Chicago Bulls

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1 Introduction

The Chicago Bulls was founded on January 26, 1966. They are an American professional basketball team based in Chicago, Illinois. The Bulls are related with Michael Jordan, who led the team to six NBA championships. In 1996 the Chicago Bulls won an NBA record of 72 games during an NBA season. They are the only team in NBA history to win 70 games or more in a single season. The Chicago Bulls were predicted to be the third most valuable NBA franchise, earning an estimated 52.2 million dollars in operating income in 2013. Derrick Rose and Michael Jordan have won the NBA most valuable player award. The mascot was first introduced in 1969 as the Bulls Benny, and another mascot of Chicago Bulls is named Da Bull.

1.1 Interesting Fact

- Chicago Bulls won six championships in eight years with two threepeats.
- The six of those championship teams were led by Michael Jordan, Scottie Pippen and coach Phil Jackson.
- The Chicago Bulls won an NBA record of 72 games during the 1995 –96 NBA season.
- The Detroit Pistons are historically considered the Bulls biggest rivals due to the Jordan era in the late 80s and early 90s.
- The Chicago Bulls is the only team in the NBA history to win 70 games in a single season.

2 Reproducible Research

2.1 code

```
> ## load packages
> #This package help to access Quandl data directly from within R.
> library(Quandl)
> #This package help tp plot the graph
> library(ggplot2)

> #Quandl commands help us to retrieve data from the link directly
> cbulls = Quandl("BBALL/NBA_CHICAGOBULLS",authcode="p58gxzoFqVzMLY7jVgPS")
> cbulls #Displaying current data

          Year Wins Losses  W-L%   GB  PS/G  PA/G   SRS
1  2014-12-31   48     34 0.585  8.0  93.7  91.8  1.20
2  2013-12-31   45     37 0.549  4.5  93.2  92.9 -0.01
3  2012-12-31   50     16 0.758   NA  96.3  88.2  7.43
4  2011-12-31   62     20 0.756   NA  98.6  91.3  6.53
5  2010-12-31   41     41 0.500 20.0  97.5  99.1 -1.63
6  2009-12-31   41     41 0.500 25.0 102.2 102.5 -0.16
7  2008-12-31   33     49 0.402 26.0  97.3 100.4 -3.19
8  2007-12-31   49     33 0.598  4.0  98.8  93.8  4.52
9  2006-12-31   41     41 0.500 23.0  97.8  97.2  0.51
10 2005-12-31   47     35 0.573  7.0  94.5  93.4  0.65
11 2004-12-31   23     59 0.280 38.0  89.7  96.0 -6.69
12 2003-12-31   30     52 0.366 20.0  95.0 100.1 -5.31
13 2002-12-31   21     61 0.256 29.0  89.5  98.0 -8.52
14 2001-12-31   15     67 0.183 37.0  87.6  96.7 -9.09
15 2000-12-31   17     65 0.207 39.0  84.8  94.2 -9.23
16 1999-12-31   13     37 0.260 20.0  81.9  91.4 -8.58
17 1998-12-31   62     20 0.756   NA  96.7  89.6  7.24
18 1997-12-31   69     13 0.841   NA 103.1  92.3 10.70
19 1996-12-31   72     10 0.878   NA 105.2  92.9 11.80
20 1995-12-31   47     35 0.573  5.0 101.5  96.7  4.31
21 1994-12-31   55     27 0.671  2.0  98.0  94.9  2.87
22 1993-12-31   57     25 0.695   NA 105.2  98.9  6.19
23 1992-12-31   67     15 0.817   NA 109.9  99.5 10.07
24 1991-12-31   61     21 0.744   NA 110.0 101.0  8.57
25 1990-12-31   55     27 0.671  4.0 109.5 106.2  2.74
26 1989-12-31   47     35 0.573 16.0 106.4 105.0  2.13
27 1988-12-31   50     32 0.610  4.0 105.0 101.6  3.76
28 1987-12-31   40     42 0.488 17.0 104.8 103.9  1.27
29 1986-12-31   30     52 0.366 27.0 109.3 113.1 -3.12
30 1985-12-31   38     44 0.463 21.0 108.7 109.6 -0.50
31 1984-12-31   27     55 0.329 23.0 103.7 108.9 -4.69
```

```
32 1983-12-31   28     54 0.341 23.0 111.0 115.9 -4.41
33 1982-12-31   34     48 0.415 21.0 106.6 108.6 -1.57
34 1981-12-31   45     37 0.549 15.0 109.0 107.0  2.34
35 1980-12-31   30     52 0.366 19.0 107.5 110.2 -2.63
36 1979-12-31   31     51 0.378 17.0 104.7 108.7 -3.78
37 1978-12-31   40     42 0.488  8.0 103.9 104.8 -0.79
38 1977-12-31   44     38 0.537  6.0  98.9  98.0  0.93
39 1976-12-31   24     58 0.293 14.0  95.9  98.8 -2.90
40 1975-12-31   47     35 0.573   NA  98.1  95.0  2.89
41 1974-12-31   54     28 0.659  5.0 102.0  98.7  3.20
42 1973-12-31   51     31 0.622  9.0 104.1 100.6  3.43
43 1972-12-31   57     25 0.695  6.0 111.2 102.9  7.91
44 1971-12-31   51     31 0.622 15.0 110.6 105.4  5.47
45 1970-12-31   39     43 0.476  9.0 114.9 116.7 -1.71
```

In the above steps we are just picking a dataset and entering its Quandl code. You can find your auth_ token under the API tab on your account page. With the Quandl account, registering is free and only takes a few seconds. The Quandl package is able to return data in 4 very usable formats: data frame raw, ts, zoo and xts. The default is raw data type.

```
> #Full Data Retriive
> cbulls.new <-cbulls[, -3:-5]#Removing the older column
>
```

```
> #Steps in cleaning your data
> cbulls.new1 <- cbulls.new[, -5:-5]#cleaning of data
> cbulls.new1 #Displaying the data frame
```

```
         Year Wins  PS/G  PA/G
1  2014-12-31   48  93.7  91.8
2  2013-12-31   45  93.2  92.9
3  2012-12-31   50  96.3  88.2
4  2011-12-31   62  98.6  91.3
5  2010-12-31   41  97.5  99.1
6  2009-12-31   41 102.2 102.5
7  2008-12-31   33  97.3 100.4
8  2007-12-31   49  98.8  93.8
9  2006-12-31   41  97.8  97.2
10 2005-12-31   47  94.5  93.4
11 2004-12-31   23  89.7  96.0
12 2003-12-31   30  95.0 100.1
13 2002-12-31   21  89.5  98.0
14 2001-12-31   15  87.6  96.7
15 2000-12-31   17  84.8  94.2
16 1999-12-31   13  81.9  91.4
```

```
17 1998-12-31   62  96.7  89.6
18 1997-12-31   69 103.1  92.3
19 1996-12-31   72 105.2  92.9
20 1995-12-31   47 101.5  96.7
21 1994-12-31   55  98.0  94.9
22 1993-12-31   57 105.2  98.9
23 1992-12-31   67 109.9  99.5
24 1991-12-31   61 110.0 101.0
25 1990-12-31   55 109.5 106.2
26 1989-12-31   47 106.4 105.0
27 1988-12-31   50 105.0 101.6
28 1987-12-31   40 104.8 103.9
29 1986-12-31   30 109.3 113.1
30 1985-12-31   38 108.7 109.6
31 1984-12-31   27 103.7 108.9
32 1983-12-31   28 111.0 115.9
33 1982-12-31   34 106.6 108.6
34 1981-12-31   45 109.0 107.0
35 1980-12-31   30 107.5 110.2
36 1979-12-31   31 104.7 108.7
37 1978-12-31   40 103.9 104.8
38 1977-12-31   44  98.9  98.0
39 1976-12-31   24  95.9  98.8
40 1975-12-31   47  98.1  95.0
41 1974-12-31   54 102.0  98.7
42 1973-12-31   51 104.1 100.6
43 1972-12-31   57 111.2 102.9
44 1971-12-31   51 110.6 105.4
45 1970-12-31   39 114.9 116.7
```

```
> colnames (cbulls.new1)[3] <-"PS" #changing the column name
> colnames (cbulls.new1)[4] <-"PA" #changing the column Name
> cbulls.new1
```

```
         Year Wins    PS    PA
1  2014-12-31   48  93.7  91.8
2  2013-12-31   45  93.2  92.9
3  2012-12-31   50  96.3  88.2
4  2011-12-31   62  98.6  91.3
5  2010-12-31   41  97.5  99.1
6  2009-12-31   41 102.2 102.5
7  2008-12-31   33  97.3 100.4
8  2007-12-31   49  98.8  93.8
9  2006-12-31   41  97.8  97.2
10 2005-12-31   47  94.5  93.4
```

```
11 2004-12-31   23  89.7  96.0
12 2003-12-31   30  95.0 100.1
13 2002-12-31   21  89.5  98.0
14 2001-12-31   15  87.6  96.7
15 2000-12-31   17  84.8  94.2
16 1999-12-31   13  81.9  91.4
17 1998-12-31   62  96.7  89.6
18 1997-12-31   69 103.1  92.3
19 1996-12-31   72 105.2  92.9
20 1995-12-31   47 101.5  96.7
21 1994-12-31   55  98.0  94.9
22 1993-12-31   57 105.2  98.9
23 1992-12-31   67 109.9  99.5
24 1991-12-31   61 110.0 101.0
25 1990-12-31   55 109.5 106.2
26 1989-12-31   47 106.4 105.0
27 1988-12-31   50 105.0 101.6
28 1987-12-31   40 104.8 103.9
29 1986-12-31   30 109.3 113.1
30 1985-12-31   38 108.7 109.6
31 1984-12-31   27 103.7 108.9
32 1983-12-31   28 111.0 115.9
33 1982-12-31   34 106.6 108.6
34 1981-12-31   45 109.0 107.0
35 1980-12-31   30 107.5 110.2
36 1979-12-31   31 104.7 108.7
37 1978-12-31   40 103.9 104.8
38 1977-12-31   44  98.9  98.0
39 1976-12-31   24  95.9  98.8
40 1975-12-31   47  98.1  95.0
41 1974-12-31   54 102.0  98.7
42 1973-12-31   51 104.1 100.6
43 1972-12-31   57 111.2 102.9
44 1971-12-31   51 110.6 105.4
45 1970-12-31   39 114.9 116.7
```

With the help of functions,I am deleting and cleaning the data frame. I have changed the column name in the data frame from PS/G to PS and PA/G to PA.

2.2 Class

```
> #using class function
> class(cbulls.new1)

[1] "data.frame"
```

This attribute is a character vector containing the list of classes that an object inherits from. The data objects existing in R are vectors, arrays, matrices, tables and data frames.

Looking at the above result, we can say that the object which is stored in the data frame called "cbulls.new1."

2.3 str()

The str function is the most useful function which provides great information about the structure of some object. This function for data frames provides the information they are used to seeing on the variable view tab. Also this function helps to display the information in diffrent format (e.g. as an HTML or LaTeX table).

```
> #using str function
> str(cbulls.new1)

'data.frame':        45 obs. of  4 variables:
 $ Year: Date, format: "2014-12-31" "2013-12-31" ...
 $ Wins: num  48 45 50 62 41 41 33 49 41 47 ...
 $ PS  : num  93.7 93.2 96.3 98.6 97.5 ...
 $ PA  : num  91.8 92.9 88.2 91.3 99.1 ...
```

2.4 Summary

```
> #using summary function which is used to represent nearly every dataset
> summary(cbulls.new1)

      Year                 Wins             PS              PA
 Min.   :1970-12-31   Min.   :13.00   Min.   : 81.9   Min.   : 88.2
 1st Qu.:1981-12-31   1st Qu.:31.00   1st Qu.: 96.7   1st Qu.: 94.9
 Median :1992-12-31   Median :45.00   Median :102.2   Median : 99.1
 Mean   :1992-12-30   Mean   :42.84   Mean   :101.2   Mean   :100.3
 3rd Qu.:2003-12-31   3rd Qu.:51.00   3rd Qu.:106.6   3rd Qu.:105.0
 Max.   :2014-12-31   Max.   :72.00   Max.   :114.9   Max.   :116.7
```

The summary attribute is used to display the statistical objects, and generally the output of some model fitting process. The summary attribute will provide output for the results of any analysis. The output of the summary() function shows you for every variable a set of descriptive statistics, depending on the type of the variable:

- Numerical variables: gives you the range, quartiles, median, and mean.
- Factor variables: gives you a table with frequencies.
- Numerical and factor variables: gives you the number of missing values.
- Character variables: does not give you any information.

3 Result

3.1 Data Set

> cbulls.new1

	Year	Wins	PS	PA
1	2014-12-31	48	93.7	91.8
2	2013-12-31	45	93.2	92.9
3	2012-12-31	50	96.3	88.2
4	2011-12-31	62	98.6	91.3
5	2010-12-31	41	97.5	99.1
6	2009-12-31	41	102.2	102.5
7	2008-12-31	33	97.3	100.4
8	2007-12-31	49	98.8	93.8
9	2006-12-31	41	97.8	97.2
10	2005-12-31	47	94.5	93.4
11	2004-12-31	23	89.7	96.0
12	2003-12-31	30	95.0	100.1
13	2002-12-31	21	89.5	98.0
14	2001-12-31	15	87.6	96.7
15	2000-12-31	17	84.8	94.2
16	1999-12-31	13	81.9	91.4
17	1998-12-31	62	96.7	89.6
18	1997-12-31	69	103.1	92.3
19	1996-12-31	72	105.2	92.9
20	1995-12-31	47	101.5	96.7
21	1994-12-31	55	98.0	94.9
22	1993-12-31	57	105.2	98.9
23	1992-12-31	67	109.9	99.5
24	1991-12-31	61	110.0	101.0
25	1990-12-31	55	109.5	106.2
26	1989-12-31	47	106.4	105.0
27	1988-12-31	50	105.0	101.6
28	1987-12-31	40	104.8	103.9
29	1986-12-31	30	109.3	113.1
30	1985-12-31	38	108.7	109.6
31	1984-12-31	27	103.7	108.9
32	1983-12-31	28	111.0	115.9
33	1982-12-31	34	106.6	108.6
34	1981-12-31	45	109.0	107.0
35	1980-12-31	30	107.5	110.2
36	1979-12-31	31	104.7	108.7
37	1978-12-31	40	103.9	104.8
38	1977-12-31	44	98.9	98.0

```
39 1976-12-31   24  95.9  98.8
40 1975-12-31   47  98.1  95.0
41 1974-12-31   54 102.0  98.7
42 1973-12-31   51 104.1 100.6
43 1972-12-31   57 111.2 102.9
44 1971-12-31   51 110.6 105.4
45 1970-12-31   39 114.9 116.7
```

Year: is a date column that can have values from 1st January 1970 to 2014.

Wins: is a numeric value can have any values between 0 and 82. The maximum number of games that a NBA team can play in a year is 82.

PS: It is calculated by dividing the total number of points(team) by number of games(team).

PA: It is the total number of points against(team) by number of games(team).

Points scored and points against example: Game 1: bulls 100 beat spurs 90 Game 2: bulls 90 beat clippers 80 Game 3: bulls 110 lost to lakers 120

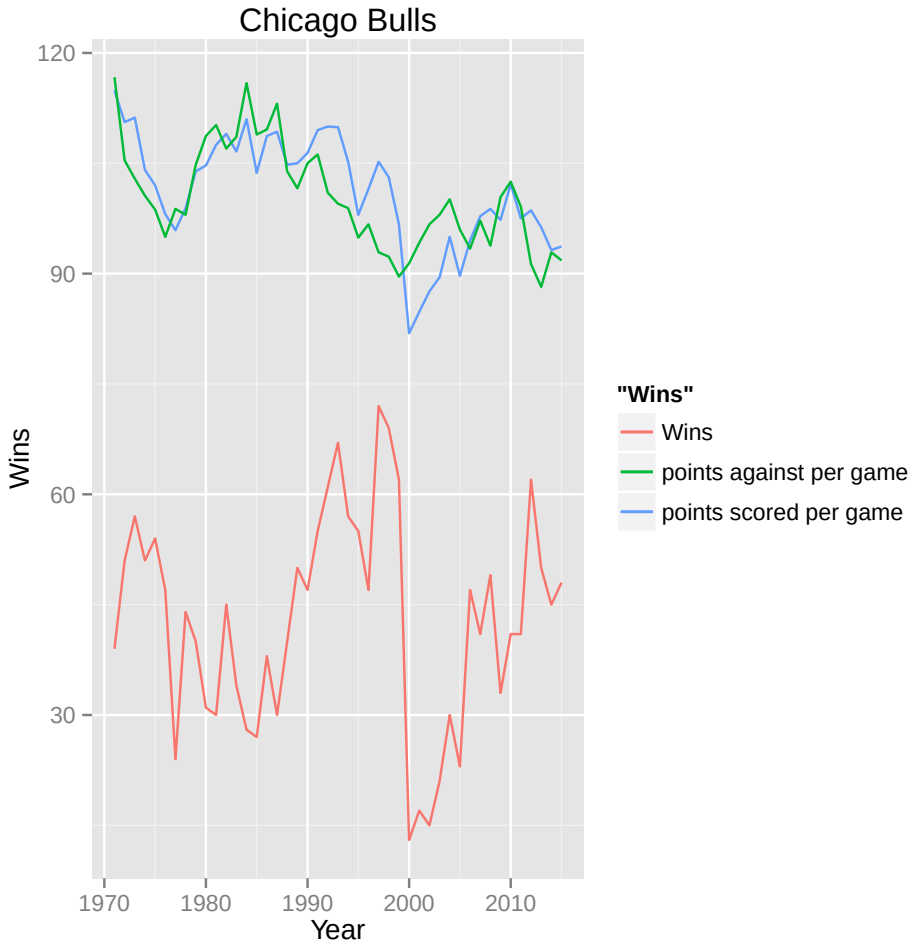
From these 3 games bulls point scored per game would be (100 + 90 + 110)/ 3 = 100

Points against per game will be the sum of points scored by the other 3 teams they faced and then divided by 3 . In this case it would be (90 + 80 + 120)/3 = 96.66

So this way instead of 3 it is done for a whole regular season which consists of 82 games.

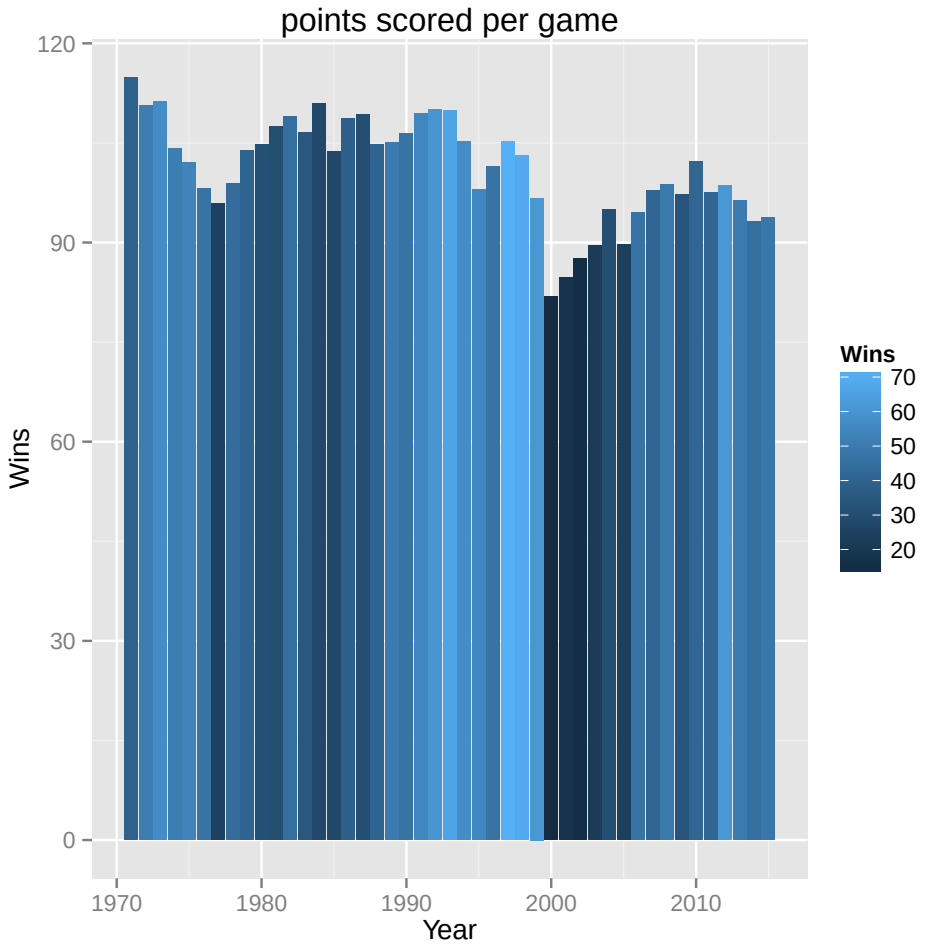
3.2 Graph

```
> # Graph plot between points scored per game (PS/G) and points against per game (PA/G
> ggplot(data=cbulls.new1, aes(Year))+geom_line(aes(y=Wins, color="Wins"))+geom_line(a
>
```



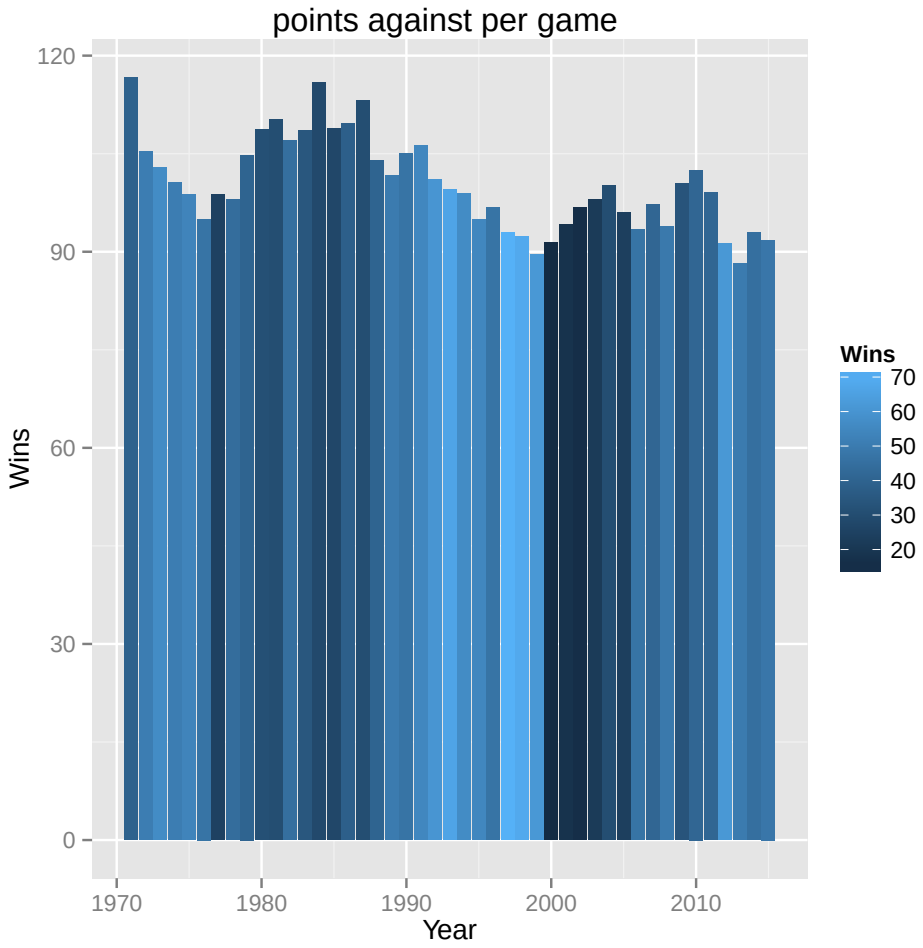
The graph shows the number of wins of the Chicago Bulls. The Chicago Bulls won more games in 1996 with an 82 –game schedule 72.The 1996 team that went 72-10 (NBA record) in route to a fourth Bulls championship.The blue line is showing points scored game and the green one shows points scored againts game in championship.In 1996 the points scored per game is much higher.In year 1997 Chicago Bulls wins 69 games and got second consecutive NBA title.

```
> #ploting of graph between PS/G,Year,Wins
> ggplot(cbulls.new1, aes(Year, PS)) +geom_bar(aes(fill = Wins), position = "dodge", s
>
```



The graph shows the number of wins in a particular year and also points scored per game in a particular year.The 1969-70 team finished 39-43 and was the highest-scoring Bulls outfit in history, putting up 114.9 points per game.On the other hand number of wins were more in 1996 year.In year around 2000 there was downfall in history of the Chicago bulls.

```
> #ploting of graph between PA/G,Year,Wins
> ggplot(cbulls.new1, aes(Year, PA)) +geom_bar(aes(fill = Wins), position = "dodge", s
>
```



The graph shows the number of wins in a particular year and also points scored against per game in a particular year.In the early 1990s, the Bulls assembled a strong supporting cast for Jordan and Pippen which won three consecutive NBA titles, becoming the third franchise in history to string together a trio of crowns.Michael Jordan was driven to lead the Bulls to the NBA championship for the fourth time in six years. In 1996 the number of wins and points scored per game was highest and in year 2000 there was lowest total number of points(team) by number of games(team).

3.3 Conclusion

The Chicago Bulls are the most successful franchise in terms of Championships in the National Basketball Association. With two of the greatest basketball players of all time, Michael Jordan and Scottie Pippen, and with coach Phil Jackson, the Chicago Bulls are well known for the greatest regime in the 1990's. They managed together to win 6 NBA Championships in the 90's decade. In the 1990s, the Bulls helped spread the popularity of the NBA around the world. The Chicago Bulls are the only team in history to win 70 or more games in a single season (1995–1996). The Bulls won many of the postseason awards: Jordan was named the league's Most Valuable Player.

4 References

http://www.nba.com/bulls/history/Chicago_ Bulls_ History-24393-42.html