

# Pitch-by-Pitch Savant Variables

[Variable Documentation](#) - November 10, 2023

## Variables by Category

### Pitch Values:

- pitch type
- pitch name
- release speed
- release position
- pitch location zone
- induced horizontal movement
- induced vertical movement
- horizontal location of ball
- vertical location of ball
- effective release speed
- spin rate
- release extension
- release distance from plate (release\_pos\_y)
- spin\_axis
- 3D velocity of pitch @ 50ft
- 3D acceleration of pitch @ 50ft

### Hit / Play Results:

- pitch result
- batted ball type
- hit location
- horizontal hit location
- vertical hit location
- hit distance
- launch speed
- launch angle
- xBA (speed angle)
- xwOBA (speed angle)
- wOBA
- wOBA denominator
- BABIP
- ISO
- launch speed & angle zone classification
- change in [home] win expectancy
- change in [home] run expectancy

**Game / Pitch Context:**

- game date
- game year
- game type
- unique game id
- home team
- away team
- runner on 3b
- runner on 2b
- runner on 1b
- outs
- inning
- inning top/bot
- pitcher
- pitcher throwing hand
- fielder 2 - 9
- umpire
- strikezone top
- strikezone bottom
- at bat number
- pitch number
- home score
- away score
- batting team score
- fielding team score
- infield fielding alignment
- outfield fielding alignment

## Full List of Variables

- **pitch\_type**
  - The type of pitch derived from Statcast.
- **game\_date**
  - Date of the Game.
- **release\_speed**
  - Velocities from 2017 and beyond are Statcast, which are reported out-of-hand.
  - Pitch velocities from 2008-16 are via Pitch F/X, and adjusted to roughly out-of-hand release point.
- **release\_pos\_x**
  - Horizontal Release Position of the ball measured in feet from the catcher's perspective.
- **release\_pos\_z**
  - Vertical Release Position of the ball measured in feet from the catcher's perspective.
- **player\_name**
  - Player's name tied to the event of the search.
- **batter**
  - MLB Player Id tied to the play event.
- **pitcher**
  - MLB Player Id tied to the play event.
- **events**
  - Event of the resulting Plate Appearance.
- **description**
  - Description of the resulting pitch.
- **spin\_dir**
  - \* Deprecated field from the old tracking system.
- **spin\_rate\_deprecated**
  - \* Deprecated field from the old tracking system. Replaced by **release\_spin**
- **break\_angle\_deprecated**
  - \* Deprecated field from the old tracking system.
- **break\_length\_deprecated**
  - \* Deprecated field from the old tracking system.
- **zone**
  - Zone location of the ball when it crosses the plate from the catcher's perspective.
- **des**
  - Plate appearance description from game day.
- **game\_type**
  - Type of Game: E = Exhibition, S = Spring Training, R = Regular Season, F = Wild Card, D = Divisional Series, L = League Championship Series, W = World Series
- **stand**
  - Side of the plate batter is standing.
- **p\_throws**
  - Hand pitcher throws with.
- **home\_team**
  - Abbreviation of home team.
- **away\_team**
  - Abbreviation of away team.
- **type**
  - Short hand of pitch result: B = ball, S = strike, X = in play.
- **hit\_location**
  - Position of first fielder to touch the ball.
- **bb\_type**
  - Batted ball type: **ground\_ball**, **line\_drive**, **fly\_ball**, **popup**.
- **balls**
  - Pre-pitch number of balls in count.
- **strikes**
  - Pre-pitch number of strikes in count.
- **game\_year**
  - Year game took place.
- **pfx\_x**
  - Horizontal movement in feet from the catcher's perspective.
- **pfx\_z**
  - Vertical movement in feet from the catcher's perspective.
- **plate\_x**
  - Horizontal position of the ball when it crosses home plate from the catcher's perspective.

- plate\_z
  - Vertical position of the ball when it crosses home plate from the catcher's perspective.
- on\_3b
  - Pre-pitch MLB Player Id of Runner on 3B.
- on\_2b
  - Pre-pitch MLB Player Id of Runner on 2B.
- on\_1b
  - Pre-pitch MLB Player Id of Runner on 1B.
- outs\_when\_up
  - Pre-pitch number of outs.
- inning
  - Pre-pitch inning number.
- inning\_topbot
  - Pre-pitch top or bottom of inning.
- hc\_x
  - Hit coordinate X of batted ball.
- hc\_y
  - Hit coordinate Y of batted ball.
- tfs\_deprecated
  - \* Deprecated field from old tracking system.
- tfs\_zulu\_deprecated
  - \* Deprecated field from old tracking system.
- fielder\_2
  - Pre-pitch MLB Player Id of Catcher.
- umpire
  - \* Deprecated field from old tracking system.
- sv\_id
  - Non-unique Id of play event per game.
- vx0
  - The velocity of the pitch, in feet per second, in x-dimension, determined at y=50 feet.
- vy0
  - The velocity of the pitch, in feet per second, in y-dimension, determined at y=50 feet.
- vz0
  - The velocity of the pitch, in feet per second, in z-dimension, determined at y=50 feet.
- ax
  - The acceleration of the pitch, in feet per second per second, in x-dimension, determined at y=50 feet.
- ay
  - The acceleration of the pitch, in feet per second per second, in y-dimension, determined at y=50 feet.
- az
  - The acceleration of the pitch, in feet per second per second, in z-dimension, determined at y=50 feet.
- sz\_top
  - Top of the batter's strike zone set by the operator when the ball is halfway to the plate.
- sz\_bot
  - Bottom of the batter's strike zone set by the operator when the ball is halfway to the plate.
- hit\_distance
  - Projected hit distance of the batted ball.
- launch\_speed
  - Exit velocity of the batted ball as tracked by Statcast. For the limited subset of batted balls not tracked directly, estimates are included based on the process described here.
- launch\_angle
  - Launch angle of the batted ball as tracked by Statcast. For the limited subset of batted balls not tracked directly, estimates are included based on the process described here.
- effective\_speed
  - Derived speed based on the the extension of the pitcher's release.
- release\_spin
  - Spin rate of pitch tracked by Statcast.
- release\_extension
  - Release extension of pitch in feet as tracked by Statcast.
- game\_pk
  - Unique Id for Game.
- pitcher
  - MLB Player Id tied to the play event.
- fielder\_2
  - MLB Player Id for catcher.
- fielder\_3
  - MLB Player Id for 1B.

- fielder\_4
  - MLB Player Id for 2B.
- fielder\_5
  - MLB Player Id for 3B.
- fielder\_6
  - MLB Player Id for SS.
- fielder\_7
  - MLB Player Id for LF.
- fielder\_8
  - MLB Player Id for CF.
- fielder\_9
  - MLB Player Id for RF.
- release\_pos\_y
  - Release position of pitch measured in feet from the catcher's perspective.
- estimated\_ba\_using\_speedangle
  - Estimated Batting Avg based on launch angle and exit velocity.
- estimated\_woba\_using\_speedangle
  - Estimated wOBA based on launch angle and exit velocity.
- woba\_value
  - wOBA value based on result of play.
- woba\_denom
  - wOBA denominator based on result of play.
- babip\_value
  - BABIP value based on result of play.
- iso\_value
  - ISO value based on result of play.
- launch\_speed\_angle
  - Launch speed/angle zone based on launch angle and exit velocity.
    - 1: Weak
    - 2: Topped
    - 3: Under
    - 4: Flare/Burner
    - 5: Solid Contact
    - 6: Barrel
- at\_bat\_number
  - Plate appearance number of the game.
- pitch\_number
  - Total pitch number of the plate appearance.
- pitch\_name
  - The name of the pitch derived from the Statcast Data.
- home\_score
  - Pre-pitch home score
- away\_score
  - Pre-pitch away score
- bat\_score
  - Pre-pitch bat team score
- fld\_score
  - Pre-pitch field team score
- post\_home\_score
  - Post-pitch home score
- post\_away\_score
  - Post-pitch away score
- post\_bat\_score
  - Post-pitch bat team score
- if\_fielding\_alignment
  - Infield fielding alignment at the time of the pitch.
- of\_fielding\_alignment
  - Outfield fielding alignment at the time of the pitch.
- spin\_axis
  - The Spin Axis in the 2D X-Z plane in degrees from 0 to 360, such that 180 represents a pure backspin fastball and 0 degrees represents a pure topspin (12-6) curveball
- delta\_home\_win\_exp
  - The change in Win Expectancy before the Plate Appearance and after the Plate Appearance
- delta\_run\_exp
  - The change in Run Expectancy before the Pitch and after the Pitch