

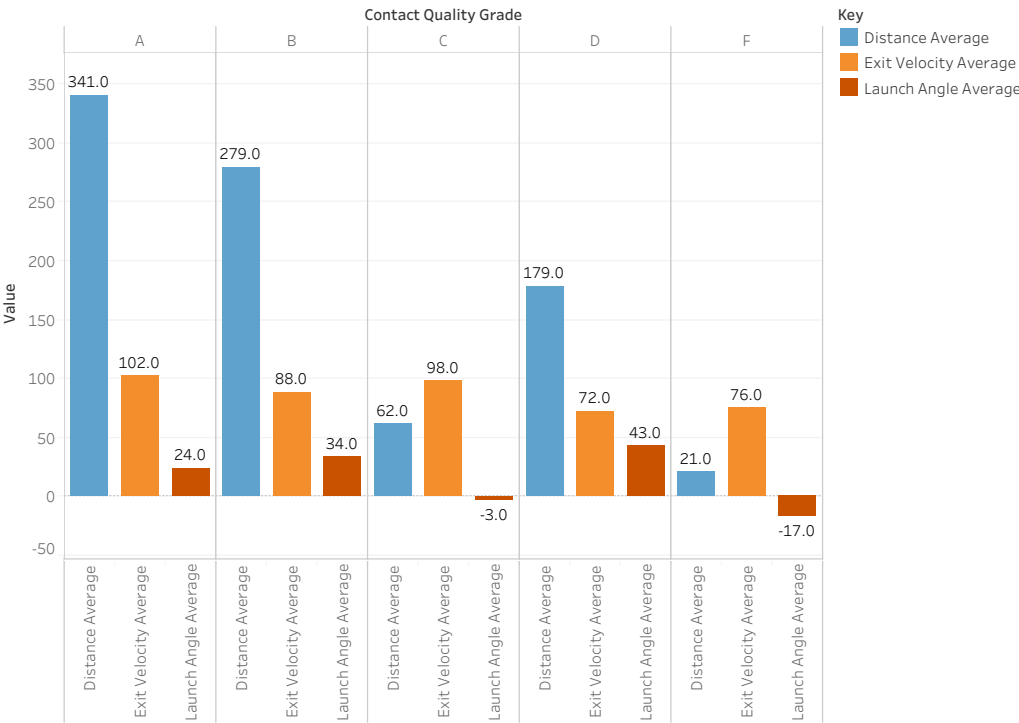
# Grading Contact Quality

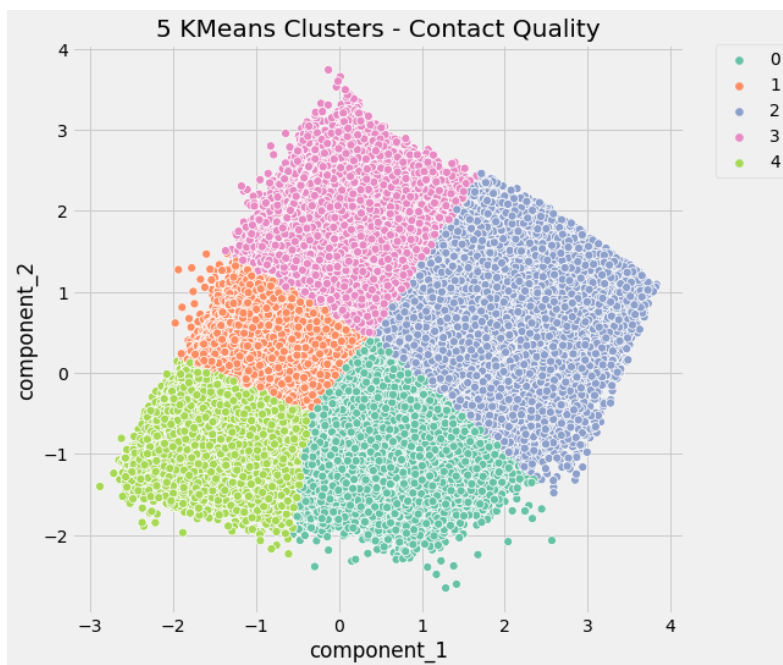
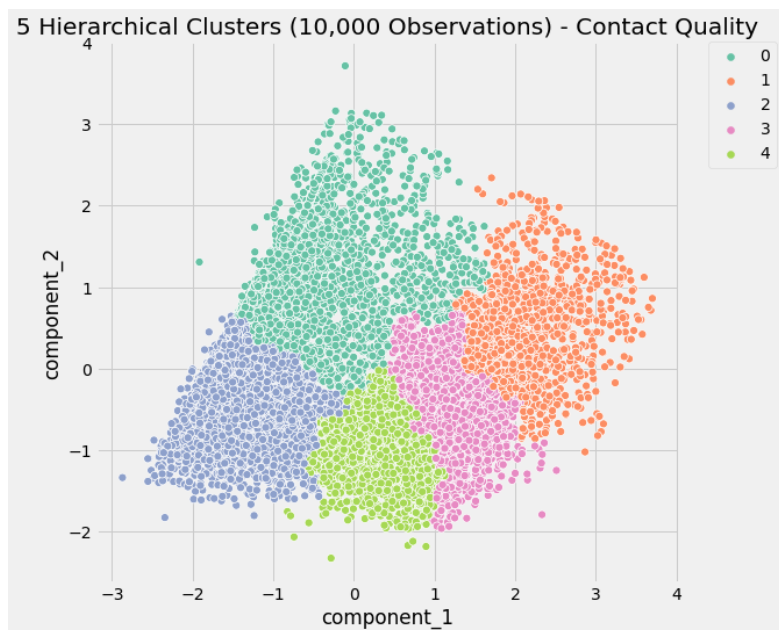
## A Summary of Results in Tables, Charts, and Heat Maps

Contact Quality Grade Breakdown by Average Exit Velocity, Launch Angle, and Distance

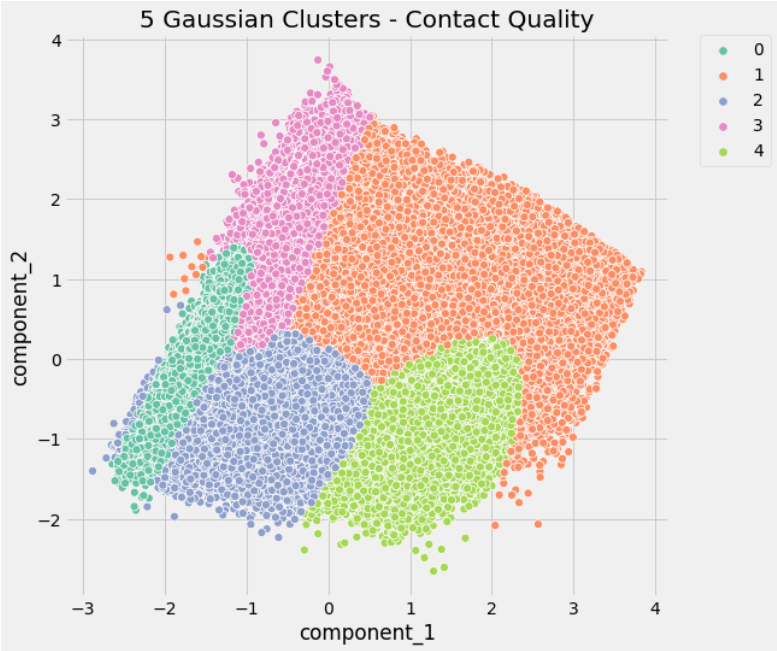
Cluster	Average Launch Angle		Average Exit Velocity		Average Distance	
	25%	75%	25%	75%	25%	75%
A	16°	31°	97 mph	105 mph	303 ft	385 ft
B	22°	44°	70 mph	83 mph	248 ft	315 ft
C	-10°	5°	84 mph	92 mph	14 ft	105 ft
D	24°	60°	70 mph	77 mph	140 ft	222 ft
F	-25°	-6°	70 mph	82 mph	5 ft	27 ft

Contact Quality Grade Breakdown by Average Distance, Exit Velocity, & Launch Angle



*K-Means Clustering Plot**Agglomerative Hierarchical Clustering Plot*

Gaussian Mixture Model Clustering Plot



K-Means Cluster Analysis Average of Key Variables Table

cluster	distance	exit_speed	angle	direction	bearing
0	62.0	98.0	-3.0	-2.0	-2.0
1	279.0	88.0	34.0	-0.0	0.0
2	21.0	76.0	-17.0	-2.0	-2.0
3	179.0	72.0	43.0	1.0	1.0
4	341.0	102.0	24.0	-1.0	-0.0

K-Means Cluster Analysis Median of Key Variables Table

cluster	distance	exit_speed	angle	direction	bearing
0	38.0	98.0	-1.0	-4.0	-3.0
1	286.0	88.0	33.0	-0.0	1.0
2	11.0	78.0	-16.0	-4.0	-3.0
3	178.0	73.0	43.0	1.0	2.0
4	354.0	101.0	23.0	-1.0	0.0

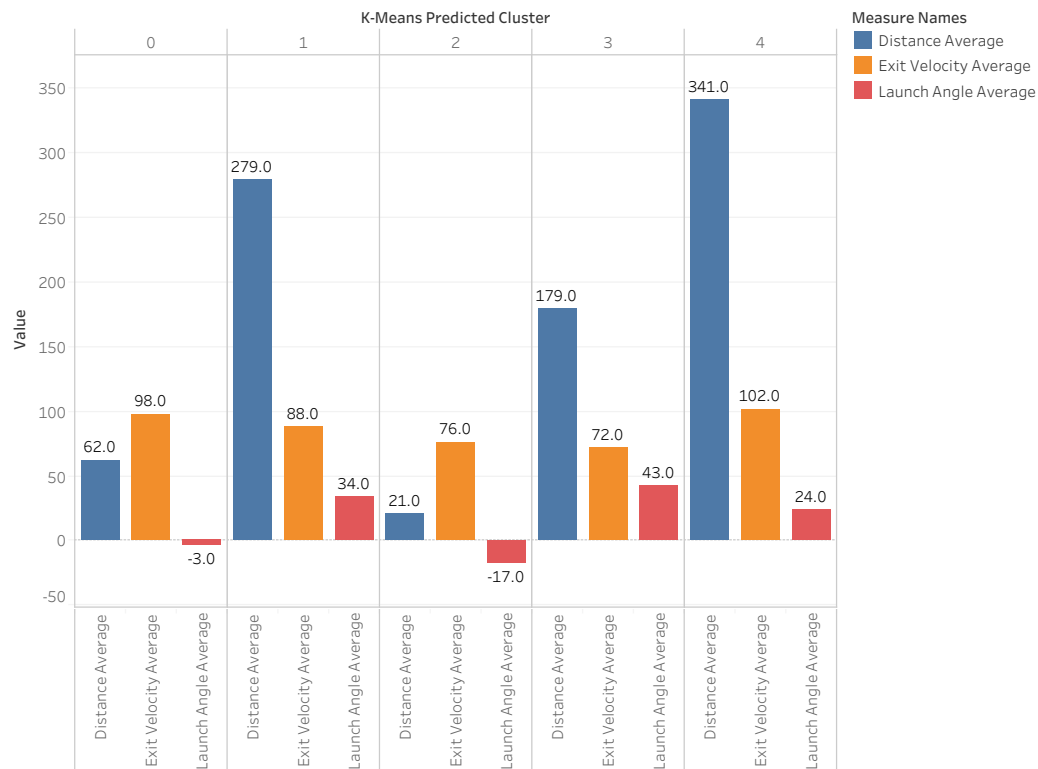
*K-Means Cluster Analysis Hit Type Frequency Table*

cluster	Bunt	GroundBall	PopUp	LineDrive	FlyBall
0	0	25541	0	4644	2
1	0	886	7070	3864	3817
2	16	24480	1	191	0
3	0	10	23	13395	12191
4	0	9	1179	8547	12989

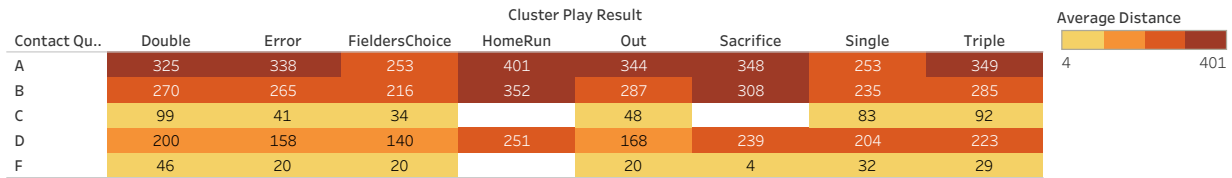
*K-Means Cluster Analysis Play Result Frequency Table*

cluster	Out	Single	Double	Triple	HomeRun	Error	Sacrifice	FieldersChoice
0	160140	10595	1385	81	0	507	0	1605
1	10947	3997	456	24	1	72	52	88
2	19013	2631	233	11	0	584	2	2214
3	9337	3884	4966	515	6422	49	441	5
4	16952	3568	1225	135	158	59	618	9

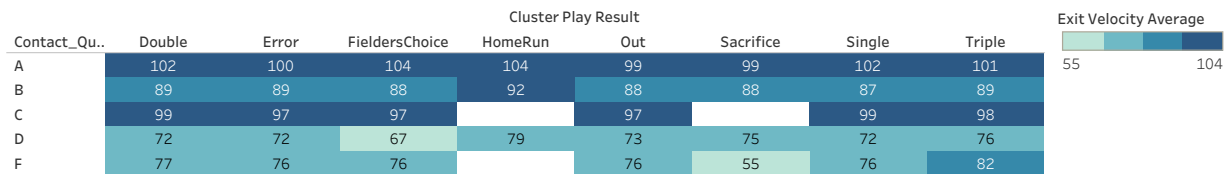
*K-Means Cluster Analysis Key Variables Breakdown*



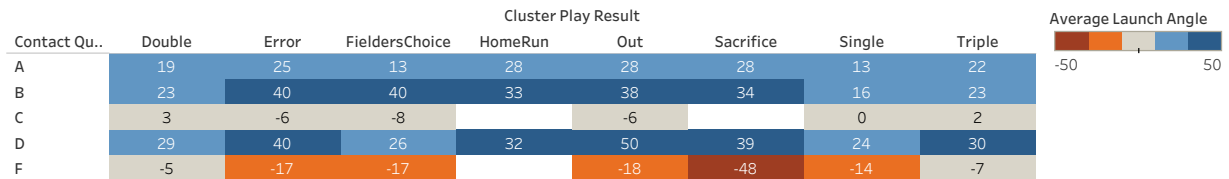
### Average Distance by Play Result by Contact Quality Grade



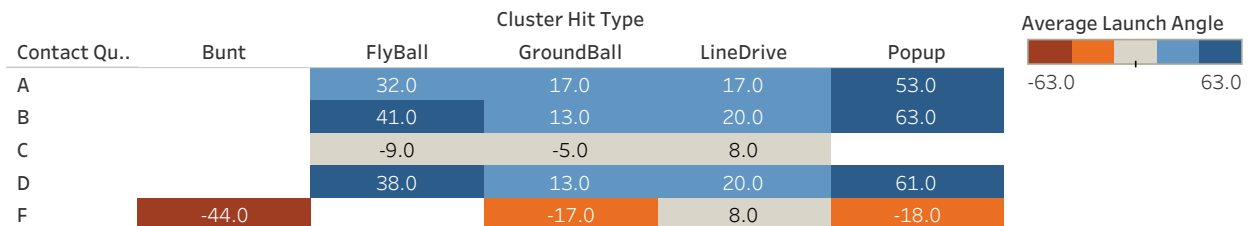
### Average Exit Velocity by Play Result by Contact Quality Grade



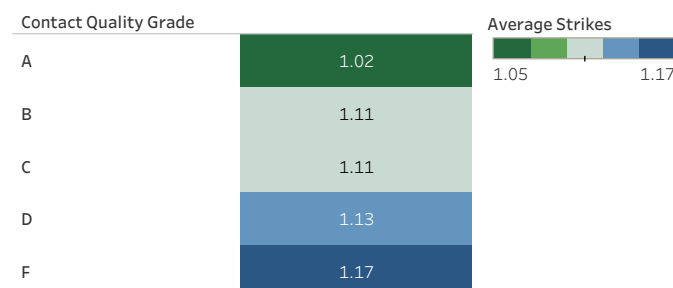
### Average Launch Angle by Play Result by Contact Quality Grade

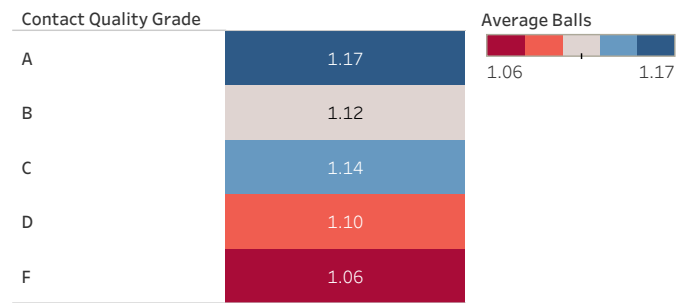


### Average Launch Angle by Hit Type by Contact Quality Grade



### Contact Quality Grade Heatmap by Average Strikes on Batter



*Contact Quality Grade Heatmap by Average Balls on Batter**Contact Quality Grade Heatmap by Average Outs*