NBA Salaries

Predicting market value based on statistical performance

King of the Market?

Goal: Who is the top free agent in the summer of 2021 based on their season this year? How much will they get paid?

Kawhi Leonard

- 29 Years Old, Small Forward
- **2x** NBA Champion / Finals MVP
- **5x** NBA All Star, **6x** All NBA Defensive team
- **$34.3 million** current salary (**11th highest**)

What should he be paid? Is he the best available?

Model Setup

-Scraped with BeautifulSoup

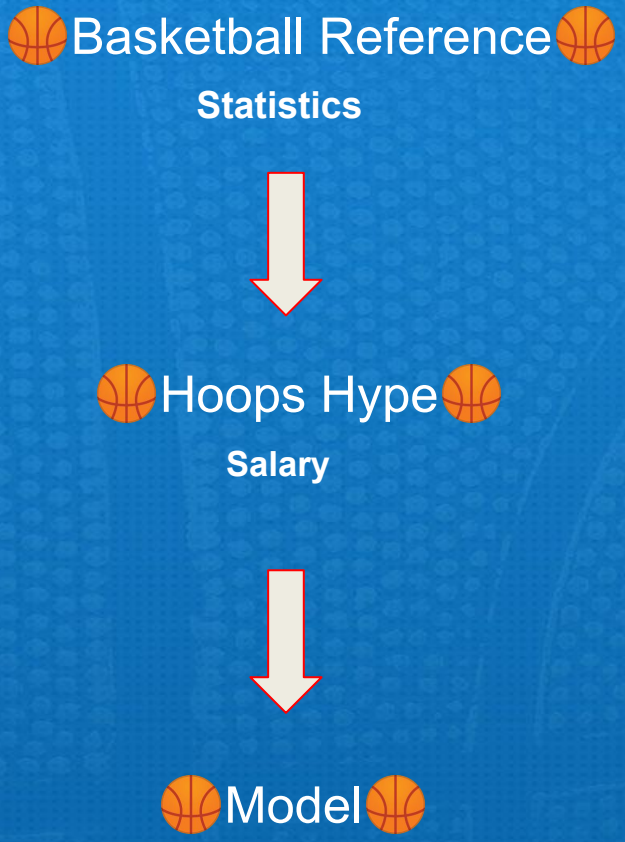
-Data **2009-2021** / “Start of Analytical Era”

-**55 features** statistics

-Over **6,000** individual players

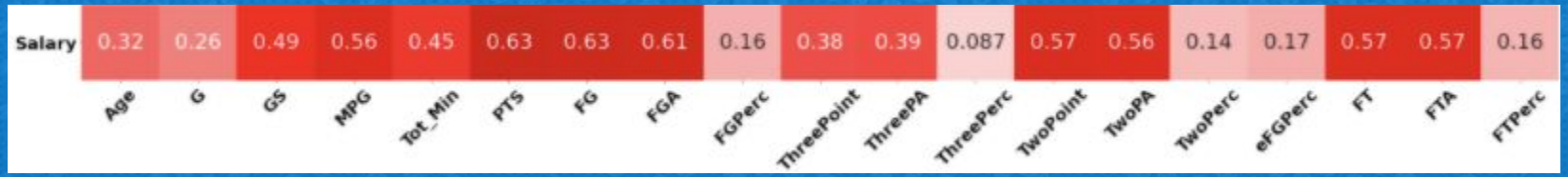
-Limited data to games played > 4 (5%)

Target: Predicted Salary

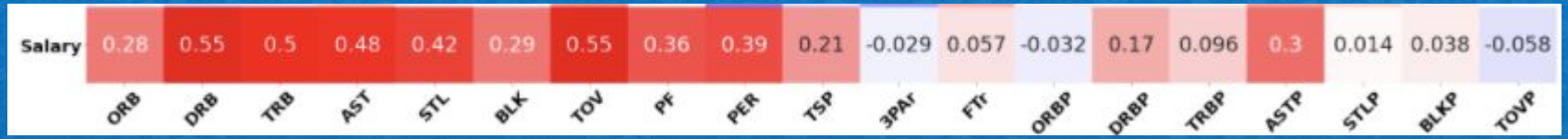


Features - Points is the MVP

Availability & Scoring

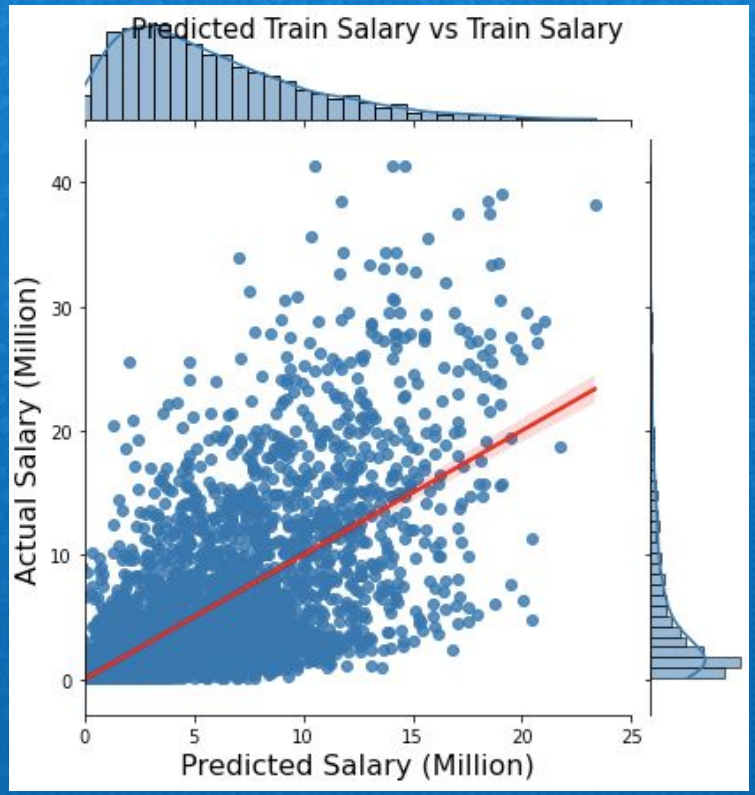


Rebounding, Passing, Defense and Advanced



Team, Efficiency & Year

More To Life Than Scoring



Points to Predict Salary

R^2 = . 39
Mean Error: $3.5 Million

Next Step: Add **ALL** Features

Mo’ Money Mo’ Problems

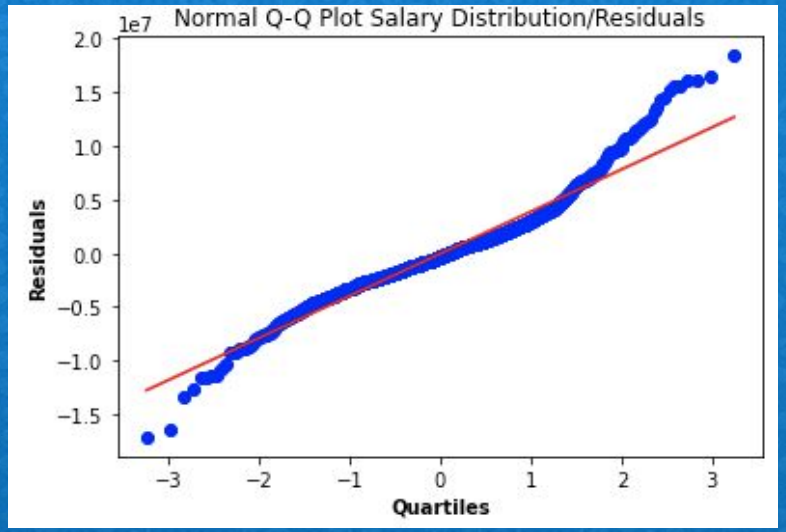
-Linear Regression w all features

R^2 = . 591

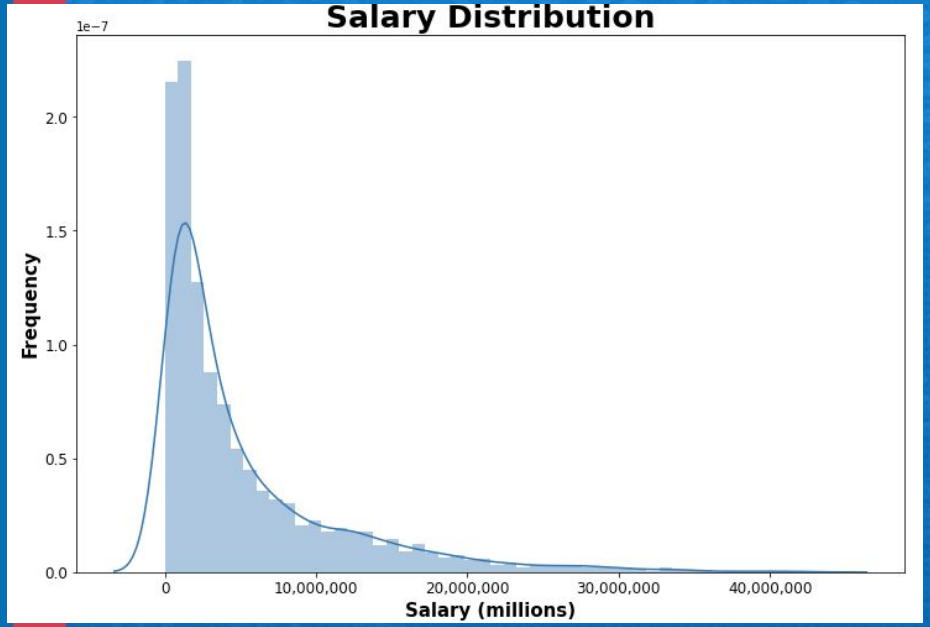
Mean Error: $2.98 Million

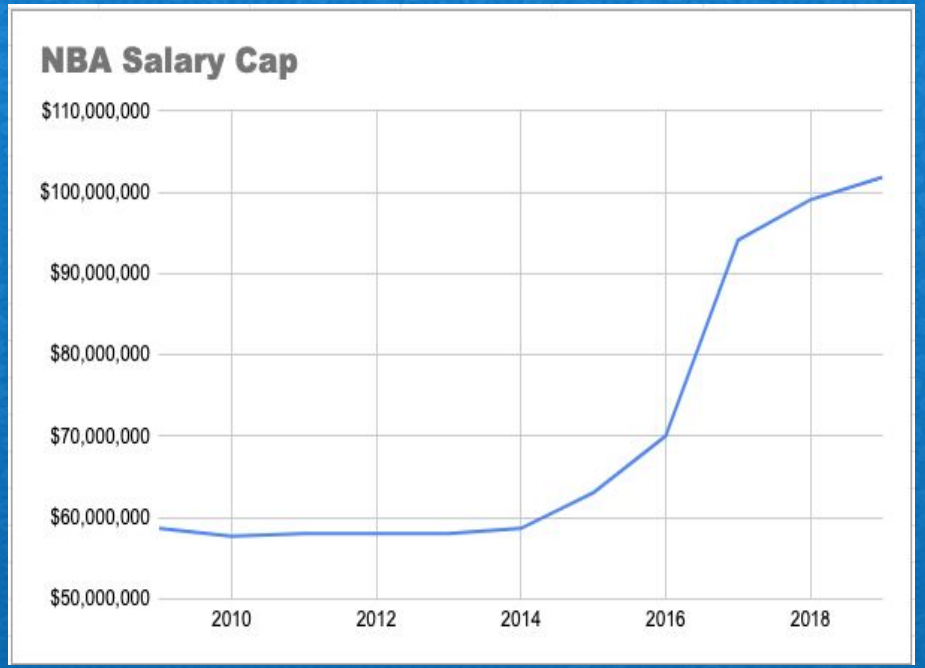
-Salaries at Extremes less accurate

-Skewed Distribution with less sample of high paid players



Growing Revenues



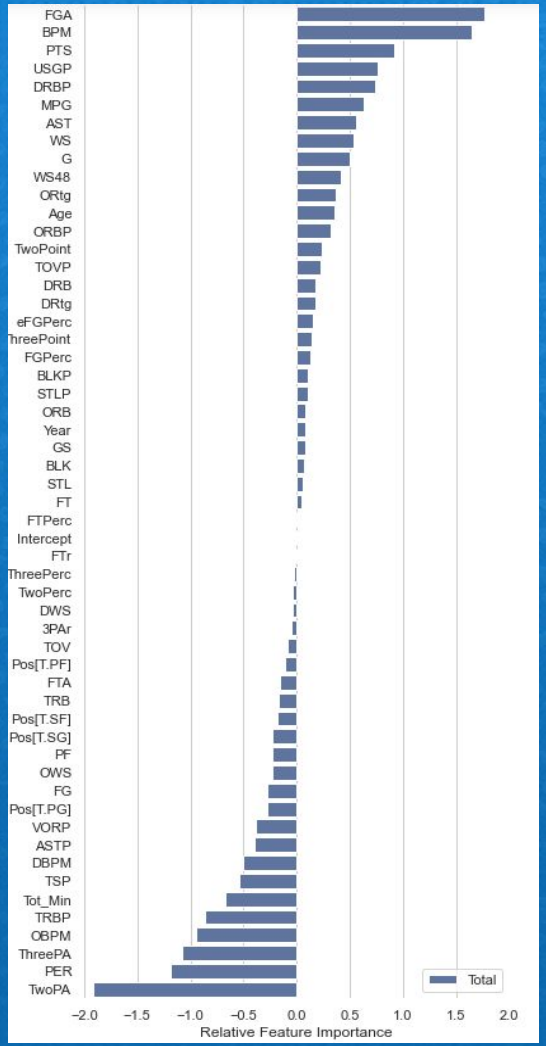


Modeling - Ridge Wins At the Buzzer

Methodology	R^2 (Train/Val)	R^2 (Cross Val)
Linear Regression	.5918	.593
🏆Ridge Regression🏆	.5919	.5933
Lasso Regularization	.5916	.5918
Elastic Net	.591	.5914

Final Ridge Test Score: .594

Mean Error: $2.8 Million

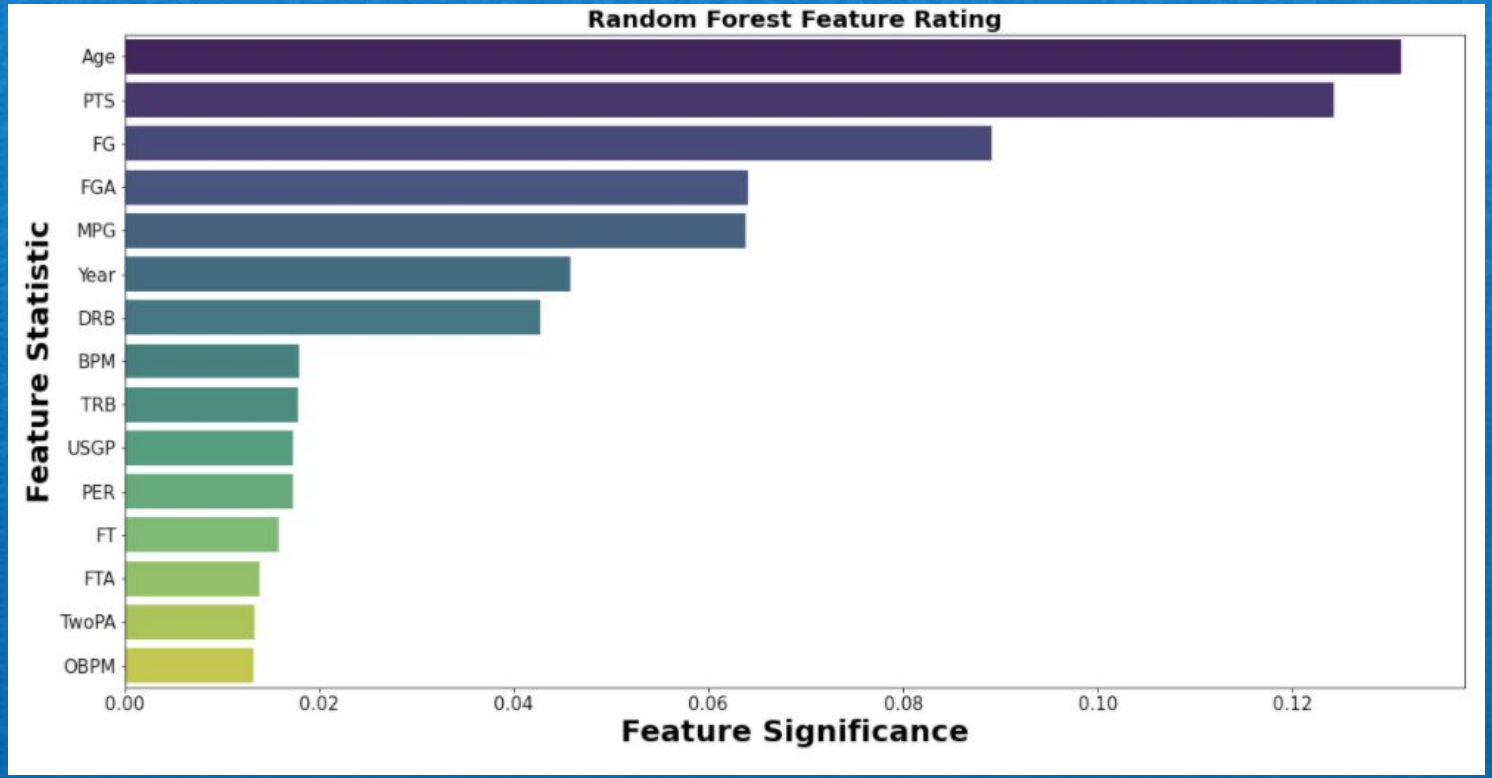


Top Ridge Features

Field Goal Attempts
Box Plus Minus
Points
Usage
Defensive Rebounding
Minutes Per Game
Assists
Win Share

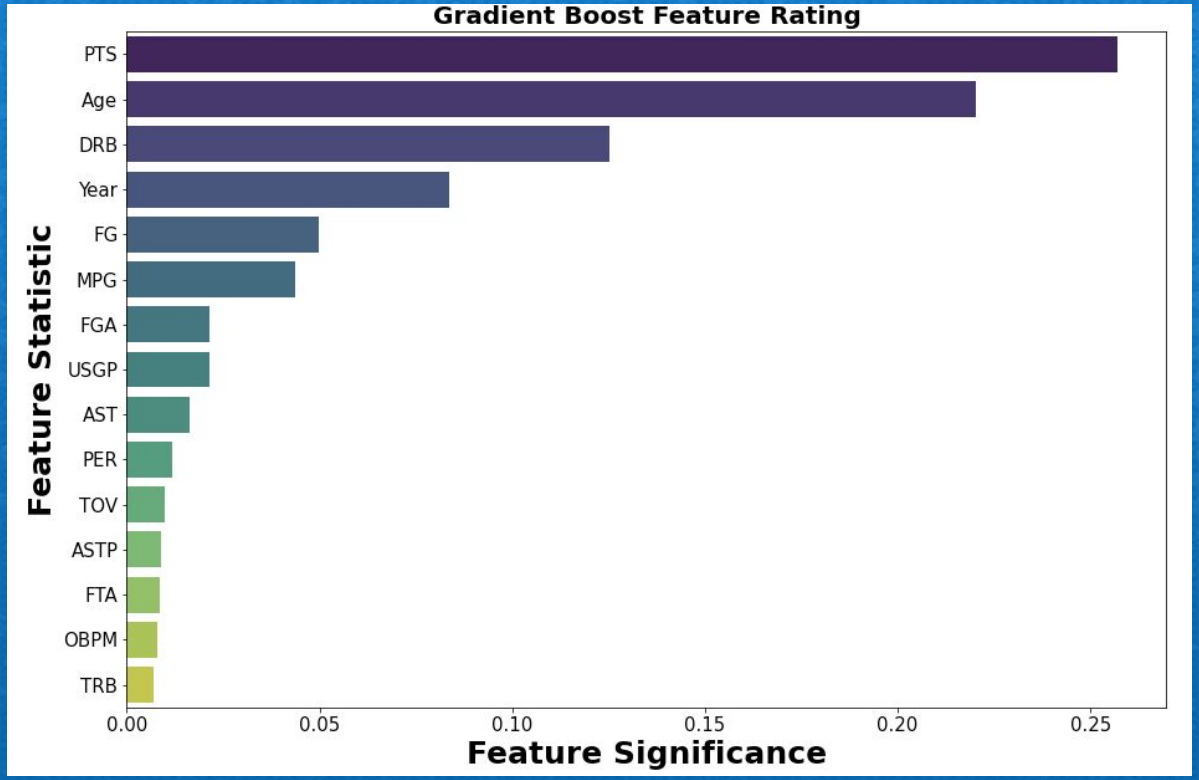
Random Forest - Feature Importance

Using up to 15 variables Random Forest able to achieve .**66 R^2** / **Error: $2.42 M**



Gradient Boosting- Feature Importance

Gradient Boost able to achieve the best of .**67 R^2** / **Error: $2.39 M**



Show Me The Money

Khwai Model Value

$24.8 Million +/- 2.8 M vs 34 Current

+$2 million vs all possible free agents

Why So Low?

-Playoff data not in sample/Player Awards

-Defense not valued in model

-Khwai plays limited games to prevent injury

-Brand Value not factored in

Next Steps

-Bring in postseason data/award elements

-Utilize team data

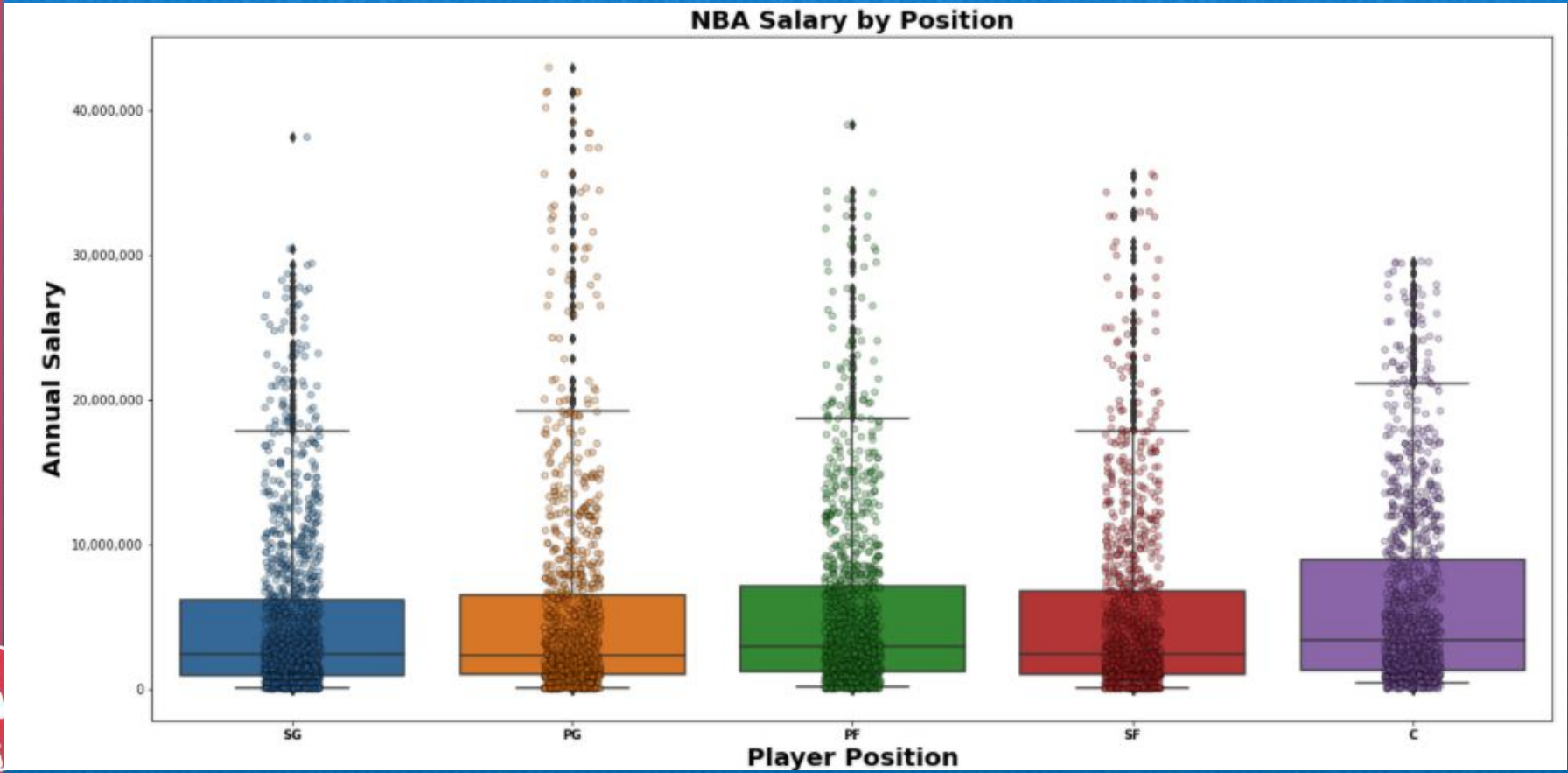
-Better incorporate Salary cap data/time element

-Explore player revenue off court (i.e. Followers)

-Further explore eliminating lower salaries/outliers

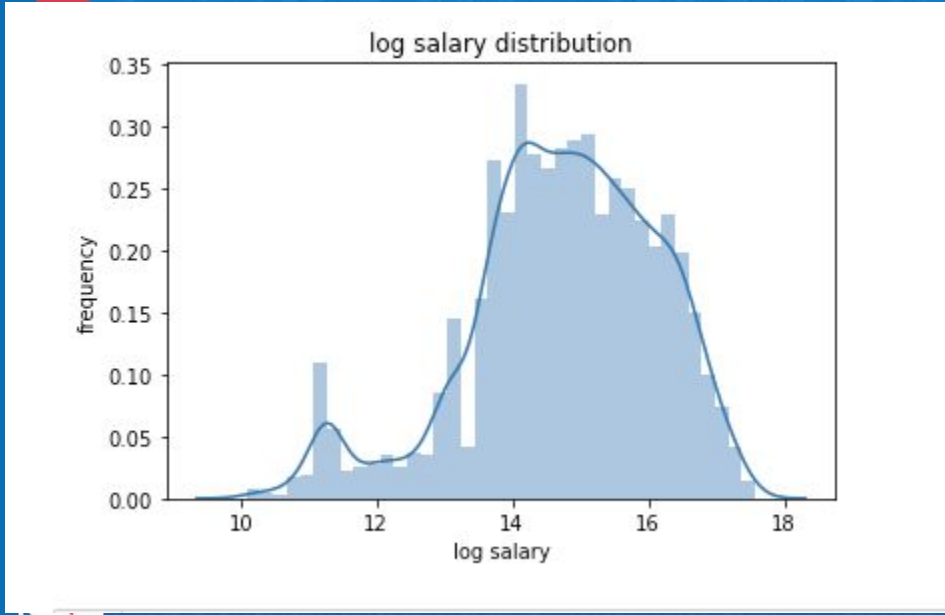
Appendix

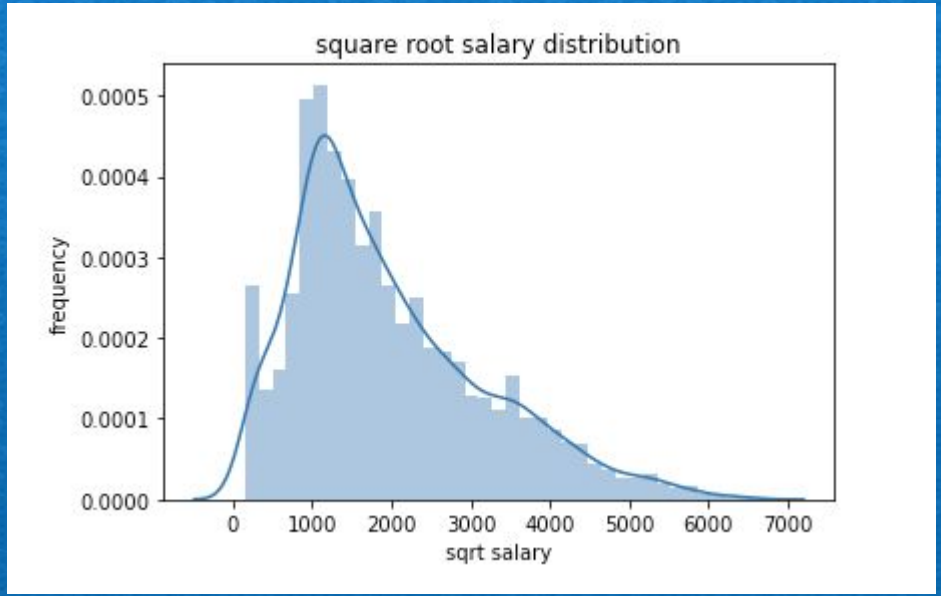
Positional Distributions



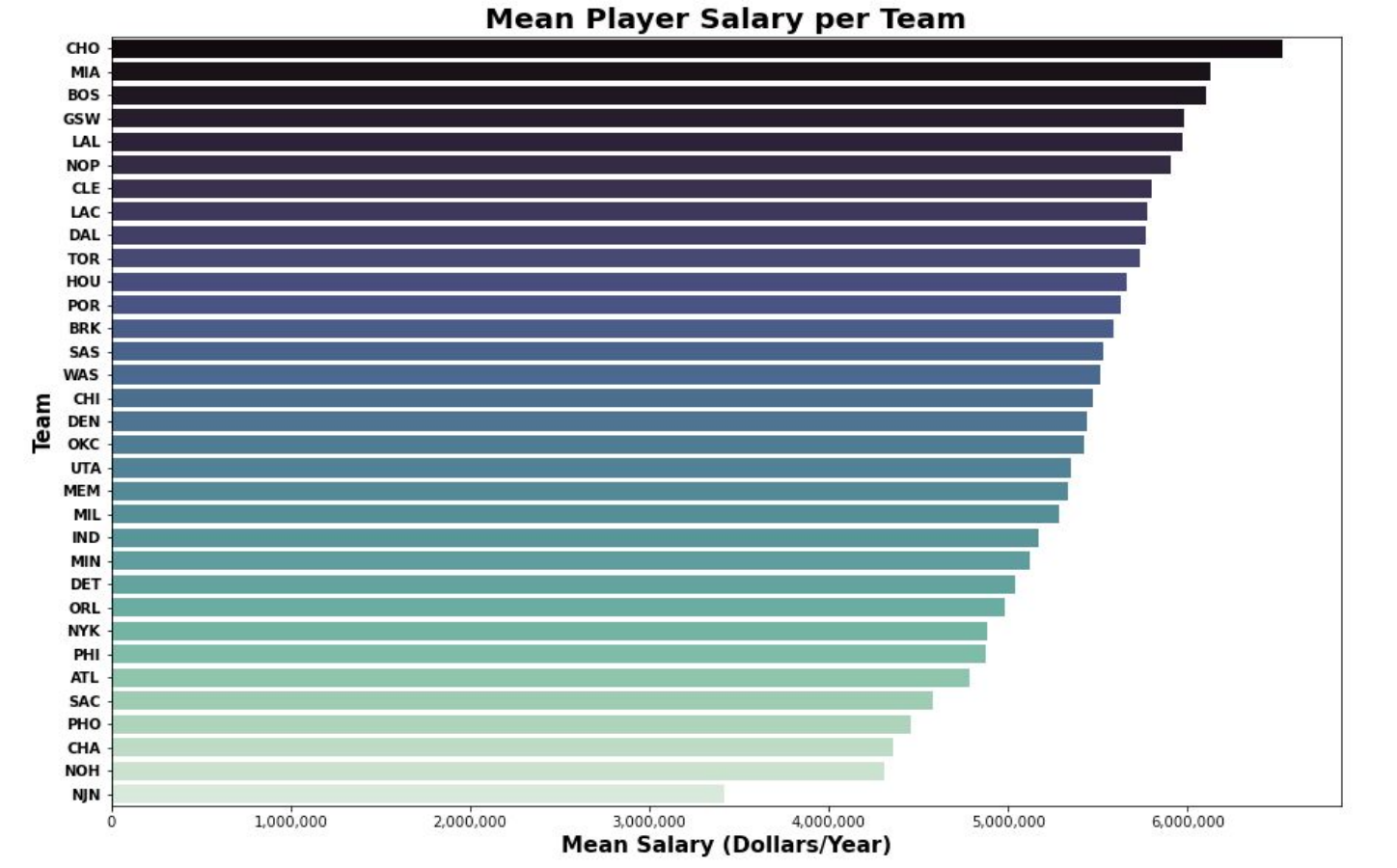
Log and Square Root Target Distributions

Square root achieved R^2 of .612 (Ridge)





EDA - Teams

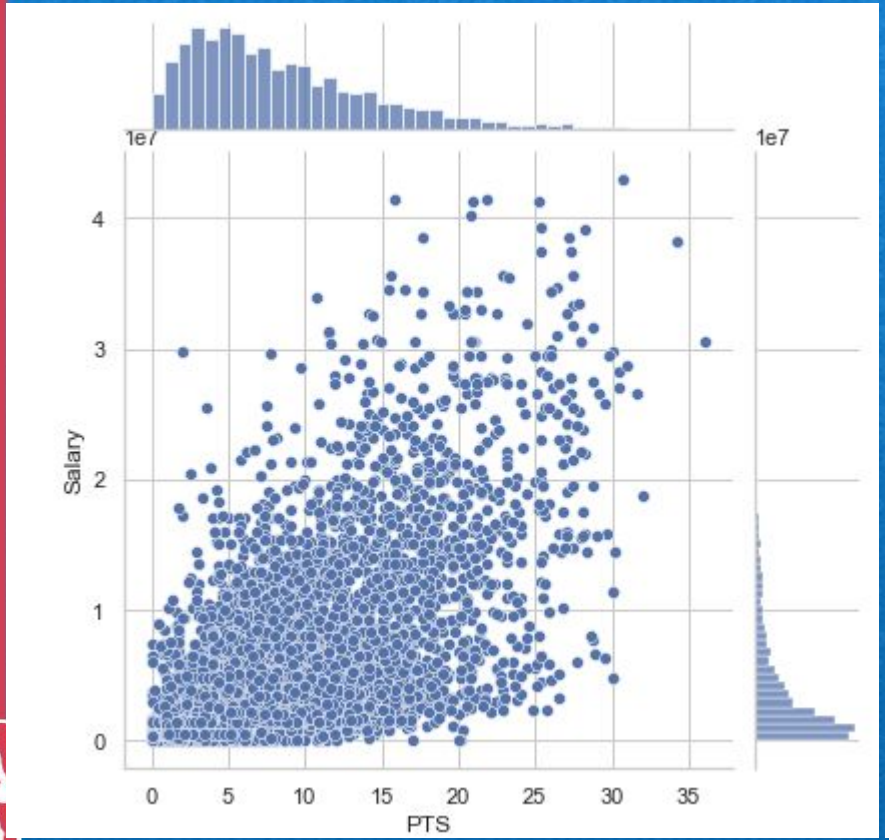

Mean Player Salary per Team
CHO
MIA
BOS
GSW
LAL
NOP
CLE
LAC
DAL
TOR
HOU
POR
BRK
SAS
WAS
CHI
DEN
OKC
UTA
MEM
MIL
IND
MIN
DET
ORL
NYK
PHI
ATL
SAC
PHO
CHA
NOH
NJN
Team
0
1,000,000
2,000,000
3,000,000
4,000,000
5,000,000
6,000,000
Mean Salary (Dollars/Year)

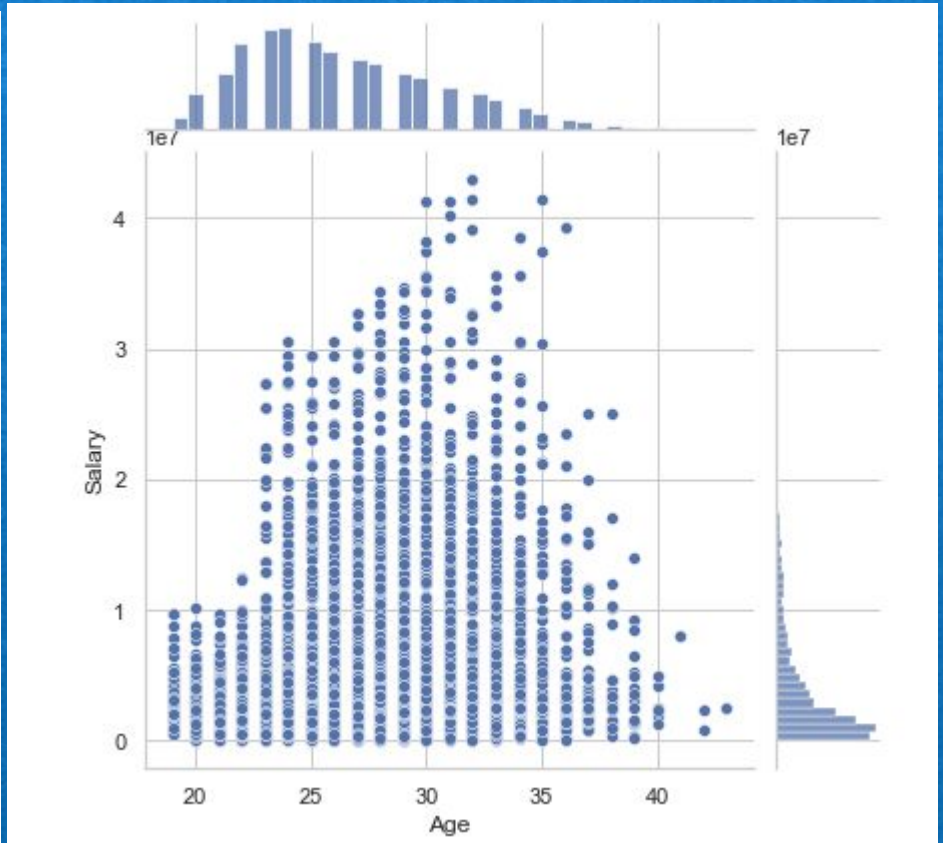
Prediction vs Current - Free Agents

Player	Predicted	Current
John Collins	$12.9	$2.7
Mike Conley	$18.9	$34
Victor Oladipo	$19.3	$21
Demar Derozan	$22.7	$27.7
Serge Ibaka	$14.1	$9.2

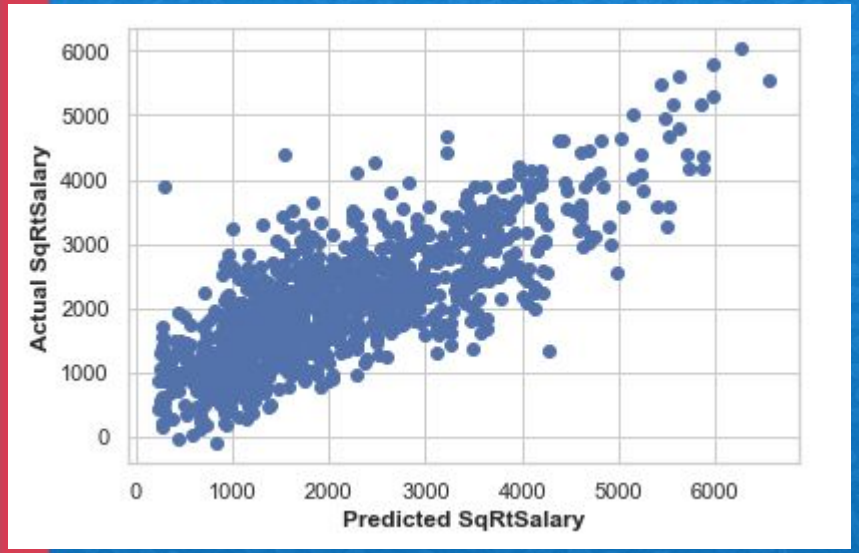
*** Values in Millions

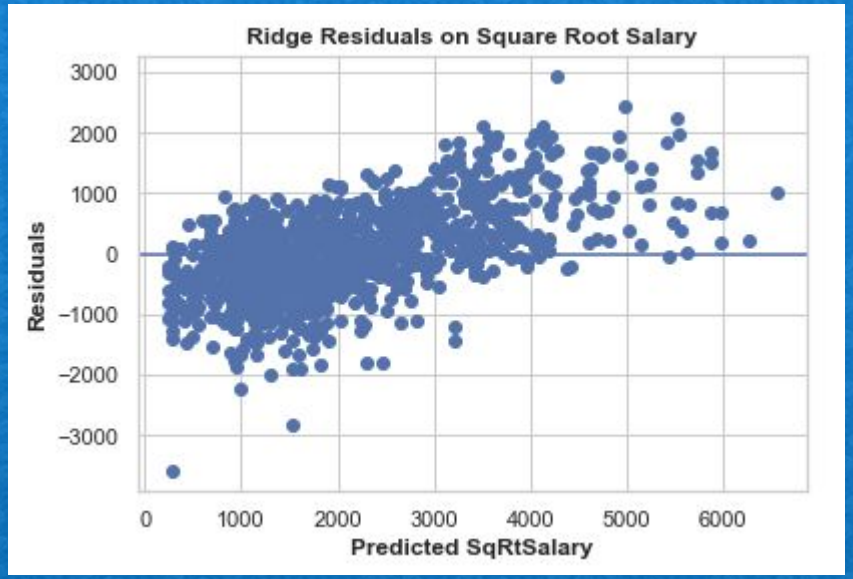
Example Distributions From Data





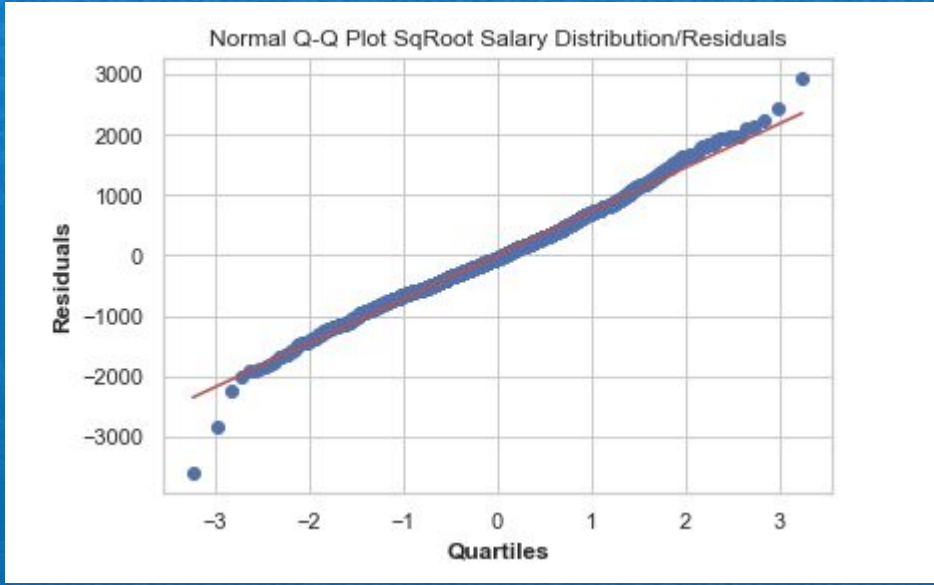
Ridge SqRoot Salary Prediction/Residual





Square Root Salary - QQ Plot

Improved prediction on higher salary



Ridge Salary Prediction/Residual