Predicting NBA Player Salary with Regression Modeling

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Motivation & Goals:
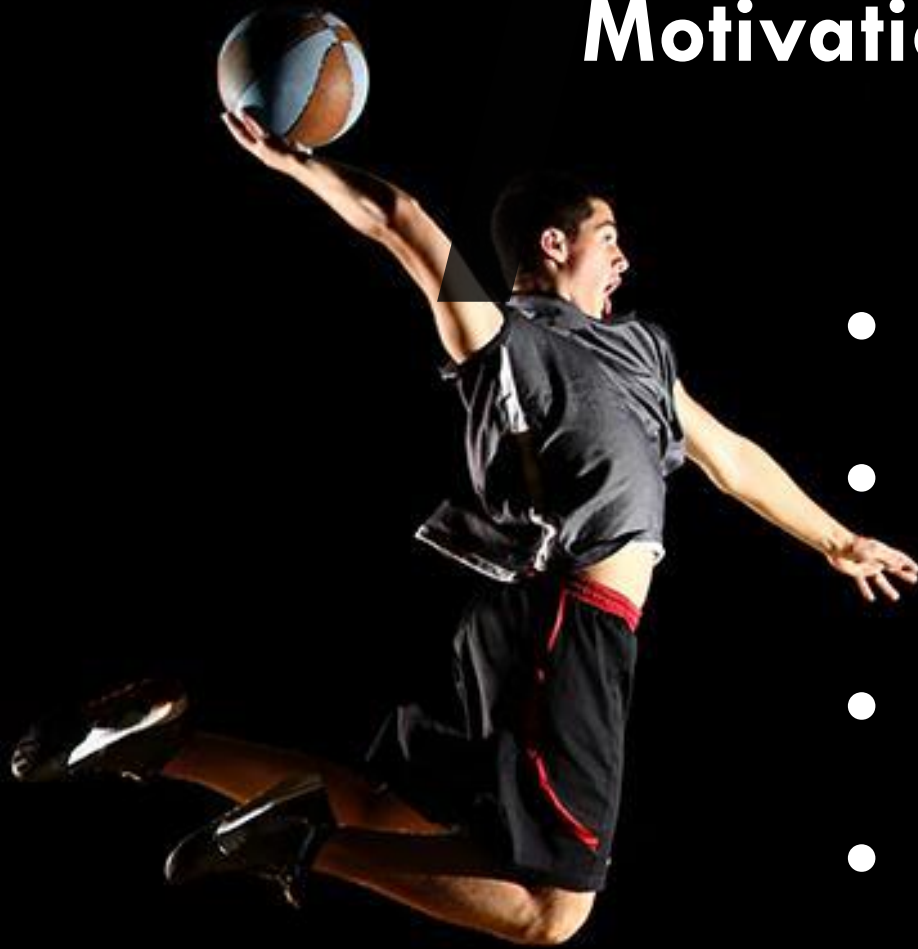
- Basketball fanatic, dream job to work for NBA
- Use NBA stats to create best fitting model to predict salary
- Identify the most valuable stat categories
- Identify overpaid/underpaid players

Obtaining Data

Data

- **NBA Player Stats: Per Game**

- **NBA Salary Data**

- **10 Seasons (2021 - 2012)**

Design

- Removed redundant features to avoid multicollinearity

- Features: Age, MP, Pos, 3P, 2P, FT, TRB, AST, STL, BLK, TOV, PTS, YEAR

  - Feature Engineering: Dummify Pos (PG, G, SG, SF, F, PF, C)

  - Approximate Value (AV) metric:

    - Credits Formula = (PTS)+(TRB)+(AST)+(STL)+(BLK)-(Field Goals Missed)-(Free Throws Missed)-(TOV)
    AV = (Credits(3/4))/21   *<https://www.nbastuffer.com/analytics101/approximate-value/>*

Model Performance

	R2 Train+Val	R2 Test
LR	0.568	0.575
Poly	0.689	0.682
Lasso	0.648	0.648
Ridge	0.568	0.573

Linear Regression

NBA Player Salary Predicted By Performance Stats

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Polynomial Regression

NBA Player Salary Predicted By Performance Stats
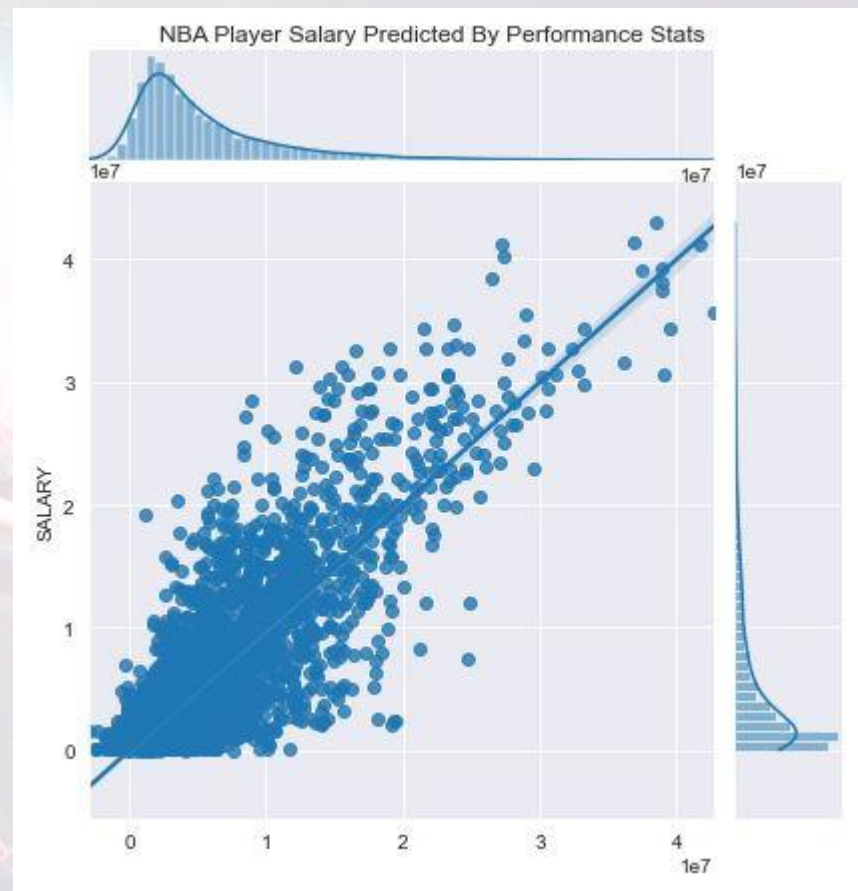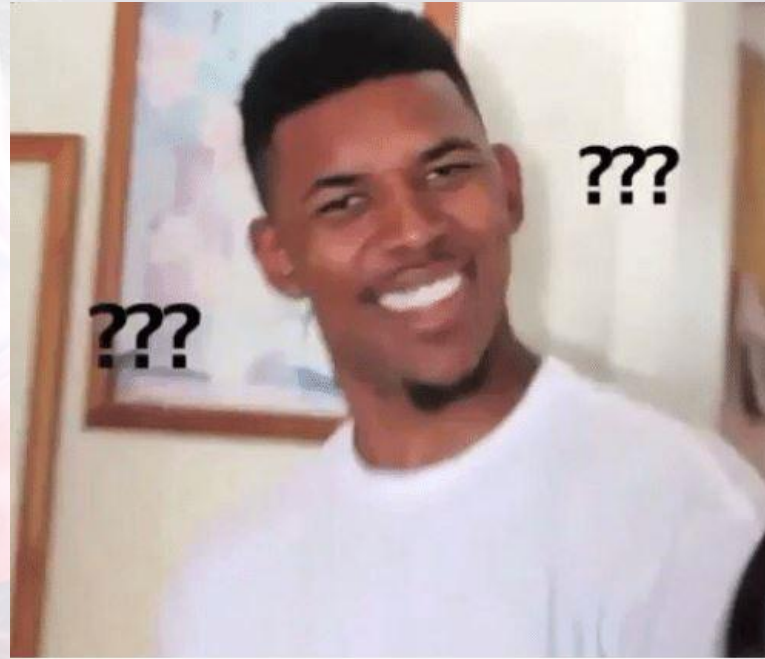
Analysis

Ridge Coefficients (Std Scale)

```
[('Age', 1900245.746051401),
 ('MP', -902568.4031844139),
 ('3P', 277465.9616549164),
 ('2P', 251649.71882582456),
 ('FT', 997134.7957209796),
 ('TRB', 2519541.3127245605),
 ('AST', 2480395.016233772),
 ('STL', 66794.61689321697),
 ('BLK', 499877.48130229115),
 ('TOV', -467192.91103423014),
 ('PTS', 3908709.0961064333),
 ('YEAR', 1019288.0419373773),
 ('F', -61019.08661196381),
 ('G', -101635.01323973387),
 ('PF', -168820.82794250362),
 ('PG', -855922.2149009109),
 ('SF', -118103.34746275842),
 ('SG', -439735.08500635624),
 ('AV', -3487477.8972201645)]
```


- **PTS, AST, TRB, AGE**
  - **AGE: Veteran minimums based on number of years in the league**
- **MP negative relationship**
  - **Contracts have guarantees, regardless of whether they actually play**

Analysis/Insights

	Player	Pos	Age	Tm	GS	MP	FG	FGA	FG%	3P	...	TRB	AST	STL	BLK	TOV	PTS	YEAR	SALARY	AV	res
315	Donovan Mitchell	SG	24	UTA	50	33.6	9.0	20.6	0.438	3.3	...	4.5	5.3	1.0	0.3	2.7	26.3	2021	5195501	0.516344	13442105
118	Luka Doncic	PG	21	DAL	47	35.1	10.2	21.0	0.485	3.0	...	8.1	8.7	1.0	0.6	4.3	28.5	2021	8049360	0.666044	13527802
1408	Dwyane Wade	SG	37	MIA	2	26.2	5.8	13.3	0.433	1.2	...	4.0	4.2	0.8	0.5	2.3	15.0	2019	2393887	0.373787	13798024
482	Trae Young	PG	22	ATL	50	34.3	7.8	17.8	0.435	2.3	...	4.0	9.5	0.8	0.2	4.3	25.4	2021	6571800	0.559325	14077175
884	Pascal Siakam	PF	25	TOR	60	35.2	8.3	18.4	0.453	2.2	...	7.3	3.5	1.0	0.9	2.5	22.9	2020	2351838	0.517957	14624049
1007	Devin Booker	SG	22	PHO	64	35.0	9.2	19.6	0.467	2.1	...	4.1	6.8	0.9	0.2	4.1	26.6	2019	3314365	0.533994	14675887
1964	Giannis Antetokounmpo	SF	22	MIL	80	35.6	8.2	15.7	0.521	0.6	...	8.8	5.4	1.6	1.9	2.9	22.9	2017	2995420	0.640683	14736420
606	Luka Doncic	PG	20	DAL	61	33.6	9.5	20.6	0.463	2.8	...	9.4	8.8	1.0	0.2	4.3	28.8	2020	7683360	0.685223	15220874
946	Trae Young	PG	21	ATL	60	35.3	9.1	20.8	0.437	3.4	...	4.3	9.3	1.1	0.1	4.8	29.6	2020	6273000	0.598161	15575691
1695	Nikola Jokic	C	22	DEN	73	32.6	6.7	13.5	0.499	1.5	...	10.7	6.1	1.2	0.8	2.8	18.5	2018	1471382	0.585827	15681131

- Does not account for contract length
- Does not account for Super Max franchise players
- Not trained on a player-by-player basis

CONTRACT: 5/$228,200,826	BONUS: -	AVG. SALARY: $45,640,165

YEAR		AGE	BASE SALARY
2021-22		26	$39,344,970
2022-23		27	$42,492,568
2023-24		28	$45,640,165
2024-25		29	$48,787,763
2025-26		30	$51,935,360

Future Work

- **Add number of years played data**

- **Factor in salary length**

- **Player trajectory regression**

Appendix

- https://www.spotrac.com/nba/milwaukee-bucks/giannis-antetokounmpo-13328/
- https://www.nbastuffer.com/analytics101/approximate-value/
- https://hoopshype.com/salaries/players/
- https://www.basketball-reference.com/leagues/NBA_2021_per_game.html