Introduction

In the present year of 2023, the Women's World Cup has delivered an unforgettable tale of Spain's triumph, with **Aitana Bonmatí** at the epicenter of their success. Aitana has not only played a pivotal role in Spain's championship run but has also claimed the prestigious Golden Ball award as the tournament's MVP. Spain has been a showcase of their unique style of play, emphasizing ball possession and pitch control. What has truly set Aitana Bonmatí apart, however, is not just her impressive goal-scoring and play-making abilities (she contributed with 3 goals and 2 assists), but her incredible ability to drive the ball towards the opposite goal, even against closed defenses. In moments when a football match resembles a strategic chess battle, players who can carry the ball forward and execute precise passes that breach defensive lines emerge as the decisive factors.

This assignment will delve into a detailed analysis of Aitana Bonmatí's performance, seeking to test the hypothesis that she significantly advanced the ball towards the opposite goal (either carrying it or passing it) more than her teammates during the tournament.

Ploting actions

Our first step is to identify and analyze these actions within the available data. We will consider actions where Aitana Bonmatí either receives the ball, carries it, passes it, or combines carrying and passing, resulting in the ball getting closer to the opposing goal. For the sake of plot comprehension, only actions during the knockout stage are shown in Figure 1. We can see her influence across the entire pitch, but especially on the right side of it, where she usually plays.

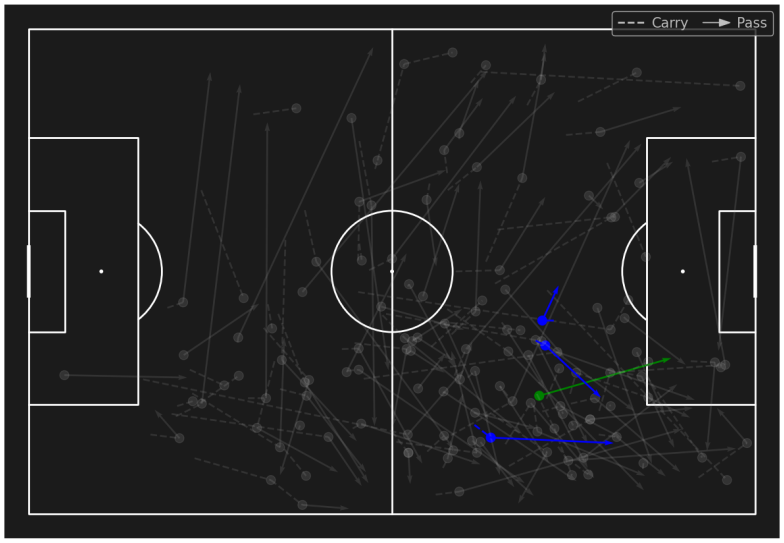

Figure 1. **Passes and carries** by Aitana Bonmatí during the knockout stage, resulting in **shots on goal** and **goal assists**.

Subsequently, for each action, we will calculate the distance the ball has traveled along the horizontal axis. The distribution of all of Aitana's forward actions is depicted in the following plot:

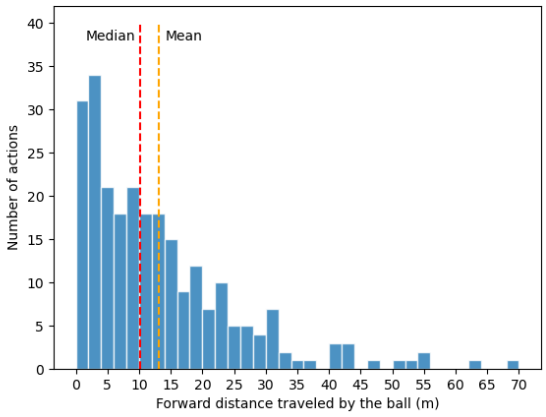

Figure 2. Distribution of ball advancement for Aitana Bonmatí.

Player	Forward median distance (m)	Num. actions
A. Bonmatí	10.2	252
T. Abelleira	10.0	392
A. Putellas	8.8	126
I. Guerrero	8.2	48
J. Hermoso	7.1	295
M. Pérez	6.5	6
A. Redondo	6.20	83

Table 1. Spanish midfielders forward actions.

Figure 2 illustrates the distribution of these actions. Notably, this distribution does not adhere to a normal distribution pattern. Consequently, we will utilize alternative statistical tests, such as the Mann-Whitney U test, to rigorously assess whether a statistically significant disparity exists in advancing the ball forward.

When we assess her performance relative to her teammates, specifically those who have played as midfielders in any of the games, it becomes evident that she stands out as the top performer. We only consider Spanish midfielders because defenders typically play further back on the pitch, which makes it comparatively simpler for them to advance the ball. Furthermore, Spain's unique possession play style makes it challenging to draw comparisons between her and other midfielders in the competition. This is why we exclusively use Spanish players for the comparison.

Hypothesis Testing

We formulate the following null and alternative hypotheses:

- Null Hypothesis (H_0): There is no statistically significant disparity in ball advancement between Aitana Bonmatí and her teammates, whether through carries or passes.
- Alternative Hypothesis (H_1): Aitana Bonmatí demonstrates statistically significant superiority in advancing the ball forward compared to her teammates, either by carrying it or by passing it.

After conducting the test with a significance level of 95%, we have sufficient evidence to reject the null hypothesis (p-value $= 0.03$). This suggests that Aitana Bonmatí does indeed exhibit a statistically significant advantage in advancing the ball compared to her teammates, either through carries or passes. So we can conclude that our hypothesis was right.