

NFL Offense Analysis

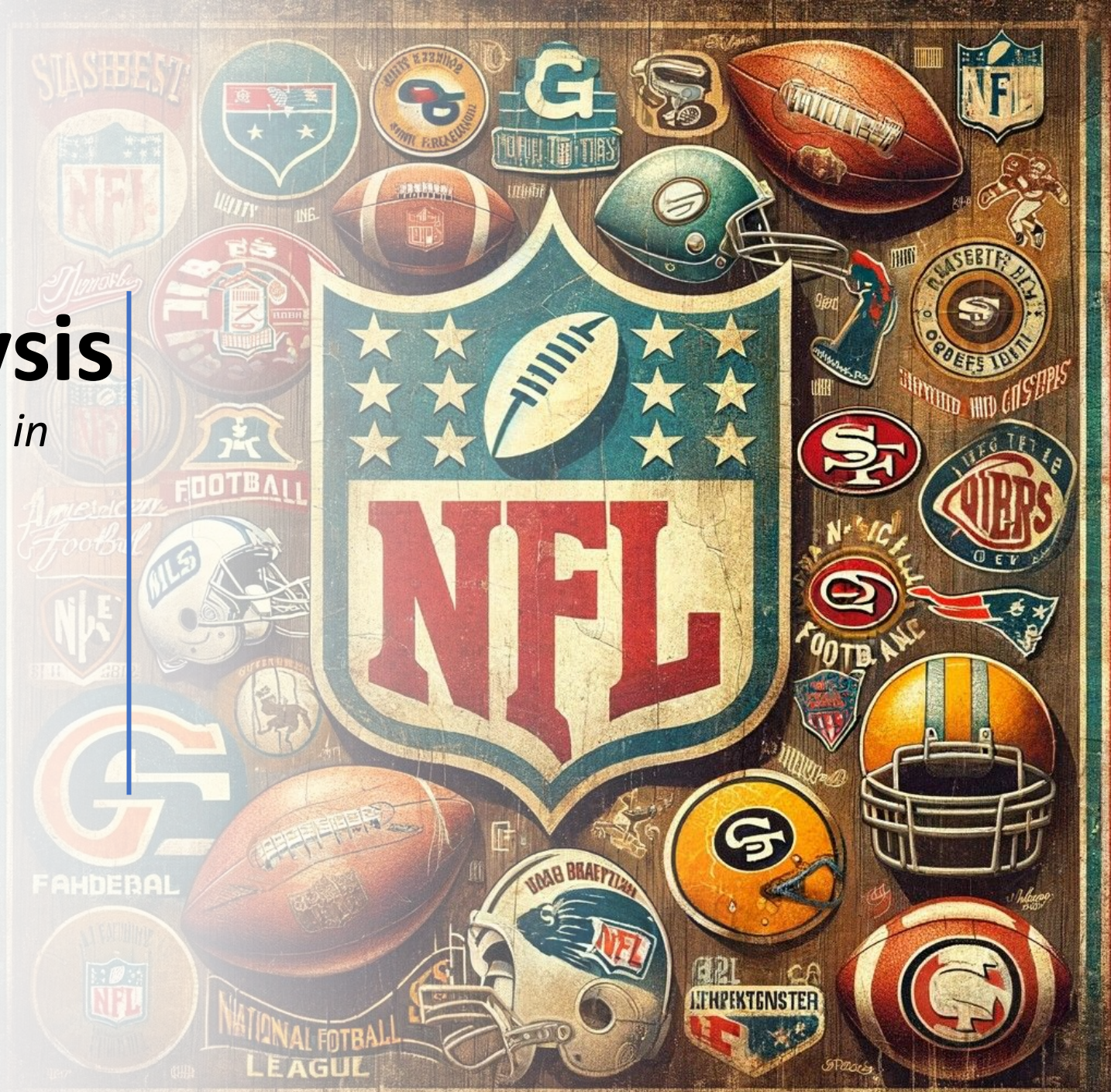
An observational analysis of offenses in the NFL from 2009 – 2017

Unit 14: Final Project 2

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Section | 2023-fall-sec04-Ysis Tarter-tues



Overview | As analytics increasingly influences sports such as Major League Baseball, our research turns to American football to understand its strategies, trends, and patterns

Main Research Question

How can analyzing NFL play data from the 2009-2017 seasons inform the development of effective offensive and defensive coaching strategies by highlighting key aspects and risks?

Sub-Analytical Categories

1

Impact of General Factors on Offense

Field Position and Time Pressure:

- **Play Type** (Pass vs Run, Direction)
- **Critical Errors** (Turnovers and Penalties)

2

Impact of Home Field Advantage

Is there a home field advantage in the NFL?

What was the impact of time of year on the home advantage?

3

General Insights of Offensive NFL Team Strategies

Do teams favor the run or pass more?

How do teams receivers rank in yards after catch (YAC)?

Do winners need a better passing or running attack?

Sanity Check | To ensure the accuracy and integrity of our data, we conducted a comprehensive review, checking a variety of counts and correcting several issues such as misnamed teams or franchises that moved cities

Kaggle Data Set: [Detailed NFL Play-by-Play Data 2009-2017](#)

Sanctity Checks

Teams in data: 34 

Seasons in data: 9 

Teams in each season: 32 

Games in each season: 256 

Home and away games for each teams: 8 

Added Key Columns

New Classification / Grouping Columns

- ▶ Quarter Time Category (Start, Middle, End)
- ▶ Yardline Groupings (Ten yard bins)
- ▶ Various Binary columns for charts (Run / Pass Location, etc.)

Calculated Columns

- ▶ Total Points
- ▶ Total Turnovers

Removed Columns

Precalculated Probability Columns

- ▶ Scoring Probabilities (Touchdown, Two Points, Field Goal, etc.)

Unused Statistic Columns

- ▶ Player Information (Receiver, Rusher, Blocking Player, etc.)
- ▶ Timeout stats

Initial Exploration | The data suggests a shift towards increased excitement in the NFL, characterized by a reduction in one-sided big losses per season and an increase in high-scoring games decided by narrow margins.

Data Snapshot

(2009 - 2017 season)

Total Games

2,304

Avg Total Points

↔ 42 (Little Change)

Avg Total Yards

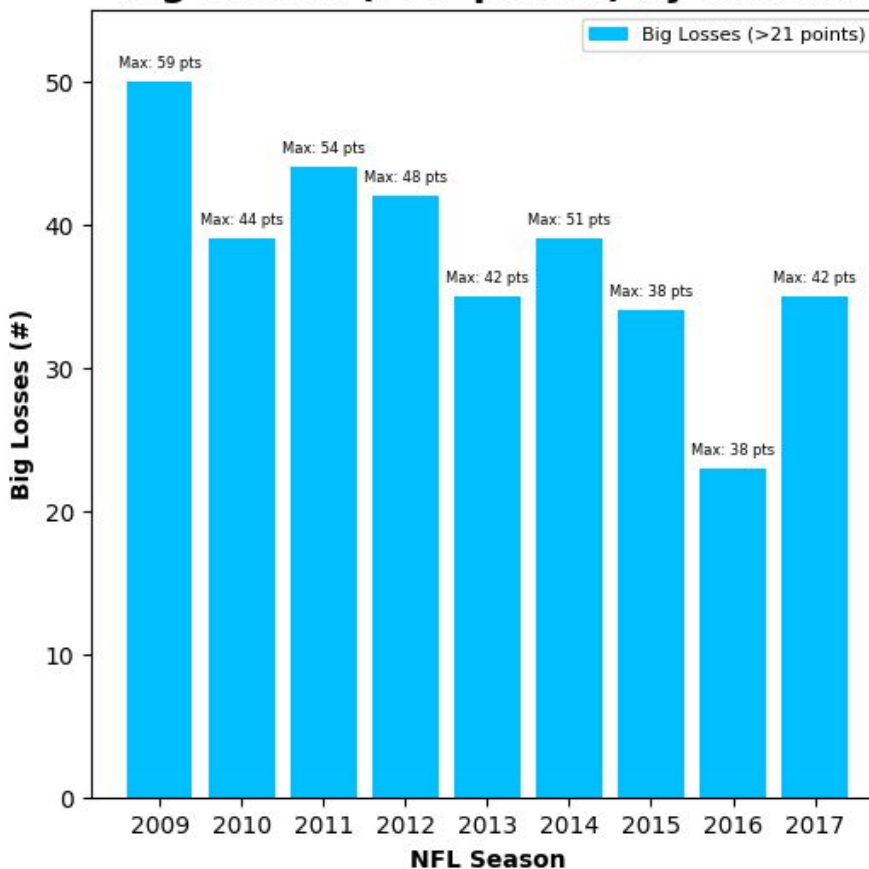
↓ 90 yds

Avg Penalties

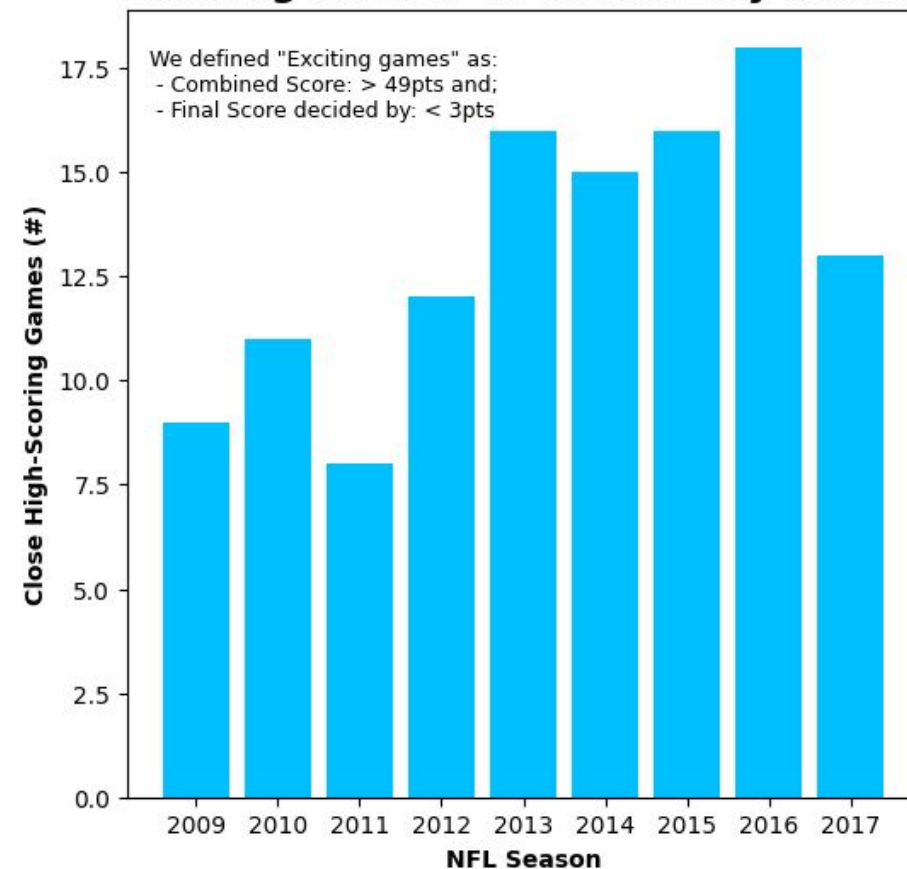
↑ 2

The Charts tell a different story than the snapshot...

Big Losses (>21 points) by Season



"Exciting Games" in the NFL by Season

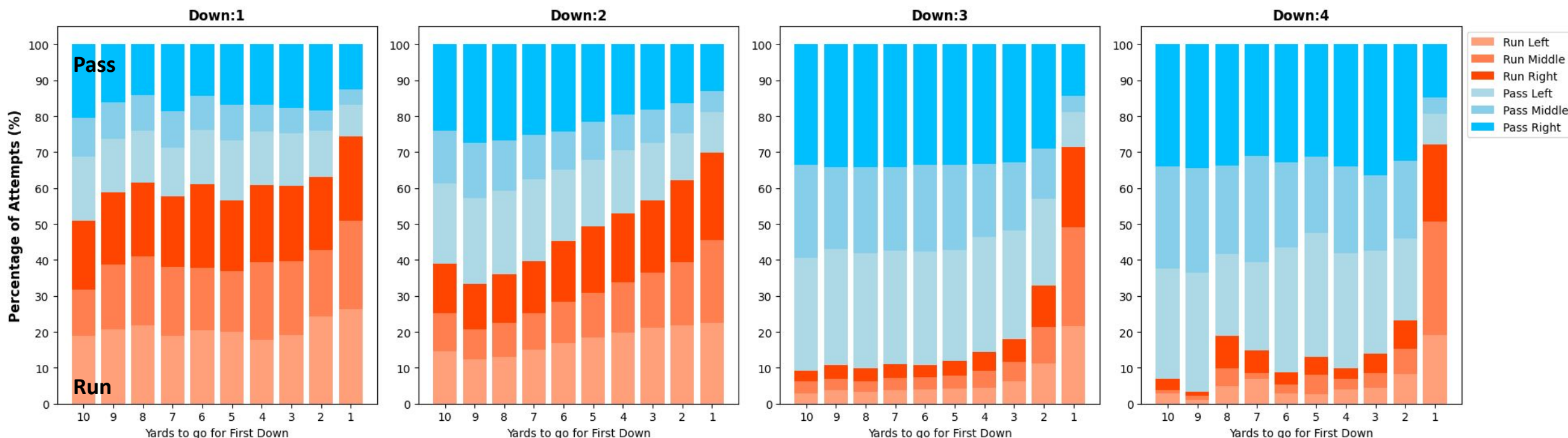


1

General Factors (1 of 3) | When we begin looking at how field position may impact offenses, our findings highlight a clear relationship between the down number, distance to first down and the preferred play by NFL offenses

Field Position | Identifying Play Type by Down and Yards to First Down

Percentage of Play Types (Pass vs Run) by Direction and Distance to First Down

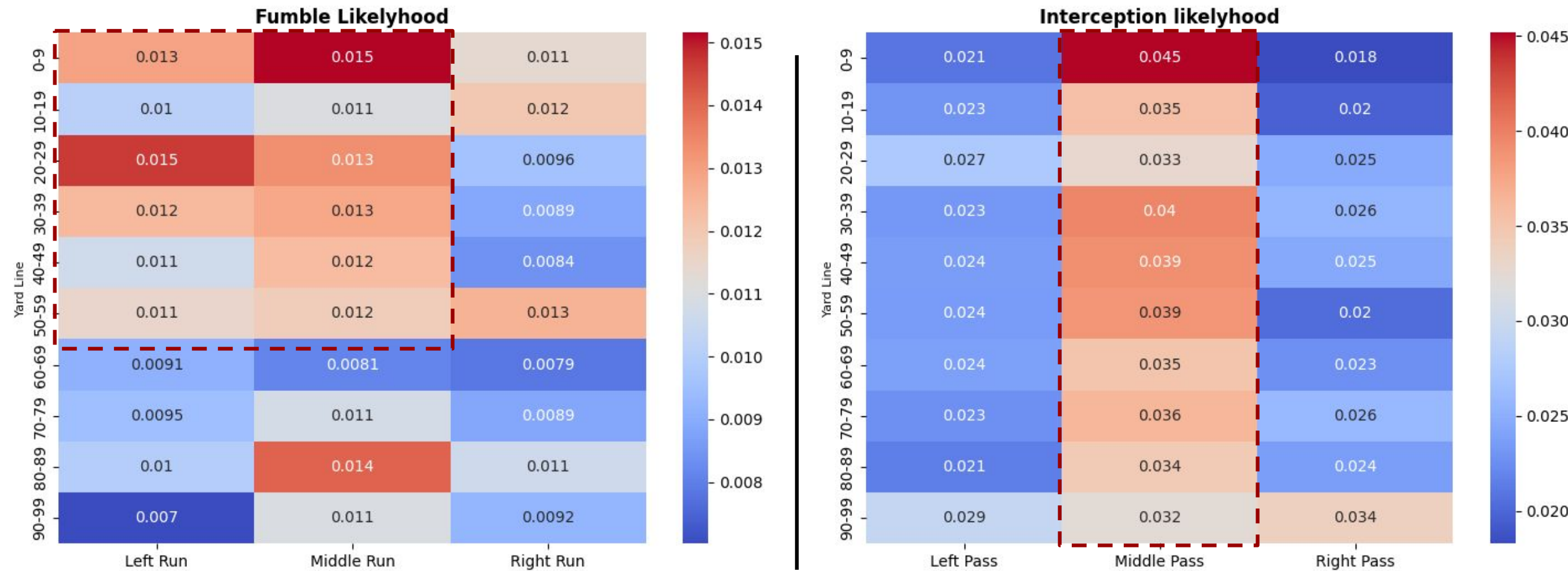


First down often starts with a run, but transitions to pass plays if there's no forward progress

1

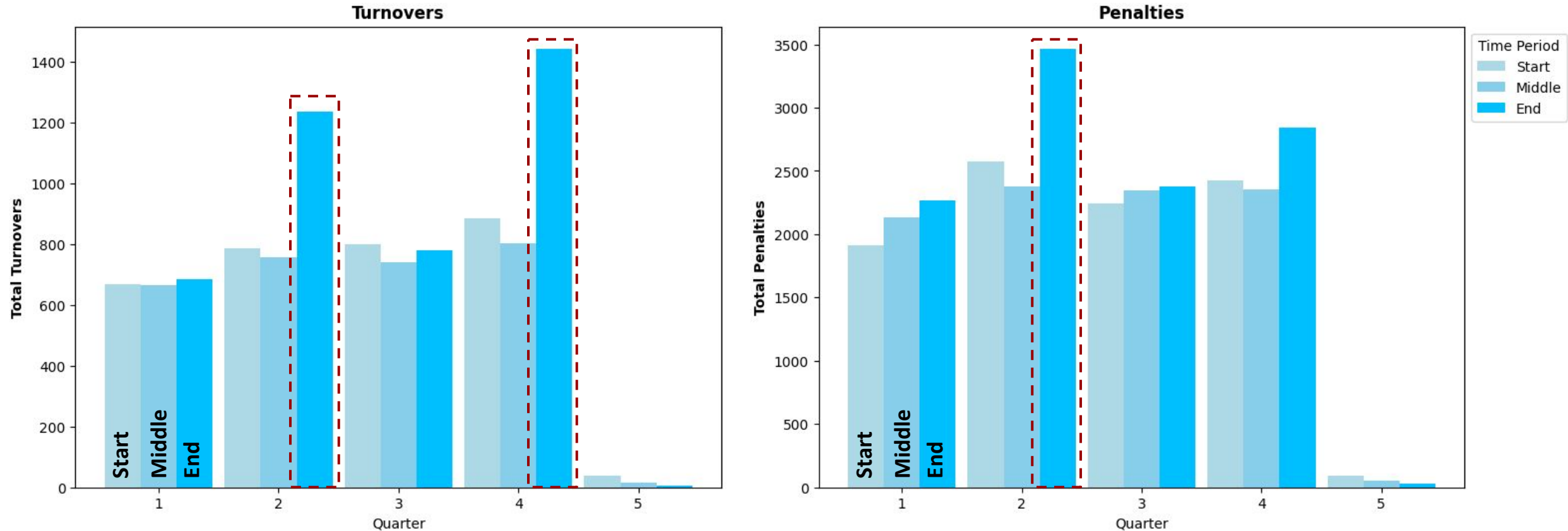
General Factors (2 of 3) | Shifting to identifying high-risk areas. Fumbles tend to occur once teams cross mid field, often on middle or left runs. In contrast, interceptions have higher risk associated with middle passes (~2x rate)

Field Position | Identifying frequency of Turnovers by location



1 General Factors (3 of 3) | When it comes to time pressure we can see impacts on both total turnovers (fumbles + interceptions) and penalties

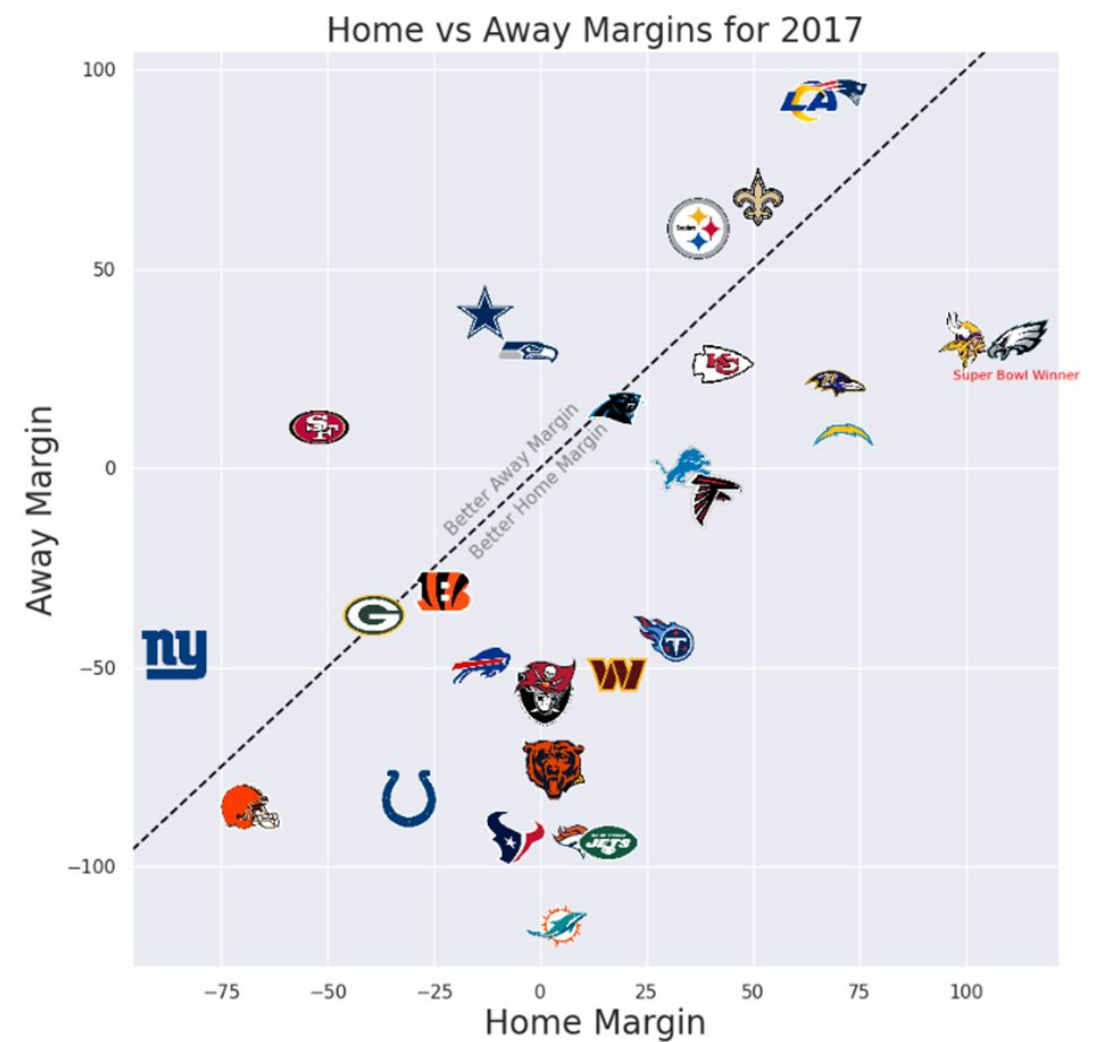
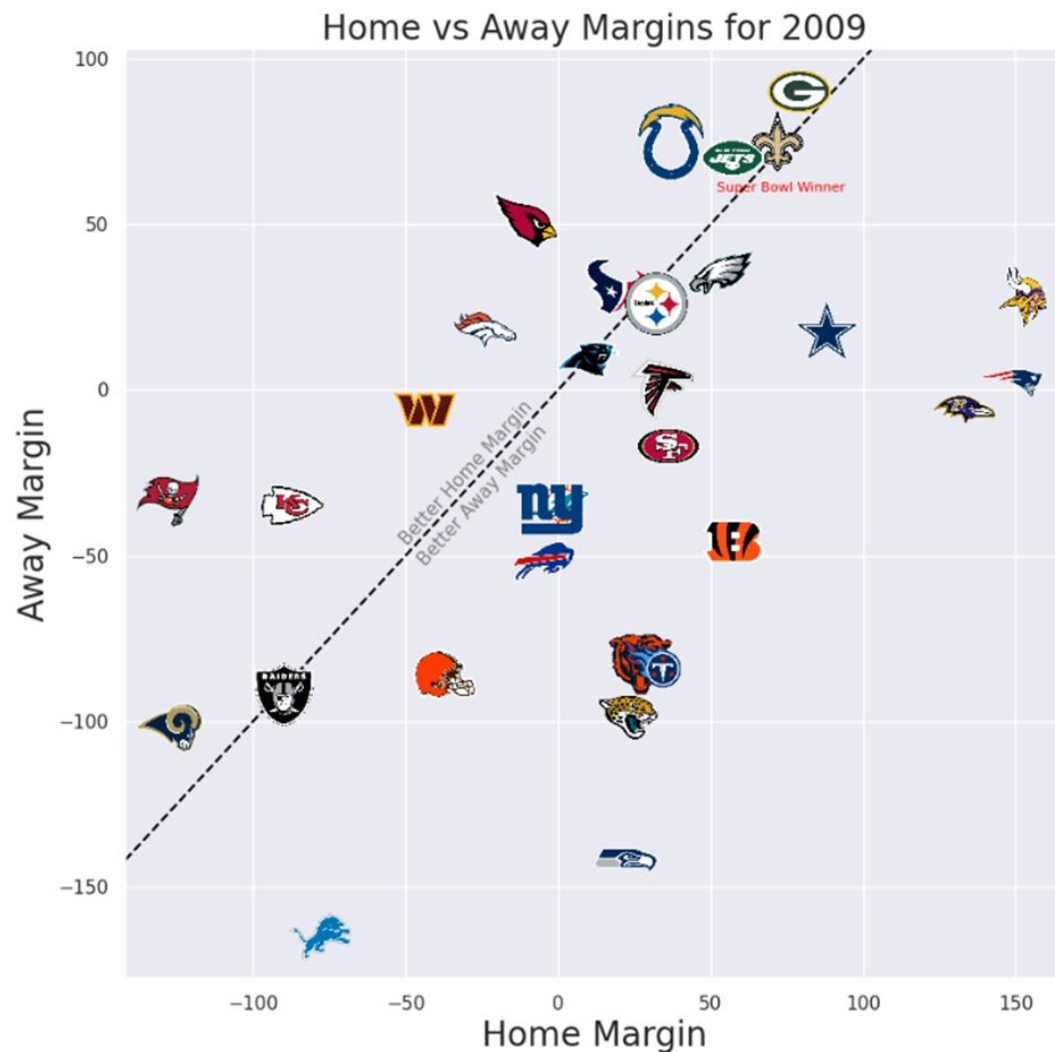
Time | Identifying the Impact of Time Pressure on Critical Errors



Time pressure increases turnovers in the late 2nd and 4th quarters and drives up 2nd-quarter penalties

2

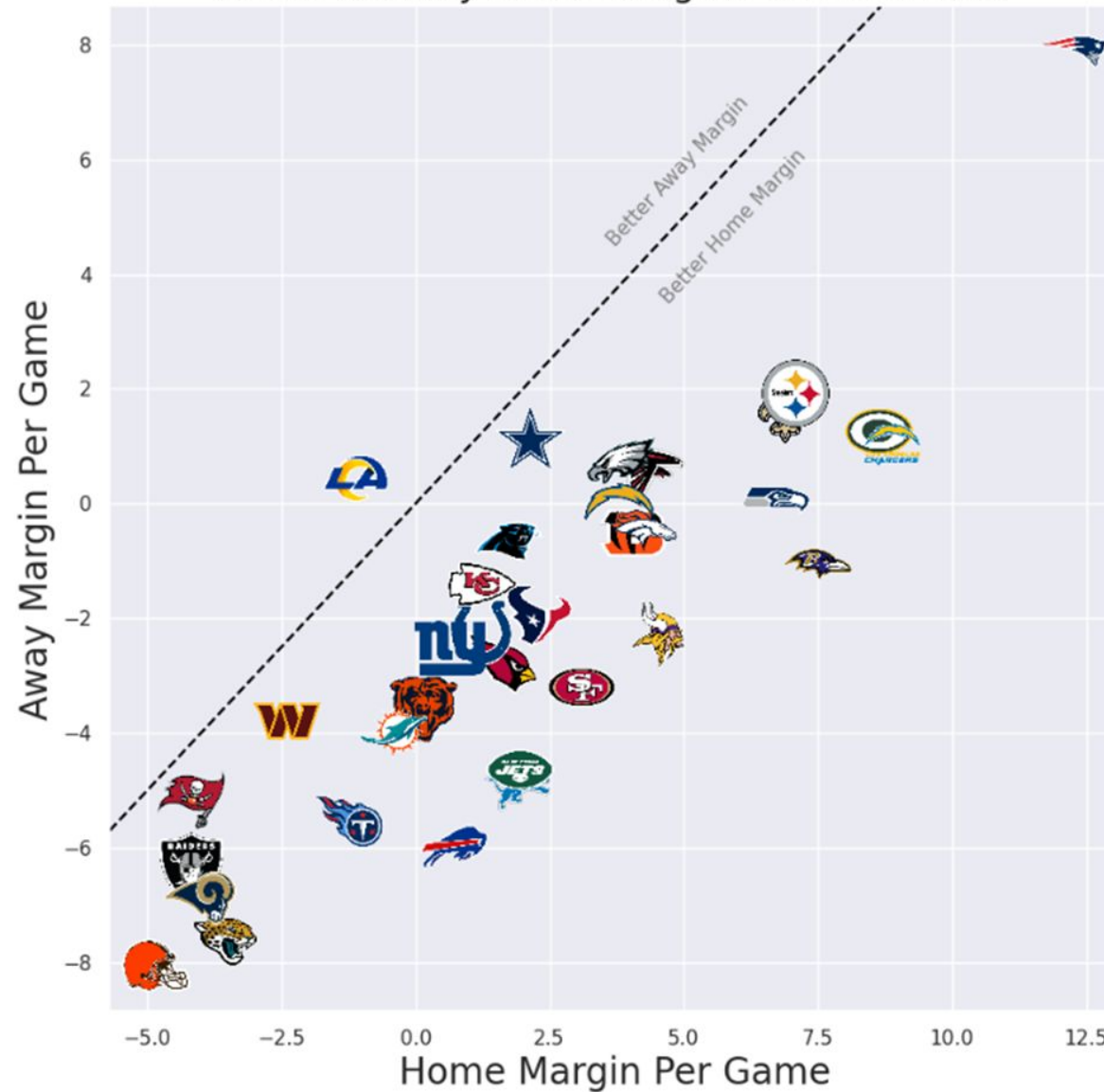
Impact of Home Field Advantage (1 of 3) | There's a home advantage for teams...



2

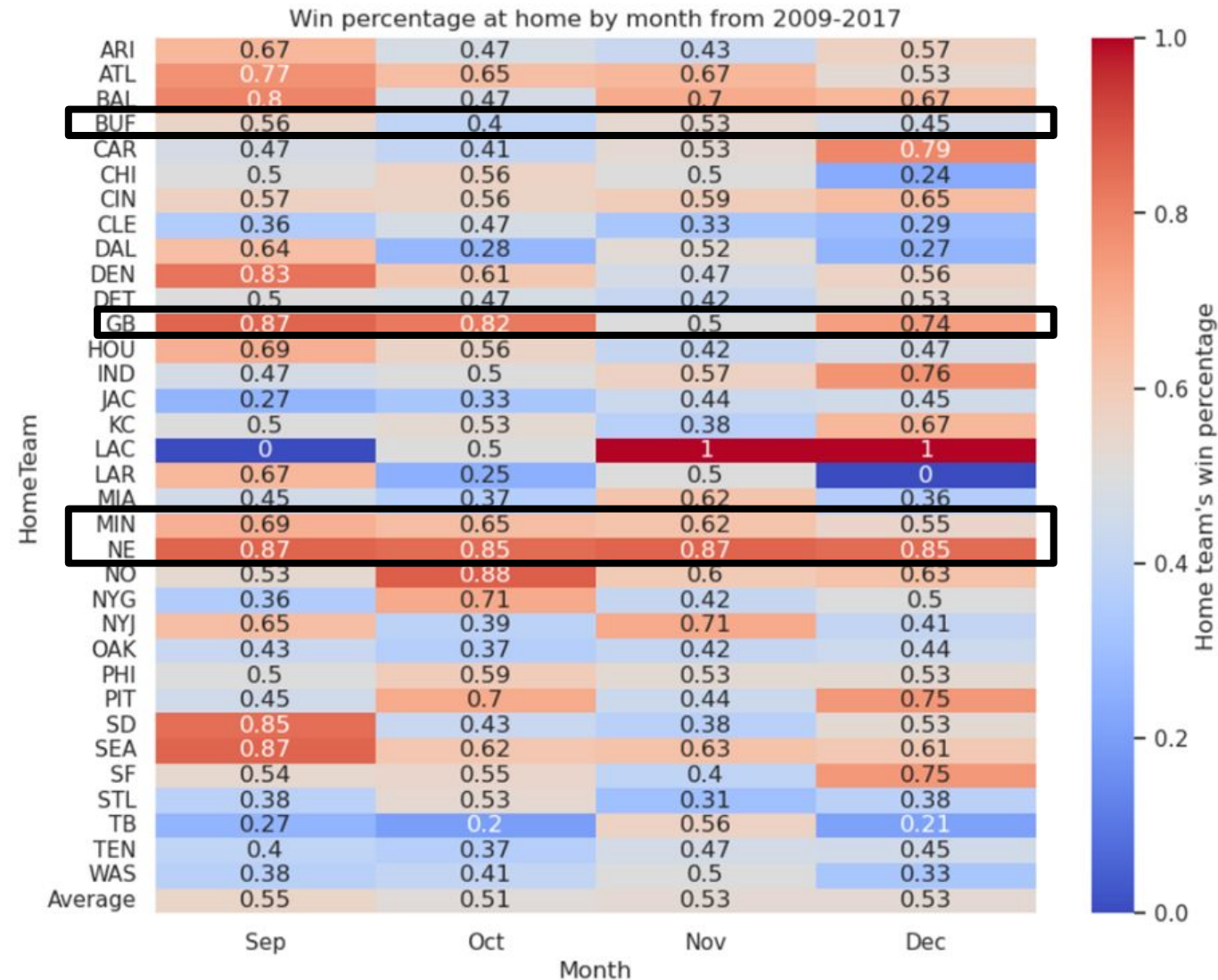
Impact of Home Field Advantage (1 of 3) | And this is more evident from nine seasons of data

Home vs Away Score Margins for 2009-2017



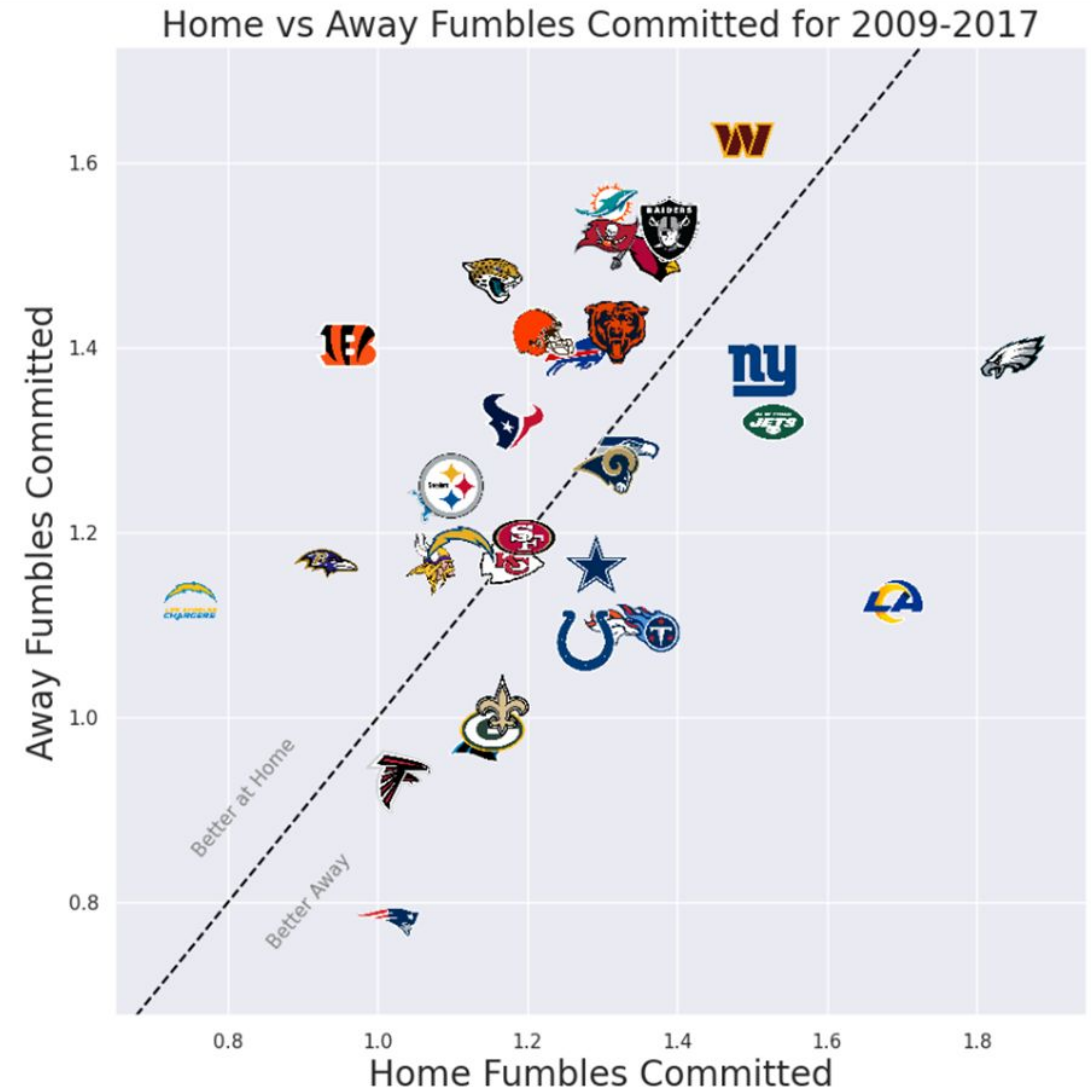
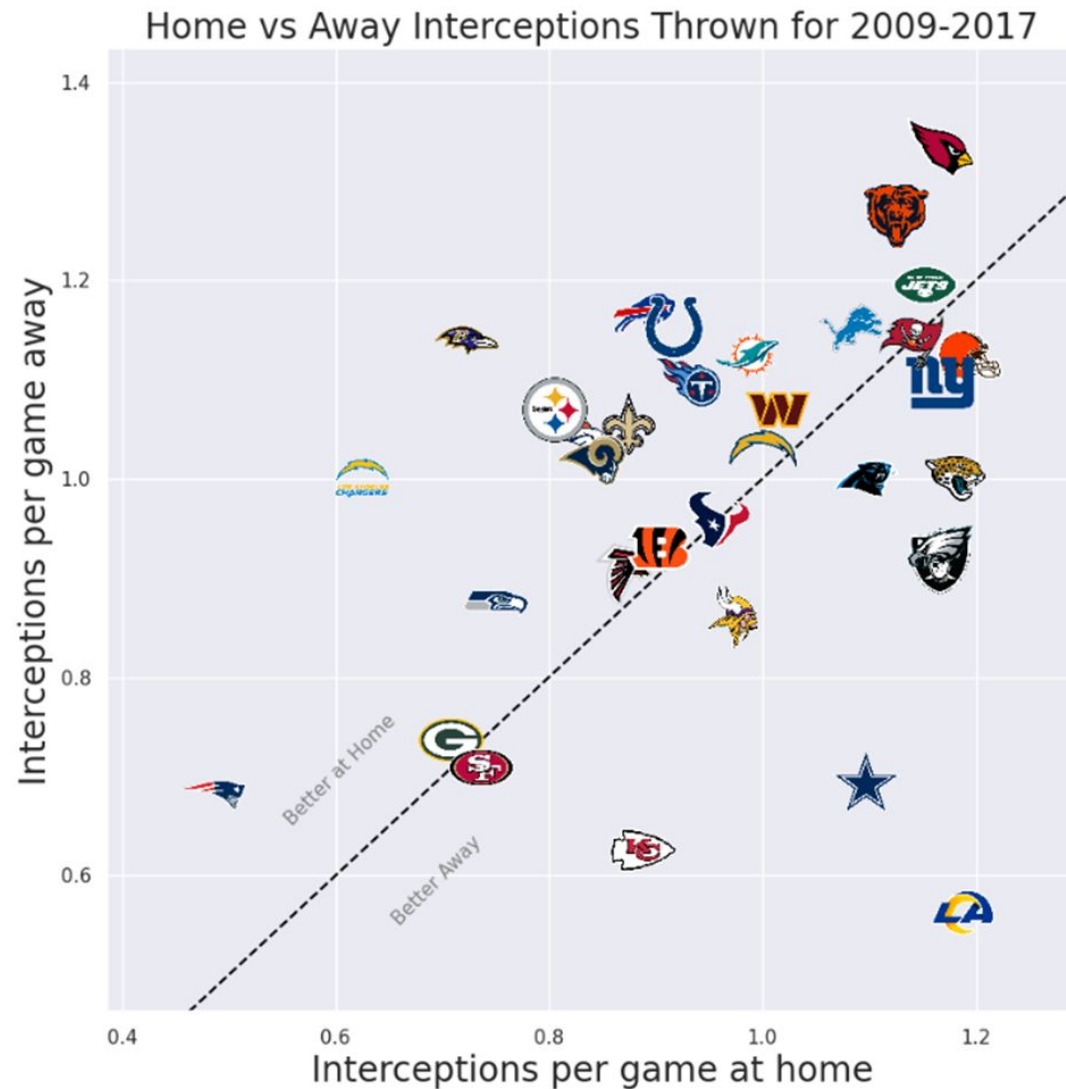
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Impact of Home Field Advantage (2 of 3) | No impact of month/time of year on the home advantage



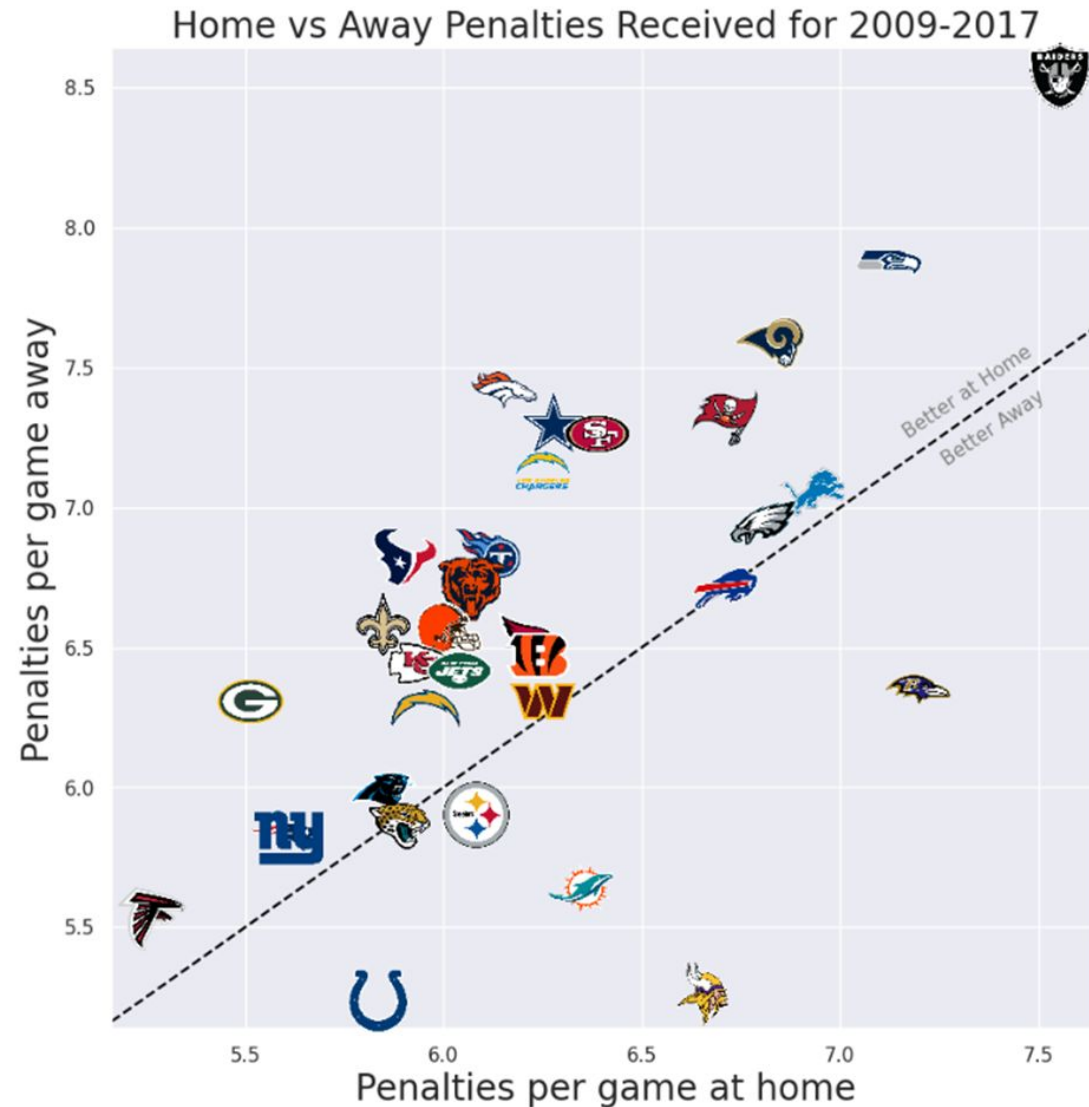
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Impact of Home Field Advantage (3 of 3) | Weak home advantage effect on interceptions/fumbles...



2

Impact of Home Field Advantage (3 of 3) | But referees are biased in favor of home teams

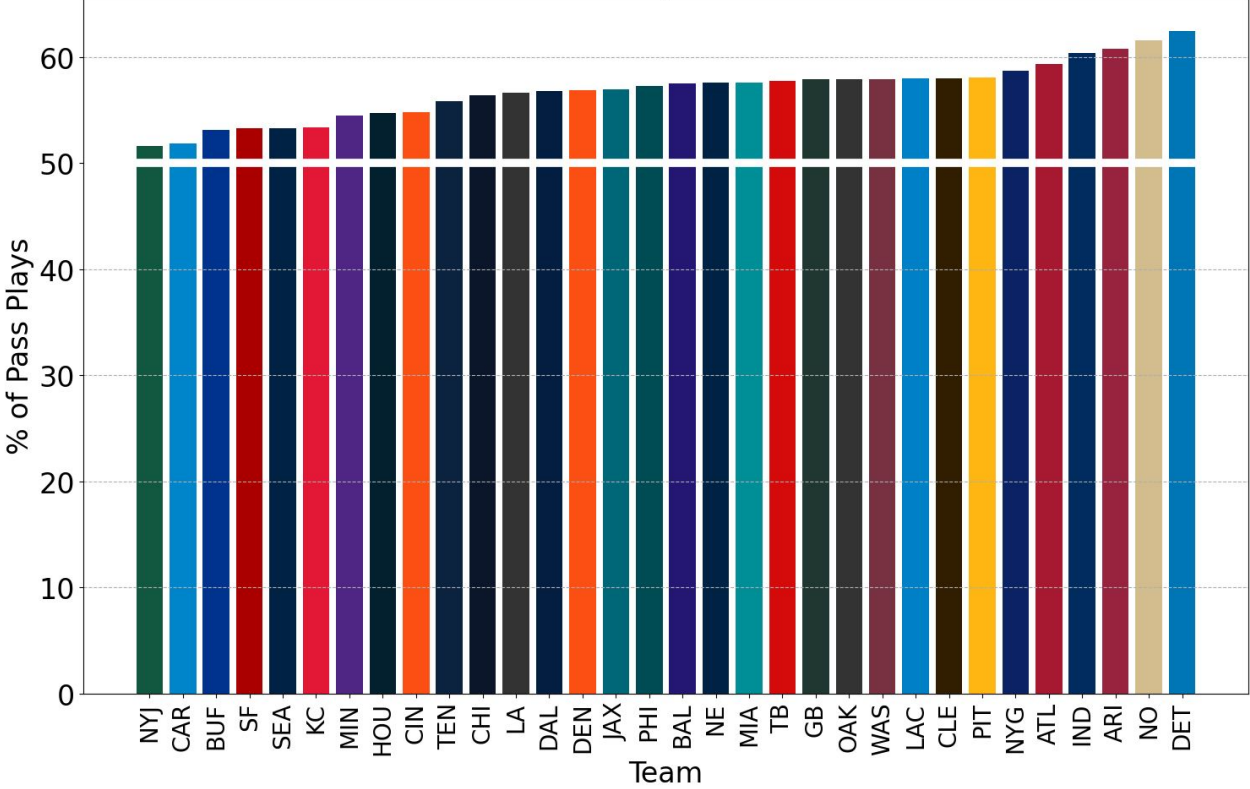


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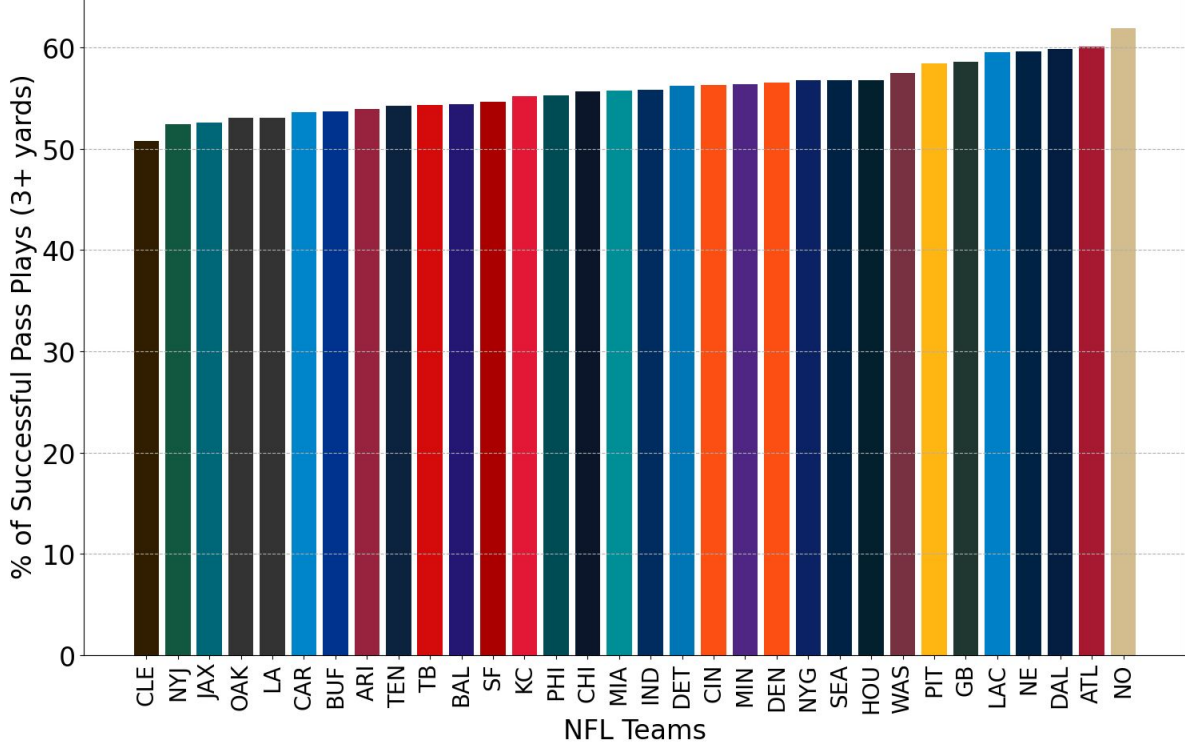
NFL Team Specific Strategies (1 of 3) | Let's look closer at the % of times teams pass the ball and how successful they are at passing

Passing | Identifying Pass Heavy Teams and Success Rates

% of Pass Plays 2009-2017

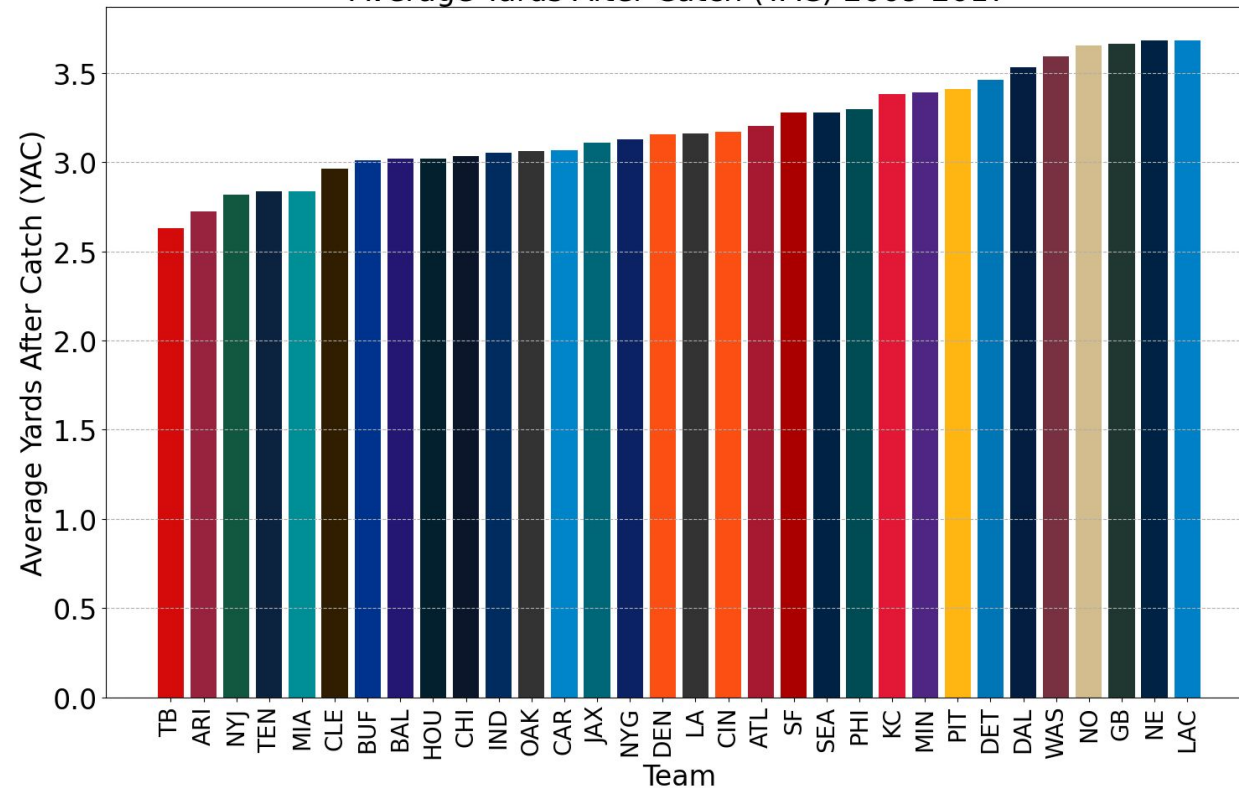


% of Successful Pass Plays (3+ yards) by NFL Teams

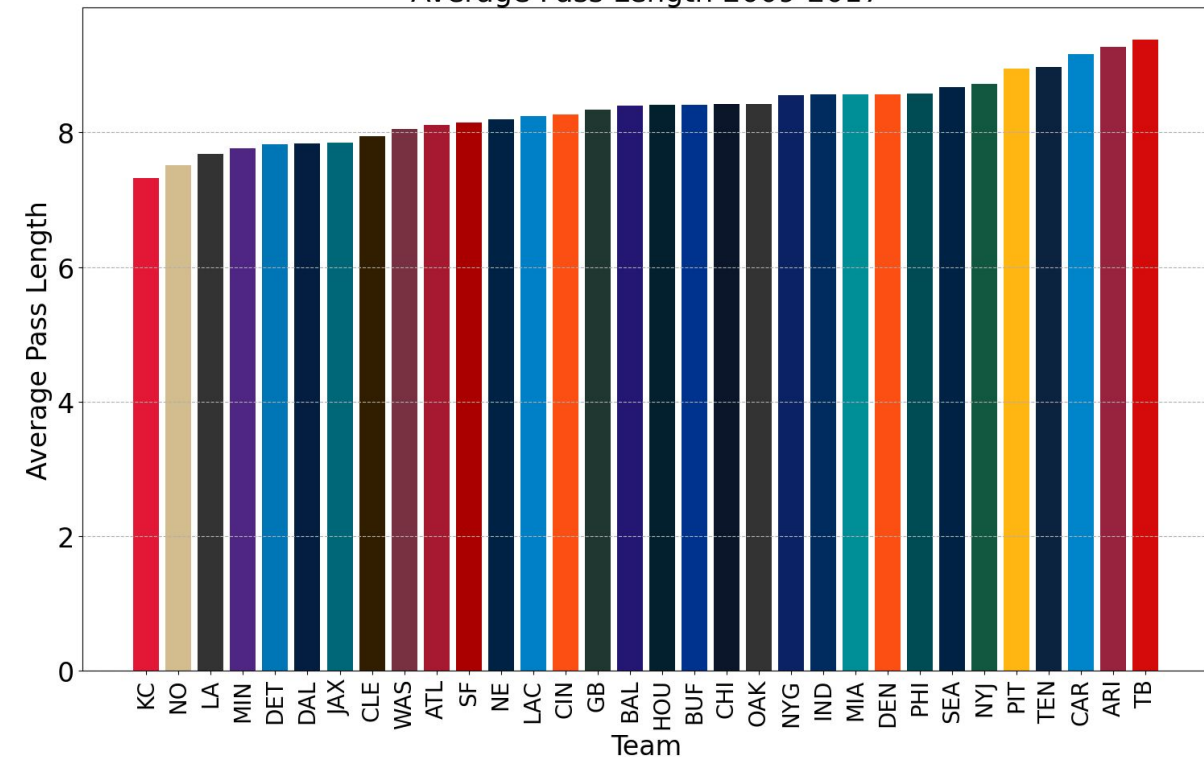


Passing | Identifying Teams with Dynamic Receivers

Average Yards After Catch (YAC) 2009-2017



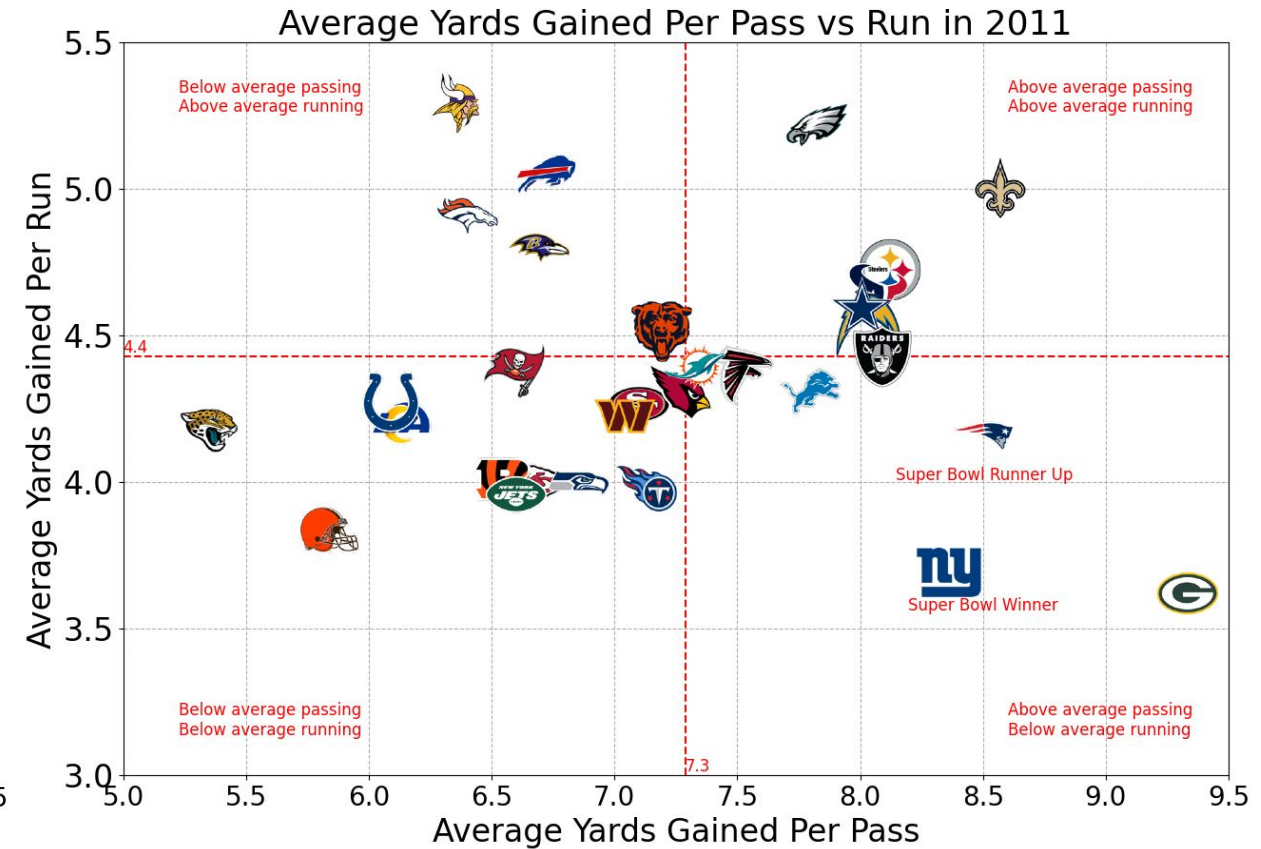
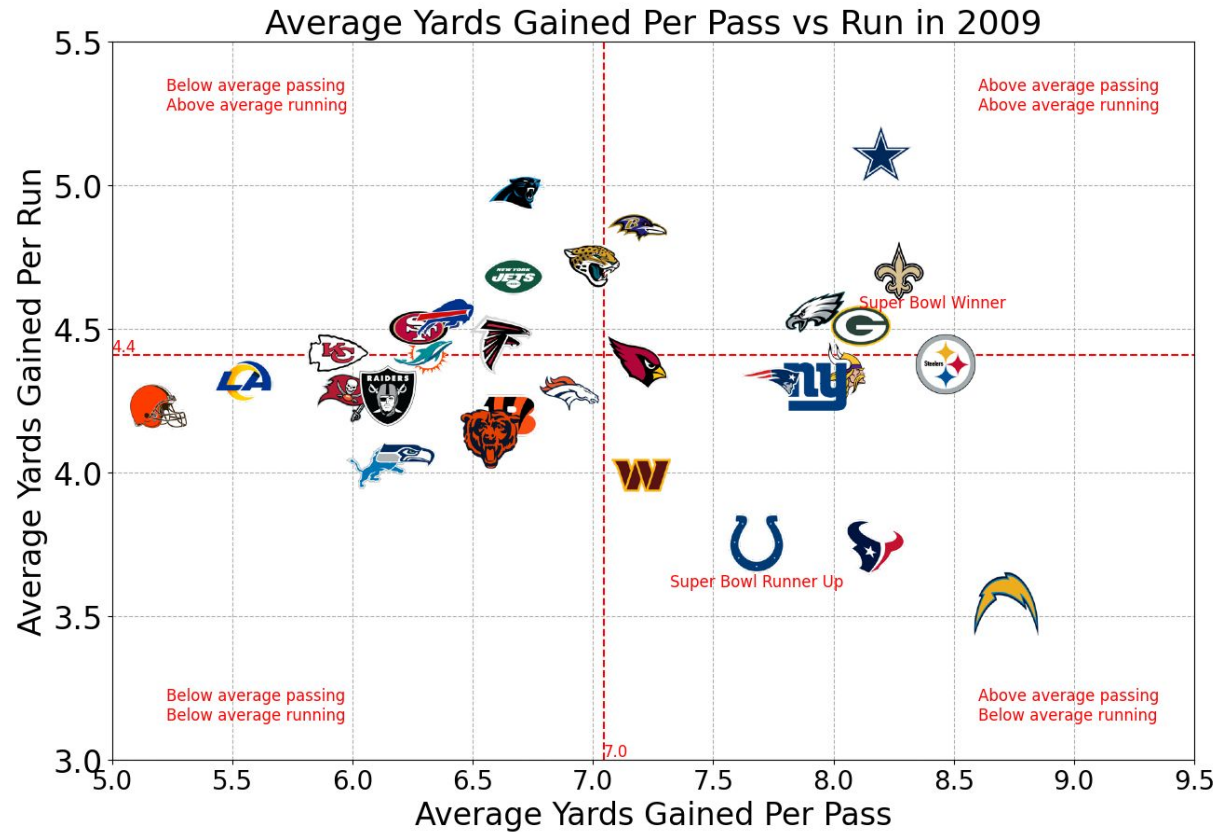
Average Pass Length 2009-2017



3

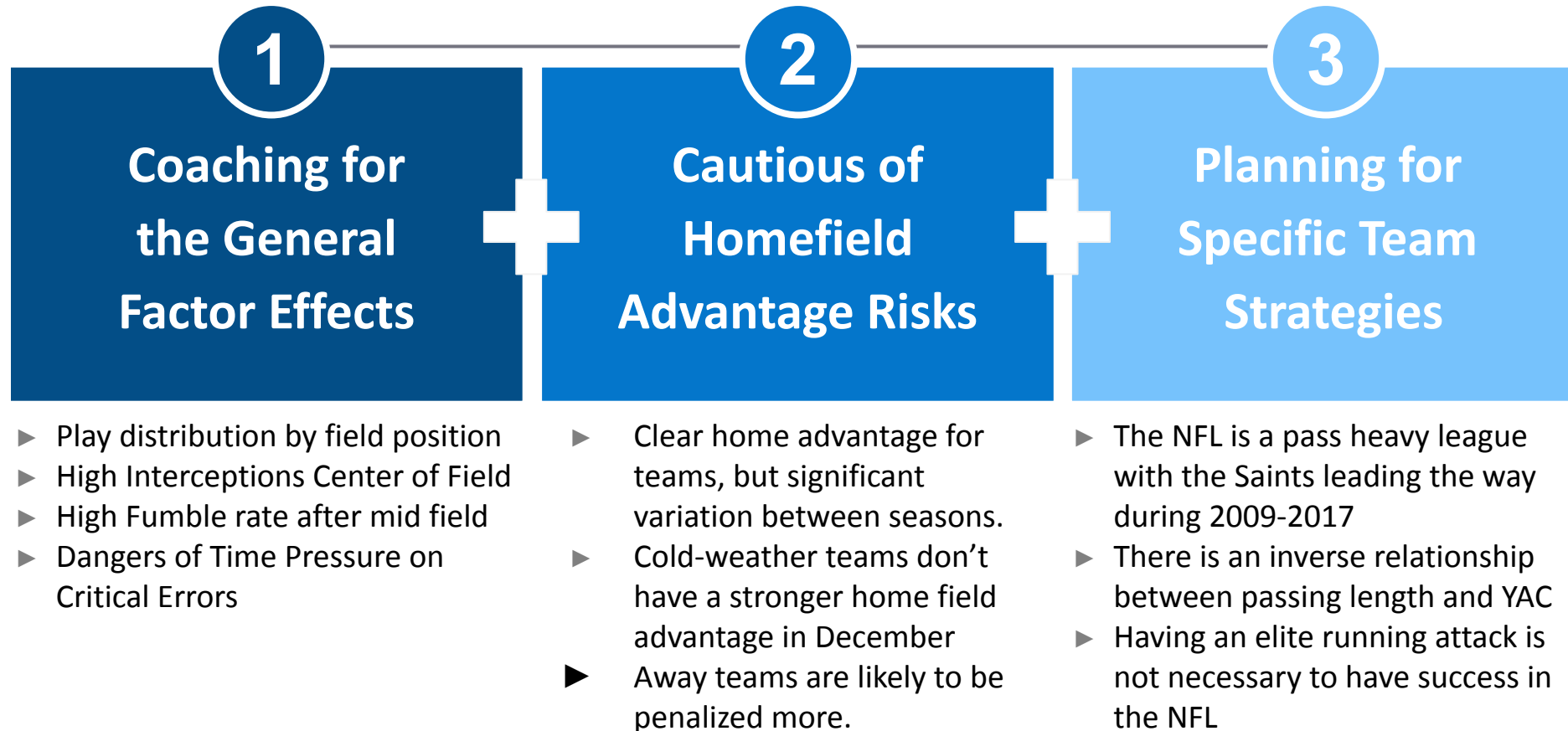
NFL Team Specific Strategies (3 of 3) | Let's look into the offences of Super Bowl Winners and Runner Up's

Pass & Run | Identifying Winning Teams Avg Yards Gained



Summarizing Impact | By grasping the key aspects and risks in these areas that we have highlighted; a coach can create an effective offensive and defensive coaching strategy for the NFL

A Strong Comprehensive NFL Coaching Strategy is...



Thank You!



Statement of Contributions

This research project was prepared collaboratively, and each team member brought unique skills and perspectives.

All team members contributed equally to this effort.

Focus Areas:

1. ***Impact of General Factors:*** Tyler Gustafson
2. ***Impact of Home Field Advantage:*** Abhishek Shetty
3. ***Team Specific Strategies:*** Bikram Khaira

Appendix | Sources

Work Cited

- **Data Set: Detailed NFL Play-by-Play Data 2009-2017**

<https://www.kaggle.com/datasets/maxhorowitz/nflplaybyplay2009to2016>

Pictures Resources

- The cover and thank you photos were created with DALL-E 2 art generator <https://openai.com/dall-e-2>