



Measuring Relief Pitcher Performance

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Outline



1 **Introduction**

2 **wSaves**

3 **WPA vs. Run Minimization**

4 **Controlling for Batter Quality**

5 **Accounting for Situation**

6 **Evaluating "Fireman" Value**

7 **Release Point Analysis**

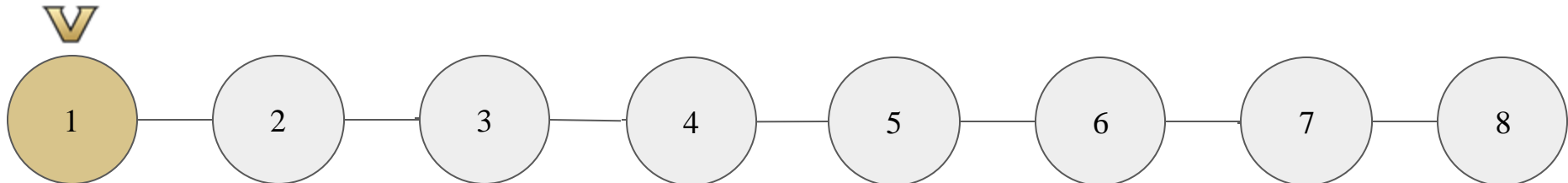
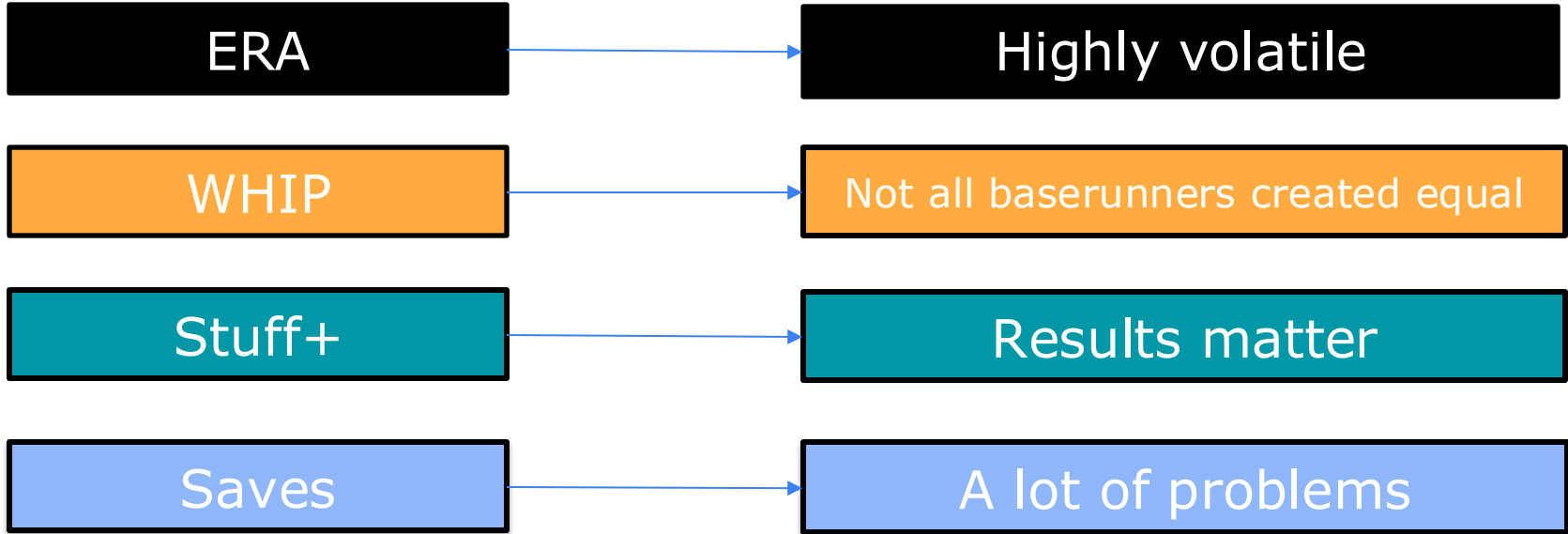
8 **Dashboard and Conclusions**



Introduction



The Problem with Current Stats





wSaves

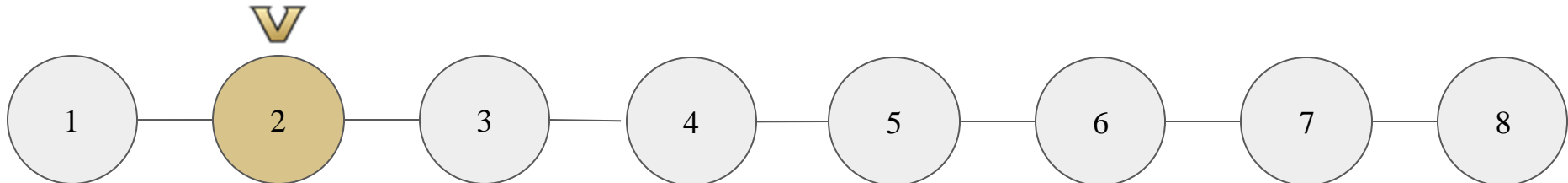


Redesigning the Save



Reliever must pitch with a lead in the 9th inning or later (can enter earlier)

$$wSaves = \sum_{\text{all batters}} (wp_{\text{end of batter}} - wp_{\text{start of batter}})$$





Saves vs. wSaves



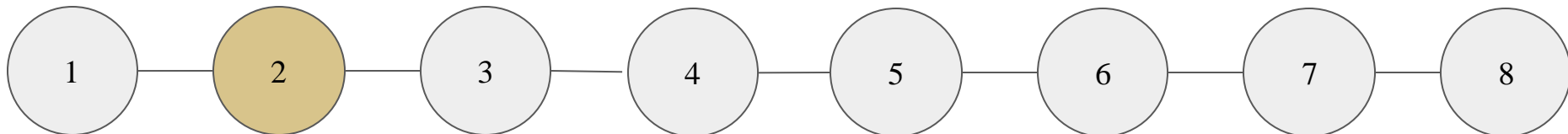
$$wSaves = \sum_{\text{all batters}} (wP_{\text{end of batter}} - wP_{\text{start of batter}})$$

Saves:

- Arbitrary conditions
- All saves are made equal
- Blown saves are separate + weighted equally

wSaves:

- Simple conditions
- Saves are weighted for difficulty
- Blown saves are included + weighted based on true impact





The Tale of Two Extremes



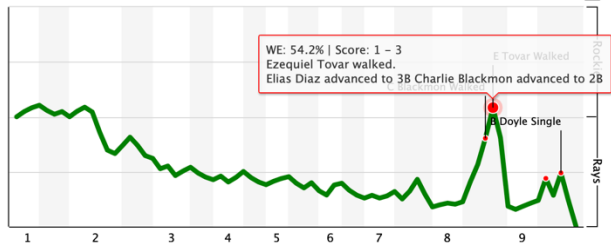
"Best" save of the year

Shawn Armstrong, TB (@ COL, 4/7/24)



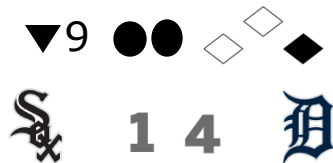
WP_{enter} = 45.8%
Saves = 1
wSaves = 0.568

4/7/2024 - Rays(3) @ Rockies(2)



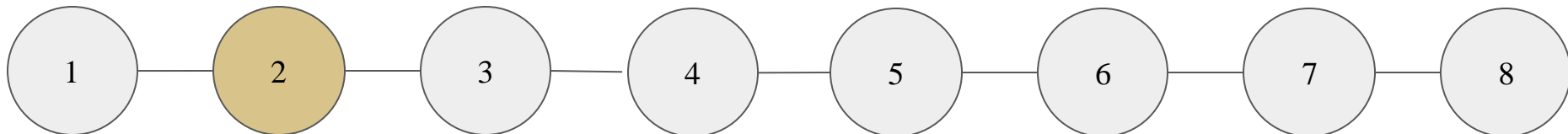
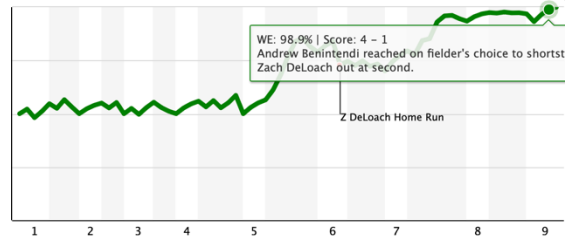
"Worst" save of the year

Jason Foley, DET (vs. CWS, 9/27/24)



WP_{enter} = 98.9%
Saves = 1
wSaves = 0.011

9/27/2024 - White Sox(1) @ Tigers(4)





Top Five Closers by wSaves in 2023 and 2024



2023 wSaves Leaderboard



Alexis Diaz(3.136)



David Bednar(2.776)



Trevor May(2.546)



Jordan Romano(2.195)



Adbert Alzolay(2.106)



2024 wSaves Leaderboard



Emmanuel Clase(4.763)



Kirby Yates(3.811)



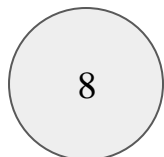
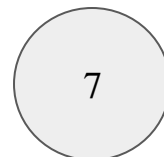
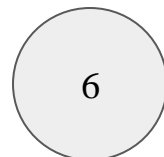
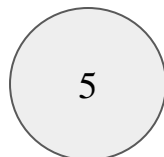
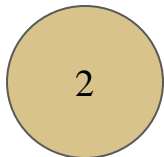
Ryan Helsley(3.473)



Mason Miller(3.354)



Andrés Muñoz(2.753)





Most Impacted Closers in 2023 and 2024



Biggest Risers (2023)



Trevor May(23rd in saves, 3rd in wSaves)



Adbert Alzolay(22nd in saves, 5th in wSaves)



David Robertson(24th in saves, 8th in wSaves)

Biggest Risers (2024)



Andrés Muñoz(19th in saves, 5th in wSaves)



Chad Green(26th in saves, 13th in wSaves)



Trevor Megill(21st in saves, 10th in wSaves)

Biggest Fallers (2023)



Emmanuel Clase(1st in saves, 29th in wSaves)



Camilo Doval(3rd in saves, 16th in wSaves)



Carlos Estevez(T11th in saves, 24th in wSaves)

Biggest Fallers (2024)



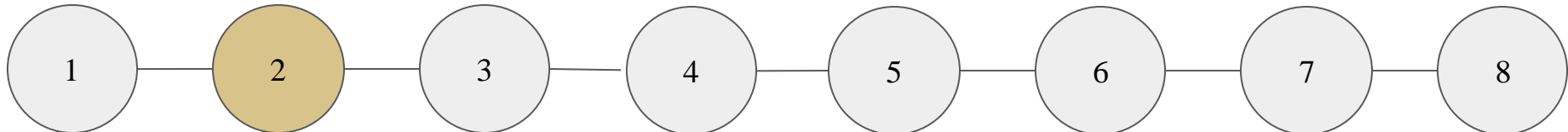
Clay Holmes(8th in saves, 28th in wSaves)



Craig Kimbrel(T14th in saves, 29th in wSaves)



David Bednar(T14th in saves, 27th in wSaves)

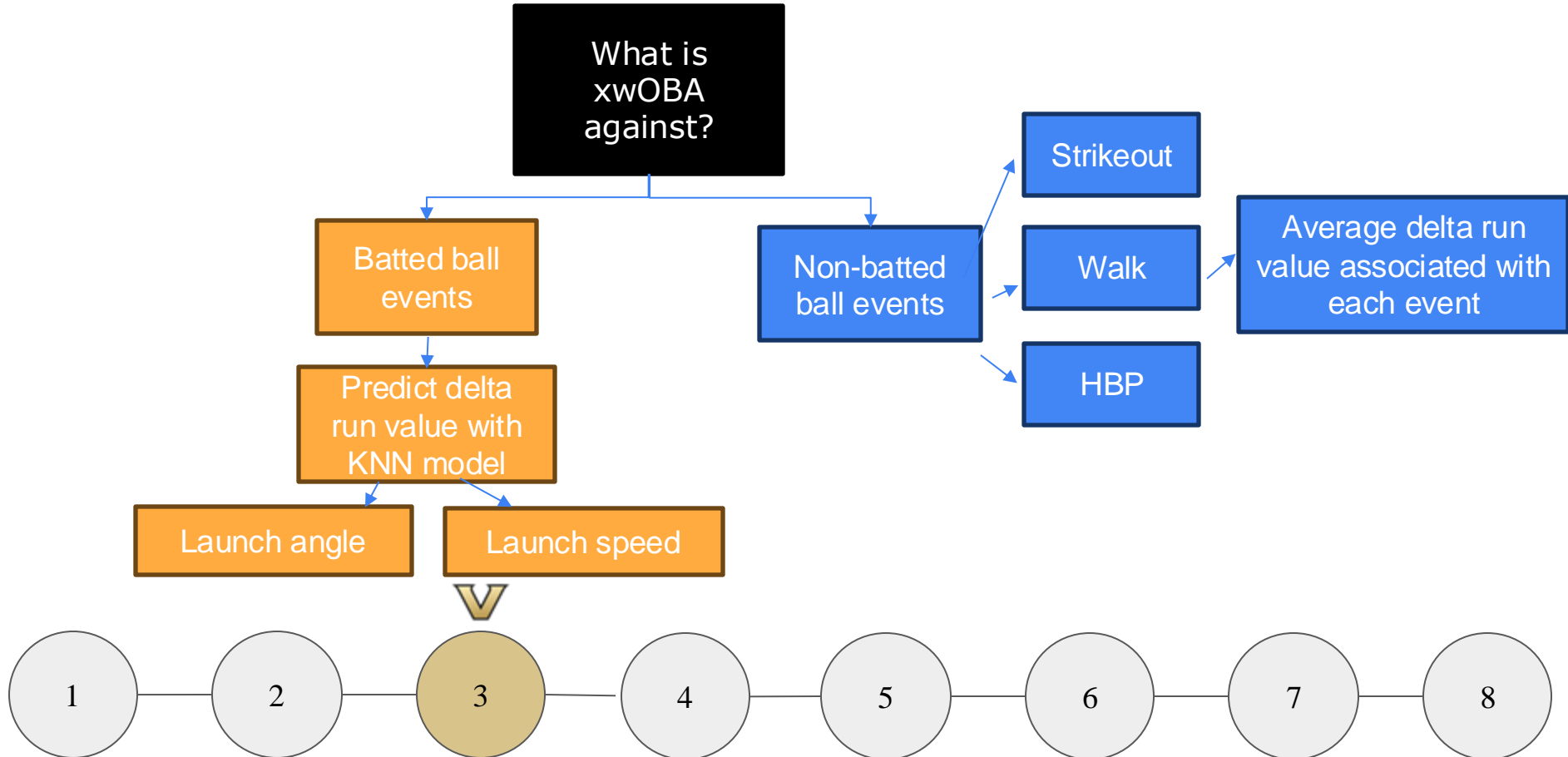




WPA vs. Run Minimization



1st Layer: xwOBA Against





Controlling for Batter Quality

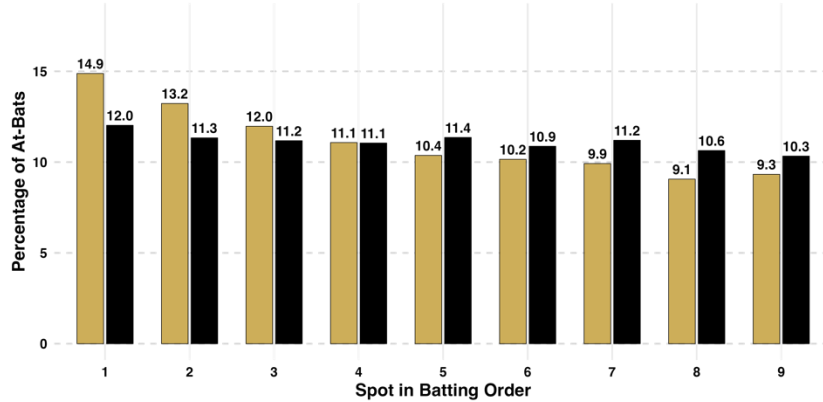


Why is Batter Quality Important?



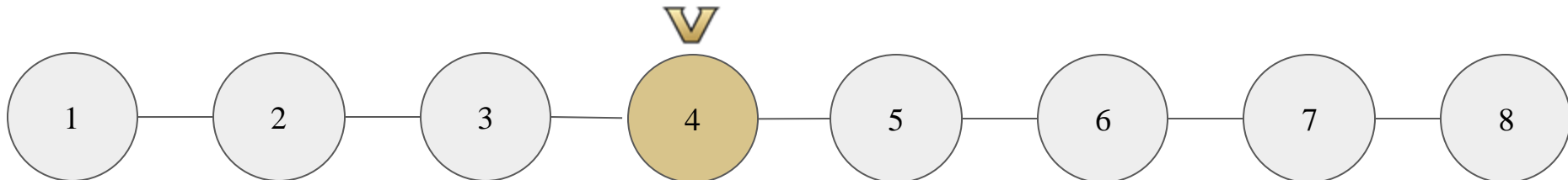
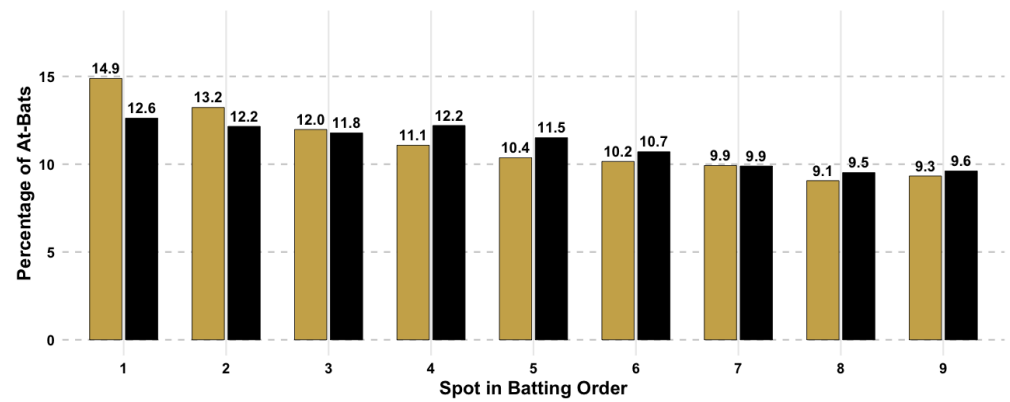
Lineup Spot Distribution: Top 30 xWOPA against Relief vs. Starting Pitchers

Pitcher Group ■ Relief Pitchers ■ Starting Pitchers



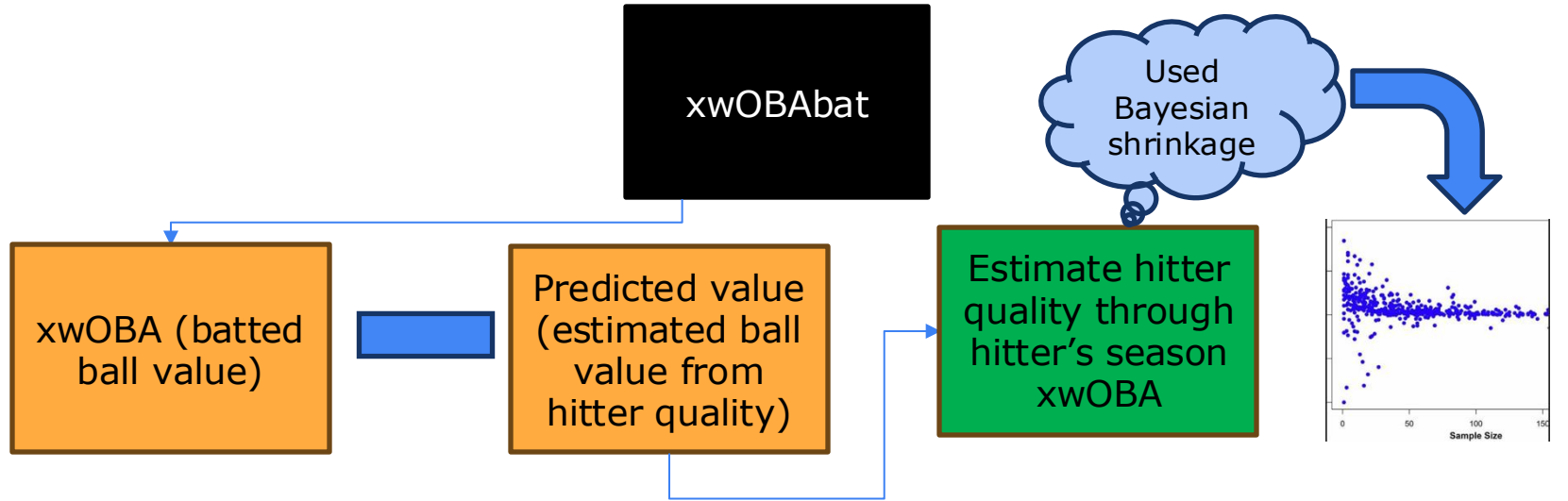
Lineup Spot Distribution: Top 30 vs. Bottom 30 Relief Pitchers based on xWOPA against

Pitcher Group ■ Top 30 Relief Pitchers ■ Bottom 30 Relief Pitchers

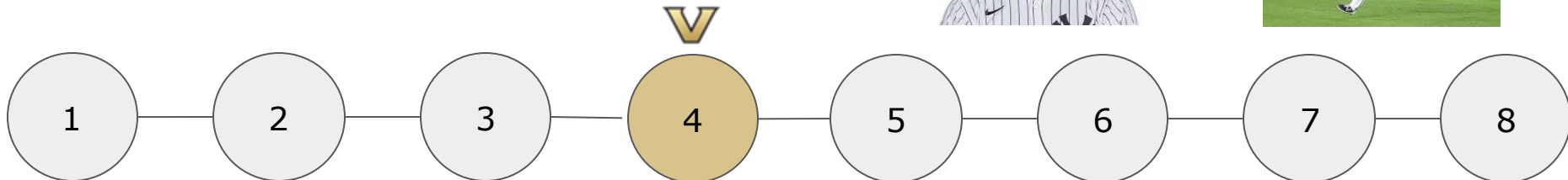




Our Solution: xwOBAbat



Vs.





Top 5 Relievers by xwOBAbat



2024 xwOBAbat Leaderboard



Mason Miller (144.1)



Kirby Yates (140.1)



Edwin Uceta (138.9)



Raisel Iglesias (131.7)



Joe Jimenez (129.0)

2023 xwOBAbat Leaderboard



Felix Bautista (139.6)



Josh Hader (130.5)



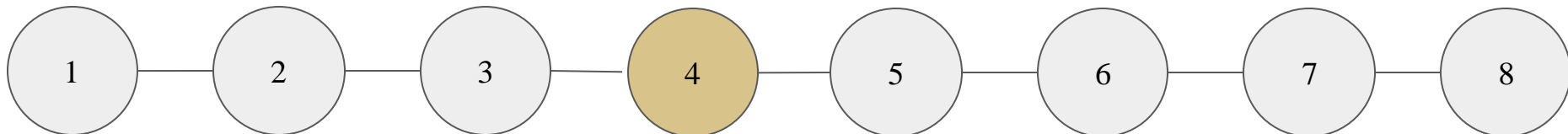
Jhoan Duran (126.0)



Gregory Soto (125.9)



Tanner Scott (125.9)

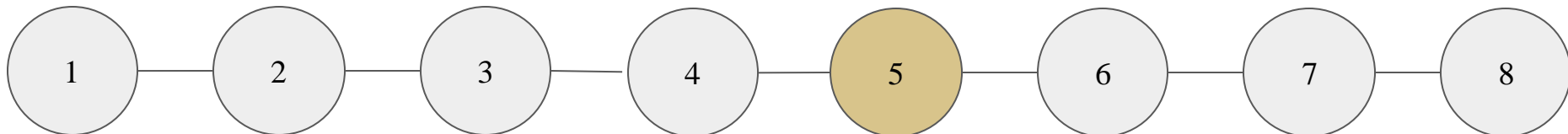
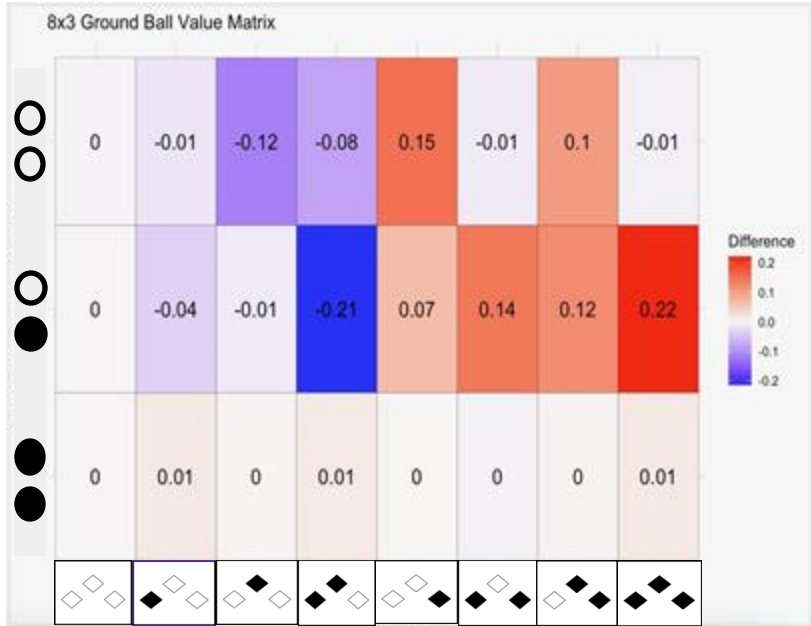




Accounting for Situation



Is a Groundout or a Strikeout Better? It Depends...

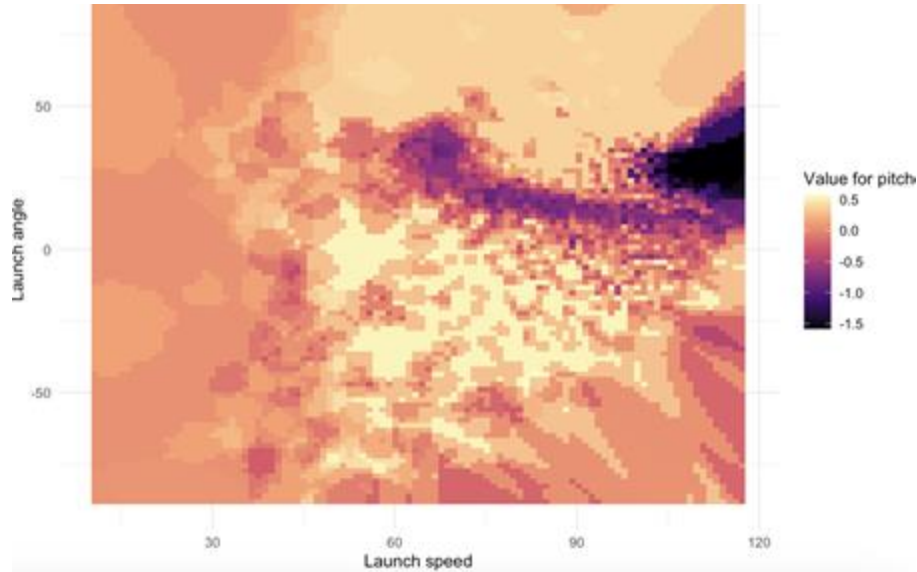




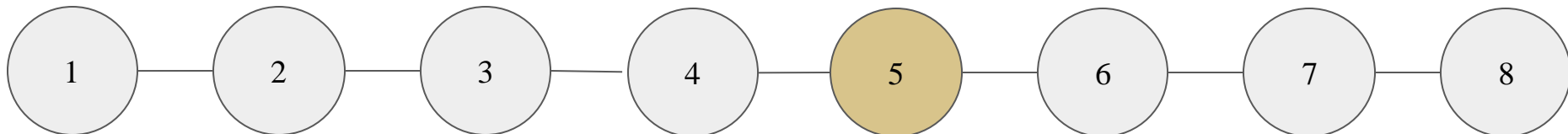
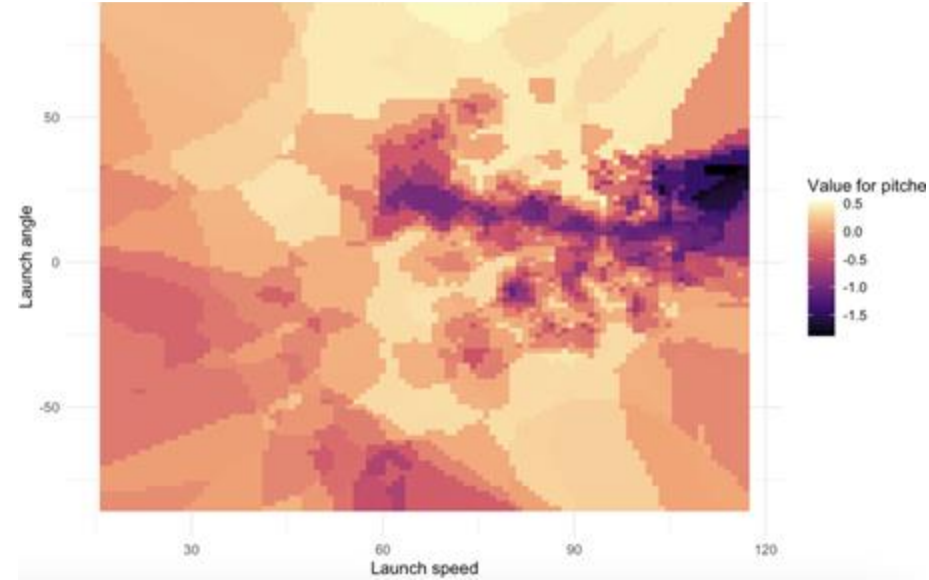
Same Batted Balls but Different Values



KNN Regression Predictions with
Runner on 1B, 0 outs



KNN Regression Predictions with
Runners on 2B and 3B, 0 outs

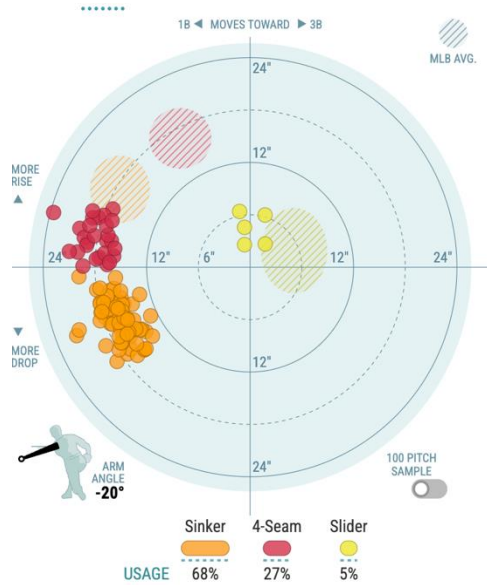




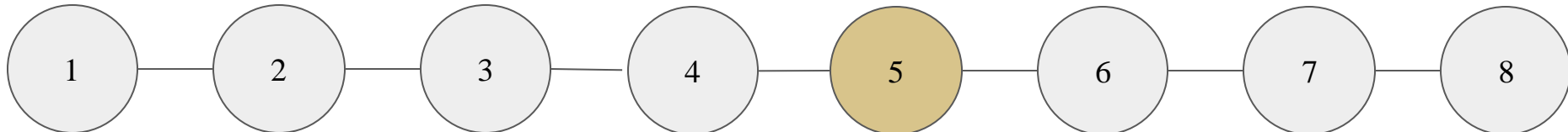
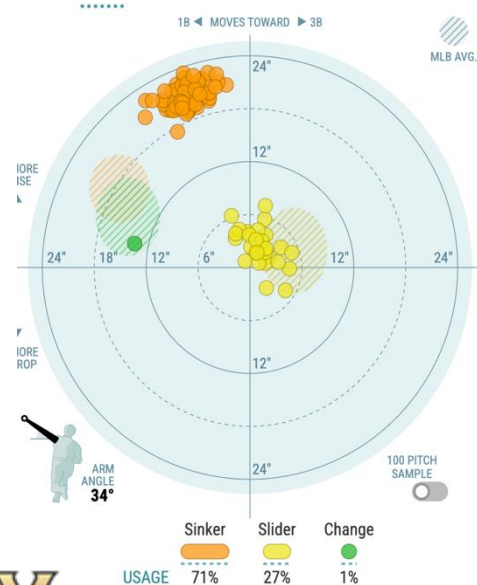
Tim Hill vs. Josh Hader



Tim Hill

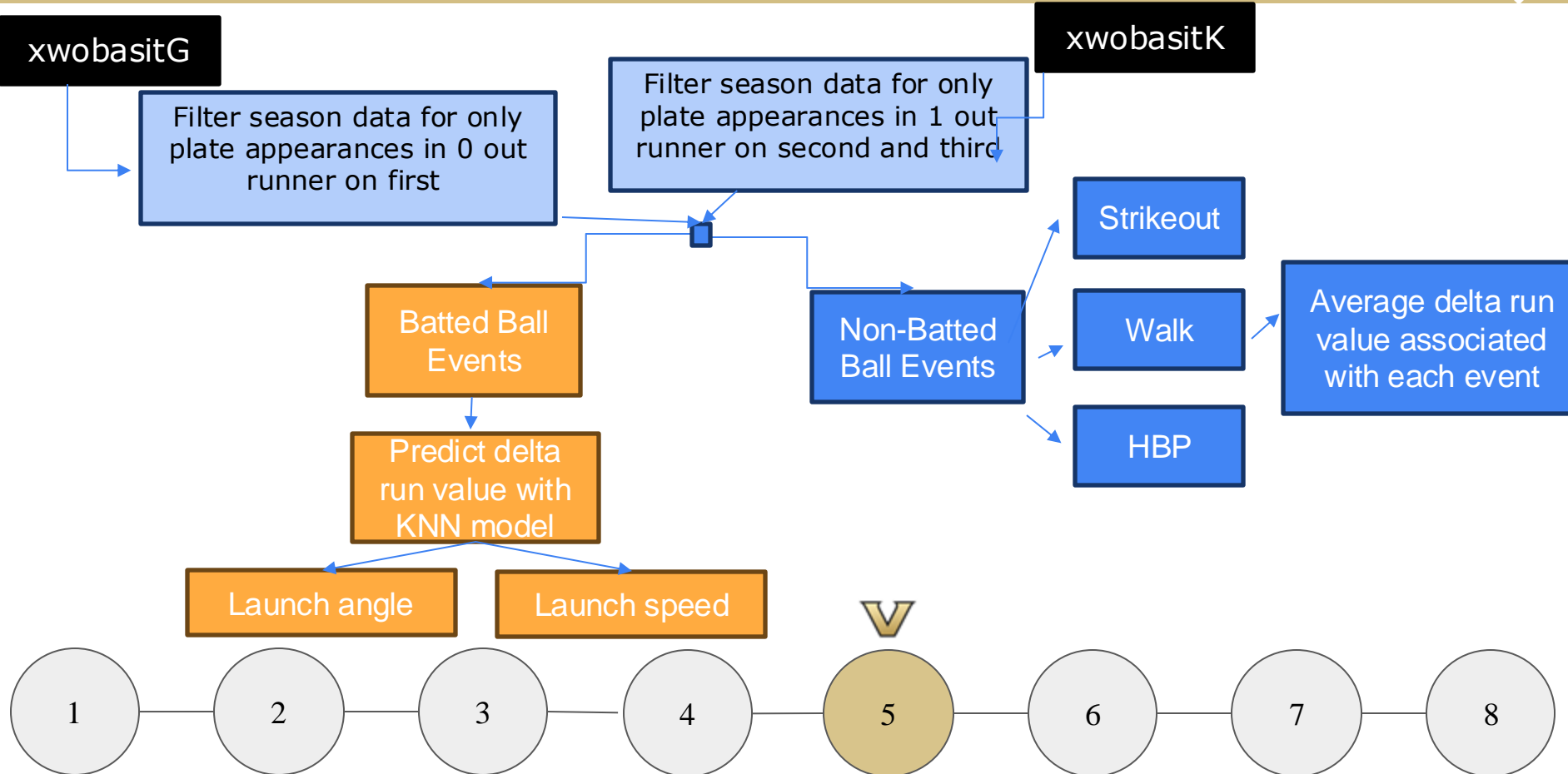


Josh Hader





xwOBAsitG and xwOBAsitK





Evaluating “Fireman” Value



Leaderboard by Situation



2024 Top 5 in each situation in comparison to xwOBAbat

 xwOBA_{sitG} - xwOBA_{bat} Leaderboard(2024):



Brendon Little(31.104)



Enyel De Los Santos(26.497)



Ryan Thompson(26.022)



Yennier Cano(24.839)



Fernando Cruz(24.794)

 xwOBA_{sitK} - xwOBA_{bat} Leaderboard(2024):



Fernando Cruz(36.927)



Craig Kimbrel(34.620)



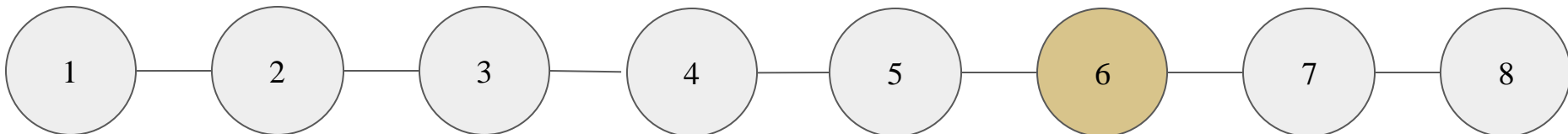
Enyel De Los Santos(32.084)



Nick Sandlin(25.802)



Scott Barlow(25.378)





Release Point Analysis



Release Point Analysis



```
Call:
lm(formula = xwoba ~ release_pos_z_diff + `pitcher_quality(xwoba_bat)` +
  `hitter_quality(estimated xwoba)`, data = batter_pa %>% filter(same_pitcher ==
    0, same_hand == 1))
```

Residuals:

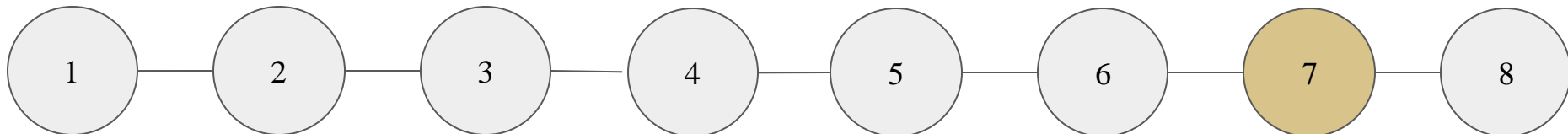
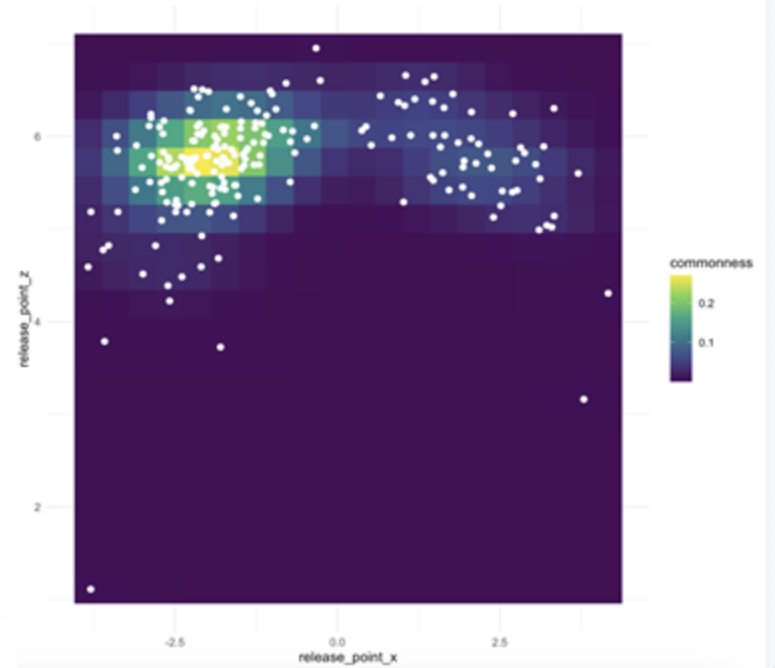
Min	1Q	Median	3Q	Max
-0.5323	-0.2728	-0.1467	0.2483	1.7715

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.066634	0.023623	-2.821	0.0048 **
release_pos_z_diff	-0.002787	0.002543	-1.096	0.2733
`pitcher_quality(xwoba_bat)`	0.944865	0.072079	13.109	<2e-16 ***
`hitter_quality(estimated xwoba)`	1.223773	0.076038	16.094	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.361 on 26379 degrees of freedom
(11603 observations deleted due to missingness)
Multiple R-squared: 0.01609, Adjusted R-squared: 0.01598
F-statistic: 143.8 on 3 and 26379 DF, p-value: < 2.2e-16





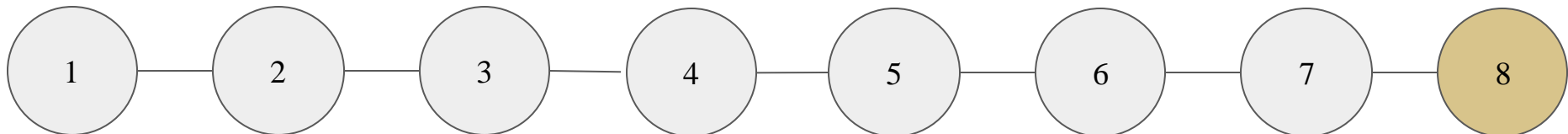
Final Dashboard and Conclusions



Cincinnati Reds







	Pitcher	Team	R/L	G	xwOBAbat	vs. L	vs.R	xwOBAstG	xwOBAstK	Rel. Pt. Uniqueness
	Alexis Diaz	CIN	R	57	100.24	94.85	106.27	95.05	108.25	118.61
	Fernando Cruz	CIN	R	67	94.61	75.82	114.06	119.41	131.54	89.07
	Brent Suter	CIN	L	45	90.25	97.65	88.71	73.32	79.04	120.46
	Buck Farmer	CIN	R	60	89.36	90.88	93.43	96.37	102.03	88.90
	Justin Wilson	CIN	L	54	89.35	95.32	89.19	88.60	95.52	114.00
	Lucas Sims	CIN	R	55	87.73	84.53	95.70	97.35	112.45	83.08

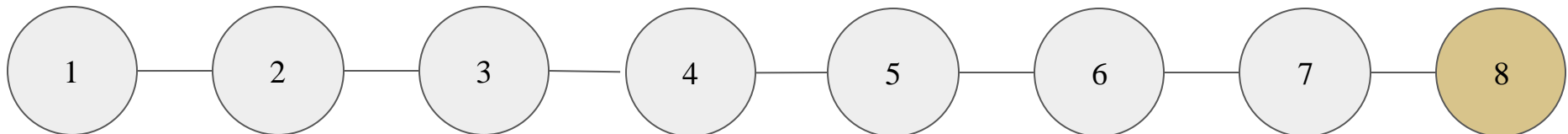




Finding Value

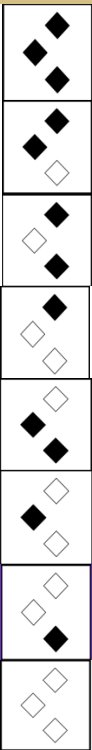


	Pitcher	Team	R/L	G	xwOBAbat	vs. L	vs.R	xwOBAsitG	xwOBAsitK	Rel. Pt. Uniqueness
	Brendon Little	TOR	L	47	94.16	112.28	73.32	125.26	91.91	111.60
	Fernando Cruz	CIN	R	67	94.61	75.82	114.06	119.41	131.54	89.07
	Hoby Milner	MIL	L	56	109.42	110.07	104.42	97.34	91.86	122.45
	Erik Miller	SF	L	69	111.74	121.83	97.80	113.83	116.20	114.06





Future Research

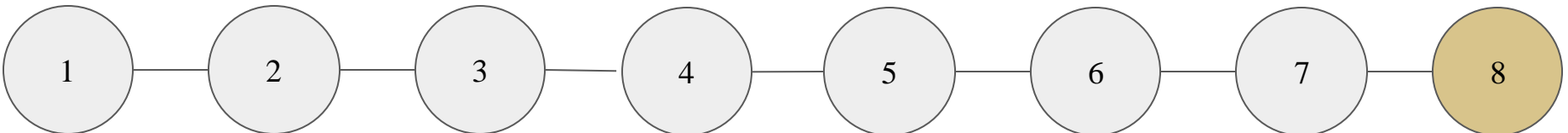
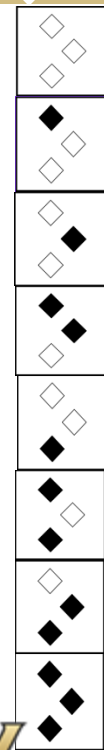


Create
xwOBAsit for
all 24
possibilities

Account for
three batter
rule

Simulate 3
batters
forward from
each starting
sit to get
better
situation
values

Using
pitcher
event
rates





Recap and Limitations



wSaves

Pros:

- Saves are weighted
- Blown saves are included

Con:

- Loses information batter-to-batter

xwOBAbat

Pros:

- Hitter quality
- Best single-stat for relievers

Con:

- Lacks situational value

Fireman value

Pros:

- Evaluates players in situations
- Finds undervalued players

Con:

- 3 batter rule

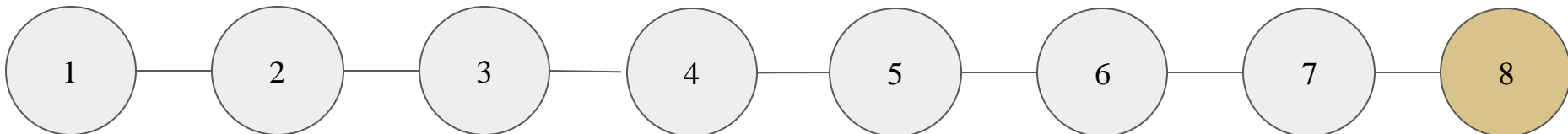
Release point

Pros:

- Loves uniqueness
- Unexplored avenue of research

Con:

- Not statistically significant





Bullpens are a Jigsaw Puzzle

