

# MLB Umpires – The Study of Imperfection

A large, stylized orange is centered in the background. It has a thick orange outline, a small leaf at the top, and a cluster of small dots on the right side representing seeds.

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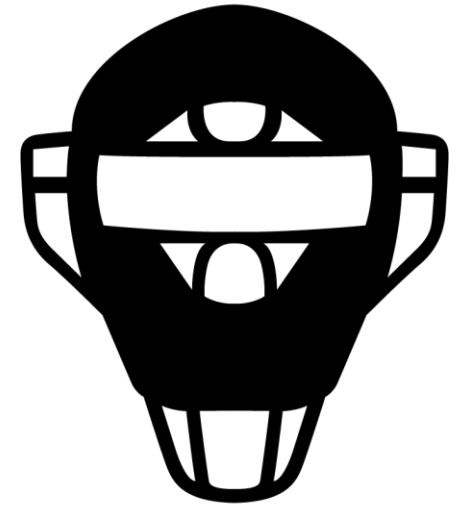
# Goals of the Project

- Analyze the variability of precision and accuracy during decision making
  - Utilize MLB Umpires as a case study
- Look for trends and factors that may cause variability
- View the magnitude of the effects.
- Evaluate possible solutions



# Methodology

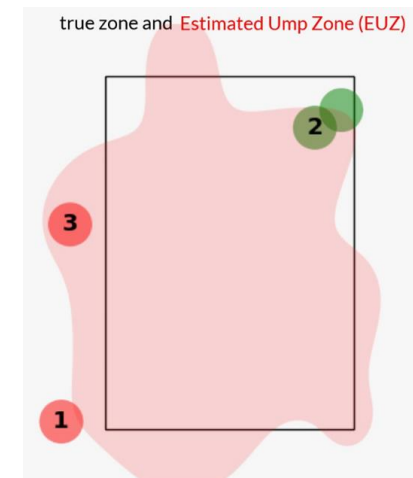
- Collect and cumulate game, umpire, and team data from Umpire Scorecards
- Conduct an analysis of umpire performance using experience as the dependant variable
- Create a Overturn Simulation to see the possible seasonwide affects



# Important Terms

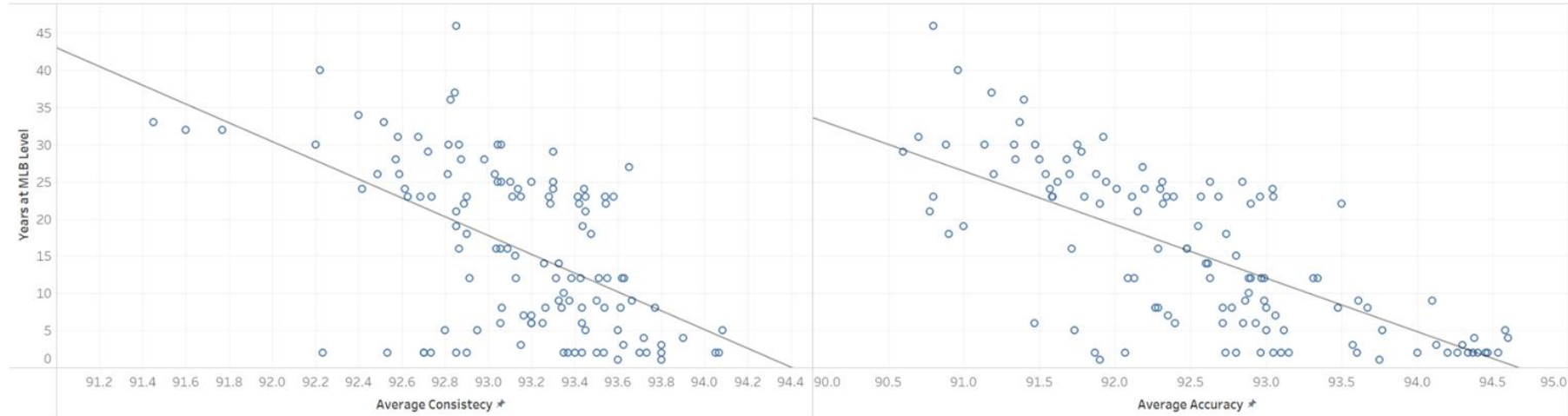
- Accuracy – How accurate an umpire is within the MLB Standard Strikezone
- Consistency – How accurate an umpire is within his own strikezone
- Favor – The cumulative difference in run expectancy values for inaccurate pitches.

Base Situation	Count												
	[0-0]	[0-1]	[0-2]	[1-0]	[1-1]	[1-2]	[2-0]	[2-1]	[2-2]	[3-0]	[3-1]	[3-2]	
1 2 3	2.28	2.24	2.28	2.34	2.26	2.21	2.35	2.26	2.15	2.81	2.55	2.49	0
1 2 3	1.93	1.89	1.62	2.03	1.88	1.73	2.3	2.02	1.78	2.14	2.06	1.65	0
1 2 3	1.76	1.71	1.6	1.78	1.66	1.63	1.94	1.81	1.64	2.09	2.1	1.85	0
1 2 3	1.4	1.28	1.13	1.53	1.49	1.47	1.48	1.46	1.34	1.45	1.71	1.49	0
1 2 3	1.47	1.4	1.31	1.53	1.45	1.33	1.67	1.5	1.46	2	1.77	1.62	0
1 2 3	1.14	1.05	0.95	1.19	1.08	0.96	1.27	1.21	1.08	1.41	1.34	1.17	0
1 2 3	0.89	0.82	0.75	0.98	0.87	0.81	1.09	0.97	0.87	1.26	1.15	1.07	0
1 2 3	0.51	0.46	0.41	0.56	0.5	0.44	0.62	0.55	0.47	0.75	0.68	0.57	0
1 2 3	1.51	1.36	1.18	1.6	1.49	1.3	1.79	1.59	1.5	2.15	1.88	1.53	1
1 2 3	1.37	1.26	1.06	1.42	1.31	1.16	1.45	1.4	1.26	1.53	1.41	1.34	1
1 2 3	1.2	1.11	1.01	1.25	1.15	1.12	1.26	1.22	1.16	1.24	1.36	1.25	1
1 2 3	0.99	0.91	0.79	1.04	0.96	0.82	1.17	1.03	0.87	1.36	1.19	0.92	1
1 2 3	0.95	0.88	0.79	1	0.94	0.81	1.06	1.01	0.87	1.16	1.19	1.04	1
1 2 3	0.69	0.65	0.59	0.72	0.66	0.59	0.78	0.71	0.68	0.92	0.87	0.71	1
1 2 3	0.54	0.49	0.42	0.57	0.52	0.44	0.62	0.58	0.5	0.77	0.66	0.62	1
1 2 3	0.27	0.24	0.2	0.3	0.27	0.22	0.34	0.3	0.25	0.42	0.37	0.32	1
1 2 3	0.74	0.59	0.41	0.88	0.68	0.45	1.11	0.86	0.65	1.35	1.09	1.04	2
1 2 3	0.58	0.5	0.34	0.59	0.56	0.41	0.61	0.55	0.42	0.85	0.68	0.56	2
1 2 3	0.5	0.43	0.35	0.55	0.47	0.37	0.57	0.54	0.4	0.65	0.66	0.46	2
1 2 3	0.37	0.31	0.24	0.4	0.34	0.25	0.44	0.41	0.3	0.46	0.41	0.39	2
1 2 3	0.44	0.38	0.28	0.46	0.41	0.33	0.53	0.46	0.39	0.67	0.58	0.5	2
1 2 3	0.33	0.29	0.2	0.35	0.3	0.22	0.38	0.31	0.25	0.51	0.38	0.3	2
1 2 3	0.22	0.18	0.13	0.26	0.22	0.17	0.29	0.24	0.19	0.36	0.32	0.26	2
1 2 3	0.1	0.09	0.06	0.12	0.1	0.07	0.14	0.12	0.09	0.17	0.15	0.13	2

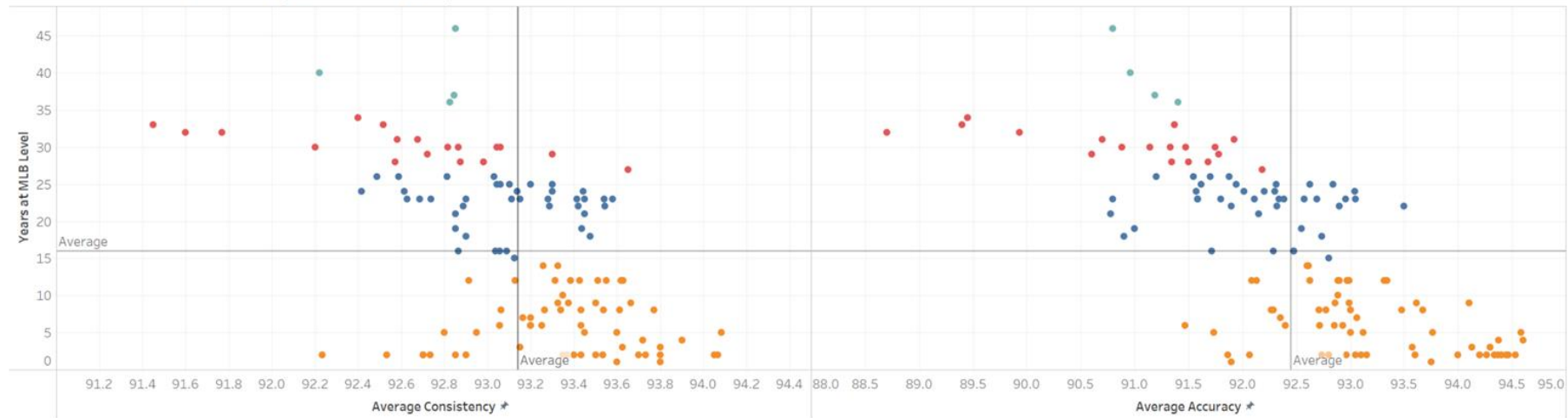


# Umpire Analysis

Average Consistency vs Experience

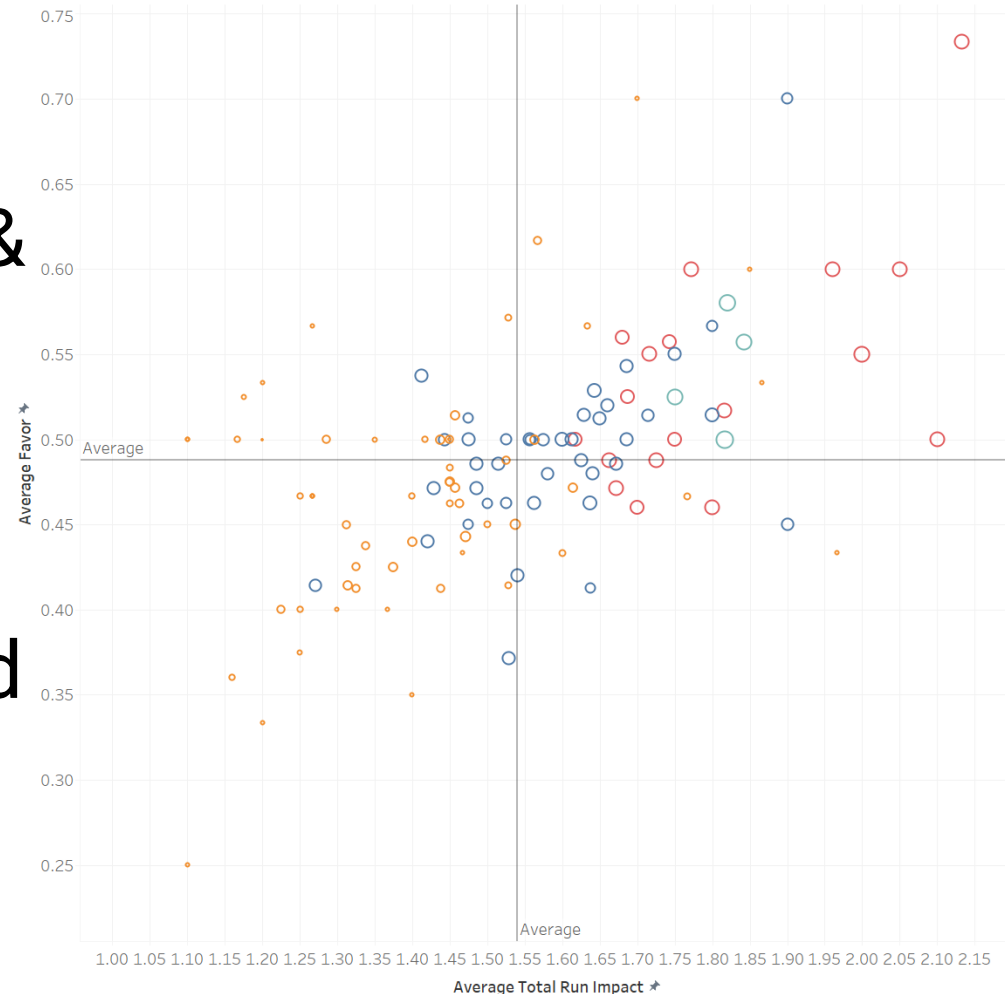


Consistency vs Experience (Cluster Analysis)



# Conclusions

- Significant Correlation between Years Experience & Umpire Impact
- Strong case to say experience/age can be used to explain differences in accuracy between umpires.



# Umpire Overturns

- What is it: When the favor of a team is greater than its winning or losing run differential.
- 284 occurrences ~2% of games since 2015
- 171 vs 113 for the Home and Away teams
- Significant decrease in overturns per year.

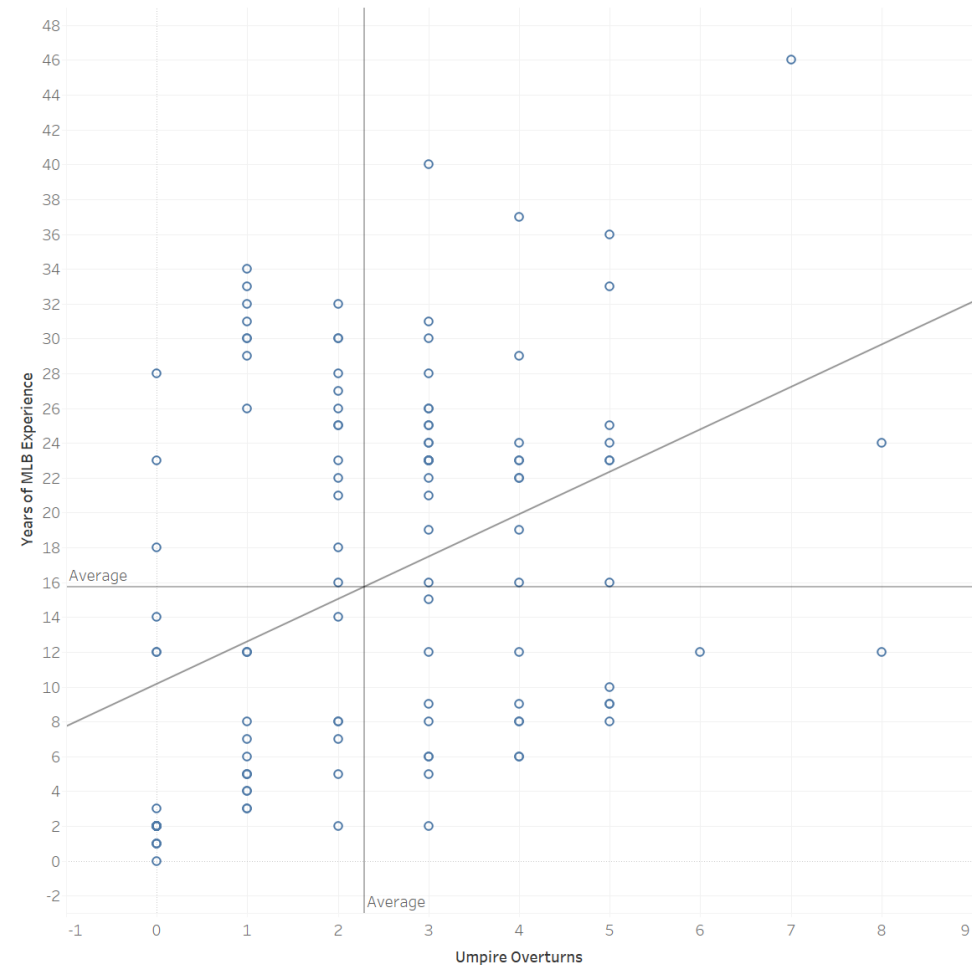
Year	Overturns
2015	57
2016	49
2017	48
2018	31
2019	35
2020	20
2021	22
2022	22



# Umpire Impact

- Positive Correlation between experience and Overturns ( $R^2 = .16$ )
- Fits similar theme

Overturns vs Years of Experience



Sum of Umpire Overturns vs. maximum of Years.at.MLB.Level. Details are shown for Umpire.





# Season Wide Impact

- Separated Overturns into wins gained and lost per team
- Calculated percentage of overturned outcome using pythagorean expected win percentage taking into account favor

Team	Wins Gained	Wins Lost	Team PlusMinus
ARI	11	10	+1
ATL	5	13	-8
BAL	8	5	+3
BOS	9	20	-11
CHC	12	11	+1
CIN	20	5	+15
CLE	4	12	-8
COL	7	6	+1
CWS	8	8	0
DET	8	3	+5
HOU	14	9	+5
KC	10	4	+6
LAA	6	11	-5
LAD	4	10	-6
MIA	9	10	-1
MIL	8	10	-2
MIN	7	10	-3
NYM	9	11	-2
NYY	16	10	+6
OAK	12	7	+5
PHI	9	2	+7
PIT	8	4	+4
SD	9	12	-3
SEA	9	18	-9
SF	12	10	+2
STL	11	11	0
TB	6	9	-3
TEX	8	8	0
TOR	10	11	-1
WSH	15	14	+1



# Case Study 1

2019 NL Playoff Standings				
Seed		Team	Record	Wild Card
1		Los Angeles Dodgers	106-56	--
2		Atlanta Braves	97-65	--
3		St. Louis Cardinals	91-71	--
4		Washington Nationals	93-69	+4
5		Milwaukee Brewers	89-73	0
E		New York Mets	86-76	-3
E		Arizona Diamondbacks	85-77	-4

2019 NL Adjusted Playoff Standings				
Seed		Team	Record	Wild Card
1		Los Angeles Dodgers	106-56	--
2		Washington Nationals	95-67	--
3		Atlanta Braves	94-68	+6
4		St. Louis Cardinals	91-71	--
5		Milwaukee Brewers	88-74	0
E		Arizona Diamondbacks	86-76	-2
E		New York Mets	84-78	-4
Probability of Scenario:			7.90%	

Outcome	Probability
WSH BEAT ATL	32.47%
WSH TIE ATL	23.35%
ATL BEAT WSH	47.39%



# Case Study 2

## 2018 NL Playoff Standings

Seed		Team	Record	Wild Card
T-1		Milwaukee Brewers	95-67	--
T-1		Chicago Cubs	95-67	+4
T-2		Los Angeles Dodgers	91-71	--
T-2		Colorado Rockies	91-71	0
3		Atlanta Braves	90-72	--
E		St. Louis Cardinals	88-74	-3
E		Pittsburgh Pirates	82-79	-9

## 2018 NL Adjusted Playoff Standings

Seed		Team	Record	Wild Card
1		Milwaukee Brewers	95-67	--
2		Atlanta Braves	91-71	--
3		Colorado Rockies	90-73	--
4		Chicago Cubs	94-68	+6
5		St. Louis Cardinals	89-74	0
E		Los Angeles Dodgers	88-74	0
E		Pittsburgh Pirates	81-80	-7



Outcome	Probability
CHC BEAT MIL	67.52%
CHC TIE MIL	16.36%
MIL BEAT CHC	10.44%
COL BEAT LAD	45.61%
COL TIE LAD	32.80%
LAD BEAT COL	21.58%

Outcome	Probability
STL ADV, LAD ELIM	14.25%
STL & LAD TIE	25.43%
STL & COL TIE	12.52%
STL ELIM	30.30%



# Case Study 3

2016 NL Playoff Standings				
Seed		Team	Record	Wild Card
1		Chicago Cubs	103-59	--
2		Washington Nationals	95-67	--
3		Los Angeles Dodgers	91-71	--
T-4		New York Mets	87-75	0
T-4		San Francisco Giants	87-75	0
E		St. Louis Cardinals	86-76	-1
E		Miami Marlins	79-82	-8

2016 NL Adjusted Playoff Standings				
Seed		Team	Record	Wild Card
1		Chicago Cubs	101-61	--
2		Washington Nationals	95-67	--
3		Los Angeles Dodgers	91-71	--
T-4		New York Mets	86-76	0
T-4		St. Louis Cardinals	86-76	0
T-4		San Francisco Giants	86-76	0
E		Miami Marlins	80-81	-6
Probability of Scenario:			17.74%	

Outcome	Probability
<b>NYM &amp; SF ADV</b>	20.54%
<b>SF &amp; STL ADV</b>	12.53%
<b>NYM &amp; STL ADV</b>	16.18%
<b>3 WAY TIE</b>	17.74%
<b>STL &amp; SF TIE, NYM ADV</b>	6.76%
<b>STL &amp; NYM TIE, SF ADV</b>	14.60%
<b>SF &amp; NYM TIE, STL ADV</b>	10.31%



# Concluding Thoughts

- Umpire variability is legitimate, and correlates strongly with years of experience.
- No bias was found towards or against any team
- Variability can have a real impact on a season.
- What will the effect of AAA Robot Umpires be?



Thank you!

Questions?

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