NFL Quarterbacks

Final Project

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Introduction

A collection of statistics from NFL.com was imported into python to analyze. The data was taken from 2000-2023 on quarterbacks in the NFL. 260 different quarterbacks were taken to compare up against each other. For the purposes of this assignment, data collected has been limited to the modern era (2000-now) to allow for easier data comparisons. This data was extracted from NFL.com and placed in a CSV file which consisted of 1150 observations or rows and 17 attributes or columns. The CSV is imported into python and built into a pandas Dataframe so we can perform data analysis. The python program runs through the data to find trends and analyze the statistics of the modern era quarterbacks. There was a bit of preprocessing done as we limited the quarterbacks to the top 50 each year. Due to injuries and the occasional, non quarterback, passer, the data was made to focus on those who are full time starting quarterbacks.

Another source of data comes from Twitter. A series of tweets were pulled to see what the twitter community thinks about the NFL and its quarterbacks. This was collected over the past 3 years and contains 5000 tweets from two different searches. One of the searches looks for quarterbacks and MVP and the other looks at both quarterbacks and GOAT (Greatest of All Time). Looking at common trends in words can explain to us how the overall community feels about the quarterbacks.

Data Cleaning

The data, once imported, required a very small amount of cleansing. After looking at the different data types there was a mix of float, object, and integer. All of them appeared to be in the correct format and did not require any changes to start working with them. The frequency of the quarterbacks was looked at to determine how many years we were tracking in our dataset. The player with the most years was Tom Brady at 21 years followed by drew Brees (19), Ben Roethlisberger (17) and Eli manning (16). The least number of years was a bunch of people having 1 year recorded.

There was also a minimal amount of cleansing needed for the twitter data as well. The tweets were gathered using the snscrape which made it very easy to pull in. The data was then easily transferred into a panda Dataframe which made it simple to extract and manipulate for our use.

Data Questions

Who statistically is the best Quarterback and what trends lead us to knowing whether that quarterback will have a prospering career?

The first operation that was performed was to create a new Dataframe which groups the data by the quarterback's name. With 23 years' worth of data. The quarterbacks' stats are collected and added up to create a unique name to statistic. In some cases, these numbers are not helpful and may be misleading due to a quarterback having a better chance of having a higher number because of the number of seasons they have played. Here we find a similar dilemma as Tom Brady is the highest on the list. Having played 21 seasons this is expected. The overall number of TD's is important however as the longevity of a players weighs on their greatness as they can sustain such a long career performing up to the highest caliber. The list is filled with notable quarterbacks which is relative to time in the league.

Player	TD,
Tom Brady	649
Drew Brees	570
Peyton Manning	487
Aaron Rodgers	474
Philip Rivers	420
Ben Roethlisberger	418
Matt Ryan	381
Eli Manning	366
Matthew Stafford	333
Russell Wilson	308

The grouping was then changed to average out the statistics and we saw a huge shift in the data. This outcome may also have its flaws due to newer quarterbacks who performed very well in 1 or 2 seasons will rise to the top as their TD's are relative to their years played. Nonetheless, there are some familiar faces on the list who are new and on the rise in the eyes of the NFL. Andrew Luck, who no longer plays made the list because of his dominance in the years he played but due to injuries his career was shorter and was not able to collect as many as those on the career list. There are a few newer players in the scene. Josh Allen and Justin Herbert made the cut but the one to look after is Patrick Mahomes who tops the list average TD's per year list and by a long shot (~6 TD's more per year than Peyton Manning).

```
Player                    TD,
Patrick Mahomes     38.400000
Peyton Manning      32.466667
Aaron Rodgers       31.600000
Justin Herbert      31.333333
Tom Brady           30.904762
Drew Brees          30.000000
Andrew Luck         28.500000
Russell Wilson      28.000000
Philip Rivers       28.000000
Josh Allen          27.600000
```

Some other important metrics in a quarterback are the number of passing yards and the completion percentage. Both have to do with the connection between the quarterback and the receivers and are not always representative of a quarterback's ability due to a smaller reliance on the receiver's ability to catch and run. However, these statistics can show us a lot about a player's ability to make plays. For passing yards, Mahomes tops the list again with Herbert right behind. Given they are on both pass heavy offenses, they are able to get more throws in games and have a higher chance of gaining more yards. This statistic is met and should be balanced with the completion percentage as more thrown balls may result in more dropped passes. In that case, Herbert stays on the list, but Mahomes drops off. This list also contains a possibility of some untrustworthy data as a quarterback who only played a game or two and had good completions in those two games, won't be brought down by slumps or the occasional bad game throughout the season.

```
Player             Pass Yds,    Player              Cmp %,
Patrick Mahomes  4791.400000    Bailey Zappe      70.600000
Justin Herbert   4696.333333    Chase Daniel      70.000000
Peyton Manning   4271.066667    Joe Burrow        68.033333
Tom Brady        4244.380952    Drew Brees        67.657895
Philip Rivers    4219.466667    Brett Rypien      67.500000
Drew Brees       4217.736842    David Fales       67.400000
Matt Ryan        4186.133333    Brock Purdy       67.100000
Andrew Luck      3945.166667    Justin Herbert    66.900000
Joe Burrow       3924.666667    Jamie Martin      66.850000
Aaron Rodgers    3915.066667    Kyler Murray      66.800000
```

In the NFL, there is an overall statistic which combines the pass attempts, number of completions, passing yards, touchdowns, and the interceptions made by a quarterback. This figure is essentially a way to compare a quarterback's performance to another quarterback. The formula is not the cleanest and the values do not make the most sense but what is important is that the higher the value the better a player performed. All ratings for all seasons the quarterbacks played were averaged and we got some

interesting data from that. Once again, our highest performers in the other categories aren't the same present here besides Mahomes, Rodgers and Brees.

```
Player              Rate,
Brock Purdy         107.300000
Todd Collins        106.400000
Patrick Mahomes     106.180000
Aaron Rodgers       103.826667
Bailey Zappe        100.900000
Russell Wilson      100.363636
Joe Burrow           99.633333
Jimmy Garoppolo      99.371429
Deshaun Watson       99.120000
Drew Brees           98.647368
```
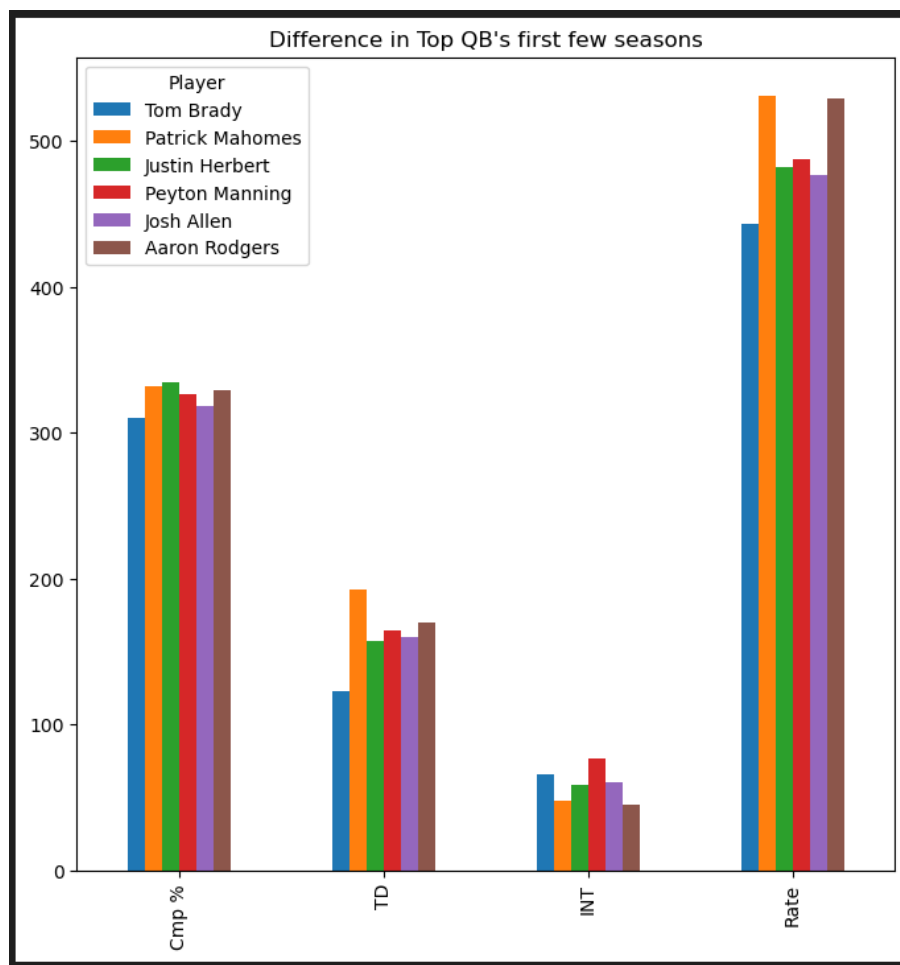
A deeper dive was done to narrow in on specific quarterbacks. I have collected a few that are long term quarterbacks who have had a long career including Tom Brady, Peyton Manning, and Aaron Rodgers. MVP's, Super Bowl winners and strong candidates for being hall of famers (Peyton already inducted). On the other hand, I also collected a couple up and coming players known as Patrick Mahomes, Justin Herbert, and Josh Allen. These players are within about 5 years of the league and are proving to be strong additions to different franchises.

All 6 quarterbacks appear on our earlier statistics. Knowing what the old timers have done over the course of their careers, a comparison to what they did in their first 5 years will provide an idea on what path these players may take. In the NFL, a lot of quarterbacks are plagued by injuries and in doing so, don't make it much longer than 5 years in the league. A strong career is more like 10 years, but most are lucky to stay that long. The comparison can show how much better or worse these players are doing and if the longevity of these types of players is present in making a player a Hall of Famer.

Player	Pass Yds	Att	Cmp	Cmp %	TD	INT	Rate	1st	SB
Tom Brady	18029.0	2545.0	1576.0	310.0	123.0	66.0	443.0	883.0	3
Patrick Mahomes	23957.0	2958.0	1963.0	331.6	192.0	48.0	530.9	1183.0	2
Justin Herbert	23481.7	3276.7	2193.3	334.5	156.7	58.3	482.0	1166.7	0
Peyton Manning	21568.0	2772.0	1807.0	326.1	164.0	77.0	487.7	1069.0	0
Josh Allen	20403.8	2807.5	1793.8	318.2	160.0	60.0	476.6	1025.0	0
Aaron Rodgers	21332.0	2606.0	1717.0	329.5	170.0	45.0	528.7	981.0	1

The above chart shows some interesting data of each of the quarterbacks. Given that we are looking at the first 5 years of each of their careers we can get a better comparison

between their statistics. Justin Herbert and Josh Allen have not been in the league for 5 years, so their data has been extrapolated to 5 years for comparison purposes. When we think about a QB we often see yards. In the first 5 years as a starting QB, Patrick Mahomes threw for almost 24,000 yards. At the bottom of these six QB's we have Tom Brady who only threw for 18,000 yards. A quick glance to the side we see Tom had 3 super bowl rings while Mahomes collected only 2. Tom Brady's career figures have labeled him as the greatest of all time (GOAT) but in his first 5 years the figures he put up did not represent that of a world class QB. Justin Herbert appears to be on pace as well with Mahomes but based on attempts and completion amounts, the yards per catch are a lot lower than that of Mahomes who will have thrown 300 less passes. Mahomes tops the most important categories with Passing yards, TD's, passer rating, and the highest number of 1st downs. Mahomes is also close to the best completion percentage and the least amount of interceptions as well in his first 5 years in the league. These are impressive figures and blow out those of some other highly efficient quarterbacks of the modern era.

These statistics may not have a huge meaning on how much the quarterback affects the team's ability to win. A strong QB like Rodgers or Herbert can only bring their team so far and might win a Super Bowl once but with Mahomes strong performances, he gives his team the ability to win. Tom Brady, on the other hand, had less than exciting statistics which means the team doesn't revolve or rely on his ability for them to win games. His performances are almost the lowest of the groups, but he was still able to win 3 super bowls in his first 5 seasons.

A quarterbacks ability to last through and have a long career may not always come in big numbers year to year, but consistent play overall and having a team back up can ultimately aide a quarterback to play better and overtime their statistics will show for themselves. Tom Brady's first 5 years did not show anything crazy. Yes, they won 3 super bowls but comparatively he was not the best quarterback at the time. As we saw with the career statistics for TD's by quarterbacks, Brady was on the top and this may be due to the number of years he played but also by the consistent effort he put in year after year. He also has the record for passing yards which is shown below.

Player	Pass Yds
Tom Brady	89132
Drew Brees	80137
Peyton Manning	64066
Ben Roethlisberger	63737
Philip Rivers	63292
Matt Ryan	62792
Aaron Rodgers	58726
Eli Manning	57023
Matthew Stafford	52082
Carson Palmer	46247

So, this does beg the question, who is the MVP, the GOAT, the best quarterback. Statistics can tell a lot but there is a strong backing on the mindset of individuals and there is no better place for people to speak their minds than twitter. After getting 5000 tweets from the past 3 years containing both quarterbacks and MVP keywords as well as quarterbacks and GOAT, there are a couple of word clouds below which show what the highest frequency of words were.

For keywords of GOAT, the most prominent name that appears is Brady. This is common because of his reputation and dominance in the league to which he has been given the title. The most interesting part of this word cloud is that in the top, partially on the right side, the word Mahomes is listed. In only 5 years in the league, there is a lot of speculation whether Mahomes will be the GOAT and surpass records made by Brady. Only time will tell and if Mahomes stays healthy and stays on track, the figures he is putting up may label him as the GOAT sooner than may be thought.

A second word cloud was made to look at MVP versus quarterback in which we see a slightly different outcome. Due to the most recent super bowls, there is a big use of Mahomes and chiefs. There is also some influence from the Eagles QB Jalen Hurts but there is no Tom Brady to be found. The title MVP is more related to a single player in a single season and within the past 5 years it has been mostly a Mahomes and Brady show. Mahomes taking more of the wins lately as Brady's last season came to an end.

Conclusion

From the data collection and analysis through Python, I was able to quickly manipulate, transform and visualize a large dataset. The outcome from the work I performed is that there are a lot of things that play into how good a quarterback is. TD's and yards are important for a quarterback to have because that is the metric that drives their work. However, that does not always mean the team is going to win with that type of one-

man mentality. TD's, passing yards, and completion percentage show how a quarterback is an active member of the team and their individual contributions affect the team. The team's winning ability is not solely based on that which may allow for a more balanced quarterback who does not have the statistics to back them but has the Super bowls wins to prove it. Undisputedly Tom Brady's statistics for his whole career are unmatched by any other quarterback. Having 7 Super bowl wins, more than any franchise, he has done something no one else may ever do. His induvial contribution may not have been as much of a factor, but his team-oriented playstyle has labeled him as the greatest of all time. A lot of people believe Patrick Mahomes will be the greatest of all time but only time will tell. A lot of players who have healthy strong starts begin to decay due to injuries or lackluster seasons. Mahomes is a bit different as he has already done more than a lot of those quarterbacks, by winning 2 Superbowl's before year six. He is the hot topic right now and the quarterback who is the MVP but at the moment Brady's longevity and statistics have proven him to be the greatest of all time.