Introduction

This document describes the proposed analysis to answer Head Coach Brian Agler's request, paraphrased as the following:

> "Arike Ogunbowale can score prolifically, but she's having a rough season from a scoring-efficiency standpoint. I think her shot selection may be partially to blame. Could you look into this?"

Potential Approaches

Investigating potential issues with shot selection can take several forms, including:

1. Examining the difficulty of shots based on location. If Ogunbowale is shooting from inefficient or difficult areas of the floor, approaching the problem in this manner should be revealing (motivation here).
2. Examining the difficulty of shots based on shot clock time remaining. Shots near the end of the shot clock are often forced, increasing difficulty (use the filters here to see how shot clock time affects team shooting percentage). As a high-usage player, such shots could impact Ogunbowale more than others.
3. Examining the difficulty of shots based on the proximity of defenders. If Ogunbowale shoots when closely guarded, forcing shots may be the issue.

Ideally, a complete analysis would contain explorations of all three approaches above.

Data

The dataset used for this analysis is the play-by-play data for the 2019 WNBA season downloaded via the data.wnba.com API as of games prior to 8/29/19. As a rookie, this is the only location data publicly available for Ogunbowale, which could limit the ability of this analysis to properly identify any issues. Table I shows the relevant structure of the dataset.

Table I: WNBA Play-by-Play Features of Interest

Field Name	Definition
Clock	Time remaining in the period
Description	Textual description of the play
Event type indicators	Integers corresponding to event types. 1 is a made shot, 2 is a missed shot

locX	X-location of an on-court action
locY	Y-location of an on-court action
pid	Player ID of the main actor on the play
tid	Team ID of the main actor on the play

Known Issues

Upon examining the dataset, the third option in the "Potential Approaches" section is no longer available. Defender location is not included in this dataset. Opponent's shooting percentage allowed by shot location could serve as a proxy for the difficulty of shots imposed by defenders, but such a metric would likely be noisy and weakly informative at best. Additionally, examining the effect of the shot clock would be difficult with this dataset. One could code up rules using the game clock when possession is gained and when the shot is taken, but that would involve a non-trivial amount of parsing.

Another issue revolves around the recorded shot location. Rather than shot location being automatically measured through a radar or camera based system, these locations are manually tagged. While not ideal and potentially noisy, these shot locations are the highest quality available.

Methodology

With the above data issues known, the best route seems to be examining the difficulty of shots based on location. If the result of the analysis is inconclusive or fruitless, some of the alternatives proposed above can be explored.

The first step would be to visualize the shot location data to see if any obvious patterns can be gleaned. From there, the approach could bin shots by distance from the basket and sample with replacement from those distance bins for both Ogunbowale and guards across the league as a whole. With the bootstrapped samples, an estimated shooting percentage can be calculated and presented with uncertainty via a boxplot, violin plot, or other visualization technique. Additionally, the shooting percentages calculated can be multiplied by the shot value (2 or 3 points) to visualize the distribution of points per shot. This would be a simplistic estimate of points per shot given that shot distance is the only feature, but this should serve as a good first draft of the analysis.

Analysis

(NOT REQUIRED, you simply have to design your analysis up to this point and include any resources below. This section is just included for context)

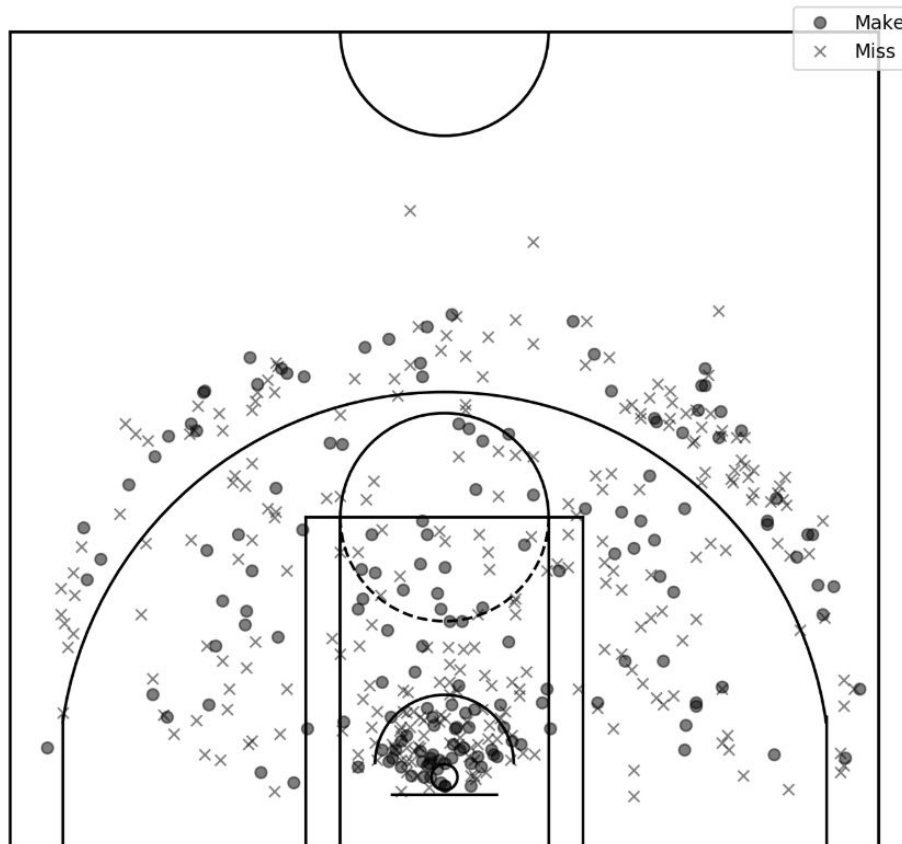Figure 1 shows the 2019 shot locations for Arike Ogunbowale.

Figure 1: Makes and misses for Arike Ogunbowale in the 2019 WNBA regular season

A few things jump out immediately upon viewing Figure 1. First, Ogunbowale seems to be proficient around the basket, especially for a 5'8" guard. That proficiency seems to drop off quickly beyond the immediate vicinity of the basket. Indeed, Ogunbowale shoots 48.8% in the restricted area, but that falls to 34.6% within 5-9 feet from the basket (data found here). Second, that shooting percentage dropoff does not seem to be as precipitous when moving to three-point field goals. This suggests that Ogunbowale may benefit from trading some long range two-point field goal attempts for three-point field goal attempts. Both of these observations would be revealing if put in the context of the performance of other guards in the league.

Resources

- stats.nba.com - referencing shot clock effects on shooting percentage

- stats.wnba.com - diving deeper on observations from Figure 1
- fivethirtyeight.com - motivation for points per shot and location-based difficulty