This project examined NFL passing offense performance through a data-driven approach using Python in a Jupyter Notebook environment. The analysis relied primarily on the pandas library for data manipulation and organization, while matplotlib and seaborn were used to generate visualizations that revealed patterns and correlations within the data. Together, these tools allowed for a structured and reproducible analysis of team-level passing metrics and their relationship to overall success.

The study focused on several central research questions. First, it investigated which NFL teams achieve the highest total passing yardage in a season, providing a baseline understanding of volume-based offensive production. It then explored whether a relationship exists between passing touchdowns and total team wins, addressing the broader question of how aerial scoring contributes to success. Additionally, the analysis considered how interception rate affects a team's passing efficiency and whether higher sack percentages negatively impact a quarterback's Total QBR.

The results revealed several consistent and meaningful insights. Teams that rank highly in total passing yards tend to establish a strong offensive foundation, suggesting that passing volume plays an important role in maintaining offensive relevance across a season. However, yardage alone does not guarantee success. The data showed a clear positive correlation between passing touchdowns and total wins, reinforcing the idea that converting offensive drives into points, rather than simply accumulating yards, is a critical determinant of winning. In contrast, interception percentage demonstrated a strong negative relationship with passer rating, underscoring how costly turnovers can be to overall passing efficiency. Even small increases in interception rate were associated with noticeable declines in quarterback performance metrics. Similarly, higher sack percentages correlated negatively with Total QBR, indicating that both offensive line protection and quarterback pocket awareness significantly influence passing effectiveness.Based on these findings, several strategic recommendations emerge. Teams should prioritize investments in offensive line play, as reducing sack frequency directly supports improved quarterback efficiency and decision-making. Coaches should also emphasize schemes and reads that limit interception risk, particularly in high-pressure situations. More broadly, offensive strategy should focus not only on generating passing yards, but on translating those yards into touchdowns, especially in red-zone scenarios where efficiency has the greatest impact on game outcomes.

While this project provides valuable insights, there are clear opportunities for future expansion. Incorporating defensive statistics would allow for a more complete evaluation of how opposing defenses shape passing performance. Extending the dataset across multiple seasons could reveal long-term trends and reduce the influence of single-season anomalies. Finally, situational analysis, such as performance by down and distance, would offer deeper tactical understanding and help distinguish between volume-driven production and high-leverage efficiency.

Overall, this analysis demonstrates that effective passing offenses are defined not solely by how much they throw, but by how efficiently they protect the quarterback, secure the football, and convert opportunities into points.