

MSA 8020 Data Visualization Group Project Report

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Comprehensive Analysis of NFL Player Performance and Game Strategies

Project Concept

The goal of this project is to conduct a comprehensive analysis of NFL player performance and game strategies using data from NFL Big Data Bowl 2024. We aim to explore the dynamic interactions between players, offensive formations, and play outcomes. The project focuses on creating meaningful visualizations to provide insights into player trajectories, game strategies, and win probability dynamics.

Data Source

The primary data sources for this project include the provided datasets: game data, play data, player data, tackles data, and tracking data. These datasets cover a range of information, including player movements, game details, player history and tackle information..

Link to Dataset and Competition: <https://www.kaggle.com/competitions/nfl-big-data-bowl-2024>

Link to Colab Notebook:  DV-Project.ipynb

Analysis Process

1. Exploratory Data Analysis (EDA)

- Conducted an in-depth EDA on each dataset to understand the distribution of variables and identify potential trends.

2. Player Performance Metrics

- Calculated key player performance metrics, such as speed, distance traveled, tackles made, and missed tackles.
- Feature engineered player positions as 'defensive' and 'offensive'.

- Calculated the BMI of each player to better understand the relationship between fitness and tackling.
- 3. Game Strategy Analysis**
 - Explored the correlation between offensive formations and play outcomes.
 - Analyzed the impact of defensive strategies on offensive plays.
 - 4. Win Probability Dynamics**
 - Examined win probability changes during critical plays.
 - Identified events that significantly influenced win probabilities.

Visualization Strategy

Our visualization strategy revolves around creating interactive and informative visualizations to convey key insights. The following visualizations were developed:

- 1. Player Trajectory Heatmaps**
 - Heatmaps illustrate player movements corresponding to each position played.
- 2. Bar Charts for Players**
 - Showing most frequent player positions in the dataset.
 - Most frequent play strategies used by all the teams.
 - Maximum, average, and minimum scores by home and visitor teams in any game
- 3. Donuts**
 - Donut chart was used for showing college and how much talent comes out of each college
- 4. Pitch Visualizations**
 - For any play we can view each player's movement frame by frame by animating each play.
 - Heatmaps allow us to better understand the likely path and direction that a particular player would traverse.
- 5. Histograms**
 - Player weights
 - Final scores

Insights

- 1. Player Performance:**
 - Identified players based on their position and BMI and gained insight into the probability that they would participate in a tackle.
- 2. Game Strategies:**
 - It is logical to view that all the players naturally gravitate towards the ball.
 - Depending on the formations utilized in plays, we can predict which player is most likely to participate in a tackle or forced fumble.

3. Win Probability Dynamics:

- Gained better understanding of the correlation between tackling and result of the game i.e, whether it is a win or a loss.

Team Roles, Collaboration Strategies, and Task Allocation

Our team comprised three members with expertise in data analysis, visualization, and storytelling. Roles were assigned based on individual strengths:

Data Analyst (Crystal Pendergrass):

- Identified, collected and preprocessed the data.
- Feature engineered and created a basis for EDA.

Visualization Developer (Hussain Kaide Johar Manasi):

- Selected, designed and developed visualizations that helped in EDA.
- Ensured the interactive and animated elements enhanced the creative storytelling aspect.

Storyteller (Dipak Bhattarai):

- Provided insights into football strategies and play dynamics.
- Contributed to the narrative development and interpretation of findings.