



Pass Forward

Anticipating Quarterback Performance



OBJECTIVE

+ + +
+ + +
+ + +

Use a QB's career data to project future
(2023) performance.

+ + +
+ + +
+ + +

Give NFL organizations insight.
Sports betting, Fantasy football.

QB PERFORMANCE



Passing Statistics:

- Yards
- Touchdowns
- Completion %

Common Rating Systems:

- Passer Rating
- ESPN QBR



GRADE

0 - 100



NEGATIVE

- Poor throws (independent of outcome)
- Turnover in a critical situation



OFFENSIVE GRADE

- Passing grade
- Rushing grade



POSITIVE

- Accurate throws (independent of outcome)
- Deep 3rd down conversions
- Great pass in a clutch situation

GOAL

+ + + Predict **Offensive grade** of NFL QBs
+ + + in the 2023 season.
+ + +





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01

DATA

THE DATASET

**288
QBs**

From 2006-2023 (18 NFL regular seasons)

**1306
Seasons**

From backups who only played 1 game to
season-long starters who played all games

**61
Features**

Passing & rushing statistics:
Raw numbers, as well as normalized percentages

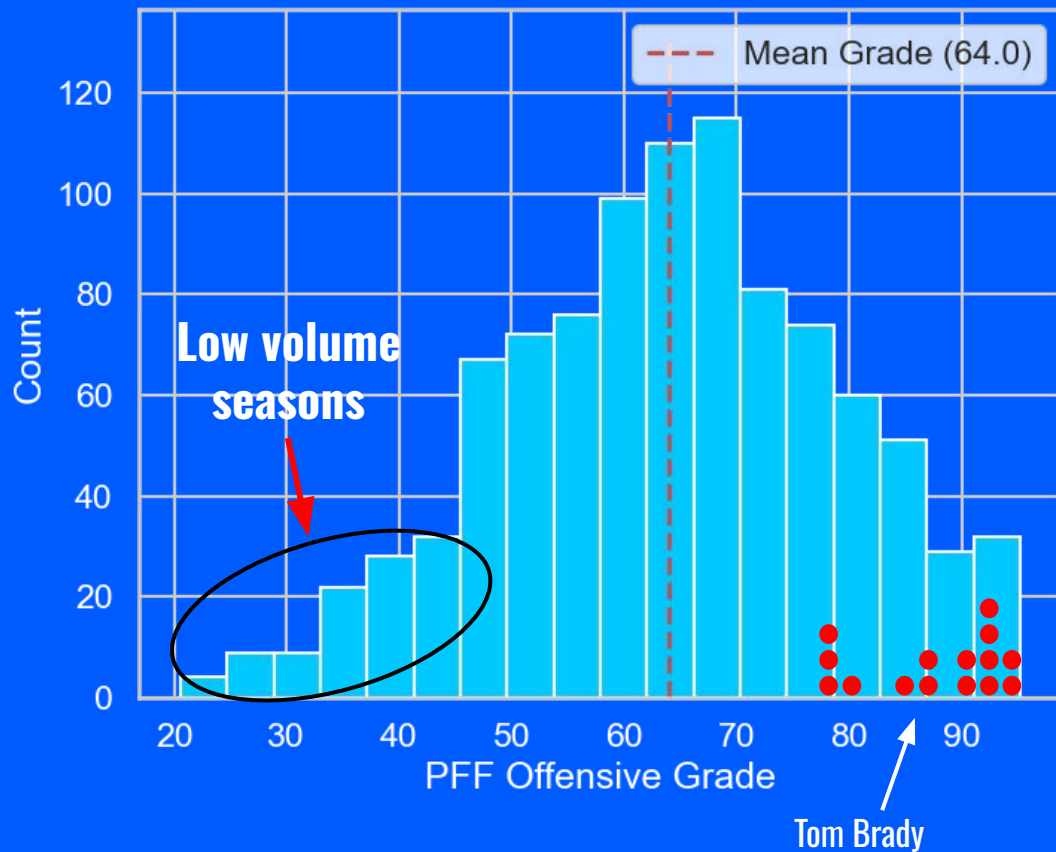


Target Distribution

Min Grade: 20.6
Geno Smith, 2018



- 3 games
- 4 Passing Attempts



Max Grade: 95.2
Tom Brady, 2016



02

ANALYSIS

CORRELATION

“Rolling Mean”:

- Capture performance in recent seasons
- Average of 3 most recent seasons offensive grade
- Correlation of 0.523

“Rolling Variance”:

- Capture consistency in recent seasons
- Variance in offensive grade of 3 most recent seasons

Pass TDs

0.536

Pass Yards

0.518

First Downs

0.517

Completions

0.508

Prev Offense Grade

0.502



03 MODELING

Algorithms

Previous season → Next season

- Linear Regression
- Decision Tree
- Random Forest
- XGBoost
- KNN

- Dense NN

Sequence of previous seasons → Next season

- RNN
- LSTM
- GRU



04

RESULTS



2023 PREDICTIONS



	2023 Grade	Prediction	Difference
Geno Smith	75.3	74.60	-0.70
Sam Darnold	59.8	58.49	-1.31
Gardner Minshew	56.6	57.99	+1.39
P.J. Walker	30.8	55.95	+25.15
Mitch Trubisky	34.8	62.58	+27.78
Aaron Rodgers	39.4	78.00	+38.60

 Injured on 4th play of the season

48 Total QBs:

- RMSE: **12.16**
- R^2 : **0.40**
- **64.6%** of preds within 10 pts



2023 PREDICTIONS



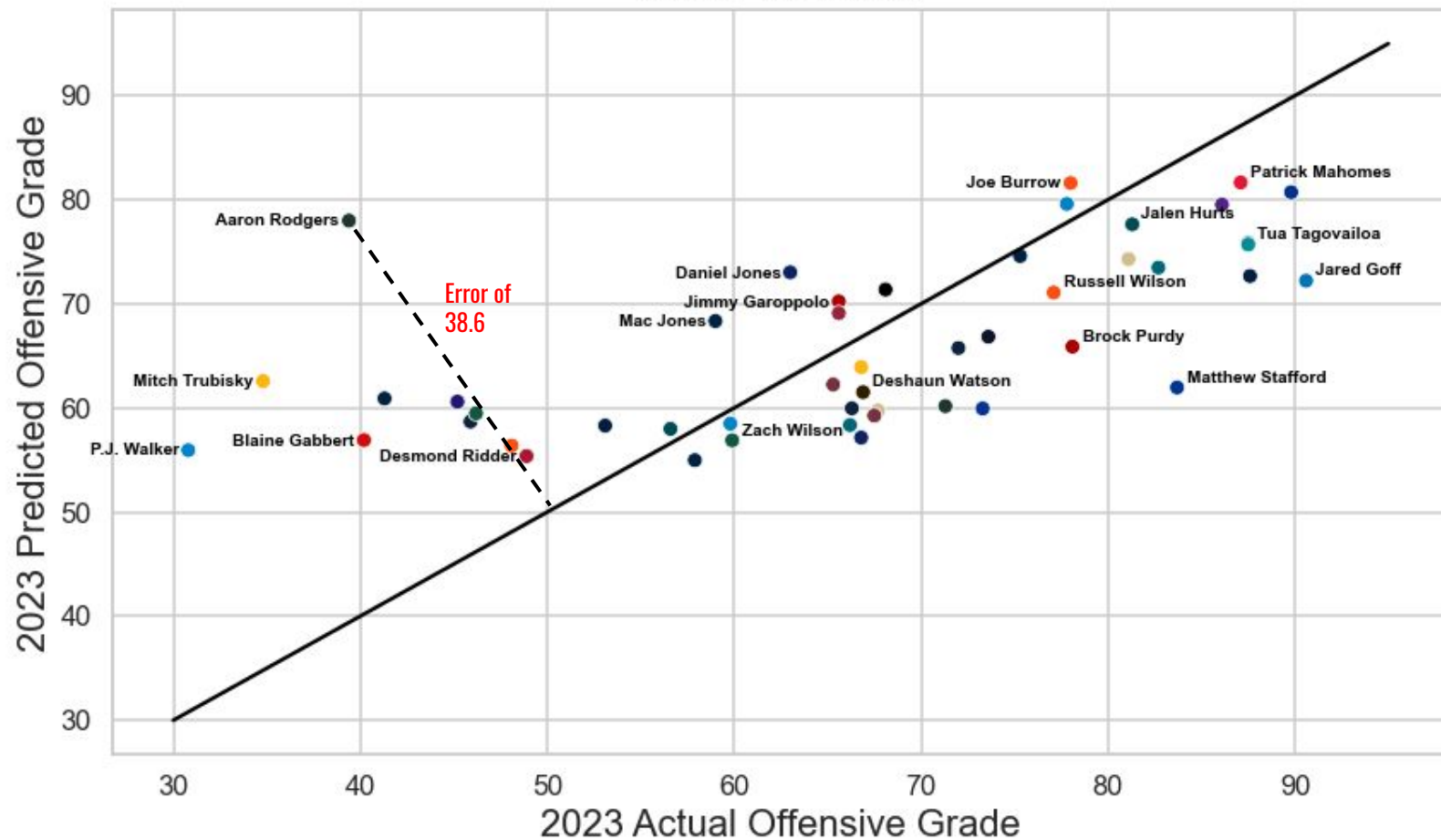
Without Aaron Rodgers

	2023 Grade	Prediction	Difference
Geno Smith	75.3	74.60	-0.70
Sam Darnold	59.8	58.49	-1.31
Gardner Minshew	56.6	57.99	+1.39
P.J. Walker	30.8	55.95	+25.15
Mitch Trubisky	34.8	62.58	+27.78

47 Total QBs:

- RMSE: **10.92**
- R^2 : **0.49**
- **66.0%** of preds within 10 pts

2023 Predictions





NEXT STEPS

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- Deploy Model
- Evaluate on complete 2023 season
- Iteratively improve model
- Data Upsampling
- 2024 Predictions

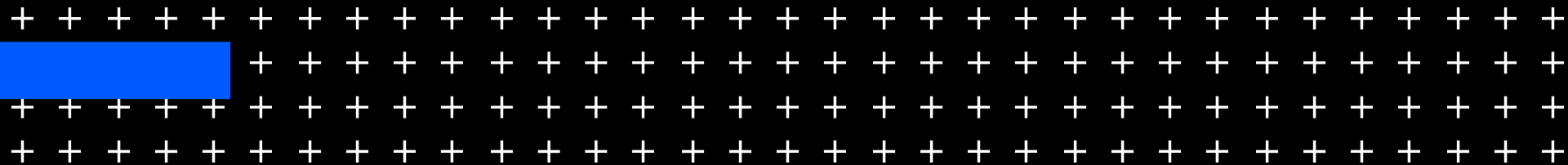


THANK YOU!



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SOURCES

Data: pff.com

Slides:  Carnival