A7: Final Project
Maryville University Baseball Offensive Offseason Summary

Introduction:

The following is a composition of data taken over the course of the fall baseball season at Maryville University. The season does not include any competitive games. The entire sample was taken during a training environment.

Data Domain:

The project takes data from the Maryville University blast motion account. Blast motion is a wireless bat sensor that tracks the motion of the bat throughout the player's swing. The domain that the data is uploaded to is private Maryville University but summaries regarding the product and how it works can be found at the link below.

https://blastmotion.com

Data File Description:

Sheets: There are 22 sheets within the file. Each sheet is named after a data set from a given player. Steven Schnieder is an exception, however. He is a switch hitter so he gets two data sets. One for his left-handed swing and one for his right-handed swing.

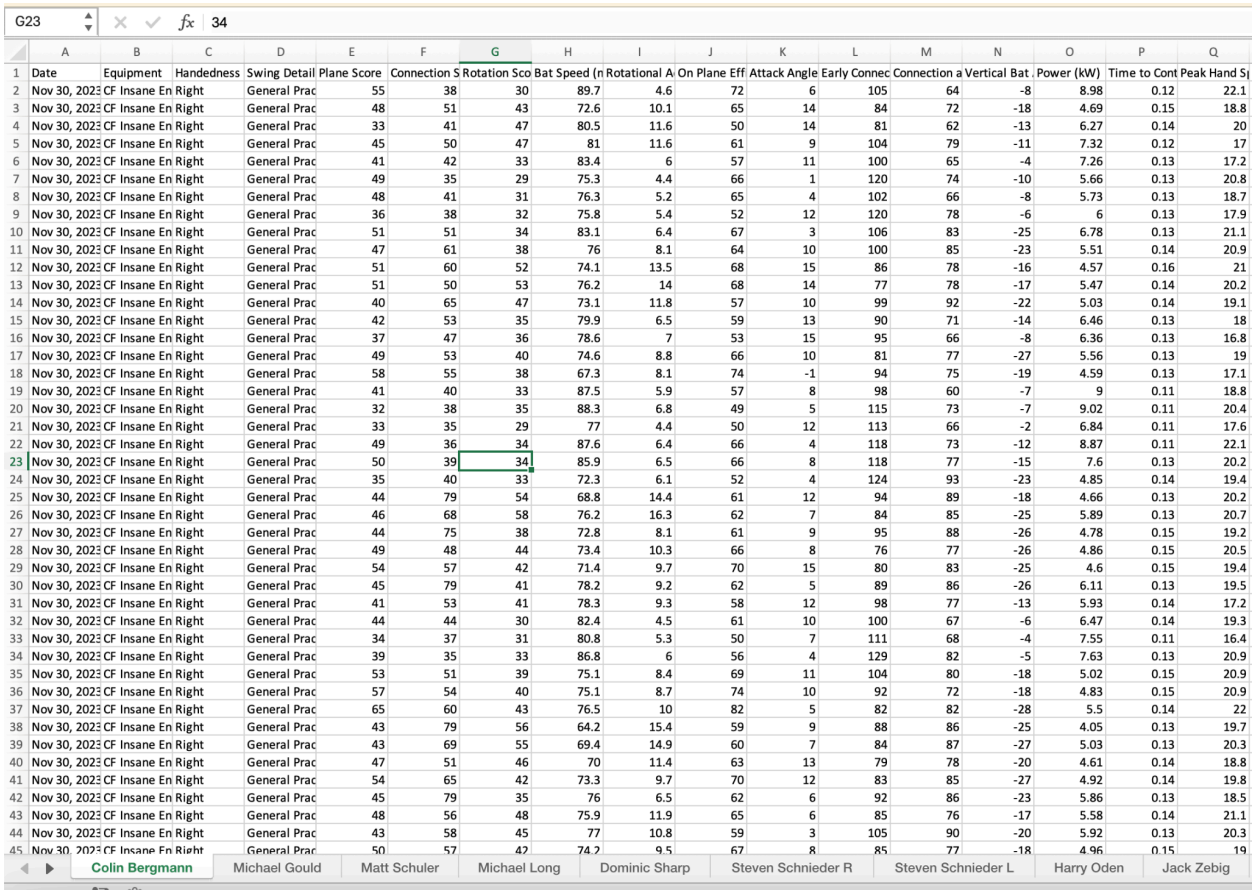
Columns:

- Date: Time and date of the sample
- Equipment: The kind of bat being swung
- Swing Detail: The training environment
- Plane Score: 20-80 Score grading the players on plane efficiency
- Connection Score: 20-80 scale grading the players early/impact connection
- Bat speed: How fast the bat was traveling at impact
- Rotational Acceleration: How quickly the bat gets up to speed
- On-Plane Efficiency: How efficiently the bat gets on plane with a given pitch
- Attack Angle: The angle that the bat approaches the ball at contact
- Early Connection: The angle of the bat before it turns forward
- Connection at Impact: The angle of the bat at impact
- Vertical Bat Angle: The vertical angle of the bat (0 is perpendicular to the ground)
- Power: The power generated when swinging the bat
- Time to Contact: how quickly the bat gets to contact
- Peak Hand Speed: how fast the player's hands are moving during the swing

Data Cleaning Strategies:

The data set is in an Excel document. I took the time to go through and remove the home page of the data set as it is just a summary page going over the averages for each player sheet. I had to split and filter the data for Steven Schnieder as he is a switch hitter. I wanted him to have distinguished data for both the left and right-handed swings. Within Tableau I filtered the swings to be within a certain batspeed range. Swings under a certain level could be a misread by the sensor such as the player just trying to get a ball on the ground away from him. Another type of swing that could cause a misread is a check swing from the hitter.

Clean Data Set:



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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Date	Equipment	Handedness	Swing Detail	Plane Score	Connection S	Rotation Sco	Bat Speed (n	Rotational A	On Plane Eff	Attack Angle	Early Connec	Connection a	Vertical Bat	Power (kW)	Time to Cont	Peak Hand S
2	Nov 30, 2023	CF Insane En	Right	General Prac	55	38	30	89.7	4.6	72	6	105	64	-8	8.98	0.12	22.1
3	Nov 30, 2023	CF Insane En	Right	General Prac	48	51	43	72.6	10.1	65	14	84	72	-18	4.69	0.15	18.8
4	Nov 30, 2023	CF Insane En	Right	General Prac	33	41	47	80.5	11.6	50	14	81	62	-13	6.27	0.14	20
5	Nov 30, 2023	CF Insane En	Right	General Prac	45	50	47	81	11.6	61	9	104	79	-11	7.32	0.12	17
6	Nov 30, 2023	CF Insane En	Right	General Prac	41	42	33	83.4	6	57	11	100	65	-4	7.26	0.13	17.2
7	Nov 30, 2023	CF Insane En	Right	General Prac	49	35	29	75.3	4.4	66	1	120	74	-10	5.66	0.13	20.8
8	Nov 30, 2023	CF Insane En	Right	General Prac	48	41	31	76.3	5.2	65	4	102	66	-8	5.73	0.13	18.7
9	Nov 30, 2023	CF Insane En	Right	General Prac	36	38	32	75.8	5.4	52	12	120	78	-6	6	0.13	17.9
10	Nov 30, 2023	CF Insane En	Right	General Prac	51	51	34	83.1	6.4	67	3	106	83	-25	6.78	0.13	21.1
11	Nov 30, 2023	CF Insane En	Right	General Prac	47	61	38	76	8.1	64	10	100	85	-23	5.51	0.14	20.9
12	Nov 30, 2023	CF Insane En	Right	General Prac	51	60	52	74.1	13.5	68	15	86	78	-16	4.57	0.16	21
13	Nov 30, 2023	CF Insane En	Right	General Prac	51	50	53	76.2	14	68	14	77	78	-17	5.47	0.14	20.2
14	Nov 30, 2023	CF Insane En	Right	General Prac	40	65	47	73.1	11.8	57	10	99	92	-22	5.03	0.14	19.1
15	Nov 30, 2023	CF Insane En	Right	General Prac	42	53	35	79.9	6.5	59	13	90	71	-14	6.46	0.13	18
16	Nov 30, 2023	CF Insane En	Right	General Prac	37	47	36	78.6	7	53	15	95	66	-8	6.36	0.13	16.8
17	Nov 30, 2023	CF Insane En	Right	General Prac	49	53	40	74.6	8.8	66	10	81	77	-27	5.56	0.13	19
18	Nov 30, 2023	CF Insane En	Right	General Prac	58	55	38	67.3	8.1	74	-1	94	75	-19	4.59	0.13	17.1
19	Nov 30, 2023	CF Insane En	Right	General Prac	41	40	33	87.5	5.9	57	8	98	60	-7	9	0.11	18.8
20	Nov 30, 2023	CF Insane En	Right	General Prac	32	38	35	88.3	6.8	49	5	115	73	-7	9.02	0.11	20.4
21	Nov 30, 2023	CF Insane En	Right	General Prac	33	35	29	77	4.4	50	12	113	66	-2	6.84	0.11	17.6
22	Nov 30, 2023	CF Insane En	Right	General Prac	49	36	34	87.6	6.4	66	4	118	73	-12	8.87	0.11	22.1
23	Nov 30, 2023	CF Insane En	Right	General Prac	50	39	34	85.9	6.5	66	8	118	77	-15	7.6	0.13	20.2
24	Nov 30, 2023	CF Insane En	Right	General Prac	35	40	33	72.3	6.1	52	4	124	93	-23	4.85	0.14	19.4
25	Nov 30, 2023	CF Insane En	Right	General Prac	44	79	54	68.8	14.4	61	12	94	89	-18	4.66	0.13	20.2
26	Nov 30, 2023	CF Insane En	Right	General Prac	46	68	58	76.2	16.3	62	7	84	85	-25	5.89	0.13	20.7
27	Nov 30, 2023	CF Insane En	Right	General Prac	44	75	38	72.8	8.1	61	9	95	88	-26	4.78	0.15	19.2
28	Nov 30, 2023	CF Insane En	Right	General Prac	49	48	44	73.4	10.3	66	8	76	77	-26	4.86	0.15	20.5
29	Nov 30, 2023	CF Insane En	Right	General Prac	54	57	42	71.4	9.7	70	15	80	83	-25	4.6	0.15	19.4
30	Nov 30, 2023	CF Insane En	Right	General Prac	45	79	41	78.2	9.2	62	5	89	86	-26	6.11	0.13	19.5
31	Nov 30, 2023	CF Insane En	Right	General Prac	41	53	41	78.3	9.3	58	12	98	77	-13	5.93	0.14	17.2
32	Nov 30, 2023	CF Insane En	Right	General Prac	44	44	30	82.4	4.5	61	10	100	67	-6	6.47	0.14	19.3
33	Nov 30, 2023	CF Insane En	Right	General Prac	34	37	31	80.8	5.3	50	7	111	68	-4	7.55	0.11	16.4
34	Nov 30, 2023	CF Insane En	Right	General Prac	39	35	33	86.8	6	56	4	129	82	-5	7.63	0.13	20.9
35	Nov 30, 2023	CF Insane En	Right	General Prac	53	51	39	75.1	8.4	69	11	104	80	-18	5.02	0.15	20.9
36	Nov 30, 2023	CF Insane En	Right	General Prac	57	54	40	75.1	8.7	74	10	92	72	-18	4.83	0.15	20.9
37	Nov 30, 2023	CF Insane En	Right	General Prac	65	60	43	76.5	10	82	5	82	82	-28	5.5	0.14	22
38	Nov 30, 2023	CF Insane En	Right	General Prac	43	79	56	64.2	15.4	59	9	88	86	-25	4.05	0.13	19.7
39	Nov 30, 2023	CF Insane En	Right	General Prac	43	69	55	69.4	14.9	60	7	84	87	-27	5.03	0.13	20.3
40	Nov 30, 2023	CF Insane En	Right	General Prac	47	51	46	70	11.4	63	13	79	78	-20	4.61	0.14	18.8
41	Nov 30, 2023	CF Insane En	Right	General Prac	54	65	42	73.3	9.7	70	12	83	85	-27	4.92	0.14	19.8
42	Nov 30, 2023	CF Insane En	Right	General Prac	45	79	35	76	6.5	62	6	92	86	-23	5.86	0.13	18.5
43	Nov 30, 2023	CF Insane En	Right	General Prac	48	56	48	75.9	11.9	65	6	85	76	-17	5.58	0.14	21.1
44	Nov 30, 2023	CF Insane En	Right	General Prac	43	58	45	77	10.8	59	3	105	90	-20	5.92	0.13	20.3
45	Nov 30, 2023	CF Insane En	Right	General Prac	50	57	42	74.2	9.5	67	8	85	77	-18	4.96	0.15	19

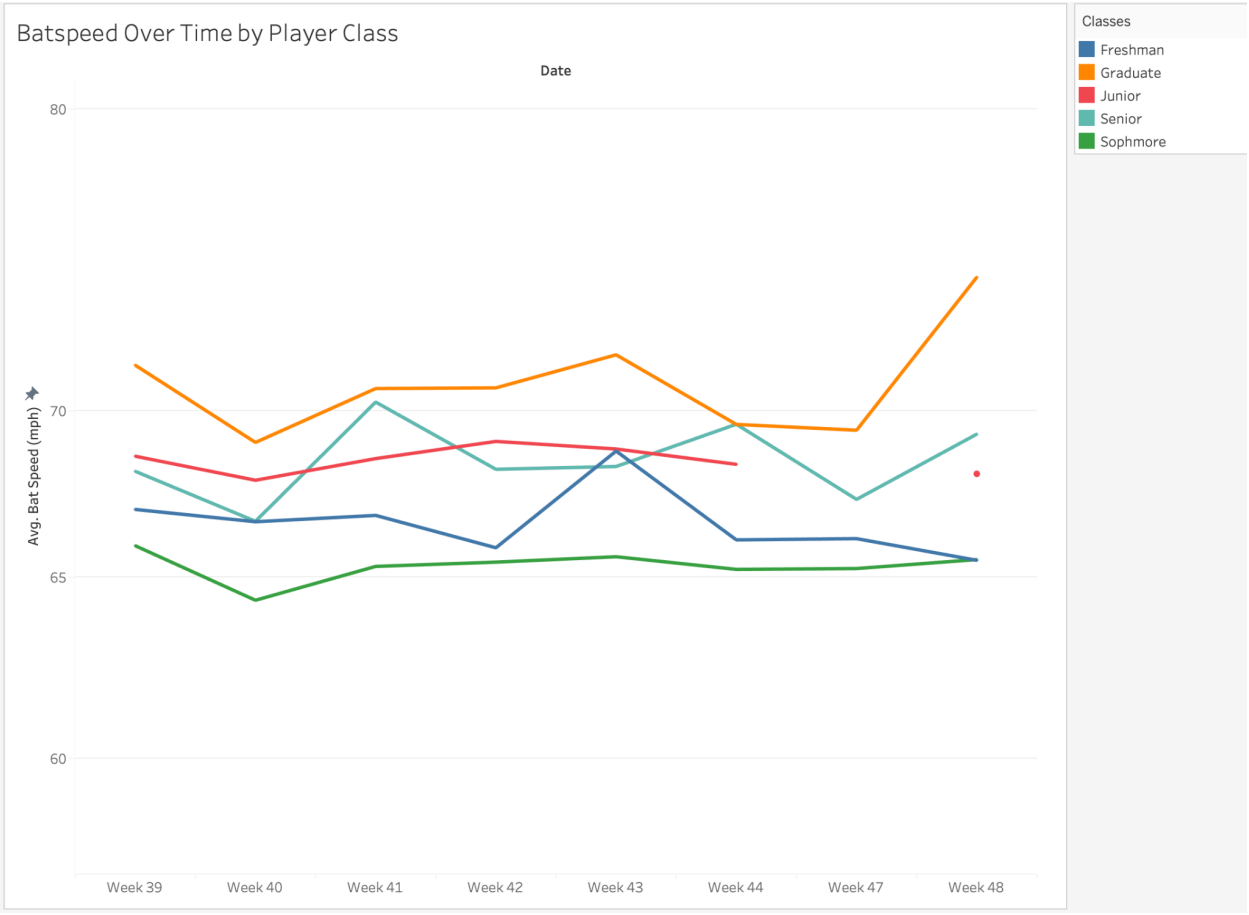
Colin Bergmann | Michael Gould | Matt Schuler | Michael Long | Dominic Sharp | Steven Schnieder R | Steven Schnieder L | Harry Oden | Jack Zebig

Visualization Tools:

I used Tableau to produce graphs and tell a story about each of the hitter's swings. I used a variety of graphs in order to show different types of concepts. This can include using a scatter plot to show the ranges that each player's swings work in, or a date line chart with different variables being plotted to show progress over time.

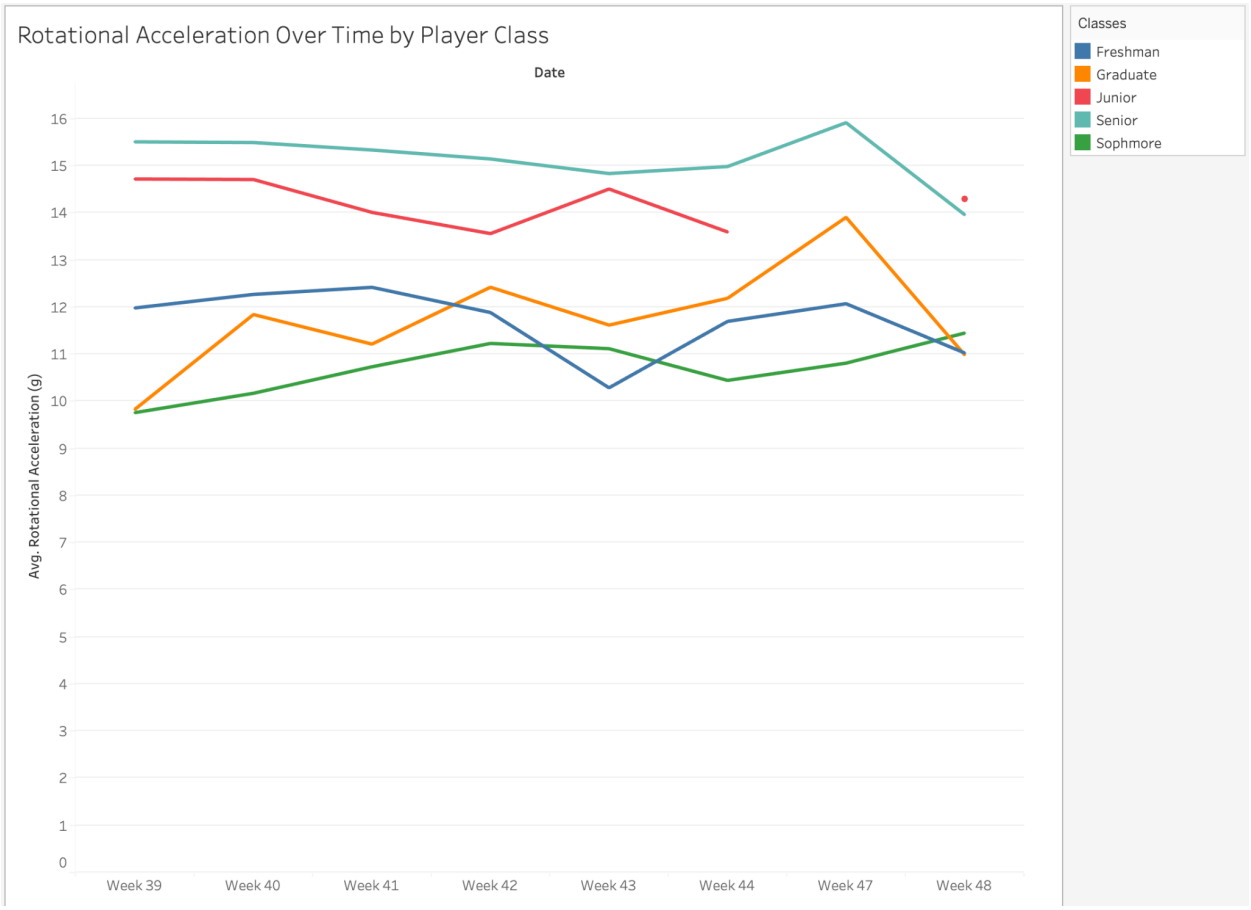
https://public.tableau.com/app/profile/ivan.quackenbush/viz/FinalProject_17085417936020/MaryvilleTrainingSummary?publish=yes

Goal 1: Show the progress of the team's bat speed throughout the offseason.



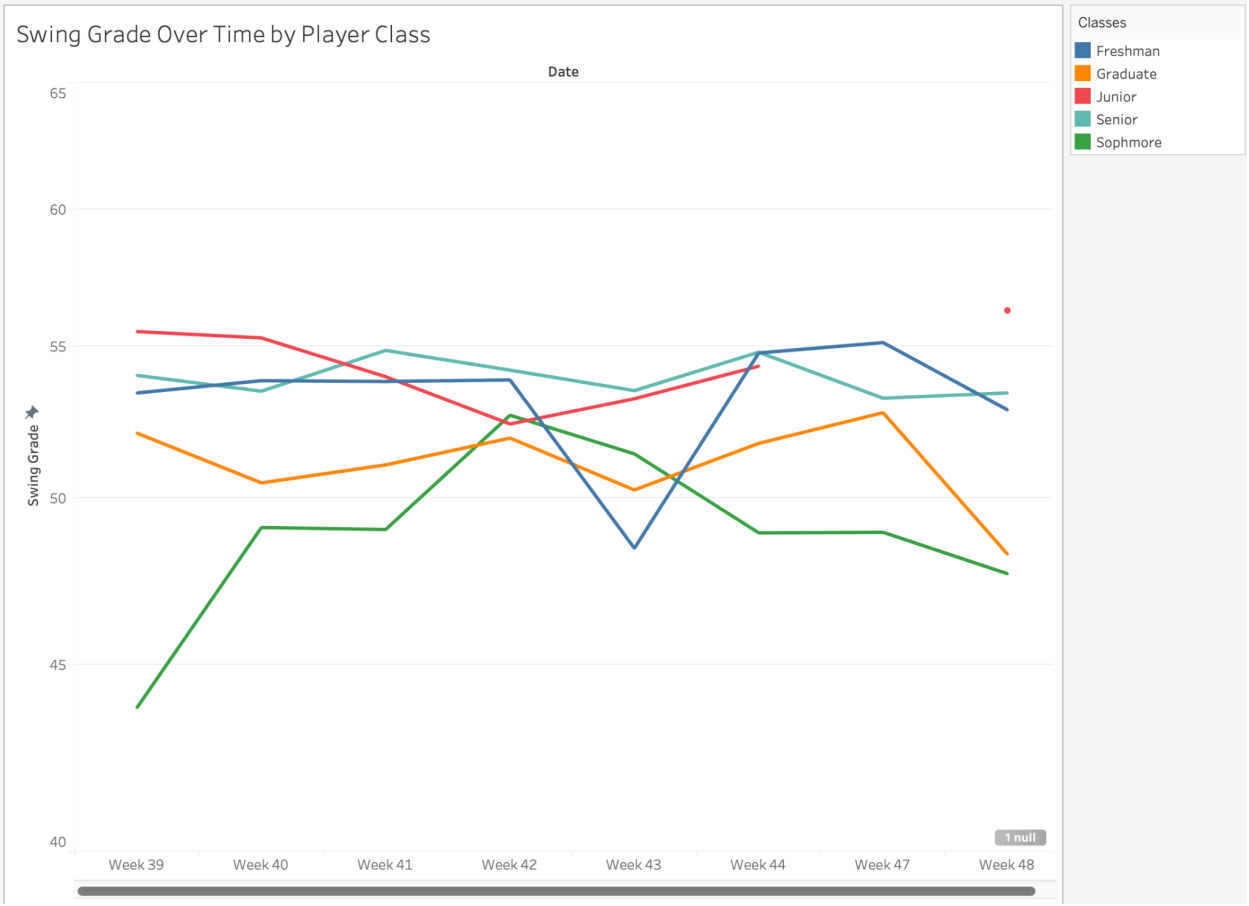
Goal 1 Story: Every class saw an increase in bat speed throughout the offseason. Week 42-43 saw the majority of the classes peak. The freshman start to see a steep decline after the middle of the data set. This is likely because this was their first college offseason and the workload might have started to be a bit much for them.

Goal 2: Show the progress of the team's rotational acceleration throughout the offseason.



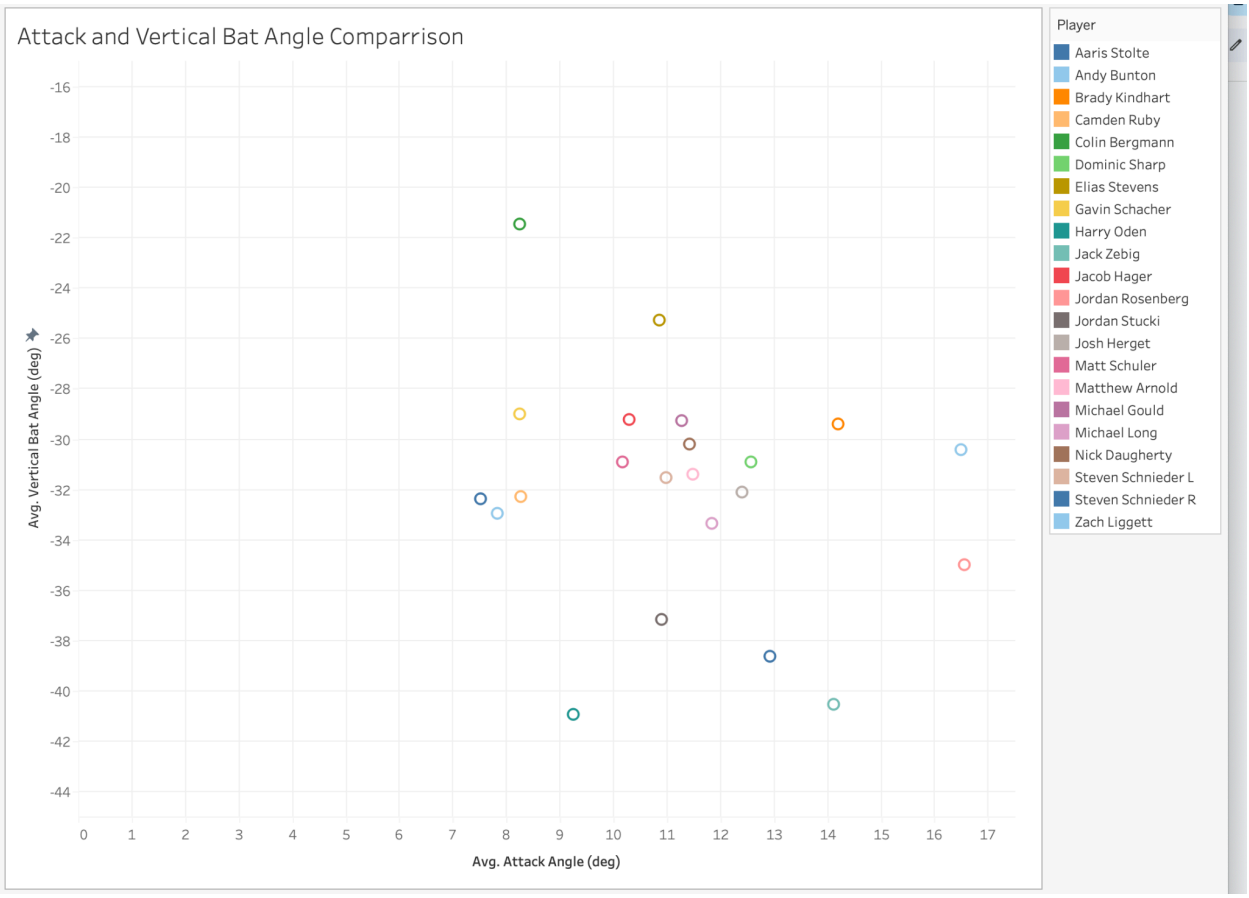
Goal 2 Story: The players all saw a new high in rotational acceleration at some point during the offseason. Like batspeed rotational acceleration is a more physical metric which is why you see some declines from the freshman and other classes towards the end as that is the beginning of when they start their more strenuous phase of the weight lifting program.

Goal 3: Show how the team's swing as a whole has progressed throughout the offseason.



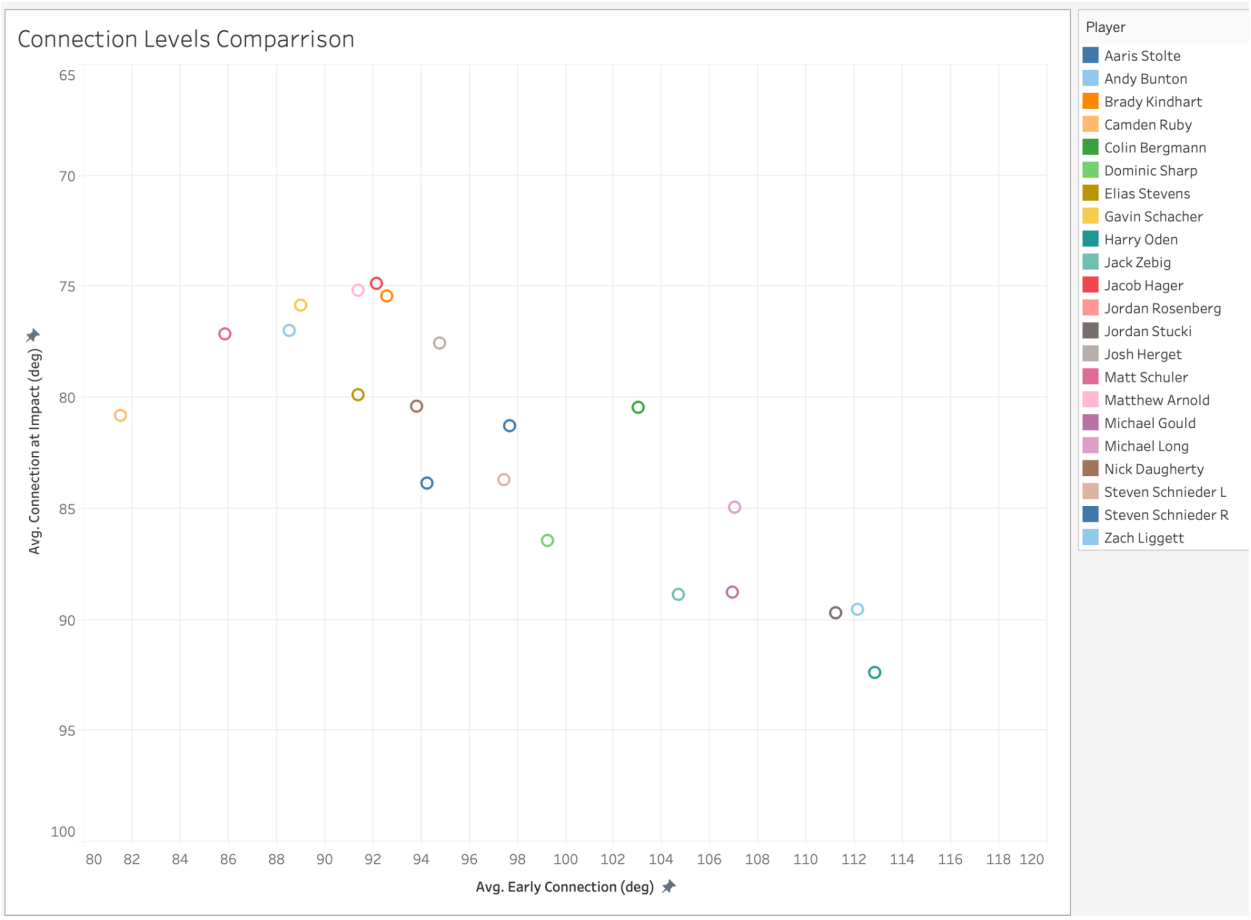
Goal 3 Story: All but the junior class saw increases in their overall swing quality at some point during the offseason. The swings start to get slightly worse towards the harder part of the offseason as the physical training begins to pick up.

Goal 4: Compare the player's attack angle and vertical bat angle averages to see what ranges the players work in.



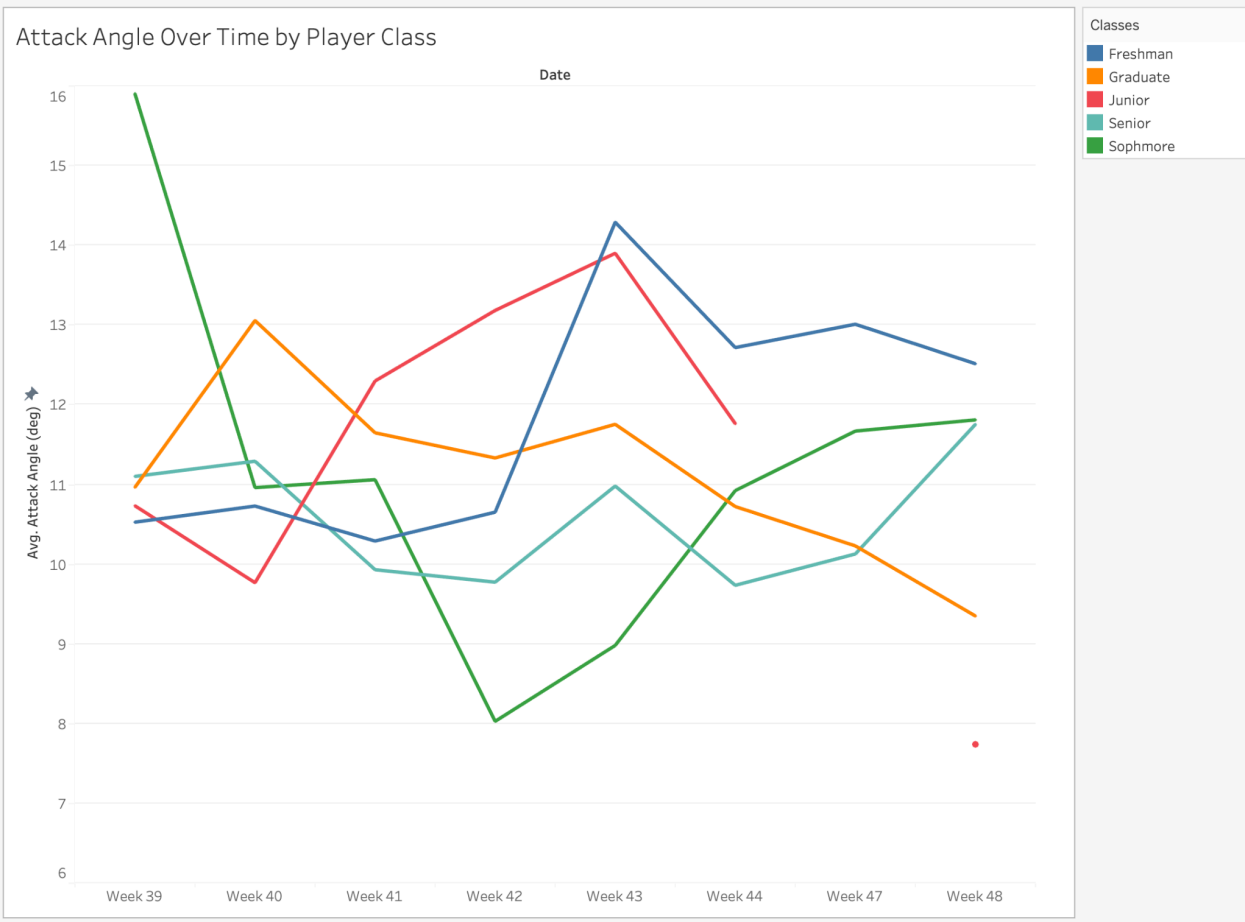
Goal 4 Story: Attack angle and vertical bat angle are a key correlator in how hard players hit the baseball. The goal is to be within -25 to -35 for vertical bat angle, and 8-13 degrees for attack angle. The players who tend to perform well during practice all fall into the cluster in the middle of the chart. These players often have a chance to hit the ball harder than those who are outside this range.

Goal 5: Compare the early and impact connection levels among the players to see what ranges they are working in.



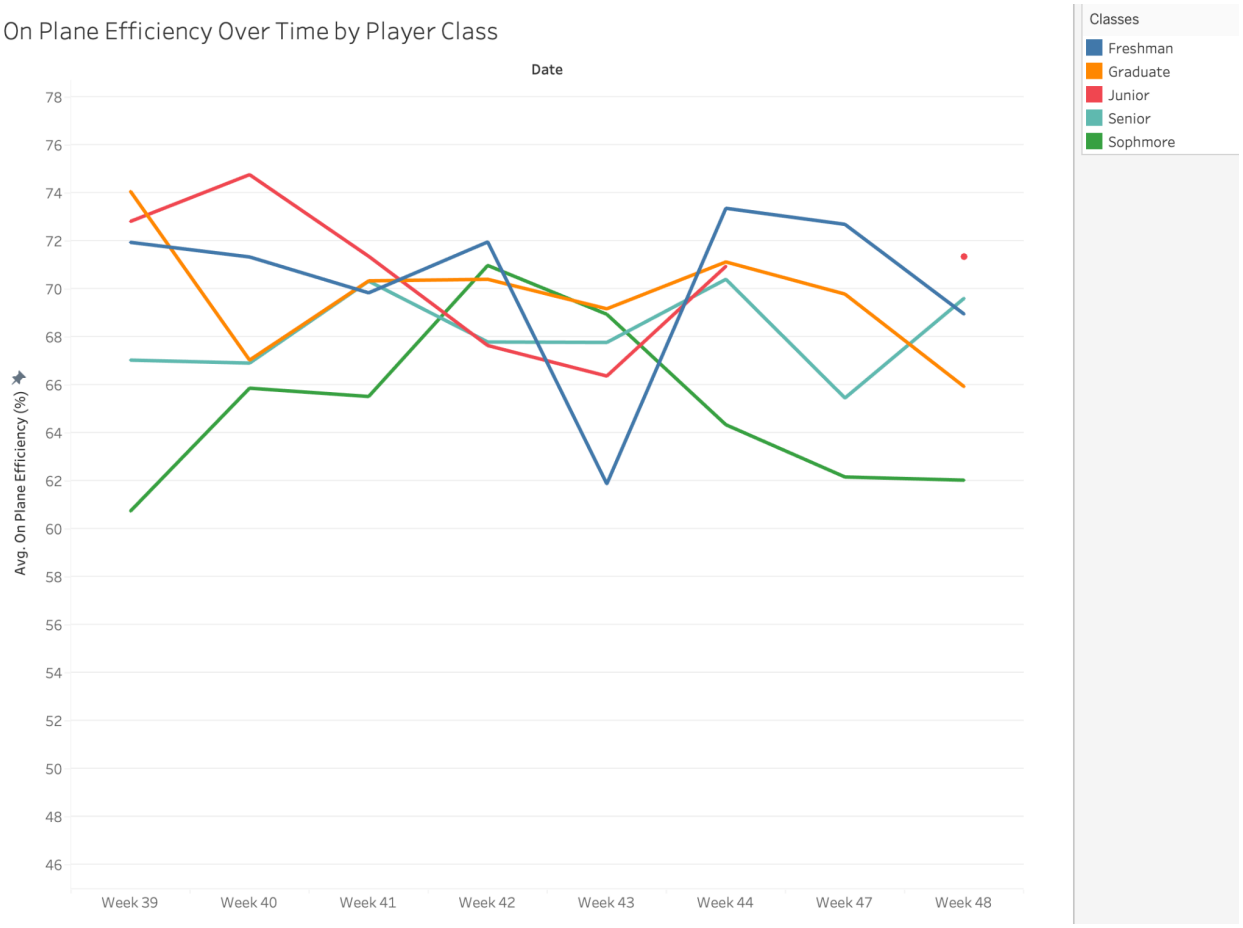
Goal 5 Story: connection values relate to a player's consistency levels. The goal is to be within 10 degrees of 90 for early and impact connection. Early connection it is acceptable to be within 90-110 but players who are closer to 90 tend to move better earlier on in the swing. The players that are within this range tend to hit more balls hard and on a line. The players that are 90-110 early connection but are sub 80 in connection at impact frequently hit balls hard to the poolside. Players who are in the more desired range tend to be more balanced hitters as a whole and use the whole field better.

Goal 6: Asses the team's attack angle over time to see how the direction of the player's swing has changed throughout the offseason.



Goal 6 Story: Attack angle is the approach angle of the bat at impact. The goal is to create an attack angle that is the opposite of the pitch's decent angle. Pitchers tend to create angles that are around -8 to -13 degrees. As a result, a player wants to be within this range. Swings that are higher than 15 are typically poor swings where the hitter comes off the ball, often resulting in a ball that has been top-spun. The sophomore class in particular had several players that fell into this trend resulting in the massive spike at the beginning of the training. The large fluctuation within the 8-13 range is the result of working on different things on a week-to-week basis. One week might include working on fastballs more frequently which results in a lower decent angle of the pitch. The inverse happens with breaking pitches. Both of these will affect the player's sample size.

Goal 7: See how the team's on-plane efficiency has changed throughout the offseason.



Goal 7 Story: The on-plane efficiency of the team fluctuates greatly throughout the offseason. Players have different things that they need to work on week to week and as a result. Other than the Juniors who got hurt in the middle of the offseason, the entire team saw peaks in on-plane efficiency at some point. The freshman fell off heavily due to the strain of being in a college off-season environment for the first time. Fluctuations in on-plane efficiency are normal depending on how different the training environments are from week to week. For example, in week 43 which saw most of the players dip the fastballs in this time were cranked up significantly higher, giving the players less time to react.

Course Prompts

1. How did you choose this project focus:
    a. I always choose baseball-related focuses because it is my job and my passion and you can take it in so many different directions.
2. Describe how you applied the concepts learned in the course to this project. Which techniques or skills were most valuable for your work:
    a. I used nearly everything in this project, from cleaning and organizing the data to actually making the visualizations in Tableau.
3. Based on your experience in this project, which aspects of data visualization are you most interested in exploring further?
    a. I would love to further explore tableau. You are able to do so many cool things in that software and make many satisfying visuals.
4. What was the hardest part of the project/course:
    a. I think that getting things to union correctly was a bit frustrating at first. Everything was pretty straightforward for the most part.
5. What was the most interesting part:
    a. The most interesting part in my opinion was creating the visuals in tableau and seeing how layered you can make things.
6. Any suggestions for future students (or the instructors):
    a. none
7. Link to your PDF file here:
    a. https://github.com/Quackman21/Data-Visualization-final-project/tree/main