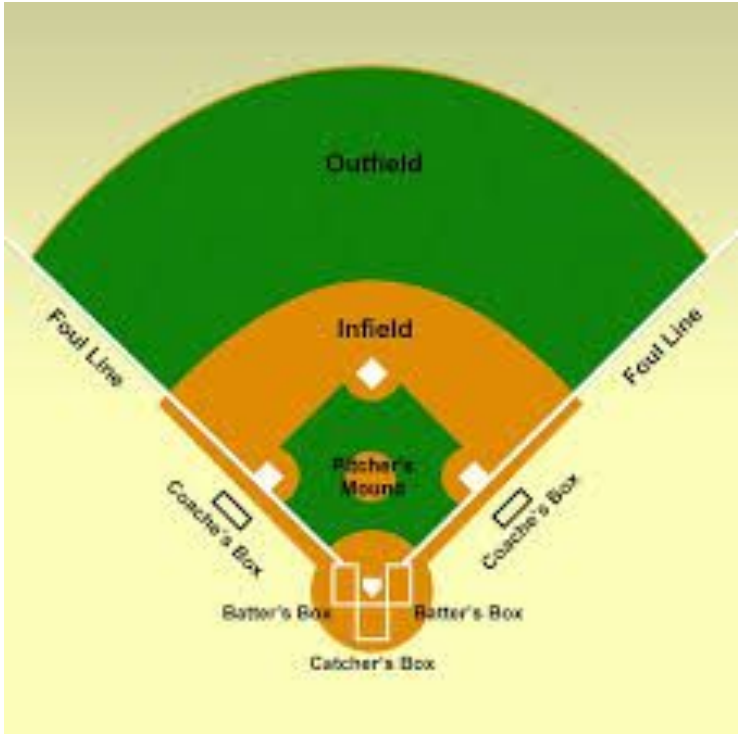
Analyzing UNCW Pitchers

William Toman, Mavin James, and Sean Burke

A Background of America's Pastime - Baseball

A bat-and-ball game where two teams compete to score runs by advancing around four bases.The team with the most runs after **9 innings** wins.

- **Pitcher vs. Batter**: The pitcher throws the ball; the batter tries to hit.
- **Run**: When a player advances around all four bases.
- **Out**: Three outs end a team’s turn to bat.



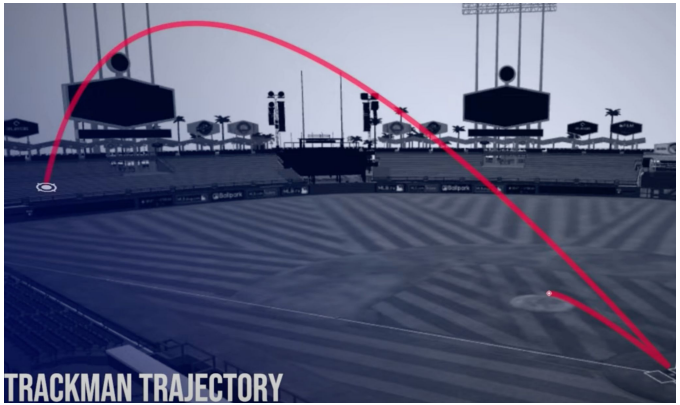
What Makes a Good Pitcher

1. **Accuracy**:
   - Consistently throws strikes and hits target zones to outsmart batters.
2. **Pitch Variety**:
   - Uses different pitches.
3. **Velocity & Movement**:
   - Fast pitches challenge hitters; movement makes them harder to hit.
4. **Mental Toughness**:
   - Stays composed in high-pressure moments, like pitching with runners on base.

UNCW Pitcher RJ Sales finished the year with a team leading 93 Strikeouts making him one of the most dangerous pitchers in College Baseball

What is Trackman Data?

- Originally created for golf
- A platform that uses Doppler radar to track the baseball during a game
- $19,000 for the most basic setup
- Used by all professional teams in the U.S. and Japan, starting to grow in college baseball
- Provides meaningful data for player and team development



Data Wrangling & our Dataset

- 2023-24 season (43 out of 61 total games)
- **167 columns** and around **54,000 rows**
- Filtered for pitch specific columns
- TaggedPitchType', 'PitchCall', 'PlateLocSide', and 'PlateLocHeight'
- Well structured data

PitchCall	
BallCalled	4984
StrikeCalled	2490
InPlay	2286
FoulBall	2175
StrikeSwinging	1517
BallinDirt	409

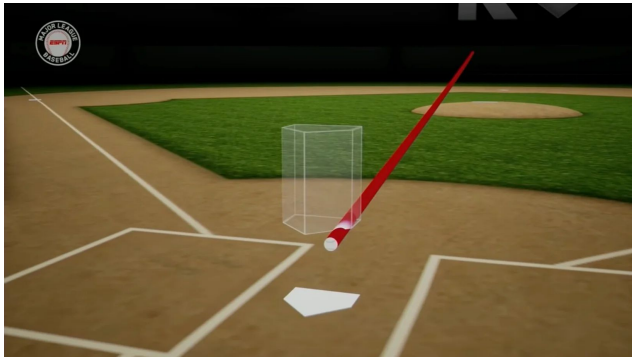
TaggedPitchType	
FourSeamFastBall	3993
Slider	3048
Sinker	2832
ChangeUp	1566
Cutter	1191
Curveball	956

Function to Visualize Pitch Locations

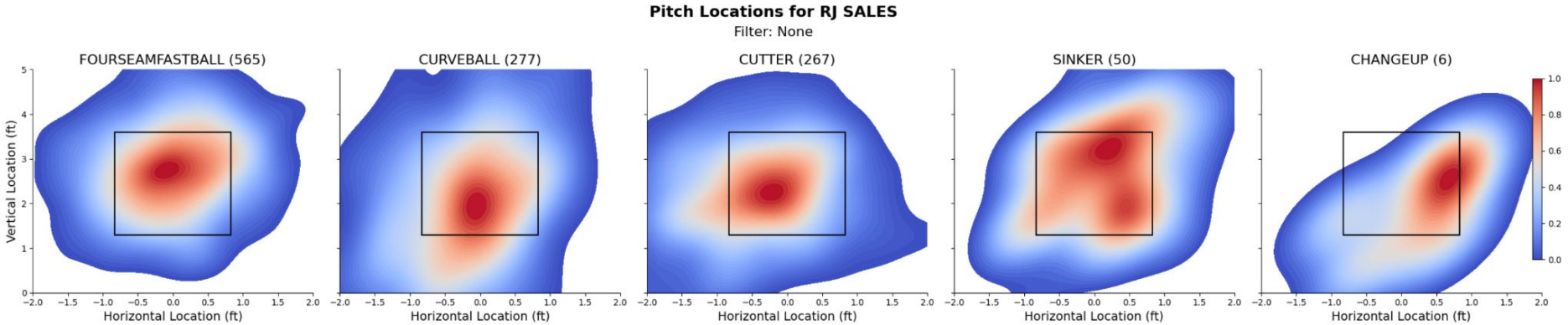
```
def plot_pitcher_data_heat(pitchers_df, pitcher_firstname, pitcher_lastname, pitch_call = None)
```

- **Input**: Pitcher's first and last name and optional pitch outcome
- **Purpose**: Explore a pitcher's entire pitch arsenal by their accuracy
- **Sorting**: Filter by pitch outcomes ("StrikeSwinging", "FoulBall", "InPlay", etc.).
- **Output**: Grid displaying a heatmap for each pitch type in a pitcher's arsenal

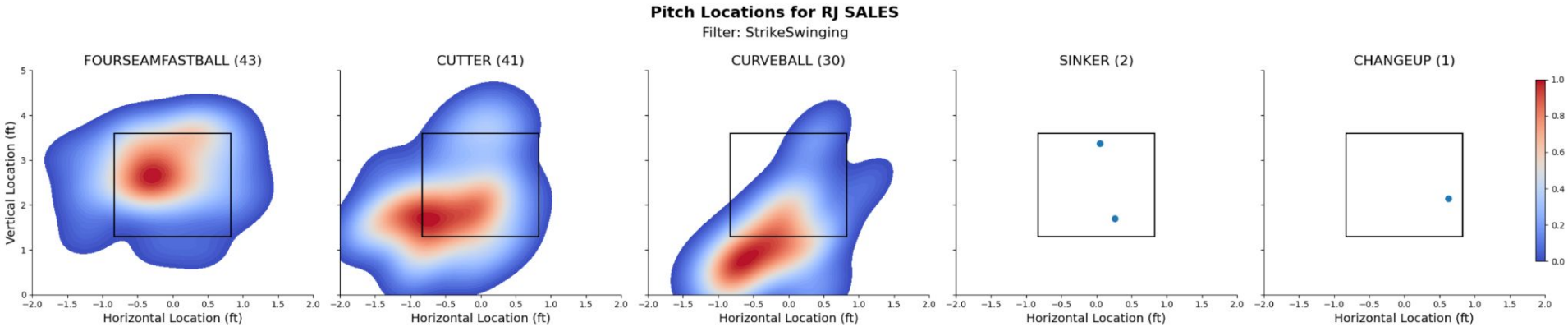
Pitch location relative to home plate:



```
plot_pitcher_data_heat(all_pitcher_info, "rj", "sales")
```



```
plot_pitcher_data_heat(all_pitcher_info, "rj", "sales", "StrikeSwinging")
```



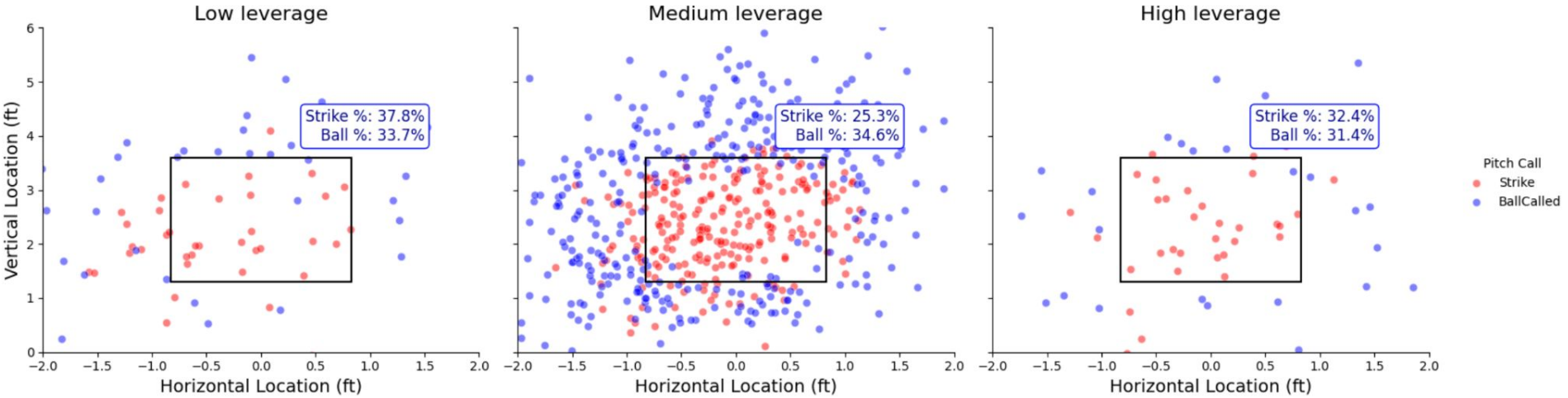
Using Situations to View the Bigger Picture

Leverage

- Evaluating how much a single play can impact the game result.
- **High leverage** is defined as the most crucial parts of the game.
- **Medium Leverage**: relevant plays but do not have a drastic importance.
- **Low leverage** usually occurs when the game is out of reach or a blowout.

Handedness

- Is the pitcher throwing right or left handed and is the batter hitting from the right or left side.


Pitch Locations for RJ SALES
Low leverage
Medium leverage
High leverage
Strike %: 37.8%
Ball %: 33.7%
Strike %: 25.3%
Ball %: 34.6%
Strike %: 32.4%
Ball %: 31.4%
Vertical Location (ft)
Horizontal Location (ft)
Pitch Call
Strike
BallCalled

UNCW Pitch Type by Count :

(Top five pitchers in 2023)

Strikes

(Pitcher advantage)

Balls

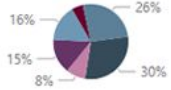
(Batter advantage)

Pitch Type

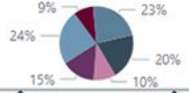
- FastBall
- ChangeUp
- Cutter
- Slider
- Curveball
- Sinker

Result of Pitch 1

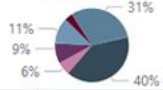
Count 0-0



Count 0-1

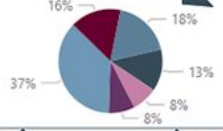


Count 1-0

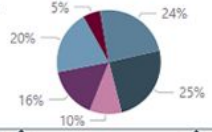


Result of Pitch 2

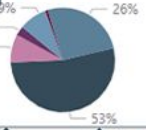
Count 0-2



Count 1-1



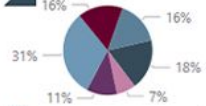
Count 2-0



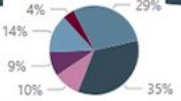
Result of Pitch 3

Strike Out

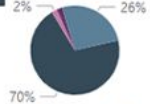
Count 1-2



Count 2-1



Count 3-0

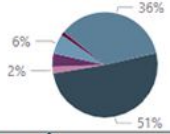


Result of Pitch 4

Strike Out

Count 2-2

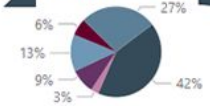
Count 3-1



Walk

Result of Pitch 5

Count 3-2



Strike Out

Walk

Conclusion:

- Data Relevance
- Functions allow versatility
- Scouting, player development, and game strategy

Future Work - Application in Models

1. **Performance Prediction**:
    - Use features like K%, BB%, and pitch qualities to predict a pitcher’s success in specific situations.
2. **Matchup Optimization**:
    - Leverage handedness and leverage metrics to determine ideal matchups and roles for pitchers.
3. **Pitch Effectiveness**:
    - Evaluate the impact of pitch qualities (e.g., IVB, Spin Rate) on strikeout rates and opponent batting averages.
4. **Player Development**:
    - Identify areas for improvement based on performance trends.

Thank you!!!

Questions?

Feature Creation

1. **Pitch Qualities**:
    - **Velocity**: Measures the speed of each pitch..
    - **Horizontal Break & Induced Vertical Break (IVB)**: Quantifies pitch movement.
    - **Spin Rate**: Indicates how much spin is imparted on the ball, affecting movement.
2. **Extension**:
    - Measures how far a pitcher releases the ball from the mound.
3. **Performance Metrics**:
    - **K%**: Percentage of plate appearances ending in a strikeout.
    - **BB%**: Percentage of plate appearances resulting in a walk.
4. **Leverage-Based Performance**:
    - Pitcher performance analyzed across **low**, **medium**, and **high leverage** situations.
5. **Handedness Matchups**:
    - Metrics broken down by batter hand, revealing matchup-specific strengths.