Swing That Way: Analyzing a Batter's Push-Pull Tendency

SMT Data Challenge 2024

Graduate Division

University of Utah

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Three outta ten ain't bad!

"The hardest thing to do in baseball is to hit a round baseball with a round bat, squarely"

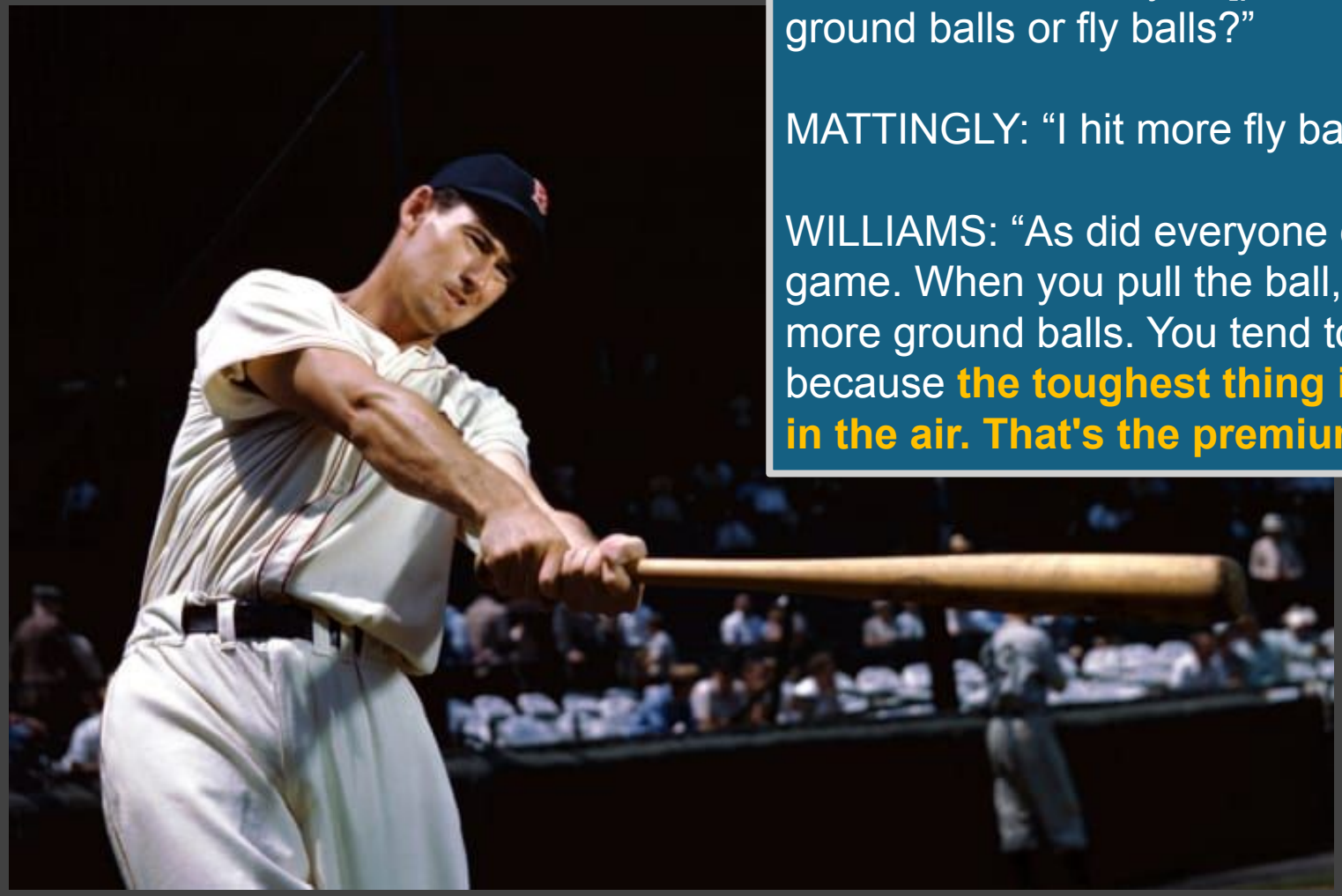
"Baseball is the only field of endeavor where a man can succeed three times out of ten and be considered a good performer"

"[…] you can improve a hitter, more than you can improve a fielder. More mistakes are made hitting than in any other part of the game"

– Ted Williams

Unconvinced? Some more evidence...

Not just contact, but placement too?!

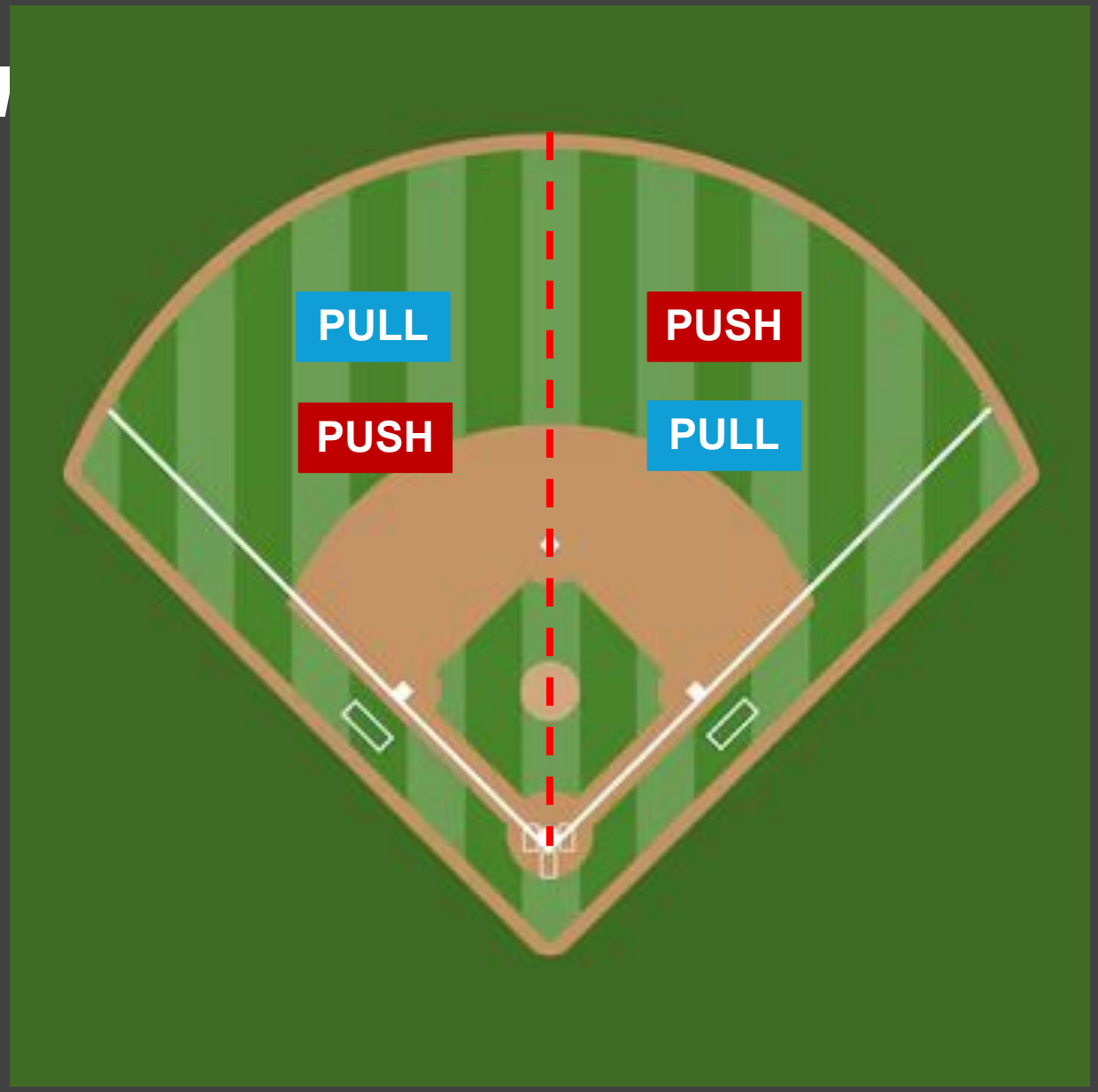


WILLIAMS: “When you [push the ball], do you hit more ground balls or fly balls?”

MATTINGLY: “I hit more fly balls.”

WILLIAMS: “As did everyone else who ever played the game. When you pull the ball, you have a tendency to hit more ground balls. You tend to hit the ball on the ground because **the toughest thing is to pull the ball and get it in the air. That's the premium, par excellence hit**.”

Defining Push vs Pu

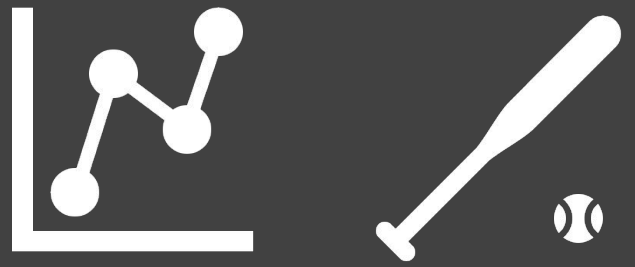


Analysis Overview

Part 1:
Sort and prioritize farm system players

Part 2:
Systematically determine pitcher hand

Part 3:
Produce batting report including an ANOVA



Farm System's Almanac

player_id	1A	2A	3A	4A	Total	Weighted	AllPosition
586	0	0	0	28	28	112	2B, 3B, LF, CF
513	9	16	3	0	28	50	2B, 3B, SS, LF, CF, RF
492	9	14	4	0	27	49	LF, CF, RF
993	4	18	4	0	26	52	SS
471	9	16	0	0	25	41	1B, 2B, LF
495	9	16	0	0	25	41	CF
337	0	0	6	18	24	90	2B, 3B, SS, CF
537	19	5	0	0	24	29	RF
435	24	0	0	0	24	24	LF, CF, RF

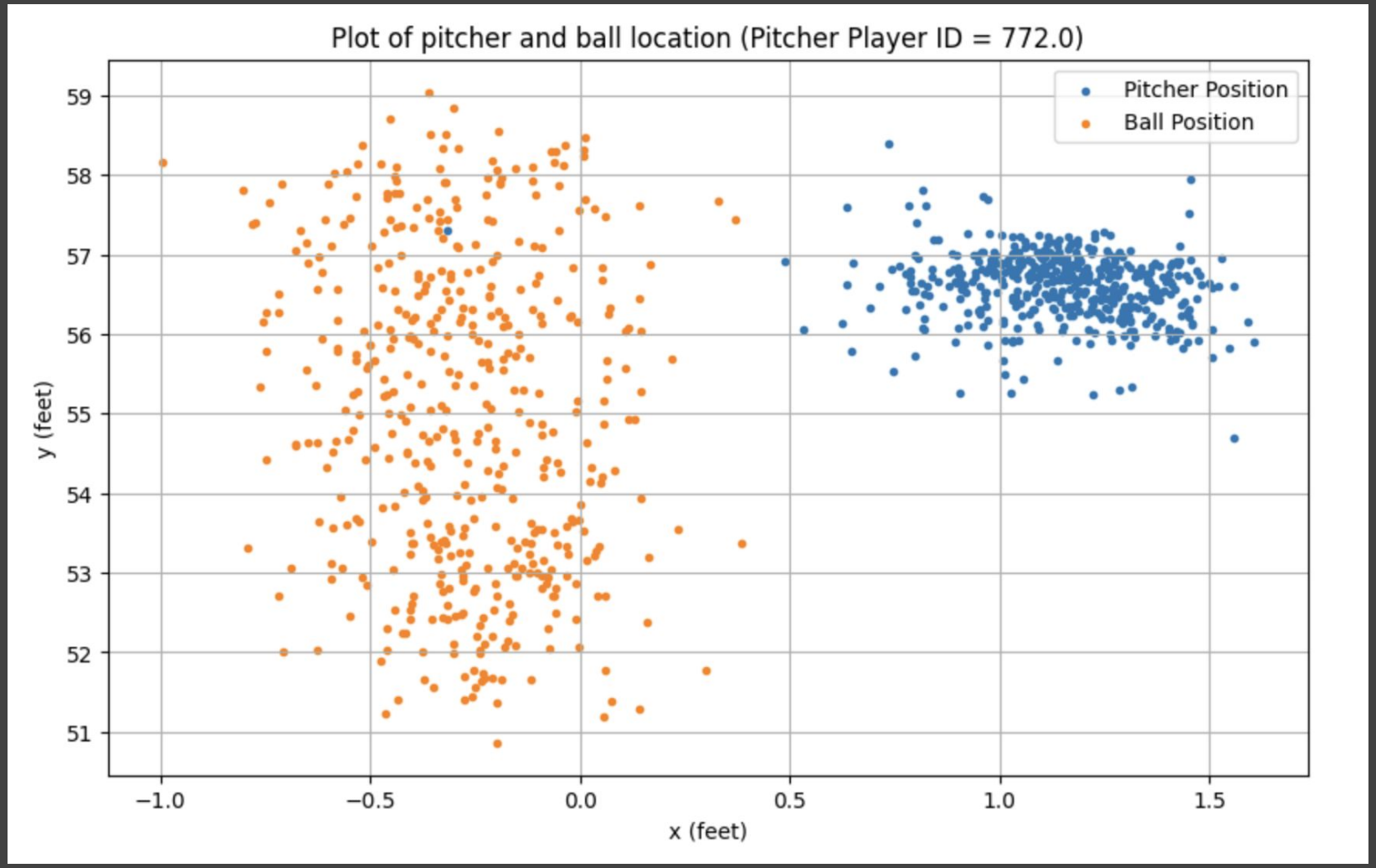
“Wait, this pitcher is a lefty, right?”

-me, actually

Why pitcher-handedness?

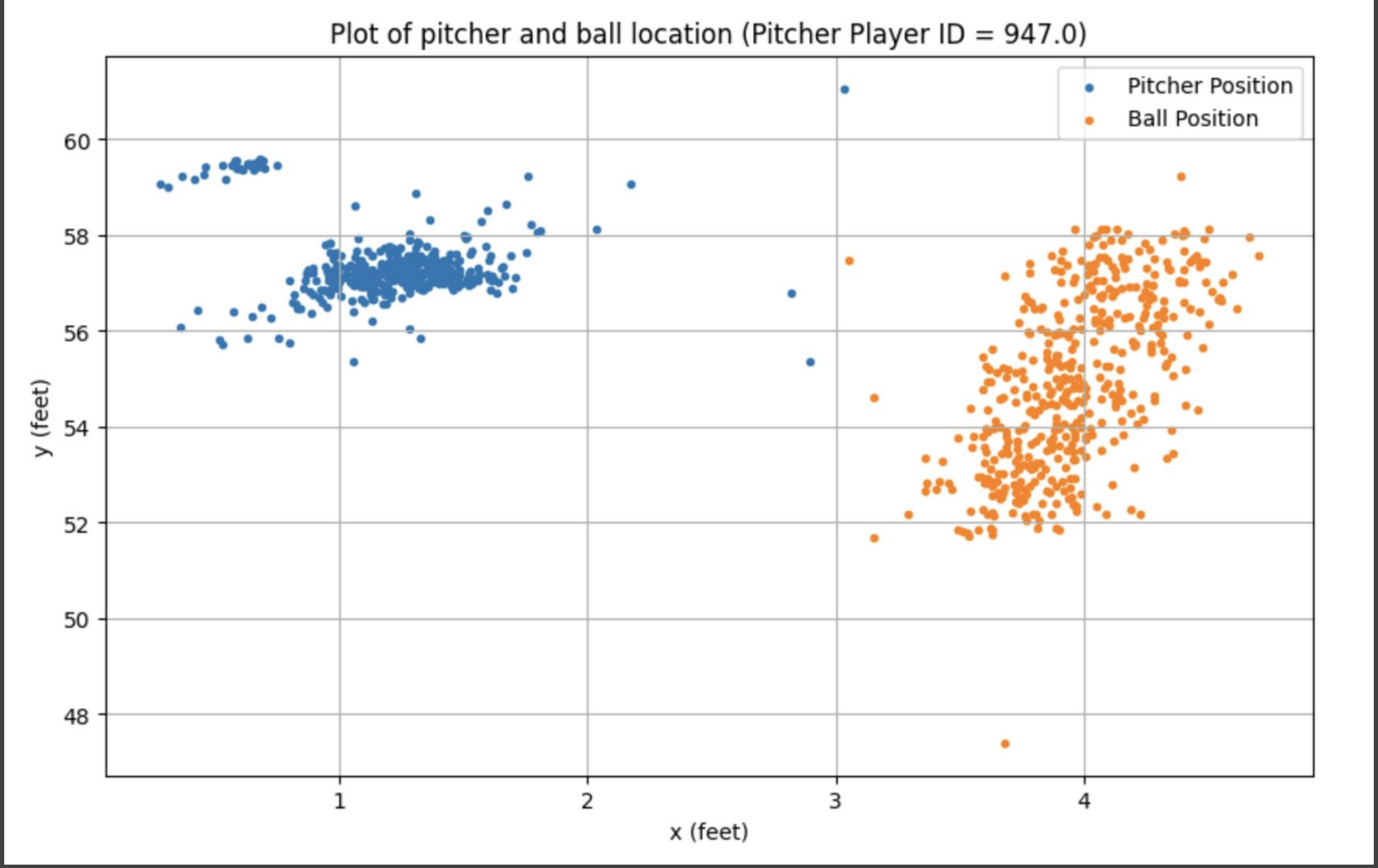
- What affects the hit more than anything else, aside from the swing itself? □ the pitch!
- Pitcher handedness a key variable in ANOVA later

Right-handed Example

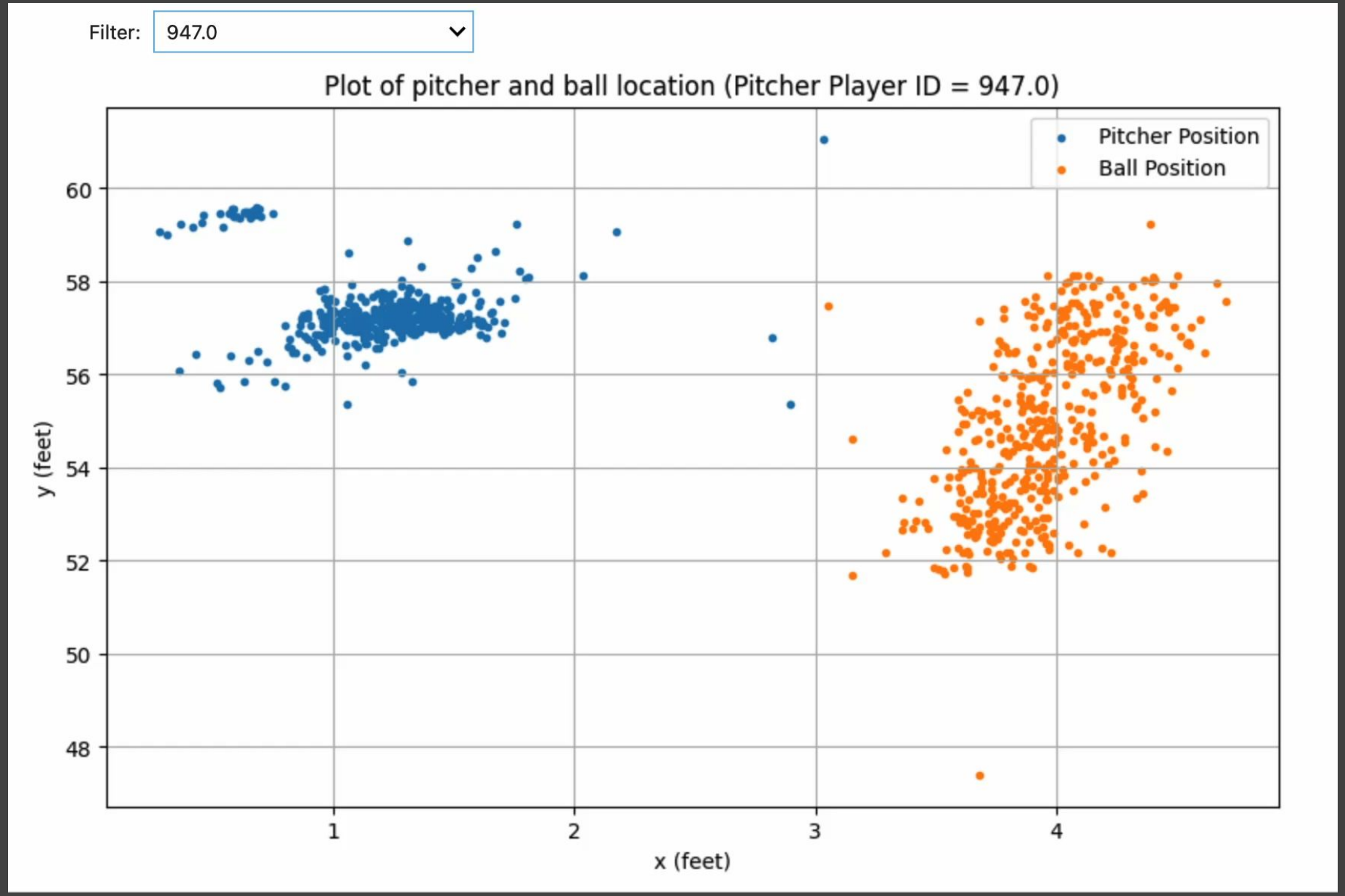


- $pitchDifference = pitcherXLocation - ballXLocation$

Left-handed Example



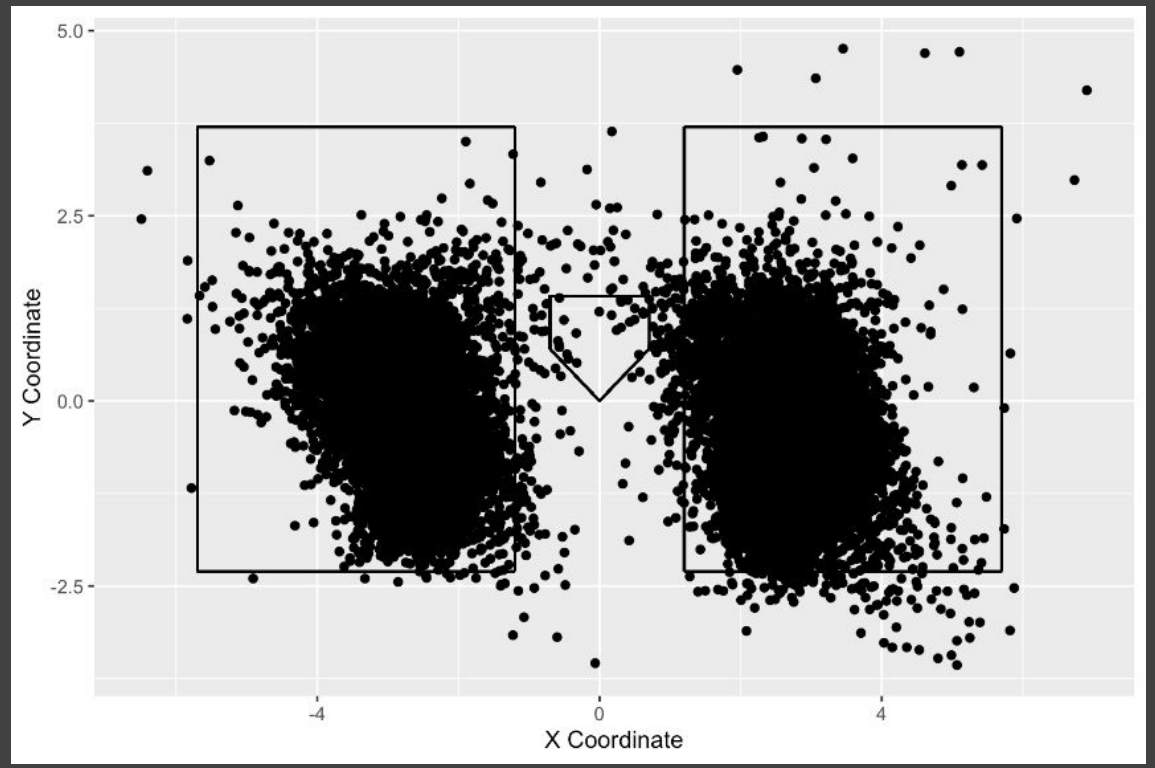
- $pitchDifference = pitcherXLocation - ballXLocation$


Filter:
947.0
Plot of pitcher and ball location (Pitcher Player ID = 947.0)
Pitcher Position
Ball Position
60
58
56
54
52
50
48
y (feet)
1
2
3
4
x (feet)

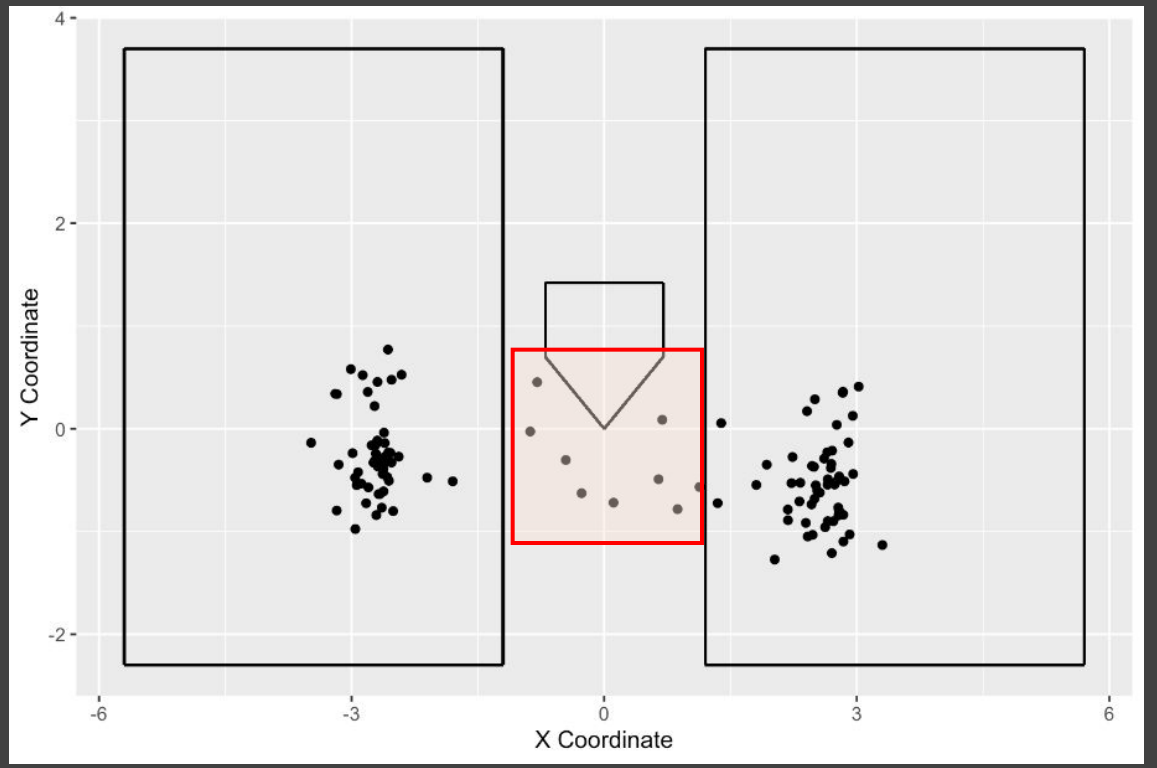
Batting Report Creation

- ANOVA analysis to see which interactions of variables had the most significant effect on average distance of balls hit
- Slides following will illustrate a few of the most significant, including
  - Spray Charts
  - ANOVA Results
  - Chart of players tendencies, separated by batter/pitcher hand

Handy Guide to Batter Handedness

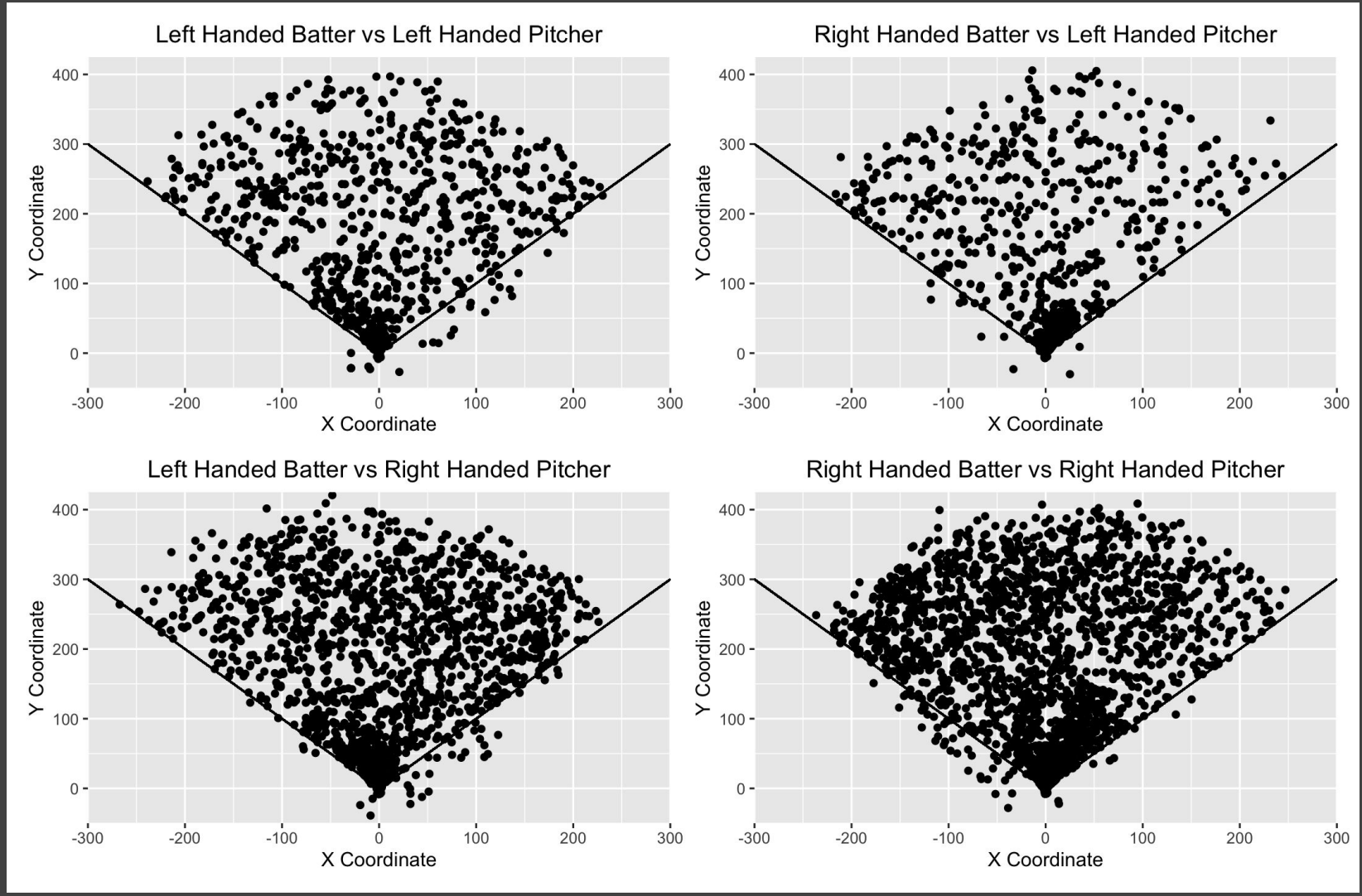


- Batter Position at each individual pitch



- Average Batter Position over all pitches

Com-batting the LHP vs RHP

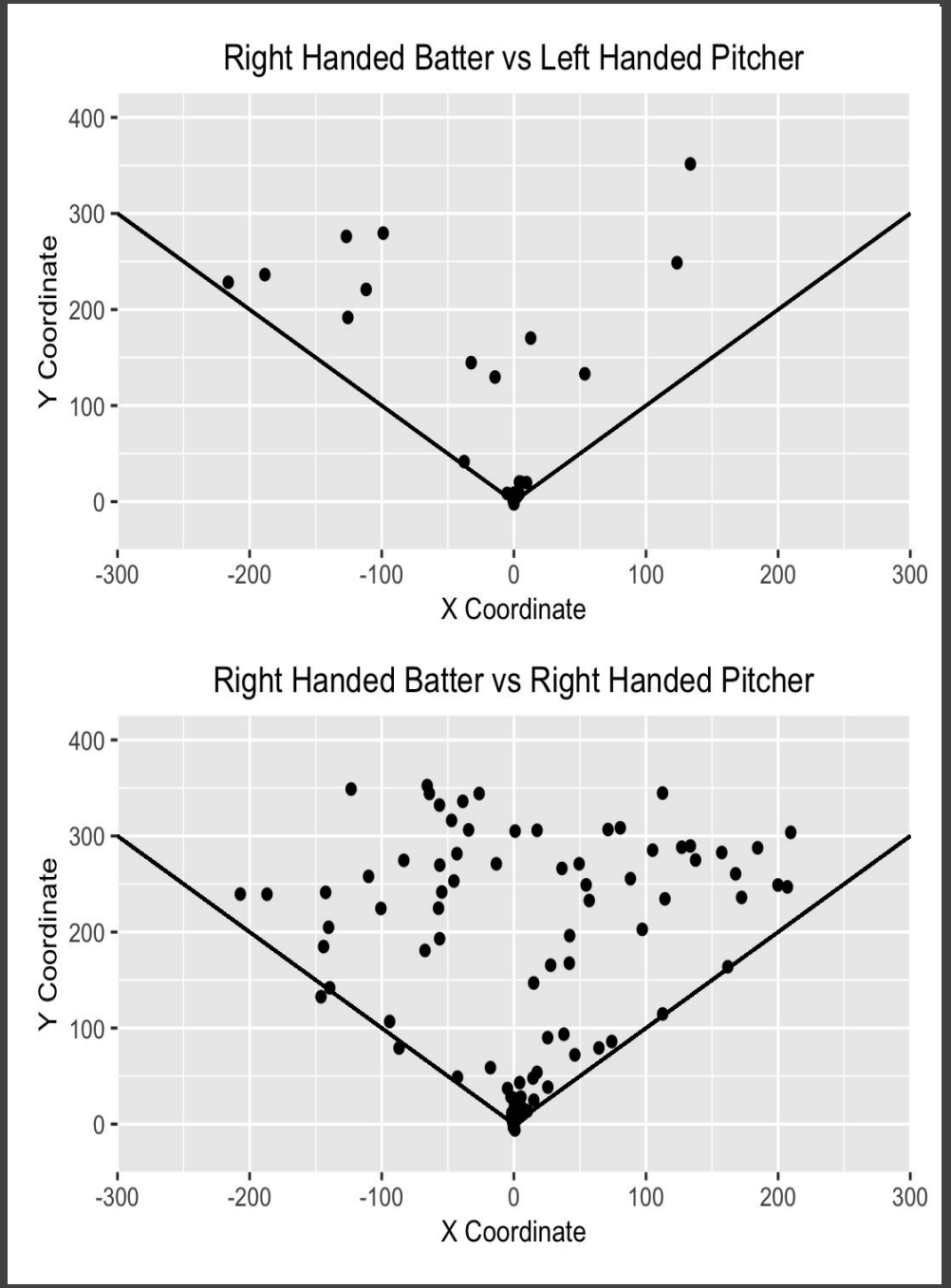


Batter 475

	P-Value
Push vs Pull Distance	0.084
Pitcher Hand	0.044
Push vs Pull Distance/ Pitcher Hand	0.078

Pitcher Hand	N	Pushes	Pulls	Avg Dist.	Push Avg Dist.	Pull Avg Dist.
L	31	19	12	101.509	58.046	170.326
R	107	60	47	157.316	150.331	166.234

Scouting Report: Batter 475 needs to work on hitting left-handed pitchers better. His average hit distance against left handers is almost 60 feet shorter than his average distance against right handers. If batter 475 does not work on improving this, then teams can combat his abilities easily by substituting in left-handed pitchers when he is up to bat, especially left-handed pitchers who are good at getting right-handed batters out.



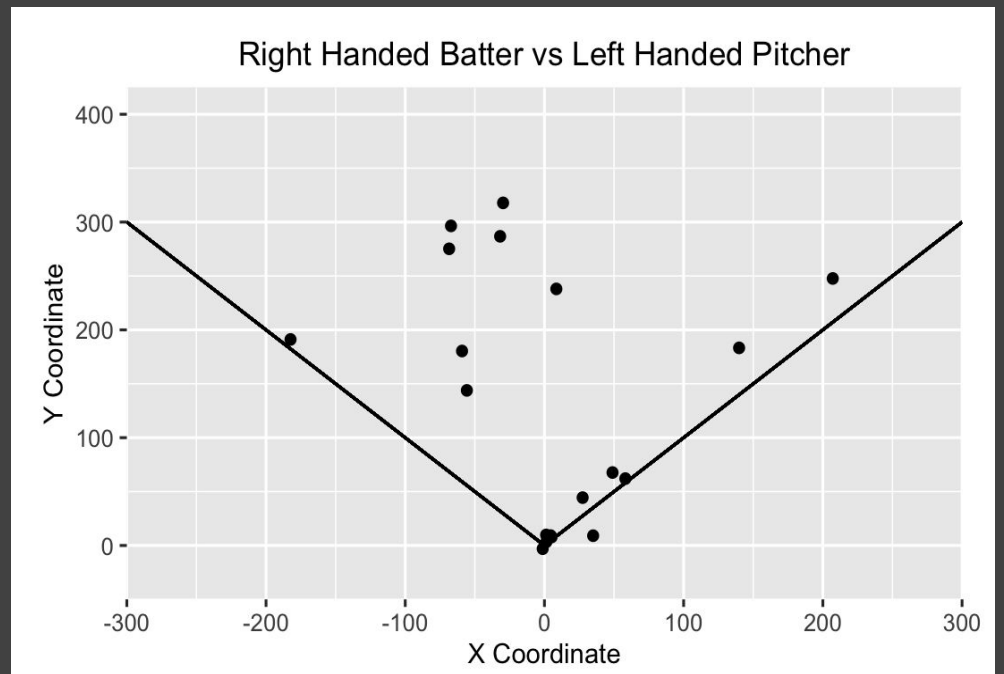
Batter 427

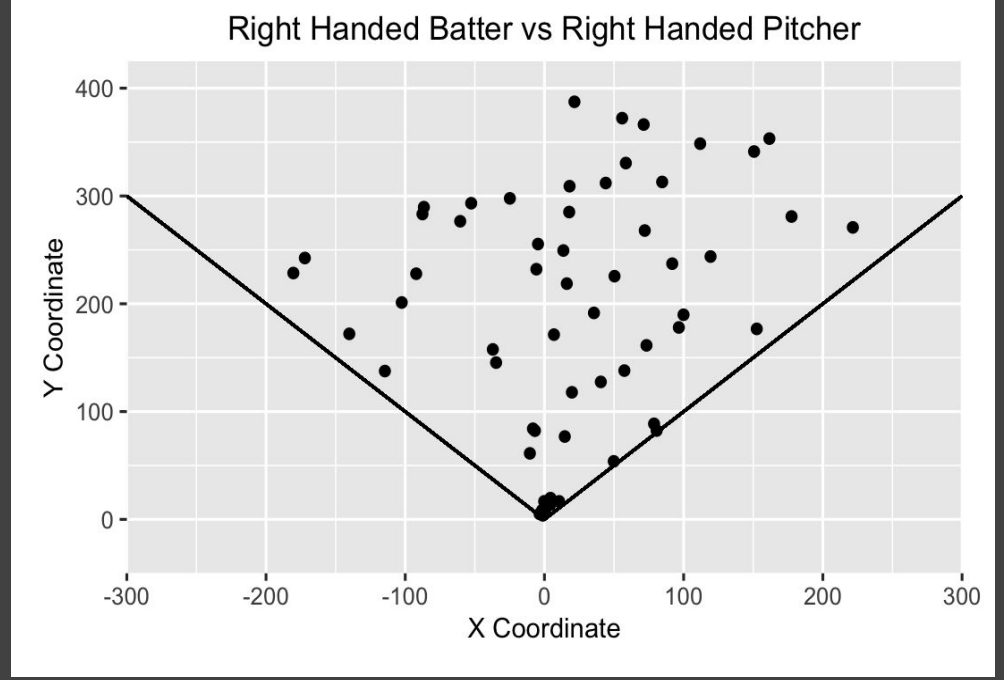
	P-Value
Batter Hand	0.244
Push vs Pull Distance	0.472
Pitcher Hand	0.204
Push vs Pull / Pitcher Hand Interaction	0.003

Pitcher Hand	N	Pushes	Pulls	Avg Dist.	Push Avg Dist.	Pull Avg Dist.
L	19	11	8	152.023	98.322	225.861
R	63	37	26	192.133	218.349	154.826

Scouting Report: Batter 427 pulls his hits further against left-handed pitchers and pushes them further against right-handed pitchers. He needs to work on being consistent in his pull/push of hits.

He also may need to work on swing timing against LHP, as his push hits against them appear to pop-up



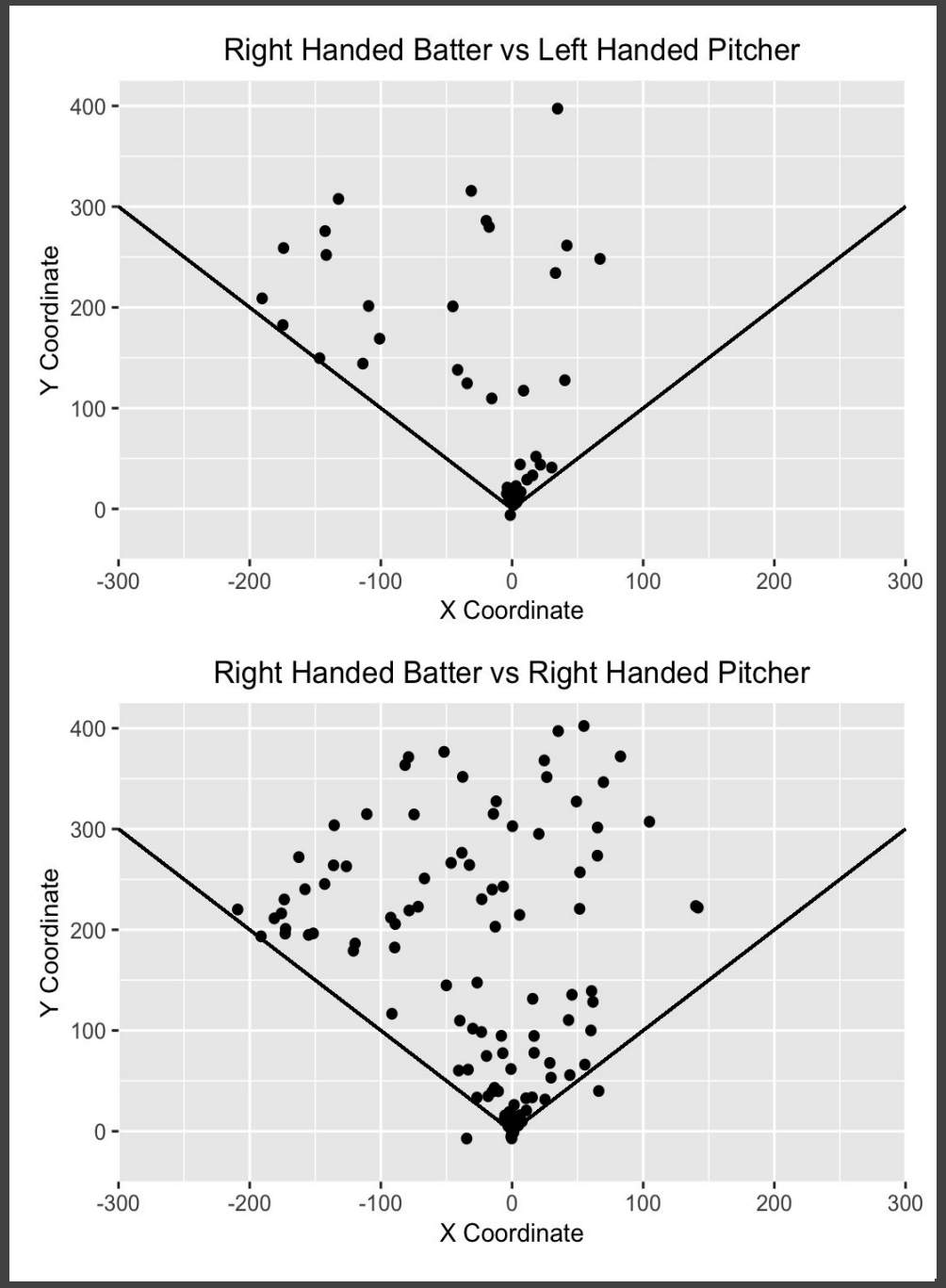


Batter 586

	P-Value
Push vs Pull Distance	5.676 * 10^-5
Pitcher Hand	0.122
Push vs Pull Distance/ Pitcher Hand	0.489

Pitcher Hand	N	Pushes	Pulls	Avg Dist.	Push Avg Dist.	Pull Avg Dist.
L	56	29	27	107.810	63.516	155.385
R	137	66	71	140.975	107.473	172.118

Scouting Report: Batter 586 needs to improve his ability to push his hits against both pitcher handedness. He is currently able to pull the ball significantly further against both handiness pitchers. Since batter 586 is swinging early and pulling the ball further, teams could learn to throw more offspeed pitches to him, which due to their slower nature would more than likely cause him to swing early and miss.



Conclusion

- 92 unique batters in farm system dataset
  - 33 batters had at least one statistically significant variable
- We believe our Batting Report could be used in farm system coaching to target deficiencies and identify tendencies in a hitter's game and help them overcome these tendencies if appropriate

Conclusion

Baseball's farm system aimed at development

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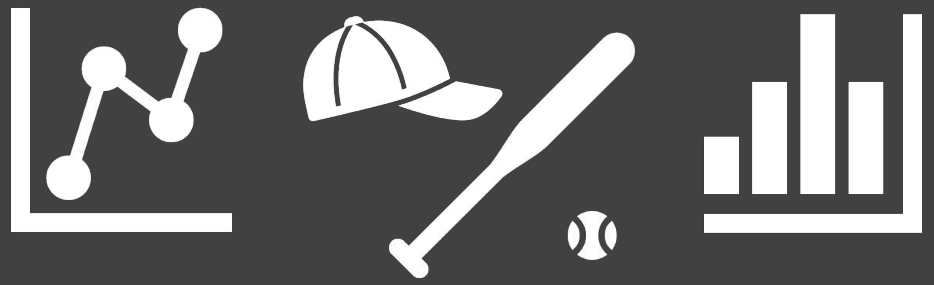
Massive amounts of sports data collected



Use the data-driven insights to improve player performance