

Introduction

Often overlooked by viewers, catcher framing is beyond helpful for softball and baseball teams. Catcher framing is the art of turning a "ball", or a pitch outside the strike zone, into a "strike". This is very beneficial to the defense because it can help get the other team to be called out (after 3 strikes) and prevent walks (4 balls). The data collected by the LSU Trackman offers in-depth details of the position of a pitch as it crosses the batter's plate. Hence, showing if it was inside or outside the strike zone, we then were able to compare this location data with the actual call made, ball or strike, to quantify and model the benefits of catcher framing.

Objectives

Our goal was to create multiple models that showed the location of the Shadow Zone, the values of a given "frame" by a catcher, and the error rate of the Umpire for a given game. The goal of all these models is to inform the pitcher, hitter, and catcher about where the most vital areas are to train. For example, where should a pitcher aim to maximize a ball being called a strike, or where should a catcher focus on fine-tuning their catching? We also thought these models would help LSU hitters identify which pitches are most likely to be called strikes, and hence when they should swing. All in all we aim to help the LSU Softball team by finding ways to get more strikes called, cause weaker hits from the batter, and fine tune the catcher's skills.

Code Structure and Approach

[1] MatLab and Seaborn Library.

Python code sample

```
import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(6,8))

plt.contourf(xx, zz, prob_grid, levels=200, cmap="coolwarm")

sns.scatterplot(
    data=df.sample(2000),
    x="PlateLocSide",
    y="PlateLocHeight",
    alpha=0.2,
    color="black"
)

plt.title("Called Strike Probability Map")
plt.xlabel("PlateLocSide")
plt.ylabel("PlateLocHeight")

plt.contour(xx, zz, prob_grid, levels=[0.5], colors="black", linewidths=2)

plt.show()
```

Figure 1. Segment of Python Code

Output

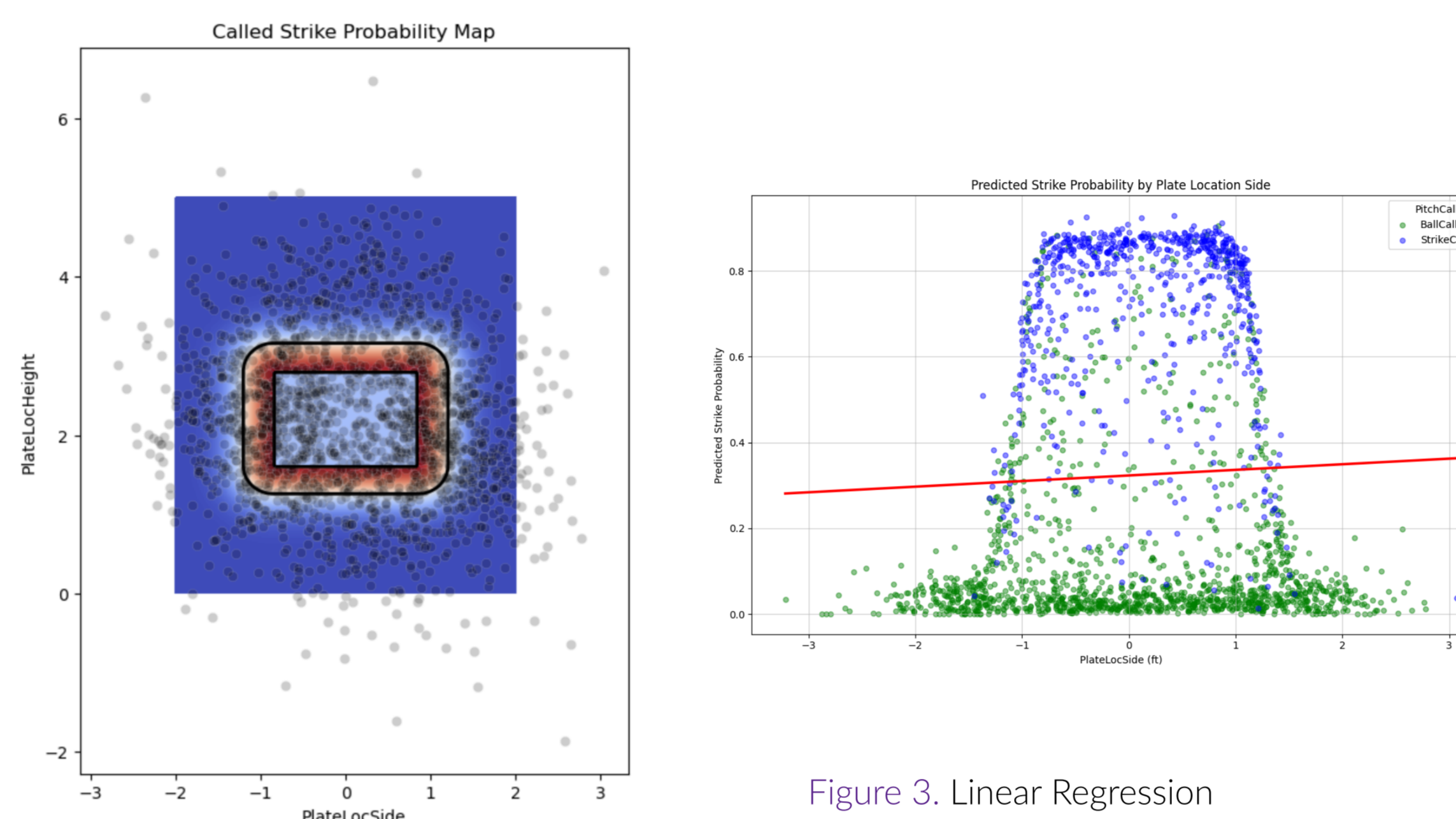


Figure 2. Catcher Frame

Figure 3. Linear Regression

Python Capabilities

Our visualization uses a linear regression model to analyze the relationship between in-game incorrect calls and umpire reliability in softball. The regression line highlights the overall trend between the frequency of wrong calls and performance consistency. In the error graph, larger residuals indicate greater inconsistency, suggesting lower umpire reliability, whereas smaller residuals reflect more consistent and dependable officiating. Figure 2, offers the visual representation of what the strike zone and shadow zone look like next to each other. The red zone is what is deemed to be the shadow zone, with the varying shades of red indicating where it was more likely for strikes to be called (darker = higher, lighter = lower). This is beneficial because it shows where catchers should focus their attention, and where their framing has been successful. The lighter blue zone just outside the shadow zone is classified as the "chase zone", these are balls that are easy for the batter to think is in the strike zone, and have the potential to cause swings and weak hits, which benefit offense.

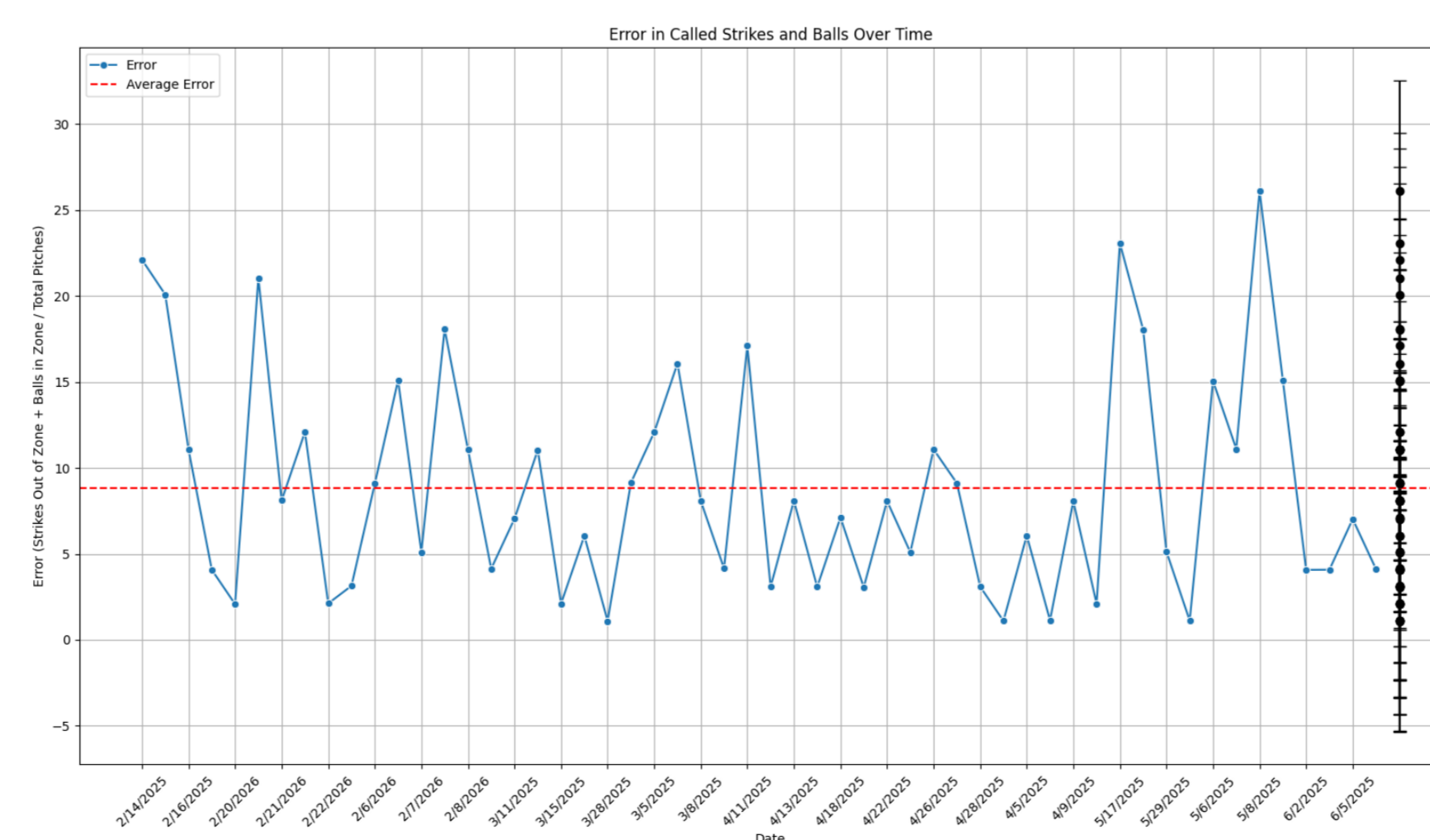


Figure 4. Graph of Error Rates Each Game

Challenges

The first challenge we ran into was determine which angle to look at this project from. We bounced between which model would be the best as well as if we should focus our attention on creating a predictive "shadow zone" model, address how pitchers and umpires influence the catcher framing, or showing who the best catchers were on the current LSU team. We ultimately decided that all of these models would be very helpful for the LSU softball team, and we decided to produce all of them. The second issue we ran into was the immense amount of data. Not only was there data types with no value to our project that we had to pick out, but the sheer amount of data entries slowed down our computers and made it hard to run and compute the code. To over come this we broke the data into sets, such as groups of 100 or groups based on the day. This added to the process, but it also helped strengthen our models.

Moving Forward

We suggest looking into the trajectory of balls hit in the shadow zone. Our research showed that most hitters get worse and worse at hitting balls outside of the strike zone. We think that this would be an area for our LSU batters to train in, seeing that our models show that there is a good amount of balls outside of the strike zone that are called strikes. By looking at the trajectory, we could see how good our batters are and track their improvement as they continue to play throughout the season.

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References

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