



# Predicting Daily Fantasy Basketball

Linda Ju

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Unlike regular season-long fantasy leagues, DFB contests generally last for a night

Fantasy

**Pick a team of players** based on a “salary cap” and **earn points** based on the actual statistical performance of your chosen players

Basketball



# Project Motivation

Objective: predict players' fantasy points in order to pick a high-scoring team

Perfect Lineup				Best Submitted Lineup	SALARY \$198	POINTS 346.5
Pos	Points	FPPG	Salary	Player		
PG	<b>56.8</b>	41.6	\$37	 John Wall WAS 115 @ CLE 119, Final		
SG	<b>38.9</b>	16.8	\$12	 Allen Crabbe BKN 119 @ MIL 111, Final		
G	<b>30.8</b>	22.0	\$11	 Joe Harris BKN 119 @ MIL 111, Final		
SF	<b>38.6</b>	27.1	\$16	 Bojan Bogdanovic GS 106 @ IND 126, Final		
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C	<b>50.3</b>	48.4	\$46	 Nikola Jokic MIN 96 @ DEN 100, Final		
UTIL	<b>44.3</b>	32.7	\$31	 Khris Middleton BKN 119 @ MIL 111, Final		

# Data

In total, 34 **features** were scraped for 6,000+ observations

Features can be grouped into three broad categories:

1. Player's past performance represented as average of past three games

- Minutes, points, rebounds, steals, blocks, turnovers, etc.

2. Opponent's stats

- Offensive and defensive ratings, pace, etc.

3. Game/player-specific

- Home vs away, days rest

**Target:** fantasy points scored

The screenshot shows a player profile for James Harden (#13, Houston Rockets) with basic stats like height (6-5), weight (220 lbs), and birth date (08/26/1989). It also shows his draft information (2009 Rnd 1 Pick 3) and career spans (10 yrs). Below the profile is a table of advanced box scores for the 2018-19 regular season. The table includes columns for Match Up, W/L, MIN, PTS, FGM, FGA, FG%, 3PM, 3PA, 3P%, FTM, FTA, FT%, OREB, DREB, REB, AST, STL, BLK, TOV, PF, and +/-, along with a note that stats go back to the 1996-97 season. The table lists various games from April 2019, such as Apr 09, 2019 - HOU @ OKC and Mar 20, 2019 - HOU @ MEM.

MATCH UP		W/L	MIN	PTS	FGM	FGA	FG%	3PM	3PA	3P%	FTM	FTA	FT%	OREB	DREB	REB	AST	STL	BLK	TOV	PF	+/−
Apr 09, 2019 - HOU @ OKC	L	37	39	11	28	39.3	5	15	33.3	12	13	92.3	1	9	10	3	1	1	4	4	1	
Apr 07, 2019 - HOU vs. PHX	W	29	30	10	14	71.4	5	6	83.3	5	7	71.4	0	13	13	9	2	0	6	3	39	
Apr 05, 2019 - HOU vs. NYK	W	29	26	8	21	38.1	5	13	38.5	5	5	100	1	8	9	8	1	1	3	2	29	
Apr 03, 2019 - HOU @ LAC	W	30	31	9	15	60.0	3	7	42.9	10	12	83.3	1	6	7	7	0	0	6	3	16	
Apr 02, 2019 - HOU @ SAC	W	29	36	12	19	63.2	7	12	58.3	5	6	83.3	0	3	3	10	1	0	2	2	29	
Mar 30, 2019 - HOU vs. SAC	W	38	50	13	31	41.9	7	23	30.4	17	18	94.4	1	10	11	10	0	0	3	1	17	
Mar 28, 2019 - HOU vs. DEN	W	32	38	10	22	45.5	5	11	45.5	13	14	92.9	2	4	6	6	1	1	4	2	14	
Mar 26, 2019 - HOU @ MIL	L	38	23	9	26	34.6	1	9	11.1	4	5	80.0	0	10	10	7	0	2	4	4	-14	
Mar 24, 2019 - HOU @ NOP	W	29	28	10	19	52.6	6	12	50.0	2	2	100	0	3	3	4	1	1	6	1	14	
Mar 22, 2019 - HOU vs. SAS	W	37	61	19	34	55.9	9	13	69.2	14	17	82.4	2	5	7	1	3	0	3	3	18	
Mar 20, 2019 - HOU @ MEM	L	46	57	18	39	46.2	9	17	52.9	12	12	100	1	6	7	8	2	2	3	3	11	

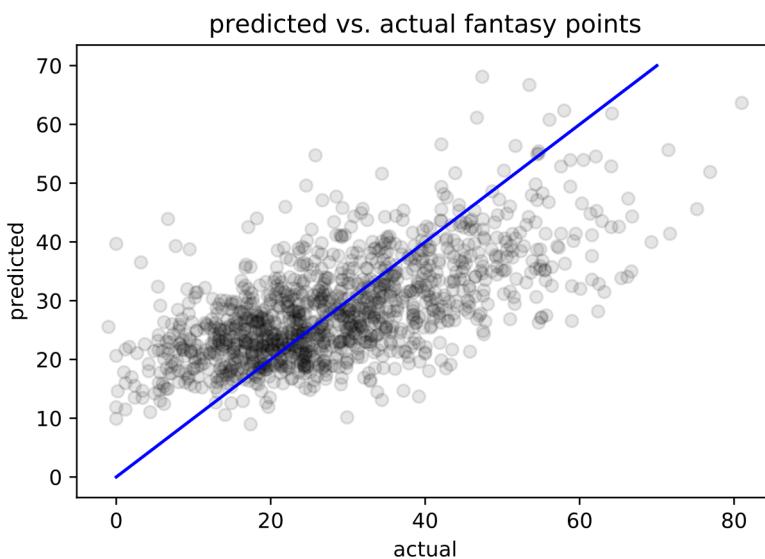
# METHODOLOGY

	<b>Exploratory Data Analysis</b>	<b>Modeling</b>
<b>Tasks</b>	<ul style="list-style-type: none"><li>• Remove outliers</li><li>• Normalize and/or standardize data</li></ul>	<ul style="list-style-type: none"><li>• Linear regression with 34 features</li><li>• Lasso vs. ridge regularization</li><li>• Cross validation to find the best alpha/lambda</li><li>• Compare <math>R^2</math> score</li></ul>
<b>Tools</b>	<ul style="list-style-type: none"><li>• Histograms and boxplots</li><li>• Box-cox and log transformations</li><li>• StandardScaler()</li></ul>	<ul style="list-style-type: none"><li>• Sklearn<ul style="list-style-type: none"><li>▪ <code>train_test_split</code></li><li>▪ <code>LinearRegression()</code></li><li>▪ <code>LassoCV</code>, <code>RidgeCV</code></li><li>▪ <code>r2_score</code></li></ul></li></ul>

## Results and Conclusion

- Features with the highest absolute coefficients :
  - Avg **fantasy points** in the past three games:  $\beta \approx 2.92$
  - Avg **field goal attempts** in the past three games:  $\beta \approx 2.07$
  - Avg number of **assists** in the past three games:  $\beta \approx 1.66$
  - Avg number of **turnovers** in the past three games:  $\beta \approx 1.57$
  - Avg number of **defensive rebounds** in the past three games:  $\beta \approx 0.83$

- Lasso regression
- $R^2$  and  $adj. R^2 \approx 41\%$  (on Test data)
- Mean absolute error  $\approx 8.4$



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- Look for players who have scored the most fantasy points, attempted the most shots, passed the ball often, and got rebounds
  - Russell Westbrook



## Future Enhancements

- Scrape more features
  - Assist to turnover ratio
  - Playoff standing and time to playoffs
  - Opponent's stats allowed
- Choose different way to represent past performance
  - Average of past five or ten games vs. three games
  - Weighted average vs. simple average
- Extend analysis to players in other positions
  - Forwards
  - Centers
- Compare value to salary cost of player

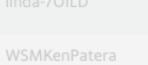
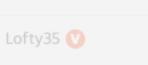
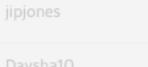


# APPENDIX

# DFB Contest Example: Picking Players

Pos	Player	Salary	FPPG
PG	Eric Bledsoe BKN 119 @ MIL 111, Final	\$32	32.2
SG	Donovan Mitchell LAC 95 @ UTA 117, Final	\$33	37.2
G	Bradley Beal WAS 115 @ CLE 119, Final	\$30	43.6
SF	Khris Middleton BKN 119 @ MIL 111, Final	\$31	32.7
PF	Derrick Favors LAC 95 @ UTA 117, Final	\$18	27.8
F	Jabari Parker BKN 119 @ MIL 111, Final	\$19	27.2
C	Kevin Love WAS 115 @ CLE 119, Final	\$26	33.0
UTIL	John Henson BKN 119 @ MIL 111, Final	\$11	16.2

# DFB Contest Example: Earning Points

NBA \$110-Team 50/50 [Rookie Only]  		Started Thu, 7:00 PM EDT (6 NBA games) 		ENTRIES 10/10		ENTRY FEE \$1.00		PRIZE POOL \$9.00		MANAGEMENT FEE 10.0%		PLACES PAID 5		EARN YSRP 1	
<b>linda-7OILD</b>		263.0	0 PMR	—		Select a team below to compare Or view all player scores									
Player	FPPG	PMR	Points	Pos	Rank	User	Points	PMR	Prizes						
40% Eric Bledsoe BKN 119 @ MIL 111, Final		32.2	0	<b>40.6</b>	PG	1	 user-K6D15 	277.4	0	<b>\$1.80</b>					
30% Donovan Mitchell LAC 95 @ UTA 117, Final		37.2	0	<b>33.5</b>	SG	1	 MurphyDog	277.4	0	<b>\$1.80</b>					
10% Bradley Beal WAS 115 @ CLE 119, Final		43.6	0	<b>40.8</b>	G	3	 linda-7OILD	263.0	0	<b>\$1.80</b>					
30% Khris Middleton BKN 119 @ MIL 111, Final		32.7	0	<b>44.3</b>	SF	5	 Lofty35 	250.8	0	<b>\$1.80</b>					
40% Derrick Favors LAC 95 @ UTA 117, Final		27.8	0	<b>25.6</b>	PF	6	 snowflakexx 	250.7	0						
10% Jabari Parker BKN 119 @ MIL 111, Final		27.2	0	<b>29.0</b>	F	7	 bballboy5-ND4U 	238.9	0						
20% Kevin Love WAS 115 @ CLE 119, Final		33.0	0	<b>27.7</b>	C	8	 lukasz-E76MM	226.8	0						
80% John Henson BKN 119 @ MIL 111, Final		16.2	0	<b>21.5</b>	UTIL	9	 jipjones	218.1	0						
10	 Daysha10														
6 GAMES	<	FINAL GS 106 IND 126	FINAL WAS 115 CLE 119	FINAL POR 94 HOU 96	FINAL BKN 119 MIL 111	FINAL LAC 95 UTA 117	FINAL MIN 96 DEN 100								

# DFB Contest Example: Earning Points

NBA \$1 10-Team 50/50 [Rookie Only] R i  
 Started Thu, 7:00 PM EDT (6 NBA games) G Guaranteed to Run

ENTRIES	ENTRY FEE	PRIZE POOL	MANAGEMENT FEE	PLACES PAID	EARN YSRP
10/10	\$1.00	\$9.00	10.0%	5	1

**linda-7OILD** 3rd place  263.0 Points  
 0 PMR —

Select a team below to compare  
[Or view all player scores](#)

Player	FPPG	PMR	Points	Pos	Rank	User	Points	PMR	Prizes	
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**linda-7OILD**

3rd place



263.0

0

Points  
PMR



Select a team below to compare

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6 GAMES <

FINAL GS 106	FINAL WAS 115	FINAL POR 94	FINAL BKN 119	FINAL LAC 95	FINAL MIN 96
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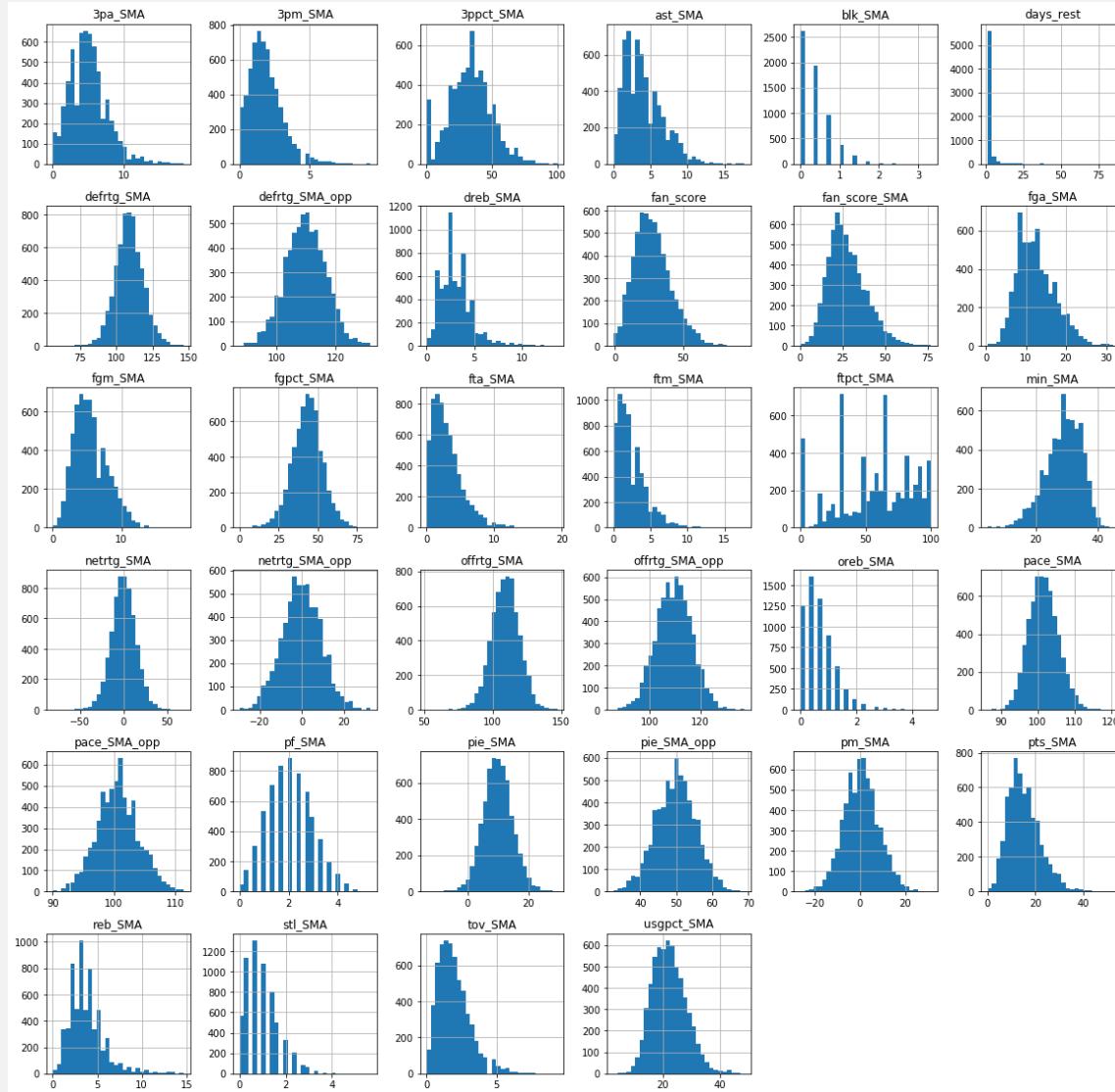
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# Project Motivation

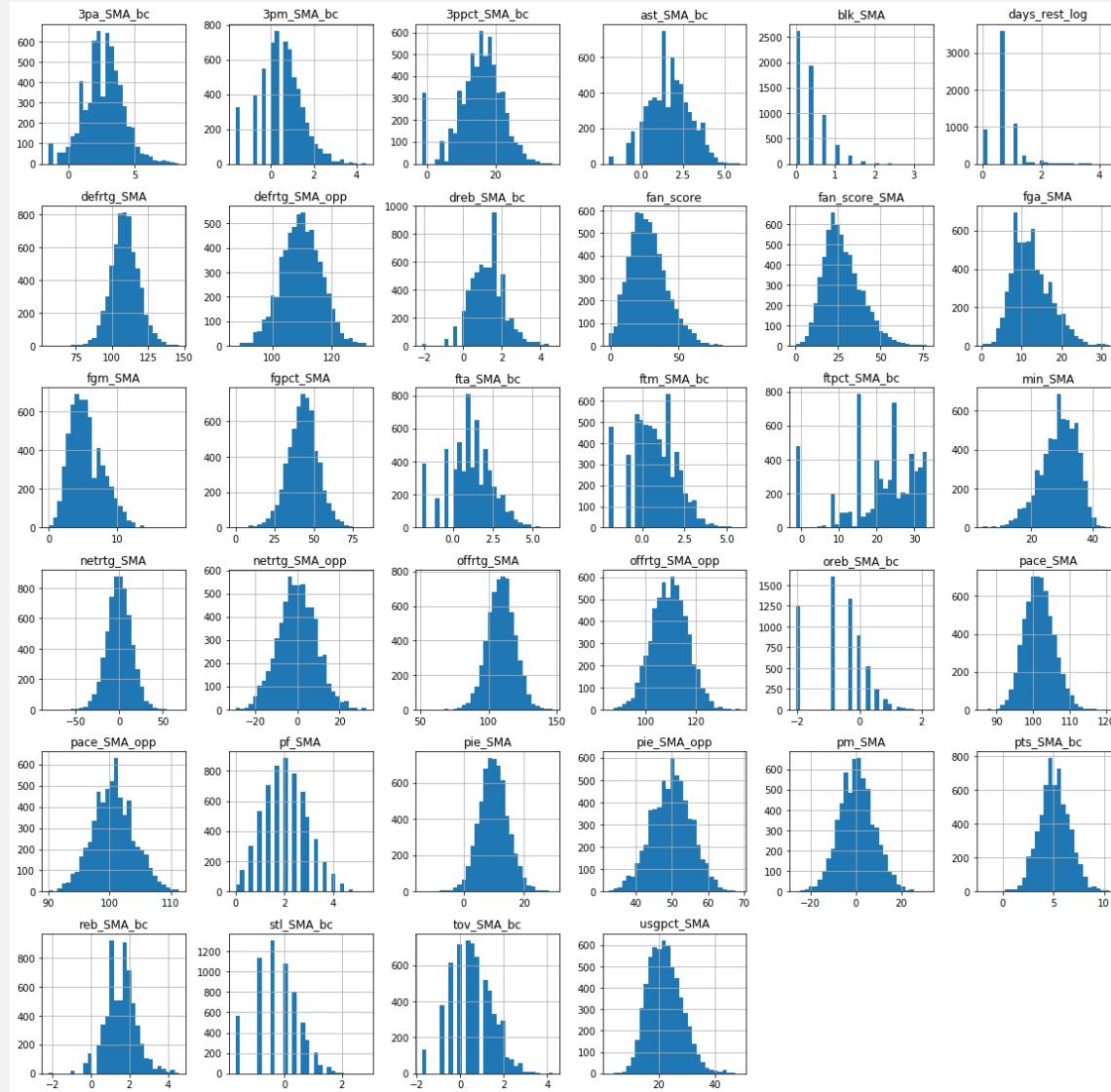
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# Distributions Pre-Transformations

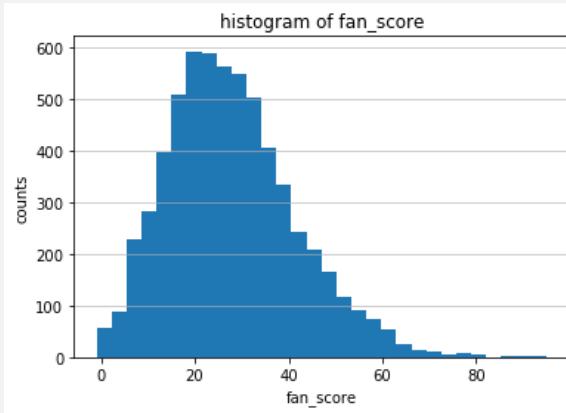


# Distributions Post-Transformations

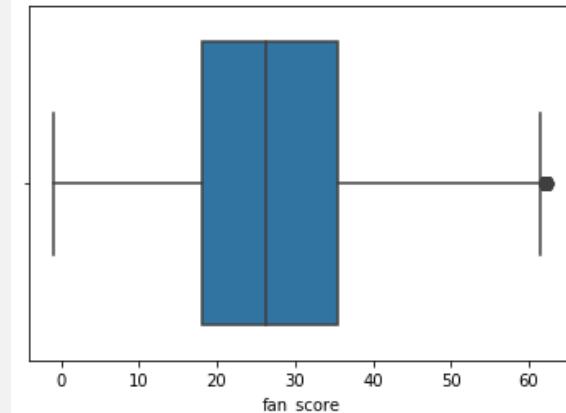
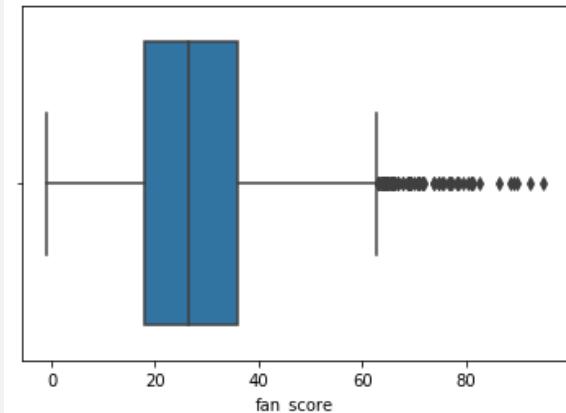
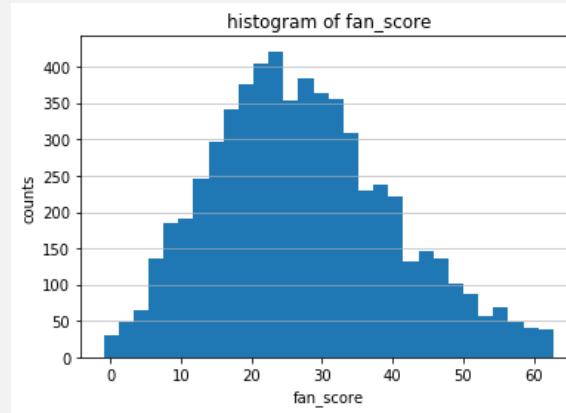


# Outliers in Target

Before Removal of Outliers



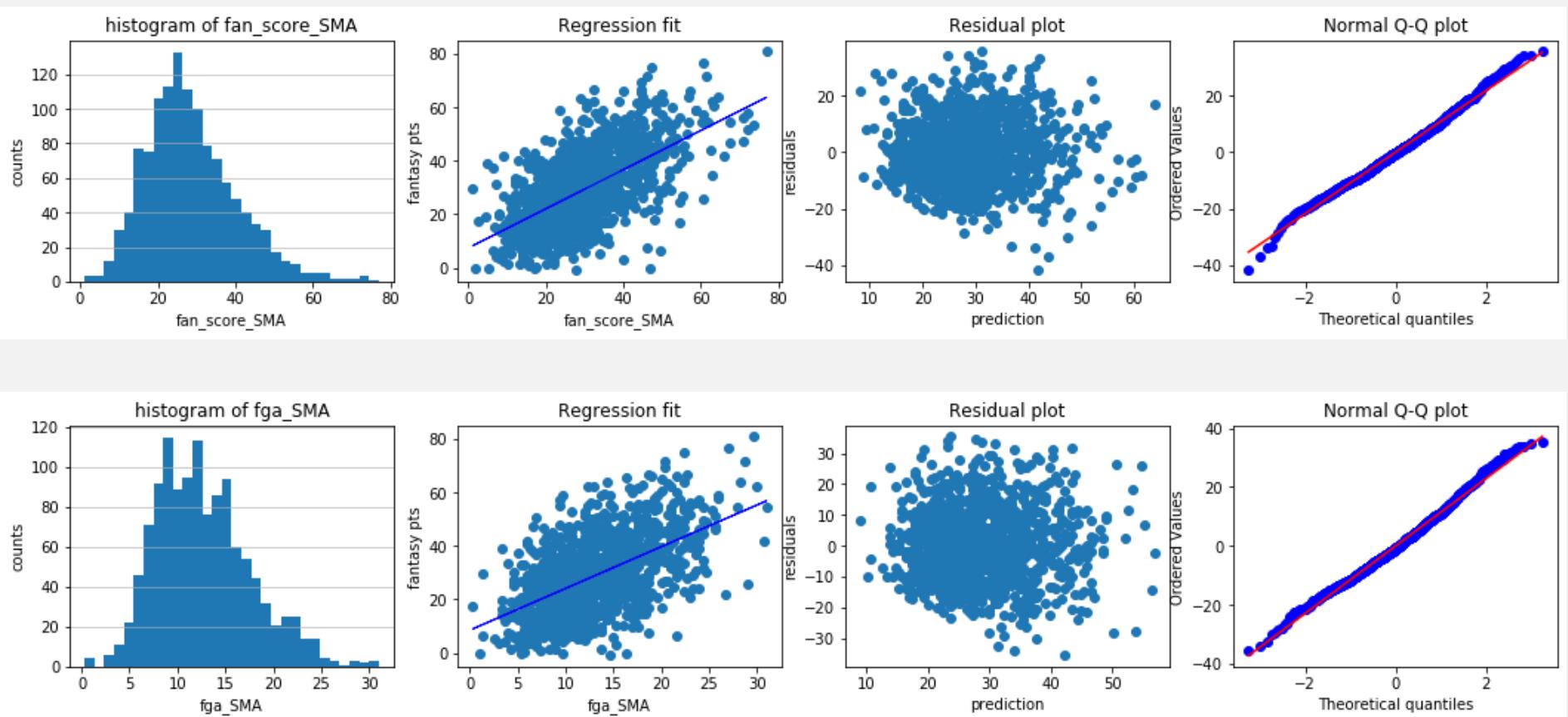
After Removal of Outliers



## More Coefficients

- Avg **free throws made** in the past three games:  $\beta \approx 0.73$
- Avg **3-pt percentage** in the past three games:  $\beta \approx -0.48$
- Avg **opponent pace** in the past three games:  $\beta \approx 0.39$
- Avg **free throw attempts** in the past three games:  $\beta \approx 0.36$
- Avg **player impact estimate** in the past three games:  $\beta \approx -0.31$
- Number of **rest days**:  $\beta \approx -0.28$
- Avg **opponent defensive rating** in the past three games:  $\beta \approx 0.21$
- Avg number of **blocks** in the past three games:  $\beta \approx 0.19$
- Avg number of **steals** in the past three games:  $\beta \approx 0.19$
- Avg **opponent player impact estimate** in the past three games:  $\beta \approx -0.18$
- Avg **defensive rating** in the past three games:  $\beta \approx 0.17$
- Avg **3-pt attempts** in the past three games:  $\beta \approx 0.12$

# Residuals vs. Features with Highest Coefficients



# Residuals vs. Features with Highest Coefficients

