DATA 608: Homework 1 (Baseball Regression)

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First, let's read in the provided dataset

Data Exploration

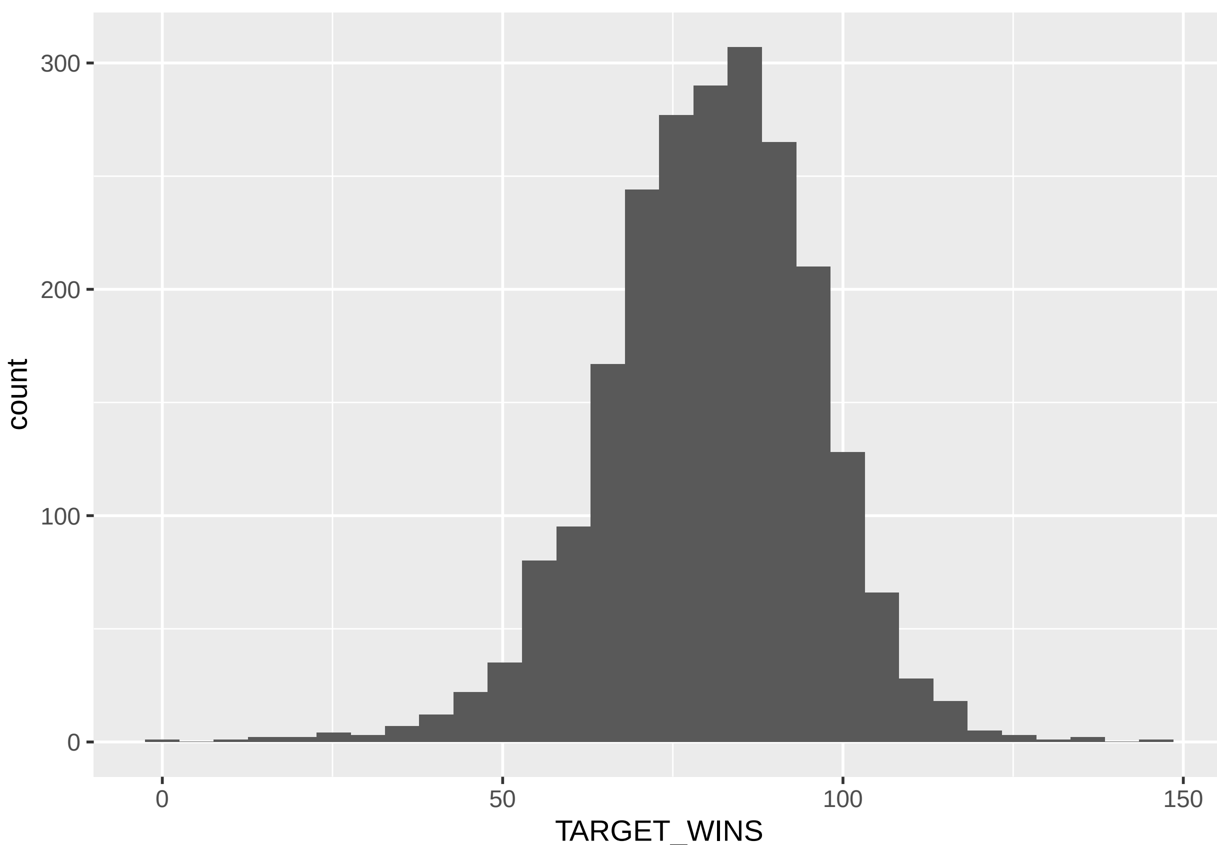
First, let's print out some summary statistics. We're primarily interested in the `TARGET_WINS` feature, so we'll look at that first

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

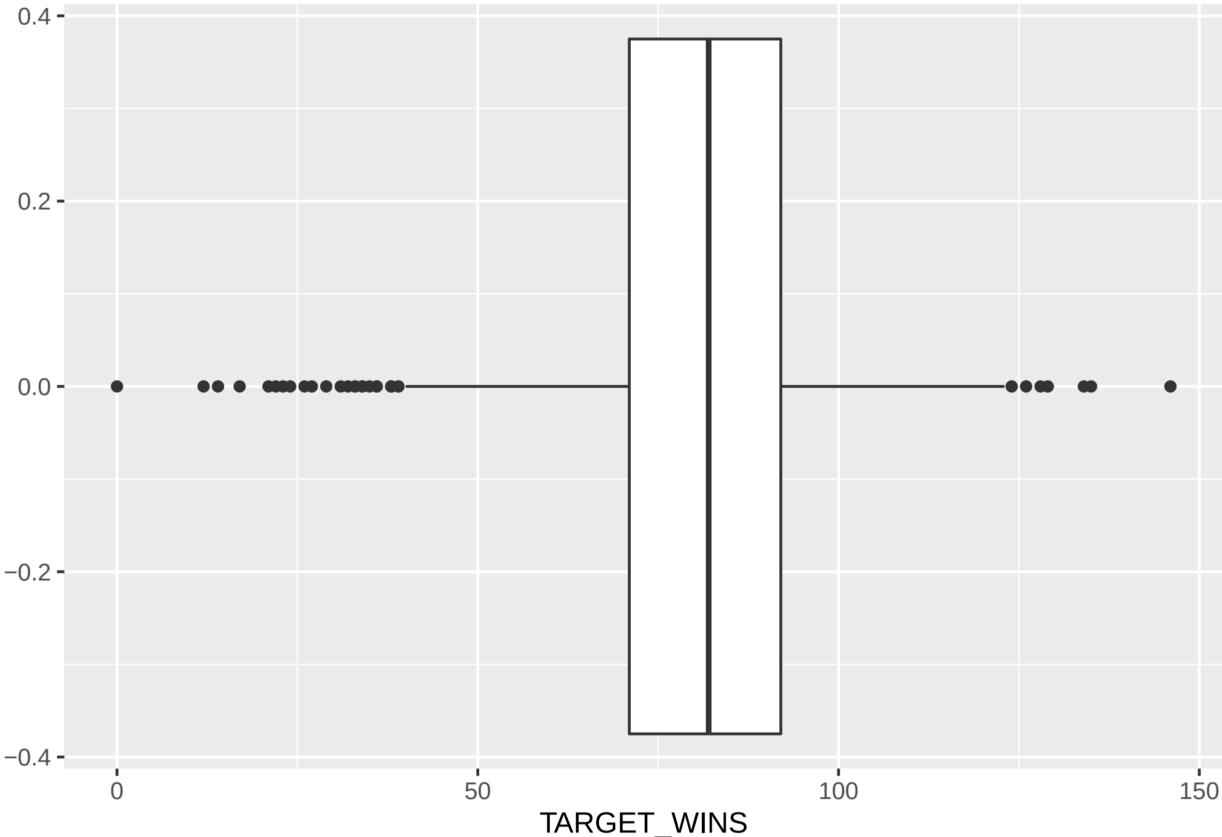
```
## The median number of wins in a season is 82
```

```
## 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 a team's win total for a season:

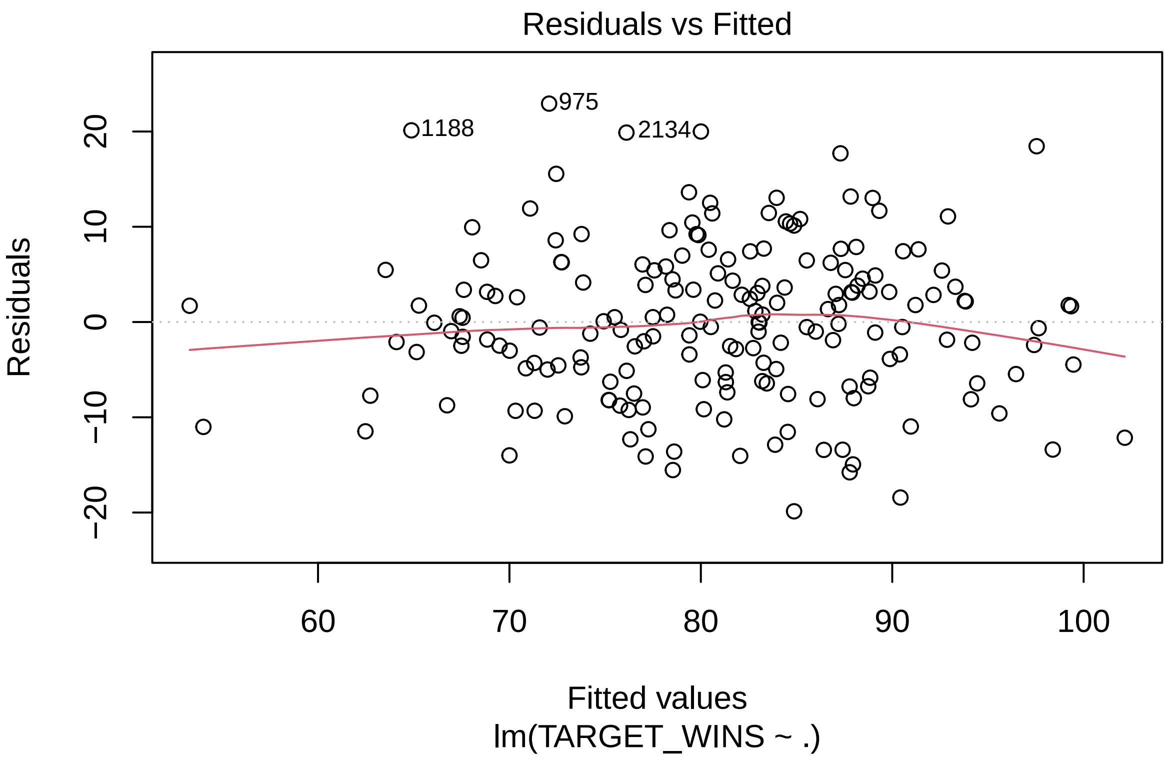
```
##                       [,1]
## TARGET_WINS       1.0000000
## TEAM_BATTING_H    0.3887675
## TEAM_BATTING_2B   0.2891036
## TEAM_BATTING_3B   0.1426084
## TEAM_BATTING_HR   0.1761532
## TEAM_BATTING_BB   0.2325599
## TEAM_BATTING_SO          NA
## TEAM_BASERUN_SB          NA
## TEAM_BASERUN_CS          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
```

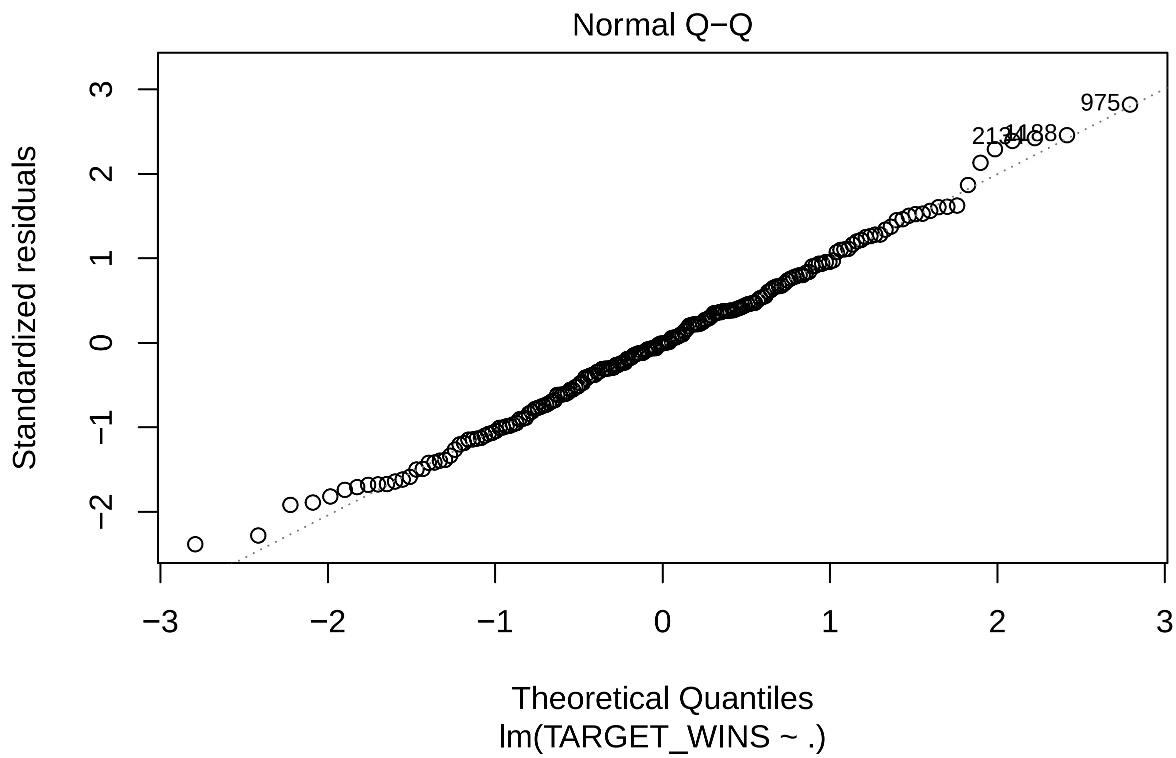
Let's make a basic model with some offensive inputs (hits, 2B, 3B, Home Runs)

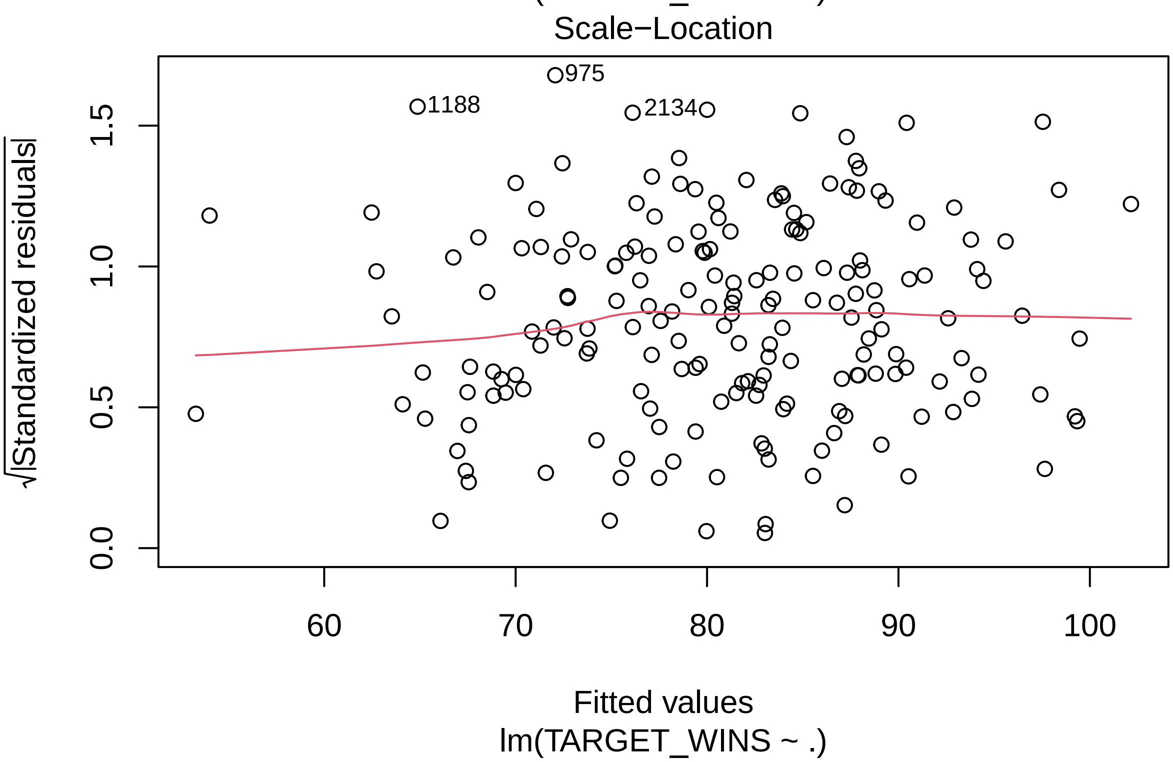
```
##      (Intercept)   TEAM_BATTING_H  TEAM_BATTING_2B  TEAM_BATTING_3B
##      60.28826257       1.91347621       0.02638808      -0.10117554
```

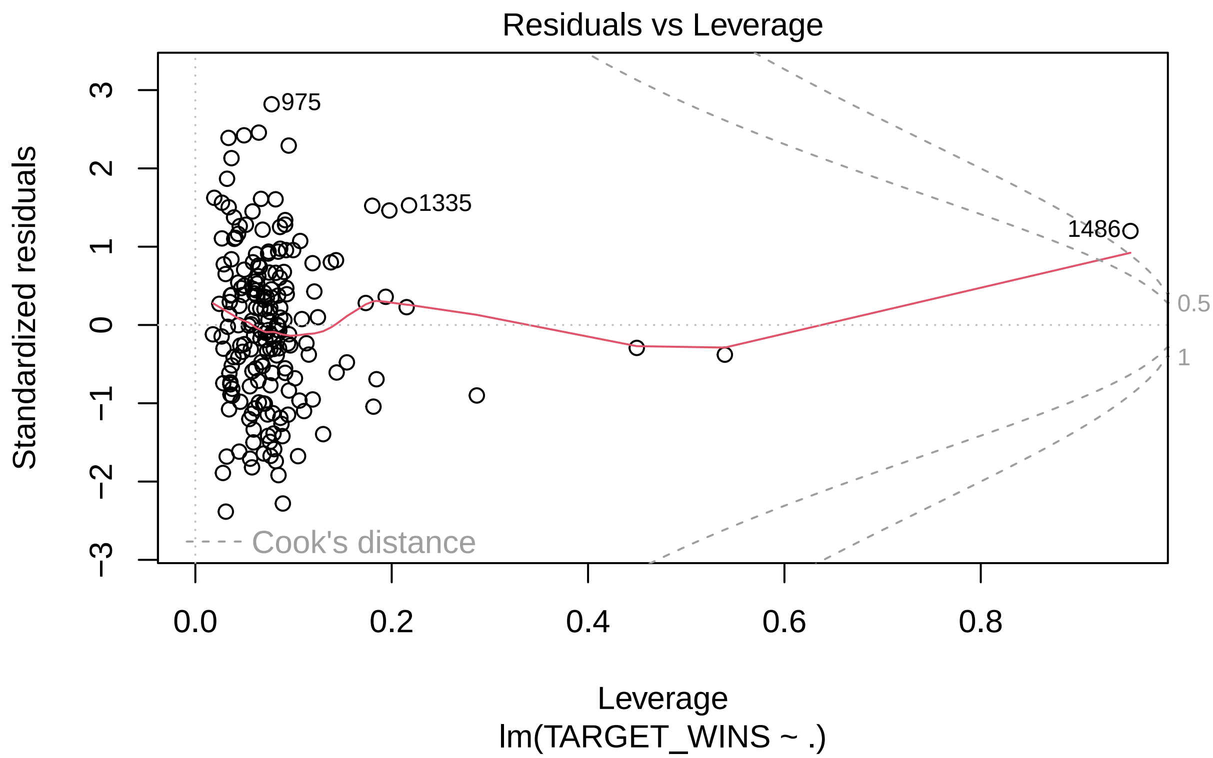
```
##  TEAM_BATTING_HR  TEAM_BATTING_BB  TEAM_BATTING_SO  TEAM_BASERUN_SB
##      -4.84370721      -4.45969136       0.34196258       0.03304398
##  TEAM_BASERUN_CS TEAM_BATTING_HBP  TEAM_PITCHING_H TEAM_PITCHING_HR
##      -0.01104427       0.08247269      -1.89095685       4.93043182
## TEAM_PITCHING_BB 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
Theoretical Quantiles
lm(TARGET_WINS ~ .)
975
2134
1188


Scale−Location
√|Standardized residuals|
Fitted values
lm(TARGET_WINS ~ .)
975
1188
2134



Model Evaluation

We'll need to read in our evaluation data, which is hosted on GitHub for reproduceability.

```
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

Below is the code for this report to generate the models and charts above

```r
knitr::opts_chunk$set(echo = TRUE)
library(glue)
library(tidyverse)
```

```
library(car)
df <- read.csv("https://raw.githubusercontent.com/andrewbowen19/businessAnalyticsDataMiningDATA621/main/
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/mai

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