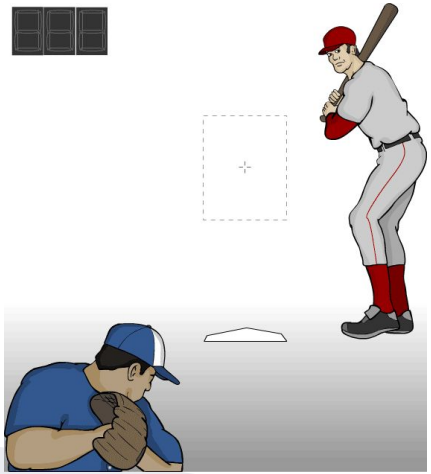
STATS TO EVALUATE THE PERFORMANCE OF BATTERS

BY CHIEN YUAN CHANG 10-1-2021

INTRODUCTION - MOTIVATION

- Statcast
  - Introduced to all 30 MLB stadiums in 2015



INTRODUCTION - OBJECTIVE/GOALS

- Objectives
  - A Linear Regression model to interpret the factors and predict the performances of the batters
- Goals
  - Baseball franchises and fantasy baseball players
    - Evaluate the batters
  - The coaches and players
    - Adjust hitting types and improve performances

METHODOLOGY - OVERVIEW

- Data
  - 2015-2019 Batters with at least 162 PA in a single season
- Tools
  - Python: BeautifulSoup, SQLAlchemy, Pandas, Numpy, Matplotlib, Seaborn, Scikit-learn, Statsmodels, Scipy
  - SQLite 3

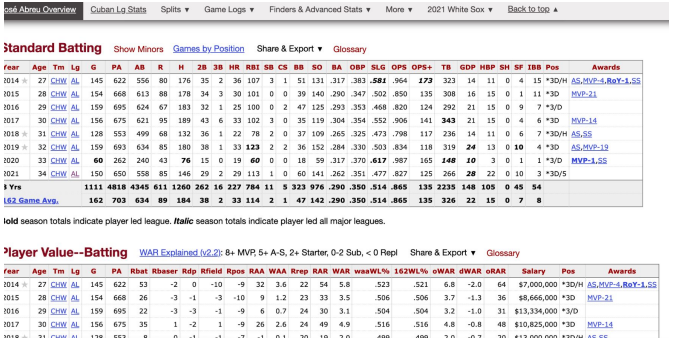
TARGET - ON-BASE PLUS SLUGGING PLUS (OPS+)

- What is OPS (on-base plus slugging)?
  - OBP(on-base percentage) + SLG (slugging percentage)
- What is OPS+?
  - (OPS / league OPS, adjusted for park factors) x 100
- Why OPS+?
  - Easy to understand
  - Representative of important offensive skills
  - Normalized, mean = 100

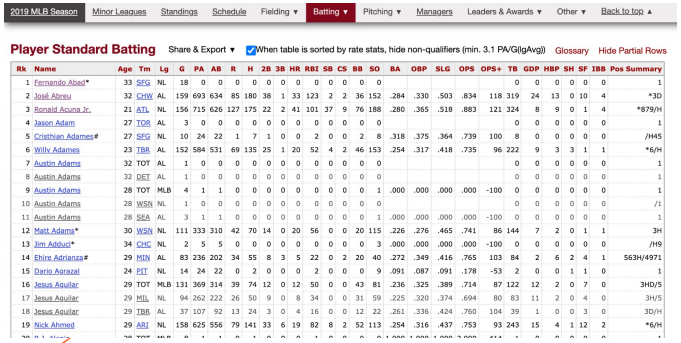
WEB-SCRAPING FROM BASEBALL REFERENCE

1. Scraping the list of 2015-2019 players and the addresses of their player pages

2. Scraping the pages of each player



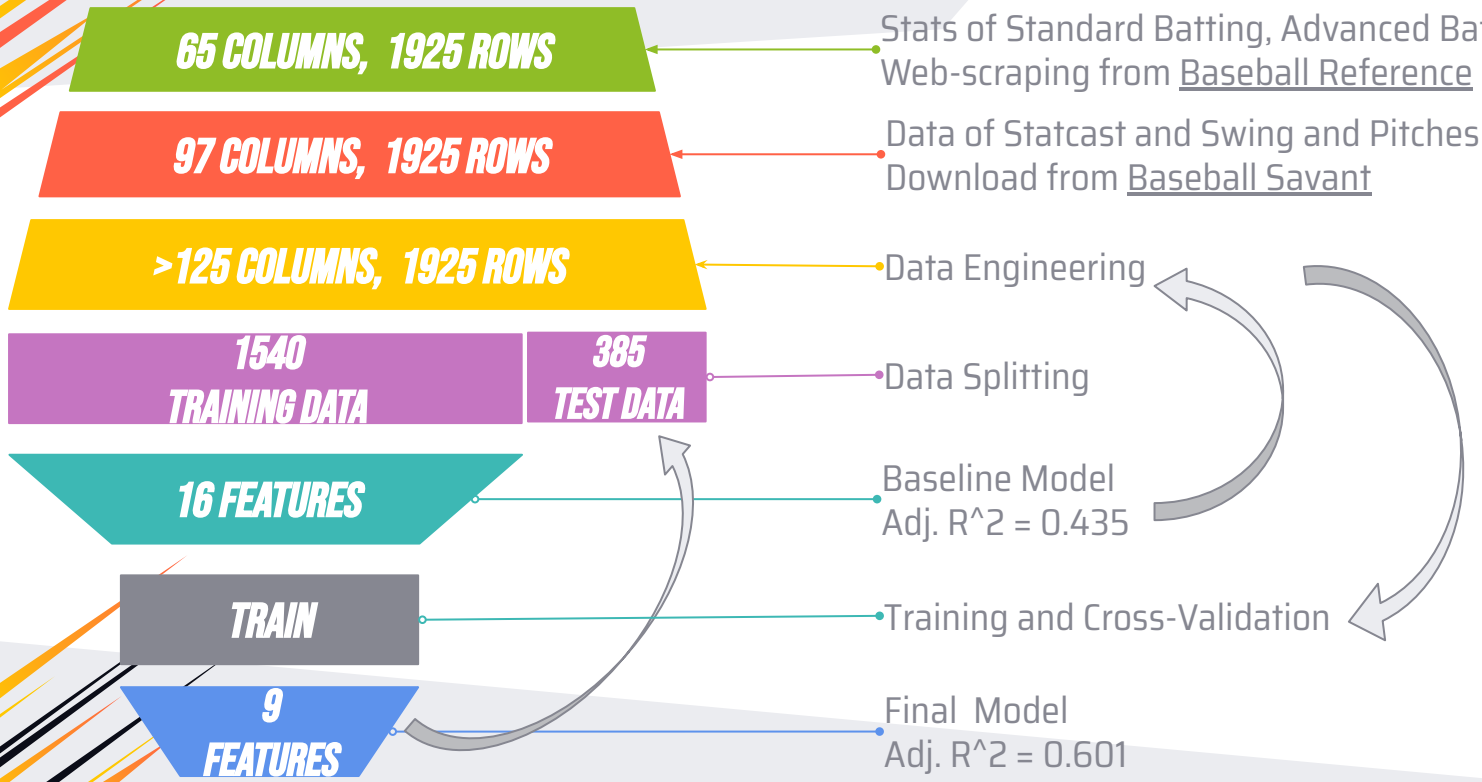
3. CSV



4. Data Cleaning by Pandas

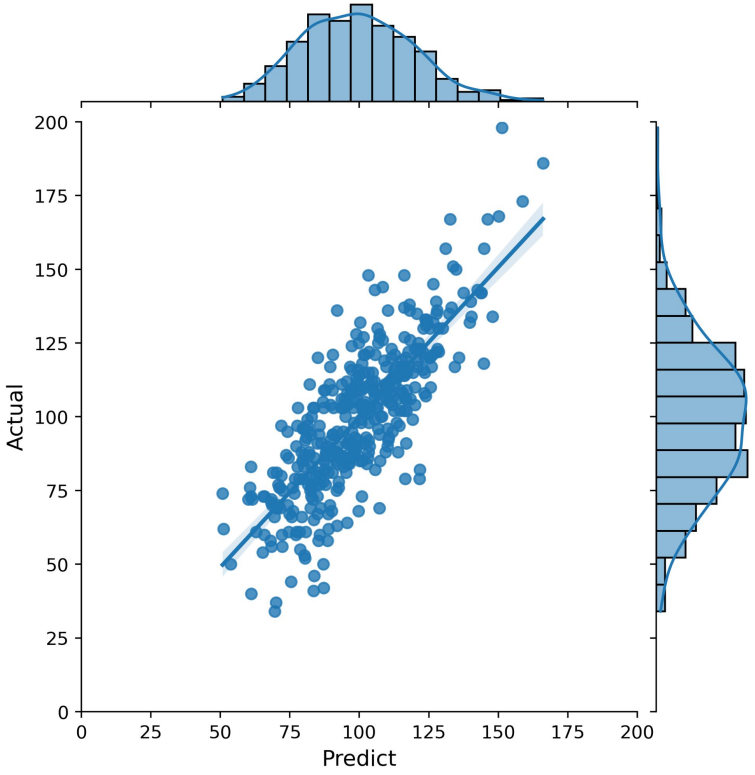
5. SQLite3

DATA FLOW


65 COLUMNS, 1925 ROWS
Stats of Standard Batting, Advanced Batting, and Ratio Batting
Web-scraping from Baseball Reference
97 COLUMNS, 1925 ROWS
Data of Statcast and Swing and Pitches
Download from Baseball Savant
>125 COLUMNS, 1925 ROWS
Data Engineering
1540 TRAINING DATA
385 TEST DATA
Data Splitting
16 FEATURES
Baseline Model
Adj. R^2 = 0.435
TRAIN
Training and Cross-Validation
9 FEATURES
Final Model
Adj. R^2 = 0.601

RESULT - LINEAR REGRESSION MODEL(OLS)

- Test Data
  - Adj. R^2
    - 0.626
  - R^2
    - 0.635
  - MAE
    - 11.963
  - RMSE
    - 15.367



RESULT - FEATURES

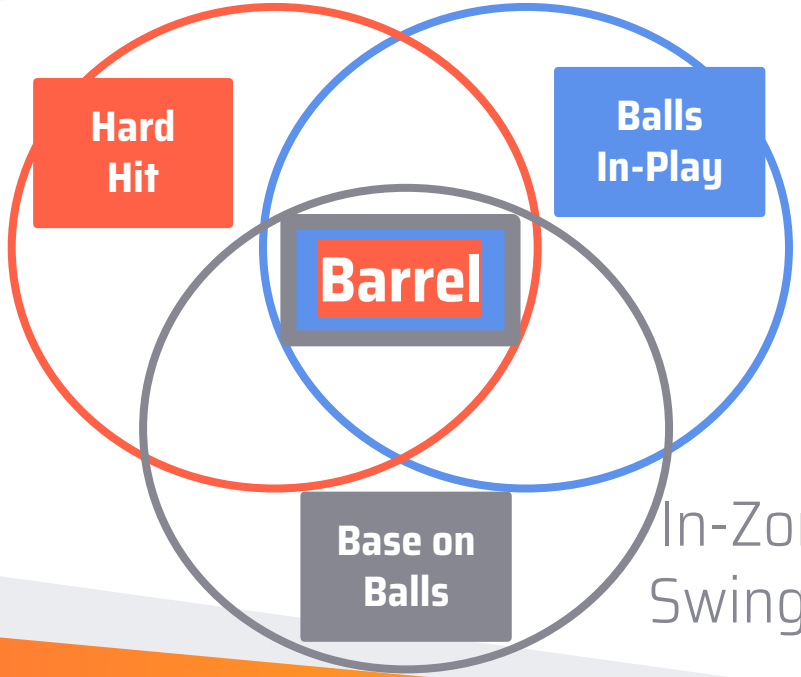
Features	Coefficient	P-Value
Constant	-41.53	0.001*
Barrel Batted%	6.263	<0.001*
Sprint Speed(ft/sec)	3.075	<0.001*
Swing%	-1.568	<0.001*
Z-Swing% * Z-Contact% / 100	1.563	<0.001*
SweetSpot% - Barrel Batted%	1.393	<0.001*
Outside the Zone Swing&Miss%	-0.966	<0.001*
Hard Hit% - Barrel Batted%	0.658	<0.001*
Fly Ball%	-0.522	<0.001*
Age - 17	-0.393	0.001*

Comprehensive | Eye | Contact | Power | Other

CONCLUSIONS - STATCAST IS A GREAT TOOL

Power
Higher Exit Velocity

- Speed
  - Advantage
- Age
  - Small Disadvantage



Contact
Swing and Contact With Right Angle (Sweet Spot)

Eye
In-Zone/Out-Zone Swing/Don't Swing

FUTURE WORK

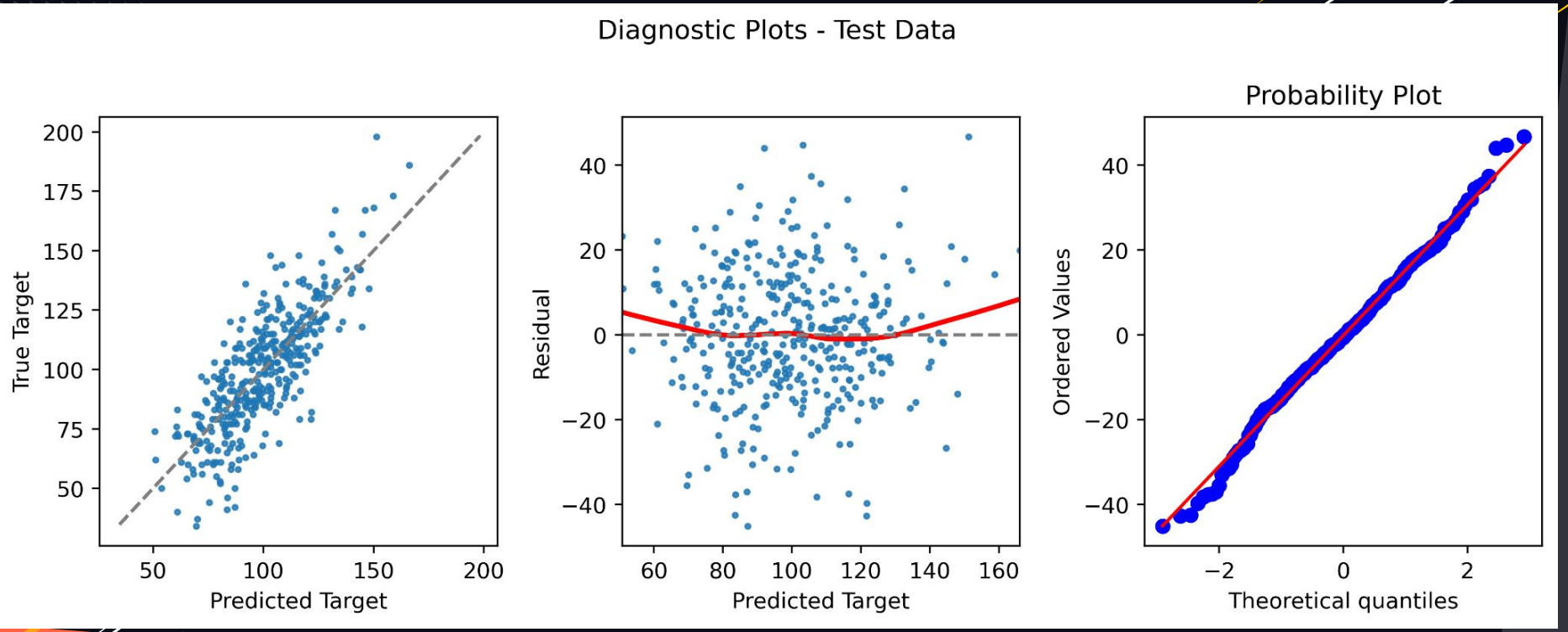
- Test the model with 2020, 2021 and future data
- Dig into the swing data more
- Research the play-by-play data with the statcast
- Analyze pitcher data

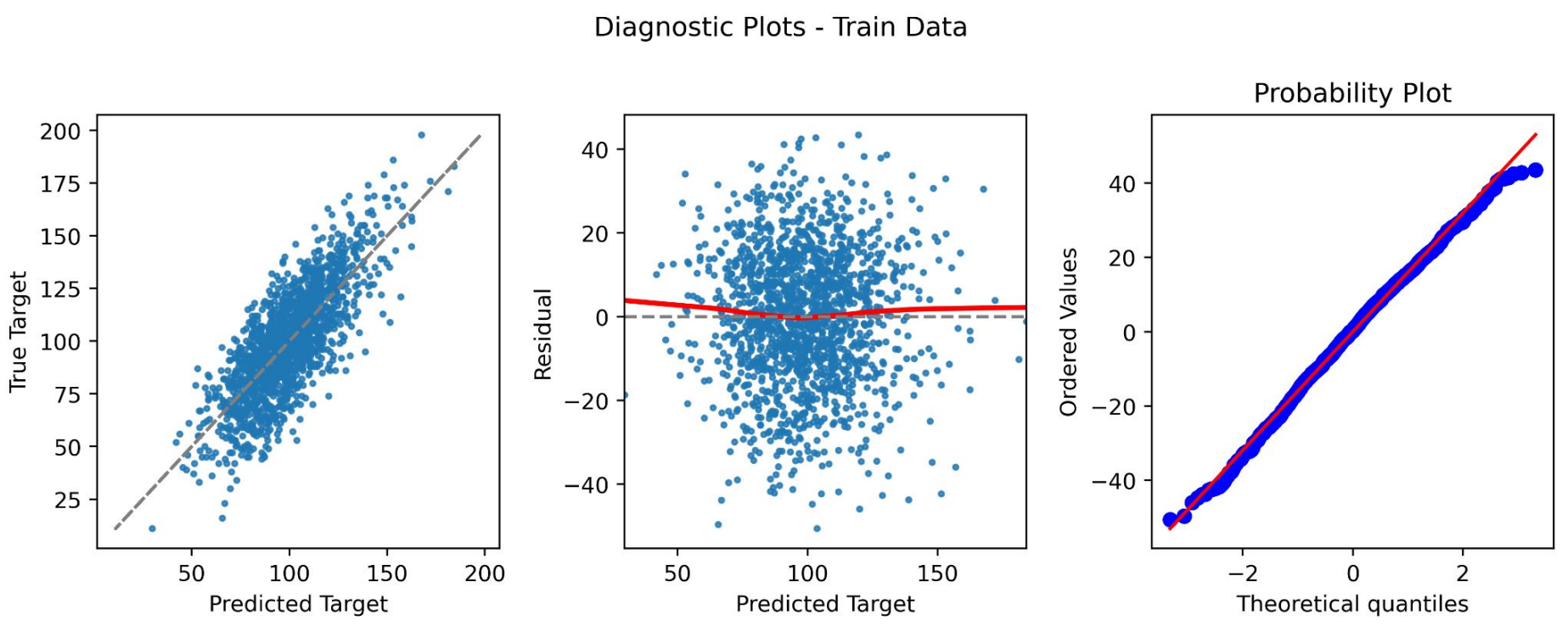
THANK YOU!

APPENDIX

RESOURCES

- https://www.mlb.com/
- https://www.baseball-reference.com/
- https://baseballsavant.mlb.com/
- https://en.wikipedia.org/


Diagnostic Plots - Test Data
True Target
Predicted Target
Residual
Predicted Target
Probability Plot
Ordered Values
Theoretical quantiles


Diagnostic Plots - Train Data
True Target
Predicted Target
Residual
Predicted Target
Probability Plot
Ordered Values
Theoretical quantiles