

The NBA logo is centered in the background, featuring a white silhouette of a basketball player in mid-air, set against a blue and red background. The letters "NBA" are written in white at the bottom of the logo.

NBA Prop Bet Analyzer

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What is a prop bet

- A bet on an outcome within the game
- Typical prop line represents a predictive median outcome
 - Could be for points, rebounds, or assists, for a player in a given game
 - Bettors choose “over” or “under” the line.

OPEN

★ BEST ODDS



BETMGM



FANDUEL
SPORTSBOOK



DRAFTKINGS
SPORTSBOOK



CAESARS
SPORTSBOOK



MIA at BOS

M. Brogdon

BOS - G

O 14.5 (-113)

U 14.5 (-113)

O 14.5 (-115)

U 14.5 (-108)

O 14.5 (-120)

U 14.5 (-110)

O 14.5 (-118)

U 14.5 (-108)

O 14.5 (-115)

U 14.5 (-115)

O 14.5 (-119)

U 14.5 (-115)

Today 8:30 PM EDT - TNT

Project Idea

- Create models that can predict players statistics for a game, based on historical data
- Compare them to available prop lines
- Give advice on whether to bet over or under on a prop bet.



OVER
UNDER

Three Main Models

- Reinforcement Learning
- SVM
- Random Forest
- Trained, validated, and tested separately

Model 1: Reinforcement Learning

Player's Season: n games

Training: first n - 20 games

Features:

	Basic Box Score Stats																			
Starters	MP	FG	FGA	FG%	3P	3PA	3P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	+/-
Andrew Wiggins	37:25	8	17	.471	2	8	.250	5	7	.714	3	5	8	3	3	1	0	2	23	+7

	Advanced Box Score Stats															
Starters	MP	TS%	eFG%	3PAr	FTr	ORB%	DRB%	TRB%	AST%	STL%	BLK%	TOV%	USG%	ORtg	DRtg	BPM
Andrew Wiggins	37:25	.573	.529	.471	.412	10.7	16.0	13.5	12.1	3.7	2.5	0.0	21.9	128	117	4.7

Team Totals	240	.660	.622	.395	.291	30.0	80.6	53.9	65.2	9.5	4.5	17.1	100.0	121.7	116.9	
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Inactive: DEN [Collin Gillespie](#), [Jamal Murray](#) GSW [Andre Iguodala](#), [Ty Jerome](#), [Anthony Lamb](#)

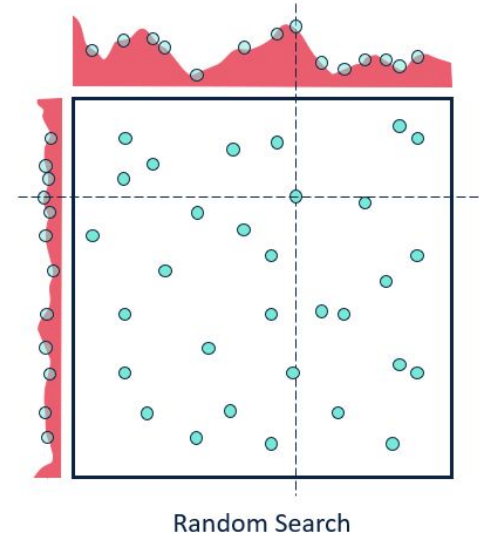
Weights: $w_i \leftarrow w_i + \alpha * \text{difference} * f_i(k)$

Reinforcement Learning

Validation: $[n - 20, n - 11]$ games

4 parameters: weight, feature average,
and opposing team average learning rates
and inactive weight

Random Search on 4 hyperparameters
on 100 randomly selected NBA players



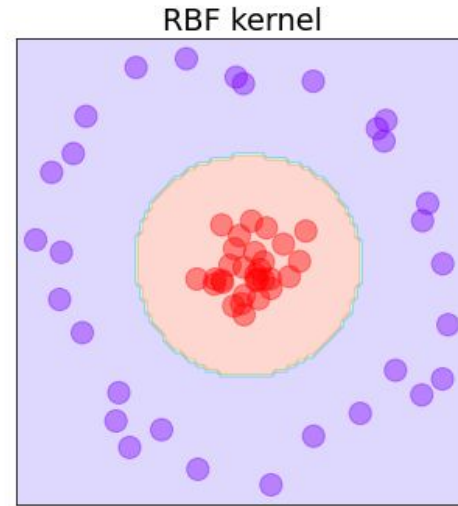
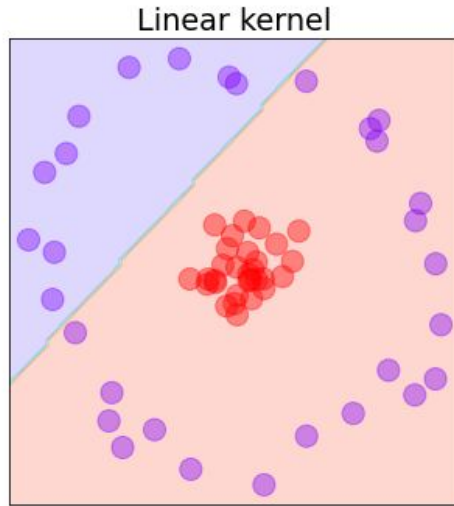
Reinforcement Learning: Evaluation

Tested on the last 10 games of every NBA player with at least 30 games in the 2023 NBA season.

```
Testing reinforcement learning model...  
Testing on all players from the 2023 NBA season.  
Average pts difference: 2.9060114512343134  
Average ast difference: 0.8447984531694237  
Average trb difference: 1.2586504817505393  
Ratio of correct pts bets: 0.5209934949733885  
Ratio of correct ast bets: 0.5199761478831246  
Ratio of correct trb bets: 0.5264705882352941
```

Model 2: SVM

- Multiclass classification - 38 models (0.5, 1.5, ...)
- Kernel SVM (rbf kernel) - to capture nonlinearities



SVM

- Feature Extraction
 - Player Priors
 - Season Performance
 - Recent Performance
 - Game State
- Hyper-parameter tuning
 - 2 parameters: C, gamma
 - Grid Search
 - Maximize F1 score

Stephen Curry

GOLDEN STATE WARRIORS
POINT GUARD
34 YEARS OLD



WEIGHTED AVERAGE OF
PAST THREE SEASONS

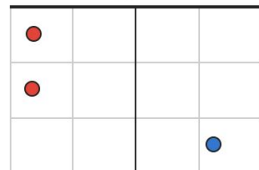
● BAD ○ AVG. ● GOOD

PERCENTILE

50TH

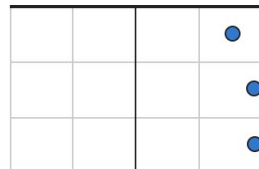
Vitals

Height	6' 2"
Weight	185
Draft position	7



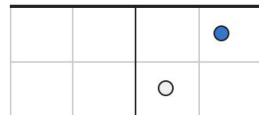
Scoring

True shooting %	62%
Free throw %	91%
Usage %	32%



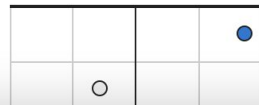
Tendencies

3 pt. frequency	58%
FT frequency	26%



Passing/ball handling

Assist %	31%
Turnover %	13%



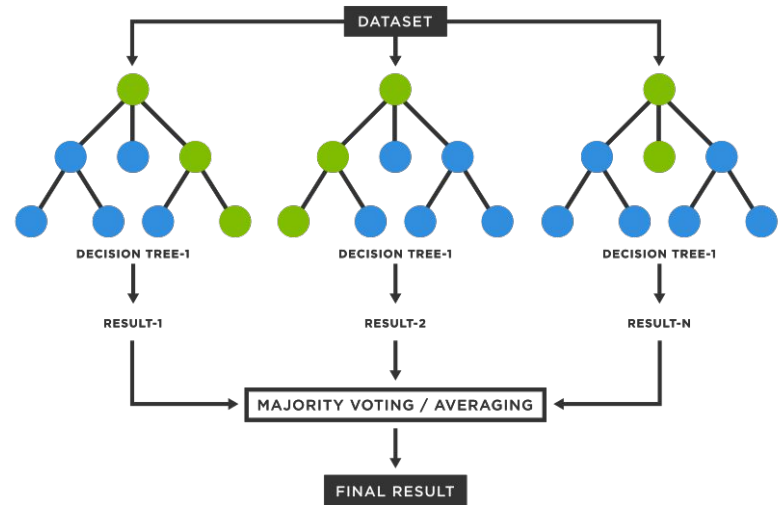
SVM: Evaluation

- Train - 2022 season
- Testing - Last 10 games of 2023 season. Validation - rest of 2023
- ~1800 test points

Category	Points	Assists	Rebounds	Total
% correct	48.12%	55.02%	52.38%	51.83%
likelihood	-	0.001%	2.15%	0.3%

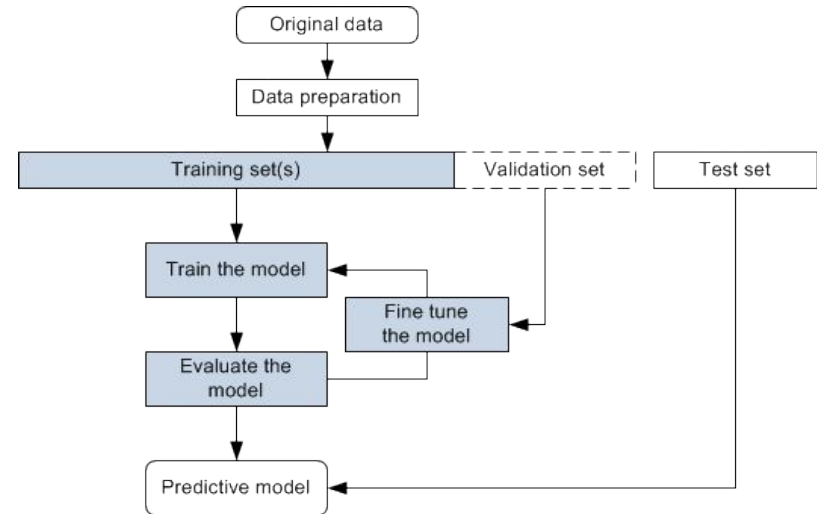
Model 3: Random Forest

- Understanding of the Random Forest Model
- Key features of the Random Forest model
- Why Random Forest is well-suited for NBA Player performance




Progress and Challenges in RFM Development

- An overview of the strides made in building the Random Forest model
- Key challenges faced during development and their impact on the project
- Steps taken to mitigate these challenges and plans for future work



GUI Demo

 NBA Prop Betting Analyzer

— □ ×

Welcome to our NBA Prop Bet Analyzer!

First select all of the stats you want to be predicted and the model to be used.

Then, input player to be analyzed and click enter below.

Enter player's name:

Enter

Points

Assists

Rebounds

Reinforcement Learning Model

SVM Model

Random Forest Model

Reset Stats

Reset Model

Model selected:

Stats selected:

