NFL Big Data Bowl 2025

Analyzing How a Shift From Trips to Twins May Affect the Probability of Various Events Occurring

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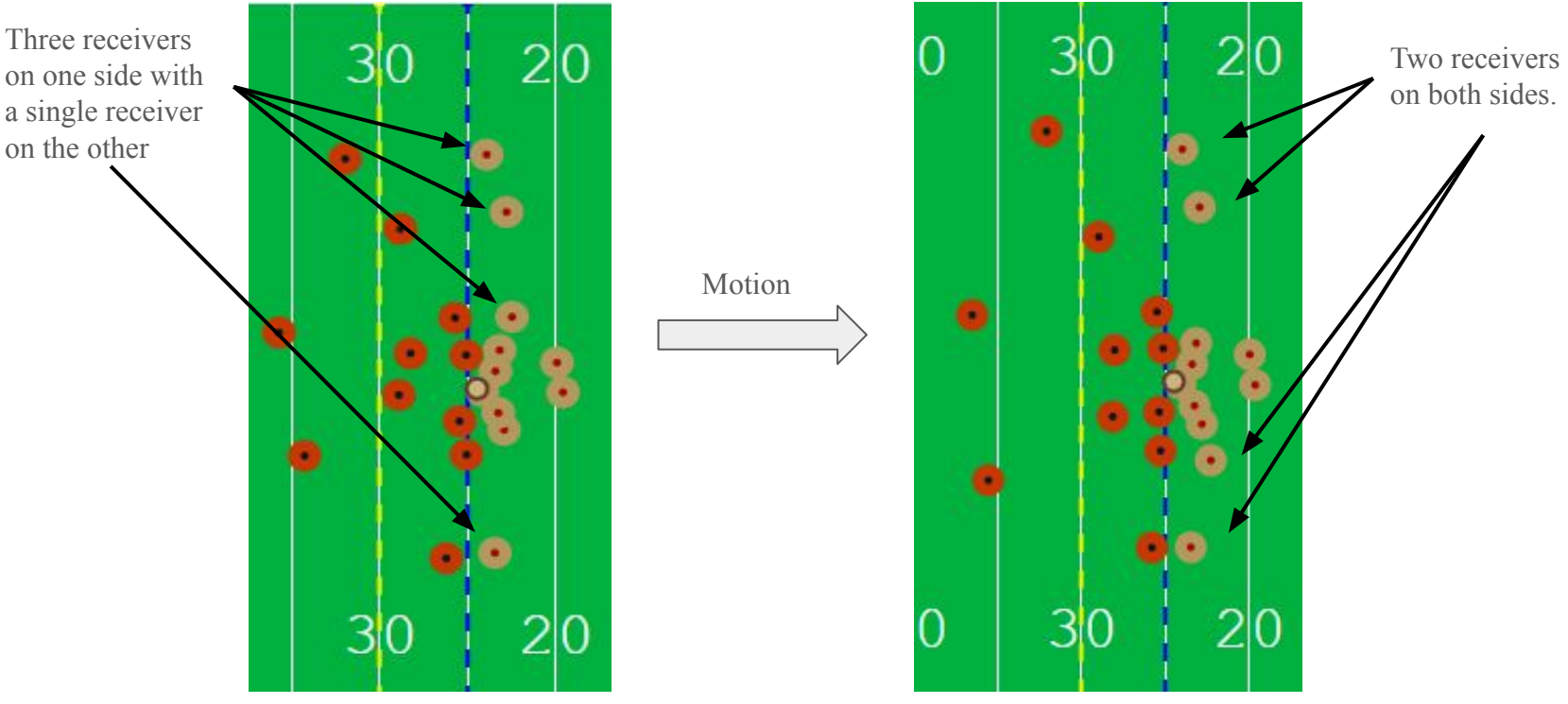
Analysis Overview

How does a receiver shift from trips on one side of the field with a single receiver on the other side to twins on both sides of the field affect the probability of certain outcomes/events happening after the ball is snapped?



Analysis Overview

This analysis analyzed data consisting of about 16,000 plays from 136 games from the 2022 NFL season to try and determine how a Trips-to-Twins (TTT) type shift affects the probability of certain outcomes or events from happening. Note that throughout this analysis a Trips-to-Twins type shift will be abbreviated as TTT for simplicity.

Plays involving a TTT shift were identified and compared against plays without a TTT shift and statistical testing methods were used to assess whether the TTT shift may influence the frequency of specific events or outcomes by comparing changes in percent frequencies. For example, it was found that when a defense is in Cover 6-Left pass coverage a flat route is run by the offense 51% of the time when there is a TTT shift compared to only 35% of the time for plays without a TTT shift. Obviously these percentages may change depending on the team being played, but the goal of this analysis is not to say that specific events or outcomes are certain to happen and coaches must act accordingly. The goal if this analysis is to arm coaches with high level observations that they can keep in the back of their mind while studying film so they may perhaps notice patterns that may have been missed before.

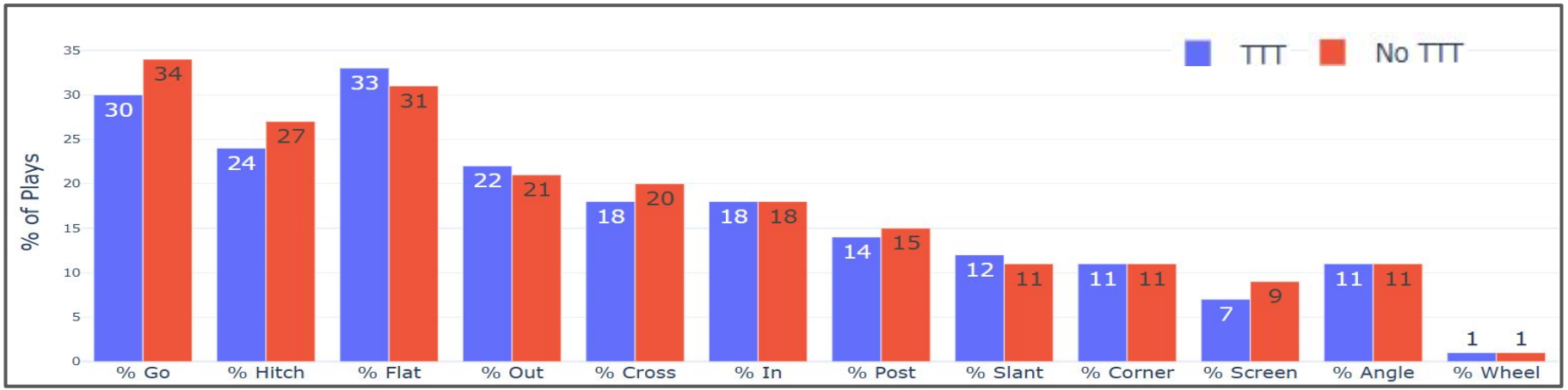
This analysis consists of two parts, the first part compares TTT plays to all other non-TTT plays and the second will compare TTT plays to only plays with double twins receiver alignment but no shift. The reason for these two different parts is to try and see what outcomes are affected purely by the pre-snap TTT shift as opposed to a simple double twins formation. If it is found that the probability of a certain route increases with a TTT shift when compared to all other plays, but shows no significant changes when compared to plays with double twins with no motion then it is likely that it is the twins formation itself which leads to the change in probability. However, if the probability of a certain route being ran shows significant difference when compared to both groups, it is more likely that the specific TTT shift led to the change in probability.

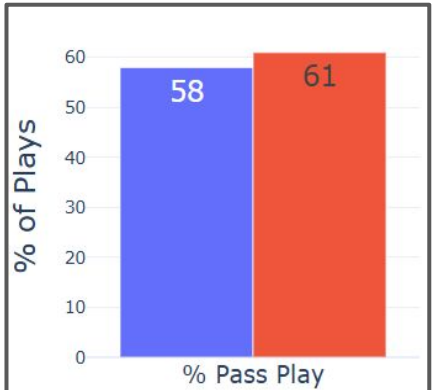
Again, the goal of this analysis is to help coaches discover small advantages while watching film that they may be able to exploit during a game in order increase their odds of success.

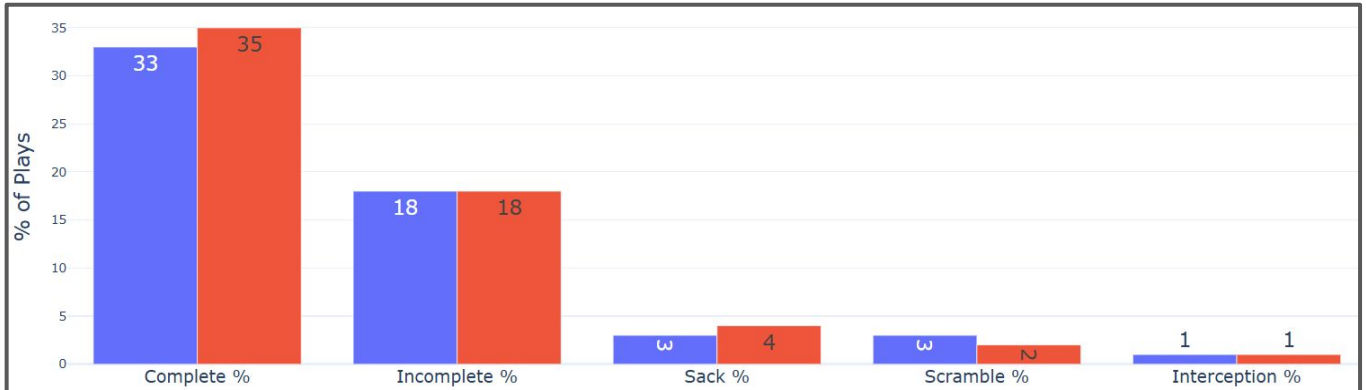
Part 1

TTT Motions vs All Other Plays

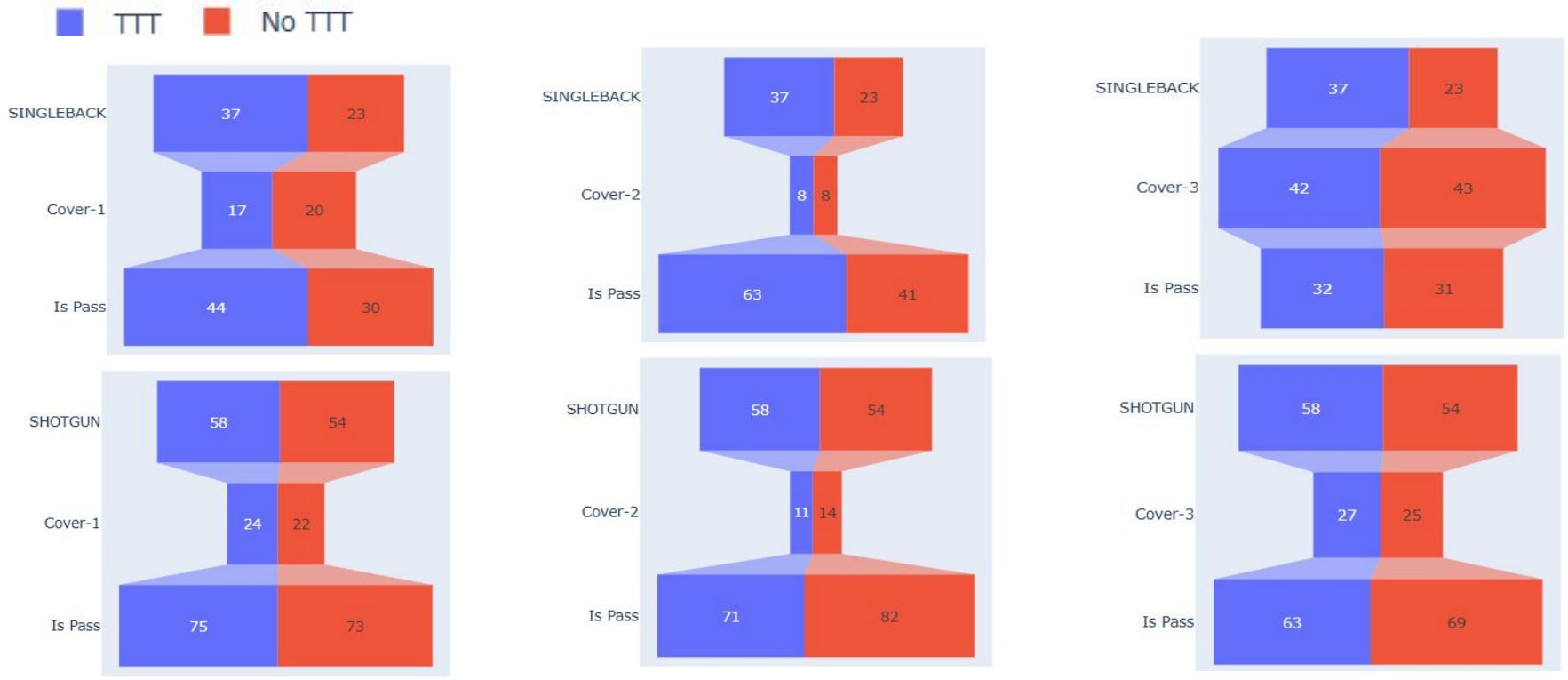
Below are graphs that show some high-level comparisons between play outcomes of TTT plays versus non-TTT plays. The top graph shows the percent of plays that involved different routes, the bottom left shows the percent of plays resulted in a pass, and the bottom right shows the percent of plays resulting in different pass results. Note how there is mostly no significant difference between these comparisons, however, it will be shown in further slides that under set conditions, differences between TTT plays and non-TTT plays can be seen.





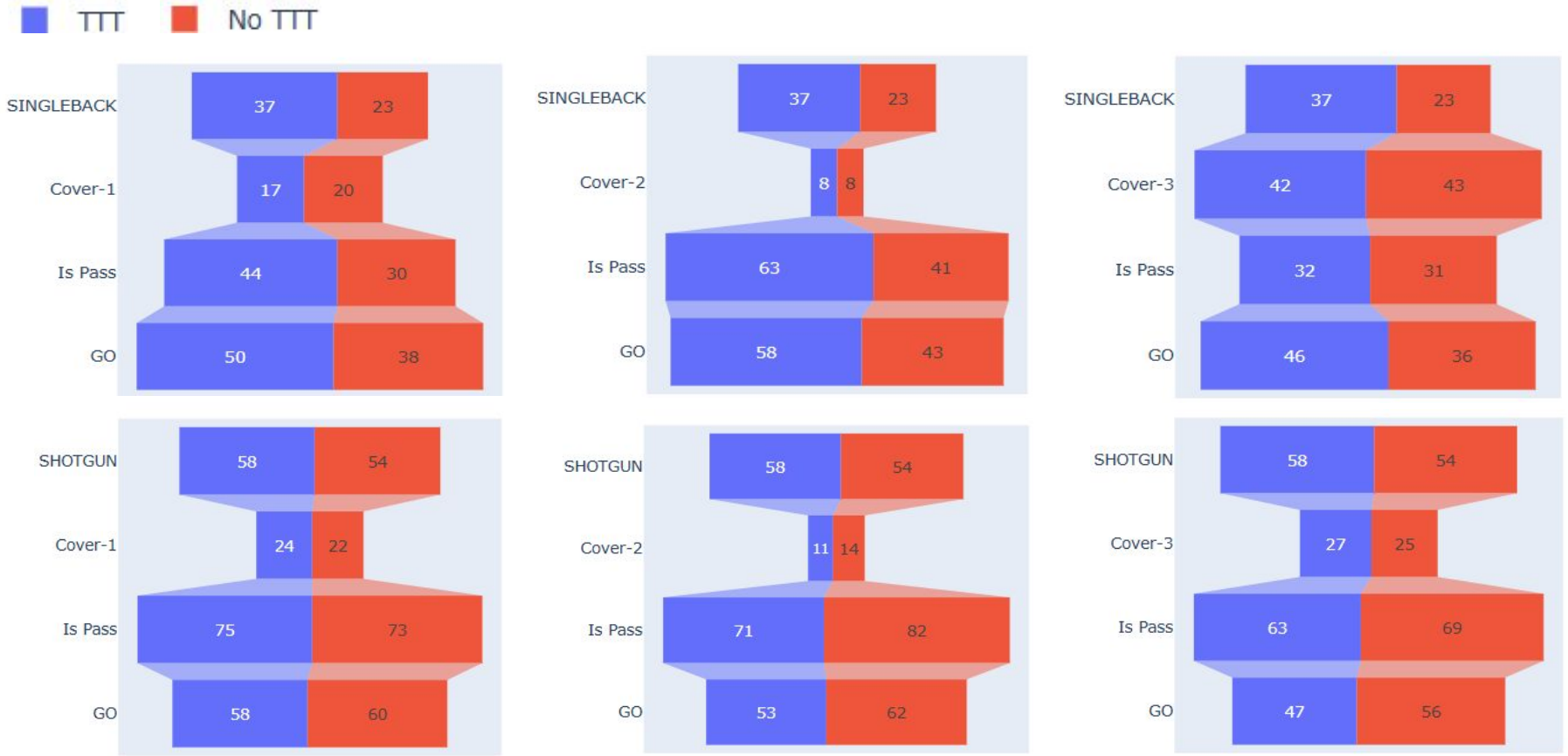


The visuals below represent the percent frequency of pass plays occurring under various conditions. The numbers in each graph represent percentages. If we look at the first graph in the top left, the 37 in the blue box at the first level means that 37% of plays with TTT motion were when the offense was in Singleback formation. The 17 in the blue box underneath means that 17% of plays with TTT motion and Singleback formation were when the defense was in Cover-1. The 44 in the blue box underneath the 17 means that 44% of plays with TTT motion, Singleback offense formation, and Cover-1 pass coverage were pass plays. It can be seen from these graphs that when the offense is in singleback formation and there is a TTT shift, there is a greater chance of a pass being thrown when the defense is in Cover-1 or Cover-2.



These graphs are to be read the same way as in the previous slide. These graphs now show the percent frequency of Cross routes under various conditions. It can be seen that a Cross route is much less likely to happen when there is a TTT shift, the offense is in Singleback formation, the defense is in Cover-2, and it is a pass play.

These graphs now look at the percent frequencies of Go routes under various conditions. It can be seen that a Go route is generally more common with a TTT shift when the offense is in Singleback formation and less common with TTT motion when the offense is in Shotgun formation.



The table below shows some additional events that are more likely to occur after a TTT shift under different circumstances.

Event	Condition	Probability without TTT	Probability with TTT	% Difference
A pass is thrown 0-10 yards in length	The offense is in Shotgun formation, the defense is in Cover-1, and it is first down	22%	43%	+ 21%
A pass is thrown	the offense is in Singleback formation, the defense is in Cover-1, and it is first down	32%	49%	+ 17%
A Flat route is run	The defense is in Cover 6-Left	35%	51%	+ 16%
A pass is thrown	The offense is in Singleback formation and the defense is in Cover-1	30%	44%	+ 14%
No pass is thrown	The offense is in Shotgun formation the defense is in Cover-3 and it is first down	42%	54%	+ 12%
No pass is thrown	the offense is in Shotgun formation and the defense is in Cover-2	18%	29%	+ 11%

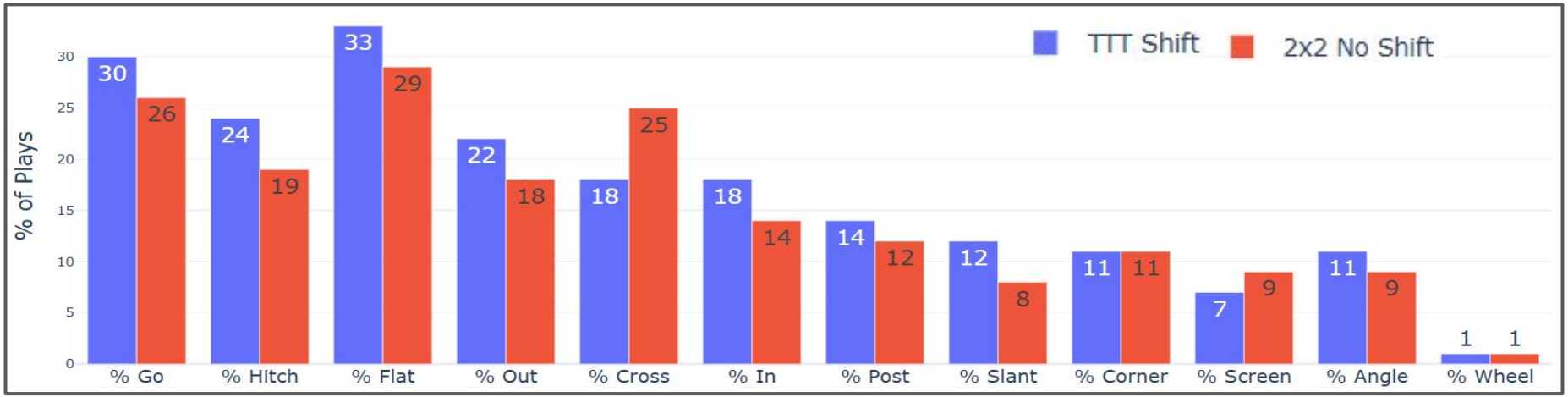
The same table as the previous slide except for events which are less likely to occur after a TTT shift under different circumstances.

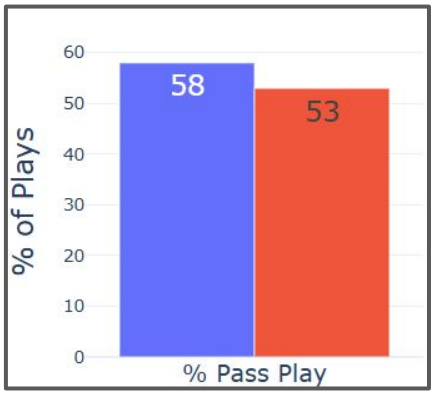
Event	Condition	Probability without TTT	Probability with TTT	% Difference
A Go route is run	The offense is in Shotgun formation, the defense is in Cover-3, it is first down, and it is a pass play.	59%	36%	- 24%
A Cross route is run	The offense is in Singleback formation, it is first down, and it is a pass play.	63%	40%	- 23%
A Cross route is run	The offense is in Singleback formation, the defense is in Cover-3, it is first down, and it is a pass play.	63%	42%	- 21%
A Cross route is run	The offense is Singleback formation and it is a pass play.	60%	42%	- 18%
A Go route is run	The offense is in Shotgun formation and the defense is in Cover-2	51%	38%	- 13%

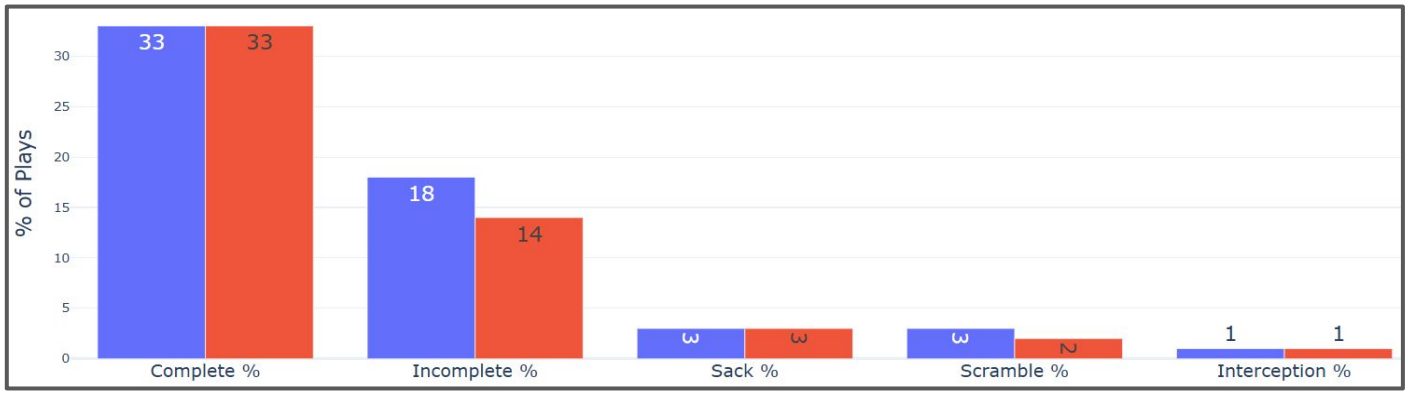
Part 2

TTT Motion vs Double Twins No Shift

The graphs below and the graphs present on the next few slides are the same as the ones in Part 1 and are to be read the same way. Just like in Part 1 there seems to be no significant differences with the exception of the percent frequency of Cross routes which shows that plays with TTT shift seem to have a significantly lower percent frequency than plays with double twins with no shift.



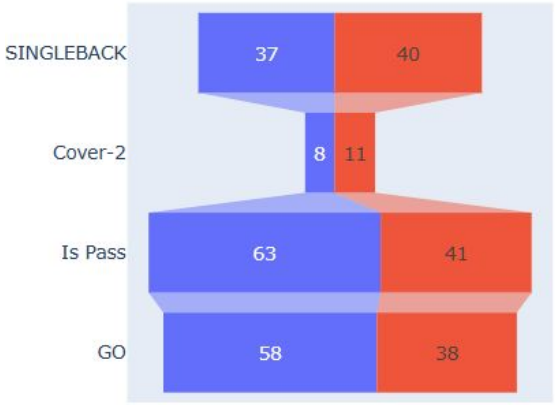


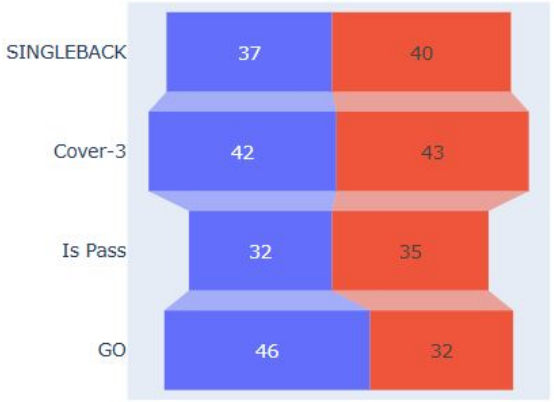


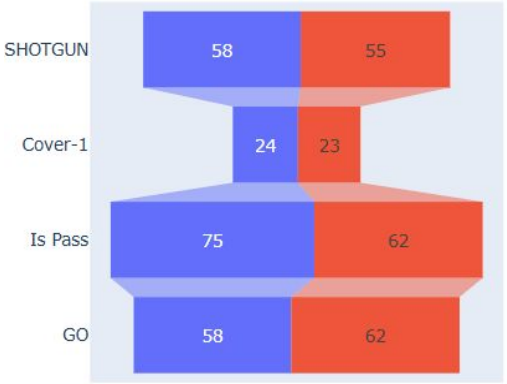
The graphs below are the same types of graphs as Part 1 and just like in Part 1 it can be seen that a pass play is more likely to happen when there is a TTT shift, the offense is in Singleback formation, and the defense is in either Cover-1 or Cover-2.

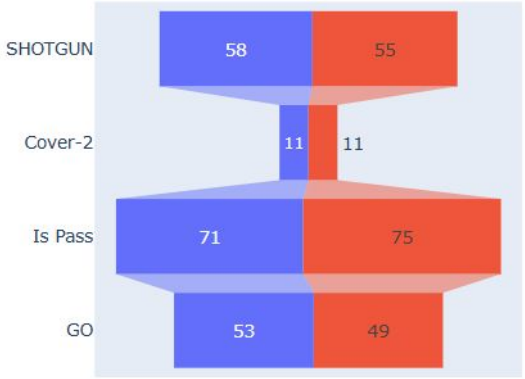
These show the percent frequency of Cross routes under different conditions. Just as in Part 1 Cross routes seem to be less likely to happen when there is a TTT shift, the offense is in Singleback formation, the defense is in Cover-2, and it is a pass play.

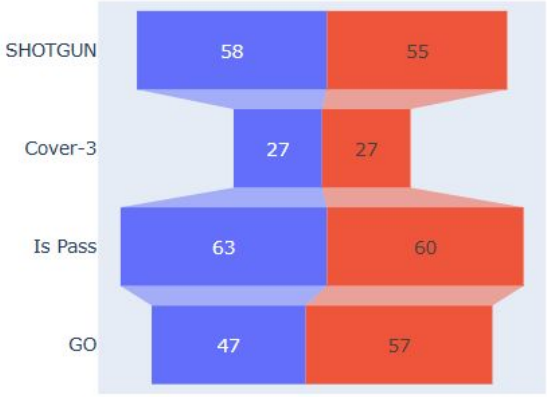
These show the percent frequency of Go routes under various conditions. The results seem to also be the same as Part 1 with Go routes being more likely to happen with TTT motion and the offense in Singleback, and less likely to happen with TTT motion and the offense in Shotgun with the exception of when the defense is in Cover-2 in this instance.











Just as in Part 1 the table below highlights some key more key examples of events that are more likely to occur with TTT motion under various conditions.

Event	Condition	Probability without TTT	Probability with TTT	% Difference
An In route is run	The defense is in Cover-3, it is second down, and it is a pass play.	20%	39%	+ 19%
An In route is run	The offense is in Shotgun formation, the defense is in Cover-2, and it is a pass play.	26%	43%	+ 17%
A pass is thrown	It is third down	70%	84%	+ 14%
A pass is thrown	The defense is in Cover-1	52%	65%	+ 13%

The same table as the previous slide except for events which are less likely to occur after a TTT shift under different circumstances.

Event	Condition	Probability without TTT	Probability with TTT	% Difference
A Cross route is run	The offense is in singleback formation and it is a pass play.	72%	42%	- 30%
A Cross route is run	The defense is in Cover-3, it is first down, and it is a pass play.	61%	34%	- 27%
A Corner route is run	The offense is in Singleback formation, it is first down, and it is a pass play.	34%	17%	- 17%
A Cross route is run	It is a pass play	47%	31%	- 16%

Conclusion

After observing the results of both parts of this analysis there are a few notable observations. The first would be the general drop in percent frequency of Cross routes given a TTT shift. The visuals from both parts show that for basic general scenarios, such as the offense being in Singleback or Shotgun formation and the defense in either Cover-1, Cover-2, or Cover-3, that a Cross route seems to be less likely when there is a TTT shift. This is most apparent when the offense is in Singleback formation and the defense is in Cover-2 and becomes even more pronounced under more specific conditions such as the down number as seen in the tables from both parts.

Another observation would be the increase in percent frequency of a pass play when the defense is in Cover-1 pass coverage and the offense is in Singleback formation. Part 1 shows a 14% increase in the probability of a pass play occurring when the offense is in Singleback formation and the defense is in Cover-1 pass coverage after a TTT shift, and Part 2 shows similar increases when the offense is in Singleback formation or Shotgun formation.

Coaches can use these observations to help better prepare their defense. For example, by understanding that if the offense is in Singleback formation and there is a TTT shift, then if the play is a pass the probability of a cross route being run will drop by about 30% can allow the defense to adjust their focus on defending other types of routes. These small adjustments can allow teams to be able increase their odds of success, even if only by small margins.

Appendix

Build Analysis Dataset - https://www.kaggle.com/code/robertturro/nfl-bdb25-build-dataset
Analysis Code - https://www.kaggle.com/code/robertturro/bdb25-analysis
Interpretation - https://www.kaggle.com/code/robertturro/bdb25-interpretation
Build Visuals - https://www.kaggle.com/code/robertturro/nfl-bdb25-visuals