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Projecting College QBs to NFL Schemes



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Introduction



- Projecting college QB success in 3 schemes for first 3 NFL seasons
- Data - only QBs drafted in 2019 and later
- Measure QB traits and determine the most and least transferable statistics
- Analyze the projectability of collegiate QBs



Methodology Overview

Cluster

K-means clustering to classify NFL schemes



Aging Curves

Aging curves to predict stats (independent variables) in first 3 NFL seasons

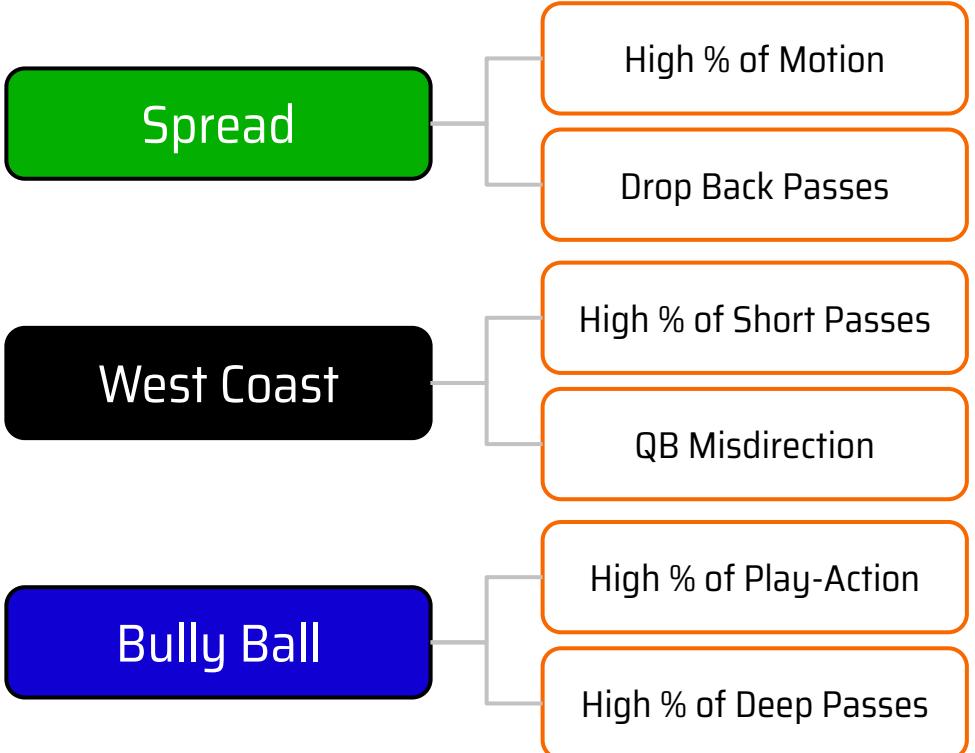


Model

XGBoost Model to predict passer points (dependent variable) in an NFL season

Step 1: Clustering

- Utilized K-Means Clustering to separate the 3 given schemes
- Player Season Data
- Focused on main characteristics given for each scheme
- Initialized clusters based on intuition



Initializing Clusters

Motion %

Play Action Pass %

Short Passes %

Spread

Bully Ball

West Coast

West Coast

Spread

Spread

Bully Ball

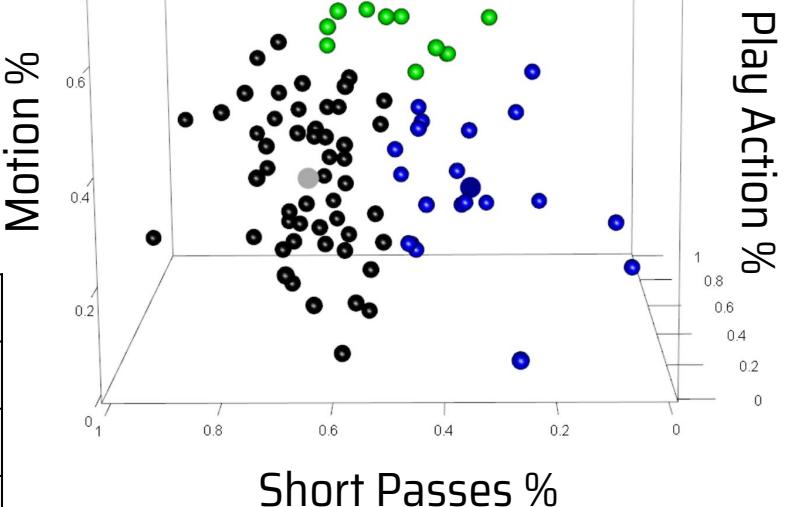
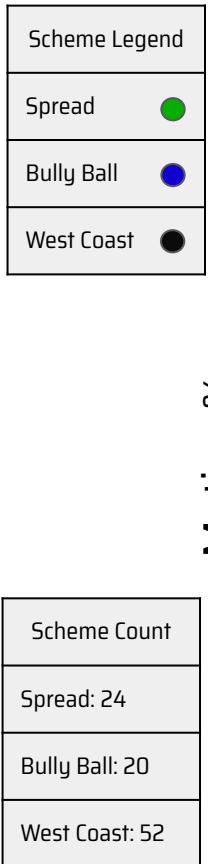
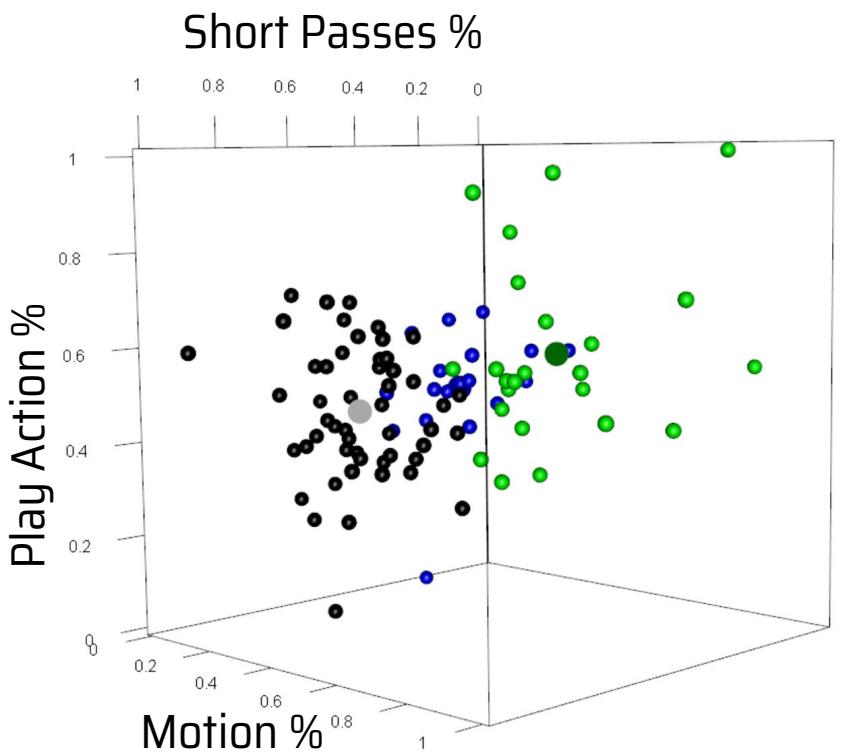
West Coast

Bully Ball

Scheme Clusters



Short Passes %



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Scheme Clusters



Spread:

West Coast:

Bully Ball:



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Step 2: Projecting Rookie QB Statistics



Individual
Statistics for All
test QBs



Calculated
Weighted
Performance
Change

$$\Delta W_P = (yoe_t - yoe_{t-1}) * \text{avg}(Att_t, Att_{t-1})$$

$$W_P = (yoe_t * Att_t)$$

Calculated
Weighted
Performance

Used mean
change for NFL
years to project
Incoming QB
Performance

Used a Lowess
Smoothing to
graph means and
Incoming QB
statistics.

Independent Variables

Accuracy

QB Mobility

Improvisation

Decision
Making

On Target % - Short
Passes

Sacks to Hurries
Rate

On Target % - Not
Planted

Turnover Rate

On Target % - Deep
Passes

Forced Missed
Tackle Rate

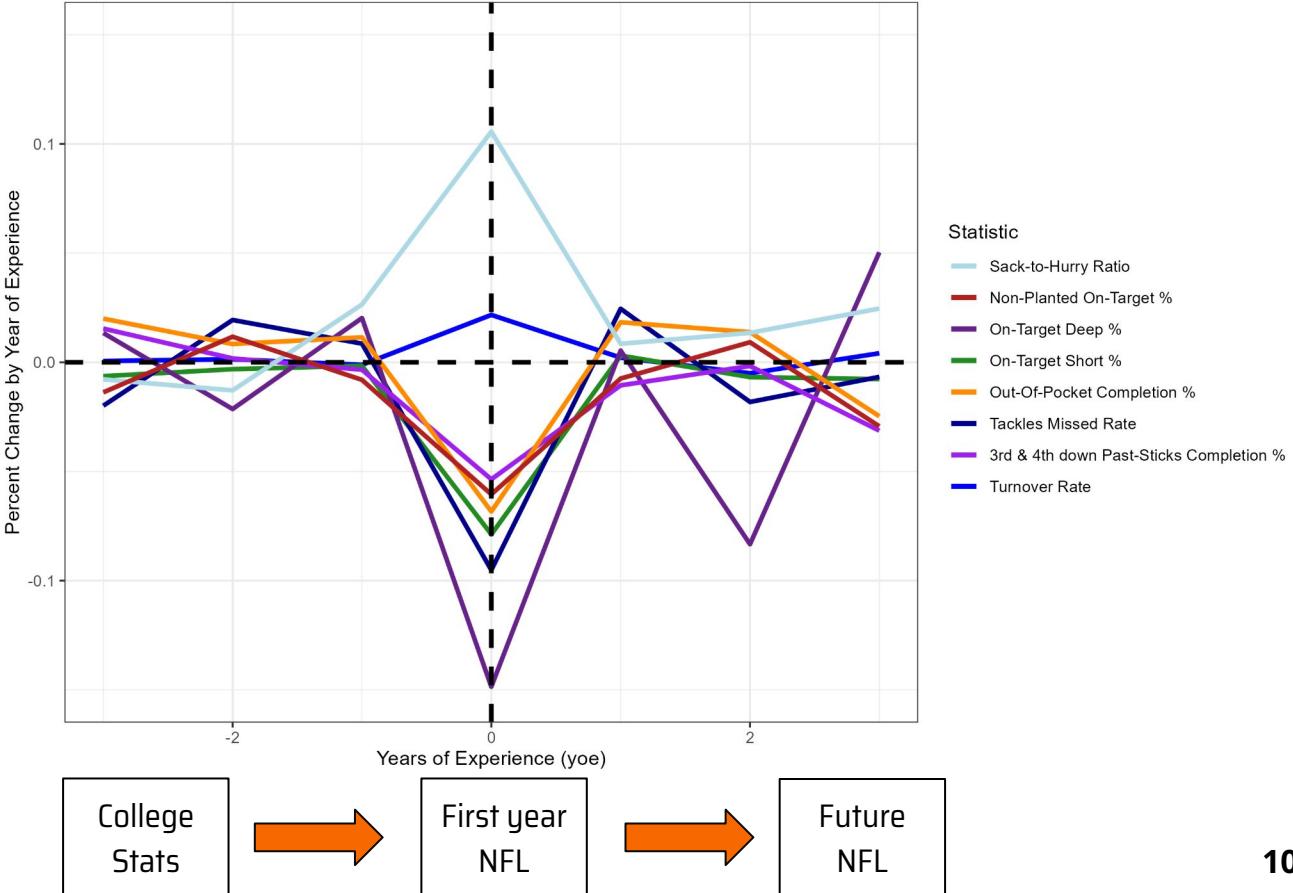
Out of Pocket
Completion % (OoP)

3rd & 4th Down
Past-Sticks
Completion %

Weighted Performance Change



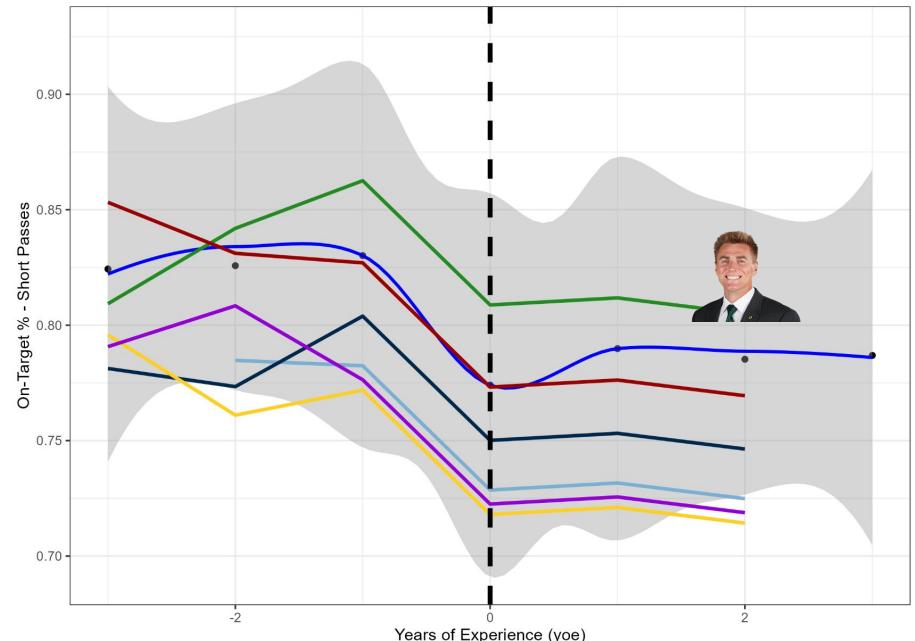
- Mean Weighted Performance Change for each Variable
- Coefficients were applied to Incoming QB's college statistics to project performance.
- Significant drop off from college to NFL, inconsistent growth beyond Year 1.



Projecting Independent Variables - Accuracy



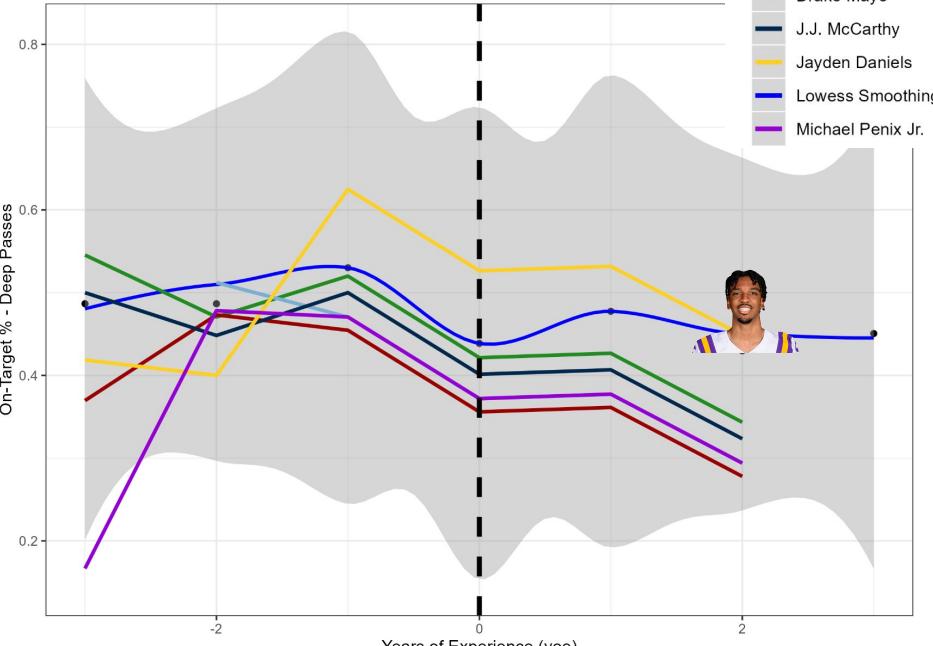
On Target % - Short Passes



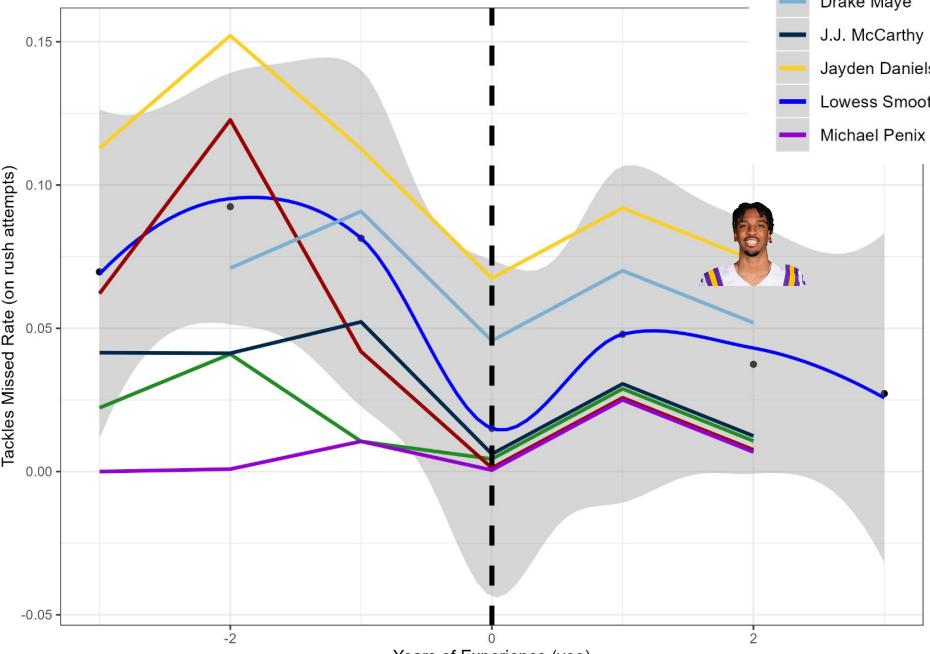
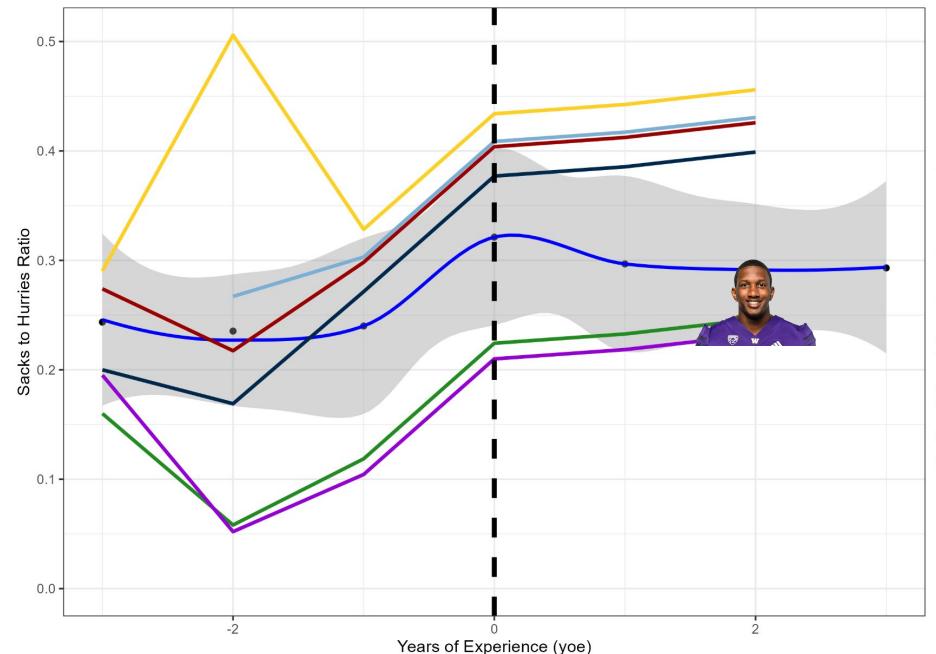
College Stats

NFL Projections

On Target % - Deep Passes



Projecting Independent Variables - QB Mobility



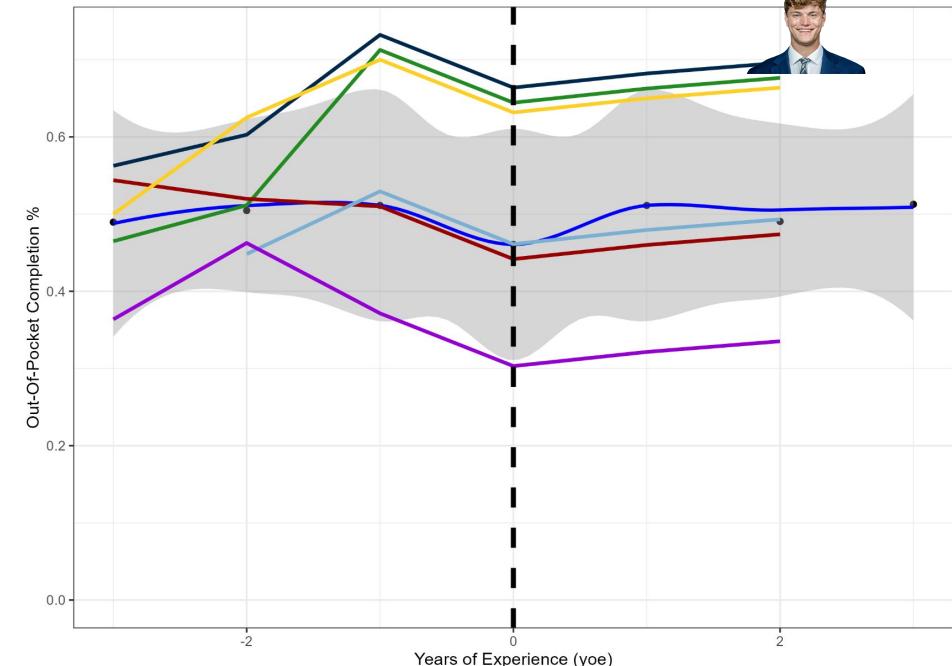
College Stats

NFL Projections

Projecting Independent Variables - Improvisation



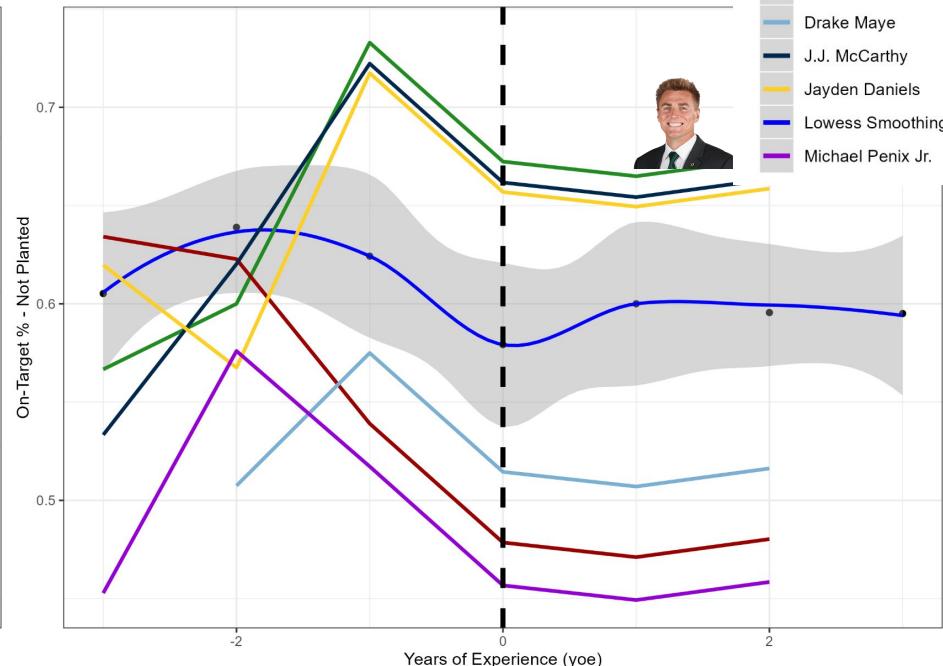
Out of Pocket Completion %



College Stats

NFL Projections

Not Planted On Target %

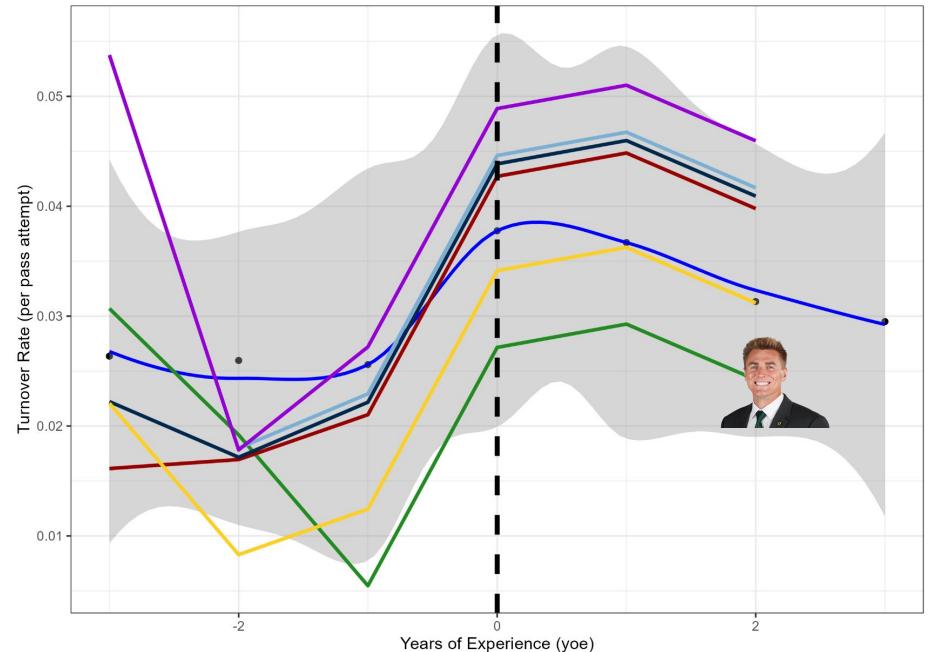


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Projecting Independent Variables - Decision Making



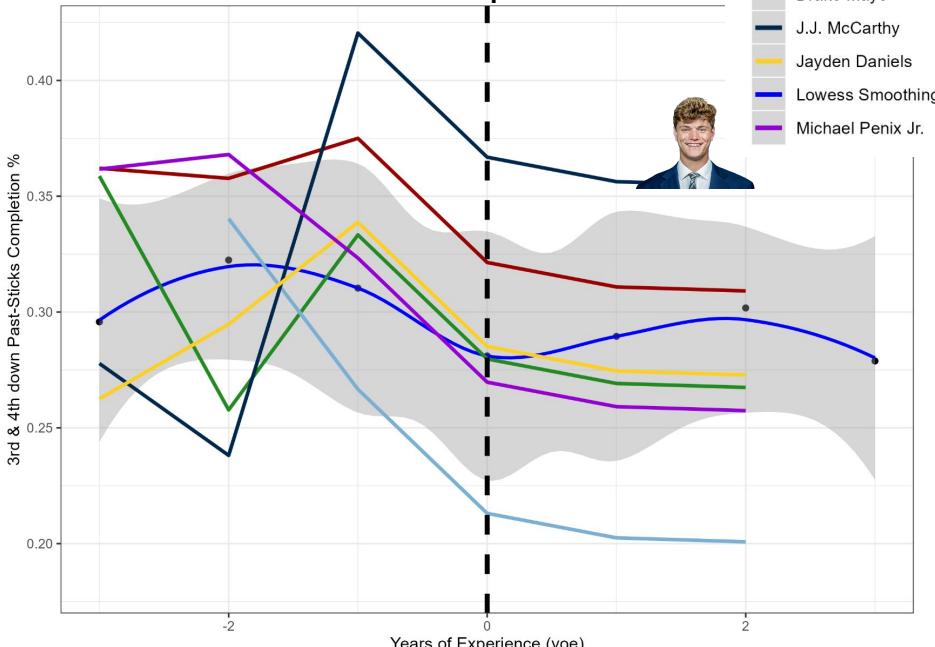
Turnover Rate



College Stats

NFL Projections

3rd & 4th Down Past-Sticks Completion %



Transferable Traits from College to NFL



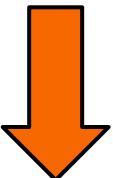
Most

Decision Making

Improvisation

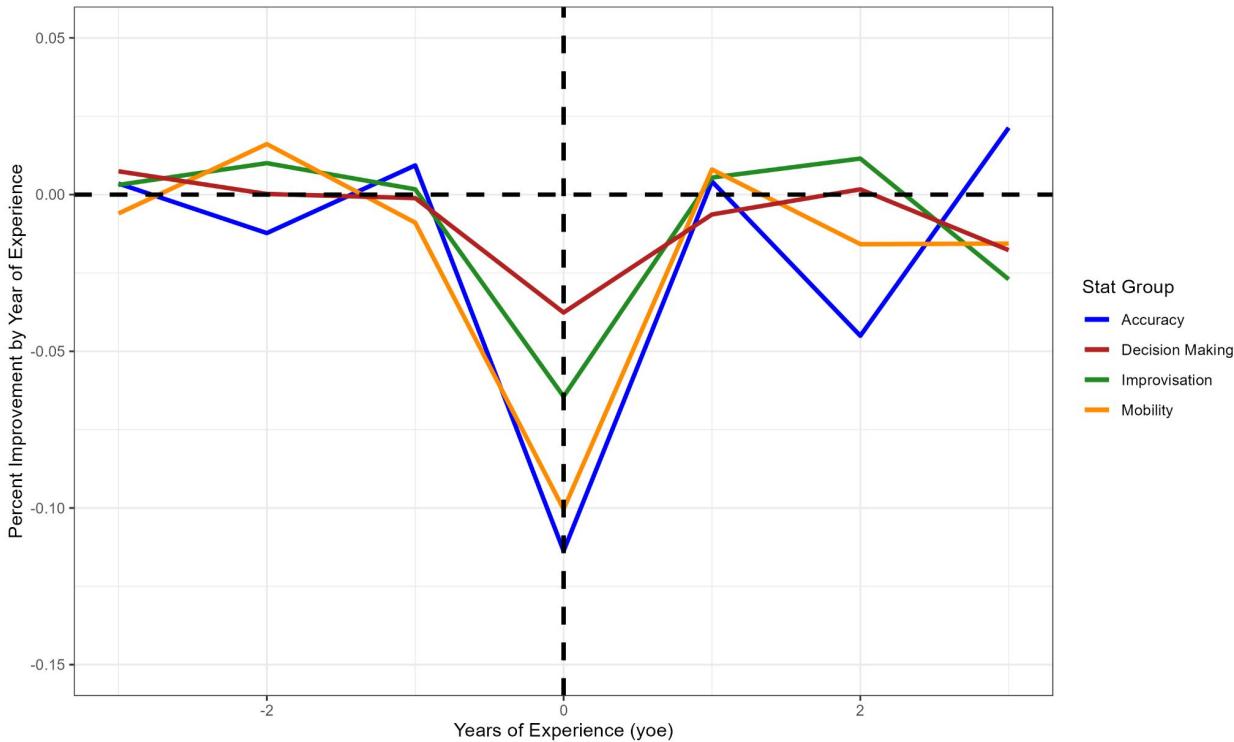
QB Mobility

Least



Accuracy

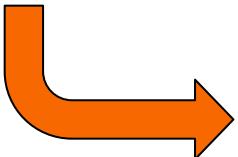
Percent Positive or Negative Improvement by Group



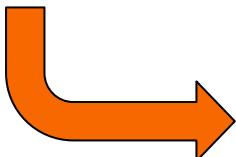
Step 3: Modeling Rookie QB Passer Points



Trained XGBoost model
on Player Season level
QBs to predict Passer
Points



Used Age Curves to get
predicted x-variables for
the Incoming QBs for 1st
3 years



Used those predictions to
predict Passer Points for
the QBs

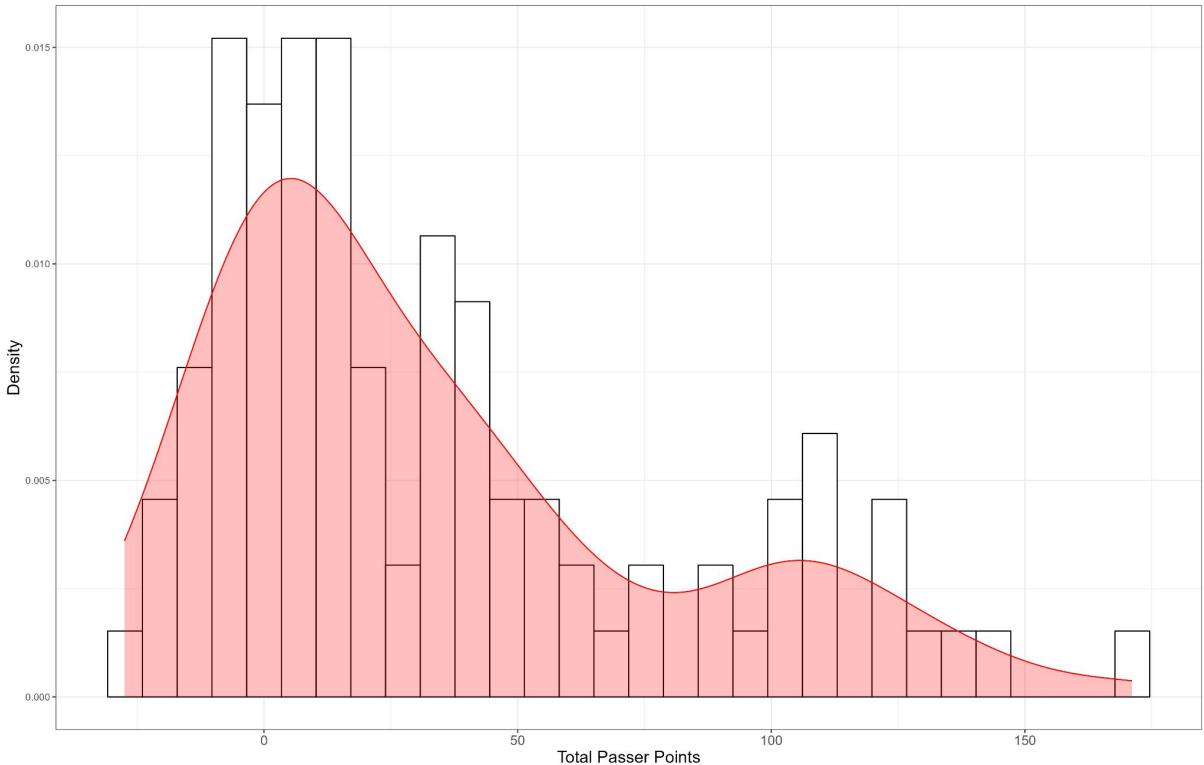
Dependent Variable



Passer Points Definition:

- Modified version of EPA
- Includes factors:
 - a. offensive line performance
 - b. sacks
 - c. off-target passes
 - d. dropped passes
 - e. dropped interceptions for passers

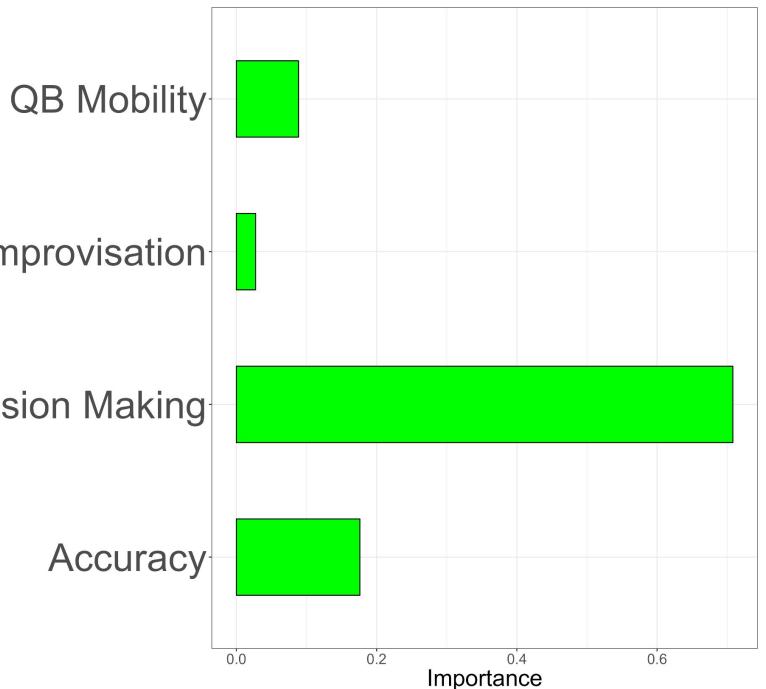
Distribution of Total Passer Points



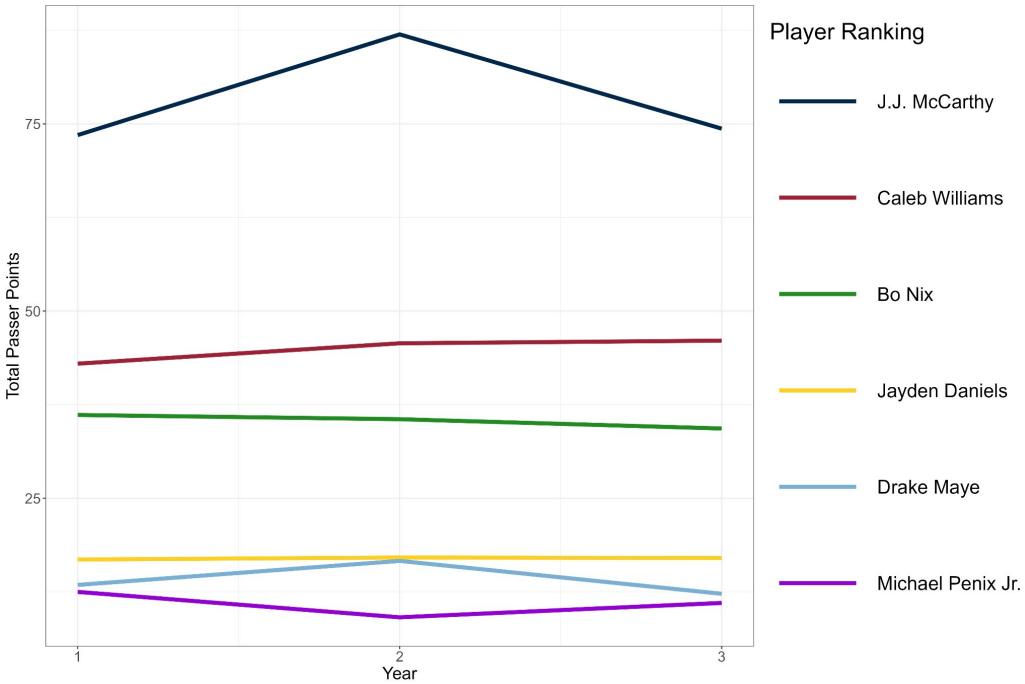
Results - Spread



Variable Importance Graphs

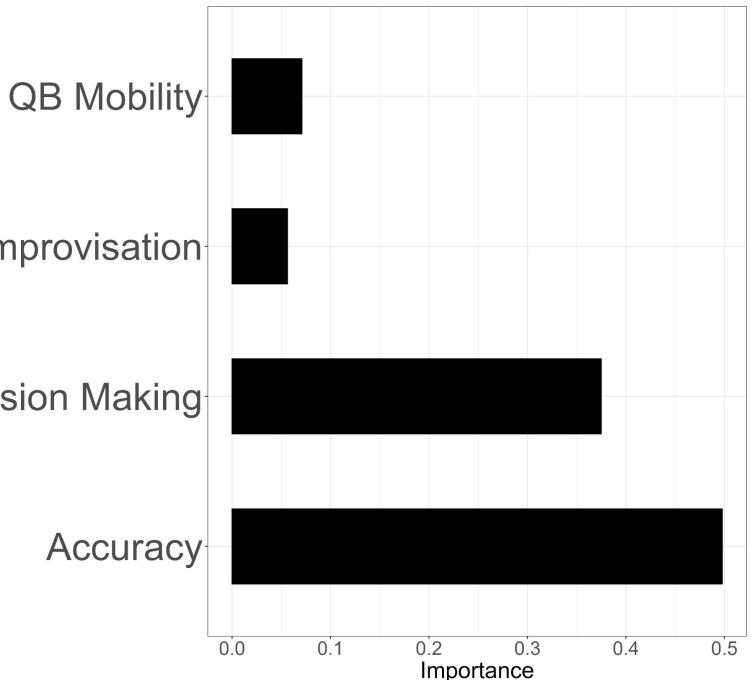


Passer Points by Year

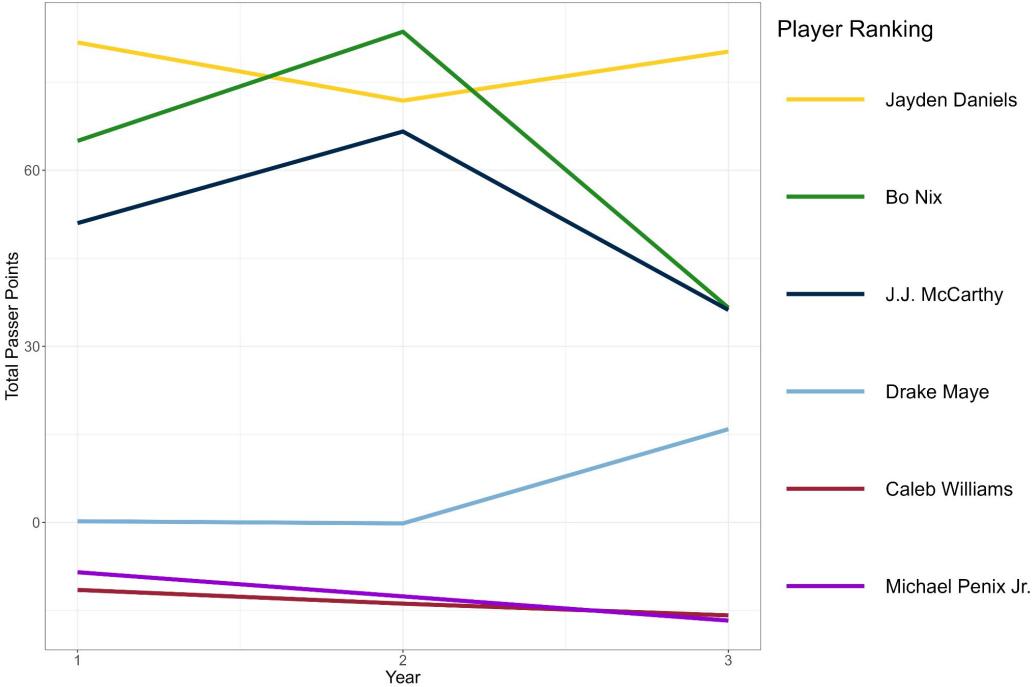


Results - West Coast

Variable Importance Graphs



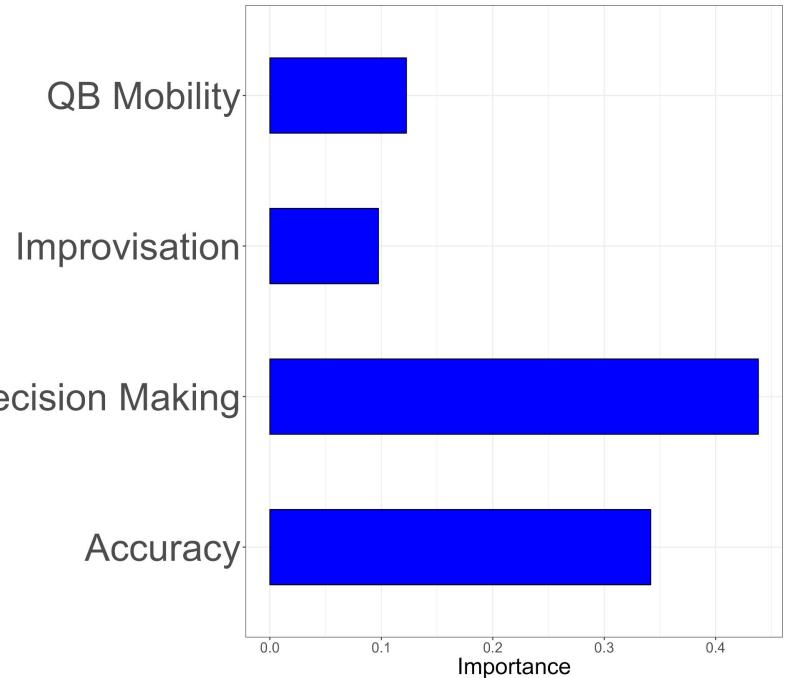
Passer Points by Year



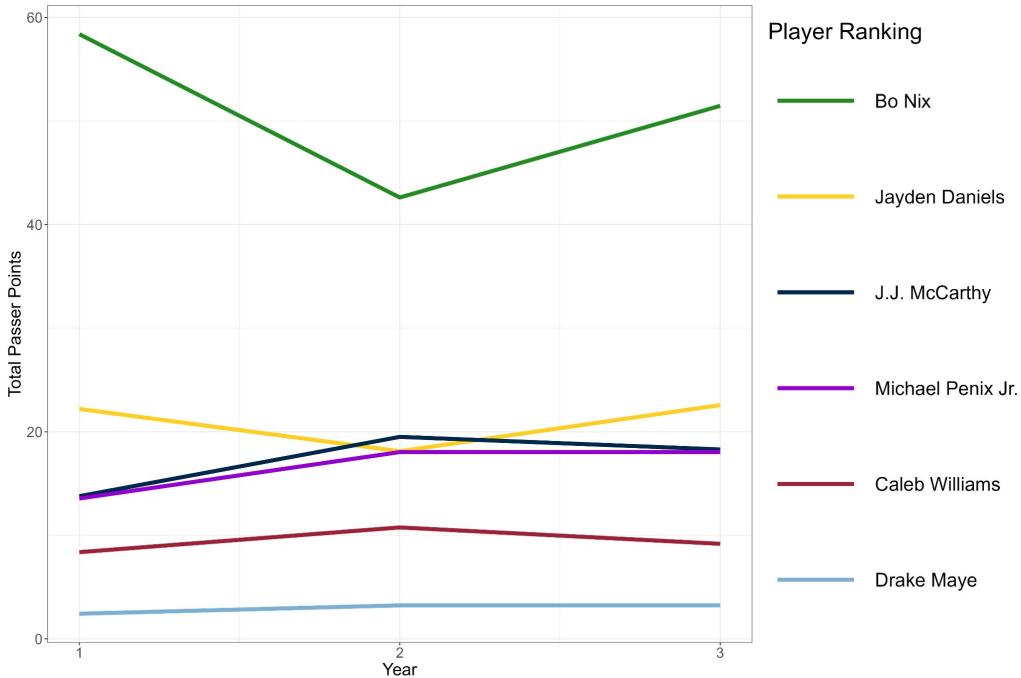
Results - Bully Ball



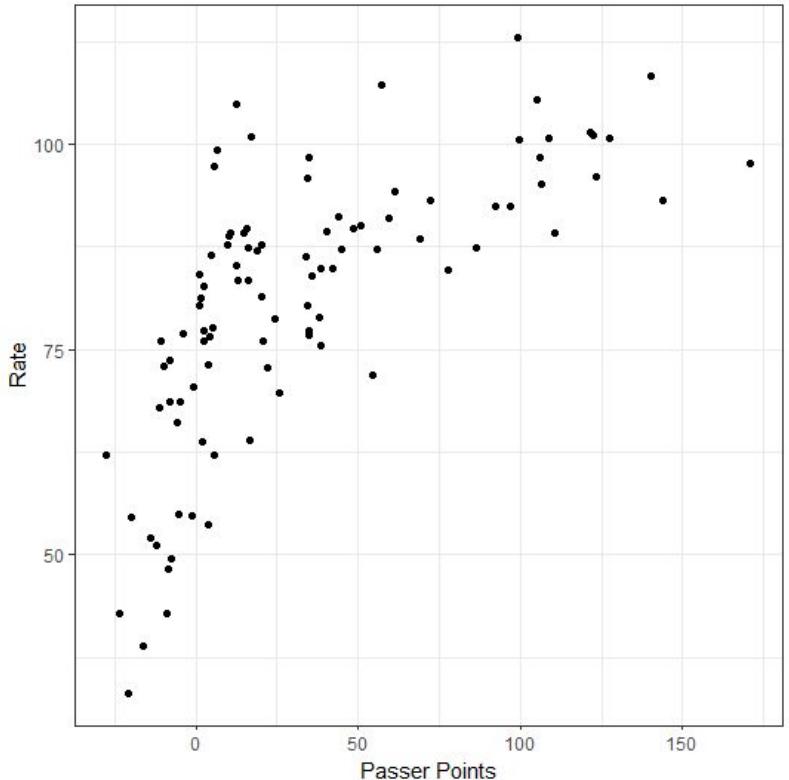
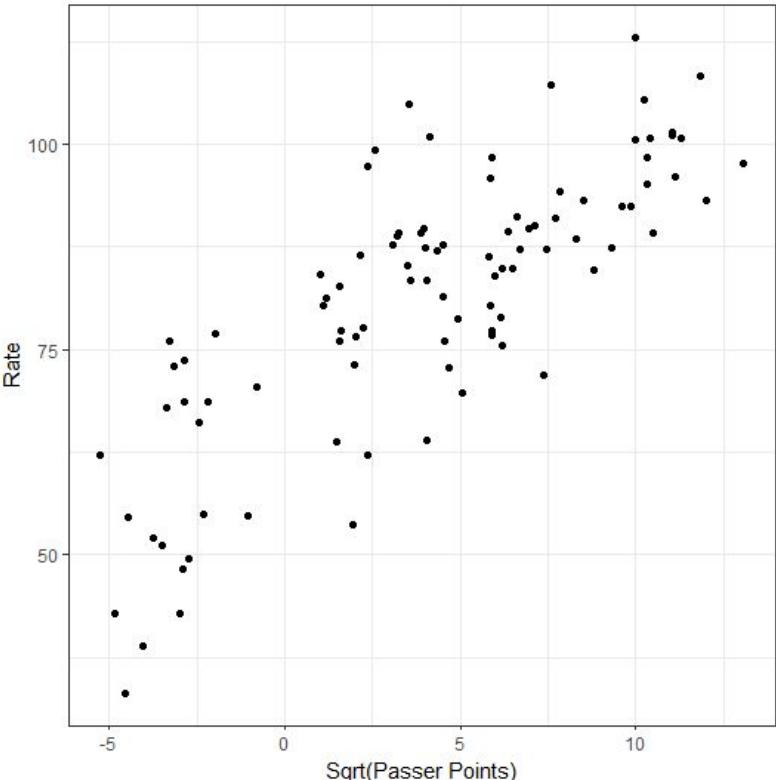
Variable Importance Graphs



Passer Points by Year



Predicting QB Ratings

 $R^2 = 0.473$  $R^2 = 0.635$ 

Results - Summary

- Colors scaled based on Passer Points for the incoming QB's
- Top Passer Points and QBR's would rank ~13-18 among NFL QB's in any given year

	Player	Season	Spread Projections		Bully Ball Projections		West Coast Projections	
			Passer Points	Rate	Passer Points	Rate	Passer Points	Rate
	Bo Nix	1	36.12	86.14	58.39	90.60	65.01	91.75
		2	35.56	86.02	42.62	87.56	83.61	94.70
		3	34.31	85.73	51.47	89.32	36.58	86.25
	Caleb Williams	1	42.97	87.63	8.37	77.64	-11.51	60.48
		2	45.69	88.19	10.76	78.69	-13.85	59.58
		3	46.05	88.26	9.18	78.01	-15.86	58.87
	Drake Maye	1	13.42	79.74	2.43	73.99	0.19	70.92
		2	16.63	80.87	3.24	74.65	-0.18	68.59
		3	12.24	79.29	3.24	74.65	15.88	80.62
	J.J. McCarthy	1	73.50	93.14	13.78	79.87	50.99	89.23
		2	86.95	95.19	19.51	81.80	66.61	92.02
		3	74.36	93.28	18.29	81.41	36.20	86.16
	Jayden Daniels	1	16.82	80.93	22.20	82.60	81.78	94.42
		2	17.08	81.02	18.12	81.36	71.87	92.88
		3	17.01	81.00	22.57	82.71	80.22	94.19
	Michael Penix Jr.	1	12.49	79.39	13.56	79.79	-8.50	61.78
		2	9.10	77.97	18.04	81.33	-12.62	60.05
		3	11.02	78.80	18.04	81.33	-16.74	58.57

Projectability of QB's



Most Projectable:



- Being older makes him closer to his ceiling entering the league
- Proven production accounts for more of his abilities
- Above average in all schemes of our predictions

Least Projectable:



- Younger prospects with high ceilings which places them lower than their potential
- Have physical traits & 'eye-test' abilities that are difficult to quantify
- Our projections give them the highest variance of outcomes

Conclusions



Top Quarterbacks:

- Spread: J.J. McCarthy - Thrives in Short Passes, able to make quick accurate decisions and limit mistakes
- West Coast: Jayden Daniels - Accurate passer, mobile quarterback with the ability to be versatile inside and out of the pocket
- Bully Ball: Bo Nix - Overall most accurate quarterback with solid improvisation. Can thrive in play action and move out of the pocket

Most Transferable Traits: Decision Making

Least Transferable Traits: Accuracy



Potential Improvements



- Collect more data to improve sample size and variability in models and stat predictions
- Find more ways to quantify the 'eye test' as well as physical traits in modeling
- Find more ways to account for the talent around the quarterbacks



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Thank You!



Any Questions?