CSE 611 Summer Project : Blitz Classification

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Abstract

In this study, we used NFL 2021 data and bowl challenge data to assess blitz, a defensive approach to attack the offensive. First, we recognized the blitzing plays, and then, based on the players' alignment with the quarterback, we determined the various openings that the defensive team might exploit when blitzing. Once we identified the blitz type based on the gap, we then attempted to determine whether the blitz was a cross blitz (in which defenders cross each other) or not. We used our data, which was centered on the Philadelphia Eagles, and demonstrated how to blitz with visualizations of players moving through gaps.

1. Introduction

American football, like many other popular team sports, is fundamentally about putting pressure on the opposition team and not letting them gain the advantage. Offensive lineman and defensive linemen struggle to take control of the space near the quarterback while one ensures that the quarterback gets sufficient time to decide who to pass the bowl to and the other attacks the quarterback to insure an incomplete pass or get sacked.

Diffensive teams use blitz, the German term "blitzkrieg," which means "lightning war," to put pressure on the offense and quarterback by sending five or more defensive players to the line of scrimmage. Blitzer can be anyone, but is usually a safety or linebacker. The main purpose of blitzing in a play is to sack the quarterback. Blitzing, on the other hand, allows defensive teams to force incomplete passes, recover an interception, or stop the running back at the line of scrimmage. In this project, we identified plays with blitz and classified them using indicators.

2. Objective

The purpose of this research was to identify the plays for 2021 NFL data in which a blitz happened as well as the blitz type—for example, the gap the blitz was performed in, the position of the blitzing players, and if a cross blitz was used or not. Additionally, in order to verify our categorization results for a given play, we attempted to create an animation for that move and looked for blitz indicators

3. Methodology

For this project, we used 2021 NFL Big data bowl challenge data from kaggle, which has information about players, their attributes , match-to-match and play-to-play for all the weeks. In the given dataset we had several columns like *gameid, playid,quarter,epa,down,yardTogo,.. Etc.*

A. Data Preprocessing

We converted the various text-columns into numeric columns using "plays.csv," which contains all the information on plays, because those columns have numeric values. Due to inconsistent statistics, we filtered out any plays with more than 5 and fewer than 3 defensive linemen (some DL are assigned as linebackers and some linebackers are assigned as DL). After filtering out the data, we found that there were 3648 such plates where data was inconsistent.

B. Defining Blitz

To find out whether there was a blitz or not in a play, we compared the number of defensive players at each position with the number of pass rushers and, based on that, we marked whether a play had a blitz or not. With personnel, we can know how many defensive linemen are in the play and if the number of pass rushers is greater than the number of d-linemen. Then we consider the play as a blitz.

> *personnelD* - This column shows how many players in each position for the defensive team.
> Ex: 4 DL, 2 LB, 5 DB

> *numberOfPassRushers -* Number of pass rushers

C. Gap Detection (Which gaps do the blitzes go to)

Gaps are the open spaces between offensive team players near the line of scrimmage where no player is being positioned. To find out the gaps, we use the quarterback's location to determine the middle point of the offensive team's format. The gap would extend from the middle point and the distance of each gap is two yards.

> Ex: F - - E - - D - - C - - B - - A - - M - - A - - B - - C - - D - - E - - F

Once we know where the gaps are, we can count how many players go pass each gap by using the tracking data

- Check the horizontal coordinate (y) to determine which gap the player at
- Check the vertical coordinate (x) if the player is in the range between LOS and 1.5 yards behind the line of scrimmage

D. Cross Blitz Detection (Do the defenders cross when blitzing?)

Once we are able to find out the gap using which blitzes happen, we can find out whether it was a cross blitz or not. If during the blitz defenders crossed each other then it is called a cross blitz.

- Get the combinations of two players with **nflId** in blisters. Ex: ['123', '234', '345'] the combination will be [('123', '234'), (123, '345'), ('234', '345')]

- For each combination, use the location when event **ball_snap** occurred and the location when the player crossed the gap to determine if the two players crossed (a initial **y** > b initial **y** and a **y** in gap < b **y** in gap) each other during the play.

4. Results

We tested our method with PHI data and check some plays with our visualization to validate

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OLB-ILB Blitz to the A gap without crossing       | GameID: 2018120300, PlayID: 1299
OLB-ILB Blitz to the B gap without crossing       | GameID: 2018120300, PlayID: 1368
OLB-OLB-ILB Blitz to the C gap without crossing   | GameID: 2018120300, PlayID: 2711
OLB-OLB-ILB Blitz to the B gap without crossing   | GameID: 2018120300, PlayID: 3380
CB-MLB Blitz to the B gap without crossing        | GameID: 2018120912, PlayID: 2836
SS-OLB-ILB Blitz to the A gap without crossing    | GameID: 2018121611, PlayID: 319
OLB-ILB-SS Blitz to the A gap without crossing    | GameID: 2018121611, PlayID: 901
OLB-ILB Blitz to the C gap without crossing       | GameID: 2018121611, PlayID: 1085
OLB-ILB Blitz to the C gap without crossing       | GameID: 2018121611, PlayID: 1606
OLB-ILB Blitz to the C gap without crossing       | GameID: 2018121611, PlayID: 1692
OLB-ILB Blitz to the A gap without crossing       | GameID: 2018121611, PlayID: 3688
ILB-ILB Blitz to the A gap without crossing       | GameID: 2018122310, PlayID: 154
OLB-FS-ILB Blitz to the B gap without crossing    | GameID: 2018122310, PlayID: 198
OLB-ILB Blitz to the A gap without crossing       | GameID: 2018122310, PlayID: 411
ILB-ILB-FS Blitz to the A gap without crossing    | GameID: 2018122310, PlayID: 1675
OLB-ILB Blitz to the B gap without crossing       | GameID: 2018122310, PlayID: 3508
OLB-ILB Blitz to the B gap without crossing       | GameID: 2018122310, PlayID: 4486
OLB-ILB Cross Blitz to the C and E gap            | GameID: 2018122310, PlayID: 4508
OLB-ILB Blitz to the C gap without crossing       | GameID: 2018122310, PlayID: 4508
OLB-ILB Blitz to the B gap without crossing       | GameID: 2018122310, PlayID: 4530
OLB-ILB Blitz to the C gap without crossing       | GameID: 2018122310, PlayID: 4566
OLB-ILB Blitz to the B gap without crossing       | GameID: 2018123012, PlayID: 182
OLB-LB Blitz to the A gap without crossing        | GameID: 2018123012, PlayID: 1339
OLB-OLB Blitz to the C gap without crossing       | GameID: 2018123012, PlayID: 1633
OLB-LB Blitz to the A gap without crossing        | GameID: 2018123012, PlayID: 2034
OLB-OLB Blitz to the C gap without crossing       | GameID: 2018123012, PlayID: 2403
Total blitz instances - 89
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Fig. 1.   Showing the Blitz type for given GameID and PlayID

From our Blitz classification model, We made some visualizations based on GameID and PlayID. Using matplotlib we created a football field and animated plays. We colored Home team as green and Away team as red. These figures are a screenshot of how the players' positions are changed from LOS to Blitzing.

A. Example Play 1

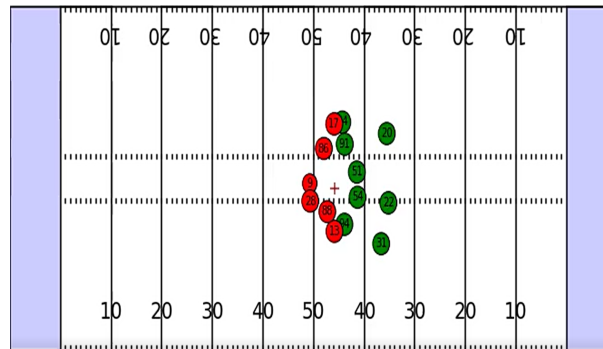(OLB-LB Blitz to the A gap without crossing | GameID: 2018123012, PlayID: 2034)
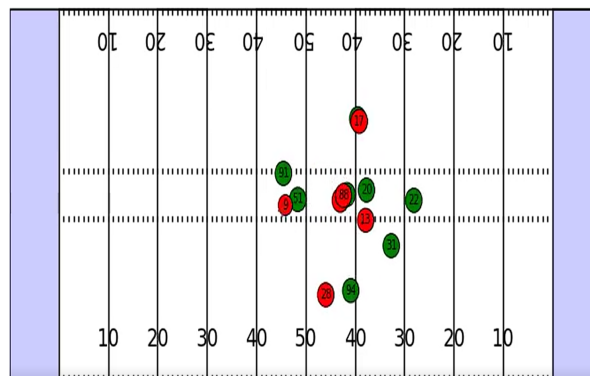

Fig 2. Players Position at LOS

Fig 3. Defensive Player Blitzing

Animated video link : 2018123012.mp4

B. Example play 2

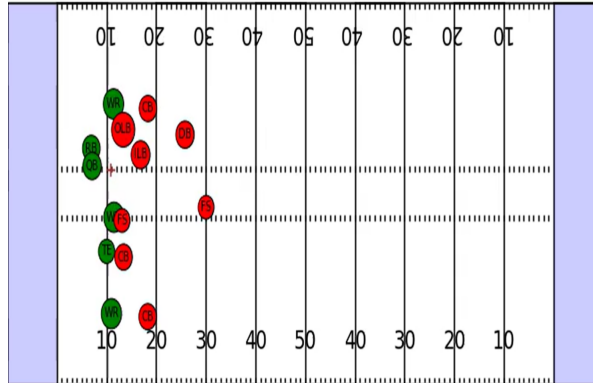(OLB Blitz to the C and E gap | GameID: 2018123010, PlayID: 4508)
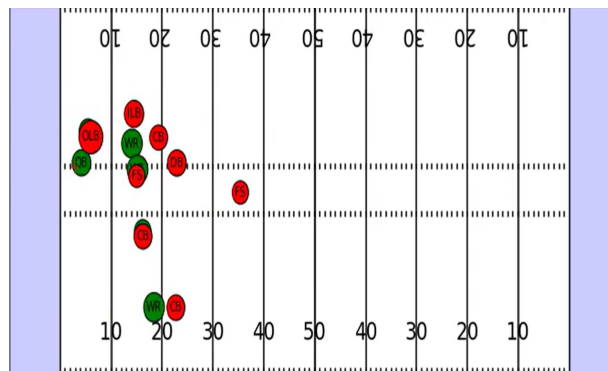
Fig 4. Players Position at LOS

Fig 5. Defensive Player Blitzing

Animated video link: 2018122310.mp4

5. Challenges Faced

The quality of the data and the lack of tracking data for offensive and defensive linemen were the two main issues we ran into while working on this project. We made some assumptions and developed our own logical function to extract information about players' positions near the line of scrimmage and their positions because we lacked tracking data for both sides and information about those players' close-by positions.

Additionally, the data's quality was poor since several players were listed as "defensive lineman" when, in reality, they were simply linebackers approaching the line of scrimmage. Similar to that, several real defensive lineman had their positions labeled as "linebackers". Due to these players' inconsistent posture, football does not allow for fronts with 6 or more "defensive lineman" or fronts with 3 or less defensive linemen. I've never seen a front with fewer than three defensive linemen, and a 6 up front often consists of 4 defensive linemen and 2 lined up linebackers.

6. Future Improvements

We lack real-time tracking information for offensive and defensive linemen, as stated in the challenges. If we can get the tracking data in the future, our analysis will be more precise. As of now, the gaps in our study are always 2 yards wide, with 6 gaps on either side of the quarterback's position..find a way around personnel problematic (6 DL fronts etc.) and all other mentioned problems would be solved with offensive and defensive lineman tracking data and more football knowledge from the nfl data science employees.

References :

- **Project Code Base   Google Colab (Code Link)**
- **Generate Play animation   GitHub - ss77995ss/plot-nfl-player-position**
- **Blitz in FootBall   The Stadium Reviews Blog**
- **NFL Big Data Bowl 2021 (** Help evaluate defensive performance on passing plays**)**
  NFL Big Data Bowl 2021