# Final_Project_Checkpoint1

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## Library Calls

```r
library(glmnet)
```

```
## Loading required package: Matrix

## Loading required package: foreach

## Loaded glmnet 2.0-18
```

```r
library(glmnetUtils)
```

```
##
## Attaching package: 'glmnetUtils'

## The following objects are masked from 'package:glmnet':
##
##     cv.glmnet, glmnet
```

```r
library(forcats)
library(corrplot)
```

```
## corrplot 0.84 loaded
```

```r
library(leaps)
library(ggplot2)
library(summarytools)
```

```
## Registered S3 method overwritten by 'pryr':
##   method      from
##   print.bytes Rcpp
```

## Data Cleaning

```r
steam <- read.csv("steam.csv")
nrow(steam[!complete.cases(steam),])
```

```
## [1] 0
```

```r
#converts the units into dollars
steam$price <- steam$price * 1.28
steam_subset <- subset(steam, select = -c(appid,english,steamspy_tags,name,release_date,platforms,devel
#removing all the ';' delimited variables and assigning them a single value for that column
steam_subset$genres <- do.call('rbind',strsplit(as.character(steam_subset$genres), ';', fixed=TRUE))[,1]
```

```
## Warning in rbind("Action", "Action", "Action", "Action", "Action",
## "Action", : number of columns of result is not a multiple of vector length
## (arg 23)
```

```r
steam_subset$categories <- do.call('rbind',strsplit(as.character(steam_subset$categories), ';', fixed=T
```

```
## Warning in rbind(c("Multi-player", "Online Multi-Player", "Local Multi-
## Player", : number of columns of result is not a multiple of vector length
## (arg 1)
```

```r
#steam_subset$steamspy_tags <- do.call('rbind',strsplit(as.character(steam_subset$steamspy_tags), ';', .
#steam_subset$publisher <- do.call('rbind',strsplit(as.character(steam_subset$publisher), ';', fixed=TR
#steam_subset$developer <- do.call('rbind',strsplit(as.character(steam_subset$developer), ';', fixed=TR
#converting them all into factors
#steam_subset$developer <- as.factor(steam_subset$developer)
steam_subset$categories <- as.factor(steam_subset$categories)
steam_subset$genres <- as.factor(steam_subset$genres)
#steam_subset$publisher <- as.factor(steam_subset$publisher)
```

## Creating our predictor variable

```r
steam_subset$successfulGame <- ifelse(steam_subset$owners == "10000000-20000000",1,
                              ifelse(steam_subset$owners == "20000000-50000000",1,
                                ifelse(steam_subset$owners == "50000000-100000000",1,
                                  ifelse(steam_subset$owners == "100000000-200000000"
                                    ifelse(steam_subset$owners == "5000000-100000
                                      ifelse(steam_subset$owners == "2000000
                                        ifelse(steam_subset$owners ==
steam_subset$successfulGame <- as.factor(steam_subset$successfulGame)
```

## Correlations

```r
numeric_cols <- sapply(steam_subset,is.numeric)
correlations <- cor(steam_subset[,numeric_cols])
corrplot(correlations)
```
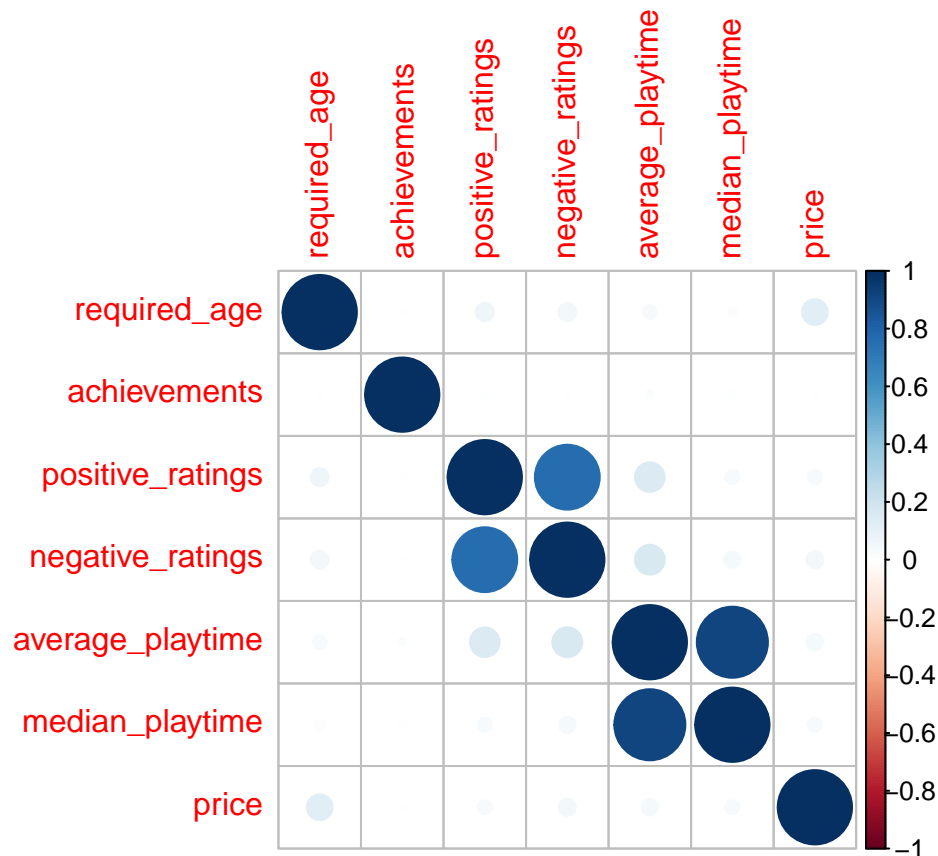
# Train/Test Split

```r
# Do not actually use this since the results from a logit mod were not useful
train_idx <- sample(1:nrow(steam_subset),size = .7*nrow(steam_subset))
steam_subset_train <- steam_subset[train_idx,]
steam_subset_test <- steam_subset[-train_idx,]
```

## Lasso Mod

```r
steam_lasso <- cv.glmnet(successfulGame~.,
                         data = steam_subset,
                         alpha = 1,
                         family = "binomial")
```

```
## Warning: from glmnet Fortran code (error code -16); Convergence for 16th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -12); Convergence for 12th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -16); Convergence for 16th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -16); Convergence for 16th
```

```
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -26); Convergence for 26th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -12); Convergence for 12th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -26); Convergence for 26th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -17); Convergence for 17th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned

## Warning: from glmnet Fortran code (error code -12); Convergence for 12th
## lambda value not reached after maxit=100000 iterations; solutions for
## larger lambdas returned
```

```r
as.matrix(round(coef(steam_lasso, s = steam_lasso$lambda.min),3))
```

```
##                                       1
## (Intercept)                      -4.894
## required_age                      0.000
## categoriesCaptions available      0.000
## categoriesCo-op                   0.000
## categoriesCross-Platform Multiplayer  0.000
## categoriesFull controller support 0.000
## categoriesIn-App Purchases        0.000
## categoriesIncludes level editor   0.000
## categoriesIncludes Source SDK     0.000
## categoriesLocal Co-op             0.000
## categoriesLocal Multi-Player      0.000
## categoriesMMO                     0.000
## categoriesMulti-player            0.000
## categoriesOnline Co-op            0.000
## categoriesOnline Multi-Player     0.000
## categoriesPartial Controller Support  0.000
## categoriesShared/Split Screen     0.000
## categoriesSingle-player           0.000
## categoriesStats                   0.000
## categoriesSteam Achievements      0.000
## categoriesSteam Cloud             0.000
## categoriesSteam Leaderboards      0.000
## categoriesSteam Trading Cards     0.000
## categoriesSteam Workshop          0.000
## categoriesVR Support              0.000
## genresAccounting                  0.000
## genresAction                      0.000
## genresAdventure                   0.000
## genresAnimation & Modeling        0.000
## genresAudio Production            0.000
## genresCasual                      0.000
```

```
## genresDesign & Illustration            0.000
## genresEarly Access                      0.000
## genresEducation                         0.000
## genresFree to Play                      0.000
## genresGore                              0.000
## genresIndie                             0.000
## genresMassively Multiplayer            0.000
## genresNudity                            0.000
## genresPhoto Editing                     0.000
## genresRacing                            0.000
## genresRPG                               0.000
## genresSexual Content                    0.000
## genresSimulation                        0.000
## genresSoftware Training                 0.000
## genresSports                            0.000
## genresStrategy                          0.000
## genresUtilities                         0.000
## genresVideo Production                  0.000
## genresViolent                           0.000
## genresWeb Publishing                    0.000
## achievements                            0.000
## positive_ratings                        0.000
## negative_ratings                        0.000
## average_playtime                        0.000
## median_playtime                         0.000
## owners0-20000                           0.000
## owners100000-200000                     0.000
## owners1000000-2000000                   5.908
## owners10000000-20000000                 0.185
## owners100000000-200000000               0.000
## owners20000-50000                       0.000
## owners200000-500000                     0.000
## owners2000000-5000000                   5.621
## owners20000000-50000000                 0.000
## owners50000-100000                      0.000
## owners500000-1000000                    0.000
## owners5000000-10000000                  4.189
## owners50000000-100000000                0.000
## price                                   0.000
```

```r
as.matrix(round(coef(steam_lasso, s = steam_lasso$lambda.1se),3))
```

```
##                                             1
## (Intercept)                            -4.813
## required_age                            0.000
## categoriesCaptions available            0.000
## categoriesCo-op                         0.000
## categoriesCross-Platform Multiplayer    0.000
## categoriesFull controller support       0.000
## categoriesIn-App Purchases              0.000
## categoriesIncludes level editor         0.000
## categoriesIncludes Source SDK           0.000
## categoriesLocal Co-op                   0.000
## categoriesLocal Multi-Player            0.000
## categoriesMMO                           0.000
```

```
## categoriesMulti-player                      0.000
## categoriesOnline Co-op                       0.000
## categoriesOnline Multi-Player                0.000
## categoriesPartial Controller Support         0.000
## categoriesShared/Split Screen                0.000
## categoriesSingle-player                      0.000
## categoriesStats                              0.000
## categoriesSteam Achievements                 0.000
## categoriesSteam Cloud                        0.000
## categoriesSteam Leaderboards                 0.000
## categoriesSteam Trading Cards                0.000
## categoriesSteam Workshop                     0.000
## categoriesVR Support                         0.000
## genresAccounting                             0.000
## genresAction                                 0.000
## genresAdventure                              0.000
## genresAnimation & Modeling                   0.000
## genresAudio Production                       0.000
## genresCasual                                 0.000
## genresDesign & Illustration                  0.000
## genresEarly Access                           0.000
## genresEducation                              0.000
## genresFree to Play                           0.000
## genresGore                                   0.000
## genresIndie                                  0.000
## genresMassively Multiplayer                  0.000
## genresNudity                                 0.000
## genresPhoto Editing                          0.000
## genresRacing                                 0.000
## genresRPG                                    0.000
## genresSexual Content                         0.000
## genresSimulation                             0.000
## genresSoftware Training                      0.000
## genresSports                                 0.000
## genresStrategy                               0.000
## genresUtilities                              0.000
## genresVideo Production                       0.000
## genresViolent                                0.000
## genresWeb Publishing                         0.000
## achievements                                 0.000
## positive_ratings                             0.000
## negative_ratings                             0.000
## average_playtime                             0.000
## median_playtime                              0.000
## owners0-20000                                0.000
## owners100000-200000                          0.000
## owners1000000-2000000                        5.697
## owners10000000-20000000                      0.000
## owners100000000-200000000                    0.000
## owners20000-50000                            0.000
## owners200000-500000                          0.000
## owners2000000-5000000                        5.398
## owners20000000-50000000                      0.000
## owners50000-100000                           0.000
```

```
## owners500000-1000000           0.000
## owners5000000-10000000         3.795
## owners50000000-100000000       0.000
## price                          0.000
```

# Forward Step-Wise

```
steam_fit_fwd <- regsubsets(successfulGame ~ ., data = steam_subset, nvmax = 8, method = 'forward')
summary(steam_fit_fwd)
```

```
## Subset selection object
## Call: regsubsets.formula(successfulGame ~ ., data = steam_subset, nvmax = 8,
##     method = "forward")
## 66 Variables  (and intercept)
##                                       Forced in Forced out
## required_age                            FALSE      FALSE
## categoriesCo-op                         FALSE      FALSE
## categoriesCross-Platform Multiplayer    FALSE      FALSE
## categoriesFull controller support       FALSE      FALSE
## categoriesIn-App Purchases              FALSE      FALSE
## categoriesIncludes level editor         FALSE      FALSE
## categoriesIncludes Source SDK           FALSE      FALSE
## categoriesLocal Co-op                   FALSE      FALSE
## categoriesLocal Multi-Player            FALSE      FALSE
## categoriesMMO                           FALSE      FALSE
## categoriesMulti-player                  FALSE      FALSE
## categoriesOnline Co-op                  FALSE      FALSE
## categoriesOnline Multi-Player           FALSE      FALSE
## categoriesPartial Controller Support    FALSE      FALSE
## categoriesShared/Split Screen           FALSE      FALSE
## categoriesSingle-player                 FALSE      FALSE
## categoriesStats                         FALSE      FALSE
## categoriesSteam Achievements            FALSE      FALSE
## categoriesSteam Cloud                   FALSE      FALSE
## categoriesSteam Leaderboards            FALSE      FALSE
## categoriesSteam Trading Cards           FALSE      FALSE
## categoriesSteam Workshop                FALSE      FALSE
## categoriesVR Support                    FALSE      FALSE
## genresAction                            FALSE      FALSE
## genresAdventure                         FALSE      FALSE
## genresAnimation & Modeling              FALSE      FALSE
## genresAudio Production                  FALSE      FALSE
## genresCasual                            FALSE      FALSE
## genresDesign & Illustration             FALSE      FALSE
## genresEarly Access                      FALSE      FALSE
## genresEducation                         FALSE      FALSE
## genresFree to Play                      FALSE      FALSE
## genresGore                              FALSE      FALSE
## genresIndie                             FALSE      FALSE
## genresMassively Multiplayer             FALSE      FALSE
## genresNudity                            FALSE      FALSE
## genresPhoto Editing                     FALSE      FALSE
## genresRacing                            FALSE      FALSE
```

```
## genresRPG                                   FALSE      FALSE
## genresSexual Content                        FALSE      FALSE
## genresSimulation                            FALSE      FALSE
## genresSoftware Training                      FALSE      FALSE
## genresSports                                FALSE      FALSE
## genresStrategy                              FALSE      FALSE
## genresUtilities                             FALSE      FALSE
## genresVideo Production                       FALSE      FALSE
## genresViolent                               FALSE      FALSE
## genresWeb Publishing                         FALSE      FALSE
## achievements                                FALSE      FALSE
## positive_ratings                            FALSE      FALSE
## negative_ratings                            FALSE      FALSE
## average_playtime                            FALSE      FALSE
## median_playtime                             FALSE      FALSE
## owners100000-200000                         FALSE      FALSE
## owners1000000-2000000                       FALSE      FALSE
## owners10000000-20000000                     FALSE      FALSE
## owners100000000-200000000                   FALSE      FALSE
## owners20000-50000                           FALSE      FALSE
## owners200000-500000                         FALSE      FALSE
## owners2000000-5000000                       FALSE      FALSE
## owners20000000-50000000                     FALSE      FALSE
## owners50000-100000                          FALSE      FALSE
## owners500000-1000000                        FALSE      FALSE
## owners5000000-10000000                      FALSE      FALSE
## owners50000000-100000000                    FALSE      FALSE
## price                                       FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: forward
##          required_age categoriesCo-op categoriesCross-Platform Multiplayer
## 1  ( 1 ) " "          " "             " "
## 2  ( 1 ) " "          " "             " "
## 3  ( 1 ) " "          " "             " "
## 4  ( 1 ) " "          " "             " "
## 5  ( 1 ) " "          " "             " "
## 6  ( 1 ) " "          " "             " "
## 7  ( 1 ) " "          " "             " "
## 8  ( 1 ) " "          " "             " "
##          categoriesFull controller support categoriesIn-App Purchases
## 1  ( 1 ) " "                                " "
## 2  ( 1 ) " "                                " "
## 3  ( 1 ) " "                                " "
## 4  ( 1 ) " "                                " "
## 5  ( 1 ) " "                                " "
## 6  ( 1 ) " "                                " "
## 7  ( 1 ) " "                                " "
## 8  ( 1 ) " "                                " "
##          categoriesIncludes level editor categoriesIncludes Source SDK
## 1  ( 1 ) " "                              " "
## 2  ( 1 ) " "                              " "
## 3  ( 1 ) " "                              " "
## 4  ( 1 ) " "                              " "
## 5  ( 1 ) " "                              " "
```

```
## 6   ( 1 ) " "                                    " "
## 7   ( 1 ) " "                                    " "
## 8   ( 1 ) " "                                    " "
##           categoriesLocal Co-op categoriesLocal Multi-Player categoriesMMO
## 1   ( 1 ) " "                   " "                          " "
## 2   ( 1 ) " "                   " "                          " "
## 3   ( 1 ) " "                   " "                          " "
## 4   ( 1 ) " "                   " "                          " "
## 5   ( 1 ) " "                   " "                          " "
## 6   ( 1 ) " "                   " "                          " "
## 7   ( 1 ) " "                   " "                          " "
## 8   ( 1 ) " "                   " "                          " "
##           categoriesMulti-player categoriesOnline Co-op
## 1   ( 1 ) " "                    " "
## 2   ( 1 ) " "                    " "
## 3   ( 1 ) " "                    " "
## 4   ( 1 ) " "                    " "
## 5   ( 1 ) " "                    " "
## 6   ( 1 ) " "                    " "
## 7   ( 1 ) " "                    " "
## 8   ( 1 ) " "                    " "
##           categoriesOnline Multi-Player
## 1   ( 1 ) " "
## 2   ( 1 ) " "
## 3   ( 1 ) " "
## 4   ( 1 ) " "
## 5   ( 1 ) " "
## 6   ( 1 ) " "
## 7   ( 1 ) " "
## 8   ( 1 ) " "
##           categoriesPartial Controller Support
## 1   ( 1 ) " "
## 2   ( 1 ) " "
## 3   ( 1 ) " "
## 4   ( 1 ) " "
## 5   ( 1 ) " "
## 6   ( 1 ) " "
## 7   ( 1 ) " "
## 8   ( 1 ) " "
##           categoriesShared/Split Screen categoriesSingle-player
## 1   ( 1 ) " "                           " "
## 2   ( 1 ) " "                           " "
## 3   ( 1 ) " "                           " "
## 4   ( 1 ) " "                           " "
## 5   ( 1 ) " "                           " "
## 6   ( 1 ) " "                           " "
## 7   ( 1 ) " "                           " "
## 8   ( 1 ) " "                           " "
##           categoriesStats categoriesSteam Achievements
## 1   ( 1 ) " "             " "
## 2   ( 1 ) " "             " "
## 3   ( 1 ) " "             " "
## 4   ( 1 ) " "             " "
## 5   ( 1 ) " "             " "
```

```
## 6 ( 1 ) " "              " "
## 7 ( 1 ) " "              " "
## 8 ( 1 ) " "              " "
##          categoriesSteam Cloud categoriesSteam Leaderboards
## 1 ( 1 ) " "                    " "
## 2 ( 1 ) " "                    " "
## 3 ( 1 ) " "                    " "
## 4 ( 1 ) " "                    " "
## 5 ( 1 ) " "                    " "
## 6 ( 1 ) " "                    " "
## 7 ( 1 ) " "                    " "
## 8 ( 1 ) " "                    " "
##          categoriesSteam Trading Cards categoriesSteam Workshop
## 1 ( 1 ) " "                           " "
## 2 ( 1 ) " "                           " "
## 3 ( 1 ) " "                           " "
## 4 ( 1 ) " "                           " "
## 5 ( 1 ) " "                           " "
## 6 ( 1 ) " "                           " "
## 7 ( 1 ) " "                           " "
## 8 ( 1 ) " "                           " "
##          categoriesVR Support genresAction genresAdventure
## 1 ( 1 ) " "                  " "         " "
## 2 ( 1 ) " "                  " "         " "
## 3 ( 1 ) " "                  " "         " "
## 4 ( 1 ) " "                  " "         " "
## 5 ( 1 ) " "                  " "         " "
## 6 ( 1 ) " "                  " "         " "
## 7 ( 1 ) " "                  " "         " "
## 8 ( 1 ) " "                  " "         " "
##          genresAnimation & Modeling genresAudio Production genresCasual
## 1 ( 1 ) " "                         " "                    " "
## 2 ( 1 ) " "                         " "                    " "
## 3 ( 1 ) " "                         " "                    " "
## 4 ( 1 ) " "                         " "                    " "
## 5 ( 1 ) " "                         " "                    " "
## 6 ( 1 ) " "                         " "                    " "
## 7 ( 1 ) " "                         " "                    " "
## 8 ( 1 ) " "                         " "                    " "
##          genresDesign & Illustration genresEarly Access genresEducation
## 1 ( 1 ) " "                          " "                " "
## 2 ( 1 ) " "                          " "                " "
## 3 ( 1 ) " "                          " "                " "
## 4 ( 1 ) " "                          " "                " "
## 5 ( 1 ) " "                          " "                " "
## 6 ( 1 ) " "                          " "                " "
## 7 ( 1 ) " "                          " "                " "
## 8 ( 1 ) " "                          " "                " "
##          genresFree to Play genresGore genresIndie
## 1 ( 1 ) " "                " "        " "
## 2 ( 1 ) " "                " "        " "
## 3 ( 1 ) " "                " "        " "
## 4 ( 1 ) " "                " "        " "
## 5 ( 1 ) " "                " "        " "
```

```
## 6  ( 1 ) " "                " "           " "
## 7  ( 1 ) " "                " "           " "
## 8  ( 1 ) " "                " "           " "
##          genresMassively Multiplayer genresNudity genresPhoto Editing
## 1  ( 1 ) " "                         " "          " "
## 2  ( 1 ) " "                         " "          " "
## 3  ( 1 ) " "                         " "          " "
## 4  ( 1 ) " "                         " "          " "
## 5  ( 1 ) " "                         " "          " "
## 6  ( 1 ) " "                         " "          " "
## 7  ( 1 ) " "                         " "          " "
## 8  ( 1 ) " "                         " "          " "
##          genresRacing genresRPG genresSexual Content genresSimulation
## 1  ( 1 ) " "          " "       " "                  " "
## 2  ( 1 ) " "          " "       " "                  " "
## 3  ( 1 ) " "          " "       " "                  " "
## 4  ( 1 ) " "          " "       " "                  " "
## 5  ( 1 ) " "          " "       " "                  " "
## 6  ( 1 ) " "          " "       " "                  " "
## 7  ( 1 ) " "          " "       " "                  " "
## 8  ( 1 ) " "          " "       " "                  " "
##          genresSoftware Training genresSports genresStrategy
## 1  ( 1 ) " "                     " "          " "
## 2  ( 1 ) " "                     " "          " "
## 3  ( 1 ) " "                     " "          " "
## 4  ( 1 ) " "                     " "          " "
## 5  ( 1 ) " "                     " "          " "
## 6  ( 1 ) " "                     " "          " "
## 7  ( 1 ) " "                     " "          " "
## 8  ( 1 ) " "                     " "          " "
##          genresUtilities genresVideo Production genresViolent
## 1  ( 1 ) " "             " "                    " "
## 2  ( 1 ) " "             " "                    " "
## 3  ( 1 ) " "             " "                    " "
## 4  ( 1 ) " "             " "                    " "
## 5  ( 1 ) " "             " "                    " "
## 6  ( 1 ) " "             " "                    " "
## 7  ( 1 ) " "             " "                    " "
## 8  ( 1 ) " "             " "                    " "
##          genresWeb Publishing achievements positive_ratings
## 1  ( 1 ) " "                  " "          " "
## 2  ( 1 ) " "                  " "          " "
## 3  ( 1 ) " "                  " "          " "
## 4  ( 1 ) " "                  " "          " "
## 5  ( 1 ) " "                  " "          " "
## 6  ( 1 ) " "                  " "          " "
## 7  ( 1 ) " "                  " "          " "
## 8  ( 1 ) " "                  " "          " "
##          negative_ratings average_playtime median_playtime
## 1  ( 1 ) " "              " "              " "
## 2  ( 1 ) " "              " "              " "
## 3  ( 1 ) " "              " "              " "
## 4  ( 1 ) " "              " "              " "
## 5  ( 1 ) " "              " "              " "
```

```
## 6  ( 1 ) "*"                    " "                    " "
## 7  ( 1 ) "*"                    " "                    " "
## 8  ( 1 ) "*"                    " "                    " "
##           owners100000-200000 owners1000000-2000000 owners10000000-20000000
## 1  ( 1 ) " "                    "*"                    " "
## 2  ( 1 ) " "                    "*"                    " "
## 3  ( 1 ) " "                    "*"                    " "
## 4  ( 1 ) " "                    "*"                    "*"
## 5  ( 1 ) " "                    "*"                    "*"
## 6  ( 1 ) " "                    "*"                    "*"
## 7  ( 1 ) " "                    "*"                    "*"
## 8  ( 1 ) " "                    "*"                    "*"
##           owners100000000-200000000 owners20000-50000 owners200000-500000
## 1  ( 1 ) " "                        " "                " "
## 2  ( 1 ) " "                        " "                " "
## 3  ( 1 ) " "                        " "                " "
## 4  ( 1 ) " "                        " "                " "
## 5  ( 1 ) " "                        " "                " "
## 6  ( 1 ) " "                        " "                " "
## 7  ( 1 ) "*"                        " "                " "
## 8  ( 1 ) "*"                        " "                " "
##           owners2000000-5000000 owners20000000-50000000 owners50000-100000
## 1  ( 1 ) " "                    " "                     " "
## 2  ( 1 ) "*"                    " "                     " "
## 3  ( 1 ) "*"                    " "                     " "
## 4  ( 1 ) "*"                    " "                     " "
## 5  ( 1 ) "*"                    "*"                     " "
## 6  ( 1 ) "*"                    "*"                     " "
## 7  ( 1 ) "*"                    "*"                     " "
## 8  ( 1 ) "*"                    "*"                     " "
##           owners500000-1000000 owners5000000-10000000
## 1  ( 1 ) " "                   " "
## 2  ( 1 ) " "                   " "
## 3  ( 1 ) " "                   "*"
## 4  ( 1 ) " "                   "*"
## 5  ( 1 ) " "                   "*"
## 6  ( 1 ) " "                   "*"
## 7  ( 1 ) " "                   "*"
## 8  ( 1 ) " "                   "*"
##           owners50000000-100000000 price
## 1  ( 1 ) " "                       " "
## 2  ( 1 ) " "                       " "
## 3  ( 1 ) " "                       " "
## 4  ( 1 ) " "                       " "
## 5  ( 1 ) " "                       " "
## 6  ( 1 ) " "                       " "
## 7  ( 1 ) " "                       " "
## 8  ( 1 ) "*"                       " "
```

## Backward Step-Wise

```
steam_fit_bwd <- regsubsets(successfulGame ~ ., data = steam_subset, nvmax = 8, method = 'backward')
summary(steam_fit_bwd)
```

```
## Subset selection object
## Call: regsubsets.formula(successfulGame ~ ., data = steam_subset, nvmax = 8,
##     method = "backward")
## 66 Variables  (and intercept)
##                                      Forced in Forced out
## required_age                           FALSE      FALSE
## categoriesCo-op                        FALSE      FALSE
## categoriesCross-Platform Multiplayer   FALSE      FALSE
## categoriesFull controller support      FALSE      FALSE
## categoriesIn-App Purchases             FALSE      FALSE
## categoriesIncludes level editor        FALSE      FALSE
## categoriesIncludes Source SDK          FALSE      FALSE
## categoriesLocal Co-op                  FALSE      FALSE
## categoriesLocal Multi-Player           FALSE      FALSE
## categoriesMMO                          FALSE      FALSE
## categoriesMulti-player                 FALSE      FALSE
## categoriesOnline Co-op                 FALSE      FALSE
## categoriesOnline Multi-Player          FALSE      FALSE
## categoriesPartial Controller Support   FALSE      FALSE
## categoriesShared/Split Screen          FALSE      FALSE
## categoriesSingle-player                FALSE      FALSE
## categoriesStats                        FALSE      FALSE
## categoriesSteam Achievements           FALSE      FALSE
## categoriesSteam Cloud                  FALSE      FALSE
## categoriesSteam Leaderboards           FALSE      FALSE
## categoriesSteam Trading Cards          FALSE      FALSE
## categoriesSteam Workshop               FALSE      FALSE
## categoriesVR Support                   FALSE      FALSE
## genresAction                           FALSE      FALSE
## genresAdventure                        FALSE      FALSE
## genresAnimation & Modeling             FALSE      FALSE
## genresAudio Production                 FALSE      FALSE
## genresCasual                           FALSE      FALSE
## genresDesign & Illustration            FALSE      FALSE
## genresEarly Access                     FALSE      FALSE
## genresEducation                        FALSE      FALSE
## genresFree to Play                     FALSE      FALSE
## genresGore                             FALSE      FALSE
## genresIndie                            FALSE      FALSE
## genresMassively Multiplayer            FALSE      FALSE
## genresNudity                           FALSE      FALSE
## genresPhoto Editing                    FALSE      FALSE
## genresRacing                           FALSE      FALSE
## genresRPG                              FALSE      FALSE
## genresSexual Content                   FALSE      FALSE
## genresSimulation                       FALSE      FALSE
## genresSoftware Training                FALSE      FALSE
## genresSports                           FALSE      FALSE
## genresStrategy                         FALSE      FALSE
## genresUtilities                        FALSE      FALSE
## genresVideo Production                 FALSE      FALSE
## genresViolent                          FALSE      FALSE
## genresWeb Publishing                   FALSE      FALSE
## achievements                           FALSE      FALSE
```

```
## positive_ratings                          FALSE      FALSE
## negative_ratings                          FALSE      FALSE
## average_playtime                          FALSE      FALSE
## median_playtime                           FALSE      FALSE
## owners100000-200000                       FALSE      FALSE
## owners1000000-2000000                     FALSE      FALSE
## owners10000000-20000000                   FALSE      FALSE
## owners100000000-200000000                 FALSE      FALSE
## owners20000-50000                         FALSE      FALSE
## owners200000-500000                       FALSE      FALSE
## owners2000000-5000000                     FALSE      FALSE
## owners20000000-50000000                   FALSE      FALSE
## owners50000-100000                        FALSE      FALSE
## owners500000-1000000                      FALSE      FALSE
## owners5000000-10000000                    FALSE      FALSE
## owners50000000-100000000                  FALSE      FALSE
## price                                     FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: backward
##          required_age categoriesCo-op categoriesCross-Platform Multiplayer
## 1  ( 1 ) " "          " "             " "
## 2  ( 1 ) " "          " "             " "
## 3  ( 1 ) " "          " "             " "
## 4  ( 1 ) " "          " "             " "
## 5  ( 1 ) " "          " "             " "
## 6  ( 1 ) " "          " "             " "
## 7  ( 1 ) " "          " "             " "
## 8  ( 1 ) " "          " "             " "
##          categoriesFull controller support categoriesIn-App Purchases
## 1  ( 1 ) " "                                " "
## 2  ( 1 ) " "                                " "
## 3  ( 1 ) " "                                " "
## 4  ( 1 ) " "                                " "
## 5  ( 1 ) " "                                " "
## 6  ( 1 ) " "                                " "
## 7  ( 1 ) " "                                " "
## 8  ( 1 ) " "                                " "
##          categoriesIncludes level editor categoriesIncludes Source SDK
## 1  ( 1 ) " "                              " "
## 2  ( 1 ) " "                              " "
## 3  ( 1 ) " "                              " "
## 4  ( 1 ) " "                              " "
## 5  ( 1 ) " "                              " "
## 6  ( 1 ) " "                              " "
## 7  ( 1 ) " "                              " "
## 8  ( 1 ) " "                              " "
##          categoriesLocal Co-op categoriesLocal Multi-Player categoriesMMO
## 1  ( 1 ) " "                   " "                          " "
## 2  ( 1 ) " "                   " "                          " "
## 3  ( 1 ) " "                   " "                          " "
## 4  ( 1 ) " "                   " "                          " "
## 5  ( 1 ) " "                   " "                          " "
## 6  ( 1 ) " "                   " "                          " "
## 7  ( 1 ) " "                   " "                          " "
```

```
## 8 ( 1 ) " "                         " "                              " "
##             categoriesMulti-player categoriesOnline Co-op
## 1 ( 1 ) " "                         " "
## 2 ( 1 ) " "                         " "
## 3 ( 1 ) " "                         " "
## 4 ( 1 ) " "                         " "
## 5 ( 1 ) " "                         " "
## 6 ( 1 ) " "                         " "
## 7 ( 1 ) " "                         " "
## 8 ( 1 ) " "                         " "
##             categoriesOnline Multi-Player
## 1 ( 1 ) " "
## 2 ( 1 ) " "
## 3 ( 1 ) " "
## 4 ( 1 ) " "
## 5 ( 1 ) " "
## 6 ( 1 ) " "
## 7 ( 1 ) " "
## 8 ( 1 ) " "
##             categoriesPartial Controller Support
## 1 ( 1 ) " "
## 2 ( 1 ) " "
## 3 ( 1 ) " "
## 4 ( 1 ) " "
## 5 ( 1 ) " "
## 6 ( 1 ) " "
## 7 ( 1 ) " "
## 8 ( 1 ) " "
##             categoriesShared/Split Screen categoriesSingle-player
## 1 ( 1 ) " "                              " "
## 2 ( 1 ) " "                              " "
## 3 ( 1 ) " "                              " "
## 4 ( 1 ) " "                              " "
## 5 ( 1 ) " "                              " "
## 6 ( 1 ) " "                              " "
## 7 ( 1 ) " "                              " "
## 8 ( 1 ) " "                              " "
##             categoriesStats categoriesSteam Achievements
## 1 ( 1 ) " "                " "
## 2 ( 1 ) " "                " "
## 3 ( 1 ) " "                " "
## 4 ( 1 ) " "                " "
## 5 ( 1 ) " "                " "
## 6 ( 1 ) " "                " "
## 7 ( 1 ) " "                " "
## 8 ( 1 ) " "                " "
##             categoriesSteam Cloud categoriesSteam Leaderboards
## 1 ( 1 ) " "                   " "
## 2 ( 1 ) " "                   " "
## 3 ( 1 ) " "                   " "
## 4 ( 1 ) " "                   " "
## 5 ( 1 ) " "                   " "
## 6 ( 1 ) " "                   " "
## 7 ( 1 ) " "                   " "
```

```
## 8   ( 1 ) " "                      " "
##            categoriesSteam Trading Cards categoriesSteam Workshop
## 1   ( 1 ) " "                           " "
## 2   ( 1 ) " "                           " "
## 3   ( 1 ) " "                           " "
## 4   ( 1 ) " "                           " "
## 5   ( 1 ) " "                           " "
## 6   ( 1 ) " "                           " "
## 7   ( 1 ) " "                           " "
## 8   ( 1 ) " "                           " "
##            categoriesVR Support genresAction genresAdventure
## 1   ( 1 ) " "                  " "          " "
## 2   ( 1 ) " "                  " "          " "
## 3   ( 1 ) " "                  " "          " "
## 4   ( 1 ) " "                  " "          " "
## 5   ( 1 ) " "                  " "          " "
## 6   ( 1 ) " "                  " "          " "
## 7   ( 1 ) " "                  " "          " "
## 8   ( 1 ) " "                  " "          " "
##            genresAnimation & Modeling genresAudio Production genresCasual
## 1   ( 1 ) " "                         " "                    " "
## 2   ( 1 ) " "                         " "                    " "
## 3   ( 1 ) " "                         " "                    " "
## 4   ( 1 ) " "                         " "                    " "
## 5   ( 1 ) " "                         " "                    " "
## 6   ( 1 ) " "                         " "                    " "
## 7   ( 1 ) " "                         " "                    " "
## 8   ( 1 ) " "                         " "                    " "
##            genresDesign & Illustration genresEarly Access genresEducation
## 1   ( 1 ) " "                          " "                " "
## 2   ( 1 ) " "                          " "                " "
## 3   ( 1 ) " "                          " "                " "
## 4   ( 1 ) " "                          " "                " "
## 5   ( 1 ) " "                          " "                " "
## 6   ( 1 ) " "                          " "                " "
## 7   ( 1 ) " "                          " "                " "
## 8   ( 1 ) " "                          " "                " "
##            genresFree to Play genresGore genresIndie
## 1   ( 1 ) " "                " "        " "
## 2   ( 1 ) " "                " "        " "
## 3   ( 1 ) " "                " "        " "
## 4   ( 1 ) " "                " "        " "
## 5   ( 1 ) " "                " "        " "
## 6   ( 1 ) " "                " "        " "
## 7   ( 1 ) " "                " "        " "
## 8   ( 1 ) " "                " "        " "
##            genresMassively Multiplayer genresNudity genresPhoto Editing
## 1   ( 1 ) " "                          " "          " "
## 2   ( 1 ) " "                          " "          " "
## 3   ( 1 ) " "                          " "          " "
## 4   ( 1 ) " "                          " "          " "
## 5   ( 1 ) " "                          " "          " "
## 6   ( 1 ) " "                          " "          " "
## 7   ( 1 ) " "                          " "          " "
```

```
## 8  ( 1 ) " "                          " "            " "
##          genresRacing genresRPG genresSexual Content genresSimulation
## 1  ( 1 ) " "          " "       " "                  " "
## 2  ( 1 ) " "          " "       " "                  " "
## 3  ( 1 ) " "          " "       " "                  " "
## 4  ( 1 ) " "          " "       " "                  " "
## 5  ( 1 ) " "          " "       " "                  " "
## 6  ( 1 ) " "          " "       " "                  " "
## 7  ( 1 ) " "          " "       " "                  " "
## 8  ( 1 ) " "          " "       " "                  " "
##          genresSoftware Training genresSports genresStrategy
## 1  ( 1 ) " "                      " "          " "
## 2  ( 1 ) " "                      " "          " "
## 3  ( 1 ) " "                      " "          " "
## 4  ( 1 ) " "                      " "          " "
## 5  ( 1 ) " "                      " "          " "
## 6  ( 1 ) " "                      " "          " "
## 7  ( 1 ) " "                      " "          " "
## 8  ( 1 ) " "                      " "          " "
##          genresUtilities genresVideo Production genresViolent
## 1  ( 1 ) " "             " "                    " "
## 2  ( 1 ) " "             " "                    " "
## 3  ( 1 ) " "             " "                    " "
## 4  ( 1 ) " "             " "                    " "
## 5  ( 1 ) " "             " "                    " "
## 6  ( 1 ) " "             " "                    " "
## 7  ( 1 ) " "             " "                    " "
## 8  ( 1 ) " "             " "                    " "
##          genresWeb Publishing achievements positive_ratings
## 1  ( 1 ) " "                   " "          " "
## 2  ( 1 ) " "                   " "          " "
## 3  ( 1 ) " "                   " "          " "
## 4  ( 1 ) " "                   " "          " "
## 5  ( 1 ) " "                   " "          " "
## 6  ( 1 ) " "                   " "          " "
## 7  ( 1 ) " "                   " "          " "
## 8  ( 1 ) " "                   " "          " "
##          negative_ratings average_playtime median_playtime
## 1  ( 1 ) " "               " "              " "
## 2  ( 1 ) " "               " "              " "
## 3  ( 1 ) " "               " "              " "
## 4  ( 1 ) " "               " "              " "
## 5  ( 1 ) " "               " "              " "
## 6  ( 1 ) " "               " "              " "
## 7  ( 1 ) " "               " "              " "
## 8  ( 1 ) " "               " "              " "
##          owners100000-200000 owners1000000-2000000 owners10000000-20000000
## 1  ( 1 ) " "                 "*"                   " "
## 2  ( 1 ) " "                 "*"                   " "
## 3  ( 1 ) " "                 "*"                   " "
## 4  ( 1 ) " "                 "*"                   "*"
## 5  ( 1 ) " "                 "*"                   "*"
## 6  ( 1 ) " "                 "*"                   "*"
## 7  ( 1 ) " "                 "*"                   "*"
```

```
## 8  ( 1 ) "*"                        "*"                       "*"
##          owners100000000-200000000 owners20000-50000 owners200000-500000
## 1  ( 1 ) " "                        " "               " "
## 2  ( 1 ) " "                        " "               " "
## 3  ( 1 ) " "                        " "               " "
## 4  ( 1 ) " "                        " "               " "
## 5  ( 1 ) " "                        " "               " "
## 6  ( 1 ) " "                        " "               " "
## 7  ( 1 ) "*"                        " "               " "
## 8  ( 1 ) "*"                        " "               " "
##          owners2000000-5000000 owners20000000-50000000 owners50000-100000
## 1  ( 1 ) " "                    " "                     " "
## 2  ( 1 ) "*"                    " "                     " "
## 3  ( 1 ) "*"                    " "                     " "
## 4  ( 1 ) "*"                    " "                     " "
## 5  ( 1 ) "*"                    "*"                     " "
## 6  ( 1 ) "*"                    "*"                     " "
## 7  ( 1 ) "*"                    "*"                     " "
## 8  ( 1 ) "*"                    "*"                     " "
##          owners500000-1000000 owners5000000-10000000
## 1  ( 1 ) " "                   " "
## 2  ( 1 ) " "                   " "
## 3  ( 1 ) " "                   "*"
## 4  ( 1 ) " "                   "*"
## 5  ( 1 ) " "                   "*"
## 6  ( 1 ) " "                   "*"
## 7  ( 1 ) " "                   "*"
## 8  ( 1 ) " "                   "*"
##          owners50000000-100000000 price
## 1  ( 1 ) " "                      " "
## 2  ( 1 ) " "                      " "
## 3  ( 1 ) " "                      " "
## 4  ( 1 ) " "                      " "
## 5  ( 1 ) " "                      " "
## 6  ( 1 ) "*"                      " "
## 7  ( 1 ) "*"                      " "
## 8  ( 1 ) "*"                      " "
```
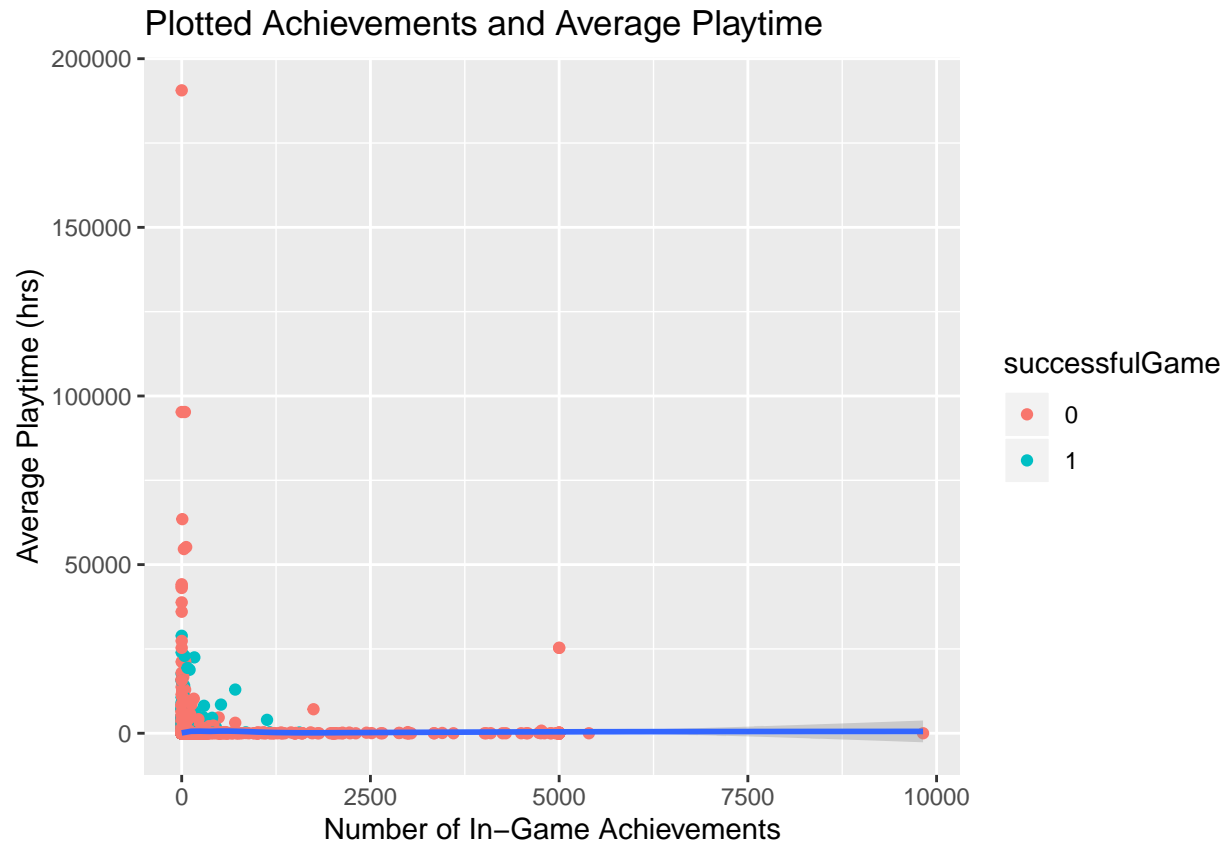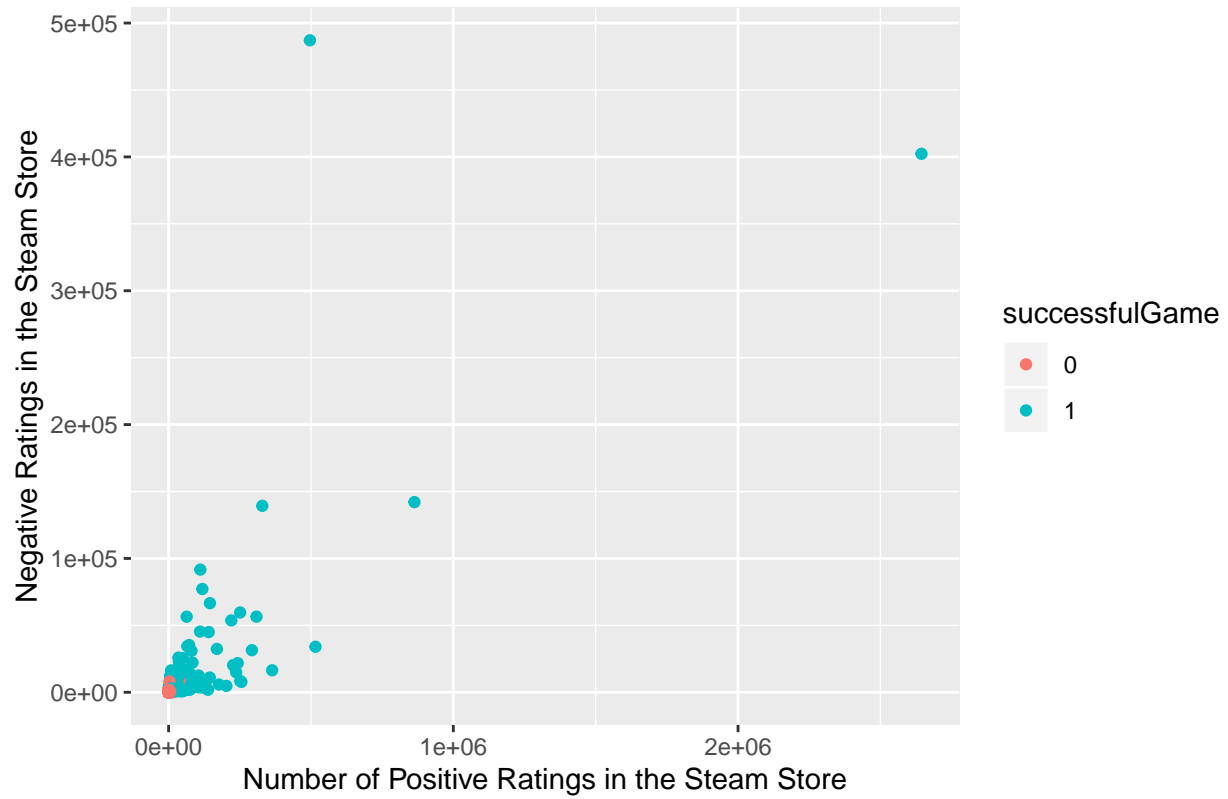
## Plots

```r
ggplot(steam_subset,aes(x = achievements,y = average_playtime)) + geom_point(aes(color = successfulGame
  geom_smooth() + labs(x = "Number of In-Game Achievements",y = "Average Playtime (hrs)",
                  title = "Plotted Achievements and Average Playtime")
```

```
## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```

## Plotted Achievements and Average Playtime



```
ggplot(steam_subset,aes(x = positive_ratings,y = negative_ratings)) +
  geom_point(aes(color = successfulGame))+
  labs(x = "Number of Positive Ratings in the Steam Store",y = "Negative Ratings in the Steam Store",
      title = "Positive Ratings Plotted Against Negative Ratings")
```

## Positive Ratings Plotted Against Negative Ratings



```
ggplot(steam_subset,aes(x = positive_ratings,y = average_playtime)) +geom_point(aes(color = successfulGa
  labs(x = "Number of Positive Ratings in the Steam Store",y = "Average Playtime (hrs)",
       title = "Average Playtime Plotted against Positive Ratings")
```

## Average Playtime Plotted against Positive Ratings
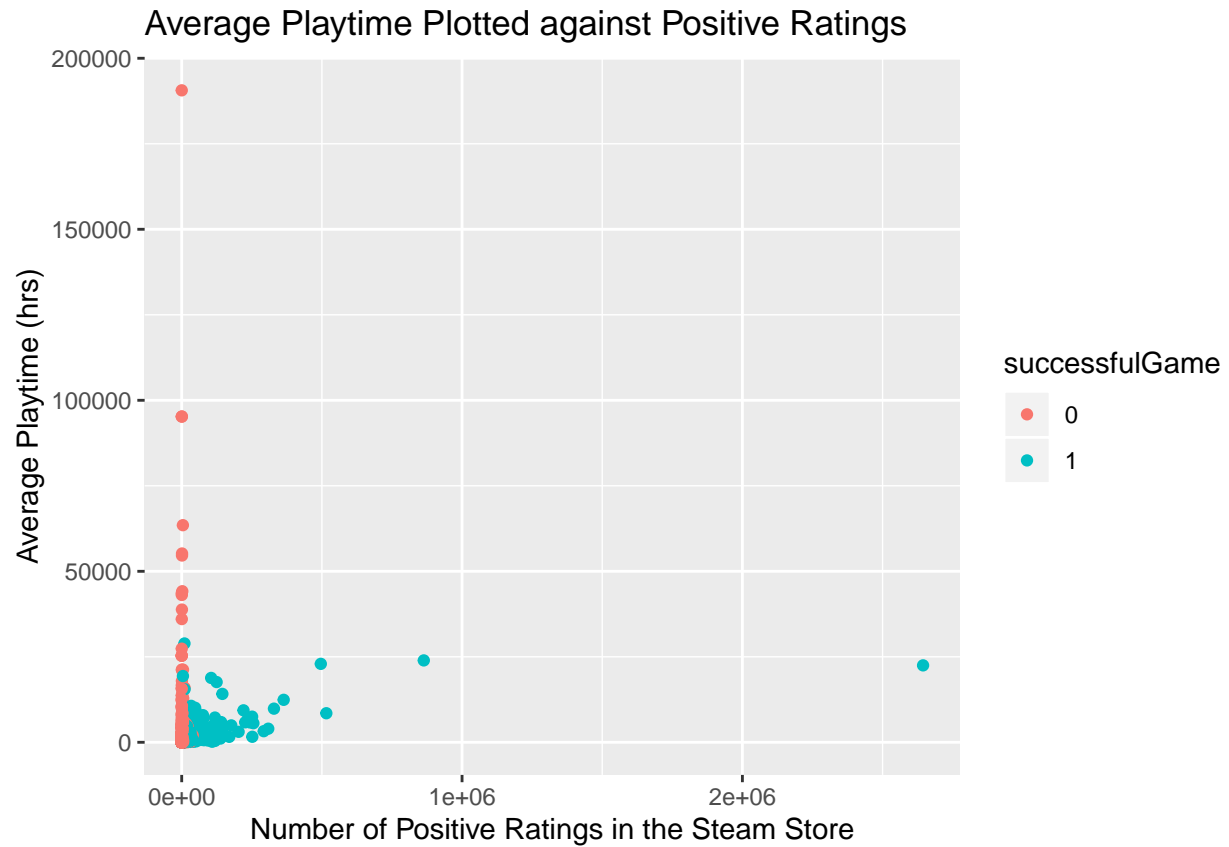


```
ggplot(steam_subset,aes(x = price,y = average_playtime)) +
  geom_point(aes(color = successfulGame)) +
  labs(x = "Price of the Game (dollars)",y ="Average Playtime (hrs)",
       title = "Average Playtime Plotted Against Price of Game")
```

Average Playtime Plotted Against Price of Game