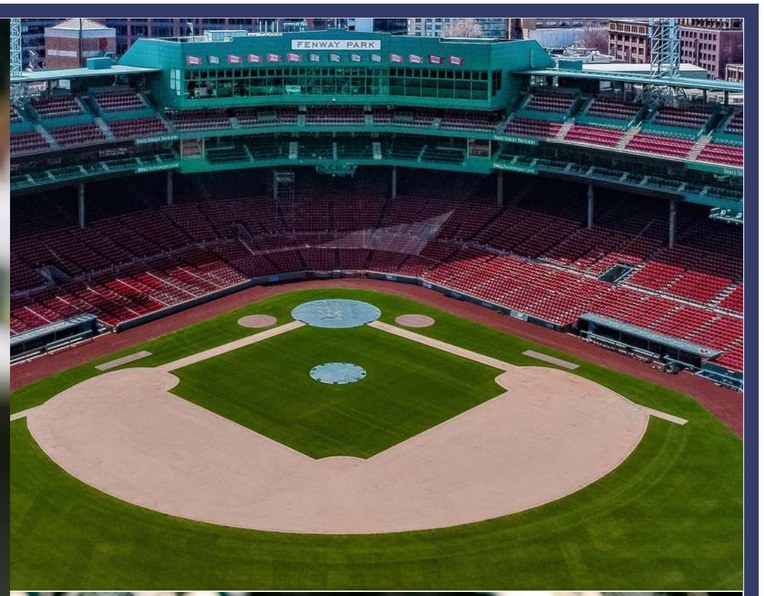
DSI314

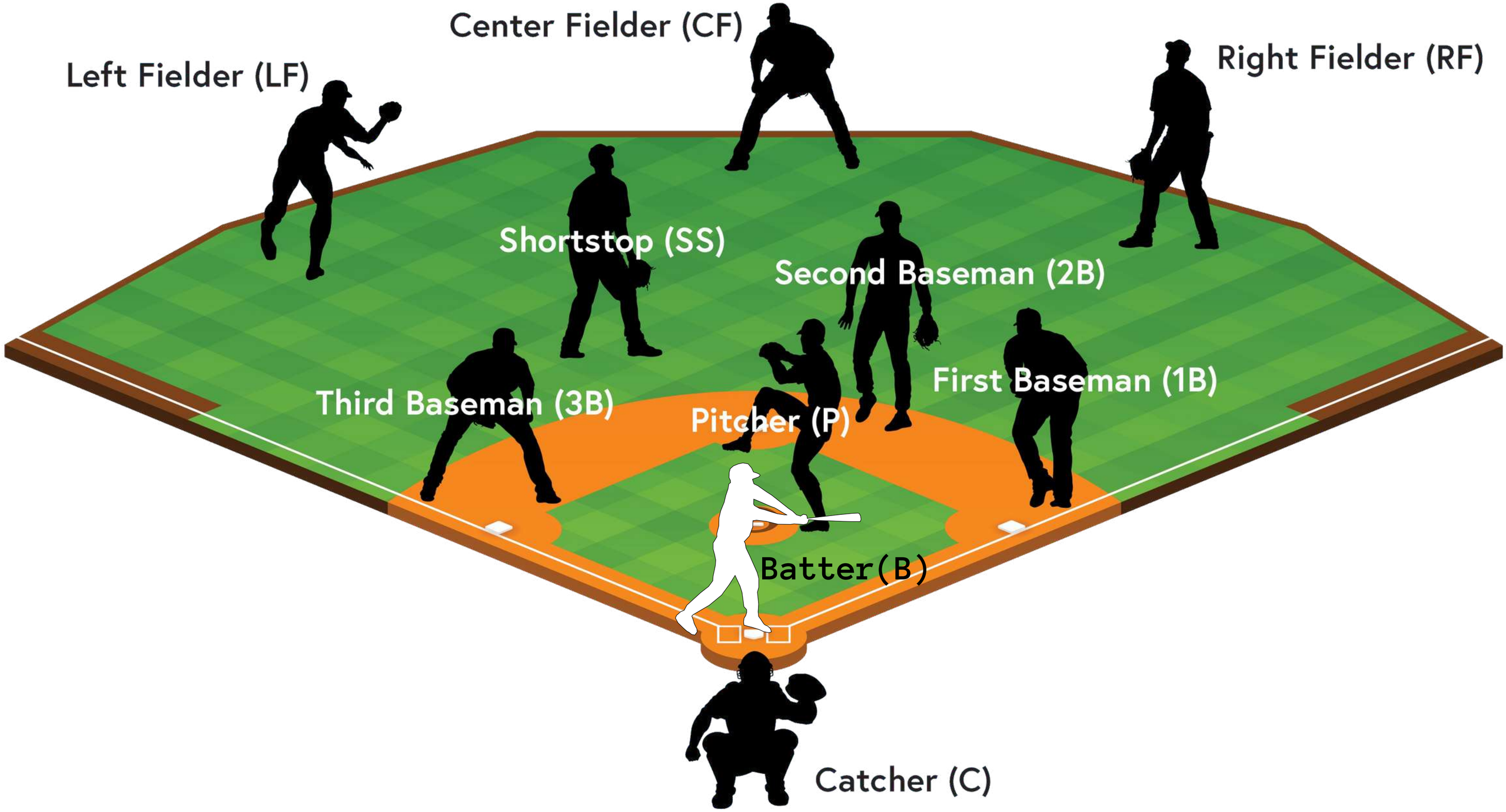
BASEBALL

Business analytics capstone project

20
Academy

Rice
13


FENWAY PARK


Center Fielder (CF)
Left Fielder (LF)
Right Fielder (RF)
Shortstop (SS)
Second Baseman (2B)
First Baseman (1B)
Third Baseman (3B)
Pitcher (P)
Batter(B)
Catcher (C)

overview

01

Objective

02

EDA

03

Data preprocessing

04

Train and Evaluate model

05

Summary

06

HOME RUN
Overview
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HOME RUN
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OVERVIEW

เบสบอลเป็นกีฬาที่ได้รับความนิยมเป็นอย่างมากในต่างประเทศ โดยเฉพาะอเมริกาและญี่ปุ่น

ถึงแม้ว่าในบางประเทศกีฬาเบสบอลไม่ได้รับความนิยมเท่ากับกีฬาอื่น แต่ก็ยังมีความสนใจและการติดตามในระดับท้องถิ่น

ดังนั้นกลุ่มของเราจึงเลือกหัวข้อนี้ เพื่อมาทำการวิเคราะห์และหาข้อสรุปที่เราสนใจ

HOME RUN
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HOME RUN
EDA
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Income
WINNER
SPONSOR
TICKET
TICKET
MERCHANDISE
TV SHOW
Payment
PLAYER
TAX
Tax
etc.

Objective

GOAL

IDENTIFY KEY FEATURES THAT CONTRIBUTE TO WINNING GAMES

Objective

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DATA COLLECTION

01

savant

DATA SOURCE

02

WEB SCRAPING

- Selenium
- BeautifulSoup

PITCHER

02

02

BATTER

DATA CLEANING

03

DATA CLEANING

- Handle Missing Value
- Correlations
- Outliers
- Convert Data Type
- Distributions

PITCHER

Rk.	Player	Pitches	Total	Pitch %	PA	BIP	Hits	3B	HR	SO	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)	Movement Toward/Away from Batter (in)	EV (MPH)	LA (°)	Dist (ft)	Hard Hit%	Barr
1	Cole, Gerrit RHP	14081	14089	99.9	3435	2073	653	5	120	1141	...	23.4	4.3	9.1	1.4	88.9	13.7	170	39.1	
2	Nola, Aaron RHP	13553	13577	99.8	3456	2236	736	12	113	979	...	33.0	5.4	3.8	0.1	88.7	11.9	145	37.2	
3	Castillo, Luis RHP	13152	13188	99.7	3252	2061	652	14	87	888	...	26.6	12.3	6.0	1.4	88.3	8.5	145	37.9	
4	Giolito, Lucas RHP	12929	12941	99.9	3184	1994	657	18	124	905	...	23.6	5.4	12.3	0.6	88.4	16.7	167	37.6	
5	Wheeler, Zack RHP	12925	12955	99.8	3320	2243	722	12	74	866	...	22.8	5.0	9.1	1.1	86.1	10.9	151	33.3	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
1043	Sousa, Bennett LHP	505	505	100.0	129	95	31	0	4	22	...	24.4	2.4	9.3	0.8	89.6	8.0	155	45.3	
1044	Rodríguez, Manuel RHP	503	503	100.0	139	94	28	0	4	24	...	25.7	6.4	5.6	0.6	83.7	6.2	128	31.9	
1045	Gose, Anthony LHP	503	504	99.8	114	61	17	0	4	37	...	20.8	3.3	10.8	1.4	91.3	19.1	200	41.0	
1046	Grotz, Zac RHP	501	501	100.0	118	73	25	0	4	22	...	32.1	8.6	4.1	3.2	88.8	6.1	128	37.0	
1047	Yamaguchi, Shun RHP	501	502	99.8	119	74	28	2	6	26	...	29.2	7.7	7.9	0.1	89.1	12.5	159	37.8	

1047 rows × 37 columns

https://baseballsavant.mlb.com/pitcher

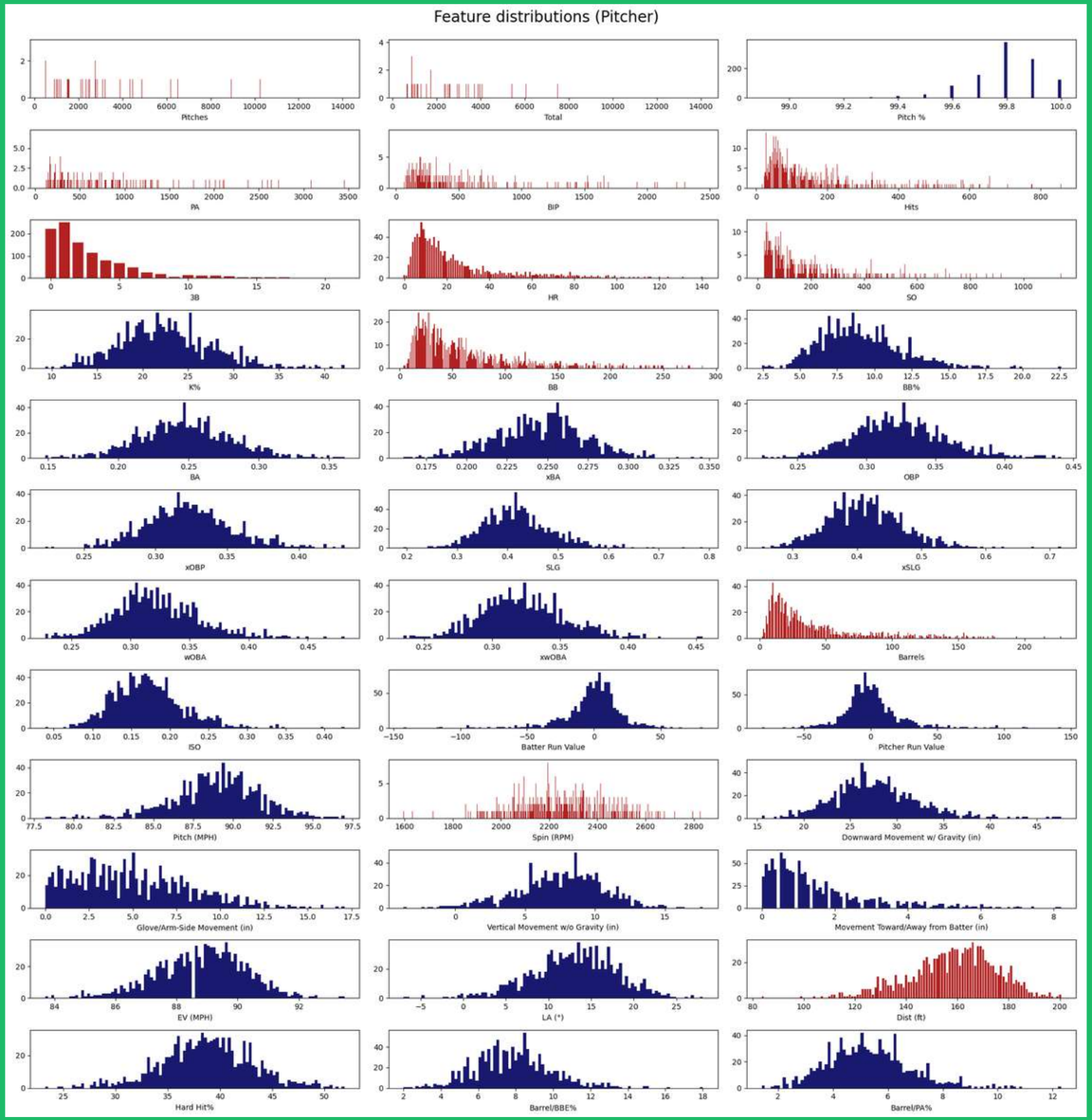
BATTER

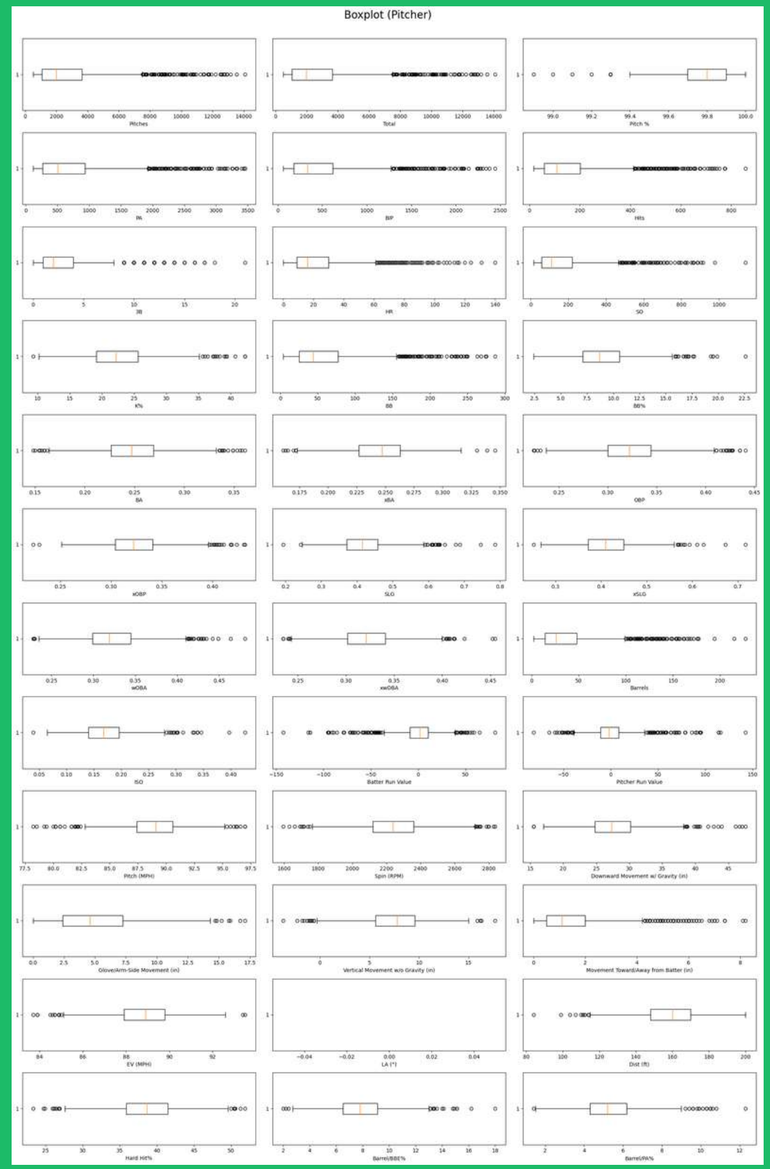
Rk.	Player	Pitches	Total	Pitch %	PA	BIP	Hits	3B	HR	SO	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)	Movement Toward/Away from Batter (in)	EV (MPH)	LA (°)	Dist (ft)	Hard Hit%	Barre
1	Semien, Marcus	14081	14089	100.0	3180	2337	755	19	140	528	...	27.9	3.7	7.7	0.6	88.4	18.6	167	37.0	
2	Goldschmidt, Paul	13553	13577	100.0	2919	1914	727	3	131	647	...	28.0	3.4	7.2	1.6	91.0	15.0	173	47.2	
3	Olson, Matt	13152	13188	99.9	2839	1828	637	4	177	664	...	27.4	4.5	7.8	2.2	92.7	17.0	175	51.1	
4	Freeman, Freddie	12929	12941	100.0	3029	2182	839	9	132	494	...	27.2	5.0	7.6	2.8	90.8	14.1	172	45.4	
5	Soto, Juan	12925	12955	99.9	2816	1819	642	10	138	478	...	28.1	5.0	7.1	2.7	92.3	8.2	161	51.2	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
800	Williams, Nick	1020	1021	100.0	125	69	16	0	2	47	...	27.4	5.2	8.0	4.5	86.7	11.2	160	30.4	
801	Gennett, Scooter	1019	1027	99.8	138	93	30	0	2	41	...	28.9	5.0	7.1	3.1	86.3	13.1	177	25.8	
802	Butler, Lawrence	1019	1020	99.8	128	88	26	0	4	35	...	28.9	5.2	6.3	4.7	88.3	16.3	154	37.5	
803	Fried, Max	1017	1019	97.0	117	75	26	0	0	33	...	26.1	5.9	8.7	2.9	88.3	-2.1	145	37.3	
804	Alcantara, Sandy	1016	1016	96.4	109	19	6	0	0	84	...	25.9	4.7	8.8	1.0	81.4	-20.9	127	21.1	

804 rows × 37 columns

https://baseballsavant.mlb.com/BATTER

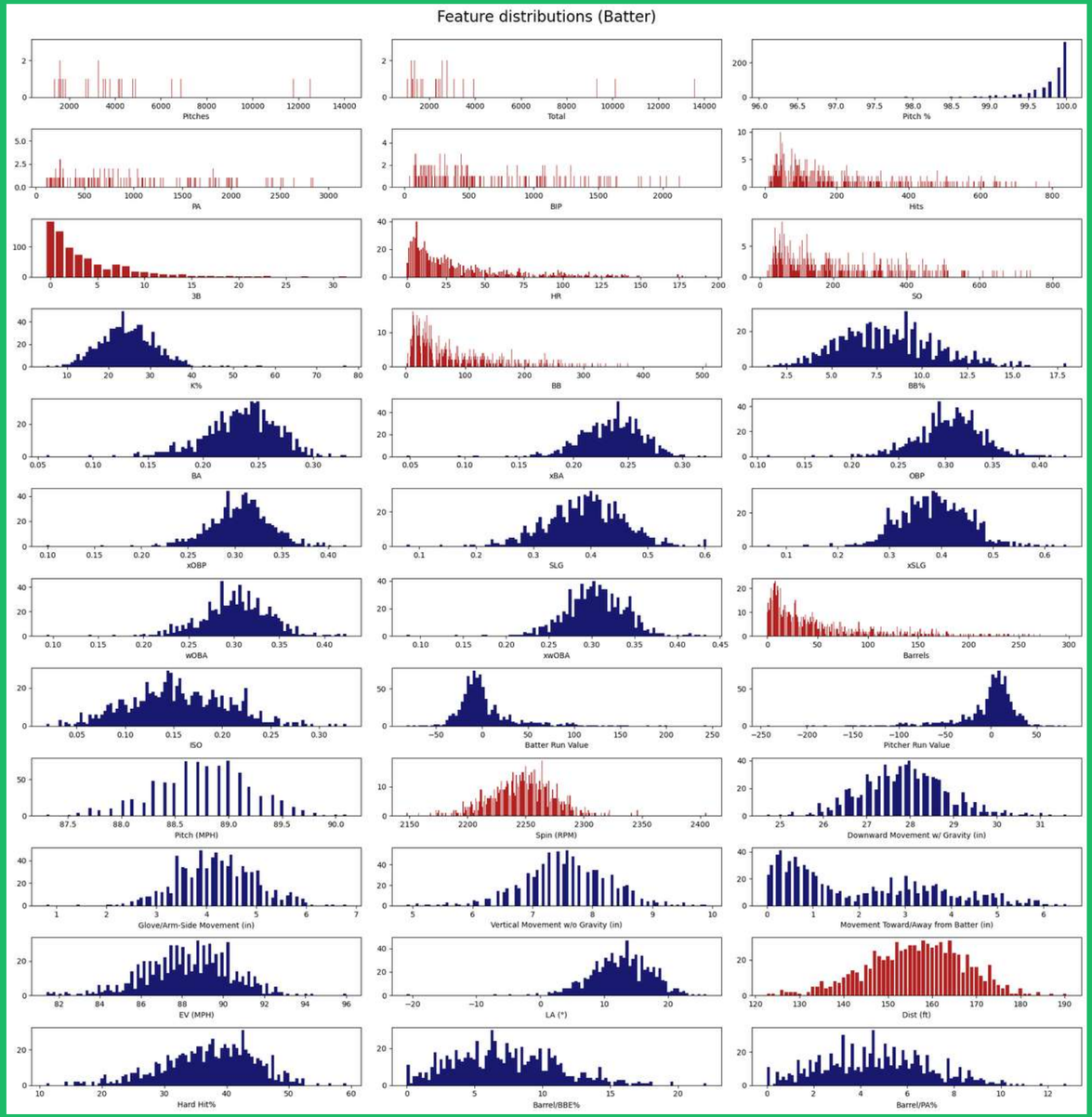
PITCHER

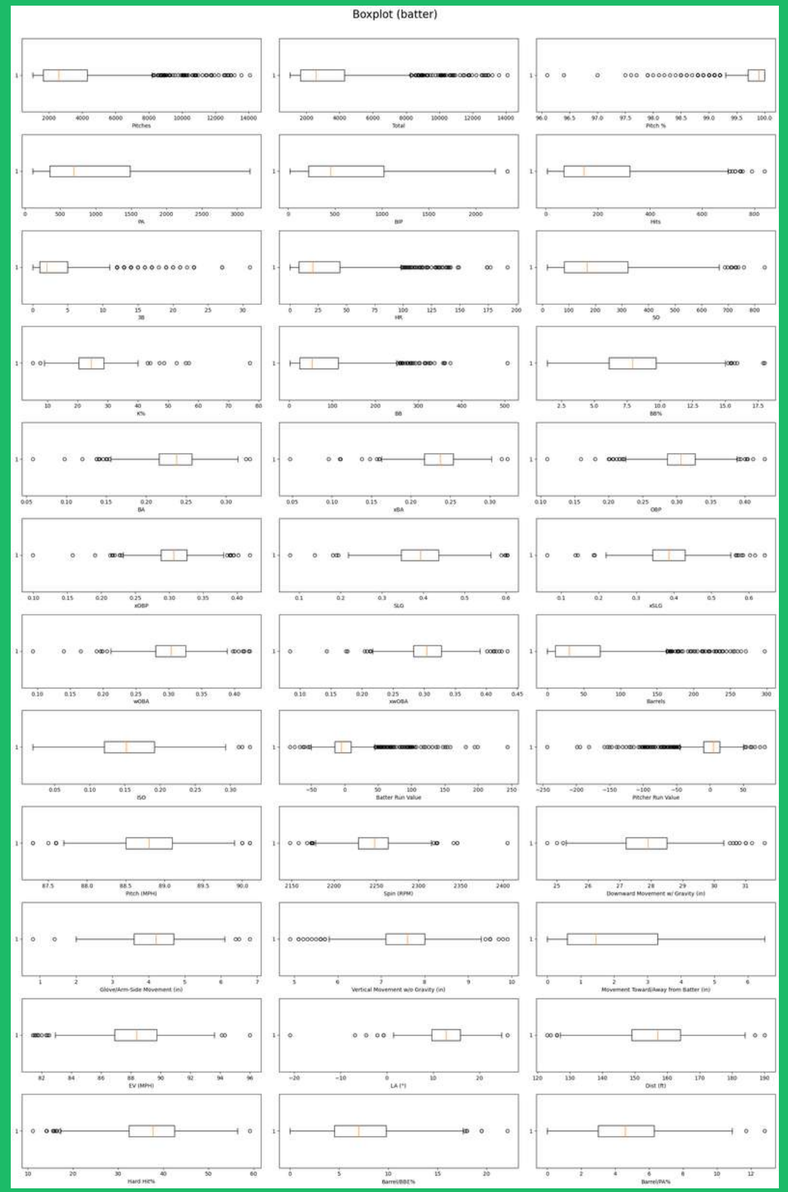

Feature distributions (Pitcher)
Pitches
Total
Pitch %
PA
BIP
Hits
3B
HR
SO
K%
BB
BB%
BA
xBA
OBP
xOBP
SLG
xSLG
wOBA
xwOBA
Barrels
ISO
Batter Run Value
Pitcher Run Value
Pitch (MPH)
Spin (RPM)
Downward Movement w/ Gravity (in)
Glove/Arm-Side Movement (in)
Vertical Movement w/o Gravity (in)
Movement Toward/Away from Batter (in)
EV (MPH)
LA (°)
Dist (ft)
Hard Hit%
Barrel/BBE%
Barrel/PA%


Boxplot (Pitcher)

BATTER

EDA


Feature distributions (Batter)
Pitches
Total
Pitch %
PA
BIP
Hits
3B
HR
SO
K%
BB
BB%
BA
xBA
OBP
xOBP
SLG
xSLG
wOBA
xwOBA
Barrels
ISO
Batter Run Value
Pitcher Run Value
Pitch (MPH)
Spin (RPM)
Downward Movement w/ Gravity (in)
Glove/Arm-Side Movement (in)
Vertical Movement w/o Gravity (in)
Movement Toward/Away from Batter (in)
EV (MPH)
LA (°)
Dist (ft)
Hard Hit%
Barrel/BBE%
Barrel/PA%


Boxplot (batter)

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ROBUSTSCALER

	Pitches	PA	BIP	Hits	3B	HR	SO	K%	BB	BA	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)
0	4.682078	4.404807	3.954571	3.817863	1.000000	4.952381	6.334869	1.705426	3.057692	-1.023810	...	-0.722222	-0.061538	0.325
1	4.477802	4.436350	4.324815	4.399299	3.333333	4.619048	5.339478	0.945736	3.173077	-0.404762	...	1.055556	0.164103	-1.000
2	4.322662	4.129929	3.927314	3.810858	4.000000	3.380952	4.780338	0.790698	4.423077	-0.595238	...	-0.129630	1.579487	-0.450
3	4.236386	4.027788	3.775128	3.845884	5.333333	5.142857	4.884793	0.961240	4.211538	-0.452381	...	-0.685185	0.164103	1.125
4	4.234839	4.232069	4.340716	4.301226	3.333333	2.761905	4.645161	0.604651	2.557692	-0.333333	...	-0.833333	0.082051	0.325
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1041	-0.570268	-0.562523	-0.531516	-0.546410	-0.666667	-0.571429	-0.571429	-1.379845	-0.615385	0.333333	...	0.129630	-0.328205	0.175
1042	-0.571042	-0.583552	-0.615559	-0.637478	-0.666667	-0.571429	-0.448541	1.596899	-0.557692	-1.714286	...	-1.203704	-0.266667	0.750
1043	-0.571042	-0.546001	-0.540602	-0.560420	-0.666667	-0.571429	-0.528418	-0.759690	-0.461538	-0.238095	...	-0.296296	0.369231	-0.550
1044	-0.571815	-0.576042	-0.586031	-0.560420	0.000000	-0.476190	-0.516129	-0.062016	-0.519231	0.928571	...	0.351852	0.635897	0.025
1045	-0.571815	-0.577544	-0.588302	-0.581436	-0.666667	-0.571429	-0.540707	-0.558140	-0.500000	0.523810	...	0.888889	0.820513	-0.925

1046 rows × 29 columns

	Pitches	PA	BIP	Hits	3B	HR	SO	K%	BB	BA	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)	Movemer Toward/Awa from Batte (ir
0	4.361999	2.191419	2.355847	2.395280	4.25	3.310345	1.496358	-0.928571	2.736842	0.654545	...	0.000000	-0.454545	0.111111	-0.31481
1	4.161752	1.961716	1.826767	2.285152	0.25	3.062069	1.991675	-0.261905	3.146814	1.163636	...	0.076923	-0.727273	-0.444444	0.05555
2	4.009671	1.891309	1.719199	1.931170	0.50	4.331034	2.062435	-0.119048	2.925208	0.484848	...	-0.384615	0.272727	0.222222	0.27777
3	3.925097	2.058526	2.161976	2.725664	1.75	3.089655	1.354839	-0.964286	2.903047	1.866667	...	-0.538462	0.727273	0.000000	0.50000
4	3.923580	1.871067	1.707942	1.950836	2.00	3.255172	1.288241	-0.880952	5.019391	1.042424	...	0.153846	0.727273	-0.555556	0.46296
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.
799	-0.591448	-0.507811	-0.487179	-0.503441	-0.25	-0.441379	-0.555671	0.785714	-0.454294	-1.309091	...	-0.076923	0.090909	0.444444	0.90740
800	-0.591827	-0.497250	-0.480926	-0.511308	-0.50	-0.496552	-0.505723	1.571429	-0.531856	-2.424242	...	-0.384615	0.909091	0.444444	1.12963
801	-0.591827	-0.494609	-0.457161	-0.471976	-0.50	-0.441379	-0.555671	0.345238	-0.542936	-0.606061	...	0.769231	0.909091	-1.444444	1.20370
802	-0.592586	-0.504290	-0.473421	-0.471976	-0.50	-0.551724	-0.563996	0.452381	-0.487535	0.072727	...	-1.384615	1.545455	1.222222	0.53703
803	-0.592965	-0.511331	-0.543465	-0.550639	-0.50	-0.551724	-0.351717	6.273810	-0.542936	-4.363636	...	-1.538462	0.454545	1.333333	-0.16666

804 rows × 29 columns

MINMAXSCALER

	Pitches	PA	BIP	Hits	3B	HR	SO	K%	BB	BA	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)	Movement Toward/Away from Batter (in)
0	1.000000	0.993716	0.845023	0.757432	0.200000	0.856115	1.000000	0.726444	0.703180	0.262911	...	0.246106	0.247059	0.598131	0.160494
1	0.961119	1.000000	0.913482	0.856124	0.550000	0.805755	0.856128	0.577508	0.724382	0.384977	...	0.545171	0.311765	0.350467	0.000000
2	0.931591	0.938959	0.839983	0.756243	0.650000	0.618705	0.775311	0.547112	0.954064	0.347418	...	0.345794	0.717647	0.453271	0.160494
3	0.915169	0.918612	0.811844	0.762188	0.850000	0.884892	0.790409	0.580547	0.915194	0.375587	...	0.252336	0.311765	0.747664	0.061728
4	0.914875	0.959306	0.916422	0.839477	0.550000	0.525180	0.755773	0.510638	0.611307	0.399061	...	0.227414	0.288235	0.598131	0.123457
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1041	0.000295	0.005984	0.010500	0.014269	0.127697	0.165792	0.012433	0.373860	0.038869	0.446009	...	0.414330	0.582353	0.341121	0.135802
1042	0.000147	0.000000	0.000000	0.001189	0.127697	0.021583	0.019538	0.705167	0.038869	0.126761	...	0.165109	0.188235	0.677570	0.160494
1043	0.000147	0.007481	0.013860	0.014269	0.127697	0.021583	0.007993	0.243161	0.056537	0.417840	...	0.317757	0.370588	0.434579	0.061728
1044	0.000000	0.001496	0.005460	0.014269	0.050000	0.035971	0.009769	0.379939	0.045936	0.647887	...	0.426791	0.447059	0.542056	0.000000
1045	0.000000	0.001197	0.005040	0.010702	0.127697	0.021583	0.006217	0.282675	0.049470	0.568075	...	0.517134	0.500000	0.364486	0.382716

1046 rows × 29 columns

	Pitches	PA	BIP	Hits	3B	HR	SO	K%	BB	BA	...	Downward Movement w/ Gravity (in)	Glove/Arm-Side Movement (in)	Vertical Movement w/o Gravity (in)	Movement Toward/Away from Batter (in)
0	1.000000	1.000000	1.000000	0.899160	0.600000	0.727749	0.622249	0.159722	0.591270	0.761029	...	0.463768	0.483333	0.56	0.078125
1	0.959587	0.915011	0.817515	0.865546	0.066667	0.680628	0.767726	0.237500	0.664683	0.838235	...	0.478261	0.433333	0.46	0.234375
2	0.928894	0.888961	0.780414	0.757503	0.100000	0.921466	0.788509	0.254167	0.625000	0.735294	...	0.391304	0.616667	0.58	0.328125
3	0.911825	0.950830	0.933132	1.000000	0.266667	0.685864	0.580685	0.155556	0.621032	0.944853	...	0.362319	0.700000	0.54	0.421875
4	0.911519	0.881472	0.776531	0.763505	0.300000	0.717277	0.561125	0.165278	1.000000	0.819853	...	0.492754	0.700000	0.44	0.406250
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
799	0.000306	0.005210	0.021570	0.012005	0.128226	0.005236	0.034230	0.451389	0.005952	0.294118	...	0.391304	0.733333	0.62	0.687500
800	0.000230	0.001303	0.019413	0.014406	0.000000	0.015707	0.019560	0.359722	0.019841	0.463235	...	0.449275	0.583333	0.62	0.593750
801	0.000230	0.006187	0.029767	0.024010	0.128226	0.015707	0.019560	0.308333	0.003968	0.569853	...	0.608696	0.733333	0.28	0.718750
802	0.000077	0.002605	0.024159	0.024010	0.128226	0.165146	0.017115	0.320833	0.013889	0.672794	...	0.202899	0.850000	0.76	0.437500
803	0.000000	0.000000	0.000000	0.000000	0.128226	0.165146	0.079462	1.000000	0.003968	0.000000	...	0.173913	0.650000	0.78	0.140625

804 rows × 29 columns

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TRAINING

Train and Evaluate model

Pitcher

Batter

Pipeline
- RobustScaler
- MinMaxScaler
- LGBMRegressor

Training data 80%

Test data 20%

K- Fold Crossvalidation

RFE
- estimator: LGBMRegressor
  - LGBMRegressor

Feature Selection
Recursive Feature Elimination

Processing

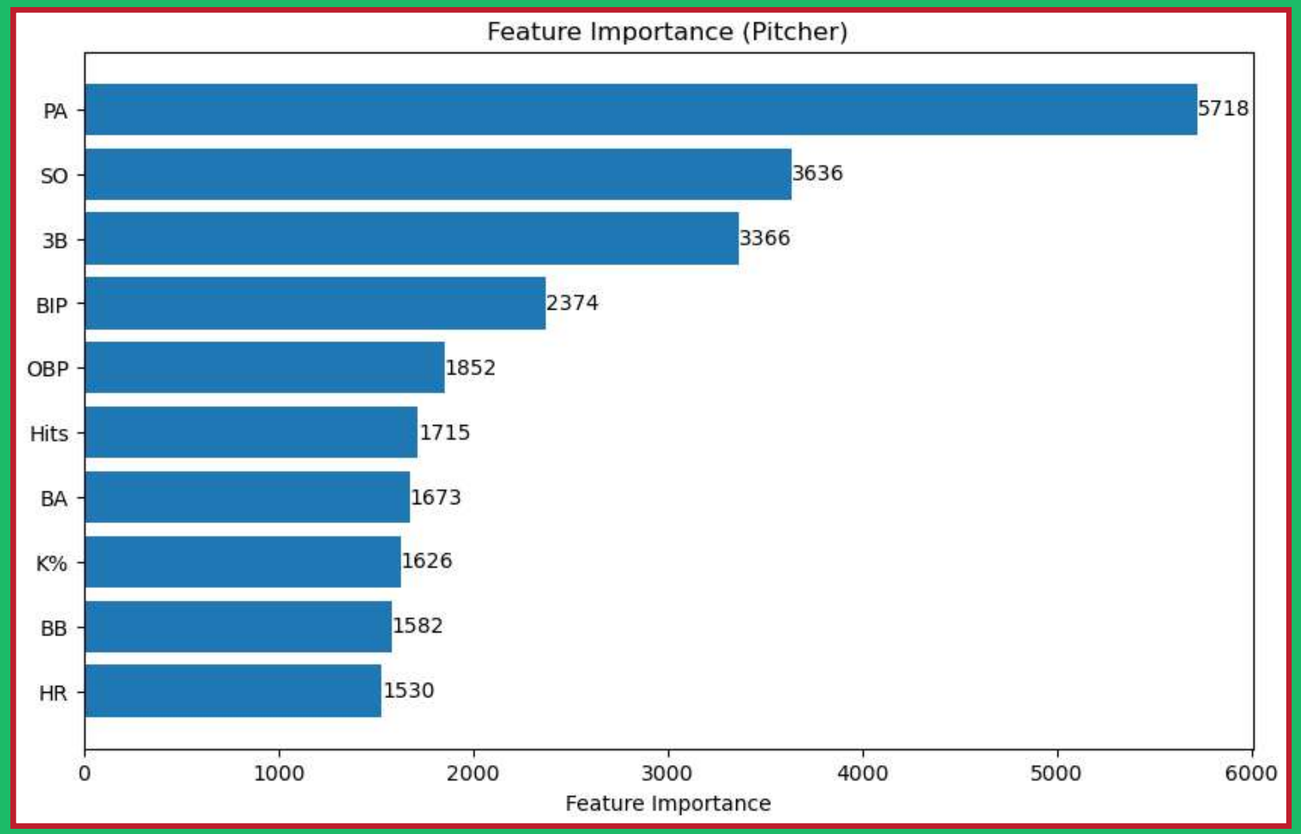
Output
Feature Importance

EVALUATION

PITCHER

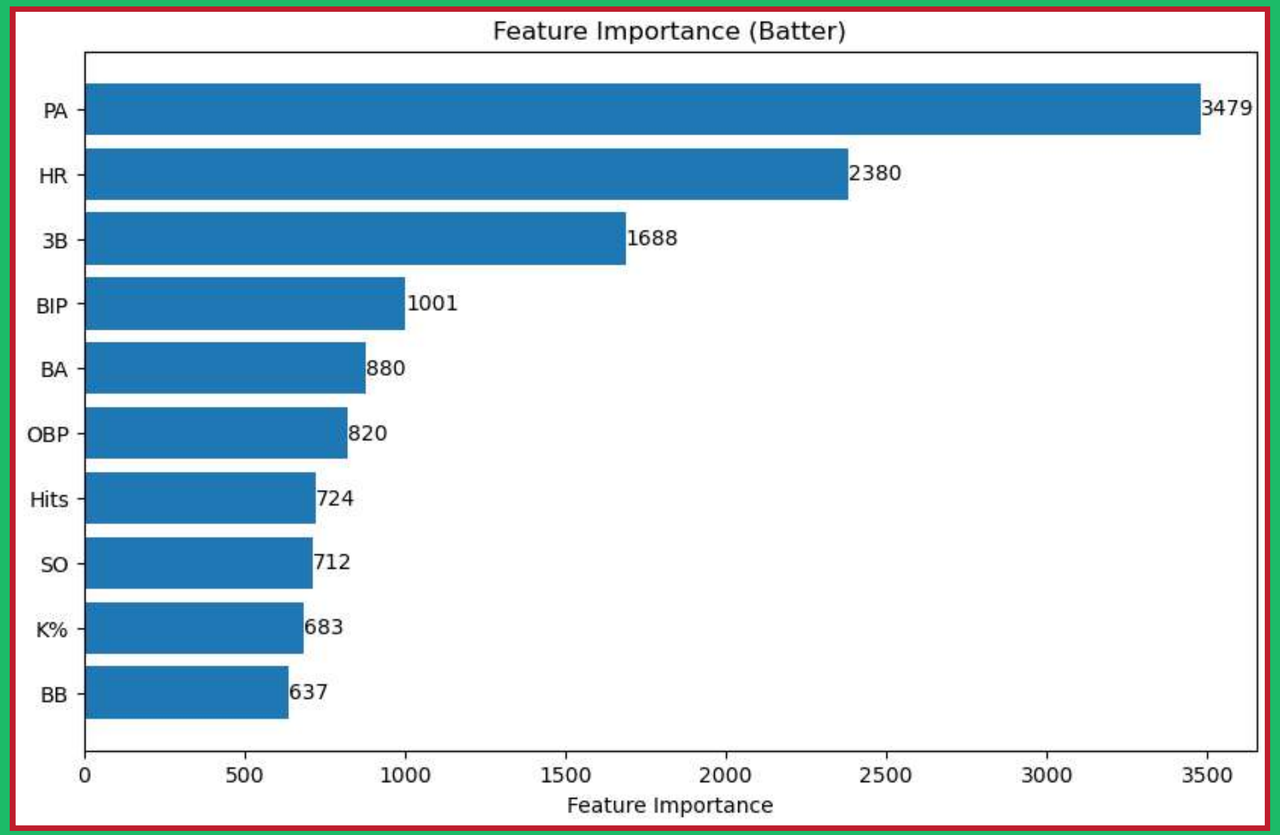
MEAN ABSOLUTE ERROR:

66.29



EVALUATION

BATTER



MEAN ABSOLUTE ERROR:

121.27

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Summary

FEATURE IMPORTANCE OF PITCHER

PA = จำนวนครั้งที่ขว้างลูกแล้วคนตีตีได้และวิ่งไปจุดต่อไปได้สำเร็จ

SO = จำนวนครั้งที่ขว้างลูกแล้วทำให้คนตี Strike out หรือตีพลาดครบ 3 ครั้ง

3B = จำนวนครั้งที่ขว้างลูกแล้วคนตีสามารถถึงฐานที่สามอย่างปลอดภัยโดยไม่มีข้อผิดพลาด

BIP = จำนวนครั้งที่ Pitcher สามารถขว้างลูกบอลให้เข้าเขตและเล่นต้อน Batter

OBP = จำนวนครั้งที่ขว้างลูกแล้วทำให้คนตีเข้าถึงฐานได้สำเร็จ โดยคำนึงถึงการตี และการเดิน

Hits = จำนวนครั้งที่ Pitcher ขว้างลูกแล้วทำให้คนตีตีได้โดยไม่มีข้อผิดพลาด

BA = ค่าเฉลี่ยที่ขว้างลูกแล้วทำให้คนตีตีบอลและทำแต้มได้

K% = เปอร์เซ็นต์ที่ขว้างลูกแล้วทำให้คนตี Strike out หรือตีพลาดครบ 3 ครั้ง

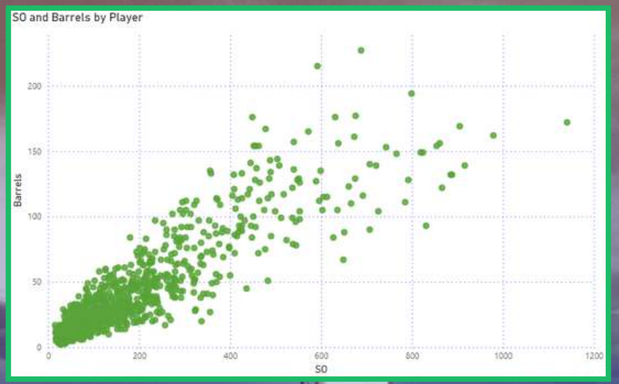
BB = จำนวนครั้งที่ขว้างลูกออกนอกเขตสี่เหลี่ยมและคนตีไม่แกว่งไม้ตี

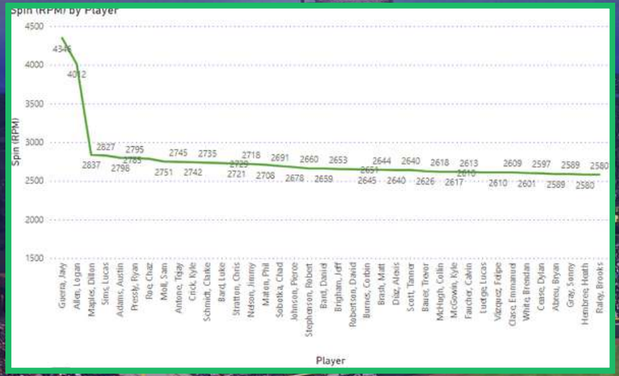
HR = จำนวนครั้งที่ Pitcher ขว้างลูกแล้วทำให้คนตีตีได้ Home Runs

FEATURE IMPORTANCE OF BATTER

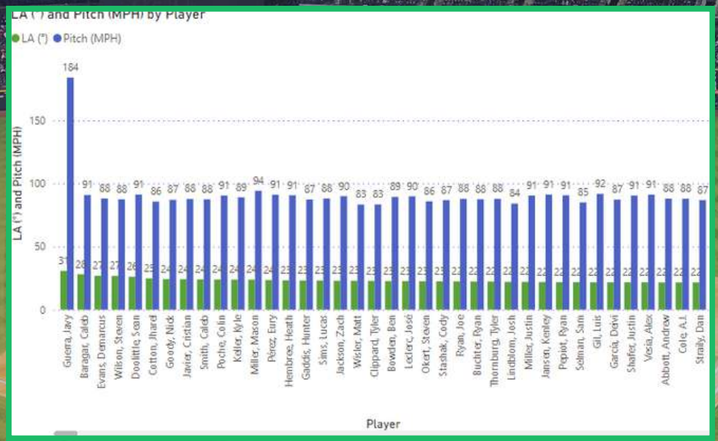
PA = จำนวนครั้งที่ตีลูกแล้วคนตีตีได้และวิ่งไปจุดต่อไปได้สำเร็จ
HR = จำนวนครั้งที่ Batter ตีได้ Home Runs
3B = จำนวนครั้งที่ Batter สามารถถึงฐานที่สามอย่างไม่มีข้อผิดพลาด
BIP = จำนวนครั้งที่ Batter ตีลูกบอลได้ดีและสามารถสร้างโอกาสในการทำคะแนนให้กับทีมได้
BA = ค่าเฉลี่ยที่ Batter ตีและสามารถทำแต้มได้
OBP = จำนวนครั้งที่ Batter เข้าถึงฐานได้สำเร็จ โดยคำนึงถึงการตี และการเดิน
Hits = จำนวนครั้งที่ตีได้
SO = จำนวนครั้งที่ Batter ทำ Strike out หรือตีพลาดครบ 3 ครั้ง
K% = เปอร์เซ็นต์ที่ Batter ทำ Strike out หรือตีพลาดครบ 3 ครั้ง
BB = จำนวนครั้งที่ Batter ไม่แกว่งไม้ตีเมื่อ Pitcher ขว้างออกนอกเขตตีสี่เหลี่ยม

PITCHER

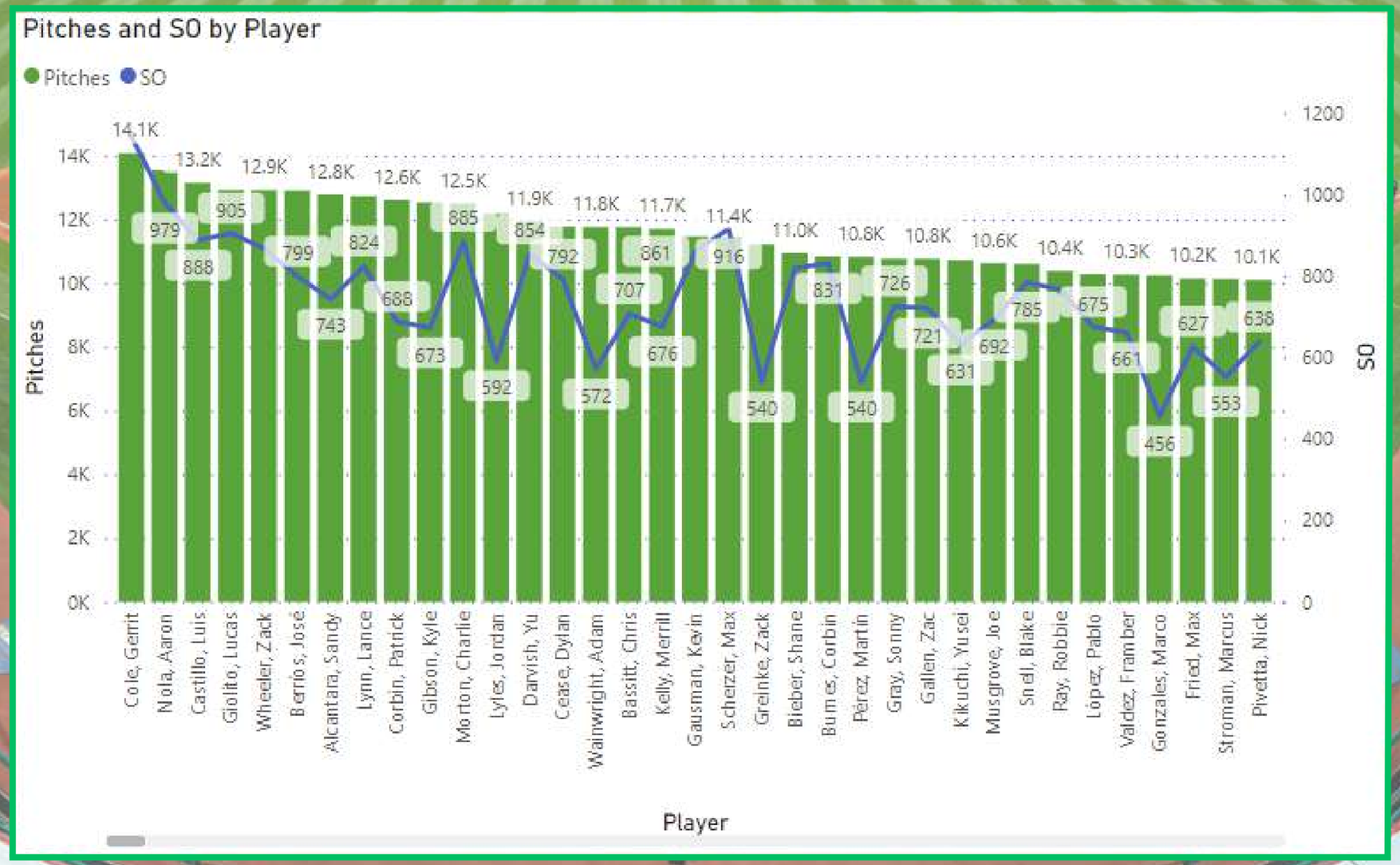


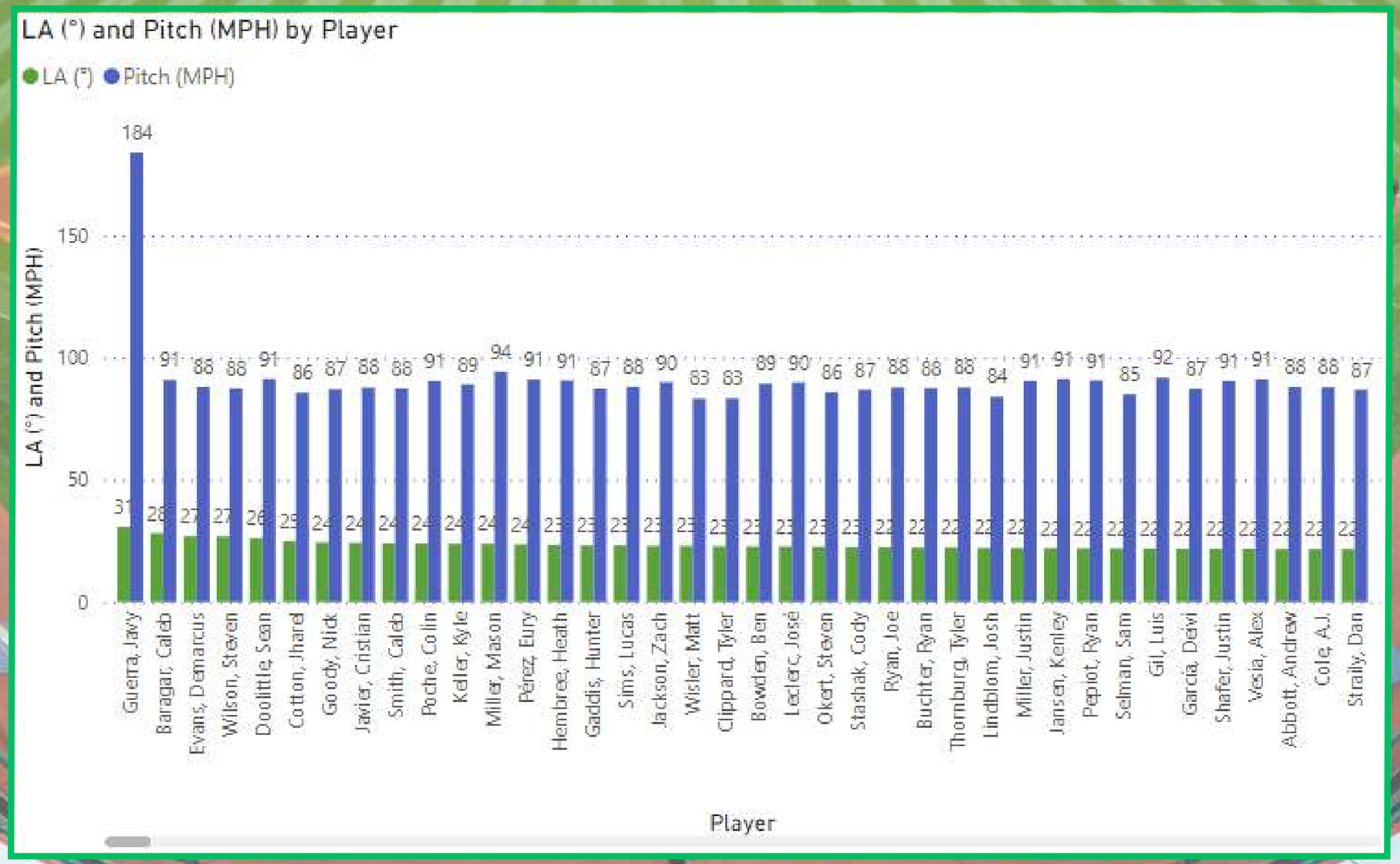


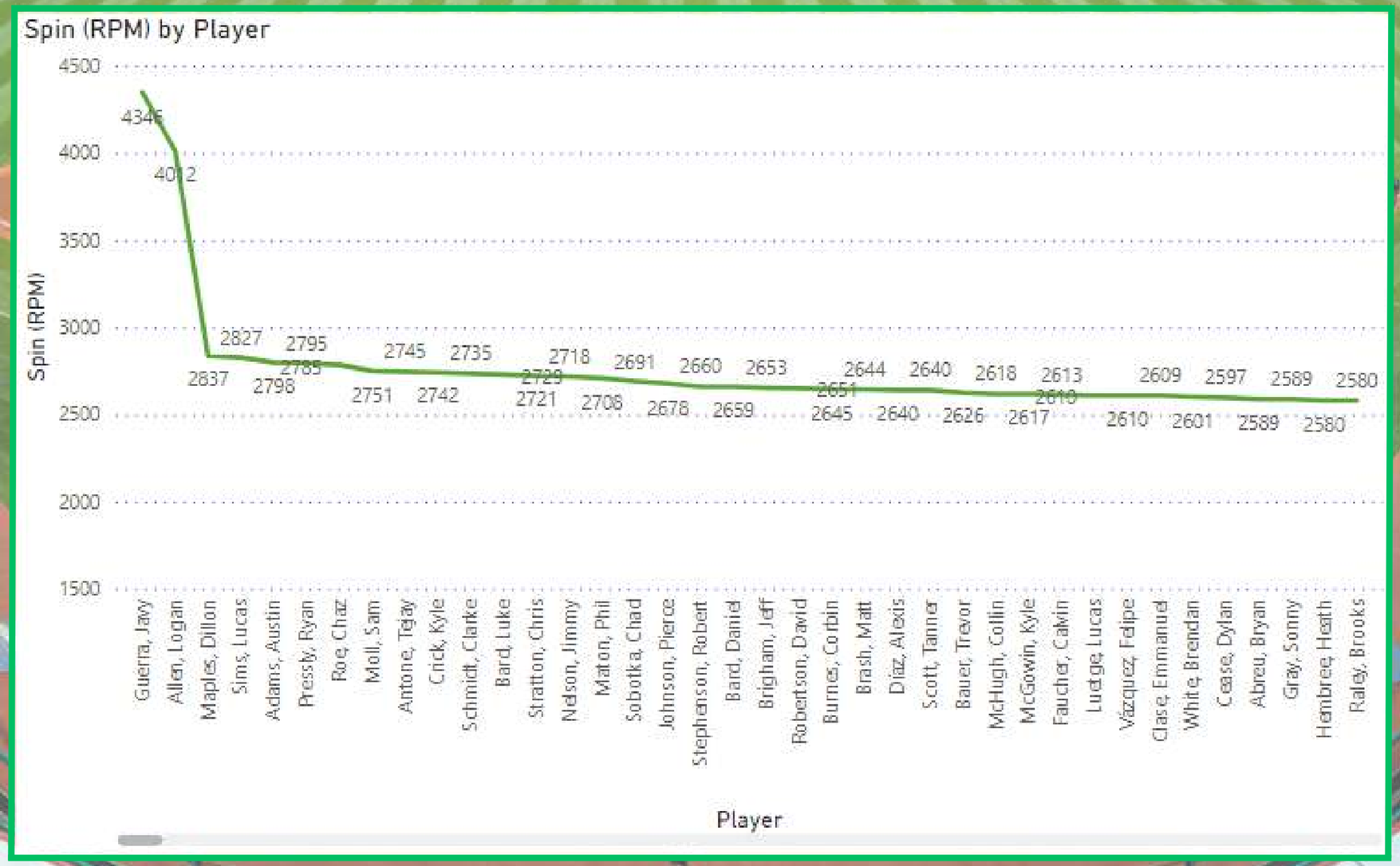
Rk.	Player	Pitches	BA	Barrels	EV (MPH)	HR	LA (°)	PA	Pitch (MPH)	Spin (RPM)	Pitcher Run Value
1	Cole, Gerrit	14081	0.20	172	88.90	120	13.70	3435	92.60	2472	142.50
2	Nola, Aaron	13553	0.23	162	88.70	113	11.90	3456	87.10	2202	50.00
3	Castillo, Luis	13152	0.22	132	88.30	87	8.50	3252	92.50	2180	54.80
4	Giolito, Lucas	12929	0.23	169	88.40	124	16.70	3184	87.70	1996	17.20
5	Wheeler, Zack	12925	0.23	122	86.10	74	10.90	3320	92.90	2379	95.20
6	Berríos, José	12912	0.25	194	88.40	110	13.10	3402	88.80	2119	25.00
7	Alcantara, Sandy	12785	0.23	153	87.90	86	7.20	3455	93.50	2261	69.50
8	Lynn, Lance	12736	0.24	149	88.20	115	15.50	3154	90.90	2427	35.60
9	Corbin, Patrick	12616	0.28	227	90.30	131	10.40	3332	87.10	2132	-81.50
10	Gibson, Kyle	12539	0.26	161	88.80	99	8.10	3261	88.00	2199	-41.10
11	Morton, Charlie	12511	0.23	132	88.30	77	10.20	3137	88.10	2565	53.30
12	Lyles, Jordan	12189	0.27	215	89.30	140	16.30	3125	86.90	2281	-65.10
13	Darvish, Yu	11936	0.22	154	88.40	106	14.80	3027	87.80	2546	79.10
14	Cease, Dylan	11777	0.23	128	88.70	82	15.60	2802	89.60	2597	26.60
15	Wainwright, Adam	11766	0.26	165	88.30	88	11.00	3084	82.20	2410	10.40
16	Bassitt, Chris	11762	0.23	140	87.20	89	12.80	3056	87.30	2166	69.90
17	Kelly, Merrill	11705	0.24	177	89.20	96	12.90	3055	89.20	2338	31.80
18	Gausman, Kevin	11470	0.24	156	89.00	77	12.50	2925	89.70	2019	55.50
19	Scherzer, Max	11416	0.21	139	88.00	92	18.50	2843	88.90	2294	114.10
20	Greinke, Zack	11218	0.26	157	88.40	96	11.50	2931	84.60	2209	31.10
21	Bieber, Shane	10951	0.23	149	90.40	81	10.50	2876	87.80	2324	91.10
22	Burnes, Corbin	10844	0.21	93	86.80	71	9.80	2697	91.40	2645	78.40
23	Pérez, Martín	10831	0.27	136	87.80	82	10.00	2897	88.90	2028	-11.90
24	Gray, Sonny	10771	0.22	104	88.00	59	9.60	2734	87.70	2589	95.00
25	Gallen, Zac	10769	0.22	139	89.10	73	12.10	2684	89.20	2248	85.70
26	Kikuchi, Yusei	10724	0.26	176	90.50	116	10.60	2719	89.90	2230	-28.50
27	Musgrove, Joe	10633	0.23	116	87.60	80	11.60	2746	87.50	2561	58.50
28	Snell, Blake	10605	0.21	111	88.50	66	12.90	2455	90.40	2314	67.10
29	Ray, Robbie	10385	0.23	148	89.90	108	16.40	2537	90.20	2223	23.10
30	López, Pablo	10286	0.24	129	87.30	75	10.60	2640	89.80	2163	42.50



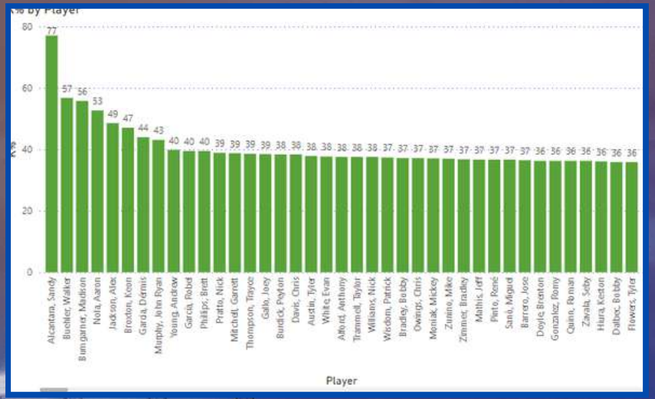
Rk.	Player	Pitches	BA	Barrels	EV (MPH)	HR	LA (°)	PA	Pitch (MPH)	Spin (RPM)	Pitcher Run Value
1	Cole, Gerrit	14081	0.20	172	88.90	120	13.70	3435	92.60	2472	142.50
2	Nola, Aaron	13553	0.23	162	88.70	113	11.90	3456	87.10	2202	50.00
3	Castillo, Luis	13152	0.22	132	88.30	87	8.50	3252	92.50	2180	54.80
4	Giolito, Lucas	12929	0.23	169	88.40	124	16.70	3184	87.70	1996	17.20
5	Wheeler, Zack	12925	0.23	122	86.10	74	10.90	3320	92.90	2379	95.20
6	Berríos, José	12912	0.25	194	88.40	110	13.10	3402	88.80	2119	25.00
7	Alcantara, Sandy	12785	0.23	153	87.90	86	7.20	3455	93.50	2261	69.50
8	Lynn, Lance	12736	0.24	149	88.20	115	15.50	3154	90.90	2427	35.60
9	Corbin, Patrick	12616	0.28	227	90.30	131	10.40	3332	87.10	2132	-81.50
10	Gibson, Kyle	12539	0.26	161	88.80	99	8.10	3261	88.00	2199	-41.10
11	Morton, Charlie	12511	0.23	132	88.30	77	10.20	3137	88.10	2565	53.30
12	Lyles, Jordan	12189	0.27	215	89.30	140	16.30	3125	86.90	2281	-65.10
13	Darvish, Yu	11936	0.22	154	88.40	106	14.80	3027	87.80	2546	79.10
14	Cease, Dylan	11777	0.23	128	88.70	82	15.60	2802	89.60	2597	26.60
15	Wainwright, Adam	11766	0.26	165	88.30	88	11.00	3084	82.20	2410	10.40
16	Bassitt, Chris	11762	0.23	140	87.20	89	12.80	3056	87.30	2166	69.90
17	Kelly, Merrill	11705	0.24	177	89.20	96	12.90	3055	89.20	2338	31.80
18	Gausman, Kevin	11470	0.24	156	89.00	77	12.50	2925	89.70	2019	55.50
19	Scherzer, Max	11416	0.21	139	88.00	92	18.50	2843	88.90	2294	114.10
20	Greinke, Zack	11218	0.26	157	88.40	96	11.50	2931	84.60	2209	31.10
21	Bieber, Shane	10951	0.23	149	90.40	81	10.50	2876	87.80	2324	91.10
22	Burnes, Corbin	10844	0.21	93	86.80	71	9.80	2697	91.40	2645	78.40
23	Pérez, Martín	10831	0.27	136	87.80	82	10.00	2897	88.90	2028	-11.90
24	Gray, Sonny	10771	0.22	104	88.00	59	9.60	2734	87.70	2589	95.00
25	Gallen, Zac	10769	0.22	139	89.10	73	12.10	2684	89.20	2248	85.70
26	Kikuchi, Yusei	10724	0.26	176	90.50	116	10.60	2719	89.90	2230	-28.50
27	Musgrove, Joe	10633	0.23	116	87.60	80	11.60	2746	87.50	2561	58.50
28	Snell, Blake	10605	0.21	111	88.50	66	12.90	2455	90.40	2314	67.10
29	Ray, Robbie	10385	0.23	148	89.90	108	16.40	2537	90.20	2223	23.10
30	López, Pablo	10286	0.24	129	87.30	75	10.60	2640	89.80	2163	42.50

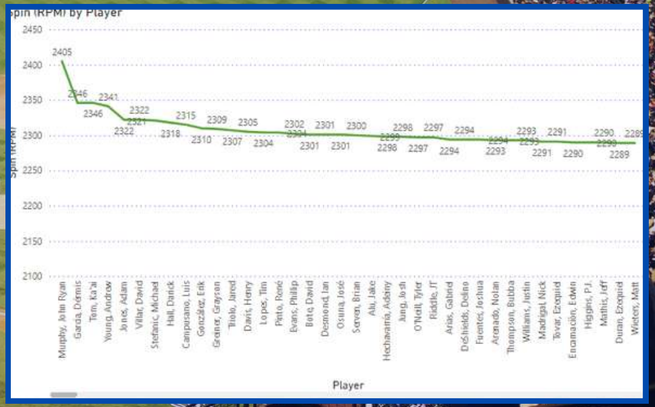

Pitches and SO by Player
Pitches
SO
14K
12K
10K
8K
6K
4K
2K
0K
1200
1000
800
600
400
200
0
14.1K
13.2K
12.9K
12.8K
12.6K
12.5K
11.9K
11.8K
11.7K
11.4K
11.0K
10.8K
10.8K
10.6K
10.4K
10.3K
10.2K
10.1K
979
888
905
799
743
824
688
673
885
592
854
792
572
707
861
676
916
540
831
540
726
721
631
692
785
675
661
456
627
553
638
Cole, Gerrit
Nola, Aaron
Castillo, Luis
Giolito, Lucas
Wheeler, Zack
Berríos, José
Alcantara, Sandy
Lynn, Lance
Corbin, Patrick
Gibson, Kyle
Morton, Charlie
Lyles, Jordan
Darvish, Yu
Cease, Dylan
Wainwright, Adam
Bassitt, Chris
Kelly, Merrill
Gausman, Kevin
Scherzer, Max
Greinke, Zack
Bieber, Shane
Burnes, Corbin
Pérez, Martín
Gray, Sonny
Gallen, Zac
Kikuchi, Yusei
Musgrove, Joe
Snell, Blake
Ray, Robbie
López, Pablo
Valdez, Framber
Gonzales, Marco
Fried, Max
Stroman, Marcus
Pivetta, Nick
Player


LA (°) and Pitch (MPH) by Player
LA (°)
Pitch (MPH)
LA (°) and Pitch (MPH)
0
50
100
150
Guerra, Javy 31 184
Baragar, Caleb 28 91
Evans, Demarcus 27 88
Wilson, Steven 27 88
Doolittle, Sean 26 91
Cotton, Jhared 29 86
Goody, Nick 24 87
Javier, Cristian 24 88
Smith, Caleb 24 88
Poche, Colin 24 91
Keller, Kyle 24 89
Miller, Mason 24 94
Pérez, Eury 24 91
Hembree, Heath 23 91
Gaddis, Hunter 23 87
Sims, Lucas 23 88
Jackson, Zach 23 90
Wisler, Matt 23 83
Clippard, Tyler 23 83
Bowden, Ben 23 89
Leclerc, José 23 90
Okert, Steven 23 86
Stashak, Cody 23 87
Ryan, Joe 22 88
Buchter, Ryan 22 88
Thornburg, Tyler 22 88
Lindblom, Josh 22 84
Miller, Justin 22 91
Jansen, Kenley 22 91
Pepiot, Ryan 22 91
Selman, Sam 22 85
Gil, Luis 22 92
García, Deivi 22 87
Shafer, Justin 22 91
Vesia, Alex 22 91
Abbott, Andrew 22 88
Cole, A.J. 22 88
Strally, Dan 22 87
Player

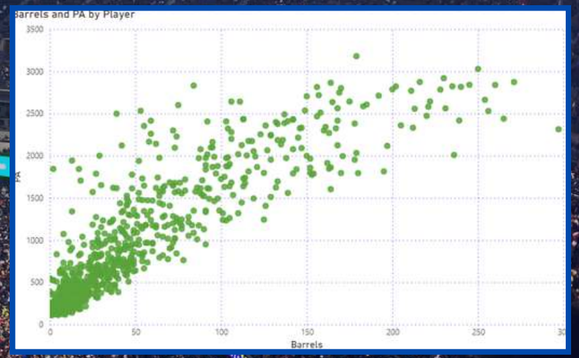

Spin (RPM) by Player
Spin (RPM)
4500
4000
3500
3000
2500
2000
1500
4346
4012
2837
2827
2798
2795
2785
2751
2745
2742
2735
2721
2729
2718
2708
2691
2678
2660
2659
2653
2645
2651
2644
2640
2626
2618
2617
2613
2610
2610
2609
2601
2597
2589
2589
2580
2580
Guerra, Javy
Allen, Logan
Maples, Dillon
Sims, Lucas
Adams, Austin
Pressly, Ryan
Roe, Chaz
Moll, Sam
Antone, Tejay
Crick, Kyle
Schmidt, Clarke
Bard, Luke
Stratton, Chris
Nelson, Jimmy
Maton, Phil
Sobotka, Chad
Johnson, Pierce
Stephenson, Robert
Bard, Daniel
Brigham, Jeff
Robertson, David
Burnes, Corbin
Brash, Matt
Diaz, Alexis
Scott, Tanner
Bauer, Trevor
McHugh, Collin
McGowin, Kyle
Faucher, Calvin
Ludtke, Lucas
Vázquez, Felipe
Clase, Emmanuel
White, Brendan
Cease, Dylan
Abreu, Bryan
Gray, Sonny
Hembree, Heath
Raley, Brooks
Player

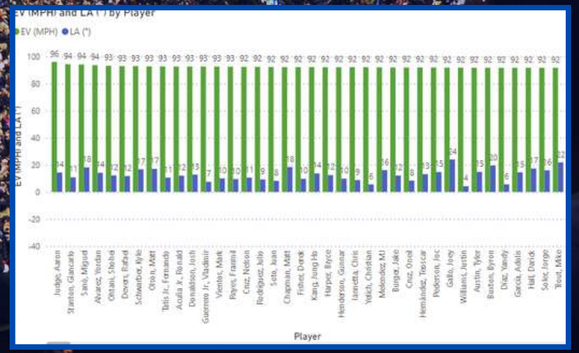
BATTER



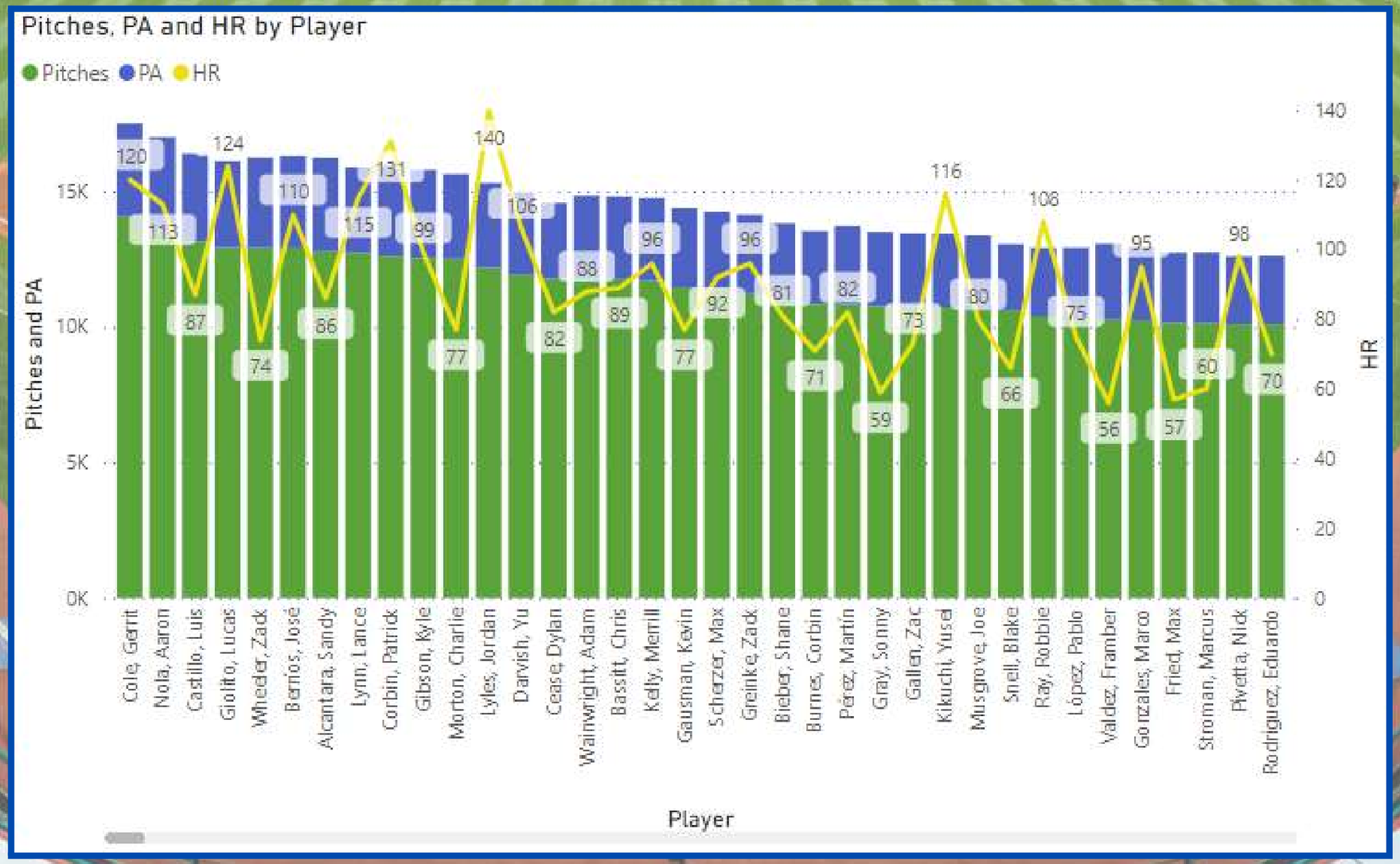


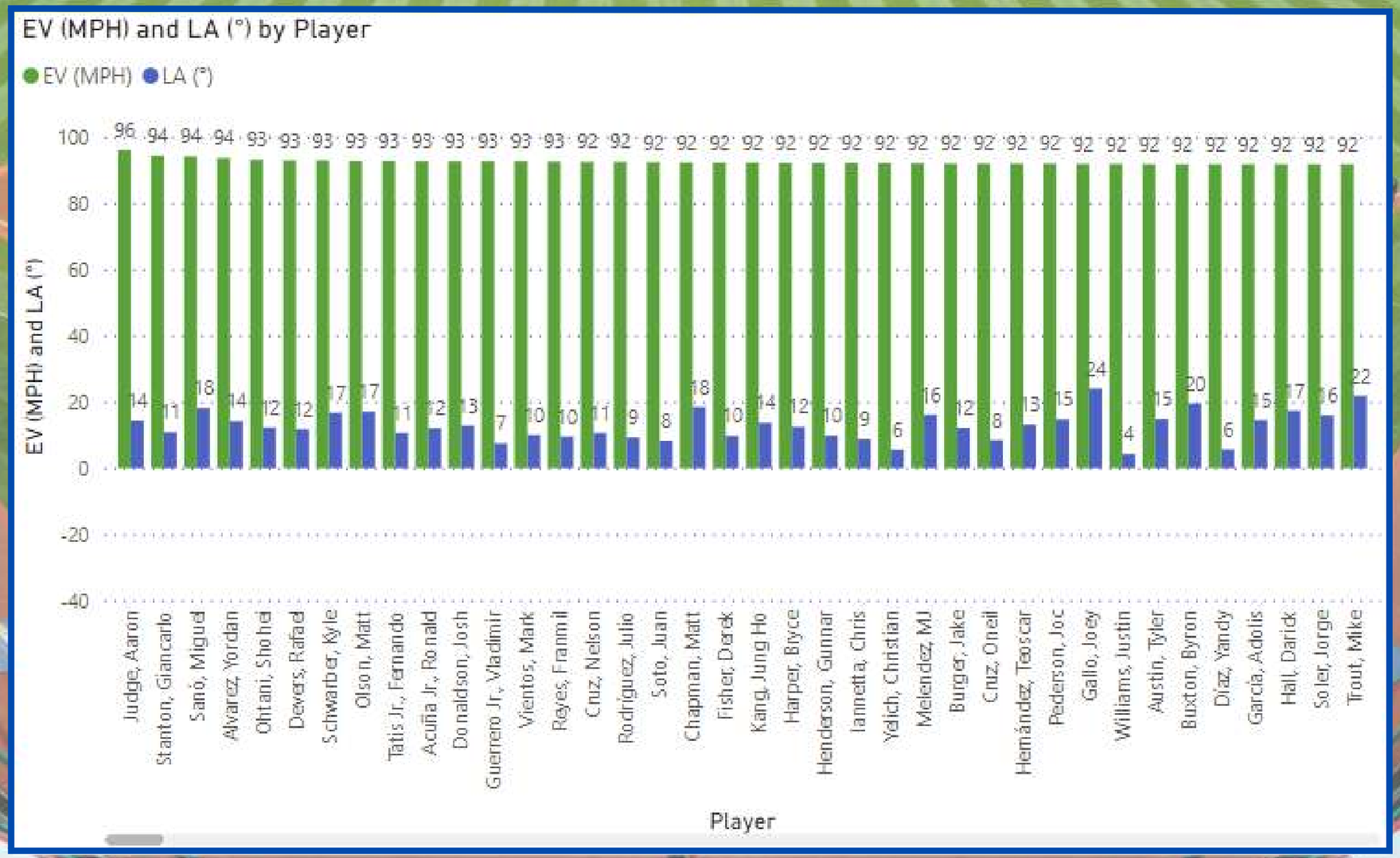
Rk.	Player	Pitches	BA	Barrels	EV (MPH)	HR	LA (°)	PA	Pitch (MPH)	Spin (RPM)	Batter Run Value
1	Semien, Marcus	14081	0.27	179	88.40	140	18.60	3180	88.60	2260	98.70
2	Goldschmidt, Paul	13553	0.29	230	91.00	131	15.00	2919	89.00	2288	137.00
3	Olson, Matt	13152	0.26	260	92.70	177	17.00	2839	89.00	2238	130.80
4	Freeman, Freddie	12929	0.32	250	90.80	132	14.10	3029	89.30	2212	243.50
5	Soto, Juan	12925	0.28	240	92.30	138	8.20	2816	89.00	2213	194.60
6	Suárez, Eugenio	12912	0.23	228	89.60	148	18.60	2784	88.70	2252	46.10
7	Abreu, José	12785	0.28	216	91.50	115	10.10	2874	89.00	2268	93.10
8	Bogaerts, Xander	12736	0.30	156	89.00	101	10.80	2814	88.70	2245	87.30
9	Schwarber, Kyle	12616	0.22	254	92.90	174	16.70	2663	88.80	2245	82.40
10	Ramírez, José	12539	0.27	169	89.10	129	19.50	2749	88.40	2199	107.30
11	Chapman, Matt	12511	0.23	222	92.20	117	18.40	2644	89.30	2274	24.90
12	Betts, Mookie	12189	0.29	202	91.10	142	19.30	2822	89.40	2267	181.30
13	Lindor, Francisco	11936	0.26	170	90.50	117	14.80	2801	88.80	2220	49.50
14	Swanson, Dansby	11777	0.26	200	89.60	101	14.40	2786	88.70	2245	32.00
15	Santana, Carlos	11766	0.23	150	90.10	103	13.00	2705	88.60	2203	29.50
16	Turner, Trea	11762	0.30	164	89.70	106	11.00	2865	88.80	2255	89.80
17	Alonso, Pete	11705	0.25	271	90.20	192	16.40	2873	89.00	2241	118.20
18	Muncy, Max	11470	0.22	213	90.40	140	17.60	2557	88.40	2249	98.00
19	Devers, Rafael	11416	0.29	245	92.90	141	11.70	2841	89.30	2224	139.90
20	McMahon, Ryan	11218	0.24	149	91.10	99	10.90	2536	89.30	2244	15.70
21	Yelich, Christian	10951	0.27	168	92.10	98	5.50	2563	88.70	2256	94.30
22	Merrifield, Whit	10844	0.28	84	86.50	57	14.90	2832	88.80	2263	1.30
23	Bregman, Alex	10831	0.27	111	88.90	107	18.30	2641	89.00	2243	120.30
24	Crawford, J.P.	10771	0.26	53	86.20	43	11.30	2533	89.20	2224	12.10
25	Adames, Willy	10769	0.24	183	88.60	108	16.00	2586	88.60	2249	25.20
26	Guerrero Jr., Vladimir	10724	0.28	235	92.60	130	7.40	2823	89.20	2255	100.80
27	Bell, Josh	10633	0.26	175	91.00	111	8.70	2643	88.80	2200	44.70
28	Walker, Christian	10605	0.25	185	89.50	115	15.40	2607	89.30	2275	38.70
29	LeMahieu, DJ	10385	0.29	106	90.50	73	4.50	2642	89.70	2242	69.40
30	Reynolds, Bryan	10286	0.28	165	89.80	98	11.40	2636	88.40	2211	92.80

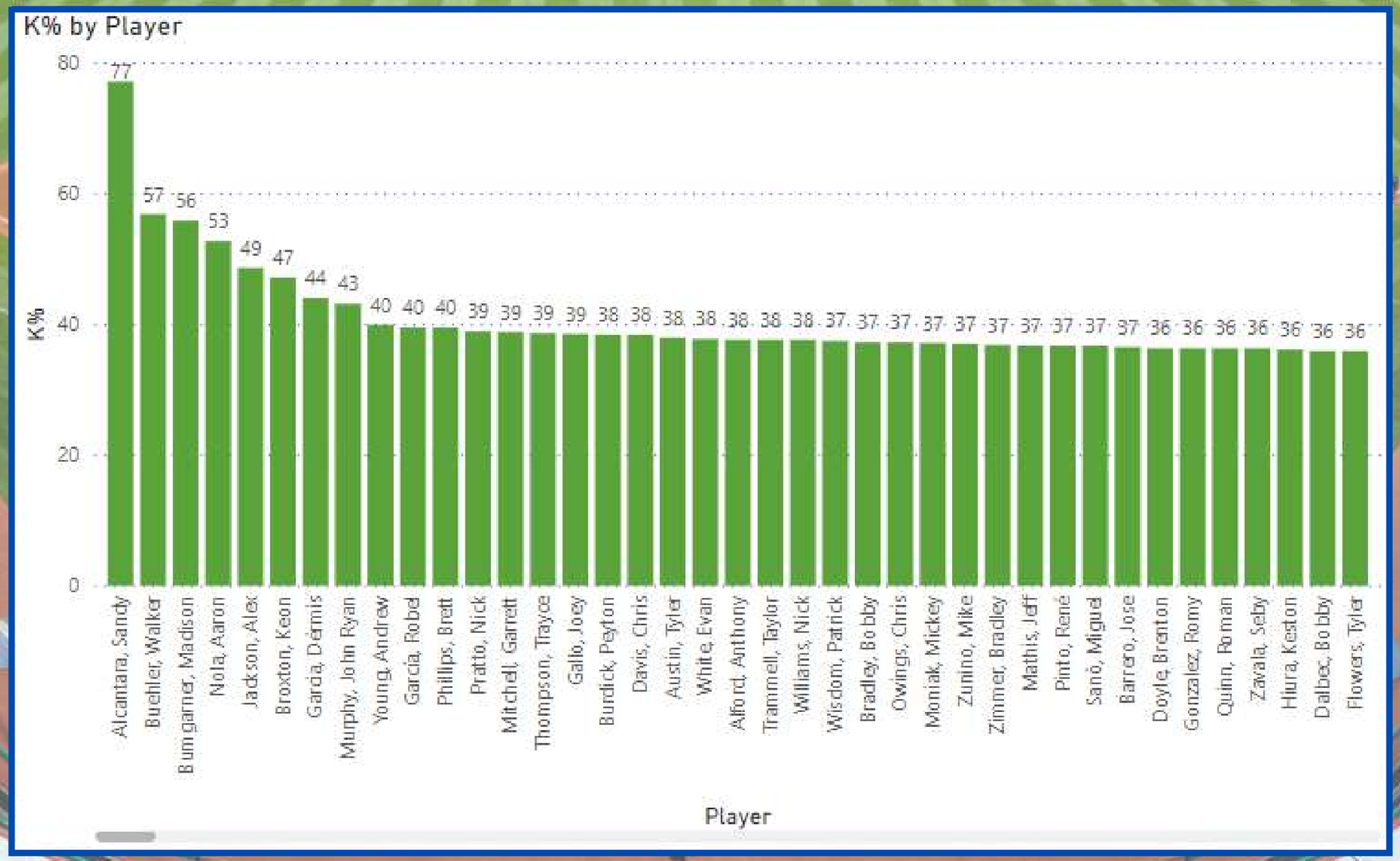


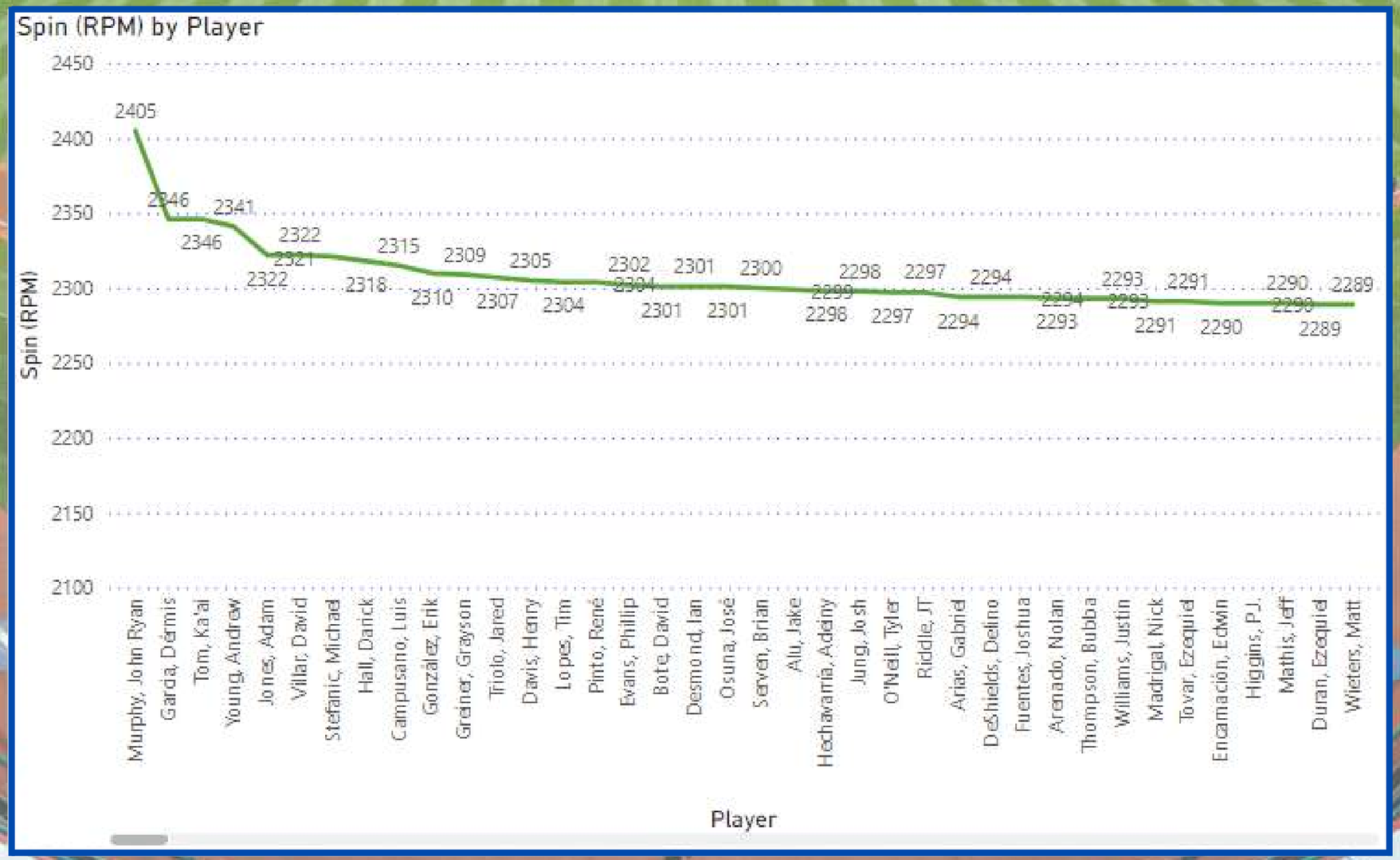


Rk.	Player	Pitches	BA	Barrels	EV (MPH)	HR	LA (°)	PA	Pitch (MPH)	Spin (RPM)	Pitcher Run Value
1	Cole, Gerrit	14081	0.20	172	88.90	120	13.70	3435	92.60	2472	142.50
2	Nola, Aaron	13553	0.23	162	88.70	113	11.90	3456	87.10	2202	50.00
3	Castillo, Luis	13152	0.22	132	88.30	87	8.50	3252	92.50	2180	54.80
4	Giolito, Lucas	12929	0.23	169	88.40	124	16.70	3184	87.70	1996	17.20
5	Wheeler, Zack	12925	0.23	122	86.10	74	10.90	3320	92.90	2379	95.20
6	Berríos, José	12912	0.25	194	88.40	110	13.10	3402	88.80	2119	25.00
7	Alcantara, Sandy	12785	0.23	153	87.90	86	7.20	3455	93.50	2261	69.50
8	Lynn, Lance	12736	0.24	149	88.20	115	15.50	3154	90.90	2427	35.60
9	Corbin, Patrick	12616	0.28	227	90.30	131	10.40	3332	87.10	2132	-81.50
10	Gibson, Kyle	12539	0.26	161	88.80	99	8.10	3261	88.00	2199	-41.10
11	Morton, Charlie	12511	0.23	132	88.30	77	10.20	3137	88.10	2565	53.30
12	Lyles, Jordan	12189	0.27	215	89.30	140	16.30	3125	86.90	2281	-65.10
13	Darvish, Yu	11936	0.22	154	88.40	106	14.80	3027	87.80	2546	79.10
14	Cease, Dylan	11777	0.23	128	88.70	82	15.60	2802	89.60	2597	26.60
15	Wainwright, Adam	11766	0.26	165	88.30	88	11.00	3084	82.20	2410	10.40
16	Bassitt, Chris	11762	0.23	140	87.20	89	12.80	3056	87.30	2166	69.90
17	Kelly, Merrill	11705	0.24	177	89.20	96	12.90	3055	89.20	2338	31.80
18	Gausman, Kevin	11470	0.24	156	89.00	77	12.50	2925	89.70	2019	55.50
19	Scherzer, Max	11416	0.21	139	88.00	92	18.50	2843	88.90	2294	114.10
20	Greinke, Zack	11218	0.26	157	88.40	96	11.50	2931	84.60	2209	31.10
21	Bieber, Shane	10951	0.23	149	90.40	81	10.50	2876	87.80	2324	91.10
22	Burnes, Corbin	10844	0.21	93	86.80	71	9.80	2697	91.40	2645	78.40
23	Pérez, Martín	10831	0.27	136	87.80	82	10.00	2897	88.90	2028	-11.90
24	Gray, Sonny	10771	0.22	104	88.00	59	9.60	2734	87.70	2589	95.00
25	Gallen, Zac	10769	0.22	139	89.10	73	12.10	2684	89.20	2248	85.70
26	Kikuchi, Yusei	10724	0.26	176	90.50	116	10.60	2719	89.90	2230	-28.50
27	Musgrove, Joe	10633	0.23	116	87.60	80	11.60	2746	87.50	2561	58.50
28	Snell, Blake	10605	0.21	111	88.50	66	12.90	2455	90.40	2314	67.10
29	Ray, Robbie	10385	0.23	148	89.90	108	16.40	2537	90.20	2223	23.10
30	López, Pablo	10286	0.24	129	87.30	75	10.60	2640	89.80	2163	42.50


Pitches, PA and HR by Player
Pitches
PA
HR
Pitches and PA
HR
Player
0K
5K
10K
15K
0
20
40
60
80
100
120
140
Cole, Gerrit
Nola, Aaron
Castillo, Luis
Giolito, Lucas
Wheeler, Zack
Berríos, José
Alcantara, Sandy
Lynn, Lance
Corbin, Patrick
Gibson, Kyle
Morton, Charlie
Lyles, Jordan
Darvish, Yu
Cease, Dylan
Wainwright, Adam
Bassitt, Chris
Kelly, Merrill
Gausman, Kevin
Scherzer, Max
Greinke, Zack
Bieber, Shane
Burnes, Corbin
Pérez, Martín
Gray, Sonny
Gallen, Zac
Kikuchi, Yusei
Musgrove, Joe
Snell, Blake
Ray, Robbie
López, Pablo
Valdez, Framber
Gonzales, Marco
Fried, Max
Stroman, Marcus
Pivetta, Nick
Rodríguez, Eduardo
120
113
87
124
74
110
86
115
131
99
77
140
106
82
88
89
96
77
92
96
81
71
82
59
73
116
80
66
108
75
56
95
57
60
98
70


EV (MPH) and LA (°) by Player
EV (MPH)
LA (°)
EV (MPH) and LA (°)
100
80
60
40
20
0
-20
-40
Judge, Aaron 96 14
Stanton, Giancarlo 94 11
Sanó, Miguel 94 18
Alvarez, Yordan 94 14
Ohtani, Shohei 93 12
Devers, Rafael 93 12
Schwarber, Kyle 93 17
Olson, Matt 93 17
Tatis Jr., Fernando 93 11
Acuña Jr., Ronald 93 12
Donaldson, Josh 93 13
Guerrero Jr., Vladimir 93 7
Vientos, Mark 93 10
Reyes, Franmil 93 10
Cruz, Nelson 92 11
Rodríguez, Julio 92 9
Soto, Juan 92 8
Chapman, Matt 92 18
Fisher, Derek 92 10
Kang, Jung Ho 92 14
Harper, Bryce 92 12
Henderson, Gunnar 92 10
Iannetta, Chris 92 9
Yelich, Christian 92 6
Meléndez, MJ 92 16
Burger, Jake 92 12
Cruz, Oneil 92 8
Hernández, Teoscar 92 13
Pederson, Joc 92 15
Gallo, Joey 92 24
Williams, Justin 92 4
Austin, Tyler 92 15
Buxton, Byron 92 20
Díaz, Yandy 92 6
García, Adolis 92 15
Hall, Darick 92 17
Soler, Jorge 92 16
Trout, Mike 92 22
Player


K% by Player
K%
80
60
40
20
0
77
57
56
53
49
47
44
43
40
40
40
39
39
39
39
38
38
38
38
38
38
38
37
37
37
37
37
37
37
37
37
37
37
36
36
36
36
36
36
36
Alcantara, Sandy
Buehler, Walker
Bumgarner, Madison
Nola, Aaron
Jackson, Alex
Broxton, Keon
Garcia, Démis
Murphy, John Ryan
Young, Andrew
Garcia, Robel
Phillips, Brett
Pratto, Nick
Mitchell, Garrett
Thompson, Trayce
Gallo, Joey
Burdick, Peyton
Davis, Chris
Austin, Tyler
White, Evan
Alford, Anthony
Trammell, Taylor
Williams, Nick
Wisdom, Patrick
Bradley, Bobby
Owings, Chris
Moniak, Mickey
Zunino, Mike
Zimmer, Bradley
Mathis, Jeff
Pinto, René
Sanó, Miguel
Barrero, Jose
Doyle, Brenton
Gonzalez, Romy
Quinn, Roman
Zavala, Seby
Hiura, Keston
Dalbec, Bobby
Flowers, Tyler
Player


Spin (RPM) by Player
Spin (RPM)
2450
2400
2350
2300
2250
2200
2150
2100
2405
2346
2341
2346
2322
2322
2321
2318
2315
2310
2309
2307
2305
2304
2302
2301
2301
2301
2300
2299
2298
2298
2297
2297
2294
2294
2293
2293
2293
2291
2291
2290
2290
2290
2289
2289
Murphy, John Ryan
Garcia, Dármis
Tom, Ka'ai
Young, Andrew
Jones, Adam
Villar, David
Stefanic, Michael
Hall, Darick
Campusano, Luis
González, Erik
Greiner, Grayson
Triolo, Jared
Davis, Henry
Lopes, Tim
Pinto, René
Evans, Phillip
Botę, David
Desmond, Ian
Osuna, José
Senven, Brian
Alu, Jake
Hechavarría, Adeiny
Jung, Josh
O'Neill, Tyler
Riddle, JT
Arias, Gabriel
DeShields, Delino
Fuentes, Joshua
Arenado, Nolan
Thompson, Bubba
Williams, Justin
Madrigal, Nick
Tovar, Ezequiel
Encarnación, Edwin
Higgins, P.J.
Mathis, Jeff
Duran, Ezequiel
Wieters, Matt
Player

SUMMARY
PITCHER

จากกราฟผู้ที่จะมีค่า Barrels สูงจะมีความเร็วในการขว้างลูกโดยเฉลี่ยอยู่ที่ **89 MPH** และมุมในการขว้างอยู่ที่ **13 องศา** โดยประมาณซึ่งจะเป็นความเร็วและมุมที่ดีที่สุดที่จะทำให้คู่แข่งพลาดได้มากที่สุด

จากกราฟเห็นได้ว่าผู้เล่นที่ขว้างลูกได้ spinมากจะเพิ่มโอกาสในการทำแต้มได้สูงขึ้นมาก**การขว้างลูกให้ Spin** จึงมีผลอย่างมากในการทำแต้มและอีกหนึ่งปัจจัยที่ทำให้ถูกเลือกลงแข่งคือ **ความเร็วการวิ่งรับลูกส่งลูก**

SUMMARY BATTER

ผู้เล่นที่ได้ค่า Barrels สูงหรือตีได้ perfect จะมีค่าองศาในการตีลูกอยู่ที่ประมาณ **15 องศา** (12-17 องศาที่ผู้ที่สูงๆตีได้)และค่าความแรงในการตีอยู่ที่ประมาณ **94 MPH** (92-96 MPH ที่ตีได้เยอะ)

จากกราฟเห็นได้ว่าการตีลูก spin **ไม่มี**ผลหรือมีผลน้อยมากต่อการเลือกผู้เล่นนั้นลงเล่น และผู้เล่นที่โอกาสได้ลงเล่นสูงนั้นมีค่า strikeouts ไม่เกิน **30%** หรือโอกาสในการตีลูกพลาดครบ 3 รอบนั้นน้อยกว่า 30%

ความเกี่ยวข้องรายวิชา

DSI310

DATA EXPLORATION AND PREPROCESSING

DSI311

DATA SCIENCE ALGORITHMS

DSI312

BUSINESS INTELLIGENCE

DSI313

MARKETING ANALYTICS

DSI310

DATA EXPLORATION AND PREPROCESSING

DSI311

DATA SCIENCE ALGORITHMS

DSI312

BUSINESS INTELLIGENCE

DSI313

MARKETING ANALYTICS

ความเกี่ยวข้องรายวิชา

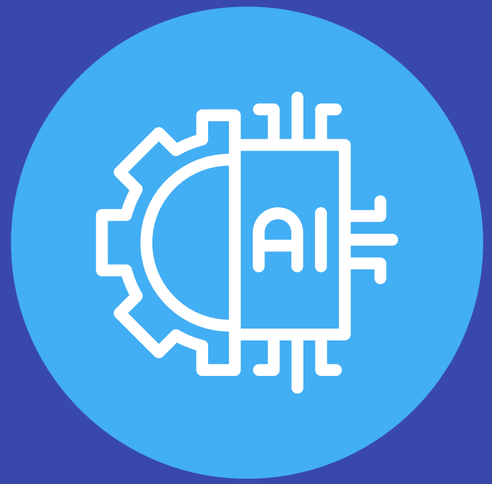
01

Web scraping | BeautifulSoup & Selenium

02

Data Preparing | **Cleaning Data**

DSI311



DATA SCIENCE ALGORITHMS

DSI310

DATA EXPLORATION AND PREPROCESSING

DSI312

BUSINESS INTELLIGENCE

DSI313

MARKETING ANALYTICS

ความเกี่ยวข้องรายวิชา

Model Building

- Model Regression
- Feature Selection
- Validation Set
- K-fold Cross Validation
- MAE(วัดประสิทธิภาพโมเดล)
- Feature Importance

ความเกี่ยวข้องรายวิชา

DSI312

Power BI

BUSINESS INTELLIGENCE

DSI310

DATA EXPLORATION AND PREPROCESSING

DSI311

DATA SCIENCE ALGORITHMS

DSI313

MARKETING ANALYTICS

ความเกี่ยวข้องรายวิชา

DSI313

MARKETING ANALYTICS

DSI310

DATA EXPLORATION AND PREPROCESSING

DSI311

DATA SCIENCE ALGORITHMS

DSI312

BUSINESS INTELLIGENCE

มุมมองเป็นผู้จัดการทีมที่ดูแล
เรื่องรายได้และค่าใช้จ่าย

Thank you!

รายชื่อสมาชิก

แพรวา ประสาทไทย รหัสนักศึกษา 6424650031

ศิวกร นิตย์กิจสมบูรณ์ รหัสนักศึกษา 6424650395

อธิชา เจริญธนกิจกุล รหัสนักศึกษา 6424650494

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วิชญาพร ธนสิทธิโชค รหัสนักศึกษา 6424650627