MLB Multi-Out Play Mechanics

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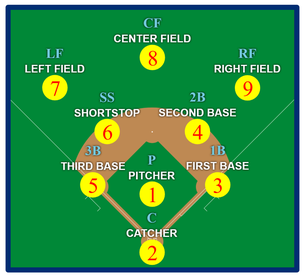
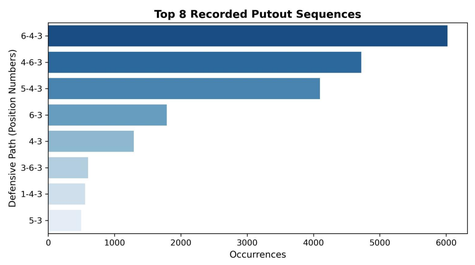
Abstract

Multi-out plays (double and triple plays) are high-leverage defensive events in Major League Baseball that can rapidly shift game win expectancy. Using data from roughly 24,000 multi-out plays, this project applies unsupervised machine learning and association rule mining to uncover how pre-pitch context dictates defensive execution and to isolate extreme anomalies.



Baseball Positions by Number



Top 8 putout sequences on multi-out plays

Methods

Dataset & Preprocessing: ~24,000 MLB plays from regular and postseason games since November 2019, each with 119 pieces of data recorded on them.

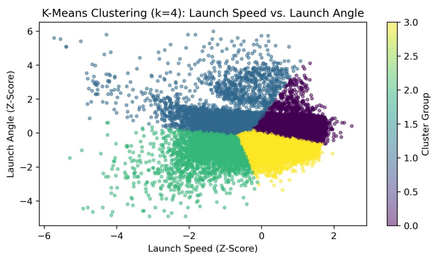
K-Means Clustering: Segmented batted-ball kinematics (Launch Speed, Launch Angle, Spray Angle, Hit Distance) to find distinct trajectory profiles (grounders vs. pop-fly outs).

Apriori Association Rule Mining: Mining frequent item sets across pitch type, count, matchup, and infield alignment, filtered to find and predict common put-out chains.

Isolation Forest & Sensitivity Analysis: Flagged the top 1% outliers (contamination = 0.01) in 4D space to find the weirdest and most unusual plays. A video clip of each play was also obtained via statcast.

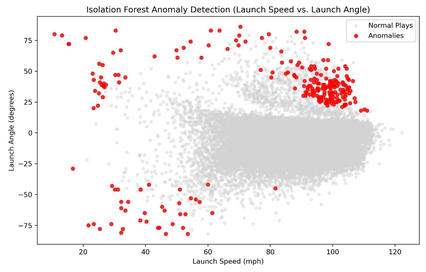
Results

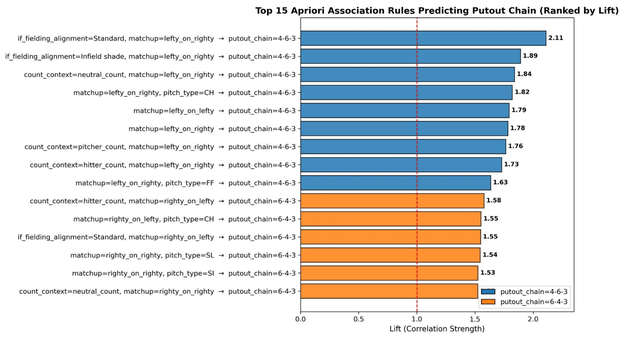
- **Matchup & Turn Direction:** Left-handed batters correlate strongly with 4-6-3 turns (lift - 2.11). Right-handed batters correlate with 6-4-3 turns (lift - 1.58).
- **Alignment & Pitch Type:** Using an Infield shade drops 4-6-3 confidence against lefties from 40.0% to 35.9% because middle infielders convert more balls into 6-3 or 3-6-3 plays. Changeups tend to make more 6-4-3 turns in Righty on Lefty matchups, while sliders and sinkers do in Righty-on-Righty matchups.
- **Outlier Detection:** The Isolation Forest (with a contamination of 0.01) flagged plays that have multiple extreme/abnormal metrics at once. The top 1% abnormal plays are mostly popped-up bunts near home plate and deep fly balls with baserunning outs.



K-Means clustering with 4 centroids, using 4 kinematic variables (Launch Speed, Launch Angle, Spray Angle, and Hit Distance) visualized in 2D via Launch Speed by Launch Angle

A scatterplot highlighting all plays recognized as an anomaly by the Isolation Forest (top 1%)





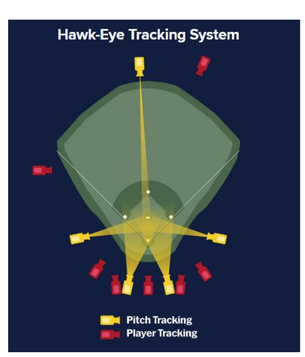
Tracking

Automated Video Retrieval: A function to match flagged anomalies to the MLB Stats API that automates finding broadcast video clips for manual review. Written in Python.



The play with the highest anomaly score: Geraldo Perdomo bunt pops into a double play in foul territory, catcher J.T. Realmuto to second baseman Bryson Stott. May 2nd, 2025
Arizona Diamondbacks @ Philadelphia Phillies

The Hawk-Eye Tracking System: A setup of 12 optical tracking cameras, implemented in all MLB stadiums to power Statcast analytics and the new ABS system as of 2026



Acknowledgements

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