

Outlier Home Runs: Outside the Sweet Spot

Evan Howard

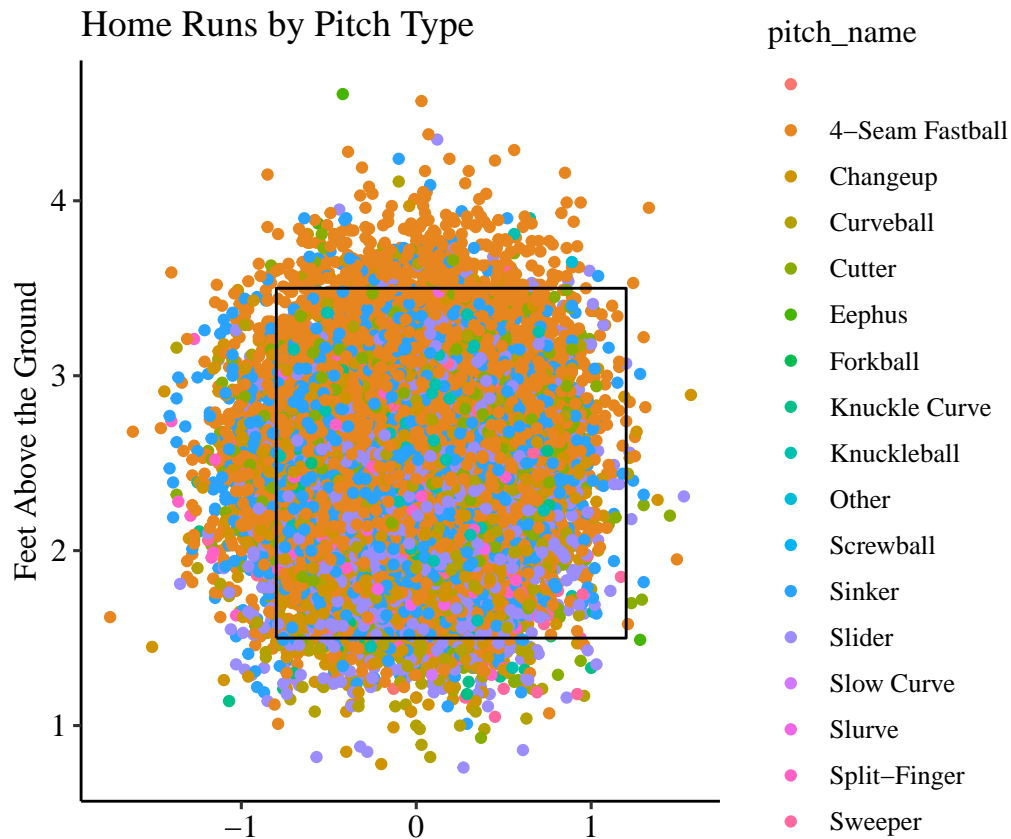
May 11, 2023

This project is focusing on all home runs that were hit between the 2015 season and April 9, 2023. It is intended to focus on home runs within different ballparks to see what constitutes an “outlier” home run. I worked on this project with Annabel Judd and Julian Coleman. The data collected was from Baseball Savant.

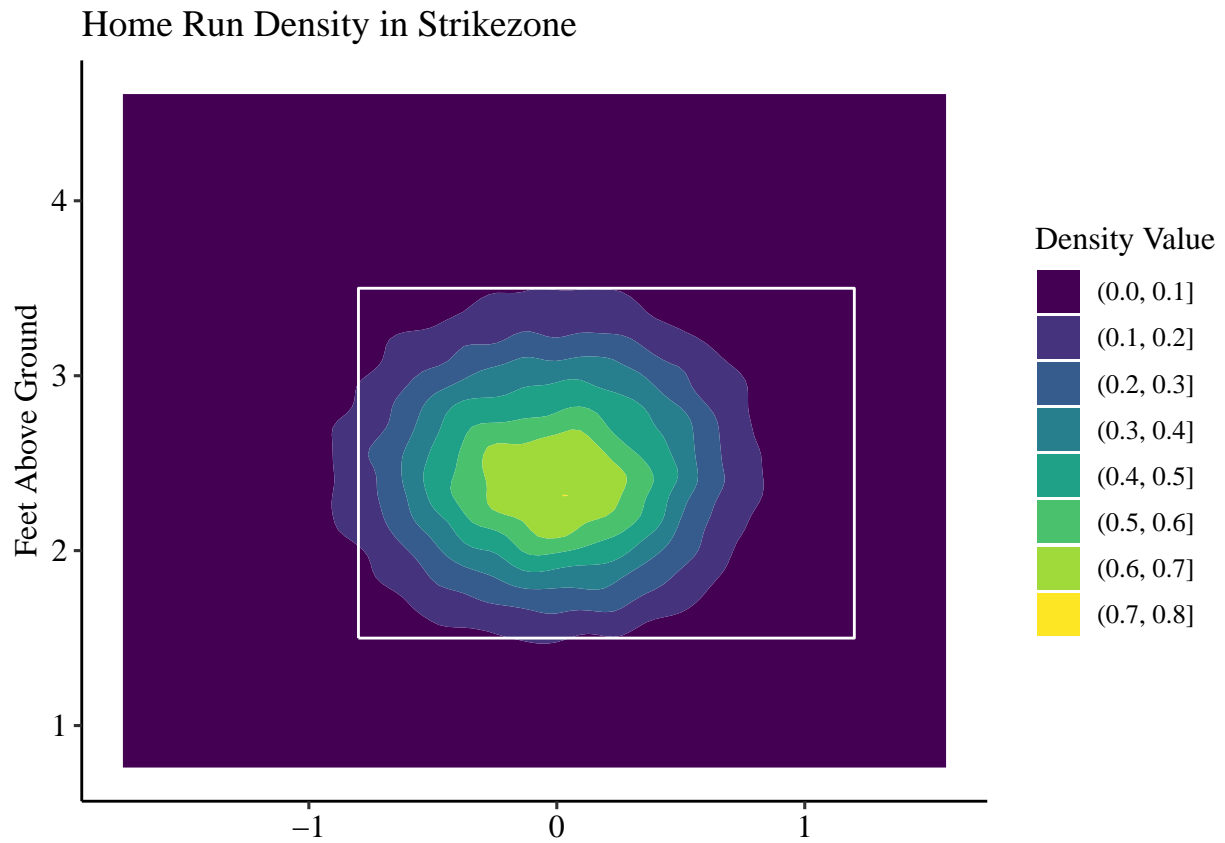
When collecting the data we wanted to view all home runs at certain ballparks. At Baseball Savant we selected Batter as Player Type, Statcast for Season, Home Run for PA Result. For Season Type we chose regular season, playoffs, wildcard, division series, league championship, world series, and all star. Since we wanted to collect all Home Run data for ballparks we chose to include the all star games.

Once we obtained this data we chose to keep only metrics that we thought might be useful to our analysis. We kept: pitch type, game date, release speed, player name, batter id, pitcher id, events, zone, game type, stand, p throws, home team, away team, bb type, pfx x, pfx z, plate x, plate z, hc x, hcy, all v 0, all a, sz top, sz bot, hit distance, launch speed, launch angle, effective speed, release spin rate, release extension, game pk, estimated ba using speed anlge, estimated woba using speed anlge, launch speed angle, pitch name, spin axis, delta home win exp, and delta run exp. Definitions for all column names can be found at Statcase Search CSV Documentation.

In the following strike zone and heatmap plots below, remember that the view is from the Catcher’s perspective. A Right handed hitter would be to the left of the strike zone, and a Left handed hitter would be to the right.

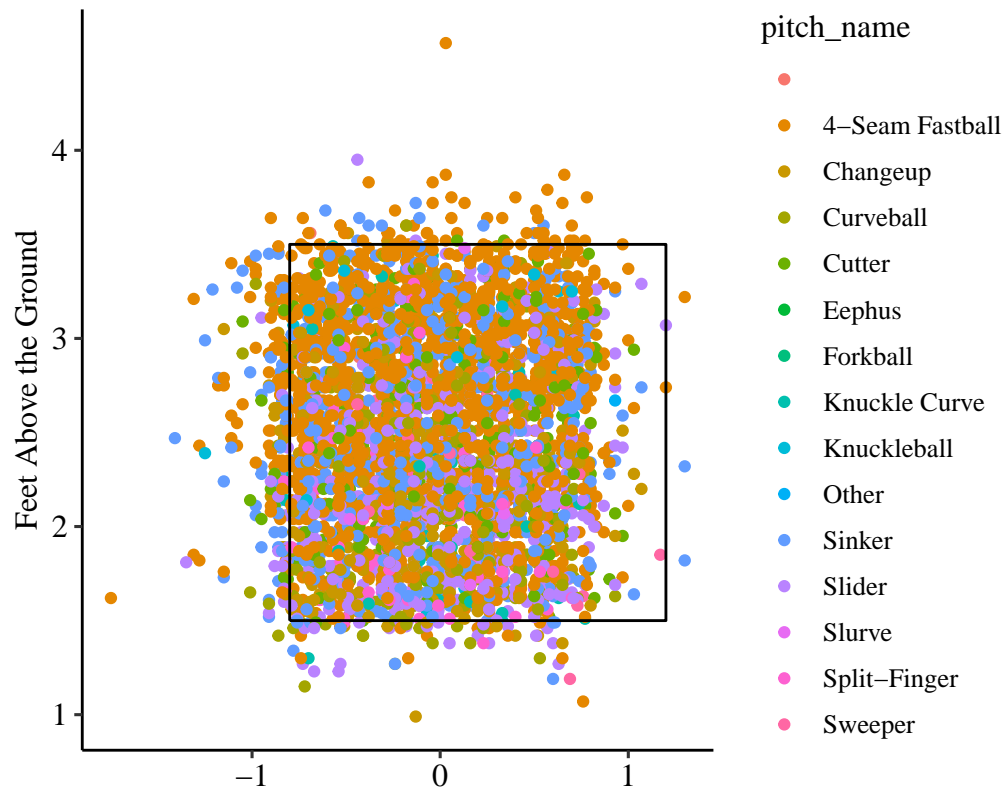


Above is a strike zone plot of all Home Runs by pitch type. It is apparent that there is a slight shift to the left of the strike zone for all pitches. This shift to the left is towards Right handed hitters and would put the majority of pitches right in the sweet spot for those hitters. There does seem to be a smattering of Home Runs that are well outside of the strike zone. Again, those that are outside the strike zone tend to be on the inside of a Right handed hitter.



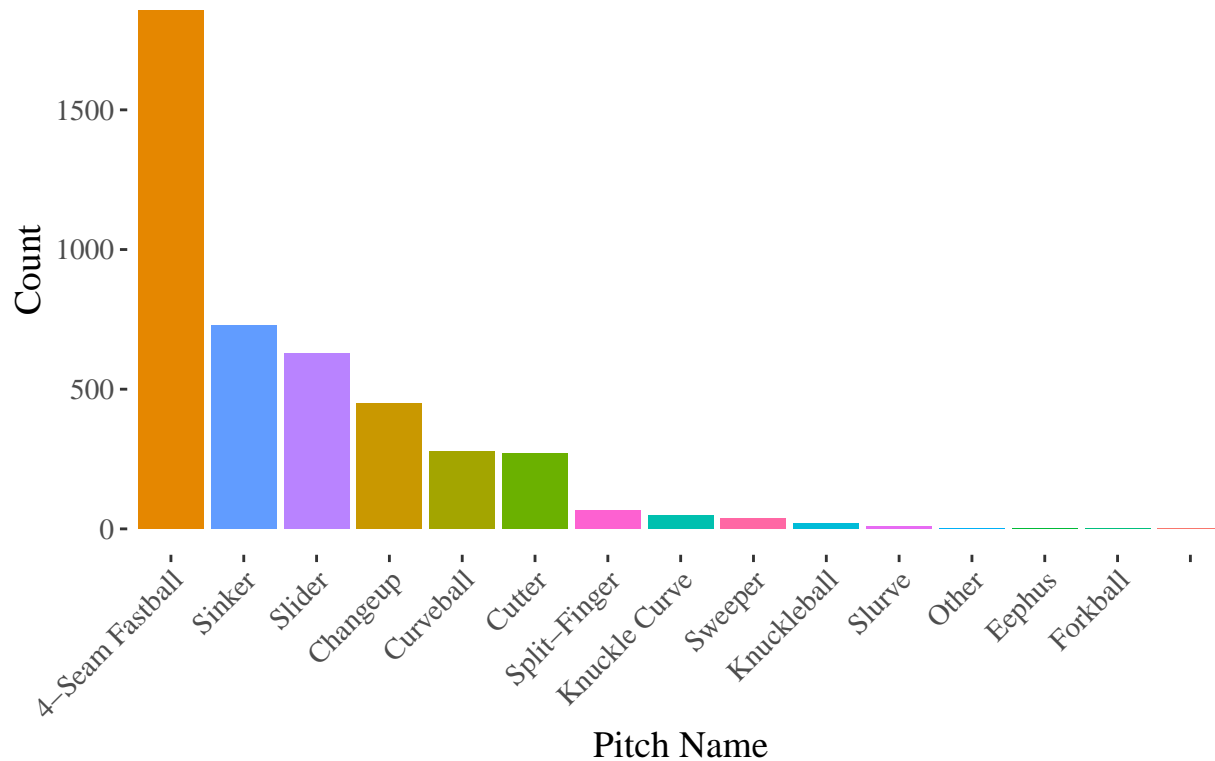
The contour heatmap above shows that the greatest density of Home Runs was around the middle part of the plate as well as middle height of the strike zone. Again, we see the slightest shift to the left of home plate, as well as the slightest shift under the middle point of the height of the strike zone. Interestingly, we see a very low density of Home Runs that would be inside to a Left handed hitter.

Home Runs by Pitch Type Where Density is ≤ 0.1



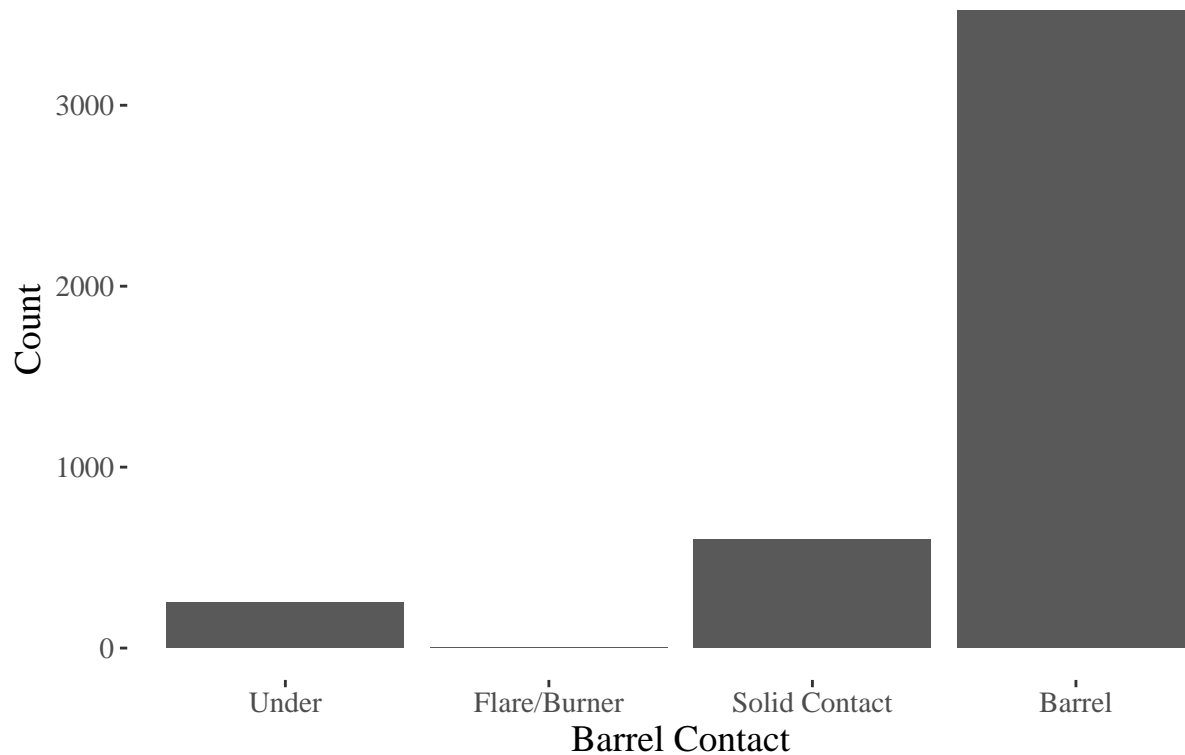
Here we see a strike zone that is much similar to the first one. Again, the density of Home Runs for every ball park seems to be on the inside portion of the plate to Right handed hitters. Of course there is every pitch imaginable including an Eephus and Kuckleball.

Count of Pitches Hit For HR Whose Density ≤ 0.1



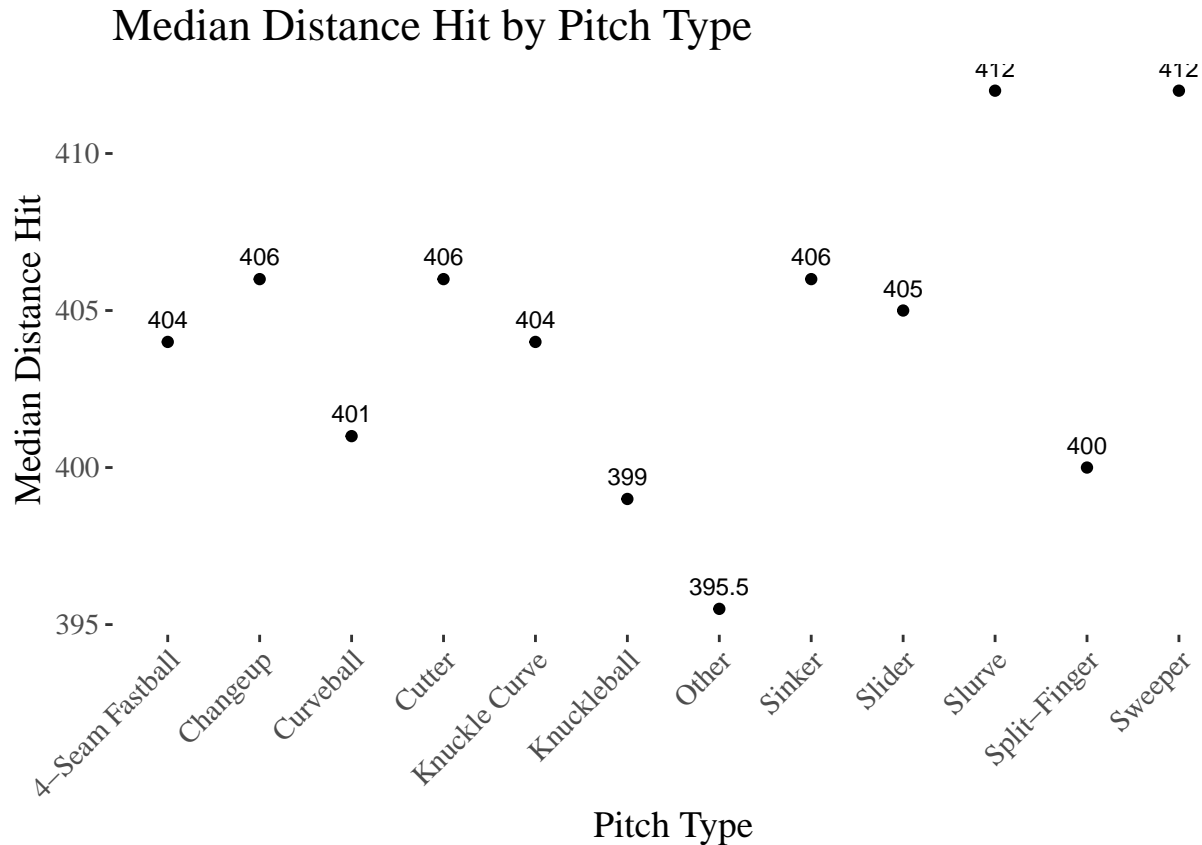
It should be no surprise that the pitch with the most amount of Home Runs whose density is less than or equal to 0.1 is a 4-Seam Fastball. This pitch, by and large, gets absolutely demolished. From there we see quite a dramatic drop off of the types of pitches that were hit for Home Runs. If the situation is a Right handed pitcher vs a Right handed hitter the down and in movement of a sinker and the down and away movement of slider makes sense that they wouldn't be hit for as many Home Runs. However, with the increased adaptation of these two pitches in pitchers' arsenals I believe that we will start to see an uptick in the amount of Home Runs hit off these pitches.

Categorization of Barrel Contact by Count



Baseball Savant classifies the column `launch_speed_angle` as, “Launch speed/angle zone based on launch angle and exit velocity.” The categorization of this is: 1) Weak, 2) Topped, 3) Under, 4) Flare/Burner, 5) Solid Contact, and 6) Barrel. From the above bar chart we see that most Home Runs whose density value is less than or equal to 0.1 is barreled. After this, it is a very steep drop off to solid contact. Interestingly, the category under has more Home Runs than flare/ burner.

For those Home Runs whose density value is less than or equal to 0.1 and whose launch speed angle is categorized as barreled (or 6) we find that the median launch speed is 104.8, the median launch angle is 27 degrees, and the median distance is 405 feet.



Here we are viewing the median distance by pitch type of Home Runs whose density value was less than or equal to 0.1 and whose `launch_speed_angle` was 6, or barreled. Slurve and sweeper pitches have the highest median distance at 412 feet. This could be because these pitches aren't thrown as frequently as other pitches and these pitches might often miss in the middle of the plate. Sinkers and sliders both have higher median distance than a 4-Seam Fastball.

##Future Research

For future research I would like to do a more in depth analysis of all Home Runs that were outside the strike zone as well as an analysis of Home Runs whose barrel contact was classified as under and flare/burner. I would also like to do an analysis on the Home Runs that were hit off Cutters and Split-Fingers to see if pitchers who utilized these pitches had lower Home Run rates than those pitchers that do not have them in their arsenal.