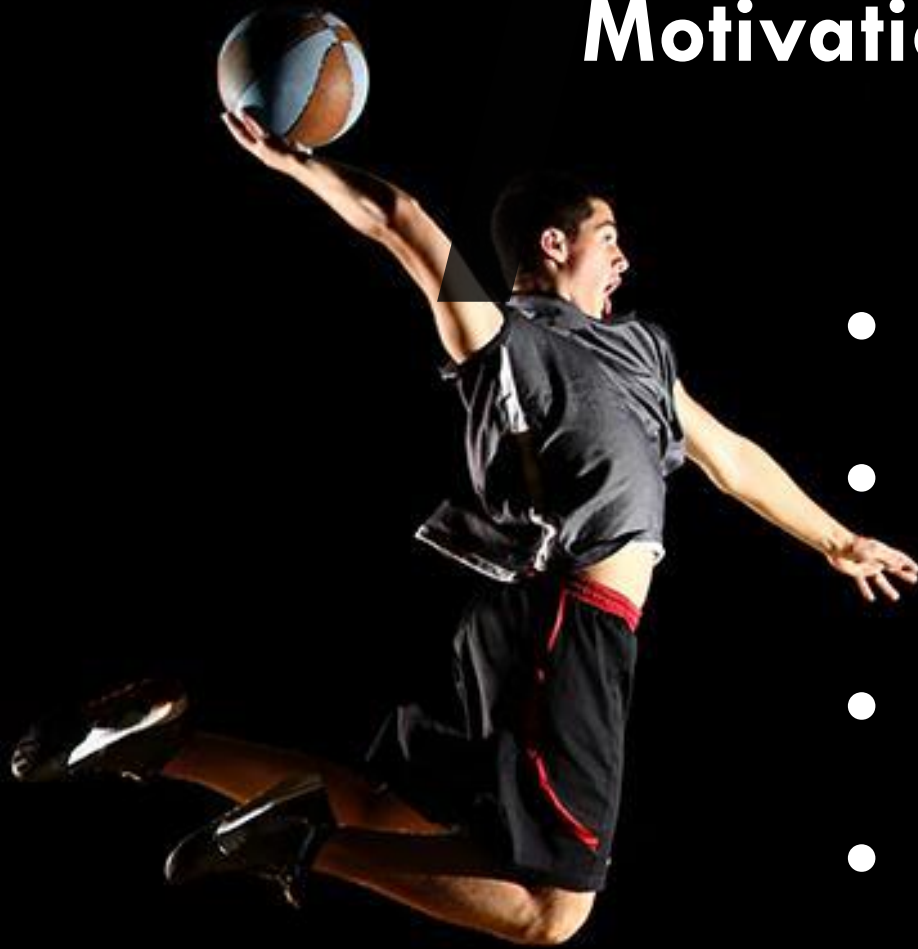


Predicting NBA Player Salary with Regression Modeling

The background of the slide is a photograph of a basketball court. In the foreground, a hand is holding a basketball. The court floor is visible, along with the basketball hoop and backboard in the background. The arena is filled with blue seats, and bright spotlights illuminate the scene from above.

Andrew Wong

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



BeautifulSoup





Data

- **NBA Player Season Stats: Per Game Averages**
- **NBA Salary Data**
- **10 Seasons (2021 - 2012)**
- **4590 rows, 28 stat columns**
- **80/20 test holdout**

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 = $(PTS) + (TRB) + (AST) + (STL) + (BLK) - (\text{Field Goals Missed}) - (\text{Free Throws Missed}) - (TOV)$
 $AV = (\text{Credits}(3/4)) / 21$

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

RMSE: \$6 million

Linear Regression

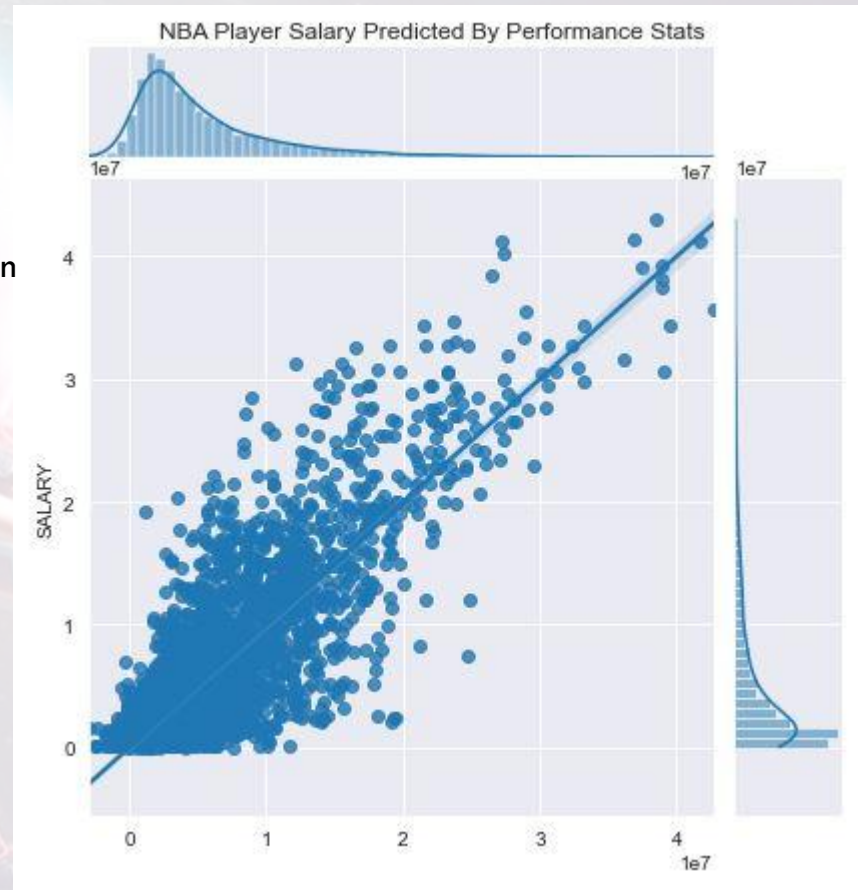


Model Performance

	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

RMSE: \$4.4 million

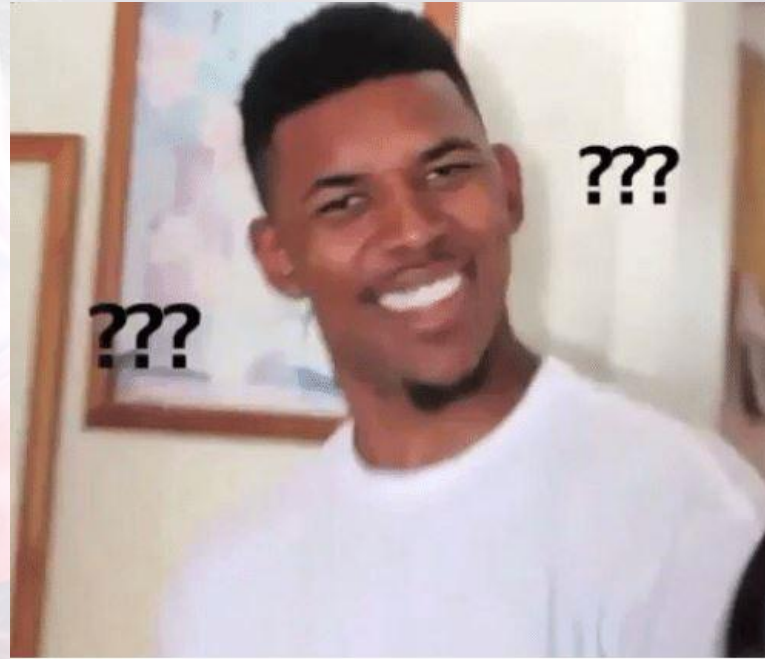
Polynomial Regression



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**
 - **Bench-warmers still get paid**

Conclusion/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

Conclusion/Insights






Player	Pos	Age	Tm	GS	MP	FG	FGA	FG%	3P	...	TRB	AST	STL	BLK	TOV	PTS	YEAR	SALARY	AV	res
Gordon Hayward	SF	27	BOS	1	5.0	1.0	2.0	0.500	0.0	...	1.0	0.0	0.0	0.0	0.0	2.0	2018	29727900	0.080085	-27518648
John Wall	PG	30	HOU	34	32.0	7.4	18.1	0.410	2.1	...	3.3	6.8	1.1	0.8	3.4	20.8	2021	41254920	0.452041	-23121182
Chris Paul	PG	35	PHO	51	31.8	6.1	12.5	0.491	1.3	...	4.7	8.7	1.4	0.2	2.3	16.2	2021	41358814	0.495222	-22205483
Blake Griffin	PF	31	TOT	21	27.6	3.7	9.4	0.395	1.7	...	4.9	3.4	0.7	0.2	1.5	11.1	2021	33900241	0.342801	-21404383
Steven Adams	C	27	NOP	49	27.9	3.4	5.5	0.616	0.0	...	8.8	1.9	1.0	0.7	1.5	7.8	2021	29592695	0.414401	-21202847
Gordon Hayward	PF	28	BOS	18	25.9	4.1	8.8	0.466	1.1	...	4.5	3.4	0.9	0.3	1.5	11.5	2019	31214295	0.359316	-20994681
Chris Paul	PG	34	OKC	70	31.5	6.2	12.7	0.489	1.6	...	5.0	6.7	1.6	0.2	2.3	17.6	2020	38506482	0.495222	-20918556
Mike Conley	PG	32	UTA	41	29.0	4.9	12.1	0.409	2.0	...	3.2	4.4	0.8	0.1	2.0	14.4	2020	32511623	0.350173	-19991431
Stephen Curry	PG	31	GSW	5	27.8	6.6	16.4	0.402	2.4	...	5.2	6.6	1.0	0.4	3.2	20.8	2020	40231758	0.467138	-19737621
Mike Conley	PG	33	UTA	43	29.7	5.7	12.7	0.452	2.8	...	3.5	5.4	1.3	0.1	1.9	16.6	2021	34502132	0.423052	-19643089

- 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 contract length**
- **Player trajectory regression**

Appendix

- <https://www.spotracer.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

THANK YOU

