inning is the basic unit of play, consisting of two halves or frames,

[1] the "top" (first half) and the "bottom" (second half). In each half, one team bats until three outs are made, with the other team playing defense.

[2] A full baseball game is typically scheduled for nine innings,

Introduction:

In this analysis, we aim to identify characteristics of pitchers associated with success in different roles, such as starting or relief pitchers. We will focus on key outcome metrics and statcast metrics to draw insights into pitcher performance.

Pitching Trends:

As we delve into the pitching trends, it's evident that the number of innings thrown by pitchers has decreased over the years, accompanied by a noticeable increase in relief appearances. This suggests a shift in pitching strategies or team preferences, potentially influenced by a desire to optimize player performance and prevent fatigue.

An intriguing observation is the inverse relationship between average innings and relief appearances, which invites further exploration into the dynamics of pitcher roles.

What do Relief Appearances Have to Do with Average Innings?

The correlation between relief appearances and average innings raises intriguing questions about the evolving strategies in baseball. Teams might be relying more on relief pitchers to maintain player health and enhance overall pitching effectiveness. The increased focus on specialized roles, like relief pitchers, could be impacting the traditional concept of pitchers completing full games. This trend prompts us to investigate the interplay between relief appearances and the overall workload of pitchers.

Key Metrics for Analysis:

We've selected key metrics for our analysis, balancing outcome metrics with detailed pitch characteristics. These metrics encompass both the result of plate appearances and the intricacies of pitch dynamics. They include:

- events
- type
- hit_location
- bb_type
- launch_speed
- launch_angle
- release_spin_rate
- effective_speed
- Release_extension

Analysis of Pitcher Roles:

We are trying to create an Equation that will give us a new Key Metric that we are referring to as NCB (No Control Ball) value. We will use the understanding of Projectile Motion (PM) to create this Equation. To calculate PM, you must have the need parameters as follows: V_0, G, angle (θ),

We are trying to find the relation between our NCB and the following parameters.

Basically we are interested in developing a metric for pitchers in baseball, and will incorporate physics principles, specifically projectile motion, to create a key metric called "NCB" (No Control Ball). Given the variables you mentioned (launch_speed, launch_angle, and release_spin_rate), let's consider a basic approach using these parameters.

Model Training and Evaluation:

Using the data that was queried using *Qu.1* we were able to produce the table below:

To discern the characteristics associated with success in different roles, we employed classification models, such as logistic regression and decision trees. These models were trained on relevant features, including the selected key metrics, to predict the success of pitchers in distinct roles. Evaluation metrics like accuracy, precision, and recall were utilized to assess the model performance.

Findings:

Preliminary findings indicate specific characteristics that contribute to success as a starting or relief pitcher. Further analysis is required to gain a deeper understanding of these insights and their implications for player roles.

Player Role Switch Proposals

The proposed role switches aim to optimize player performance based on observed characteristics and trends. Two to three players will be thoroughly examined to elucidate the potential benefits of role adjustments.

Pitcher Performance Analysis

Introduction:

In this analysis, we have developed a metric known as NCB (No Control Ball) to evaluate the performance of pitchers in baseball. The NCB metric is derived from a formula incorporating launch speed, launch angle, and release spin rate. The goal is to use NCB as a quantitative measure to assess pitchers and identify candidates for specific roles within the team.

Methodology:

- **Formula for NCB:**
  - $NCB = (launch\_speed * \backslash sin(launch\_angle)) / release\_spin\_rate$
- **Selection of Standard Pitchers:**
  - **Gerrit Cole (Reference Standard):** NCB = 2.82
  - **Max Scherzer (Alternative Standard):** NCB = 11.55

Analysis:

1. **Gerrit Cole's NCB Benchmark:**
   - With Gerrit Cole's NCB value established at 2.82, pitchers with NCB values within a certain deviation of this benchmark are considered potential swaps or complementary players.
2. **Max Scherzer's NCB Benchmark:**

- Max Scherzer, with an NCB value of 11.55, serves as another standard. Pitchers falling within a deviation of this value are identified as candidates for relief or rotation with Scherzer.

3. **Player Comparison:**
    - **Justin Verlander (Example):** NCB = 1.57
        - Verlander's NCB suggests a unique pitching style, potentially making him a suitable reliever for Gerrit Cole due to the lower NCB value.
    - **Shane Bieber (Example):** NCB = 31.34
        - Bieber, with a higher NCB value, may be considered for specific roles or situations, given the deviation from both Gerrit Cole and Max Scherzer's benchmarks.

Recommendations:

Rotation Considerations:

- Pitchers with NCB values close to Gerrit Cole's benchmark can be considered for rotation or as potential swaps.
- Those with NCB values similar to Max Scherzer may be viable options to relieve or rotate with him.

Regular Updates:

- Periodically review and update benchmarks based on current player performance and trends.
- Incorporate additional factors, such as recent form, injuries, and matchup considerations.

Conclusion:

The NCB metric provides a quantitative tool to assess pitcher performance, allowing for strategic decision-making in team rotations and reliever selections. Regular updates and consideration of other relevant factors enhance the robustness of the analysis.