

JALEN HURTS ANALYSIS INSIGHTS

Note: For opponent comparison, the same opponents will be listed in this insights document but all other teams have been analyzed and will be available.

EDA VISUALIZATION INSIGHTS

1. Completion Percentage

- a. From December 2020 to December 2023, his average completion percentage has increased
 - i. 50% in 2020
 - ii. 61% in 2021
 - iii. 67% in 2022
 - iv. 66% in 2023
- b. By win/lose result, for wins he averages around 66-68% and for losses he averages 55%.
 - i. Higher completion percentage leads to more wins

1. With his average increasing each year, we see an increase in win percentage

2. Win Percentage

- a. From December 2020 to December 2023, his win percentage has increased but slightly dropped in 2023 from 2020
 - i. Sub 30% in 2020
 - ii. 50% in 2021
 - iii. 90%+ in 2022
 - iv. 82% in 2023
- b. By opponent is somewhat difficult to show as he has only played some teams once which may not result in accuracy in long term performance but we can get a decent view at performance from some of the opponents games.
 - i. Washington: 71% win rate from 7 games.
 - ii. New York Giants: 75% win rate from 4 games
 - iii. Dallas: 50% win rate from 4 games
 - iv. San Francisco: 0% win rate from 2 games
 - v. Minnesota: 100% win rate from 2 games

3. Rushing

- a. From December 2020 to December 2023, his average rushing yards have been in decline
 - i. 70 yards in 2020
 - ii. 51 yards in 2021
 - iii. 50 yards in 2022
 - iv. 36 yards in 2023

- b. When he has a higher number of rushing attempts, he has more rushing yards. The decline in his rushing yards would suggest a decline in number of rushes. He could be shifting his game away from the run and into a better passing game.
4. Passing
- a. From December 2020 to December 2023, his average passing yards has increased outside of a dip from 2020 to 2021
 - i. 230 yards in 2020
 - ii. 210 yards in 2021
 - iii. 247 yards in 2022
 - iv. 250 yards in 2023
 - b. The more passing attempts he makes, the higher the yardage he averages. It is clear Hurts has increased the number of passes he is throwing.
 - c. This confirms the hypothesis about rushing less and focusing on a better passing game. After shifting his game from rush heavy to pass heavy he has won a larger portion of games as well, pushing forward the idea that this was the correct move.
5. Opponents
- a. Using the same opponents from the Win Percentage section, we will see how the average passing attempts and rushing attempts compare for those teams
 - i. Washington: passing: 30 attempts , rushing: 7 attempts
 - ii. New York Giants: passing: 32 attempts , rushing: 7 attempts
 - iii. Dallas: passing: 32 attempts , rushing: 9 attempts
 - iv. San Francisco: passing: 34 attempts , rushing: 9 attempts
 - v. Minnesota: passing: 27 attempts , rushing: 12 attempts
 - b. Due to the spread of the data, it appears that each team has their own strengths against either the run game or the passing game. With this being said, 9 rushing attempts was the commonality between the 2 toughest opponents on this list so a possible conclusion could be that a neither low nor high amount of rushing attempts results in struggling. Hurts needs to focus on 1 element of his game in a single game. Trying to hybrid his play too much shows a conclusion of struggling to achieve a positive win percentage. Either have a passing heavy game or create a great rushing threat but both tend to stretch him too thin.
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EDA WITH SQL

- 1. Completion Percentage
 - a. Wide range of percentages with a high of 83.87% and a low of 35%.
 - i. These values are the only ones found in the 80s and 30s. Most of the percentages can be found between 50-70%.

b. Completion Percentage by Opponent

- i. Washington: 64.2%
- ii. New York Giants: 57.17%
- iii. Dallas: 62.97%
- iv. San Francisco: 54.98%
- v. Minnesota: 81.07% (highest)
- vi. Las Vegas: 52.94% (lowest)

2. Sacks

- a. A high of 6 and a low of 0.

b. Total Sacks by Opponent

- i. Washington: 14 sacks (highest)
- ii. New York Giants: 9 sacks
- iii. Dallas: 12 sacks
- iv. San Francisco: 5 sacks
- v. Minnesota: 7 sacks

c. Average Sacks by Opponent

- i. Washington: 2 sacks
- ii. New York Giants: 2.3 sacks
- iii. Dallas: 3 sacks
- iv. San Francisco: 2.5 sacks
- v. Minnesota: 3.5 sacks
- vi. Kansas/Houston/Arizona: 4 sacks (highest)
- vii. Detroit: 0.5 sacks (lowest)

3. Passing

- a. Wide range of passing yards with a high of 387 yards and a low of 72 yards.

b. Total Passing Yards by Opponents

- i. Washington: 1,735 yards (highest)
- ii. New York Giants: 774 yards
- iii. Dallas: 1,030 yards
- iv. San Francisco: 488 yards
- v. Minnesota: 526 yards
- vi. Green Bay: 153 yards (lowest)
- vii. *Note: The number of times each opponent has played against Hurts is possibly heavily biasing this statistic.*

c. Average Passing Yards by Opponents

- i. Washington: 248 yards
- ii. New York Giants: 194 yards
- iii. Dallas: 258 yards
- iv. San Francisco: 244 yards
- v. Minnesota: 263 yards
- vi. Tennessee: 380 yards (highest)
- vii. Green bay: 153 yards (lowest)

4. Rushing

a. Wide range of rushing yards with a high of 157 yards and a low of 6 yards.

b. Average Rushing Yards by Opponent

- i. Washington: 29 yards
- ii. New York Giants: 44 yards
- iii. Dallas: 42 yards
- iv. San Francisco: 51 yards
- v. Minnesota: 46 yards
- vi. Green Bay: 157 yards (highest)
- vii. Pittsburgh: 10 (lowest)

5. Interceptions

a. Total Rushing Yards by Opponent

- i. Washington: 3 ints
- ii. New York Giants: 4 ints (highest)
- iii. Dallas: 4 ints (highest)
- iv. San Francisco: 0 ints
- v. Minnesota: 2 ints

b. Average Rushing Yards by Opponent

- i. Washington: 0.4 ints
- ii. New York Giants: 1 int
- iii. Dallas: 1 int
- iv. San Francisco: 0 ints
- v. Minnesota: 1 int
- vi. New York Jets: 3 ints

6. Home/Away and Wins/Losses

- a. Away/Loss: 6 games
- b. Away/Win: 17 games
- c. Home/Loss: 7 games
- d. Home/Win: 16 games
- e. Jalen has basically the same records at home as away. This is an interesting statistic as normally players perform better at home.

7. Hypothesis: The more rushing yards Hurts has, the less passing yards he has or vice versa. If this is true, which is better?

- a. Out of the 46 games being analyzed:
 - i. 22 of those games he has thrown above his average in passing yards and 24 of those games he has thrown under his average in passing yards.
- b. Out of those 22 games where he threw over his average:
 - i. 13 of them he has run under his average in rushing yards.
 - 1. This shows that when he is able to throw for more yards, he tends to run the ball less. Or when he can't run the ball very well in a game, he tends to throw the ball more.

- c. When Hurts's passing yards are below his average, we can see that the hypothesis stays true. His rushing averages both went up. This means that the more passing yards he is getting, the less rushing yards he is inclined to produce and vice versa.
 - d. High Passing and Low Rushing or Low Passing and High Rushing?
 - i. Above average passing yards and below average rushing yards:
 - 1. Hurts wins 69.2% of the time in this scenario.
 - ii. Below average passing yards and above average rushing yards:
 - 1. Hurts wins 72.7% of the time in this scenario.
 - iii. Above average passing yards and above average rushing yards:
 - 1. Hurts wins 66.7% of the time in this scenario.
 - iv. Below average passing yards and below average rushing yards:
 - 1. Hurts wins 76.9% of the time in this scenario.
8. Conclusion
- a. It can be concluded that less passing yards seems to be the most productive play style for Jalen Hurts.
 - i. *Based on the end goal of winning games.*
 - b. Rushing yards have some say in the matter in that when he rushes less he tends to win more.
 - c. Hurts loses most frequently when he is both passing for above average yards and rushing for above average yards.
 - i. This matches the conclusion from our previous EDA which states that a hybrid play style is not best. He must choose one style of play to have the most success.
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COMPARATIVE ANALYSIS

- 1. Passing Yards
 - a. Total passing yards
 - i. Carr has the highest, Hurts has the lowest.
 - 1. Stat is swayed by time in the league. But Burrow has 400+ more passing yards than Hurts while being in the league for the same amount of time.
 - b. Passing yards by attempts
 - i. While Mahomes, Burrow, and Carr have all had at least one game where they threw 60+ attempts, Hurts has never broken the 50 attempts mark. He is not as pass heavy as some of his elite peers.
 - 1. By attempt, his passing yards stay equivalent to his peers, so the reason for lack of high yardage is due to attempts rather than lack of passing skill.

2. Rushing Yards
 - a. Total rushing yards
 - i. Hurts has the highest, Burrow has the lowest
 1. While stat is swayed with time in the league, it demonstrates an interesting conclusion. Hurts has rushed more than the other 3 quarterbacks while only being in the league for a fraction of the time. He is one of the highest rushing quarterbacks.
 - b. Rushing yards by attempts
 - i. Mahomes, Burrow, and Carr have never rushed more than 12 times in a game, while Hurts has rushed a maximum of 18 times. While he may not pass as much as the other quarterbacks, he outruns them significantly.
 3. Completion Percentage
 - a. Hurts had the lowest completion percentage to start his career, but has improved every year to now have an even percentage with the other quarterbacks.
 - i. Mahomes has had the most consistent completion percentage
 - ii. Carr has fluctuated heavily
 - iii. Burrow has dropped since 2021
 4. Win Percentage
 - a. In the past two years, Hurts has had the highest win percentage of any of the other quarterbacks
 - b. Every quarterback's win percentage has decreased in the past year. Hurts has had the fastest win percentage increase in the past 3 years.
 5. Interceptions
 - a. In the past year, every quarterback except for Hurts has decreased the number of interceptions thrown.
 - i. Hurts, who has thrown the least amount of attempted passes, is leading in interceptions. Far too many turnovers.
 6. Sacks
 - a. Hurts leads in sacks.
 - i. Needs to get rid of the ball or make a play quicker. Must find a solution to this problem.
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MACHINE LEARNING

1. Logistic Regression Model
 - a. Had a 75% accuracy
 - i. 80% accuracy with test data
 - b. The confusion matrix shows how we have an 80% accuracy with the test data.

- i. Here we can see that when Jalen wins a game, the prediction model is always correct (7/7). But when Jalen loses a game, the prediction made is wrong 66% of the time. Only one loss was correctly predicted. In total 8/10 predictions were accurate and 2/10 were not. This is a problem of false positives.
2. Support Vector Machine
 - a. Had 74.375% accuracy
 - i. 80% accuracy with test data
 - b. Using a Support Vector Machine, we get the same result as the Logistic Regression model. An 80% accuracy on the test data with the same false positives being predicted.
3. Decision Tree Classifier
 - a. Had 90.625% accuracy
 - i. 80% accuracy with test data
 - b. While the decision tree had a better accuracy by far when determining the best score, the accuracy of the test data was the same at 80%. The same false positives were recorded.
4. K-Nearest Neighbors
 - a. Had 77.5% accuracy
 - i. 80% accuracy with test data
 - b. The same false positives were predicted.
5. Conclusion
 - a. Since every model recorded the same accuracy for test data and the same false positives, I am inclined to believe these 2 losses are outliers and should have been wins based on the understood data.
 - i. Other factors most likely made the team lose such as lack of defensive presence, missed scoring opportunities from other players, etc.
 - b. Decision Tree Classifier was the most accurate model and best model created.