

# NBAnalysis

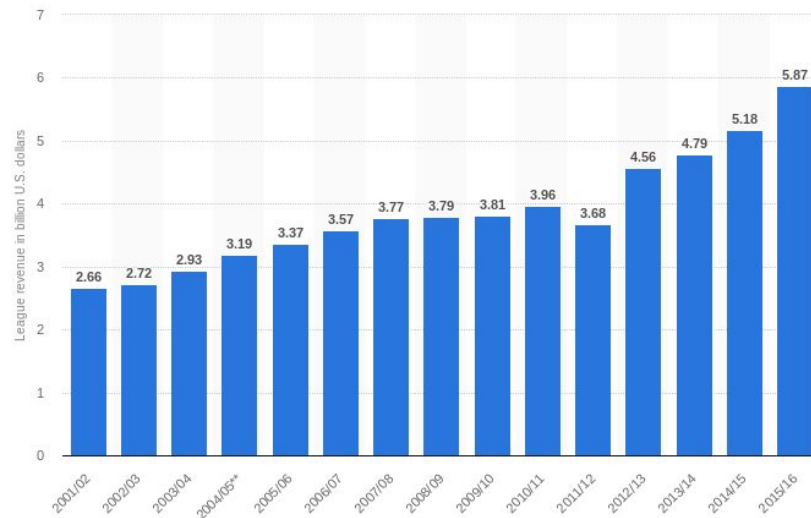
Bruno Vitorino  
Caio Rocha  
Pedro Lins





# A NBA

- Principal liga de basquete do mundo
- Finais tiveram audiência média de ~20.38M em 2017



fonte:

<https://www.statista.com/statistics/193467/total-league-revenue-of-the-nba-since-2005/>



# A coleta

- Fonte: <https://www.basketball-reference.com/>
- Dados de todos os times em todas as temporadas
  - Escolhemos as temporadas de 2014-2015 até a atual (2017-2018)
  - A configuração dos times se manteve a mesma nesse período
  - Estatísticas médias (por jogo) de cada time na temporada
- Dados dos jogadores de cada time na temporada
  - Informações
    - Altura, peso, universidade...
  - Estatísticas
    - Médias (por jogo) de alguns atributos (pontos, assistências, rebotes, etc.)
- Dificuldades
  - Site mantinha algumas tabelas comentadas

**Basketball Stats and History** Statistics, scores, and history for the NBA, ABA, WNBA, and top European competition.

## Every Player



## View any Active Player:

Choose a Team ▾

Then a player ▾

Go!

## Select a Hall of Famer:

Select a player ▾

## Recent Debuts

[Vince Hunter](#) (MEM), [Kobi Simmons](#) (MEM), [Torrey Craig](#) (DEN),  
[John Holland](#) (CLE), [Tyler Lydon](#) (DEN) and [Jacob Pullen](#) (PHI)

## In Memoriam

[Fatty Taylor](#), [Steve Jones](#), [Justin Reed](#), [Connie Hawkins](#), [Frank Hamblen](#) and [Jim McDaniels](#)

## Happy Birthday

[Langston Galloway](#), [Bill Crow](#), [Brent Price](#), [Eric Bledsoe](#), [Cliff Hagan](#)  
and [Dick Wehr](#)

Player pages include basic statistics and links to player's game logs, splits, advanced stats, and more.

## Every Team

## 2017-18 NBA Standings

[Summary](#) • [Schedule](#) • [Scores](#)

East				West			
		W	L			W	L
<a href="#">BOS</a> (1)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	22	5	<a href="#">HOU</a> (1)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	19	4
<a href="#">TOR</a> (2)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	16	7	<a href="#">GSW</a> (2)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	21	6
<a href="#">CLE</a> (3)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	18	8	<a href="#">SAS</a> (3)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	18	8
<a href="#">MIL</a> (4)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	14	10	<a href="#">MIN</a> (4)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	15	11
<a href="#">IND</a> (5)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	15	11	<a href="#">DEN</a> (5)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	14	11
<a href="#">DET</a> (6)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	14	11	<a href="#">POR</a> (6)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	13	11
<a href="#">WAS</a> (6)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	14	11	<a href="#">NOP</a> (7)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	13	13
<a href="#">PHI</a> (8)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	13	11	<a href="#">UTA</a> (7)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	13	13
<a href="#">NYK</a> (9)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	12	12	<a href="#">OKC</a> (9)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	11	13
<a href="#">MIA</a> (10)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	11	13	<a href="#">LAL</a> (10)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	9	15
<a href="#">BRK</a> (11)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	10	14	<a href="#">LAC</a> (11)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	8	15
<a href="#">ORL</a> (12)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	11	16	<a href="#">PHO</a> (12)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	9	18
<a href="#">CHO</a> (13)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	9	15	<a href="#">SAC</a> (13)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	8	17
<a href="#">ATL</a> (14)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	5	19	<a href="#">MEM</a> (13)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	8	17
<a href="#">CHI</a> (15)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	4	20	<a href="#">DAL</a> (15)	<a href="#">E</a> <a href="#">C</a> <a href="#">S</a>	7	19

## Select Team Page:

Choose a team ▾

Choose a page ▾

Go!

Team pages include statistics, rosters, payroll, schedules, game logs, splits, advanced stats, and more.

## What's Happening

## 2017-18 NBA Season

[2017-18 NBA Schedule](#)
[2017-18 NBA Transactions](#)
[2017-18 NBA MVP Tracker](#)
[Roster Continuity](#)
[Injury Report](#)
[Milestone Watch](#)
[Playoff Probabilities Report](#)
[Projected Draft Order](#)

## Trending Player Pages

[LeBron James](#), [Lonzo Ball](#), [Stephen Curry](#), [Kevin Durant](#), [Michael](#)
[Jordan](#), [James Harden](#), [Jahlil Okafor](#), [Trevor Booker](#), [Brandon](#)
[Ingram](#), [Kyrie Irving](#)

## Hoops Rumors

[Kings Notes: Hill, Randolph, G League, Draft](#)
[Rockets Becoming Contenders For LeBron James?](#)
[Gordon Hayward Hopes To Play Before The Season Ends](#)
[Knicks GM: No Plans For A Noah Buyout](#)
[Community Shootaround: All-NBA First Team](#)
[Hoops Rumors Originals: 12/2/17 – 12/9/17](#)
[Five Key Stories: 12/2/17 – 12/9/17](#)
[Atlantic Notes: Ntilikina, Stauskas, Nets, Hayward, Fultz](#)
[Southwest Notes: Rondo, Bickerstaff, Mavs, Grizzlies](#)
[Southwest Notes: Smith Jr., Green, Bickerstaff](#)

## Sports Reference Blog

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[We Don't Have an App, But Here's How to Get One Anyway](#)
[Every Championship Round Game 7](#)
[Data Developer Job at Sports Reference](#)

## Upcoming Dates


















**December 18:** Kobe Bryant jersey(s) retirement

**January 5:** 10-day contracts may be signed

**January 7:** Contracts become guaranteed if not waived by 5 PM ET

**January 15:** Last day to sign 2-way contract

[View More Items ▾](#)

No.	Player	Pos	Ht	Wt	Birth Date	Exp	College																				
20	<a href="#">Quincy Pondexter</a>	SF	6-7	220	March 10, 1988		5 <a href="#">University of Washington</a>																				
8	<a href="#">Zach LaVine</a>	G	6-5	189	March 10, 1995		3 <a href="#">University of California, Los Angeles</a>																				
22	<a href="#">Cameron Payne</a>	G	6-3	185	August 8, 1994		2 <a href="#">Murray State University</a>																				
2	<a href="#">Jerian Grant</a>	PG	6-4	195	October 9, 1992		2 <a href="#">University of Notre Dame</a>																				
5	<a href="#">Bobby Portis</a>	PF	6-11	230	February 10, 1995		2 <a href="#">University of Arkansas</a>																				
42	<a href="#">Robin Lopez</a>	C	7-0	255	April 1, 1988		9 <a href="#">Stanford University</a>																				
45	<a href="#">Denzel Valentine</a>	SG	6-6	212	November 16, 1993		1 <a href="#">Michigan State University</a>																				
16	<a href="#">Paul Zipser</a>	SF	6-8	215	February 18, 1994		1																				
32	<a href="#">Kris Dunn</a>	PG	6-4	210	March 18, 1994		1 <a href="#">Providence College</a>																				
3	<a href="#">Kav Felder</a>	PG	5-9	176	March 29, 1995		1 <a href="#">Oakland University</a>																				
11	<a href="#">David Nwaba</a>	SG	6-4	209	January 14, 1993		1 <a href="#">California Polytechnic State University, San Luis Obispo</a>																				
24	<a href="#">Lauri Markkanen</a>	PF	7-0	230	May 22, 1997		R <a href="#">University of Arizona</a>																				
6	<a href="#">Cristiano Felicio</a>	C	6-10	275	July 7, 1992		2																				
7	<a href="#">Justin Holiday</a>	SG	6-6	185	April 5, 1989		4 <a href="#">University of Washington</a>																				
44	<a href="#">Nikola Mirotic</a>	F	6-10	220	February 11, 1991		3																				
15	<a href="#">Rvan Arcidiacono</a>	PG	6-3	188	March 26, 1994		R <a href="#">Villanova University</a>																				
9	<a href="#">Antonio Blakeney</a> <small>(TW)</small>	SG	6-4	197	October 4, 1996		R <a href="#">Louisiana State University</a>																				
				G	MP	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	
Team		24		5810	884	2112	.419	254	743	.342	630	1369	.460	297	397	.748	227	844	1071	528	159	85	346	460	2319		
Team/G				242.1	36.8	88.0	.419	10.6	31.0	.342	26.3	57.0	.460	12.4	16.5	.748	9.5	35.2	44.6	22.0	6.6	3.5	14.4	19.2	96.6		
Lg Rank				17	29	18	30	15	12	26	28	19	30	30	30	21	20	15	18	23	28	29	4	5	30		
Year/Year				0.4%	-4.7%	1.1%	-.025	39.3%	38.6%	+0.02	-15.5%	-11.9%	-.019	-31.2%	-26.6%	-.049	-22.4%	3.1%	-3.6%	-2.5%	-15.5%	-26.1%	6.3%	8.0%	-6.1%		
Opponent		24		5810	951	2041	.466	273	718	.380	678	1323	.512	393	496	.792	195	916	1111	586	178	109	303	385	2568		
Opponent/G				242.1	39.6	85.0	.466	11.4	29.9	.380	28.3	55.1	.512	16.4	20.7	.792	8.1	38.2	46.3	24.4	7.4	4.5	12.6	16.0	107.0		
Lg Rank				17	12	10	23	19	17	27	10	9	20	10	7	28	2	27	20	19	5	7	30	1	13		
Year/Year				0.4%	0.4%	-1.8%	+0.010	27.6%	15.7%	+0.036	-7.5%	-9.2%	+0.009	12.2%	9.0%	+0.022	-21.0%	16.0%	7.2%	3.3%	1.0%	-1.5%	-5.9%	-14.6%	4.5%		
Rk		Age	G	GS	MP	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	eFG%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G
1	<a href="#">Justin Holiday</a>	28	<a href="#">23</a>	23	34.5	4.9	13.3	.368	2.6	7.4	.351	2.3	5.9	.390	.466	2.0	2.5	.793	0.5	3.9	4.4	2.1	1.3	0.7	1.2	2.0	14.4
2	<a href="#">Lauri Markkanen</a>	20	<a href="#">24</a>	24	30.7	5.1	12.9	.397	2.3	6.8	.340	2.8	6.2	.459	.485	2.2	2.6	.839	1.1	7.0	8.1	1.3	0.5	0.5	1.4	1.8	14.7
3	<a href="#">Robin Lopez</a>	29	<a href="#">24</a>	24	30.5	6.0	11.5	.524	0.1	0.3	.286	5.9	11.2	.530	.527	1.5	1.9	.761	2.8	2.9	5.7	2.0	0.3	0.8	1.9	2.3	13.5
4	<a href="#">Denzel Valentine</a>	24	<a href="#">24</a>	13	29.1	3.7	9.7	.384	2.2	5.3	.406	1.5	4.3	.356	.496	0.3	0.4	.667	0.8	4.5	5.3	3.0	0.8	0.1	1.0	2.0	9.8
5	<a href="#">Kris Dunn</a>	23	<a href="#">20</a>	11	28.1	5.3	12.4	.429	1.0	2.4	.426	4.3	10.0	.430	.470	1.0	1.6	.594	0.7	4.1	4.8	4.9	2.0	0.3	3.1	3.3	12.6
6	<a href="#">Jerian Grant</a>	25	<a href="#">24</a>	14	24.2	3.1	7.3	.423	0.8	2.5	.305	2.3	4.8	.483	.474	1.9	2.4	.776	0.5	2.2	2.7	4.8	0.8	0.1	1.5	1.8	8.8
7	<a href="#">David Nwaba</a>	25	<a href="#">12</a>	3	21.8	2.8	5.0	.567	0.2	0.6	.286	2.7	4.4	.604	.583	1.5	2.3	.643	0.6	4.7	5.3	1.7	0.7	0.8	0.8	1.9	7.3
8	<a href="#">Bobby Portis</a>	22	<a href="#">15</a>	0	21.7	4.5	9.9	.459	1.1	3.1	.362	3.4	6.7	.505	.517	1.6	2.1	.774	1.8	5.0	6.8	1.6	0.2	0.3	1.3	1.1	11.8
9	<a href="#">Paul Zipser</a>	23	<a href="#">21</a>	7	16.3	1.6	5.1	.318	0.6	2.1	.267	1.0	3.0	.355	.374	0.1	0.3	.333	0.2	3.1	3.3	1.0	0.4	0.1	0.9	1.6	3.9
10	<a href="#">Cristiano Felicio</a>	25	<a href="#">20</a>	0	15.3	1.8	2.9	.621	0.0	0.0		1.8	2.9	.621	.621	0.5	0.9	.556	1.2	1.8	3.0	0.7	0.2	0.2	0.8	2.1	4.1
11	<a href="#">Nikola Mirotic</a>	26	<a href="#">1</a>	0	15.0	2.0	7.0	.286	1.0	3.0	.333	1.0	4.0	.250	.357	1.0	1.0	1.000	0.0	3.0	3.0	0.0	0.0	1.0	0.0	1.0	6.0
12	<a href="#">Antonio Blakeney</a>	21	<a href="#">11</a>	0	14.8	2.5	7.0	.364	0.7	2.5	.286	1.8	4.5	.408	.416	1.3	1.7	.737	0.3	1.5	1.8	0.6	0.2	0.0	0.7	0.7	7.1
13	<a href="#">Quincy Pondexter</a>	29	<a href="#">15</a>	1	10.5	0.9	2.8	.310	0.2	1.3	.158	0.7	1.5	.435	.345	0.9	1.1	.824	0.5	0.8	1.3	0.4	0.5	0.1	0.6	1.4	2.9
14	<a href="#">Kav Felder</a>	22	<a href="#">13</a>	0	10.0	1.5	5.0	.308	0.3	1.4	.222	1.2	3.6	.340	.338	0.8	0.9	.917	0.1	1.0	1.1	1.5	0.2	0.1	1.2	0.8	4.2
15	<a href="#">Rvan Arcidiacono</a>	23	<a href="#">1</a>	0	5.0	0.0	2.0	.000	0.0	2.0	.000	0.0	0.0		.000	0.0	0.0		0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0



# Abordagens usadas

- Análises exploratórias
- *Clustering* de jogadores
- *Clustering* de times
- Predição de posições

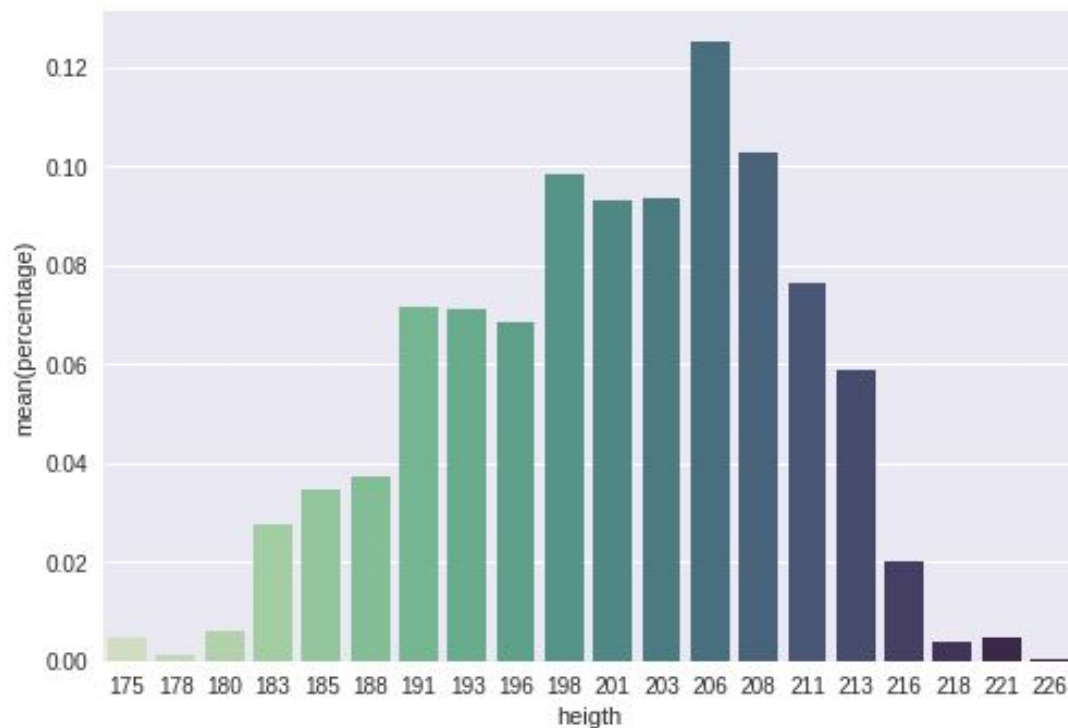


# Análises Exploratórias

- Gráficos de densidade
- Histograma por altura
- Medidas de dispersão
- Gráficos de barra por universidade

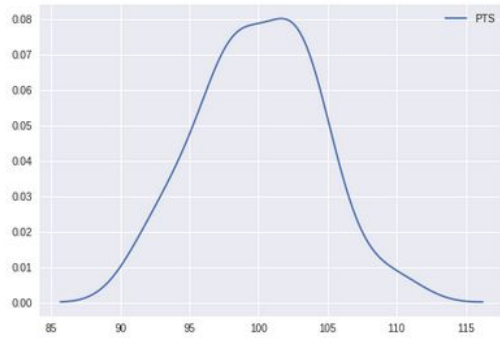


# Análises Exploratórias - Histograma

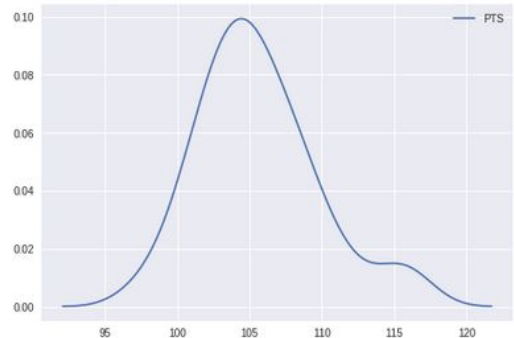




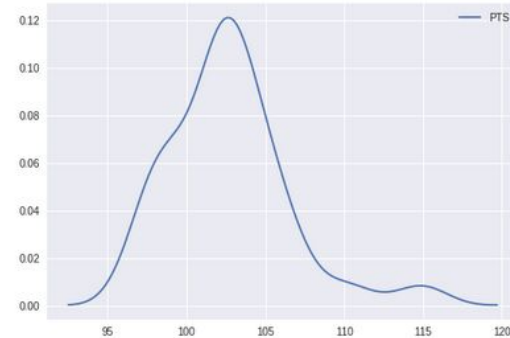
# Análises Exploratórias - Gráficos de densidade



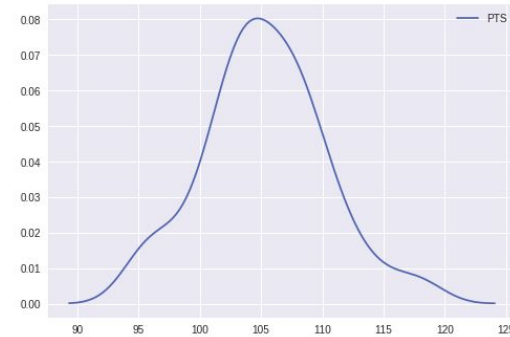
2014-2015



2016-2017

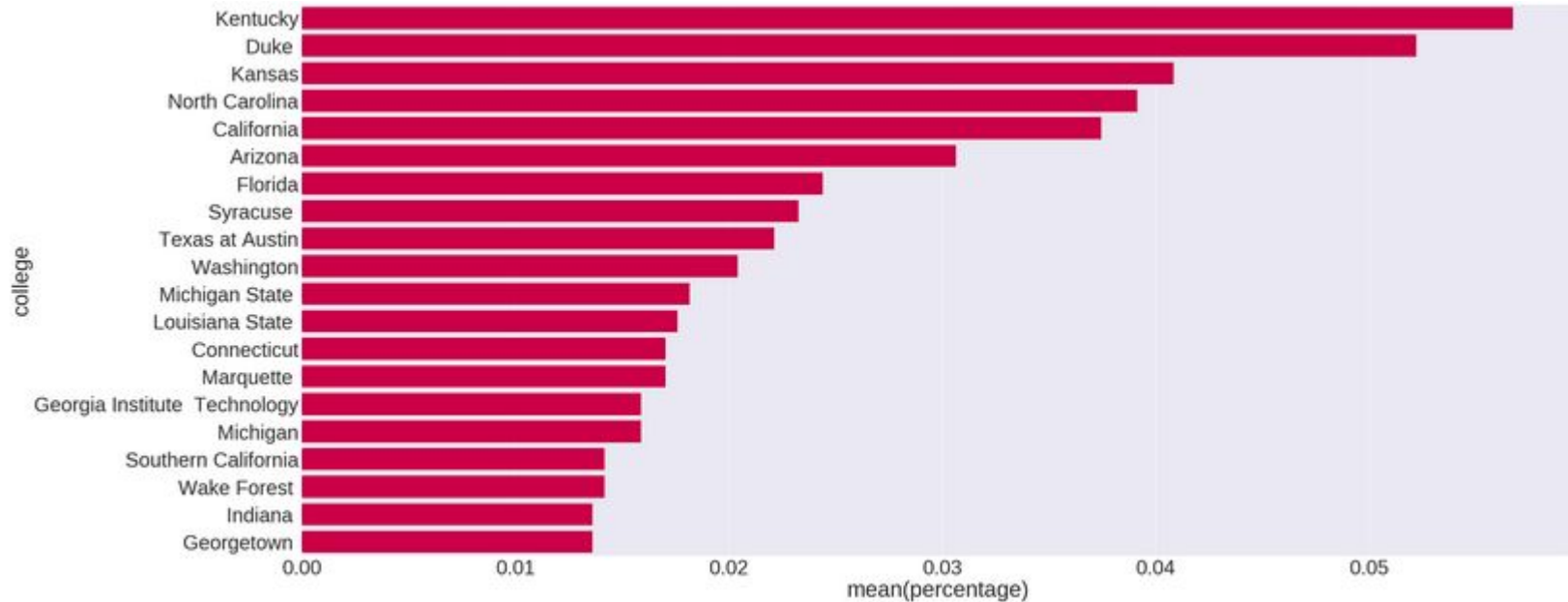


2015-2016



2017-2018

# Análises Exploratórias - Barplots





# Observações

- Altura mais comum entre os jogadores é ~2.06m (12%)
- A temporada atual está com o número de pontos por jogo mais alto dentre as quatro analisadas
- Universidades com mais jogadores: Kentucky e Duke
  - Universidades muito conhecidas pelo seu bom desempenho no torneio de basquete universitário dos Estados Unidos (NCAA)



# *Clustering de jogadores*

- Organizamos uma tabela contendo os dados de todos os jogadores que jogaram em cada temporada
  - Concatenamos as quatro tabelas formando uma tabela contendo todos os jogadores que jogaram em todas as temporadas analisadas
- Algoritmo k-Means
  - 100 clusters (escolha manual)



	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
23	Cleveland Cavaliers	2014-2015	LeBron James	30	69	69	36.1	9.0	18.5	0.488	...	0.7	5.3	6.0	7.4	1.6	0.7	3.9	2.0	25.3	29
592	Cleveland Cavaliers	2015-2016	LeBron James	31	76	76	35.6	9.7	18.6	0.520	...	1.5	6.0	7.4	6.8	1.4	0.6	3.3	1.9	25.3	84
1118	Cleveland Cavaliers	2016-2017	LeBron James	32	74	74	37.8	9.9	18.2	0.548	...	1.3	7.3	8.6	8.7	1.2	0.6	4.1	1.8	26.4	84
1660	Cleveland Cavaliers	2017-2018	LeBron James	33	25	25	37.2	11.0	18.7	0.587	...	1.2	6.8	8.0	8.6	1.4	1.2	4.1	1.7	28.2	36

	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
278	Houston Rockets	2014-2015	James Harden	25	81	81	36.8	8.0	18.1	0.440	...	0.9	4.7	5.7	7.0	1.9	0.7	4.0	2.6	27.4	84
592	Cleveland Cavaliers	2015-2016	LeBron James	31	76	76	35.6	9.7	18.6	0.520	...	1.5	6.0	7.4	6.8	1.4	0.6	3.3	1.9	25.3	84
610	Toronto Raptors	2015-2016	DeMar DeRozan	26	78	78	35.9	7.9	17.7	0.446	...	0.8	3.7	4.5	4.0	1.0	0.3	2.2	2.1	23.5	84
831	Houston Rockets	2015-2016	James Harden	26	82	82	38.1	8.7	19.7	0.439	...	0.8	5.3	6.1	7.5	1.7	0.6	4.6	2.8	29.0	84
850	Golden State Warriors	2015-2016	Stephen Curry	27	79	79	34.2	10.2	20.2	0.504	...	0.9	4.6	5.4	6.7	2.1	0.2	3.3	2.0	30.1	84
917	Portland Trail Blazers	2015-2016	Damian Lillard	25	75	75	35.7	8.2	19.7	0.419	...	0.6	3.4	4.0	6.8	0.9	0.4	3.2	2.2	25.1	84
971	Oklahoma City Thunder	2015-2016	Kevin Durant	27	72	72	35.8	9.7	19.2	0.505	...	0.6	7.6	8.2	5.0	1.0	1.2	3.5	1.9	28.2	84
972	Oklahoma City Thunder	2015-2016	Russell Westbrook	27	80	80	34.4	8.2	18.1	0.454	...	1.8	6.0	7.8	10.4	2.0	0.3	4.3	2.5	23.5	84
1103	Boston Celtics	2016-2017	Isaiah Thomas	27	76	76	33.8	9.0	19.4	0.463	...	0.6	2.1	2.7	5.9	0.9	0.2	2.8	2.2	28.9	84
1118	Cleveland Cavaliers	2016-2017	LeBron James	32	74	74	37.8	9.9	18.2	0.548	...	1.3	7.3	8.6	8.7	1.2	0.6	4.1	1.8	26.4	84
1140	Toronto Raptors	2016-2017	DeMar DeRozan	27	74	74	35.4	9.7	20.9	0.467	...	0.9	4.3	5.2	3.9	1.1	0.2	2.4	1.8	27.3	84
1227	Washington Wizards	2016-2017	John Wall	26	78	78	36.4	8.3	18.4	0.451	...	0.8	3.4	4.2	10.7	2.0	0.6	4.1	1.9	23.1	84
1355	Chicago Bulls	2016-2017	Jimmy Butler	27	76	75	37.0	7.5	16.5	0.455	...	1.7	4.5	6.2	5.5	1.9	0.4	2.1	1.5	23.9	84
1373	Houston Rockets	2016-2017	James Harden	27	81	81	36.4	8.3	18.9	0.440	...	1.2	7.0	8.1	11.2	1.5	0.5	5.7	2.7	29.1	84
1408	San Antonio Spurs	2016-2017	Kawhi Leonard	25	74	74	33.4	8.6	17.7	0.485	...	1.1	4.7	5.8	3.5	1.8	0.7	2.1	1.6	25.5	84
1459	Portland Trail Blazers	2016-2017	Damian Lillard	26	75	75	35.9	8.8	19.8	0.444	...	0.6	4.3	4.9	5.9	0.9	0.3	2.6	2.0	27.0	84
1474	New Orleans Pelicans	2016-2017	Anthony Davis	23	75	75	36.1	10.3	20.3	0.505	...	2.3	9.5	11.8	2.1	1.3	2.2	2.4	2.2	28.0	84
1515	Oklahoma City Thunder	2016-2017	Russell Westbrook	28	81	81	34.6	10.2	24.0	0.425	...	1.7	9.0	10.7	10.4	1.6	0.4	5.4	2.3	31.6	84



	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
298	Golden State Warriors	2014-2015	Stephen Curry	26	80	80	32.7	8.2	16.8	0.487	...	0.7	3.6	4.3	7.7	2.0	0.2	3.1	2.0	23.8	4
850	Golden State Warriors	2015-2016	Stephen Curry	27	79	79	34.2	10.2	20.2	0.504	...	0.9	4.6	5.4	6.7	2.1	0.2	3.3	2.0	30.1	84
1392	Golden State Warriors	2016-2017	Stephen Curry	28	79	79	33.4	8.5	18.3	0.468	...	0.8	3.7	4.5	6.6	1.8	0.2	3.0	2.3	25.3	4
1891	Golden State Warriors	2017-2018	Stephen Curry	29	23	23	32.6	8.3	17.7	0.473	...	0.7	4.4	5.1	6.6	1.7	0.2	2.9	2.5	26.3	36

	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
22	Cleveland Cavaliers	2014-2015	Kyrie Irving	22	75	75	36.4	7.7	16.5	0.468	...	0.7	2.4	3.2	5.2	1.5	0.3	2.5	1.9	21.7	4
138	Washington Wizards	2014-2015	John Wall	24	79	79	35.9	6.6	14.8	0.445	...	0.5	4.2	4.6	10.0	1.7	0.6	3.8	2.3	17.6	4
298	Golden State Warriors	2014-2015	Stephen Curry	26	80	80	32.7	8.2	16.8	0.487	...	0.7	3.6	4.3	7.7	2.0	0.2	3.1	2.0	23.8	4
299	Golden State Warriors	2014-2015	Klay Thompson	24	77	77	31.9	7.8	16.9	0.463	...	0.4	2.9	3.2	2.9	1.1	0.8	1.9	1.6	21.7	4
375	Portland Trail Blazers	2014-2015	Damian Lillard	24	82	82	35.7	7.2	16.6	0.434	...	0.6	4.0	4.6	6.2	1.2	0.3	2.7	2.0	21.0	4
414	Utah Jazz	2014-2015	Gordon Hayward	24	76	76	34.4	6.4	14.3	0.445	...	0.7	4.2	4.9	4.1	1.4	0.4	2.7	1.7	19.3	4
458	Los Angeles Clippers	2014-2015	Chris Paul	29	82	82	34.8	6.9	14.3	0.485	...	0.6	4.0	4.6	10.2	1.9	0.2	2.3	2.5	19.1	4
556	Dallas Mavericks	2014-2015	Monta Ellis	29	80	80	33.7	7.5	16.9	0.445	...	0.4	2.0	2.4	4.1	1.9	0.3	2.5	2.5	18.9	4
576	Boston Celtics	2015-2016	Isaiah Thomas	26	82	79	32.2	7.2	16.9	0.428	...	0.6	2.4	3.0	6.2	1.1	0.1	2.7	2.0	22.2	4
609	Toronto Raptors	2015-2016	Kyle Lowry	29	77	77	37.0	6.6	15.6	0.427	...	0.7	4.0	4.7	6.4	2.1	0.4	2.9	2.7	21.2	4
629	Detroit Pistons	2015-2016	Reggie Jackson	25	79	79	30.7	6.8	15.7	0.434	...	0.7	2.5	3.2	6.2	0.7	0.1	2.8	2.4	18.8	4



	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
539	Sacramento Kings	2014-2015	DeMarcus Cousins	24	59	59	34.1	8.4	18.1	0.467	...	3.1	9.5	12.7	3.6	1.5	1.7	4.3	4.1	24.1	59
1073	Sacramento Kings	2015-2016	DeMarcus Cousins	25	65	65	34.6	9.2	20.5	0.451	...	2.4	9.1	11.5	3.3	1.6	1.4	3.8	3.6	26.9	59
1475	New Orleans Pelicans	2016-2017	DeMarcus Cousins	26	17	17	33.8	8.4	18.5	0.452	...	2.2	10.2	12.4	3.9	1.5	1.1	3.6	4.4	24.4	36
1602	Sacramento Kings	2016-2017	DeMarcus Cousins	26	55	55	34.4	9.2	20.3	0.452	...	2.1	8.5	10.6	4.8	1.4	1.3	3.8	3.7	27.8	59
1964	New Orleans Pelicans	2017-2018	DeMarcus Cousins	27	25	25	35.6	8.9	19.3	0.462	...	2.2	10.5	12.6	5.1	1.6	1.7	5.0	3.5	25.9	36



	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
42	Toronto Raptors	2014-2015	DeMar DeRozan	25	60	60	35.0	6.8	16.5	0.413	...	0.7	3.9	4.6	3.5	1.2	0.2	2.3	2.0	20.1	59
179	Miami Heat	2014-2015	Dwyane Wade	33	62	62	31.8	8.2	17.5	0.470	...	0.9	2.6	3.5	4.8	1.2	0.3	3.4	1.7	21.5	59
393	New Orleans Pelicans	2014-2015	Anthony Davis	21	68	68	36.1	9.4	17.6	0.535	...	2.5	7.7	10.2	2.2	1.5	2.9	1.4	2.1	24.4	59
436	Oklahoma City Thunder	2014-2015	Russell Westbrook	26	67	67	34.4	9.4	22.0	0.426	...	1.9	5.4	7.3	8.6	2.1	0.2	4.4	2.7	28.1	59
457	Los Angeles Clippers	2014-2015	Blake Griffin	25	67	67	35.2	8.6	17.1	0.502	...	1.9	5.7	7.6	5.3	0.9	0.5	2.3	2.9	21.9	59
539	Sacramento Kings	2014-2015	DeMarcus Cousins	24	59	59	34.1	8.4	18.1	0.467	...	3.1	9.5	12.7	3.6	1.5	1.7	4.3	4.1	24.1	59
933	New Orleans Pelicans	2015-2016	Anthony Davis	22	61	61	35.5	9.2	18.6	0.493	...	2.1	8.1	10.3	1.9	1.3	2.0	2.0	2.4	24.3	59
1073	Sacramento Kings	2015-2016	DeMarcus Cousins	25	65	65	34.6	9.2	20.5	0.451	...	2.4	9.1	11.5	3.3	1.6	1.4	3.8	3.6	26.9	59
1393	Golden State Warriors	2016-2017	Kevin Durant	28	62	62	33.4	8.9	16.5	0.537	...	0.6	7.6	8.3	4.8	1.1	1.6	2.2	1.9	25.1	59
	Team	Season	Name	Age	G	GS	MP	FG	FGA	FG%	...	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS/G	Cluster
437	Oklahoma City Thunder	2014-2015	Kevin Durant	26	27	27	33.8	8.8	17.3	0.510	...	0.6	6.0	6.6	4.1	0.9	0.9	2.7	1.5	25.4	36
1475	New Orleans Pelicans	2016-2017	DeMarcus Cousins	26	17	17	33.8	8.4	18.5	0.452	...	2.2	10.2	12.4	3.9	1.5	1.1	3.6	4.4	24.4	36
1646	Boston Celtics	2017-2018	Kyrie Irving	25	25	25	31.8	8.7	17.8	0.490	...	0.5	2.6	3.1	5.0	1.5	0.3	2.3	2.1	23.5	36
1660	Cleveland Cavaliers	2017-2018	LeBron James	33	25	25	37.2	11.0	18.7	0.587	...	1.2	6.8	8.0	8.6	1.4	1.2	4.1	1.7	28.2	36
1675	Toronto Raptors	2017-2018	DeMar DeRozan	28	22	22	34.3	8.4	17.5	0.478	...	0.8	3.6	4.5	4.9	1.3	0.2	2.6	1.8	23.3	36
1707	Philadelphia 76ers	2017-2018	Joel Embiid	23	20	20	29.9	8.1	17.0	0.478	...	2.6	8.7	11.3	3.1	0.7	1.8	4.0	3.5	23.0	36
1721	Milwaukee Bucks	2017-2018	Giannis Antetokounmpo	23	22	22	37.2	10.9	20.0	0.547	...	2.0	8.2	10.2	4.5	1.7	1.7	2.9	3.6	29.6	36
1738	Indiana Pacers	2017-2018	Victor Oladipo	25	24	24	33.4	8.5	17.5	0.483	...	0.6	4.6	5.2	3.9	1.9	1.1	3.3	2.5	23.3	36





# ***Clustering de times***

- Organizamos uma tabela contendo os dados de todos os times que jogaram em cada temporada
  - Concatenamos as quatro tabelas formando uma tabela contendo todos os times que jogaram em todas as temporadas analisadas
- Algoritmo k-Means
  - 15 clusters (escolha manual)

# Cluster 0 & 11

	2P	2P%	2PA	3P	3P%	3PA	AST	BLK	CONF	DRB	...	PF	POS	PTS	STL	Season	TOV	TRB	Team	WIN	Cluster
8	28.3	0.454	62.3	6.8	0.347	19.7	21.3	4.7	E	29.8	...	21.6	15.0	91.9	7.0	2014-2015	14.7	40.4	New York Knicks	17.0	0
10	30.8	0.486	63.3	6.8	0.347	19.5	20.6	3.8	E	31.8	...	20.9	13.0	95.7	7.9	2014-2015	14.9	41.8	Orlando Magic	25.0	0
18	31.5	0.461	68.3	5.0	0.332	14.9	21.6	4.0	W	29.3	...	19.2	15.0	97.8	8.1	2014-2015	15.0	40.9	Minnesota Timberwolves	16.0	0
25	30.8	0.461	66.8	6.5	0.344	18.9	20.9	4.5	W	32.3	...	21.2	14.0	98.5	7.0	2014-2015	13.2	43.9	Los Angeles Lakers	21.0	0
41	31.8	0.481	66.0	6.5	0.352	18.4	22.3	4.0	E	31.9	...	18.0	14.0	98.6	7.6	2015-2016	14.8	42.4	Brooklyn Nets	21.0	0

	2P	2P%	2PA	3P	3P%	3PA	AST	BLK	CONF	DRB	...	PF	POS	PTS	STL	Season	TOV	TRB	Team	WIN	Cluster
4	25.3	0.449	56.3	8.4	0.320	26.3	20.5	5.9	E	30.9	...	21.7	14.0	92.0	9.6	2014-2015	17.7	42.9	Philadelphia 76ers	18.0	11
34	26.9	0.476	56.5	9.3	0.339	27.5	21.5	6.0	E	31.8	...	21.7	15.0	97.4	8.3	2015-2016	16.4	41.2	Philadelphia 76ers	10.0	11
55	27.3	0.454	60.2	7.8	0.317	24.6	18.0	4.1	W	32.3	...	20.3	15.0	97.3	7.2	2015-2016	13.7	43.0	Los Angeles Lakers	17.0	11
56	28.2	0.472	59.8	9.0	0.348	25.8	20.7	3.8	W	33.3	...	22.7	14.0	100.9	7.7	2015-2016	17.2	44.8	Phoenix Suns	23.0	11
71	27.1	0.506	53.6	10.7	0.338	31.6	21.4	4.7	E	35.1	...	21.0	15.0	105.8	7.2	2016-2017	16.5	43.9	Brooklyn Nets	20.0	11

## Cluster 2 & 14

	2P	2P%	2PA	3P	3P%	3PA	AST	BLK	CONF	DRB	...	PF	POS	PTS	STL	Season	TOV	TRB	Team	WIN	Cluster
1	27.6	0.504	54.7	10.1	0.367	27.5	22.1	4.1	E	31.9	...	18.4	2.0	103.1	7.4	2014-2015	14.3	43.0	Cleveland Cavaliers	53.0	14
15	25.6	0.506	50.6	11.4	0.348	32.7	22.2	5.0	W	32.0	...	22.0	2.0	103.9	9.5	2014-2015	16.7	43.7	Houston Rockets	56.0	14
24	29.3	0.519	56.4	10.1	0.376	26.9	24.8	5.0	W	33.1	...	21.3	3.0	106.7	7.8	2014-2015	12.3	42.6	Los Angeles Clippers	56.0	14
31	27.9	0.514	54.4	10.7	0.362	29.6	22.7	3.9	E	33.9	...	20.3	1.0	104.3	6.7	2015-2016	13.6	44.5	Cleveland Cavaliers	57.0	14
32	28.0	0.483	58.0	8.6	0.370	23.4	18.7	5.5	E	33.2	...	19.6	2.0	102.7	7.8	2015-2016	13.1	43.4	Toronto Raptors	56.0	14
42	26.4	0.479	55.0	10.6	0.362	29.4	21.7	5.3	E	35.0	...	18.1	6.0	103.4	7.3	2015-2016	12.6	43.9	Charlotte Hornets	48.0	14
43	28.7	0.512	56.1	9.9	0.350	28.4	25.6	5.9	E	33.8	...	19.1	4.0	102.8	9.1	2015-2016	15.0	42.1	Atlanta Hawks	48.0	14
54	28.6	0.513	55.7	9.7	0.364	26.7	22.8	5.6	W	33.3	...	21.3	4.0	104.5	8.6	2015-2016	13.0	42.0	Los Angeles Clippers	53.0	14
82	27.3	0.511	53.5	9.6	0.372	26.0	20.1	5.0	W	33.8	...	18.8	5.0	100.7	6.7	2016-2017	13.6	43.2	Utah Jazz	51.0	14
84	29.3	0.525	55.8	10.3	0.375	27.4	22.5	4.2	W	34.0	...	19.8	4.0	108.7	7.5	2016-2017	13.0	43.0	Los Angeles Clippers	51.0	14

	2P	2P%	2PA	3P	3P%	3PA	AST	BLK	CONF	DRB	...	PF	POS	PTS	STL	Season	TOV	TRB	Team	WIN	Cluster
13	28.1	0.506	55.5	10.0	0.380	26.2	25.7	4.6	E	31.8	...	17.8	1.0	102.5	9.1	2014-2015	14.2	40.6	Atlanta Hawks	60.0	2
47	33.2	0.515	64.4	7.0	0.375	18.5	24.5	5.9	W	34.5	...	17.5	2.0	103.5	8.3	2015-2016	13.1	43.9	San Antonio Spurs	67.0	2
77	30.1	0.500	60.2	9.2	0.391	23.5	23.8	5.9	W	33.9	...	18.3	2.0	105.3	8.0	2016-2017	13.4	43.9	San Antonio Spurs	61.0	2



## Cluster 10



	2P	2P%	2PA	3P	3P%	3PA	AST	BLK	CONF	DRB	...	PF	POS	PTS	STL	Season	TOV	TRB	Team	WIN	Cluster
16	30.8	0.514	60.0	10.8	0.398	27.0	27.4	6.0	W	34.3	...	19.9	1.0	110.0	9.3	2014-2015	14.5	44.7	Golden State Warriors	67.0	10
46	29.4	0.528	55.7	13.1	0.416	31.6	28.9	6.1	W	36.2	...	20.7	1.0	114.9	8.4	2015-2016	15.2	46.2	Golden State Warriors	73.0	10
76	31.1	0.557	55.8	12.0	0.383	31.2	30.4	6.8	W	35.0	...	19.3	1.0	115.9	9.6	2016-2017	14.8	44.4	Golden State Warriors	67.0	10



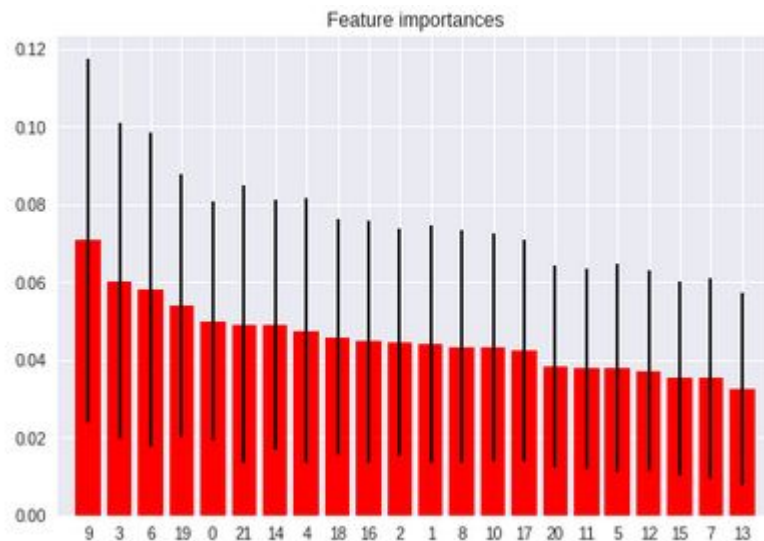
# Predição

- Análise de importância de features
  - Random Forest
  - Modelos Lineares
- Posterior predição com features mais importantes
  - Random Forest

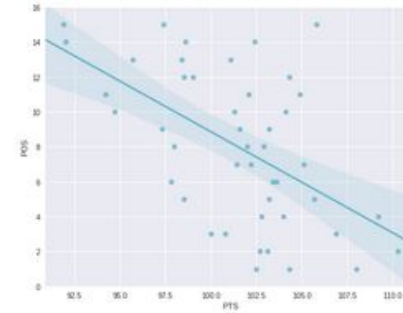
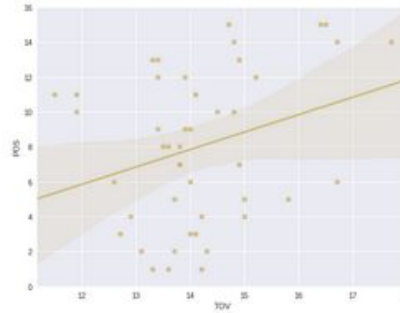
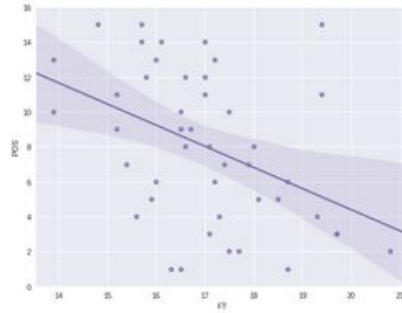
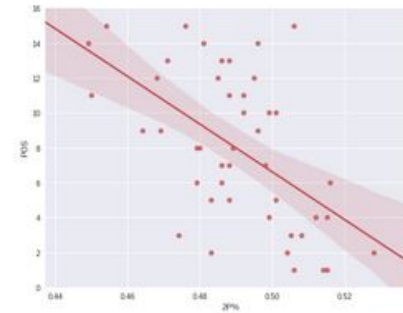
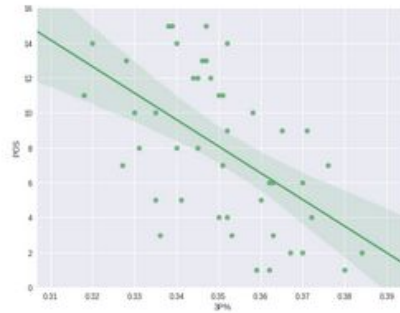
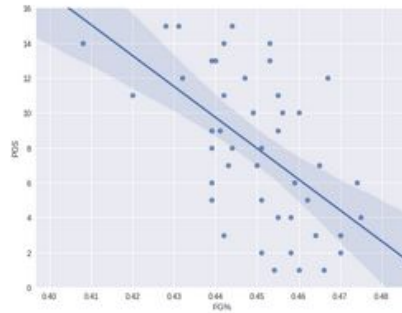
# Importância das *Features*

Feature ranking:

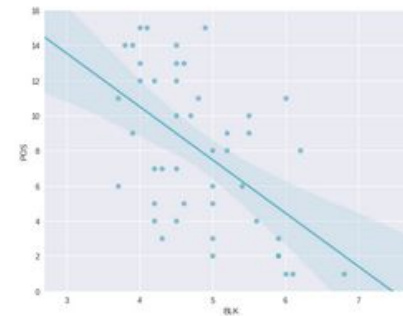
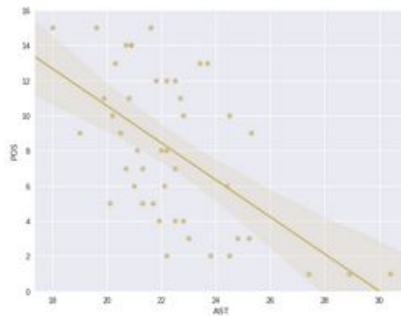
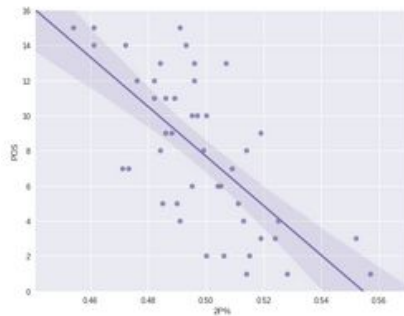
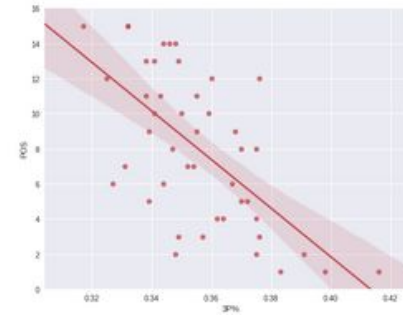
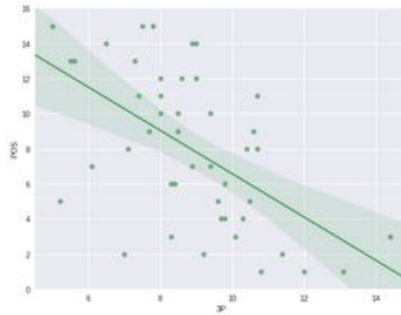
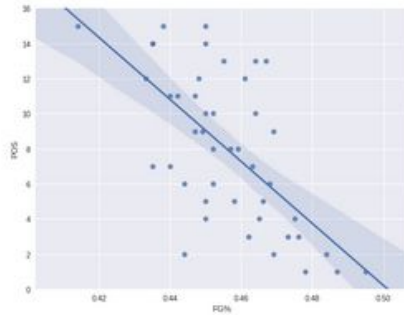
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2. feature 3 (0.060250)
3. feature 6 (0.057904)
4. feature 19 (0.054016)
5. feature 0 (0.049957)
6. feature 21 (0.049160)
7. feature 14 (0.049040)
8. feature 4 (0.047459)
9. feature 18 (0.045806)



# Importância das *Features* - Leste



# Importância das *Features* - Oeste







# Modelo linear treinado

- Algoritmo treinado para prever posição de um time
- Treino - Temporadas passadas
- Teste - Temporada atual
- Erro médio observado nas posições

2.86666666667



# Conclusões

- Resultados coerentes com as estatísticas da temporada atual
- Possíveis melhorias que podem ser feitas:
  - Análises exploratórias
    - Explorar outros atributos para achar outros padrões interessantes de serem investigados
  - Clustering
    - Usar métodos de validação cruzada para definir “automaticamente” os números de clusters ótimos tanto para os jogadores quanto para os times
    - Usar outros algoritmos e comparar o resultado com o k-Means, que já é um algoritmo consagrado na aprendizagem não supervisionada
  - Predição
    - Buscar novos atributos e explorar a relevância deles para a posição de uma equipe na temporada
    - Usar esses novos atributos para tentar obter melhoras na predição

# FIM!

Dúvidas?

