DATA 608: Homework 1 (Baseball Regression)

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First, let's read in the provided dataset

Data Exploration

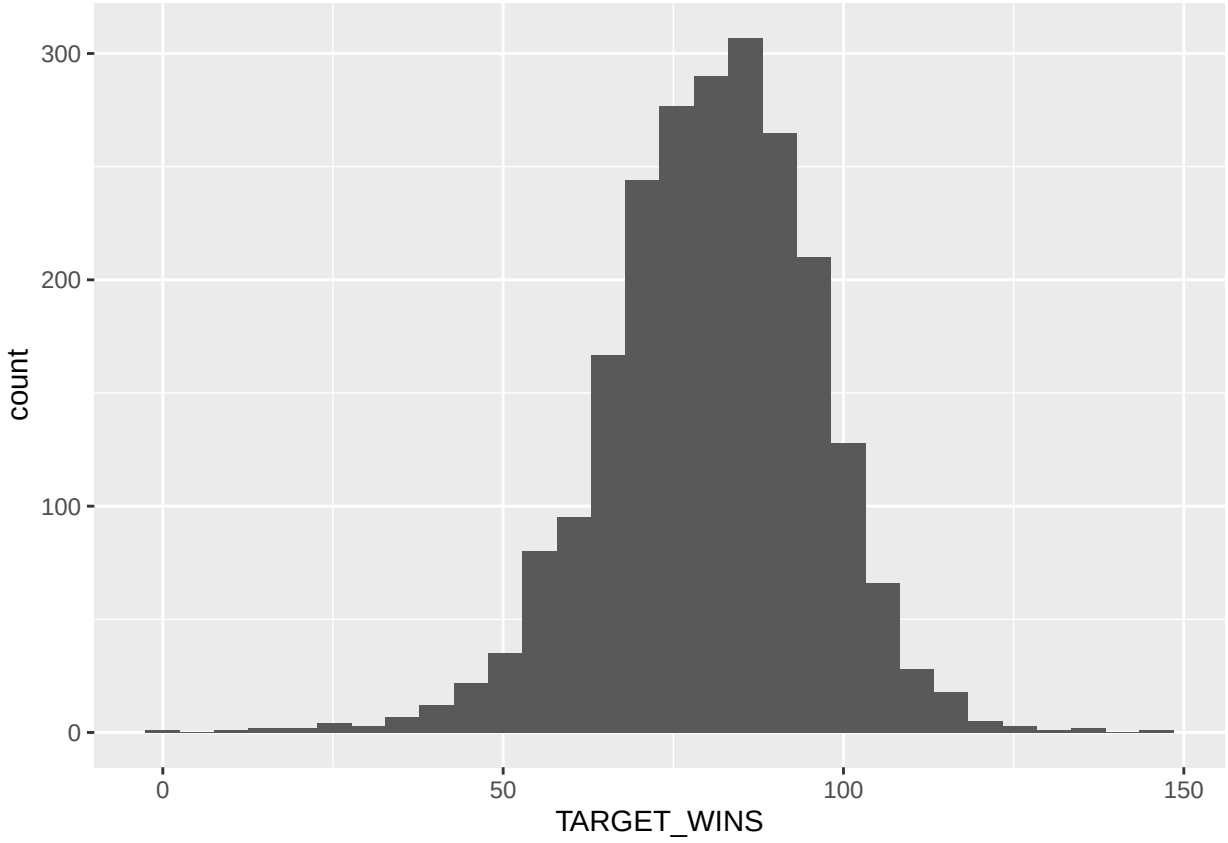
First, let's print out some summary statistics. We're primarily interested in the `TARGET_WINS` feature, so we'll look at that first

```
## The mean number of wins in a season is 80.7908611599297
```

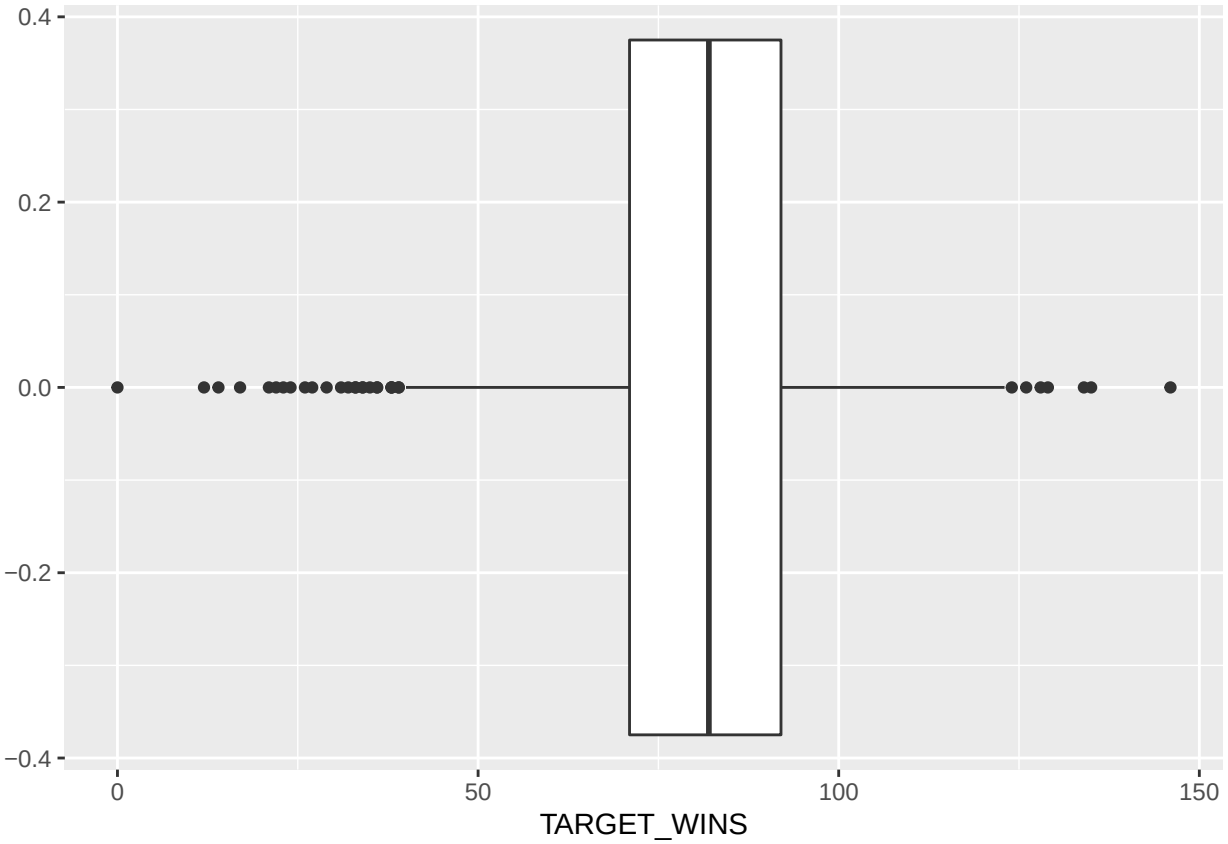
```
## The median number of wins in a season is 82
```

```
## The standard deviation for number of wins in a season is 15.7521524768421
```

Let's also make a boxplot and histogram of the `TARGET_WINS` variable. This should give us a sense of the distribution of wins for teams/seasons in our population



Overall, the number of wins in a season for a given baseball team looks fairly normally distributed. We can also plot this distribution via a boxplot, which helps to highlight outliers.



Let's look at raw correlations between our other included variables and `TARGET_WINS`

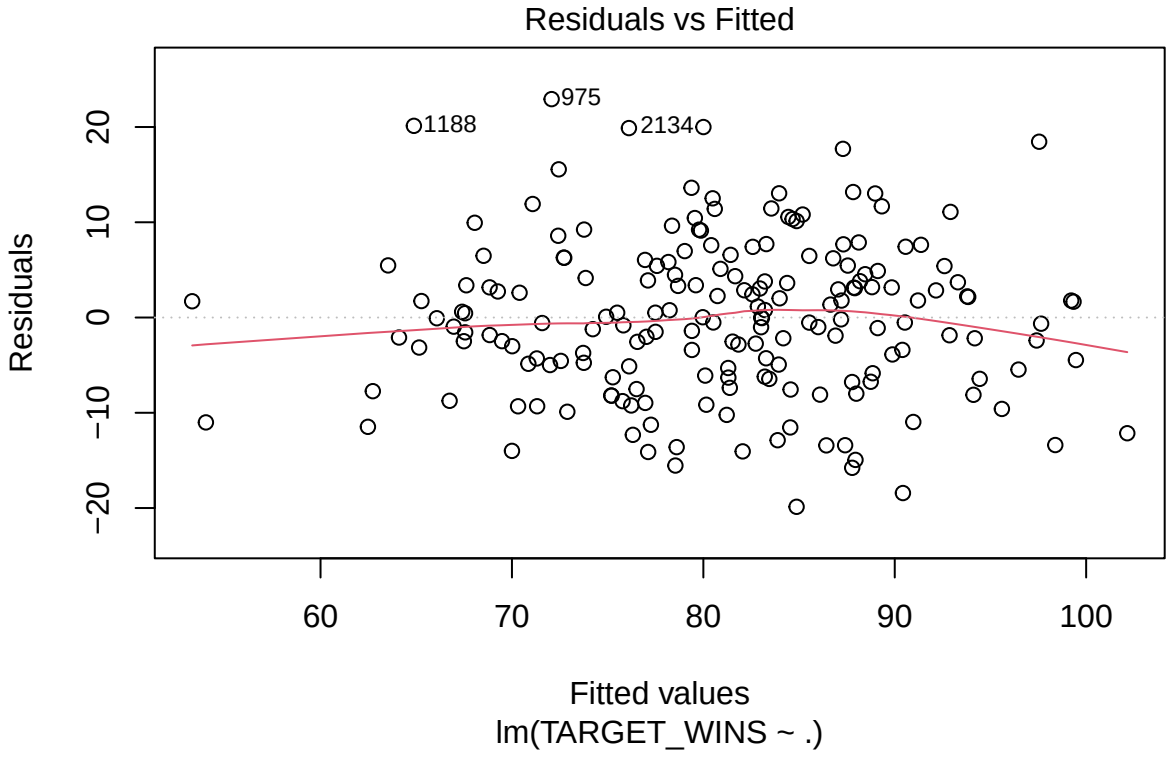
```
##                       [,1]
## TARGET_WINS       1.0000000
## TEAM_BATTING_H    0.3887675
## TEAM_BATTING_2B   0.2891036
## TEAM_BATTING_3B   0.1426084
## TEAM_BATTING_HR   0.1761532
## TEAM_BATTING_BB   0.2325599
## TEAM_BATTING_SO          NA
## TEAM_BASERUN_SB          NA
## TEAM_BASERUN_CS          NA
## TEAM_BATTING_HBP         NA
## TEAM_PITCHING_H  -0.1099371
## TEAM_PITCHING_HR  0.1890137
## TEAM_PITCHING_BB  0.1241745
## TEAM_PITCHING_SO         NA
## TEAM_FIELDING_E  -0.1764848
## TEAM_FIELDING_DP         NA
```

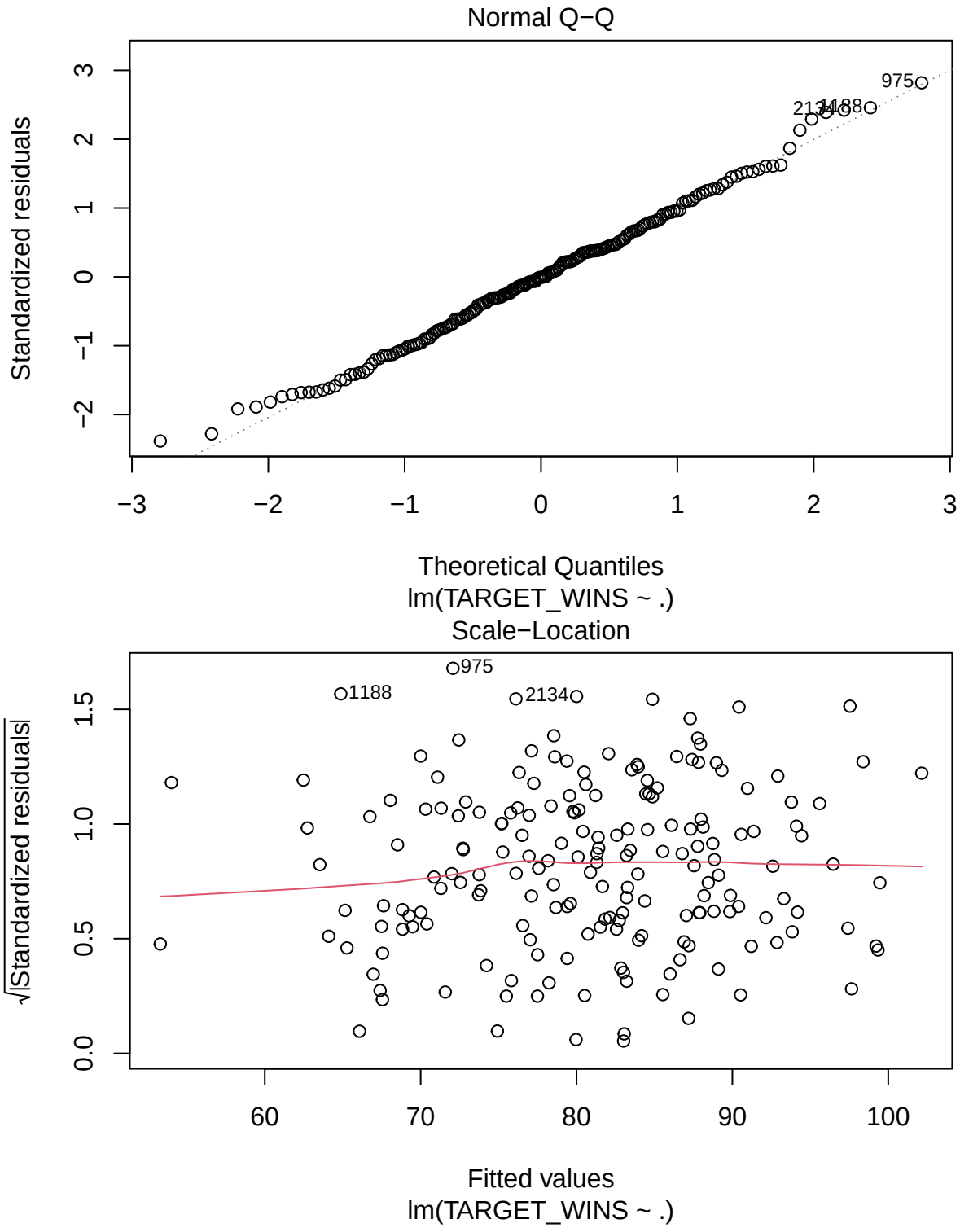
Let's make a basic model with some offensive inputs (hits, 2B, 3B, Home Runs)

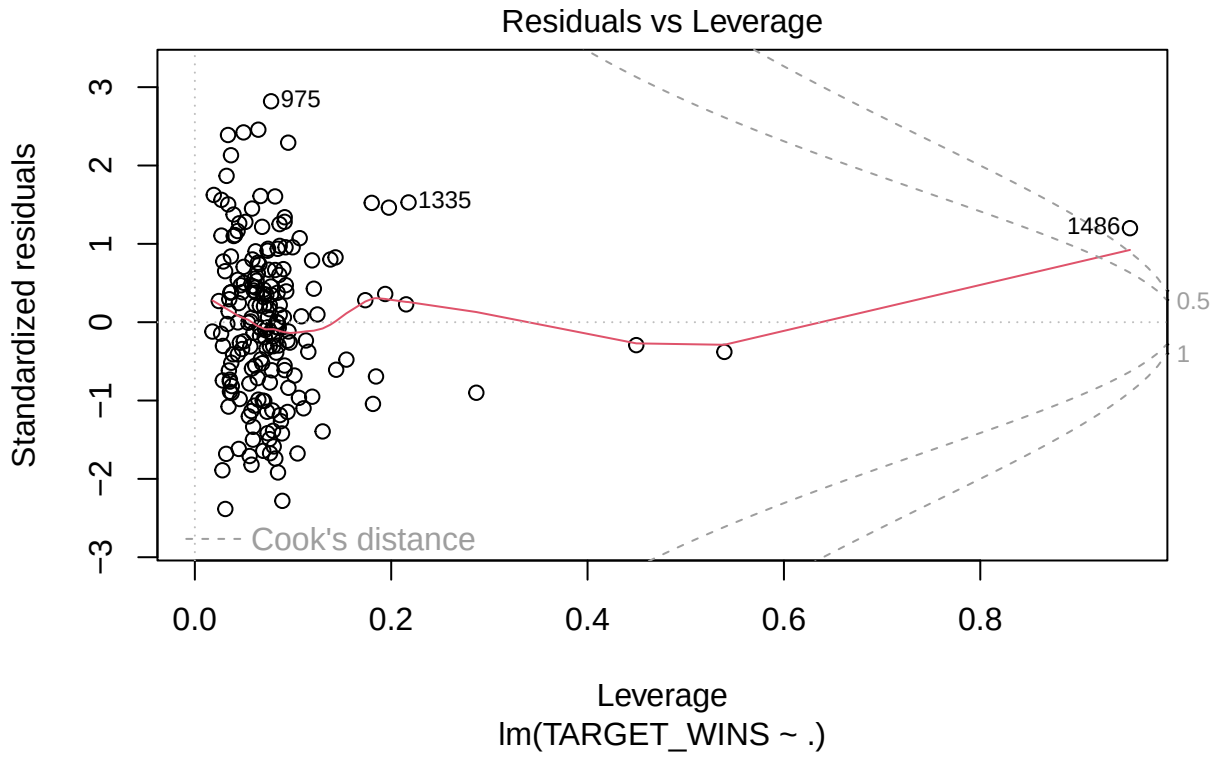
```
##      (Intercept)   TEAM_BATTING_H  TEAM_BATTING_2B  TEAM_BATTING_3B
##      60.28826257       1.91347621       0.02638808      -0.10117554
```

```
##  TEAM_BATTING_HR  TEAM_BATTING_BB  TEAM_BATTING_SO  TEAM_BASERUN_SB
##      -4.84370721      -4.45969136       0.34196258       0.03304398
##  TEAM_BASERUN_CS TEAM_BATTING_HBP  TEAM_PITCHING_H TEAM_PITCHING_HR
##      -0.01104427       0.08247269      -1.89095685       4.93043182
## TEAM_PITCHING_BB TEAM_PITCHING_SO  TEAM_FIELDING_E TEAM_FIELDING_DP
##       4.51089069      -0.37364495      -0.17204198      -0.10819208
```

We can make some plots to help test our assumptions of our basic model using the `plot` function on our model variable




Normal Q−Q
Standardized residuals
975
2134
1188
−3
−2
−1
0
1
2
3
Theoretical Quantiles
lm(TARGET_WINS ~ .)
Scale−Location
√|Standardized residuals|
975
1188
2134
0.0
0.5
1.0
1.5
60
70
80
90
100
Fitted values
lm(TARGET_WINS ~ .)



Model Evaluation

```
predict(lm_all, test)
```

```
##        1        2        3        4        5        6        7        8
##       NA       NA       NA 79.60984       NA       NA       NA       NA
##        9       10       11       12       13       14       15       16
##       NA       NA       NA       NA       NA       NA       NA       NA
##       17       18       19       20       21       22       23       24
##       NA 78.95693       NA       NA       NA       NA       NA       NA
##       25       26       27       28       29       30       31       32
## 77.16939 86.81801       NA       NA       NA       NA       NA       NA
##       33       34       35       36       37       38       39       40
##       NA       NA       NA       NA       NA       NA       NA       NA
##       41       42       43       44       45       46       47       48
##       NA       NA       NA       NA       NA       NA       NA       NA
##       49       50       51       52       53       54       55       56
##       NA       NA       NA       NA       NA       NA       NA       NA
##       57       58       59       60       61       62       63       64
##       NA       NA       NA       NA       NA       NA       NA 85.05198
##       65       66       67       68       69       70       71       72
## 81.33195       NA       NA       NA       NA       NA       NA       NA
##       73       74       75       76       77       78       79       80
##       NA       NA       NA       NA       NA       NA       NA       NA
##       81       82       83       84       85       86       87       88
##       NA       NA       NA       NA       NA       NA       NA       NA
##       89       90       91       92       93       94       95       96
```

```
##       NA       NA       NA       NA       NA       NA       NA       NA
##       97       98       99      100      101      102      103      104
##       NA       NA       NA       NA       NA       NA       NA       NA
##      105      106      107      108      109      110      111      112
##       NA       NA       NA 72.39264 87.56175       NA       NA       NA
##      113      114      115      116      117      118      119      120
##       NA       NA       NA       NA       NA 74.49284 65.15701       NA
##      121      122      123      124      125      126      127      128
##       NA       NA       NA       NA       NA       NA       NA       NA
##      129      130      131      132      133      134      135      136
##       NA       NA       NA       NA       NA       NA 86.10463       NA
##      137      138      139      140      141      142      143      144
##       NA       NA       NA       NA       NA       NA       NA       NA
##      145      146      147      148      149      150      151      152
##       NA       NA       NA       NA       NA       NA       NA       NA
##      153      154      155      156      157      158      159      160
##       NA       NA       NA       NA 86.64915       NA       NA       NA
##      161      162      163      164      165      166      167      168
##       NA       NA       NA       NA       NA       NA       NA       NA
##      169      170      171      172      173      174      175      176
##       NA       NA       NA       NA       NA       NA       NA       NA
##      177      178      179      180      181      182      183      184
##       NA       NA       NA       NA       NA       NA       NA 88.27315
##      185      186      187      188      189      190      191      192
##       NA       NA       NA       NA       NA       NA       NA       NA
##      193      194      195      196      197      198      199      200
##       NA       NA       NA       NA       NA       NA       NA       NA
##      201      202      203      204      205      206      207      208
##       NA       NA       NA       NA       NA       NA       NA       NA
##      209      210      211      212      213      214      215      216
##       NA       NA       NA       NA       NA       NA       NA       NA
##      217      218      219      220      221      222      223      224
##       NA       NA       NA       NA       NA       NA 77.10932 65.54638
##      225      226      227      228      229      230      231      232
##       NA       NA       NA 69.38398 79.72822       NA       NA       NA
##      233      234      235      236      237      238      239      240
##       NA       NA       NA       NA       NA       NA       NA       NA
##      241      242      243      244      245      246      247      248
##       NA       NA       NA       NA       NA       NA       NA       NA
##      249      250      251      252      253      254      255      256
##       NA 78.12011 74.97230       NA       NA       NA       NA       NA
##      257      258      259
##       NA       NA       NA
```

Appendix: Report Code

```
knitr::opts_chunk$set(echo = TRUE)
library(glue)
library(tidyverse)
library(car)
df <- read.csv("https://raw.githubusercontent.com/andrewbowen19/businessAnalyticsDataMiningDATA621/main/
```

```r
df <- data.frame(df)
mean_wins <- mean(df$TARGET_WINS)
median_wins <- median(df$TARGET_WINS)
sd_wins <- sd(df$TARGET_WINS)

# Print summary stats
print(glue("The mean number of wins in a season is {mean_wins}"))
print(glue("The median number of wins in a season is {median_wins}"))
print(glue("The standard deviation for number of wins in a season is {sd_wins}"))
ggplot(df, aes(x=TARGET_WINS)) + geom_histogram()
ggplot(df, aes(x=TARGET_WINS)) + geom_boxplot()
train <- subset(df, select=-c(INDEX))
cor(train, df$TARGET_WINS)
lm_all <- lm(TARGET_WINS~., train)
coef(lm_all)
plot(lm_all)
eval_data_url <- "https://raw.githubusercontent.com/andrewbowen19/businessAnalyticsDataMiningDATA621/ma

test <- read.csv(eval_data_url)
predict(lm_all, test)
```