this model, there was not anything that excluded injuries from performances. If there was something that include injuries in this model this project would have been better, but that would be hard to predict.

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