NBAProjectFall2018

March 15, 2019

0.0.1 The object of this project was to implement webscraping, dataframe merging, Machine Learning techniques (Linear Regression, Ridge Regression), show the patterns in the data using Data Visualization libraries (Seaborn, matplotlib), and to generally identify some of the more versatile players in the NBA as it corresponds to multiple variables.

```
In [1]: #Here I imported the packages I needed.
    import pandas as pd
    import numpy as np
    import seaborn as sns
    import matplotlib.pyplot as plt
    %matplotlib inline
    from sklearn.model_selection import train_test_split
    from sklearn import datasets
    from sklearn import svm
    from sklearn import datasets, linear_model
    from sklearn.metrics import mean_squared_error, r2_score
    from sklearn.linear_model import SGDClassifier
In [2]: from urllib.request import urlopen
    from bs4 import BeautifulSoup
```

• The data I collected will be from www.nba.com and www.basketballreference.com for a longitudinal study from the 2008 - 2009 season to the current 2018 - 2019 season.

The salary data I collected comes from www.espn.com and I will be collecting salary data over the span of a decade. 2009 - 2010 link: http://www.espn.com/nba/salaries//year/2010 2010 link: 2011 http://www.espn.com/nba/salaries//year/2011 2011 2012 link: http://www.espn.com/nba/salaries//year/2012 2012 2013 link: http://www.espn.com/nba/salaries//year/2013 2013 2014 link: http://www.espn.com/nba/salaries//year/2014 2014 2015 link: http://www.espn.com/nba/salaries//year/2015 2015 2016 link: http://www.espn.com/nba/salaries//year/2016 2016 2017 http://www.espn.com/nba/salaries//year/2017 2017 2018 link: http://www.espn.com/nba/salaries/_/year/2018 2018 2019 link: http://www.espn.com/nba/salaries

```
In [4]: #Maybe put in a picture at the beginning to show versatility?
          Image(url="https://pm1.narvii.com/6516/3a46595380d732cb1224736a92b7a54039777fae_hq.jpg
Out[4]: <IPython.core.display.Image object>
In [5]: import requests
         from lxml import html
         import csv
In [6]: #this is how to access basketballreference website and tap into the data points in que
         #I'll have to merge the heights into this at some point soon and get better at webscra
         r = requests.get('https://www.basketball-reference.com/leagues/NBA_2014_totals.html')
         data = html.fromstring(r.text)
In [7]: #definitely use some feature engineering
In [8]: #sal14 = requests.get('http://www.espn.com/nba/salaries/_/year/2014.html')
         #data14 = html.fromstring(sal14.text)
         url = "http://www.espn.com/nba/salaries/_/year/2014"
         html = urlopen(url)
In [9]: #this allows me to scrape the data from the espn salary web page
         soup = BeautifulSoup(html, 'lxml')
         type(soup)
Out[9]: bs4.BeautifulSoup
In [10]: title = soup.title
          print(title)
<title>NBA Player Salaries - National Basketball Association - ESPN</title>
In [11]: text = soup.get_text()
In [12]: soup.find_all('td')
          #in this step I scrape table cells which is ID'd by 'td'
Out[12]: [RK,
            NAME,
            TEAM,
            SALARY,
            1,
            <a href="http://www.espn.com/nba/player/_/id/110/kobe-bryant">Kobe Bryant</a>, S
            <a href="http://www.espn.com/nba/team/_/name/lal/los-angeles-lakers">Los Angeles
            $30,453,805,
            2,
            <a href="http://www.espn.com/nba/player/_/id/609/dirk-nowitzki">Dirk Nowitzki</a
            <a href="http://www.espn.com/nba/team/_/name/dal/dallas-mavericks">Dallas Mavericks">Dallas Mavericks</a>
            $22,721,381,
```

```
3,
<a href="http://www.espn.com/nba/player/_/id/1727/amar'e-stoudemire">Amar'e Stoudemire">Amar'e Stoudemire |
<a href="http://www.espn.com/nba/team/_/name/ny/new-york-knicks">New York Knicks</a>
$21,679,893,
4,
<a href="http://www.espn.com/nba/player/_/id/1007/joe-johnson">Joe Johnson</a>,
<a href="http://www.espn.com/nba/team/_/name/bkn/brooklyn-nets">Brooklyn Nets</a
$21,466,718,
5,
<a href="http://www.espn.com/nba/player/_/id/1975/carmelo-anthony">Carmelo Anthony">Carmelo Anthony
<a href="http://www.espn.com/nba/team/_/name/ny/new-york-knicks">New York Knicks
$21,388,953,
6,
<a href="http://www.espn.com/nba/player/_/id/2384/dwight-howard">Dwight Howard</
<a href="http://www.espn.com/nba/team/_/name/hou/houston-rockets">Houston Rockets
$20,513,178,
7,
<a href="http://www.espn.com/nba/player/_/id/996/pau-gaso1">Pau Gaso1</a>, C</td
<a href="http://www.espn.com/nba/team/_/name/lal/los-angeles-lakers">Los Angeles
$19,285,850,
<a href="http://www.espn.com/nba/player/_/id/1977/chris-bosh">Chris Bosh</a>, PF
<a href="http://www.espn.com/nba/team/_/name/mia/miami-heat">Miami Heat</a>
$19,067,500,
9,
<a href="http://www.espn.com/nba/player/_/id/1966/lebron-james">LeBron James</a>
<a href="http://www.espn.com/nba/team/_/name/mia/miami-heat">Miami Heat</a>
$19,067,500,
10,
<a href="http://www.espn.com/nba/player/_/id/1987/dwyane-wade">Dwyane Wade</a>, %
<a href="http://www.espn.com/nba/team/_/name/mia/miami-heat">Miami Heat</a>
$18,673,000,
RK,
NAME,
TEAM,
SALARY,
11
<a href="http://www.espn.com/nba/player/_/id/2779/chris-paul">Chris Paul</a>, PG
<a href="http://www.espn.com/nba/team/_/name/lac/la-clippers">LA Clippers</a></to>
$18,668,431,
12,
<a href="http://www.espn.com/nba/player/_/id/2798/deron-williams">Deron Williams</a>
<a href="http://www.espn.com/nba/team/_/name/bkn/brooklyn-nets">Brooklyn Nets</a
$18,466,130,
13,
<a href="http://www.espn.com/nba/player/_/id/1017/zach-randolph">Zach Randolph</
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Memphis Grizzlies">Memphis Grizzlies

\$18,238,333,

```
14,
<a href="http://www.espn.com/nba/player/_/id/3005/rudy-gay">Rudy Gay</a>, SF
<a href="http://www.espn.com/nba/team/_/name/tor/toronto-raptors">Toronto Raptors
$17,888,932,
15,
<a href="http://www.espn.com/nba/player/_/id/3202/kevin-durant">Kevin Durant</a>
<a href="http://www.espn.com/nba/team/_/name/okc/oklahoma-city-thunder">Oklahoma
$17,832,627,
16,
<a href="http://www.espn.com/nba/player/_/id/3456/derrick-rose">Derrick Rose</a>
< a href="http://www.espn.com/nba/team/_/name/chi/chicago-bulls">Chicago Bulls</a>
$17,632,688,
17,
<a href="http://www.espn.com/nba/player/_/id/3989/blake-griffin">Blake Griffin</a>
<a href="http://www.espn.com/nba/team/_/name/lac/la-clippers">LA Clippers</a></to>
$16,441,500,
18,
<a href="http://www.espn.com/nba/player/_/id/662/paul-pierce">Paul Pierce</a>, Si
<a href="http://www.espn.com/nba/team/_/name/bkn/brooklyn-nets">Brooklyn Nets</a
$15,333,334
19,
<a href="http://www.espn.com/nba/player/_/id/1703/carlos-boozer">Carlos Boozer</
<a href="http://www.espn.com/nba/team/_/name/chi/chicago-bulls">Chicago Bulls</a>
$15,300,000,
20,
<a href="http://www.espn.com/nba/player/_/id/2983/lamarcus-aldridge">LaMarcus Ale
<a href="http://www.espn.com/nba/team/_/name/por/portland-trail-blazers">Portland-trail-blazers</a>
$14,878,000,
RK,
NAME,
35%">TEAM,
SALARY,
21,
<a href="http://www.espn.com/nba/player/_/id/3206/marc-gasol">Marc Gasol</a>, C<
<a href="http://www.espn.com/nba/team/_/name/mem/memphis-grizzlies">Memphis Griz:
$14,860,523,
22,
<a href="http://www.espn.com/nba/player/_/id/3468/russell-westbrook">Russell Wes
<a href="http://www.espn.com/nba/team/_/name/okc/oklahoma-city-thunder">Oklahoma
$14,693,906,
23,
<a href="http://www.espn.com/nba/player/_/id/3449/kevin-love">Kevin Love</a>, PF-
<a href="http://www.espn.com/nba/team/_/name/min/minnesota-timberwolves">Minneso
$14,693,906,
24,
<a href="http://www.espn.com/nba/player/_/id/2399/emeka-okafor">Emeka Okafor</a>
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Philadelphia-76ers ">Philadelphia-76ers ">Philad

\$14,487,500,

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25,
<a href="http://www.espn.com/nba/player/_/id/3431/eric-gordon">Eric Gordon</a>, %
<a href="http://www.espn.com/nba/team/_/name/no/new-orleans-pelicans">New Orleans
$14,283,844,
26,
<a href="http://www.espn.com/nba/player/_/id/3436/roy-hibbert">Roy Hibbert</a>,
<a href="http://www.espn.com/nba/team/_/name/ind/indiana-pacers">Indiana Pacers<
$14,283,844,
27,
<a href="http://www.espn.com/nba/player/_/id/2429/luol-deng">Luol Deng</a>, SF</
<a href="http://www.espn.com/nba/team/_/name/cle/cleveland-cavaliers">Cleveland
$14,275,000,
28,
<a href="http://www.espn.com/nba/player/_/id/984/tyson-chandler">Tyson Chandler<
<a href="http://www.espn.com/nba/team/_/name/ny/new-york-knicks">New York Knicks</a>
$14,100,538,
29,
<a href="http://www.espn.com/nba/player/_/id/2747/andrew-bogut">Andrew Bogut</a>
<a href="http://www.espn.com/nba/team/_/name/gs/golden-state-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors</a>
$14,000,000,
30,
<a href="http://www.espn.com/nba/player/_/id/2772/david-lee">David Lee</a>, PF</-
<a href="http://www.espn.com/nba/team/_/name/gs/golden-state-warriors">Golden State-warriors</a>
$13,878,000,
RK,
NAME,
TEAM,
SALARY,
31,
<a href="http://www.espn.com/nba/player/_/id/3992/james-harden">James Harden</a>
<a href="http://www.espn.com/nba/team/_/name/hou/houston-rockets">Houston Rockets
$13,701,250,
32,
<a href="http://www.espn.com/nba/player/_/id/2389/al-jefferson">Al Jefferson</a>
Charlotte Bobcats,
$13,500,000,
33,
<a href="http://www.espn.com/nba/player/_/id/2411/josh-smith">Josh Smith</a>, PF
<a href="http://www.espn.com/nba/team/_/name/det/detroit-pistons">Detroit Pistons
$13,500,000,
34,
<a href="http://www.espn.com/nba/player/_/id/1713/nene-hilario">Nene Hilario</a>
<a href="http://www.espn.com/nba/team/_/name/wsh/washington-wizards">Washington '
$13,000,000,
35,
<a href="http://www.espn.com/nba/player/_/id/2386/andre-iguodala">Andre Iguodala
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Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors">Golden State-warriors

\$12,868,632,

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36,
<a href="http://www.espn.com/nba/player/_/id/1015/tony-parker">Tony Parker</a>, I
<a href="http://www.espn.com/nba/team/_/name/sa/san-antonio-spurs">San Antonio S
$12,500,000,
37,
<a href="http://www.espn.com/nba/player/_/id/261/kevin-garnett">Kevin Garnett</a>
<a href="http://www.espn.com/nba/team/_/name/bkn/brooklyn-nets">Brooklyn Nets</a
$12,433,735,
38,
<a href="http://www.espn.com/nba/player/_/id/3439/serge-ibaka">Serge Ibaka</a>,
<a href="http://www.espn.com/nba/team/_/name/okc/oklahoma-city-thunder">Oklahoma
$12,350,000,
39,
<a href="http://www.espn.com/nba/player/_/id/3453/nikola-pekovic">Nikola Pekovic"
<a href="http://www.espn.com/nba/team/_/name/min/minnesota-timberwolves">Minnesota-timberwolves">Minnesota-timberwolves">Minnesota-timberwolves</a>
$12,100,000,
40,
<a href="http://www.espn.com/nba/player/_/id/2433/kris-humphries">Kris Humphries</a>
<a href="http://www.espn.com/nba/team/_/name/bos/boston-celtics">Boston Celtics</a>
$12,000,000]
```

In [13]: x = pd.read_html(r.text)

In [14]: x[0]

Out[14]:	Rk	Player	Pos	Age	Tm	G	GS	MP	FG	FGA	\
0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141	
1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14	
2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127	
3	2	Steven Adams	C	20	OKC	81	20	1197	93	185	
4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275	
5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40	
6	3	Jeff Adrien	PF	27	MIL	28	12	705	121	235	
7	4	Arron Afflalo	\mathtt{SG}	28	ORL	73	73	2552	464	1011	
8	5	Alexis Ajinca	C	25	NOP	56	30	951	136	249	
9	6	Cole Aldrich	C	25	NYK	46	2	330	33	61	
10	7	LaMarcus Aldridge	PF	28	POR	69	69	2498	652	1423	
11	8	Lavoy Allen	PF	24	TOT	65	2	1072	134	300	
12	8	Lavoy Allen	PF	24	PHI	51	2	960	117	266	
13	8	Lavoy Allen	PF	24	IND	14	0	112	17	34	
14	9	Ray Allen*	\mathtt{SG}	38	MIA	73	9	1936	240	543	
15	10	Tony Allen	\mathtt{SG}	32	MEM	55	28	1278	204	413	
16	11	Al-Farouq Aminu	SF	23	NOP	80	65	2045	234	494	
17	12	Lou Amundson	PF	31	TOT	19	0	185	16	32	
18	12	Lou Amundson	PF	31	NOP	18	0	184	16	32	
19	12	Lou Amundson	PF	31	CHI	1	0	1	0	0	
20	13	Chris Andersen	C	35	MIA	72	0	1396	177	275	
21	14	Alan Anderson	SF	31	BRK	78	26	1773	194	485	

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23
                                            PF
                                                       NOP
                                                             22
                                                                  14
                                                                        795
                                                                                      354
       16
                      Ryan Anderson
                                                  25
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24
       17
            Giannis Antetokounmpo
                                            SF
                                                  19
                                                       MIL
                                                             77
                                                                  23
                                                                       1897
                                                                              173
                                                                                      418
25
       18
                   Carmelo Anthony
                                            PF
                                                  29
                                                       NYK
                                                             77
                                                                  77
                                                                       2982
                                                                              743
                                                                                    1643
26
       19
                                             C
                                                             33
                                                                        186
                                                                                       32
                       Joel Anthony
                                                  31
                                                       TOT
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27
                       Joel Anthony
                                             C
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28
       19
                       Joel Anthony
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                         Pero Antic
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605
      457
                        Earl Watson
                                            PG
                                                  34
                                                       POR
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                                                                                 3
                                                                                       11
      458
                                            PG
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606
                       Maalik Wayns
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607
      459
                                            SF
                                                  27
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                                                                                      587
                   Martell Webster
                                                       WAS
                                                             78
                                                                  13
                                            PF
                                                                                      939
608
                         David West
                                                  33
                                                       IND
                                                             80
                                                                  80
                                                                       2472
                                                                              458
      460
                                                              G
                                                                  GS
                                                                         MP
                                                                                      FGA
609
       R.k
                              Player
                                           Pos
                                                 Age
                                                        Tm
                                                                               FG
610
      461
                 Russell Westbrook
                                            PG
                                                  25
                                                       OKC
                                                             46
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                                                                       1412
                                                                              346
                                                                                      791
611
      462
                         D.J. White
                                            PF
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612
      463
                        Royce White
                                            PF
                                                  22
                                                       SAC
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613
      464
                    Deron Williams
                                            PG
                                                  29
                                                       BRK
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614
      465
                  Derrick Williams
                                        SF-PF
                                                  22
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615
      465
                  Derrick Williams
                                            PF
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                                                             11
                  Derrick Williams
616
      465
                                            SF
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                                                       SAC
                                                             67
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                                                                              187
                                                                                      428
                   Elliot Williams
                                            SG
                                                  24
                                                       PHI
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617
      466
                                                                       1157
                                                                              140
618
      467
                       Lou Williams
                                            PG
                                                  27
                                                       ATL
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                                                                       1445
                                                                              197
                                                                                      493
619
      468
                   Marvin Williams
                                            PF
                                                  27
                                                       UTA
                                                             66
                                                                       1674
                                                                              231
                                                                                      526
                                                                  50
                                           PG
620
      469
                        Mo Williams
                                                  31
                                                       POR
                                                             74
                                                                   0
                                                                       1834
                                                                              280
                                                                                      672
621
      470
                                            SF
                                                  27
                                                       OKC
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                                                                                        9
                   Reggie Williams
                                                                         17
622
      471
                   Shawne Williams
                                            PF
                                                  27
                                                                        751
                                                                               73
                                                                                      192
                                                       LAL
                                                             36
                                                                  13
623
      472
                                             C
                                                       NOP
                                                                   4
                        Jeff Withey
                                                  23
                                                             58
                                                                        684
                                                                               69
                                                                                      129
                                            PG
624
      473
                                                  22
                                                       MIL
                                                             58
                                                                  31
                                                                       1309
                                                                              170
                                                                                      389
                       Nate Wolters
625
      474
                 Metta World Peace
                                            SF
                                                       NYK
                                                             29
                                                                   1
                                                                        388
                                                                               56
                                                                                      141
626
      475
                    Brandan Wright
                                             C
                                                  26
                                                       DAL
                                                             58
                                                                   0
                                                                       1077
                                                                              224
                                                                                      331
627
      476
                       Chris Wright
                                            SF
                                                  25
                                                       MIL
                                                              8
                                                                   0
                                                                        126
                                                                               21
                                                                                       35
628
      477
                      Dorell Wright
                                            SF
                                                  28
                                                       POR
                                                             68
                                                                  13
                                                                        984
                                                                              111
                                                                                      297
629
      478
                        Tony Wroten
                                            PG
                                                  20
                                                       PHI
                                                             72
                                                                  16
                                                                       1765
                                                                              345
                                                                                      808
630
      479
                                            SG
                                                  28
                                                                   9
                         Nick Young
                                                       LAL
                                                             64
                                                                       1810
                                                                              387
                                                                                      889
                                                       PHI
631
      480
                    Thaddeus Young
                                            PF
                                                  25
                                                             79
                                                                  78
                                                                       2718
                                                                              582
                                                                                    1283
632
                                                              G
                                                                  GS
                                                                         MΡ
       Rk
                              Player
                                          Pos
                                                 Age
                                                        Tm
                                                                               FG
                                                                                      FGA
633
      481
                        Cody Zeller
                                             C
                                                  21
                                                       CHA
                                                             82
                                                                   3
                                                                       1416
                                                                              172
                                                                                      404
634
      482
                       Tyler Zeller
                                             C
                                                  24
                                                       CLE
                                                             70
                                                                   9
                                                                       1049
                                                                              156
                                                                                      290
               FT%
                      ORB
                            DRB
                                  TRB
                                        AST
                                              STL
                                                    BLK
                                                          TOV
                                                                  PF
                                                                        PTS
                            144
                                                                 122
0
               .660
                       72
                                  216
                                         28
                                               23
                                                      26
                                                            30
                                                                        171
1
               .625
                        5
                             10
                                   15
                                          4
                                                 4
                                                       3
                                                             2
                                                                   8
                                                                         19
      . . .
2
               .667
                       67
                            134
                                  201
                                                      23
                                                                        152
      . . .
                                         24
                                               19
                                                            28
                                                                 114
3
               .581
                      142
                            190
                                  332
                                         43
                                               40
                                                      57
                                                            71
                                                                 203
                                                                        265
      . . .
4
               .639
                      102
                            204
                                  306
                                         38
                                               24
                                                      36
                                                            39
                                                                 108
                                                                        362
      . . .
                                          7
                                                 7
5
               .520
                       33
                             55
                                   88
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SG

PHI

James Anderson

7		.815	32	230	262	248	35	3	146	136	1330
8		.836	94	183	277	40	23	46	63	187	328
9		.867	37	92	129	14	8	30	18	40	92
10		.822	166	599	765	178	63	68	123	147	1603
11		.660	119	192	311	71	24	33	44	126	303
12		.675	106	171	277	65	22	27	40	115	263
13		.600	13	21	34	6	2	6	4	11	40
14		.905	23	182	205	143	54	8	84	115	701
15		.628	79	129	208	94	90	19	90	121	495
16		.664	129	367	496	114	82	38	88	147	572
17		.250	28	27	55	6	9	11	14	49	38
18		.250	28	27	55	6	9	11	14	49	38
19		NaN	0	0	0	0	0	0	0	0	0
20		.710	129	250	379	19	32	97	53	162	477
21		.780	40	135	175	81	48	11	62	147	564
22		.726	59	241	300	149	74	28	106	154	810
23		.952	66	76	142	17	10	7	20	47	436
24		.683	78	261	339	150	60	61	122	173	525
25		.848	145	477	622	242	95	51	198	224	2112
26		.500	15	23	38	2	3	12	3	17	28
27		1.000	2	5	7	0	0	4	1	4	6
28		.333	13	18	31	2	3	8	2	13	22
29		.758	57			58	19	12	55	126	352
605		1.000	5	10	15	28	5	1	17	33	12
606		NaN	0	2	2	2	2	0	0	4	2
607		.840	38	184	222	97	41	15	58	150	759
608		.789	120	422	542	223	61	74	133	186	1118
609		FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS
610		.826	55	208	263	319	88	7	177	104	1002
611		NaN	0	2	2	0	1	0	0	1	0
612		NaN	0	0	0	0	0	0	0	2	0
613		.801	15	153	168	392	93	13	143	148	
614	• • •	.718	71	252	323	56	48	20	76	114	624
615	• • •	.875	3	23	26	1	4	4	6	9	54
616	• • •	.708	68	229	297	55	44	16	70	105	570
617	• • •	.731	30	100	130	72	35	3	68	126	404
618	• • •	.849	10	114	124	210	45	4	92	65	625
619	• • •		82	252	334	78	54	31	53	151	603
620	• • •	.781 .876	42	111	153	321		10		197	721
	• • •				0	321	55 1	0	149 2		
621	• • •	NaN	0	0			1			1	11
622	• • •	.700	25	142	167	30	19	30	21	93	202
623		.712	49	101	150	26	15	50	20	73	190
624	• • •	.656	33	116	149	187	35	15	57	67	417
625	• • •	.625	18	41	59	17	24	8	19	44	139
626	• • •	.726	102	142	244	31	32	55	35	94	525
627 628		.400	10	10	20	5	7	5	5	17	48
		.754	29	162	191	64	23	16	39	62	343

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                                                     60
                                                          137
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[635 rows x 30 columns]

In [15]: x = x[0]

In [16]: x = x[x.Rk != "Rk"]

In [17]: x

III (I'). A											
Out[17]:	Rk	Player	Pos	Age	Tm	G	GS	MP	FG	FGA	\
0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141	
1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14	
2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127	
3	2	Steven Adams	C	20	OKC	81	20	1197	93	185	
4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275	
5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40	
6	3	Jeff Adrien	PF	27	MIL	28	12	705	121	235	
7	4	Arron Afflalo	\mathtt{SG}	28	ORL	73	73	2552	464	1011	
8	5	Alexis Ajinca	C	25	NOP	56	30	951	136	249	
9	6	Cole Aldrich	C	25	NYK	46	2	330	33	61	
10	7	LaMarcus Aldridge	PF	28	POR	69	69	2498	652	1423	
11	8	Lavoy Allen	PF	24	TOT	65	2	1072	134	300	
12	8	Lavoy Allen	PF	24	PHI	51	2	960	117	266	
13	8	Lavoy Allen	PF	24	IND	14	0	112	17	34	
14	9	Ray Allen*	SG	38	MIA	73	9	1936	240	543	
15	10	Tony Allen	SG	32	MEM	55	28	1278	204	413	
16	11	Al-Farouq Aminu	SF	23	NOP	80	65	2045	234	494	
17	12	Lou Amundson	PF	31	TOT	19	0	185	16	32	
18	12	Lou Amundson	PF	31	NOP	18	0	184	16	32	
19	12	Lou Amundson	PF	31	CHI	1	0	1	0	0	
20	13	Chris Andersen	C	35	MIA	72	0	1396	177	275	
21	14	Alan Anderson	SF	31	BRK	78	26	1773	194	485	
22	15	James Anderson	\mathtt{SG}	24	PHI	80	62	2309	309	717	
23	16	Ryan Anderson	PF	25	NOP	22	14	795	155	354	
24	17	Giannis Antetokounmpo	SF	19	MIL	77	23	1897	173	418	
25	18	Carmelo Anthony	PF	29	NYK	77	77	2982	743	1643	
26	19	Joel Anthony	C	31	TOT	33	0	186	12	32	
27	19	Joel Anthony	C	31	MIA	12	0	37	2	6	
28	19	Joel Anthony	C	31	BOS	21	0	149	10	26	
29	20	Pero Antic	C	31	ATL	50	26	925	123	294	
		• • •									
603		Casper Ware	PG	24	PHI	9	0	116	18	42	
604	456	C.J. Watson	PG	29	IND	63	5	1193	146	334	

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605
      457
                        Earl Watson
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                       Maalik Wayns
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607
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                   Martell Webster
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      460
                          David West
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      461
                 Russell Westbrook
                                            PG
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                          D.J. White
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                        Royce White
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                   Elliot Williams
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                       Lou Williams
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                   Marvin Williams
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                        Mo Williams
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                                             95
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                                                         12
                                                                     156
                                                                            1144
       . . .
631
                .712
                        166
                              310
                                     476
                                            182
                                                  167
                                                         36
                                                              165
                                                                     213
                                                                            1417
       . . .
633
                .730
                              235
                                             92
                                                         41
                                                                     170
                                                                             490
                        118
                                     353
                                                    40
                                                                87
       . . .
634
                .719
                        103
                              179
                                     282
                                             36
                                                    18
                                                         38
                                                                60
                                                                     137
                                                                             399
      . . .
```

[611 rows x 30 columns]

In [18]: x[x.Tm == "SAC"]

Out[18]: Rk Player Pos Age Tm G GS MP FG FGA ... \

```
2
        1
                     Quincy Acy
                                    SF
                                         23
                                              SAC
                                                    56
                                                          0
                                                               786
                                                                       60
                                                                             127
                                                                                    . . .
             DeMarcus Cousins
      102
                                         23
                                                         71
                                                              2298
                                                                      591
                                                                            1191
139
                                     \mathsf{C}
                                              SAC
                                                    71
                                                                                    . . .
                                                                        5
150
      109
             Jared Cunningham
                                    SG
                                         22
                                              SAC
                                                     8
                                                          0
                                                                58
                                                                              19
                                                                                    . . .
199
      140
                  Reggie Evans
                                    PF
                                         33
                                              SAC
                                                    24
                                                         14
                                                               500
                                                                       48
                                                                              91
      153
               Jimmer Fredette
                                    SG
                                         24
                                              SAC
                                                    41
                                                          0
                                                               463
                                                                       94
                                                                             198
214
226
      161
                       Rudy Gay
                                    SF
                                         27
                                              SAC
                                                         55
                                                              1892
                                                                      407
                                                    55
                                                                             844
243
      174
                     Aaron Gray
                                     С
                                         29
                                              SAC
                                                    33
                                                          6
                                                               335
                                                                       25
                                                                              58
                                                                                    . . .
274
      197
                   Chuck Hayes
                                     С
                                         30
                                              SAC
                                                    16
                                                          1
                                                                179
                                                                       14
                                                                              32
                                                                                    . . .
323
      239
               Orlando Johnson
                                         24
                                              SAC
                                                                50
                                                                        3
                                    SG
                                                     7
                                                          0
                                                                              17
                                                                                    . . .
347
      261
                    Carl Landry
                                    ΡF
                                         30
                                              SAC
                                                    18
                                                          1
                                                               233
                                                                       31
                                                                              60
                                                                                    . . .
387
      293
                                    SF
                                         27
                                              SAC
                                                          5
             Luc Mbah a Moute
                                                     9
                                                               196
                                                                       15
                                                                              32
389
      294
                  Ray McCallum
                                    PG
                                         22
                                              SAC
                                                    45
                                                         10
                                                               897
                                                                      113
                                                                             300
392
      297
                                         20
                                                                      255
                  Ben McLemore
                                    SG
                                              SAC
                                                    82
                                                         55
                                                              2187
                                                                             679
                                                                                    . . .
430
      326
                                     C
                                         27
                                              SAC
                                                          0
                                                                 74
                                                                        3
                Hamady N'Diaye
                                                    14
                                                                                9
                                                                                    . . .
454
      343
                                    SF
                                         29
                 Travis Outlaw
                                              SAC
                                                    63
                                                          4
                                                              1065
                                                                      130
                                                                             326
                                                                                    . . .
460
      348
            Patrick Patterson
                                    PF
                                         24
                                              SAC
                                                    17
                                                               415
                                                                       50
                                                                             122
                                                          6
                                                                                    . . .
500
      382
                   John Salmons
                                    SF
                                         34
                                              SAC
                                                    18
                                                          8
                                                               445
                                                                       41
                                                                             117
                                                                                    . . .
      425
                                                                      496
558
                 Isaiah Thomas
                                    PG
                                         24
                                              SAC
                                                    72
                                                         54
                                                              2497
                                                                            1096
                                                                                    . . .
564
      429
                Jason Thompson
                                    PF
                                         27
                                              SAC
                                                    82
                                                         61
                                                              2007
                                                                      251
                                                                             496
                                                                                    . . .
568
      432
               Marcus Thornton
                                    SG
                                         26
                                              SAC
                                                    46
                                                         26
                                                              1121
                                                                      142
                                                                             373
590
      445
               Greivis Vasquez
                                    PG
                                         27
                                              SAC
                                                    18
                                                         18
                                                               465
                                                                       65
                                                                             150
                                                                                    . . .
612
      463
                    Royce White
                                         22
                                                     3
                                                          0
                                                                  9
                                    PF
                                              SAC
                                                                        0
                                                                                1
                                                                                    . . .
616
      465
             Derrick Williams
                                    SF
                                         22
                                              SAC
                                                    67
                                                         15
                                                              1658
                                                                      187
                                                                             428
                                                                                    . . .
        FT%
              ORB
                     DRB
                           TRB
                                 AST
                                        STL BLK
                                                   TOV
                                                          PF
                                                                PTS
2
       .667
                67
                     134
                           201
                                   24
                                         19
                                              23
                                                    28
                                                         114
                                                                 152
       .726
               218
                     613
                           831
                                 207
                                        109
                                              91
                                                         270
                                                               1614
139
                                                   251
                       4
                                    5
                                          3
                                                                  24
150
       .929
                 1
                              5
                                               0
                                                     0
                                                          13
                62
                     123
                                                    30
199
       .569
                           185
                                   16
                                         24
                                               1
                                                          65
                                                                 133
214
       .895
                 7
                      38
                            45
                                   61
                                         14
                                               3
                                                    44
                                                          28
                                                                 241
226
       .836
                84
                     220
                           304
                                 169
                                         67
                                              33
                                                   165
                                                         124
                                                               1107
243
       .556
                39
                      64
                           103
                                   19
                                         10
                                               8
                                                    27
                                                          57
                                                                  60
274
                                               2
       .714
                20
                      27
                            47
                                    6
                                         11
                                                     7
                                                          18
                                                                  33
323
       .500
                 2
                       2
                              4
                                    4
                                          0
                                                            3
                                                                   9
                                               1
                                                     1
347
                15
                      42
                            57
                                    5
                                          3
                                               1
                                                     9
                                                          34
                                                                  76
       .824
387
                            27
                                                     4
       .692
                 9
                      18
                                   15
                                          9
                                               5
                                                           18
                                                                  40
389
       .744
                      61
                            79
                                 120
                                         22
                                               9
                                                          69
                                                                 280
                18
                                                    39
392
       .804
                53
                     182
                           235
                                   82
                                         45
                                              18
                                                    96
                                                         201
                                                                 720
430
       .000
                 5
                      13
                            18
                                    3
                                          0
                                               4
                                                     3
                                                          15
                                                                   6
454
       .808
                36
                     132
                           168
                                         20
                                              19
                                                    26
                                                          94
                                                                 343
                                   48
460
       .563
                34
                      65
                            99
                                   15
                                         13
                                               3
                                                    16
                                                          39
                                                                 118
500
      1.000
                 8
                      38
                            46
                                   44
                                         12
                                               8
                                                    14
                                                          32
                                                                 105
558
       .850
                47
                     163
                           210
                                 454
                                         93
                                               8
                                                   213
                                                         185
                                                                1465
                           527
                                                         251
564
       .579
               153
                     374
                                   53
                                         32
                                              56
                                                    95
                                                                 586
568
                                                          74
       .808
                39
                      85
                           124
                                   47
                                         31
                                               8
                                                    38
                                                                 383
590
       .938
                 5
                      29
                            34
                                   95
                                          6
                                               1
                                                    27
                                                          38
                                                                 176
612
        NaN
                 0
                       0
                              0
                                    0
                                          0
                                               0
                                                     0
                                                            2
                                                                   0
```

.708

[23 rows x 30 columns]

```
In [19]: # pairwise comparison where their total games = team number
          # speak about tradeoffs
          # add x["Year" ... 2014] you could do loops to get through your years
          # add year column for each year, one data frame. so you can get bulls from an entire
          # bulls from end to end and evaluate the curves
          # look @ the massive increase or decrease, talk about interesting or not interesting
          # look at the fluctuating 3 PT attempts. All the same? Differences? Massive peaks or
          # exploratory data is good --> load into tableau and go nuts
          # evaluate dynasties: clustering to identify my outliers? jordan years? larry bird ye
          # best three pointers across the decades? teammates? temporal clustering: how do thes
          # increased period of free throw shooting? percentages? hand checking rules? uptick i
          # which role becomes most important? what caused the change in PF affinity?
In [20]: x[x.Tm == "POR"]
Out [20]:
                                                                   MP
                                                                        FG
                                                                                          \
                Rk
                                 Player Pos Age
                                                   Tm
                                                         G
                                                            GS
                                                                              FGA
                 7
                                                                       652
         10
                    LaMarcus Aldridge
                                         PF
                                              28
                                                  POR
                                                        69
                                                            69
                                                                 2498
                                                                             1423
         47
                35
                           Will Barton
                                              23
                                                  POR
                                                        41
                                                                  387
                                                                        65
                                                                              156
         50
                38
                         Nicolas Batum
                                         SF
                                              25
                                                  POR
                                                        82
                                                            82
                                                                 2956
                                                                       381
                                                                              819
         131
                95
                         Victor Claver
                                         SF
                                              25
                                                  POR
                                                        21
                                                             0
                                                                  184
                                                                        17
                                                                               42
         141
               104
                          Allen Crabbe
                                                  POR
                                                        15
                                                                  100
                                                                        12
                                         SG
                                              21
                                                             0
                                                                               33
         216
               154
                         Joel Freeland
                                          С
                                              26
                                                  POR
                                                        52
                                                             0
                                                                  727
                                                                        77
                                                                              162
         357
               269
                        Meyers Leonard
                                          С
                                              21
                                                  POR
                                                        40
                                                             0
                                                                  355
                                                                        41
                                                                               91
         361
               273
                        Damian Lillard
                                         PG
                                              23
                                                  POR
                                                        82
                                                            82
                                                                 2937
                                                                       553
                                                                             1304
         365
               277
                           Robin Lopez
                                          С
                                              25
                                                  POR
                                                        82
                                                            82
                                                                 2603
                                                                       355
                                                                              644
         380
               289
                       Wesley Matthews
                                         SG
                                              27
                                                  POR
                                                        82
                                                            82
                                                                 2780
                                                                       445
                                                                             1009
         390
                           CJ McCollum
                                              22
                                                  POR
                                                                        74
               295
                                         SG
                                                        38
                                                             0
                                                                  476
                                                                              178
         491
               375
                       Thomas Robinson
                                        PF
                                              22
                                                  POR
                                                        70
                                                             0
                                                                  873
                                                                       141
                                                                              293
         605
               457
                           Earl Watson
                                         PG
                                              34
                                                  POR
                                                        24
                                                                  161
                                                                         3
                                                             0
                                                                               11
                                                  POR
                                                        74
         620
               469
                           Mo Williams
                                         PG
                                              31
                                                             0
                                                                 1834
                                                                       280
                                                                              672
         628
               477
                                         SF
                                              28
                                                  POR
                                                        68
                                                                  984
                         Dorell Wright
                                                            13
                                                                       111
                                                                              297
                 FT%
                       ORB
                            DRB
                                  TRB
                                       AST STL
                                                 BLK
                                                       TOV
                                                             PF
                                                                   PTS
         10
                .822
                       166
                            599
                                  765
                                       178
                                             63
                                                            147
                                                                  1603
                                                  68
                                                       123
         47
                .813
                        16
                             58
                                   74
                                        33
                                              9
                                                   7
                                                        18
                                                             31
                                                                   166
         50
                .803
                       116
                            495
                                       420
                                             75
                                                       208
                                                            156
                                                                  1070
                                  611
                                                  57
         131
                .909
                         9
                             30
                                   39
                                        12
                                              3
                                                   3
                                                        11
                                                             16
                                                                    47
                .750
                                              2
         141
                         1
                              8
                                    9
                                         6
                                                   1
                                                         3
                                                             10
                                                                    33
                                  208
                .690
                            120
                                                  22
         216
                        88
                                        36
                                             10
                                                        32
                                                             95
                                                                   174
         357
                .762
                        26
                             85
                                  111
                                        18
                                              7
                                                   5
                                                             76
                                                                    98
         361
                .871
                        35
                            253
                                  288
                                       457
                                                  22
                                                       193
                                                            197
                                                                  1695
                                             64
         365
                .818
                       326
                            374
                                  700
                                        73
                                             25
                                                 139
                                                        84
                                                            196
                                                                   908
         380
                .837
                        51
                            238
                                  289
                                       197
                                             76
                                                  14
                                                       110
                                                            176
                                                                  1343
         390
                         7
                                   48
                .676
                             41
                                        27
                                             14
                                                   2
                                                             53
                                                                   201
                                                        35
         491
                .564
                       105
                            202
                                  307
                                        34
                                             23
                                                  20
                                                        57
                                                            131
                                                                   339
```

```
605 1.000
          5
             10 15
                      28
                          5
                             1 17
                                       33
                                           12
620
    .876
          42 111 153
                      321 55
                               10 149
                                      197
                                           721
628
    .754
          29 162 191
                       64 23
                               16
                                   39
                                       62
                                           343
```

[15 rows x 30 columns]

In [21]: x[x.Tm == "MIA"]

In [21]: x[x.Tm ==	"MIA	."]												
Out[21]:	Rk			Player	r Pos	Age	Tm	G	GS	MP	FG	FGA		FT%	\
14	9			Allen,		_		73	9	1936	240	543		.905	
20	13	Chr	is An	derse	n C	35	MIA	72	0	1396	177	275		.710	
27	19	J	oel A	nthony	y C	31	MIA	12	0	37	2	6		1.000	
49	37	Sh	ane B	attie	r SF	35	MIA	73	56	1468	105	275		.652	
60	43	Mich	ael B	easley	y SF	25	MIA	55	2	831	177	355		.772	
79	60		Chri	s Bosh	n C	29	MIA	79	79	2531	492	953		.820	
12	2 88	Mar	rio Ch	almer	s PG	27	MIA	73	73	2178	254	560		.742	
13	2 96		Norri	s Cole	e PG	25	MIA	82	6	2014	207	500		.779	
18	4 127		•	ouglas		27	MIA	27	17	410	41	104		.769	
25				miltor		23	MIA	7	0	68	9	20		1.000	
26		Ud	lonis	Hasler		33	MIA	46	18	653	74	146		.568	
30		I		James		29	MIA	77	77	2902	767	1353		.750	
32				Jones		33	MIA	20	6	236	31	68		. 636	
35				Lewis		34	MIA	60	6	971	98	236		.788	
36				iggins		25	MIA	1	0	1	1	1		NaN	
37			_	Masor		33	MIA	25	2	260	25	67	• • •	1.000	
44				g Oder		26	MIA	23	6	212	27	49	• • •	. 565	
59	8 450		Dwyan	e Wade	e SG	32	MIA	54	53	1775	415	761	• • •	.733	
	ODD	DDD	mp p	A ОШ	OTT 1	DT 17	mor.	DE	DIII	a					
4.4	ORB	DRB	TRB	AST	STL 1		TOV	PF	PT						
14		182	205	143	54	8	84	115	70						
20 27		250 5	379 7	19 0	32	97 4	53 1	162 4	47						
49		104	138	63	0 50	39	21	4 124	29	6					
60		141	172	42	23	21	57	93	43						
79		424	522	87	80	78	125	192	128						
12		173	214	357	119	16	162	210	71						
13		143	160	248	77	5	127	156	52						
18		47	61	49	13	3	18	47	11						
25		3	7	0	4	0	3	8		6					
26		133	175	13	11	15	24	79	17						
30		452	533	488	121	26	270	126	208						
32		21	23	9	3	4	4	6		7					
02	-			Ü	_	-	-	J	J	-					

[18 rows x 30 columns]

60 181 241 252

7 13

79 29 161 106 1028

In [22]: x.info() <class 'pandas.core.frame.DataFrame'> Int64Index: 611 entries, 0 to 634 Data columns (total 30 columns): Rk 611 non-null object 611 non-null object Player Pos 611 non-null object Age 611 non-null object Tm611 non-null object G 611 non-null object GS 611 non-null object MP 611 non-null object FG 611 non-null object FGA 611 non-null object FG% 604 non-null object 3P 611 non-null object 3PA 611 non-null object 3P% 515 non-null object 2P 611 non-null object 2PA 611 non-null object 2P% 602 non-null object eFG% 604 non-null object FT 611 non-null object FTA 611 non-null object FT% 579 non-null object ORB 611 non-null object DRB 611 non-null object TRB 611 non-null object AST 611 non-null object STL 611 non-null object BLK 611 non-null object TOV 611 non-null object PF 611 non-null object PTS 611 non-null object dtypes: object(30) memory usage: 148.0+ KB In [23]: x.describe() Out [23]: MP FGA ... Rk Player Pos Age TmG GS FG count 611 611 611 611 611 611 611 611 611 611 ... unique 482 481 9 21 31 83 80 523 325 421 ... top 314 Darius Morris SG 23 TOT 82 0 15 0 1 ... 193 freq 4 134 69 63 28 5 19 9 ...

FT% ORB DRB TRB AST STL BLK TOV PF PTS

```
1.000
                             0
                                  0
                                             0
                                                        0
                                                              0
                                                                    0
         top
                                        0
                                                   0
                                                                         0
         freq
                      21
                            44
                                 17
                                       13
                                            32
                                                  47
                                                        78
                                                             26
                                                                   17
                                                                        15
          [4 rows x 30 columns]
In [24]: x.mean()
Out [24]: Rk
                 inf
          Age
                 inf
         G
                 inf
         GS
                 inf
         MP
                 inf
         FG
                 inf
         FGA
                 inf
         ЗР
                 inf
         3PA
                 inf
         2P
                 inf
         2PA
                 inf
         FT
                 inf
                 inf
         FTA
         ORB
                 inf
         DRB
                 inf
         TRB
                 inf
         AST
                 inf
         STL
                 inf
         BLK
                 inf
         TOV
                 inf
         PF
                 inf
         PTS
                 inf
         dtype: float64
In [25]: x.head()
          #just goes off the basis of their last name, accounts for total games, and teams they
Out [25]:
            Rk
                                                                    FGA ...
                       Player Pos Age
                                          Tm
                                                G
                                                   GS
                                                          MP
                                                               FG
                                                                                FT%
                                                                                      ORB
                                                                                           DRB
                                                                                                \
                   Quincy Acy
                                                                                       72
                                                                                           144
         0
             1
                                SF
                                    23
                                         TOT
                                              63
                                                    0
                                                         847
                                                               66
                                                                    141 ...
                                                                               .660
          1
             1
                   Quincy Acy
                                SF
                                    23
                                         TOR
                                                7
                                                    0
                                                          61
                                                                6
                                                                     14 ...
                                                                               .625
                                                                                        5
                                                                                            10
                                         SAC
          2
             1
                   Quincy Acy
                                    23
                                              56
                                                    0
                                                         786
                                                               60
                                                                    127 ...
                                                                                       67
                                                                                           134
                                SF
                                                                               .667
                Steven Adams
                                                                    185 ...
          3
             2
                                 С
                                    20
                                         OKC
                                              81
                                                   20
                                                        1197
                                                               93
                                                                               .581
                                                                                      142
                                                                                           190
             3
                 Jeff Adrien
                               PF
                                    27
                                         TOT
                                              53
                                                   12
                                                         961
                                                              143
                                                                    275 ...
                                                                               .639
                                                                                      102
                                                                                           204
             TRB AST STL BLK TOV
                                     PF
                                          PTS
                  28
                       23
                                30
                                    122
         0
             216
                            26
                                          171
          1
              15
                    4
                        4
                             3
                                 2
                                      8
                                           19
         2
             201
                  24
                       19
                           23
                                28
                                    114
                                          152
          3
             332
                  43
                       40
                           57
                                71
                                    203
                                          265
```

count

unique

306

38

24

36

39

108

579

269

611

158

611

290

611

325

611

241

611

120

611

91

611

185

611

215

611

431

```
[5 rows x 30 columns]
In [26]: #this cell helps me remove duplicates so that I can just read the player themself
                    \# documentation: https://www.geeksforgeeks.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop\_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop_duplicates.org/python-pandas-dataframe-drop-duplicates.org/python-pandas-dataframe-drop-duplicates.org/python-pandas-dataframe-drop-duplicates.org/python-dataframe-drop-duplicates.org/python-dataframe-drop-duplicates.org/python-dataframe-drop-duplicate
                    #x = x.drop_duplicates(subset=['player'], keep=False)
In [27]: # Here I'll consider the 2013-2014 salary data since it's the first year I explored:
                    # http://www.espn.com/nba/salaries/_/year/2014
In [28]: #pd.read_html('http://www.espn.com/nba/salaries/_/year/2014')
                   y = requests.get('http://www.espn.com/nba/salaries/_/year/2014.html')
                   j = pd.read_html(y.text)
In [29]: #This Cell loops through the 11 pages, and strips the data in my salaries array.
                   salaries = []
                   for i in range(1,11):
                            y = requests.get('http://www.espn.com/nba/salaries/_/year/2014/page/{}'.format(i)
                            j = pd.read_html(y.text)
                          # print(x)
                            try:
                                     salaries.append(j[0])
                            except:
                                     continue
In [30]: salaries = pd.concat(salaries)
      make both name in salaries and Player to lowercase player name.str.split() use this array, -1,
this gives me my position do a join that brings it together
In [31]: salaries.columns = salaries.iloc[0]
In [32]: salaries = salaries[salaries.RK != "RK"]
In [33]: salaries["Pos"] = salaries.NAME.apply(lambda x:x.split()[-1])
                    #change Name to Player and Position Columns
In [34]: salaries["Player"] = salaries.NAME.apply(lambda x:" ".join(x.split()[:-1]))
In [35]: salaries
Out[35]: 0
                              RK
                                                                             NAME
                                                                                                                                  TEAM
                                                                                                                                                          SALARY Pos
                                                    Kobe Bryant, SF
                   1
                                1
                                                                                                  Los Angeles Lakers $30,453,805
                                                                                                                                                                          SF
                   2
                                2
                                                Dirk Nowitzki, PF
                                                                                                       Dallas Mavericks $22,721,381
                                                                                                                                                                           PF
                   3
                                3
                                         Amar'e Stoudemire, C
                                                                                                         New York Knicks $21,679,893
                                                                                                                                                                             C
                   4
                                4
                                                       Joe Johnson, G
                                                                                                             Brooklyn Nets $21,466,718
                                                                                                                                                                             G
                   5
                                5
                                              Carmelo Anthony, F
                                                                                                         New York Knicks $21,388,953
                                                                                                                                                                             F
                   6
                                6
                                                  Dwight Howard, C
                                                                                                         Houston Rockets $20,513,178
                                                                                                                                                                             C
                   7
                                7
                                                           Pau Gasol, C
                                                                                                  Los Angeles Lakers $19,285,850
                                                                                                                                                                             C
```

Miami Heat \$19,067,500 PF

Chris Bosh, PF

8

```
9
      9
               LeBron James, SF
                                                                           SF
                                                Miami Heat
                                                             $19,067,500
10
     10
                Dwyane Wade, SG
                                                Miami Heat
                                                             $18,673,000
                                                                           SG
12
                 Chris Paul, PG
     11
                                               LA Clippers
                                                             $18,668,431
                                                                           PG
     12
             Deron Williams, PG
13
                                            Brooklyn Nets
                                                             $18,466,130
                                                                           PG
14
     13
               Zach Randolph, F
                                        Memphis Grizzlies
                                                             $18,238,333
                                                                            F
15
     14
                   Rudy Gay, SF
                                          Toronto Raptors
                                                             $17,888,932
                                                                           SF
16
     15
               Kevin Durant, SF
                                    Oklahoma City Thunder
                                                             $17,832,627
                                                                           SF
                                            Chicago Bulls
17
     16
               Derrick Rose, PG
                                                             $17,632,688
                                                                           PG
18
     17
              Blake Griffin, PF
                                               LA Clippers
                                                             $16,441,500
                                                                           PF
19
     18
                Paul Pierce, SF
                                            Brooklyn Nets
                                                             $15,333,334
                                                                           SF
20
     19
              Carlos Boozer, PF
                                                                           PF
                                            Chicago Bulls
                                                             $15,300,000
                                                                            C
21
     20
           LaMarcus Aldridge, C
                                   Portland Trail Blazers
                                                             $14,878,000
                                                                            С
23
     21
                  Marc Gasol, C
                                        Memphis Grizzlies
                                                             $14,860,523
24
     22
         Russell Westbrook, PG
                                    Oklahoma City Thunder
                                                             $14,693,906
                                                                           PG
25
     23
                 Kevin Love, PF
                                   Minnesota Timberwolves
                                                             $14,693,906
                                                                           PF
26
     24
                Emeka Okafor, C
                                                                            C
                                       Philadelphia 76ers
                                                             $14,487,500
27
     25
                Eric Gordon, SG
                                     New Orleans Pelicans
                                                             $14,283,844
                                                                           SG
28
     26
                 Roy Hibbert, C
                                           Indiana Pacers
                                                                            C
                                                             $14,283,844
29
     27
                  Luol Deng, SF
                                      Cleveland Cavaliers
                                                             $14,275,000
                                                                           SF
30
     28
              Tyson Chandler, C
                                          New York Knicks
                                                             $14,100,538
                                                                            C
                                    Golden State Warriors
31
     29
                Andrew Bogut, C
                                                             $14,000,000
                                                                            C
32
     30
                  David Lee, PF
                                    Golden State Warriors
                                                             $13,878,000
                                                                           PF
    . . .
                                             Phoenix Suns
                                                                $410,936
40
    357
             Leandro Barbosa, G
                                                                            G
41
    358
                Luke Babbitt, F
                                     New Orleans Pelicans
                                                                $387,995
                                                                            F
42
    359
                                           Boston Celtics
                                                                           SG
              Chris Johnson, SG
                                                                $320,189
                                                                           PF
43
    360
           Shavlik Randolph, PF
                                             Phoenix Suns
                                                                $306,037
1
    361
              Dewayne Dedmon, C
                                       Philadelphia 76ers
                                                                $300,000
                                                                            C
2
                                                                            C
    362
               Jason Collins, C
                                            Brooklyn Nets
                                                                $275,691
3
    363
              Danny Granger, SF
                                                                           SF
                                               LA Clippers
                                                                $249,683
4
    364
               Caron Butler, SF
                                    Oklahoma City Thunder
                                                                $244,489
                                                                           SF
5
    365
             Jimmer Fredette, G
                                                                $239,279
                                                                            G
                                         Sacramento Kings
6
    366
              Shannon Brown, PG
                                        San Antonio Spurs
                                                                $188,438
                                                                           PG
7
             Jarvis Varnado, PF
    367
                                       Philadelphia 76ers
                                                                $171,696
                                                                           PF
8
    368
               Troy Daniels, SG
                                          Houston Rockets
                                                                $158,588
                                                                           SG
9
    369
               Mike Muscala, PF
                                            Atlanta Hawks
                                                                $138,404
                                                                           PF
10
    370
             Cartier Martin, PF
                                            Chicago Bulls
                                                                $104,034
12
    371
                 D.J. White, PF
                                        Charlotte Bobcats
                                                                $104,028
                                                                           PF
             Justin Hamilton, C
13
    372
                                        Charlotte Bobcats
                                                                 $98,036
                                                                            C
14
    373
                 Chris Babb, SG
                                           Boston Celtics
                                                                 $77,852
                                                                           SG
    374
15
              Ronnie Brewer, SF
                                          Houston Rockets
                                                                 $69,792
                                                                           SF
16
    375
               Damion James, SF
                                        San Antonio Spurs
                                                                 $68,902
                                                                           SF
17
    376
                 Mike James, PG
                                                                           PG
                                            Chicago Bulls
                                                                 $57,627
18
    377
            Jorge Gutierrez, PG
                                            Brooklyn Nets
                                                                 $54,785
                                                                           PG
19
    378
                Drew Gooden, PF
                                       Washington Wizards
                                                                 $52,017
                                                                           PF
20
    379
             Othyus Jeffers, SG
                                        San Antonio Spurs
                                                                 $52,017
                                                                           SG
21
    380
               Lou Amundson, PF
                                            Chicago Bulls
                                                                 $48,854
                                                                           PF
23
    381
                                                                 $46,404
                                                                           SG
           Jared Cunningham, SG
                                         Sacramento Kings
```

```
24
    382
                  Melvin Ely, C
                                     New Orleans Pelicans
                                                                 $29,788
                                                                            С
25
    383
                 Greg Smith, PF
                                          Houston Rockets
                                                                 $15,605
                                                                          PF
26
                Josh Powell, PF
                                          Houston Rockets
    384
                                                                 $13,958
                                                                          PF
27
    385
               Chris Wright, SF
                                          Milwaukee Bucks
                                                                  $9,281
                                                                           SF
                 Lamar Odom, PF
                                                                  $8,232
                                          New York Knicks
28
    386
                                                                          PF
0
                 Player
1
          Kobe Bryant,
2
        Dirk Nowitzki,
3
    Amar'e Stoudemire,
4
           Joe Johnson,
5
      Carmelo Anthony,
6
        Dwight Howard,
7
             Pau Gasol,
8
           Chris Bosh,
9
         LeBron James,
10
          Dwyane Wade,
12
           Chris Paul,
13
       Deron Williams,
14
        Zach Randolph,
15
              Rudy Gay,
         Kevin Durant,
16
17
         Derrick Rose,
18
        Blake Griffin,
19
          Paul Pierce,
        Carlos Boozer,
20
21
    LaMarcus Aldridge,
23
           Marc Gasol,
24
    Russell Westbrook,
25
           Kevin Love,
26
         Emeka Okafor,
27
          Eric Gordon,
28
          Roy Hibbert,
29
             Luol Deng,
30
       Tyson Chandler,
31
         Andrew Bogut,
32
             David Lee,
. .
40
      Leandro Barbosa,
41
         Luke Babbitt,
42
        Chris Johnson,
43
     Shavlik Randolph,
       Dewayne Dedmon,
1
2
        Jason Collins,
3
        Danny Granger,
4
         Caron Butler,
5
      Jimmer Fredette,
6
        Shannon Brown,
```

```
7
       Jarvis Varnado,
8
         Troy Daniels,
9
         Mike Muscala,
10
       Cartier Martin,
12
           D.J. White,
13
      Justin Hamilton,
14
           Chris Babb,
        Ronnie Brewer,
15
16
         Damion James,
           Mike James,
17
18
      Jorge Gutierrez,
          Drew Gooden,
19
20
       Othyus Jeffers,
         Lou Amundson,
21
23
     Jared Cunningham,
24
           Melvin Ely,
25
           Greg Smith,
26
          Josh Powell,
27
         Chris Wright,
28
           Lamar Odom,
```

[386 rows x 6 columns]

In [36]: salaries

Out[36]:	0	RK	NAME	TEAM	SALARY	Pos	\
	1	1	Kobe Bryant, SF	Los Angeles Lakers	\$30,453,805	SF	
	2	2	Dirk Nowitzki, PF	Dallas Mavericks	\$22,721,381	PF	
	3	3	Amar'e Stoudemire, C	New York Knicks	\$21,679,893	C	
	4	4	Joe Johnson, G	Brooklyn Nets	\$21,466,718	G	
	5	5	Carmelo Anthony, F	New York Knicks	\$21,388,953	F	
	6	6	Dwight Howard, C	Houston Rockets	\$20,513,178	C	
	7	7	Pau Gasol, C	Los Angeles Lakers	\$19,285,850	C	
	8	8	Chris Bosh, PF	Miami Heat	\$19,067,500	PF	
	9	9	LeBron James, SF	Miami Heat	\$19,067,500	SF	
	10	10	Dwyane Wade, SG	Miami Heat	\$18,673,000	\mathtt{SG}	
	12	11	Chris Paul, PG	LA Clippers	\$18,668,431	PG	
	13	12	Deron Williams, PG	Brooklyn Nets	\$18,466,130	PG	
	14	13	Zach Randolph, F	Memphis Grizzlies	\$18,238,333	F	
	15	14	Rudy Gay, SF	Toronto Raptors	\$17,888,932	SF	
	16	15	Kevin Durant, SF	Oklahoma City Thunder	\$17,832,627	SF	
	17	16	Derrick Rose, PG	Chicago Bulls	\$17,632,688	PG	
	18	17	Blake Griffin, PF	LA Clippers	\$16,441,500	PF	
	19	18	Paul Pierce, SF	Brooklyn Nets	\$15,333,334	SF	
	20	19	Carlos Boozer, PF	Chicago Bulls	\$15,300,000	PF	
	21	20	LaMarcus Aldridge, C	Portland Trail Blazers	\$14,878,000	C	
	23	21	Marc Gasol, C	Memphis Grizzlies	\$14,860,523	C	
	24	22	Russell Westbrook, PG	Oklahoma City Thunder	\$14,693,906	PG	

```
$14,693,906
25
     23
                 Kevin Love, PF
                                  Minnesota Timberwolves
                                                                           PF
26
     24
                Emeka Okafor, C
                                       Philadelphia 76ers
                                                             $14,487,500
                                                                            C
27
     25
                Eric Gordon, SG
                                     New Orleans Pelicans
                                                             $14,283,844
                                                                           SG
28
                 Roy Hibbert, C
                                           Indiana Pacers
                                                             $14,283,844
                                                                            C
     26
                  Luol Deng, SF
                                                             $14,275,000
29
     27
                                      Cleveland Cavaliers
                                                                           SF
              Tyson Chandler, C
                                          New York Knicks
                                                             $14,100,538
30
     28
                                                                            C
31
     29
                Andrew Bogut, C
                                    Golden State Warriors
                                                             $14,000,000
                                                                            C
32
     30
                  David Lee, PF
                                    Golden State Warriors
                                                             $13,878,000
                                                                           PF
. .
    . . .
                                             Phoenix Suns
40
    357
             Leandro Barbosa, G
                                                                $410,936
                                                                            G
                                                                            F
41
    358
                Luke Babbitt, F
                                     New Orleans Pelicans
                                                                $387,995
42
    359
              Chris Johnson, SG
                                           Boston Celtics
                                                                $320,189
                                                                           SG
    360
           Shavlik Randolph, PF
                                             Phoenix Suns
                                                                           PF
43
                                                                $306,037
              Dewayne Dedmon, C
1
    361
                                       Philadelphia 76ers
                                                                $300,000
                                                                            C
2
    362
               Jason Collins, C
                                            Brooklyn Nets
                                                                $275,691
                                                                            C
3
    363
              Danny Granger, SF
                                               LA Clippers
                                                                $249,683
                                                                           SF
4
    364
               Caron Butler, SF
                                    Oklahoma City Thunder
                                                                $244,489
                                                                           SF
5
    365
             Jimmer Fredette, G
                                                                $239,279
                                                                            G
                                         Sacramento Kings
6
              Shannon Brown, PG
                                        San Antonio Spurs
    366
                                                                $188,438
                                                                           PG
7
    367
             Jarvis Varnado, PF
                                       Philadelphia 76ers
                                                                $171,696
                                                                           PF
                                          Houston Rockets
8
    368
               Troy Daniels, SG
                                                                $158,588
                                                                           SG
9
               Mike Muscala, PF
    369
                                             Atlanta Hawks
                                                                $138,404
                                                                           PF
10
    370
             Cartier Martin, PF
                                            Chicago Bulls
                                                                $104,034
                                                                           PF
12
                 D.J. White, PF
                                        Charlotte Bobcats
    371
                                                                $104,028
                                                                           PF
13
    372
             Justin Hamilton, C
                                        Charlotte Bobcats
                                                                 $98,036
                                                                            C
    373
14
                 Chris Babb, SG
                                           Boston Celtics
                                                                 $77,852
                                                                           SG
    374
              Ronnie Brewer, SF
                                          Houston Rockets
                                                                 $69,792
15
                                                                           SF
16
    375
               Damion James, SF
                                        San Antonio Spurs
                                                                 $68,902
                                                                           SF
                 Mike James, PG
17
    376
                                            Chicago Bulls
                                                                 $57,627
                                                                           PG
18
    377
            Jorge Gutierrez, PG
                                            Brooklyn Nets
                                                                 $54,785
                                                                           PG
                                                                           PF
19
    378
                Drew Gooden, PF
                                       Washington Wizards
                                                                 $52,017
20
    379
             Othyus Jeffers, SG
                                        San Antonio Spurs
                                                                 $52,017
                                                                           SG
21
    380
               Lou Amundson, PF
                                            Chicago Bulls
                                                                 $48,854
                                                                           PF
23
    381
           Jared Cunningham, SG
                                                                 $46,404
                                         Sacramento Kings
                                                                           SG
24
                  Melvin Ely, C
    382
                                     New Orleans Pelicans
                                                                 $29,788
                                                                            C
25
    383
                 Greg Smith, PF
                                          Houston Rockets
                                                                 $15,605
                                                                           PF
                                                                 $13,958
26
    384
                Josh Powell, PF
                                          Houston Rockets
                                                                           PF
27
    385
               Chris Wright, SF
                                          Milwaukee Bucks
                                                                  $9,281
                                                                           SF
28
    386
                 Lamar Odom, PF
                                          New York Knicks
                                                                  $8,232
                                                                           PF
0
                 Player
1
           Kobe Bryant,
2
        Dirk Nowitzki,
3
    Amar'e Stoudemire,
4
           Joe Johnson,
5
      Carmelo Anthony,
6
        Dwight Howard,
7
             Pau Gasol,
```

```
8
            Chris Bosh,
9
         LeBron James,
10
          Dwyane Wade,
12
            Chris Paul,
13
       Deron Williams,
14
        Zach Randolph,
15
              Rudy Gay,
         Kevin Durant,
16
17
         Derrick Rose,
        Blake Griffin,
18
19
          Paul Pierce,
20
        Carlos Boozer,
21
    LaMarcus Aldridge,
23
            Marc Gasol,
24
    Russell Westbrook,
25
            Kevin Love,
26
         Emeka Okafor,
27
          Eric Gordon,
28
          Roy Hibbert,
29
             Luol Deng,
       Tyson Chandler,
30
31
         Andrew Bogut,
32
             David Lee,
. .
40
      Leandro Barbosa,
41
         Luke Babbitt,
42
        Chris Johnson,
43
     Shavlik Randolph,
1
       Dewayne Dedmon,
2
        Jason Collins,
3
        Danny Granger,
4
         Caron Butler,
      Jimmer Fredette,
5
6
        Shannon Brown,
7
       Jarvis Varnado,
8
         Troy Daniels,
9
         Mike Muscala,
10
       Cartier Martin,
12
            D.J. White,
13
      Justin Hamilton,
            Chris Babb,
14
15
        Ronnie Brewer,
16
         Damion James,
17
            Mike James,
18
      Jorge Gutierrez,
19
          Drew Gooden,
20
       Othyus Jeffers,
21
         Lou Amundson,
```

```
23
              Jared Cunningham,
         24
                    Melvin Ely,
         25
                    Greg Smith,
         26
                    Josh Powell,
                  Chris Wright,
         27
                    Lamar Odom,
         28
         [386 rows x 6 columns]
In [37]: x["Player"] = x["Player"].apply(lambda x:x.strip())
         salaries["Player"] = salaries["Player"].apply(lambda x:x[:-1].strip())
C:\Users\andre\Anaconda4\lib\site-packages\ipykernel_launcher.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.htm
  """Entry point for launching an IPython kernel.
In [38]: salaries.Player.unique
Out[38]: <bound method Series.unique of 1
                                                     Kobe Bryant
         2
                   Dirk Nowitzki
         3
               Amar'e Stoudemire
         4
                     Joe Johnson
         5
                 Carmelo Anthony
         6
                   Dwight Howard
         7
                       Pau Gasol
                       Chris Bosh
         8
         9
                    LeBron James
                     Dwyane Wade
         10
         12
                       Chris Paul
         13
                  Deron Williams
         14
                   Zach Randolph
         15
                        Rudy Gay
         16
                    Kevin Durant
         17
                    Derrick Rose
                   Blake Griffin
         18
         19
                     Paul Pierce
         20
                   Carlos Boozer
         21
               LaMarcus Aldridge
         23
                      Marc Gasol
         24
               Russell Westbrook
         25
                       Kevin Love
         26
                    Emeka Okafor
         27
                     Eric Gordon
         28
                     Roy Hibbert
```

Luol Deng

```
Tyson Chandler
         31
                    Andrew Bogut
         32
                       David Lee
         40
                 Leandro Barbosa
                    Luke Babbitt
         41
         42
                   Chris Johnson
         43
                Shavlik Randolph
                  Dewayne Dedmon
         1
         2
                    Jason Collins
         3
                   Danny Granger
         4
                    Caron Butler
                 Jimmer Fredette
         5
         6
                   Shannon Brown
         7
                  Jarvis Varnado
         8
                    Troy Daniels
         9
                    Mike Muscala
         10
                  Cartier Martin
         12
                      D.J. White
         13
                 Justin Hamilton
         14
                       Chris Babb
                   Ronnie Brewer
         15
         16
                    Damion James
                      Mike James
         17
         18
                 Jorge Gutierrez
                     Drew Gooden
         19
         20
                  Othyus Jeffers
         21
                    Lou Amundson
         23
                Jared Cunningham
         24
                      Melvin Ely
         25
                      Greg Smith
         26
                      Josh Powell
         27
                    Chris Wright
                       Lamar Odom
         Name: Player, Length: 386, dtype: object>
In [39]: salaries.loc[:, "SALARY"] = salaries["SALARY"].str.replace(",", "")
         salaries.loc[:, "SALARY"] = salaries["SALARY"].str.replace("$", "")
         salaries["SALARY"] = salaries["SALARY"].astype(int)
In [40]: x[["Tm"]].drop_duplicates().to_excel("Tm.xlsx")
         #do the same with salaries Tm, bring up both spreadsheets, cut and paste and sort the
In [41]: salaries[["TEAM"]].drop_duplicates().to_excel("TEAM.xlsx")
In [42]: excel_file = 'TeamsUpdtd.xlsx'
In [43]: teamsupd = pd.read_excel(excel_file)
```

```
In [44]: teamsupd
Out [44]:
                                     TEAM
              Tm
             ATL
                            Atlanta Hawks
         1
             BOS
                           Boston Celtics
         2
             BRK
                            Brooklyn Nets
         3
             CHA
                       Charlotte Bobcats
         4
             CHI
                            Chicago Bulls
         5
             CLE
                     Cleveland Cavaliers
         6
             DAL
                        Dallas Mavericks
         7
             DEN
                           Denver Nuggets
         8
             DET
                         Detroit Pistons
         9
             GSW
                   Golden State Warriors
                         Houston Rockets
         10
             HOU
         11
             IND
                           Indiana Pacers
         12
            LAC
                              LA Clippers
         13 LAL
                      Los Angeles Lakers
         14
             MEM
                       Memphis Grizzlies
             MIA
         15
                               Miami Heat
             MIL
                         Milwaukee Bucks
         16
         17
             MIN
                  Minnesota Timberwolves
         18
             NOP
                    New Orleans Pelicans
         19
             NYK
                         New York Knicks
             OKC
         20
                   Oklahoma City Thunder
         21
             ORL
                            Orlando Magic
         22
             PHI
                      Philadelphia 76ers
             PHO
                             Phoenix Suns
         23
         24
             POR
                 Portland Trail Blazers
         25
             SAC
                        Sacramento Kings
         26
             SAS
                       San Antonio Spurs
         27
             TOR
                         Toronto Raptors
         28
             UTA
                                Utah Jazz
         29
             WAS
                      Washington Wizards
         30
             TOT
                                    Total
In [45]: salaries=salaries.merge(teamsupd,how="left",on="TEAM")
In [46]: #x[["Tm"]].drop_duplicates().to_excel("Tm.xlsx")
         #do the same with salaries Tm, bring up both spreadsheets, cut and paste and sort the
         \#salaries[["TEAM"]].drop\_duplicates().to\_excel("TEAM.xlsx")
In [47]: #attempting to put salary and player data together
         #the merge dataframe
         mrgdf = x.merge(salaries, how = 'inner', left_on='Player', right_on='Player')
In [48]: #x.merge(salaries, , on=['Player', 'TEAM'])
         \#x["Tm"] = x.NAME.apply(lambda x:x.split()[-1])
         #change Name to Player and Position Columns
```

#merge the x dataframe with the team expansion #x TM needs to be merged with x TEAM so that they call the same team when you are toy

 ${\tt mrgdf}$

Out[48]:		Rk	Player	Pos_x	Age	Tm_x	G	GS	MP	FG	FGA		\
	0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141		
	1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14		
	2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127		
	3	2	Steven Adams	С	20	OKC	81	20	1197	93	185		
	4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275		
	5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40		
	6	3	Jeff Adrien	PF	27	MIL	28	12	705	121	235		
	7	5	Alexis Ajinca	C	25	NOP	56	30	951	136	249		
	8	6	Cole Aldrich	C	25	NYK	46	2	330	33	61		
	9	7	LaMarcus Aldridge	PF	28	POR	69	69	2498	652	1423		
	10	8	Lavoy Allen	PF	24	TOT	65	2	1072	134	300		
	11	8	Lavoy Allen	PF	24	PHI	51	2	960	117	266		
	12	8	Lavoy Allen	PF	24	IND	14	0	112	17	34		
	13	10	Tony Allen	SG	32	MEM	55	28	1278	204	413		
	14	11	Al-Farouq Aminu	SF	23	NOP	80	65	2045	234	494		
	15	12	Lou Amundson	PF	31	TOT	19	0	185	16	32		
	16	12	Lou Amundson	PF	31	NOP	18	0	184	16	32		
	17	12	Lou Amundson	PF	31	CHI	1	0	1	0			
	18	13	Chris Andersen	C	35	AIM	72	0	1396	177	275		
	19	14	Alan Anderson	SF	31	BRK	78	26	1773	194	485		
	20	16	Ryan Anderson	PF	25	NOP	22	14	795	155	354		
	21	17	Giannis Antetokounmpo	SF	19	MIL	77	23	1897	173	418		
	22	18	Carmelo Anthony	PF	29	NYK	77	77	2982	743	1643		
	23	19	Joel Anthony	C	31	TOT	33	0	186	12			
	24	19	Joel Anthony	С	31	MIA	12	0	37	2	6	• • •	
	25	19	Joel Anthony	С	31	BOS	21	0	149	10			
	26	20	Pero Antic	C	31	ATL	50	26	925	123	294		
	27	21	Trevor Ariza	SF	28	WAS	77	77	2723	389	853		
	28	22	Hilton Armstrong	С	29	GSW	15	1	97	9			
	29	23	Darrell Arthur	SF	25	DEN	68	1	1161	162	410	• • •	
	• •			• • •	• •	• • •	• •	• •	• • •	• • •		• • •	
	443	446	Jan Vesely	PF	23	TOT	54	1	776	89	173		
	444	446	Jan Vesely	PF	23	WAS	33	1	470	48		• • •	
	445	446	Jan Vesely	PF	23	DEN	21	0	306	41		• • •	
	446	447	Charlie Villanueva	PF	29	DET	20	0	180	35		• • •	
	447	448	Nikola Vucevic	C	23	ORL	57	57	1812	353	696		
	448	450	Dwyane Wade	SG	32	MIA	54	53	1775	415	761		
	449	451	Dion Waiters	SG	22	CLE	70	24	2072	430	993		
	450	452	Kemba Walker	PG	23	CHA	73	73	2614	449	1143		
	451	453	John Wall	PG	23	WAS	82	82	2980	579	1337	• • •	

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452
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                    Gerald Wallace
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                      Nate Wolters
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                                                 Quincy Acy, F
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                114
                       152
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                                                 Quincy Acy, F
3
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                203
                       265
                             225
                                               Steven Adams, C
           71
4
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           39
                108
                       362
                             309
                                               Jeff Adrien, SF
5
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                 35
                        57
                                               Jeff Adrien, SF
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6
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                       305
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                                               Jeff Adrien, SF
7
     46
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                187
                       328
                             336
                                             Alexis Ajinca, C
8
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                             317
                                               Cole Aldrich, C
9
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                                         LaMarcus Aldridge, C
10
           44
                126
                       303
                             183
                                                Lavoy Allen, F
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                             183
                                                Lavoy Allen, F
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                             183
                                                Lavoy Allen, F
13
                121
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      19
           90
                                                Tony Allen, SG
14
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                             154
                                          Al-Farouq Aminu, PF
15
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                        38
                             380
                                             Lou Amundson, PF
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                                             Lou Amundson, PF
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                                            Alan Anderson, SG
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                                            Rvan Anderson, PF
21
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                       525
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                                   Giannis Antetokounmpo, PF
22
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                                           Carmelo Anthony, F
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                                            Trevor Ariza, SF
28
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                                        Hilton Armstrong, PF
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                                           Darrell Arthur, F
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                                               Jan Vesely, PF
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                       104
                            164
                                               Jan Vesely, PF
                        93
                                               Jan Vesely, PF
445
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446
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                              66
                                      Charlie Villanueva, PF
447
     47
          112
                169
                       811
                            238
                                           Nikola Vucevic, C
448
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                106
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                                              Dwyane Wade, SG
449
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                                            Dion Waiters, SG
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          169
                128
                     1289
                            204
                                            Kemba Walker, PG
451
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          295
                219
                     1583
                             85
                                                John Wall, PG
452
     14
           97
                 79
                       298
                             53
                                          Gerald Wallace, SF
453
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           60
                 66
                       414
                            227
                                              C.J. Watson, PG
454
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           58
                150
                       759
                            116
                                         Martell Webster, SF
      7
          177
                104
                     1002
                             22
                                       Russell Westbrook, PG
455
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                            371
                                               D.J. White, PF
                148
                                          Deron Williams, PG
457
     13
          143
                       915
                              12
           76
                       624
458
     20
                114
                            118
                                        Derrick Williams, PF
459
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            6
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                        54
                            118
                                        Derrick Williams, PF
460
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                105
                       570
                                        Derrick Williams, PF
     16
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461
      3
           68
                126
                       404
                            320
                                         Elliot Williams, SG
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462
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                151
                       603
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                                         Marvin Williams, PF
                       721
                                              Mo Williams, PG
463
     10
          149
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464
     15
           57
                 67
                       417
                            345
                                            Nate Wolters, PG
465
     55
           35
                 94
                       525
                                           Brandan Wright, F
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                        48
                            385
                                            Chris Wright, SF
467
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                 62
                       343
                                           Dorell Wright, SF
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468
     16
          204
                151
                       939
                            284
                                              Tony Wroten, SG
469
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                     1144
                            291
                                                Nick Young, G
                213
                     1417
                                          Thaddeus Young, PF
470
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          165
                              62
                       490
471
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                170
                            150
                                               Cody Zeller, C
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472
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                            245
                                              Tyler Zeller, C
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0
             Toronto Raptors
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             Toronto Raptors
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2
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             Toronto Raptors
3
      Oklahoma City Thunder
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4
           Charlotte Bobcats
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                                                   CHA
                                   916099
5
                                               SF
           Charlotte Bobcats
                                   916099
                                                   CHA
6
           Charlotte Bobcats
                                   916099
                                               SF
                                                   CHA
7
        New Orleans Pelicans
                                   635880
                                                С
                                                   NOP
8
             New York Knicks
                                   884293
                                                С
                                                   NYK
9
     Portland Trail Blazers
                                 14878000
                                                С
                                                   POR
```

10	Philadelphia 76ers	3060000	F	PHI
11	Philadelphia 76ers	3060000	F	PHI
12	Philadelphia 76ers	3060000	F	PHI
13	Memphis Grizzlies	4494383	\mathtt{SG}	MEM
14	New Orleans Pelicans	3749602	PF	NOP
15	Chicago Bulls	48854	PF	CHI
16	Chicago Bulls	48854	PF	CHI
17	Chicago Bulls	48854	PF	CHI
18	Miami Heat	1399507	PF	MIA
19	Brooklyn Nets	947907	\mathtt{SG}	BRK
20	New Orleans Pelicans	8308500	PF	NOP
21	Milwaukee Bucks	1792560	PF	MIL
22	New York Knicks	21388953	F	NYK
23	Miami Heat	3800000	PF	MIA
24	Miami Heat	3800000	PF	MIA
25	Miami Heat	3800000	PF	MIA
26	Atlanta Hawks	1200000	PF	ATL
27	Washington Wizards	7727280	SF	WAS
28	Golden State Warriors	660619	PF	GSW
29	Denver Nuggets	3231683	F	DEN
	•••			
443	Washington Wizards	3340920	PF	WAS
444	Washington Wizards	3340920	PF	WAS
445	Washington Wizards	3340920	PF	WAS
446	Detroit Pistons	8580000	PF	DET
447	Orlando Magic	1793520	C	ORL
448	Miami Heat	18673000	\mathtt{SG}	MIA
449	Cleveland Cavaliers	3894240	\mathtt{SG}	CLE
450	Charlotte Bobcats	2568360	PG	CHA
451	Washington Wizards	7459925	PG	WAS
452	Boston Celtics	10105855	SF	BOS
453	Indiana Pacers	2016000	PG	IND
454	Washington Wizards	5150000	SF	WAS
455	Oklahoma City Thunder	14693906	PG	OKC
456	Charlotte Bobcats	104028	PF	CHA
457	Brooklyn Nets	18466130	PG	BRK
458	Sacramento Kings	5016960	PF	SAC
459	Sacramento Kings	5016960	PF	SAC
460	Sacramento Kings	5016960	PF	SAC
461	Philadelphia 76ers	797545	\mathtt{SG}	PHI
462	Utah Jazz	7500000	PF	UTA
463	Portland Trail Blazers	2652000	PG	POR
464	Milwaukee Bucks	500000	PG	\mathtt{MIL}
465	Dallas Mavericks	5000000	F	DAL
466	Milwaukee Bucks	9281	SF	MIL
467	Portland Trail Blazers	3000000	SF	POR
468	Philadelphia 76ers	1160040	\mathtt{SG}	PHI
469	Los Angeles Lakers	1106942	G	LAL

```
470
                  Philadelphia 76ers
                                        8850000
                                                    PF PHI
         471
                    Charlotte Bobcats
                                                     С
                                                        CHA
                                        3857040
         472
                 Cleveland Cavaliers
                                                        CLE
                                        1633440
         [473 rows x 36 columns]
In [49]: x.info()
<class 'pandas.core.frame.DataFrame'>
Int64Index: 611 entries, 0 to 634
Data columns (total 30 columns):
Rk
          611 non-null object
Player
          611 non-null object
Pos
          611 non-null object
          611 non-null object
Age
Tm
          611 non-null object
G
          611 non-null object
GS
          611 non-null object
          611 non-null object
MP
FG
          611 non-null object
          611 non-null object
FGA
FG%
          604 non-null object
3P
          611 non-null object
3PA
          611 non-null object
3P%
          515 non-null object
2P
          611 non-null object
2PA
          611 non-null object
2P%
          602 non-null object
eFG%
          604 non-null object
FT
          611 non-null object
FTA
          611 non-null object
FT%
          579 non-null object
ORB
          611 non-null object
          611 non-null object
DRB
TRB
          611 non-null object
AST
          611 non-null object
STL
          611 non-null object
          611 non-null object
BLK
TOV
          611 non-null object
PF
          611 non-null object
PTS
          611 non-null object
dtypes: object(30)
memory usage: 148.0+ KB
In [50]: xx2=x.copy()
         for c in xx2.columns:
             xx2[c]=pd.to_numeric(xx2[c],errors="ignore")
```

In [51]: xx2.info() <class 'pandas.core.frame.DataFrame'> Int64Index: 611 entries, 0 to 634 Data columns (total 30 columns): Rk 611 non-null int64 Player 611 non-null object 611 non-null object Pos 611 non-null int64 Age 611 non-null object TmG 611 non-null int64 GS 611 non-null int64 MP 611 non-null int64 FG611 non-null int64 FGA 611 non-null int64 FG% 604 non-null float64 3P 611 non-null int64 3PA 611 non-null int64 515 non-null float64 3P% 2P 611 non-null int64 2PA 611 non-null int64 2P% 602 non-null float64 eFG% 604 non-null float64 FT 611 non-null int64 611 non-null int64 FTA FT% 579 non-null float64 ORB 611 non-null int64 DRB 611 non-null int64 TRB 611 non-null int64 AST 611 non-null int64 STL 611 non-null int64 611 non-null int64 BLK TOV 611 non-null int64 PF 611 non-null int64 611 non-null int64 PTS dtypes: float64(5), int64(22), object(3) memory usage: 148.0+ KB In [52]: mrgdf

Out[52]:	Rk	Player	Pos_x	Age	Tm_x	G	GS	MP	FG	FGA	\
0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141	
1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14	
2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127	
3	2	Steven Adams	C	20	OKC	81	20	1197	93	185	
4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275	
5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40	

```
12
                                                                                   235 ...
6
        3
                        Jeff Adrien
                                           PF
                                                27
                                                     MIL
                                                          28
                                                                      705
                                                                           121
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                                            С
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                                                                                   249 ...
                     Alexis Ajinca
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8
        6
                       Cole Aldrich
                                            C
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        7
                LaMarcus Aldridge
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        8
                       Lavoy Allen
                                           PF
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        8
                        Lavoy Allen
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                                                                     960
                                                                            117
                                                                                   266 ...
11
                                           PF
                                                24
                                                     PHI
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12
        8
                        Lavoy Allen
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13
       10
                         Tony Allen
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14
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                   Al-Farouq Aminu
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       12
                      Lou Amundson
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                      Lou Amundson
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                    Chris Andersen
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                     Alan Anderson
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            Giannis Antetokounmpo
22
       18
                   Carmelo Anthony
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                         Pero Antic
                                            C
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27
       21
                       Trevor Ariza
                                           SF
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                                                                                   853 ...
                                                28
                                                     WAS
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       22
                 Hilton Armstrong
                                            C
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                    Darrell Arthur
                                           SF
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                         Jan Vesely
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                                                                     776
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                                           PF
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                                                                                    92 ...
                         Jan Vesely
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445
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                         Jan Vesely
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446
     447
                                           PF
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               Charlie Villanueva
                                                                      180
447
      448
                    Nikola Vucevic
                                            C
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                                                                    1812
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                                                                                   696 ...
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448
     450
                                           SG
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                        Dwyane Wade
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     451
                      Dion Waiters
                                           SG
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                       Kemba Walker
                                           PG
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     453
                          John Wall
                                           PG
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451
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452
      454
                    Gerald Wallace
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453
      456
                        C.J. Watson
                                           PG
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                                                                                   587 ...
454
                   Martell Webster
                                           SF
                                                27
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455
     461
                Russell Westbrook
                                           PG
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                                                     OKC
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                                                               46
                                                                    1412
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      462
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457
      464
                    Deron Williams
                                           PG
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458
     465
                 Derrick Williams
                                       SF-PF
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459
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                  Derrick Williams
                                           PF
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460
     465
                  Derrick Williams
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                                                                                   428 ...
                                                    PHI
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461
      466
                   Elliot Williams
                                                24
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                                                                    1157
462
     468
                   Marvin Williams
                                           PF
                                                27
                                                     UTA
                                                          66
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                                                                    1674
                                                                           231
                                                                                   526 ...
                                                                                   672 ...
463
      469
                        Mo Williams
                                           PG
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                                                                    1834
                                                                           280
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464
     473
                      Nate Wolters
                                           PG
                                                22
                                                    MIL
                                                          58
                                                               31
                                                                    1309
                                                                           170
465
     475
                    Brandan Wright
                                            C
                                                26
                                                     DAL
                                                          58
                                                                0
                                                                    1077
                                                                           224
                                                                                   331 ...
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466
     476
                      Chris Wright
                                          SF
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                                                   MIL
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                                                                    126
                                                                           21
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467
     477
                     Dorell Wright
                                               28
                                          SF
                                                   POR
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                                                              13
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                                                                                808 ...
468
     478
                       Tony Wroten
                                          PG
                                               20
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                                                              16
                                                                  1765
469
     479
                        Nick Young
                                          SG
                                               28
                                                   LAL
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     480
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                                               25
                                                   PHI
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                    Thaddeus Young
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                                                              78
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     481
                       Cody Zeller
                                           C
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                                                   CHA
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     482
                      Tyler Zeller
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                       PTS
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                 PF
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                122
                       171
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                  8
                        19
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1
                                                 Quincy Acy, F
2
     23
                114
                       152
                             325
           28
                                                 Quincy Acy, F
3
                203
                       265
                                               Steven Adams, C
     57
           71
                             225
4
           39
                108
                       362
     36
                             309
                                               Jeff Adrien, SF
5
                        57
     15
            8
                 35
                             309
                                               Jeff Adrien, SF
6
     21
           31
                 73
                       305
                             309
                                               Jeff Adrien, SF
7
     46
           63
                187
                       328
                             336
                                             Alexis Ajinca, C
8
     30
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                 40
                        92
                             317
                                               Cole Aldrich, C
                      1603
9
     68
          123
                147
                              20
                                        LaMarcus Aldridge, C
10
     33
           44
                126
                       303
                             183
                                               Lavoy Allen, F
                                               Lavoy Allen, F
11
     27
           40
                115
                       263
                             183
12
                        40
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                 11
                             183
                                               Lavoy Allen, F
13
     19
           90
                121
                       495
                             132
                                               Tony Allen, SG
                                          Al-Farouq Aminu, PF
14
                147
                       572
                             154
     38
           88
15
     11
           14
                 49
                        38
                             380
                                             Lou Amundson, PF
                 49
                        38
                             380
16
           14
                                             Lou Amundson, PF
     11
17
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                                             Lou Amundson, PF
                162
                       477
18
     97
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                             266
                                           Chris Andersen, PF
19
                147
                       564
                             305
                                            Alan Anderson, SG
     11
           62
20
       7
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                 47
                       436
                              70
                                            Ryan Anderson, PF
                173
21
     61
          122
                       525
                             239
                                   Giannis Antetokounmpo, PF
22
     51
          198
                224
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                                           Carmelo Anthony, F
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23
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24
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                                             Joel Anthony, PF
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                        22
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                                             Joel Anthony, PF
26
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                126
                       352
                             281
                                                Pero Antic, PF
27
          132
                179
     20
                      1107
                              77
                                             Trevor Ariza, SF
28
       4
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                 11
                        25
                             333
                                        Hilton Armstrong, PF
29
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                185
                       401
                             170
                                            Darrell Arthur, F
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443
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           36
                121
                       197
                             164
                                                Jan Vesely, PF
444
     19
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                 64
                       104
                             164
                                                Jan Vesely, PF
445
     16
           14
                 57
                        93
                             164
                                                Jan Vesely, PF
       5
            7
                 16
446
                        92
                              66
                                      Charlie Villanueva, PF
     47
447
          112
                169
                       811
                             238
                                            Nikola Vucevic, C
448
     29
          161
                106
                      1028
                              10
                                               Dwyane Wade, SG
449
     17
          154
                153
                      1113
                             149
                                             Dion Waiters, SG
450
     32
          169
                128
                      1289
                             204
                                             Kemba Walker, PG
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451
     40
          295
               219
                     1583
                             85
                                               John Wall, PG
452
                 79
                      298
                                         Gerald Wallace, SF
     14
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453
      8
           60
                 66
                      414
                            227
                                             C.J. Watson, PG
454
                      759
                                        Martell Webster, SF
     15
           58
               150
                            116
      7
                     1002
                                      Russell Westbrook, PG
455
          177
                104
                             22
                        0
                            371
                                              D.J. White, PF
456
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457
     13
          143
               148
                      915
                             12
                                         Deron Williams, PG
458
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               114
                      624
                            118
                                       Derrick Williams, PF
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                       54
                            118
                                       Derrick Williams, PF
459
460
     16
           70
               105
                      570
                            118
                                       Derrick Williams, PF
           68
                      404
                            320
461
      3
               126
                                        Elliot Williams, SG
462
                                        Marvin Williams, PF
     31
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               151
                      603
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463
                197
                      721
                            201
                                             Mo Williams, PG
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                                            Nate Wolters, PG
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                      417
                            345
465
     55
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                 94
                      525
                            122
                                          Brandan Wright, F
466
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                       48
                            385
                                            Chris Wright, SF
467
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                      343
                            186
                                          Dorell Wright, SF
468
          204
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                      939
                            284
                                             Tony Wroten, SG
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469
           95
               156
                            291
                                               Nick Young, G
     12
                     1144
470
     36
          165
               213
                     1417
                             62
                                         Thaddeus Young, PF
                                              Cody Zeller, C
471
     41
           87
               170
                      490
                            150
472
                      399
                            245
                                             Tyler Zeller, C
     38
           60
               137
                          TEAM
                                  SALARY Pos_y Tm_y
0
             Toronto Raptors
                                  788872
                                               F
                                                  TOR
             Toronto Raptors
1
                                               F
                                                  TOR
                                  788872
2
                                               F
             Toronto Raptors
                                                  TOR
                                   788872
3
                                               С
      Oklahoma City Thunder
                                  2090880
                                                  OKC
4
           Charlotte Bobcats
                                              SF
                                                  CHA
                                   916099
5
           Charlotte Bobcats
                                  916099
                                              SF
                                                  CHA
6
           Charlotte Bobcats
                                              SF
                                                  CHA
                                  916099
7
       New Orleans Pelicans
                                   635880
                                               С
                                                  NOP
8
             New York Knicks
                                  884293
                                               С
                                                  NYK
9
     Portland Trail Blazers
                                               С
                                                  POR
                                14878000
          Philadelphia 76ers
                                               F
10
                                  3060000
                                                  PHI
11
          Philadelphia 76ers
                                  3060000
                                               F
                                                  PHI
          Philadelphia 76ers
12
                                  3060000
                                               F
                                                  PHI
13
           Memphis Grizzlies
                                  4494383
                                              SG
                                                  MEM
14
       New Orleans Pelicans
                                              PF
                                                  NOP
                                  3749602
15
               Chicago Bulls
                                    48854
                                              PF
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16
                                    48854
                                              PF
                                                  CHI
               Chicago Bulls
17
               Chicago Bulls
                                              PF
                                                  CHI
                                    48854
18
                   Miami Heat
                                  1399507
                                              PF
                                                  MIA
19
               Brooklyn Nets
                                   947907
                                              SG
                                                  BRK
20
       New Orleans Pelicans
                                  8308500
                                              PF
                                                  NOP
21
             Milwaukee Bucks
                                  1792560
                                              PF
                                                  MIL
22
             New York Knicks
                                21388953
                                               F
                                                  NYK
23
                   Miami Heat
                                  3800000
                                              PF
                                                  MIA
```

24	Miami Heat	3800000	PF	MIA
25	Miami Heat	3800000	PF	MIA
26	Atlanta Hawks	1200000	PF	ATL
27	Washington Wizards	7727280	SF	WAS
28	Golden State Warriors	660619	PF	GSW
29	Denver Nuggets	3231683	F	DEN
443	Washington Wizards	3340920	PF	WAS
444	Washington Wizards	3340920	PF	WAS
445	Washington Wizards	3340920	PF	WAS
446	Detroit Pistons	8580000	PF	DET
447	Orlando Magic	1793520	C	ORL
448	Miami Heat	18673000	SG	MIA
449	Cleveland Cavaliers	3894240	SG	CLE
450	Charlotte Bobcats	2568360	PG	CHA
451	Washington Wizards	7459925	PG	WAS
452	Boston Celtics	10105855	SF	BOS
453	Indiana Pacers	2016000	PG	IND
454	Washington Wizards	5150000	SF	WAS
455	Oklahoma City Thunder	14693906	PG	OKC
456	Charlotte Bobcats	104028	PF	CHA
457	Brooklyn Nets	18466130	PG	BRK
458	Sacramento Kings	5016960	PF	SAC
459	Sacramento Kings	5016960	PF	SAC
460	Sacramento Kings	5016960	PF	SAC
461	Philadelphia 76ers	797545	SG	PHI
462	Utah Jazz	7500000	PF	UTA
463	Portland Trail Blazers	2652000	PG	POR
464	Milwaukee Bucks	500000	PG	MIL
465	Dallas Mavericks	5000000	F	DAL
466	Milwaukee Bucks	9281	SF	MIL
467	Portland Trail Blazers	3000000	SF	POR
468	Philadelphia 76ers	1160040	\mathtt{SG}	PHI
469	Los Angeles Lakers	1106942	G	LAL
470	Philadelphia 76ers	8850000	PF	PHI
471	Charlotte Bobcats	3857040	С	CHA
472	Cleveland Cavaliers	1633440	С	CLE

[473 rows x 36 columns]

1 Data Analysis

Out[53]: SALARY count 4.730000e+02

```
4.213025e+06
         mean
         std
                 4.816370e+06
                 9.281000e+03
         min
         25%
                 9.479070e+05
         50%
                 2.511432e+06
                 5.324280e+06
         75%
                 3.045380e+07
         max
In [54]: mrgdf['Tm_x'].describe()
Out[54]: count
                    473
         unique
                     31
                    TOT
         top
         freq
                     51
         Name: Tm_x, dtype: object
In [55]: mrgdf.groupby('Tm_x').size()
Out[55]: Tm_x
         ATL
                 15
         BOS
                 17
         BRK
                 15
         CHA
                 16
         \mathtt{CHI}
                 18
         CLE
                 15
         DAL
                 11
         DEN
                 12
         DET
                 13
         GSW
                 17
         HOU
                 15
         IND
                 13
         LAC
                 12
         LAL
                 10
         MEM
                 14
         MIA
                 13
         MIL
                 18
         MIN
                 14
         NOP
                 15
         NYK
                 11
         OKC
                 13
         ORL
                  6
         PHI
                 13
         PH0
                 13
         POR
                 13
         SAC
                 19
         SAS
                 17
         TOR
                 19
         TOT
                 51
         UTA
                 13
```

```
WAS
                12
         dtype: int64
In [56]: mrgdf.groupby('Pos_x').size()
         #good, accounts for swingmen, cornermen, combos!
         #this identifies hybrid NBA players which are SUPER valuable in today's game.
Out[56]: Pos_x
                   94
         С
         PF
                   93
         PF-SF
                    1
         PG
                   80
         SF
                  102
         SF-PF
                    1
         SG
                   99
         SG-PG
                    2
         SG-SF
                    1
         dtype: int64
In [57]: rosters = mrgdf
         teams = mrgdf.groupby('Tm_x').mean().sort_values(by=['SALARY'])
         #evaluates salary per team
Out [57]:
                     SALARY
         Tm_x
         ORL
               1.949160e+06
               2.457145e+06
         PHO
         PHI
               2.539976e+06
         TOT
               2.837089e+06
         MIL
               2.902419e+06
         CHA
               3.149830e+06
               3.338704e+06
         UTA
         ATL
               3.339141e+06
         SAS
               3.710980e+06
         HOU
               3.938467e+06
               4.025506e+06
         IND
         NOP
               4.098365e+06
         TOR
               4.193324e+06
         DEN
               4.298294e+06
         CLE
               4.335845e+06
         GSW
               4.354725e+06
         SAC
               4.370928e+06
         CHI
               4.384562e+06
         BOS
               4.591921e+06
         DET
               4.655829e+06
         POR
               4.686631e+06
         MIN
               4.741885e+06
         WAS
               5.042276e+06
```

```
MEM
      5.194880e+06
LAC
      5.214602e+06
OKC
      5.293816e+06
DAL
      5.839302e+06
LAL
      6.031759e+06
AIM
      6.103404e+06
BRK
      6.300684e+06
NYK
      7.098506e+06
```

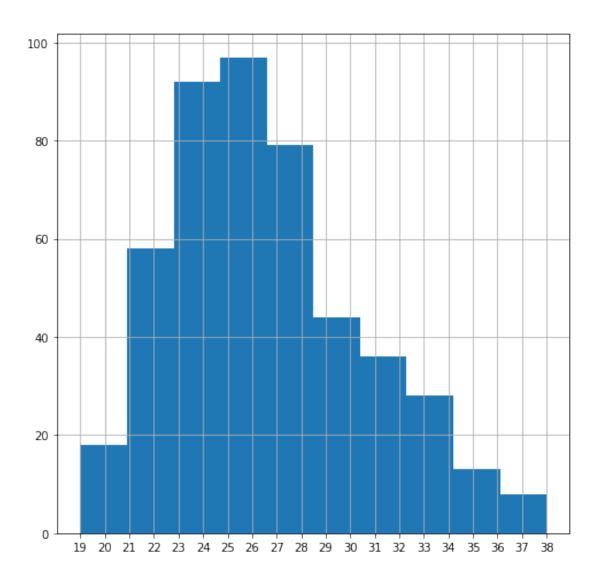
2 Data Visualizations

- 2.0.1 As discussed, there are a number of things that can have implications on any given basketball player's performance.
- 2.0.2 Among these, we consider whether or not a player is in a contract year, injury history, age, and other factors.

```
In [58]: mrgdf.info()
<class 'pandas.core.frame.DataFrame'>
Int64Index: 473 entries, 0 to 472
Data columns (total 36 columns):
Rk
          473 non-null object
Player
          473 non-null object
Pos_x
          473 non-null object
Age
          473 non-null object
          473 non-null object
Tm x
G
          473 non-null object
GS
          473 non-null object
          473 non-null object
MP
FG
          473 non-null object
FGA
          473 non-null object
FG%
          469 non-null object
3P
          473 non-null object
          473 non-null object
3PA
3P%
          403 non-null object
2P
          473 non-null object
2PA
          473 non-null object
2P%
          467 non-null object
          469 non-null object
eFG%
FT
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FTA
          473 non-null object
FT%
          461 non-null object
ORB
          473 non-null object
          473 non-null object
DRB
          473 non-null object
TRB
AST
          473 non-null object
          473 non-null object
STL
```

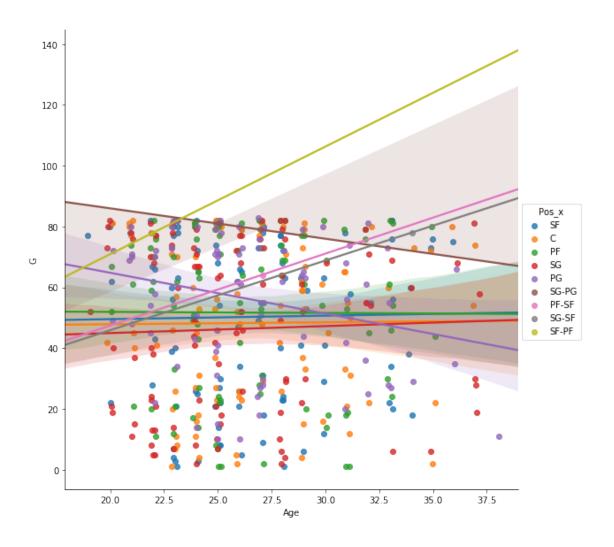
```
BLK
          473 non-null object
TOV
          473 non-null object
PF
          473 non-null object
PTS
          473 non-null object
          473 non-null object
RK
NAME
          473 non-null object
          473 non-null object
TEAM
          473 non-null int32
SALARY
Pos_y
          473 non-null object
          473 non-null object
Tm_y
dtypes: int32(1), object(35)
memory usage: 134.9+ KB
```


Out[59]: <matplotlib.axes._subplots.AxesSubplot at 0x221f9bbcb38>



In [61]: sns.lmplot("Age", "G", mrgdf, hue="Pos_x", x_jitter=.15, size=8)
#This chart was pretty challenging to make sense of so I split it into each position.

Out[61]: <seaborn.axisgrid.FacetGrid at 0x221f9bc2518>



In [62]: sns.lmplot("Age", "G", mrgdf, col="Pos_x", hue="Pos_x", x_jitter=.15, size=5)

#compares Age and Games played

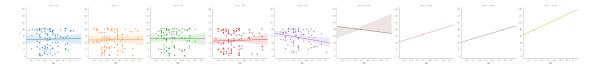
#none of the individual positions gave particularly strong correlation coefficients

#the hybrid positions showed stronger relationships between age and games played

#Point guards play less as they get older, this makes sense! PG is the easiest positi

#As positions change, PGs also are the most 'talent dense' position.

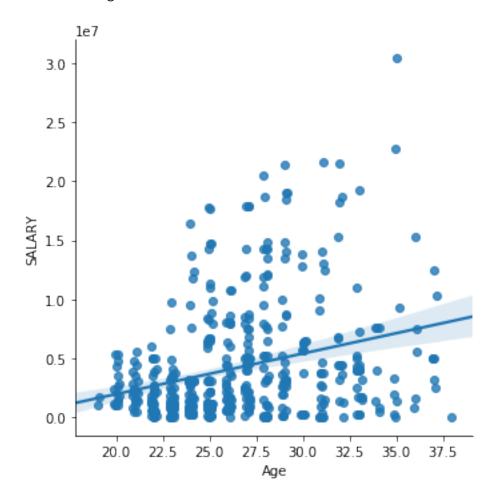
Out[62]: <seaborn.axisgrid.FacetGrid at 0x221f9c1c630>



2.1 While it may be easy to believe age and salary have an inverse relationship, this isn't necessarily true. Some players entire their primes and earn increased salaries until their age and injury history catch up with the way they are compensated through salary.

In [63]: sns.lmplot("Age", "SALARY", mrgdf, x_jitter = .15)
 #I would have thought this would have been sharper in terms of my correlation coeffic
#In theory this would resemble a bell curve

Out[63]: <seaborn.axisgrid.FacetGrid at 0x221f9b42a20>



In [64]: mrgdf

Out[64]:	Rk	Player	Pos_x	Age	Tm_x	G	GS	MP	FG	FGA	\
0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141	
1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14	
2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127	
3	2	Steven Adams	C	20	OKC	81	20	1197	93	185	
4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275	

5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40
6	3	Jeff Adrien	PF	27	MIL	28	12	705	121	235
7	5	Alexis Ajinca	C	25	NOP	56	30	951	136	249
8	6	Cole Aldrich	C	25	NYK	46	2	330	33	61
9	7	LaMarcus Aldridge	PF	28	POR	69	69	2498	652	1423
10	8	Lavoy Allen	PF	24	TOT	65	2	1072	134	300
11	8	Lavoy Allen	PF	24	PHI	51	2	960	117	266
12	8	Lavoy Allen	PF	24	IND	14	0	112	17	34
13	10	Tony Allen	\mathtt{SG}	32	MEM	55	28	1278	204	413
14	11	Al-Farouq Aminu	SF	23	NOP	80	65	2045	234	494
15	12	Lou Amundson	PF	31	TOT	19	0	185	16	32
16	12	Lou Amundson	PF	31	NOP	18	0	184	16	32
17	12	Lou Amundson	PF	31	CHI	1	0	1	0	0
18	13	Chris Andersen	С	35	MIA	72	0	1396	177	275
19	14	Alan Anderson	SF	31	BRK	78	26	1773	194	485
20	16	Ryan Anderson	PF	25	NOP	22	14	795	155	354
21	17	Giannis Antetokounmpo	SF	19	MIL	77	23	1897	173	418
22	18	Carmelo Anthony	PF	29	NYK	77	77	2982	743	1643
23	19	Joel Anthony	C	31	TOT	33	0	186	12	32
24	19	Joel Anthony	C	31	MIA	12	0	37	2	6
25	19	Joel Anthony	C	31	BOS	21	0	149	10	26
26	20	Pero Antic	C	31	ATL	50	26	925	123	294
27	21	Trevor Ariza	SF	28	WAS	77	77	2723	389	853
28	22	Hilton Armstrong	C	29	GSW	15	1	97	9	19
29	23	Darrell Arthur	SF	25	DEN	68	1	1161	162	410
443	446	Jan Vesely	PF	23	TOT	54	1	776	89	173
444	446	Jan Vesely	PF	23	WAS	33	1	470	48	92
445	446	Jan Vesely	PF	23	DEN	21	0	306	41	81
446	447	Charlie Villanueva	PF	29	DET	20	0	180	35	92
447	448	Nikola Vucevic	С	23	ORL	57	57	1812	353	696
448	450	Dwyane Wade	\mathtt{SG}	32	MIA	54	53	1775	415	761
449	451	Dion Waiters	\mathtt{SG}	22	CLE	70	24	2072	430	993
450	452	Kemba Walker	PG	23	CHA	73	73	2614	449	1143
451	453	John Wall	PG	23	WAS	82	82	2980	579	1337
452	454	Gerald Wallace	SF	31	BOS	58	16	1416	116	230
453	456	C.J. Watson	PG	29	IND	63	5	1193	146	334
454	459	Martell Webster	SF	27	WAS	78	13	2157	254	587
455	461	Russell Westbrook	PG	25	OKC	46	46	1412	346	791
456	462	D.J. White	PF	27	CHA	2	0	10	0	1
457	464	Deron Williams	PG	29	BRK	64	58	2059	322	716
458	465	Derrick Williams	SF-PF	22	TOT	78	15	1820	206	482
459	465	Derrick Williams	PF	22	MIN	11	0	162	19	54
460	465	Derrick Williams	SF	22	SAC	67	15	1658	187	428
461	466	Elliot Williams	SG	24	PHI	67	2	1157	140	337
462	468	Marvin Williams	PF	27	UTA	66	50	1674	231	526
463	469	Mo Williams	PG	31	POR	74	0	1834	280	672
464	473	Nate Wolters	PG	22	MIL	58	31	1309	170	389

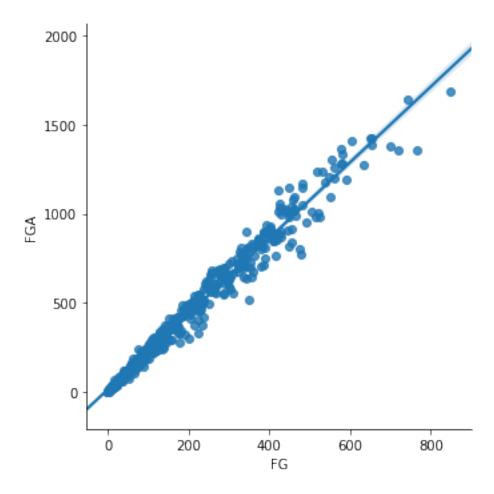
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                                                  NOP
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                                                  NOP
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           Dallas Mavericks
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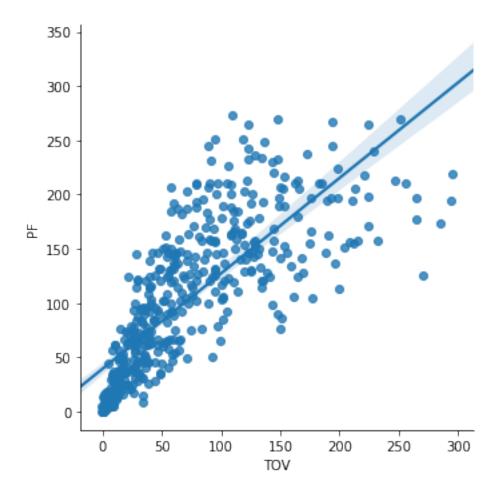
[473 rows x 36 columns]

Out[65]: <seaborn.axisgrid.FacetGrid at 0x221f5f46e80>

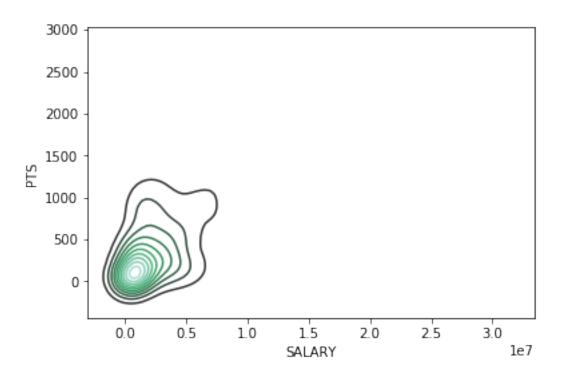


2.1.1 Also have to account for the qualities in a player that deflate their overall value/effectiveness. Consider things like ejections, technical fouls, flagrant fouls, personal fouls, turnovers, etc. Dataset only considers personal fouls and turnovers so those will be my main parameters

Out[66]: <seaborn.axisgrid.FacetGrid at 0x221f5f46400>

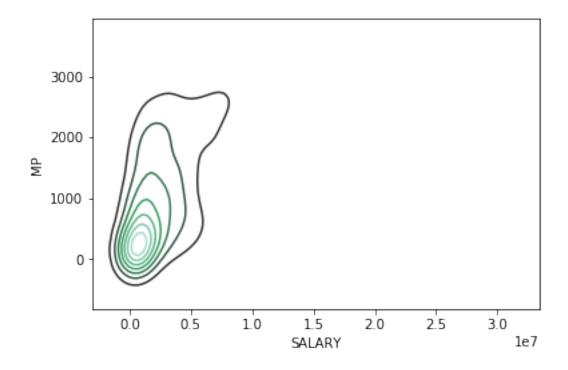


Out[67]: <matplotlib.axes._subplots.AxesSubplot at 0x221f5fc0898>



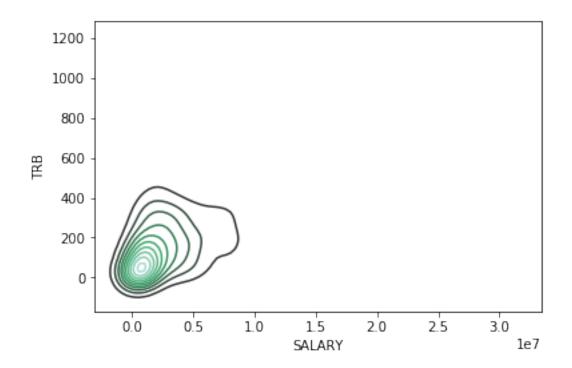
In [68]: sns.kdeplot(mrgdf.SALARY, mrgdf.MP)

Out[68]: <matplotlib.axes._subplots.AxesSubplot at 0x221f5fc0978>



In [69]: sns.kdeplot(mrgdf.SALARY, mrgdf.TRB)

Out[69]: <matplotlib.axes._subplots.AxesSubplot at 0x221f76bb828>



In [70]: mrgdf

Out[70]:		Rk	Player	Pos_x	Age	Tm_x	G	GS	MP	FG	FGA	\
	0	1	Quincy Acy	SF	23	TOT	63	0	847	66	141	
	1	1	Quincy Acy	SF	23	TOR	7	0	61	6	14	
	2	1	Quincy Acy	SF	23	SAC	56	0	786	60	127	
	3	2	Steven Adams	С	20	OKC	81	20	1197	93	185	
	4	3	Jeff Adrien	PF	27	TOT	53	12	961	143	275	
	5	3	Jeff Adrien	PF	27	CHA	25	0	256	22	40	
	6	3	Jeff Adrien	PF	27	MIL	28	12	705	121	235	
	7	5	Alexis Ajinca	C	25	NOP	56	30	951	136	249	
	8	6	Cole Aldrich	C	25	NYK	46	2	330	33	61	
	9	7	LaMarcus Aldridge	PF	28	POR	69	69	2498	652	1423	
	10	8	Lavoy Allen	PF	24	TOT	65	2	1072	134	300	
	11	8	Lavoy Allen	PF	24	PHI	51	2	960	117	266	
	12	8	Lavoy Allen	PF	24	IND	14	0	112	17	34	
	13	10	Tony Allen	\mathtt{SG}	32	MEM	55	28	1278	204	413	
	14	11	Al-Farouq Aminu	SF	23	NOP	80	65	2045	234	494	

15	12	Lou Amundson	PF	31	TOT	19	0	185	16	32
16	12	Lou Amundson	PF	31	NOP	18	0	184	16	32
17	12	Lou Amundson	PF	31	CHI	1	0	1	0	0
18	13	Chris Andersen	C	35	AIM	72	0	1396	177	275
19	14	Alan Anderson	SF	31	BRK	78	26	1773	194	485
20	16	Ryan Anderson	PF	25	NOP	22	14	795	155	354
21	17	Giannis Antetokounmpo	SF	19	MIL	77	23	1897	173	418
22	18	Carmelo Anthony	PF	29	NYK	77	77	2982	743	1643
23	19	Joel Anthony	C	31	TOT	33	0	186	12	32
24	19	Joel Anthony	C	31	MIA	12	0	37	2	6
25	19	Joel Anthony	C	31	BOS	21	0	149	10	26
26	20	Pero Antic	C	31	ATL	50	26	925	123	294
27	21	Trevor Ariza	SF	28	WAS	77	77	2723	389	853
28	22	Hilton Armstrong	C	29	GSW	15	1	97	9	19
29	23	Darrell Arthur	SF	25	DEN	68	1	1161	162	410
• •		• • •								
443	446	Jan Vesely	PF	23	TOT	54	1	776	89	173
444	446	Jan Vesely	PF	23	WAS	33	1	470	48	92
445	446	Jan Vesely	PF	23	DEN	21	0	306	41	81
446	447	Charlie Villanueva	PF	29	DET	20	0	180	35	92
447	448	Nikola Vucevic	C	23	ORL	57	57	1812	353	696
448	450	Dwyane Wade	SG	32	AIM	54	53	1775	415	761
449	451	Dion Waiters	SG	22	CLE	70	24	2072	430	993
450	452	Kemba Walker	PG	23	CHA	73	73	2614	449	1143
451	453	John Wall	PG	23	WAS	82	82	2980	579	1337
452	454	Gerald Wallace	SF	31	BOS	58	16	1416	116	230
453	456	C.J. Watson	PG	29	IND	63	5	1193	146	334
454	459	Martell Webster	SF	27	WAS	78	13	2157	254	587
455	461	Russell Westbrook	PG	25	OKC	46	46	1412	346	791
456	462	D.J. White	PF	27	CHA	2	0	10	0	1
457	464	Deron Williams	PG	29	BRK	64	58	2059	322	716
458	465	Derrick Williams	SF-PF	22	TOT	78	15	1820	206	482
459	465	Derrick Williams	PF	22	MIN	11	0	162	19	54
460	465	Derrick Williams	SF	22	SAC	67	15	1658	187	428
461	466	Elliot Williams	SG	24	PHI	67	2	1157	140	337
462	468	Marvin Williams	PF	27	UTA	66	50	1674	231	526
463	469	Mo Williams	PG	31	POR	74	0	1834	280	672
464	473	Nate Wolters	PG	22	MIL	58	31	1309	170	389
465	475	Brandan Wright	С	26	DAL	58	0	1077	224	331
466	476	Chris Wright	SF	25	MIL	8	0	126	21	35
467	477	Dorell Wright	SF	28	POR	68	13	984	111	297
468	478	Tony Wroten	PG	20	PHI	72	16	1765	345	808
469	479	Nick Young	SG	28	LAL	64	9	1810	387	889
470	480	Thaddeus Young	PF	25	PHI	79	78	2718	582	1283
471	481	Cody Zeller	C	21	CHA	82	3	1416	172	404
472	482	Tyler Zeller	C	24	CLE	70	9	1049	156	290

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445
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```

[473 rows x 36 columns]

2.1.2 This wouldn't be a true project without some kind of regression, am I right?

2.1.3 Regression!

```
In [71]: #regression packages that are necessary
    import sklearn.linear_model as lm
    from sklearn.metrics import mean_squared_error
    from sklearn.metrics import explained_variance_score
    import statsmodels.formula.api as sm
    from bokeh.models import Jitter

#lasso regression
    from sklearn import linear_model

#f_regression (feature selection)
    from sklearn.feature_selection import f_regression
    from sklearn.feature_selection import SelectKBest
```

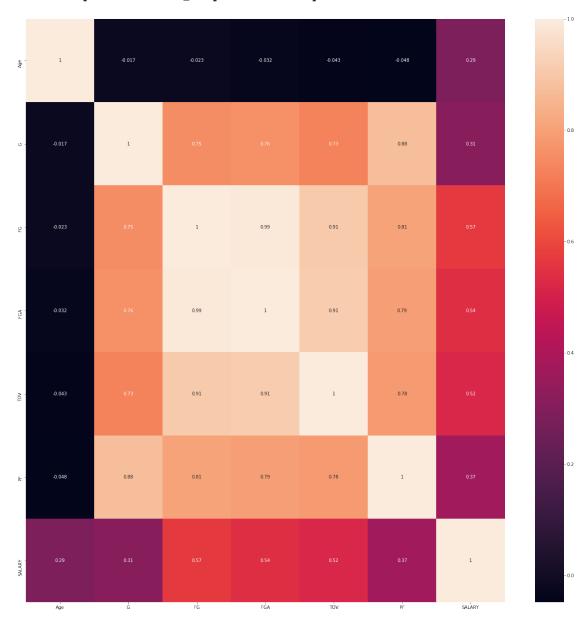
recursive feature selection (feature selection)
from sklearn.feature_selection import RFE

In [72]: plt.figure(figsize=(24,24))

#plt.colorbar()
sns.heatmap(mrgdf.corr(), annot=True)
#heatmap colors the correlation between variables pretty well

Out[72]: <matplotlib.axes._subplots.AxesSubplot at 0x221f142b978>

#closer the score is to 1, the stronger it will be



```
In [73]: # Run a Ridge Regression for the data
         from sklearn import linear_model
         from sklearn.linear_model import Ridge
In [74]: from datacleaner import autoclean
         #read about this, does some more cleaning
         #plugs in numerical variables for the categorical variables
         #qives a number to the varying positions
         #why is this important? It helps identify hybrid players --> versatile players
         clean_data = autoclean(mrgdf, drop_nans=True)
         clean_data = autoclean(mrgdf)
         clean_data.head()
Out [74]:
                 Player
                                                GS
                                                     MP
                                                           FG
                                                                FGA
                                                                            BLK
                                                                                 TOV
                                                                                       PF
             Rk
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                                     {\tt Tm\_x}
                                             G
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              0
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         [5 rows x 36 columns]
In [75]: mrgdf = clean_data.drop('Player', axis = 1)
In [76]: mrgdf = mrgdf.drop("Pos_x", axis = 1)
         mrgdf = mrgdf.drop("Tm_x", axis = 1)
In [77]: #label columns to X and Y variables
         #here I build the model
         #Why Lasso?
         #Ridge and lasso regression allow you to regularize ("shrink") coefficients.
         #This means that the estimated coefficients are pushed towards 0,
         #to make them work better on new data-sets ("optimized for prediction").
         #This allows you to use complex models and avoid over-fitting at the same time.
         y = mrgdf['SALARY']
         X = mrgdf.drop(['SALARY'], axis =1)
         reg = linear_model.Ridge (alpha = .1)
         reg.fit(X,y)
         reg_y = reg.predict(X)
         Ridge(alpha=0.5, copy_X=True, fit_intercept=True, max_iter=None,
               normalize=False, random_state=None, solver='auto', tol=0.001)
```

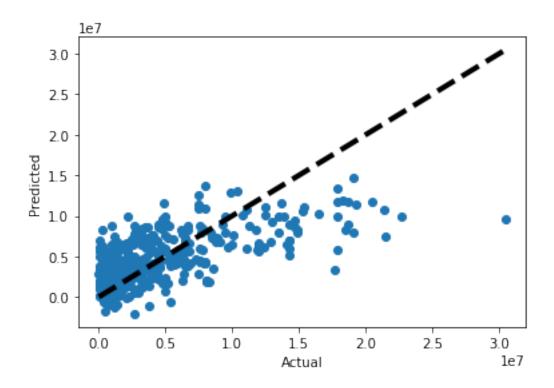
```
print(reg.coef_)
        print(reg.intercept_)
        #print_sep()
        print("mean square error: ", mean_squared_error(y, reg_y))
        #print_sep()
        print("variance or r-squared: ", explained_variance_score(y, reg_y))
        #prints out the coefficients for all the x-values
        #variance or r-squared the closer to one, the better the model predicts
        #this accuracy left a lot to be desired...
1.84958477e+04
 -1.44560186e+03 4.35724039e+04 -1.22620742e+04 2.29911412e+04
  7.91578966e+03 1.05059984e+03 6.52210294e+03 7.76370170e+02
  4.11190820e+02 6.41842827e+03 -4.40960005e+04 1.69554890e+03
  5.15915976e+02 -3.78593897e+02 8.29768109e+03 -4.27041945e+03
  3.68629832e+03 2.45883506e+03 1.27993788e+04 2.70167908e+03
  1.23854707e+04 -1.14556570e+04 -2.77581570e+02 -4.82436897e+02
  2.31185903e+03 -4.39955474e+03 -1.27779530e+05 -4.39955474e+03]
-8096128.97028
mean square error: 1.14019808957e+13
variance or r-squared: 0.533631417961
In [78]: #same approach, not much changed
        y = mrgdf['SALARY']
        X = mrgdf.drop(['SALARY'], axis =1)
        reg = linear_model.Lasso(alpha = 0.1)  #higher alpha (penality parameter), fewe
        reg.fit(X, y)
        reg_y = reg.predict(X)
        print('Coefficients: ', reg.coef_)
        print("y-intercept ", reg.intercept_)
        print("mean square error: ", mean_squared_error(y, reg_y))
        print("variance or r-squared: ", explained_variance_score(y, reg_y))
1.84957399e+04
 -1.44563060e+03 4.35709081e+04 -1.22613708e+04 2.29912627e+04
  7.91579659e+03 1.05062011e+03 6.52204492e+03 7.76388405e+02
  4.11196654e+02 6.41863603e+03 -4.40958562e+04 1.69549366e+03
  5.15988681e+02 -3.78667157e+02 8.29766323e+03 -4.27043103e+03
  3.68635471e+03 2.45883677e+03 1.27994037e+04 2.70154367e+03
  1.23855132e+04 -1.14556831e+04 -2.77567865e+02 -4.82435929e+02
  2.31183093e+03 -8.67198872e+03 -1.27792267e+05 -1.26903450e+02]
y-intercept -8096275.18132
mean square error: 1.14019808953e+13
variance or r-squared: 0.533631417981
```

C:\Users\andre\Anaconda4\lib\site-packages\sklearn\linear_model\coordinate_descent.py:491: Con

ConvergenceWarning)

```
In [79]: # The rank of features to indicate which actually provides more salary
         # all this code does is show top/most valuable variables
        y = mrgdf['SALARY']
        X = mrgdf.drop(['SALARY'], axis =1)
        lr = lm.LinearRegression()
        rfe = RFE(lr, n_features_to_select=2)
        rfe_y = rfe.fit(X,y)
        print("Features sorted by their rank:")
        print(sorted(zip(map(lambda x: x, rfe.ranking_), X.columns)))
Features sorted by their rank:
[(1, 'Age'), (1, 'Pos_y'), (2, 'G'), (3, 'FG%'), (4, 'eFG%'), (5, 'FG'), (6, 'STL'), (7, 'GS')
In [80]: x = mrgdf[['FG','FGA','TRB', 'AST','FT','FTA', 'Age', 'G', 'GS']]
        Y = mrgdf['SALARY']
        model1 = lm.LinearRegression()
        model1.fit(x, Y)
        model1_y = model1.predict(x)
         coef = ["%.3f" % i for i in model1.coef_]
        xcolumns = [ i for i in x.columns ]
        zip(xcolumns, coef)
        print("mean square error: ", mean_squared_error(y, model1_y))
         #print_sep()
        print("variance or r-squared: ", explained_variance_score(y, model1_y))
         #print_sep()
        print('Coefficients: ', model1.coef_)
         #print_sep()
        print("y-intercept ", model1.intercept_)
         #clearly the r-squared values aren't justifying my efforts
mean square error: 1.29887843627e+13
variance or r-squared: 0.468727320187
Coefficients: [ 3.58936547e+04 -6.92535378e+03 3.18610194e+02
                                                                     2.72949828e+03
   1.08258742e+03 5.98253103e+02 3.83316085e+05 -6.71987116e+04
   1.26223764e+04]
y-intercept -7150119.65656
In [81]: #percentages are good predictors
         #but it keeps decreasing the r-squared values
        x = mrgdf[['FG%', 'FT%', '3P%', '2P%', 'eFG%', 'AST', 'TOV', 'Age', 'G']]
        Y = mrgdf['SALARY']
        model1 = lm.LinearRegression()
```

```
model1.fit(x, Y)
        model1_y = model1.predict(x)
         coef = ["%.3f" % i for i in model1.coef_]
        xcolumns = [ i for i in x.columns ]
        zip(xcolumns, coef)
        print("mean square error: ", mean_squared_error(y, model1_y))
         #print sep()
        print("variance or r-squared: ", explained_variance_score(y, model1_y))
         #print_sep()
        print('Coefficients: ', model1.coef_)
         #print_sep()
        print("y-intercept ", model1.intercept_)
         #MSE takes the residuals, squares them, lower the MSE, the more accurate the model
         #Perform a scatterplot matrix, plots each pair of variables
         #Creates a heatmap plot with correlations coefficients through a dot plot to show why
         #Maybe you should consider the fact that there could be quadratic and cubic functions
         #Jamal Crawford, goes to many teams, express this through a network graph?
mean square error: 1.39929221004e+13
variance or r-squared: 0.427655659293
Coefficients: [ 33759.93886786
                                                    5723.61014202
                                                                   11557.36646141
                                   3853.11850584
  -37093.26322248
                    1738.48097496 46258.4219124
                                                    430688.27278467
 -43005.33955592]
y-intercept -10148640.9633
In [82]: #visualize actural vs. predictive using scatter plot
        plt.subplots()
        plt.scatter(y, model1_y)
        plt.plot([y.min(), y.max()], [y.min(), y.max()], 'k--', lw=4) #dotted line represen
        plt.xlabel('Actual')
        plt.ylabel('Predicted')
        plt.show()
```



OLS Regression Results

Dep. Variable:		SALARY			ıared:	0.475			
Model:			OLS	Adj.	R-squared:		0.464		
Method:		Least Squa	ares	F-sta		43.69			
Date:	T	nu, 21 Feb 2	2019	Prob	(F-statistic)	:	1.13e-49		
Time:		16:58	3:25	Log-l	Likelihood:		-6538.3		
No. Observation	s:		396	AIC:			1.309e+04		
Df Residuals:			387	BIC:		1.313e+04			
Df Model:			8						
Covariance Type	:	nonrob	oust						
	coef	std err		t	P> t	[0.025	0.975]		
Intercept -7.2	 04e+06	1.42e+06	 -5	5.071	0.000	-1e+07	-4.41e+06		

FG	3.622e+04	7206.227	5.026	0.000	2.2e+04	5.04e+04		
FGA	-8984.5429	3477.194	-2.584	0.010	-1.58e+04	-2147.987		
PTS	-410.2488	2045.221	-0.201	0.841	-4431.384	3610.886		
TRB	-22.5757	2572.720	-0.009	0.993	-5080.833	5035.682		
AST	2716.7748	2719.359	0.999	0.318	-2629.791	8063.341		
TOV	1.642e+04	6760.598	2.428	0.016	3123.371	2.97e+04		
Age	3.956e+05	4.49e+04	8.807	0.000	3.07e+05	4.84e+05		
G	-6.729e+04	1.21e+04	-5.583 	0.000	-9.1e+04	-4.36e+04		
Omnibus:		120.	 823 Durbin	 -Watson:		1.500		
Prob(Omni	ibus):	0.	000 Jarque	-Bera (JB)	:	464.921		
Skew:		1.	309 Prob(J	Prob(JB):				
Kurtosis:	:	7.	618 Cond.	No.		5.41e+03		
=======			========	========		========		

Warnings:

- [1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
- [2] The condition number is large, 5.41e+03. This might indicate that there are strong multicollinearity or other numerical problems.
- 2.1.4 As seen by the variance/r-squared value, and how it continues to decrease, my model was not particularly strong. This begs the question, what could have been done to improve the project overall? Perhaps it points to the fact that my dataset didn't have enough features to predict salary. In the future, I would be sure to find datasets with more variables to have a more precise prediction and higher variance score.

```
In [86]: jupyter nbconvert --execute --to html notebook.ipynb
```

```
File "<ipython-input-86-2304852a111c>", line 1 jupyter nbconvert --execute --to html notebook.ipynb
```

SyntaxError: invalid syntax