



# 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



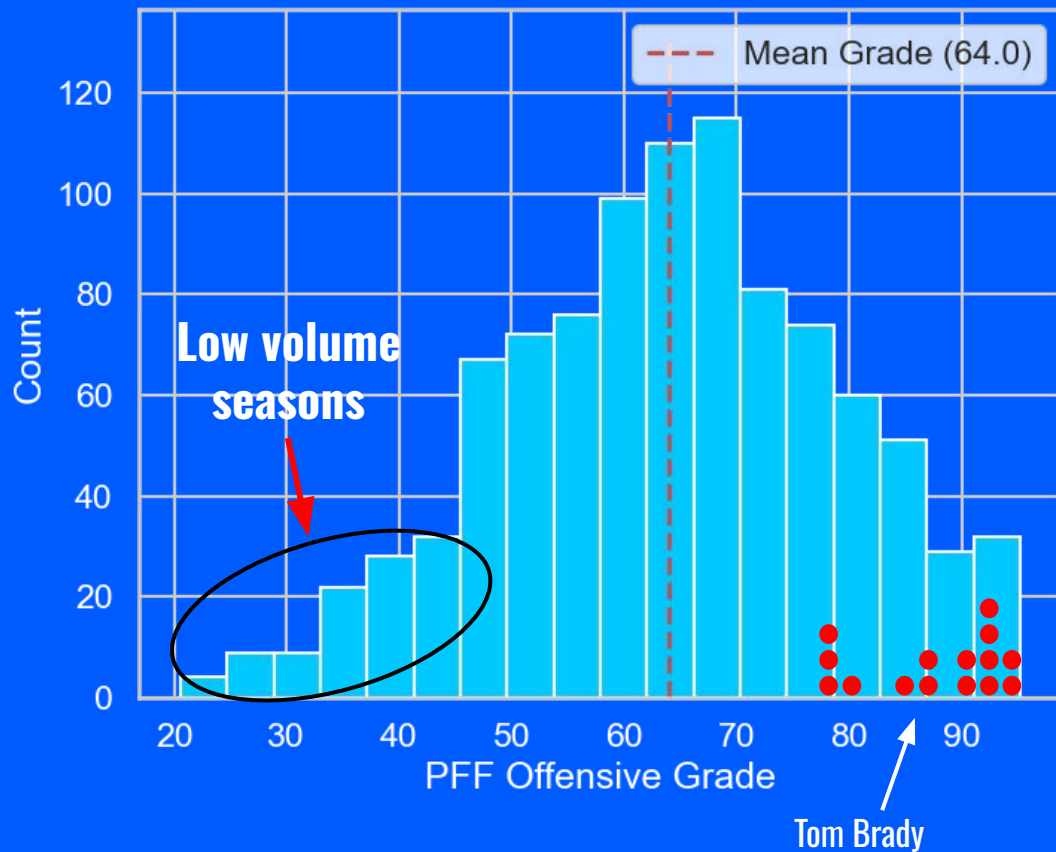


# Target Distribution

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

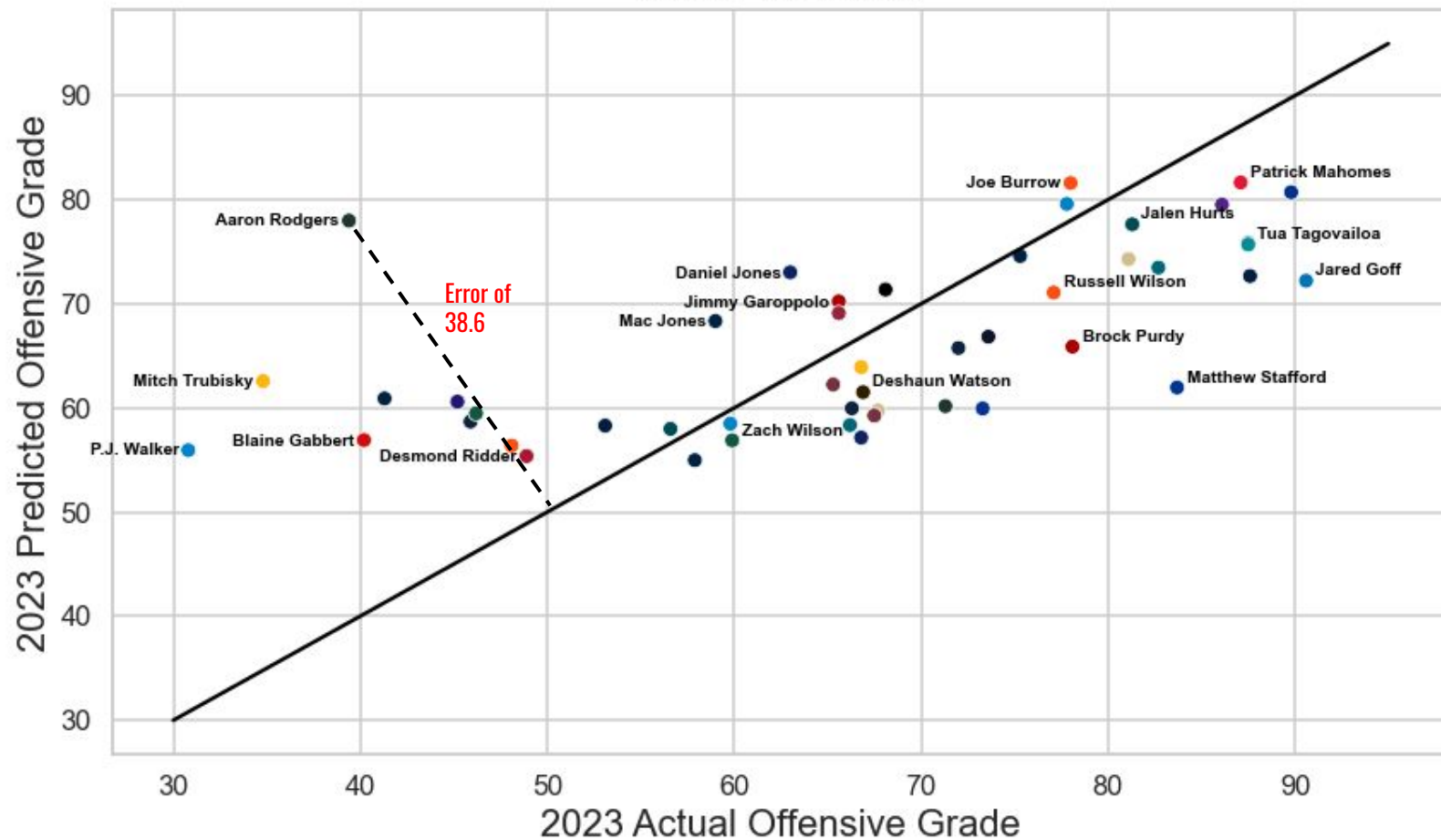


	2023 Grade	Prediction	Difference
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Sam Darnold	59.8	58.49	-1.31
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P.J. Walker	30.8	55.95	+25.15
Mitch Trubisky	34.8	62.58	+27.78

48 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



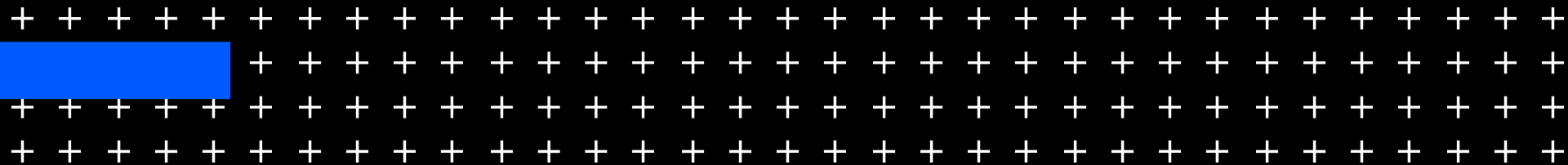


# THANK YOU!



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# SOURCES

Data: [pff.com](https://pff.com)

Slides:  Carnival