Problem Statement

In the game of softball, one crucial rule states that a pitch is only legal if the ball reaches a maximum height between 6 and 12 feet during its flight to the batter. Currently, umpires must estimate this height by eye for every single pitch. A challenging task that relies heavily on personal judgment and can vary from one umpire to another. This reliance on subjective estimation can lead to inconsistent calls, potentially altering the outcome of games and affecting the fairness and enjoyment of the sport. Players might strike out on pitches that should have been deemed illegal, and fans may witness games swayed by questionable decisions. These issues highlight a broader problem: the lack of accessible technology to assist in making precise, real-time measurements during games. To address this, we are developing an affordable and user-friendly device that tracks each pitch using a single camera, accurately measures the ball's height using machine learning, and alerts officials when a pitch falls outside the legal bounds. By eliminating the guesswork from pitch height estimation, we aim to enhance the accuracy of calls, uphold the integrity of the game, and improve the experience for players, umpires, and fans alike.

Intended Users

Our product is designed to benefit several key groups within the softball community, including umpires, players, fans, and coaches.

1. **Umpires**
   ○ **Description**: Umpires are the officials responsible for enforcing the rules of softball during games. They must make quick, accurate decisions under the pressure of real-time play, often without technological assistance.
   ○ **Needs**: Umpires need a reliable method to accurately determine if a pitch meets the legal height requirements, reducing the reliance on subjective judgment and minimizing errors that could impact the game's outcome.
   ○ **Benefits**: Our device provides umpires with precise, real-time measurements of each pitch's height. This technology aids them in making consistent and accurate calls, reducing stress and enhancing their confidence in officiating. By supporting umpires with accurate data, we help maintain the game's fairness and integrity, directly addressing the issues outlined in our problem statement.
2. **Players**
   ○ **Description**: All players in a softball game are directly affected by the calls made by umpires and strive for a fair and competitive environment to showcase their skills.
   ○ **Needs**: Players need assurance that the rules are being applied consistently so that their performance is judged fairly. Batters, in particular, need protection from illegal pitches that could unfairly result in strikeouts.
   ○ **Benefits**: With our device ensuring accurate detection of illegal pitches, players can trust that the game is being officiated fairly. Batters are less likely to be unfairly penalized, and pitchers receive clear feedback on the legality of their pitches. This fosters a fair playing field and allows players to focus on their performance, enhancing the game's overall quality in line with our problem-solving goals.
3. **Fans**
   ○ **Description**: Fans are the spectators who enjoy watching softball games, whether in person at the stadium or through broadcasts. They are passionate about the sport and value exciting, fair competition.
   ○ **Needs**: Fans desire an enjoyable viewing experience where the game's outcome is determined by player skill rather than officiating errors. They appreciate transparency and fairness in how the game is played and called.
   ○ **Benefits**: By improving the accuracy of pitch legality calls, our device enhances the fairness and excitement of the game, leading to a more

satisfying experience for fans. They can enjoy the sport knowing that technology is helping to uphold its integrity, which aligns with our aim to improve the overall enjoyment of softball.

4. **Coaches and Teams**
   ○ **Description**: Coaches and team staff are responsible for training players and developing game strategies. They work closely with players to improve skills and ensure compliance with the rules.
   ○ **Needs**: Coaches need effective tools to train pitchers on delivering legal pitches and to adjust strategies based on accurate information about gameplay.
   ○ **Benefits**: Our device can be used during practices to provide immediate feedback to pitchers on the height of their pitches, aiding in skill development and rule compliance. During games, accurate officiating supported by our product allows coaches to focus on strategy without worrying about inconsistent calls. This directly contributes to enhancing player performance and upholding fair competition, as highlighted in our problem statement.

By serving these users, our product addresses the critical issue of subjective pitch height estimation in softball. It promotes fair play, enhances the accuracy of officiating, and improves the overall experience for everyone involved in the sport. Our solution connects directly to our overarching goal of removing guesswork from the game, ensuring that softball is enjoyable, fair, and competitive for all participants.