Twitch Statistics Project

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2. Introduction

The goal of this analysis is to evaluate Twitch streamer data and make strategic recommendations for a content creator looking to succeed on the platform. The goal is to assist the content creator in making informed decisions and improving the performance of their Twitch channel.

1. Should there be a focus on mature content (18+) audience? What are the consequences one decides to do so in terms of audience reactions?
2. Does this choice lower or increase the chance of becoming a Twitch partner?
3. Is the effect of the stream minutes larger or smaller in mature content?

3. Data Description

Loading of our data-set and all the relevant libraries

```
twitch_data <- read.csv("twitch_data.csv")
library(gridExtra)
library(ggcorrplot)
```

```
library(tidyverse)
library(sjPlot)
```

We will first inspect the raw data set, such that we can take a look at the data we are working with. From this we can see the columns.

```
head(twitch_data, 4)
```

```
   Channel Watch.time.Minutes. Stream.time.minutes. Peak.viewers
1    xQcOW          6196161750               215250       222720
2 summit1g          6091677300               211845       310998
3   Gaules          5644590915               515280       387315
4 ESL_CSGO          3970318140               517740       300575
  Average.viewers Followers Followers.gained Views.gained Partnered Mature
1           27716   3246298          1734810     93036735       True  False
2           25610   5310163          1370184     89705964       True  False
3           10976   1767635          1023779    102611607       True   True
4            7714   3944850           703986    106546942       True  False
    Language
1    English
2    English
3 Portuguese
4    English
```

We want to firstly check if there are any missing/null values present in our data set.

```
print(any(sapply(twitch_data, is.null)))
```

```
[1] FALSE
```

From this, we can see that there is no missing data in any of the columns. As such, this means that we do not have to do much preliminary data cleaning.

The raw column names are in need of renaming for more consistency and future ease of access:

```
twitch_data <- twitch_data %>%
  rename(Watch.time.hours = Watch.time.Minutes.,
         Stream.time.hours = Stream.time.minutes.,
         Followers.delta = Followers.gained) %>%
```

```
  mutate(
    Watch.time.hours = Watch.time.hours / 60,
    Stream.time.hours = Stream.time.hours / 60
  )
```

4. Exploratory Data Analysis (EDA)

We can firstly take a look at the summary statistics of our data set.

```
summary(twitch_data)
```

```
   Channel           Watch.time.hours    Stream.time.hours  Peak.viewers
 Length:1000        Min.   :  2036548   Min.   :  57.75   Min.   :   496
 Class :character   1st Qu.:  2719832   1st Qu.:1229.31   1st Qu.:  9114
 Mode  :character   Median :  3916513   Median :1804.00   Median : 16676
                    Mean   :  6973799   Mean   :2008.59   Mean   : 37065
                    3rd Qu.:  7228999   3rd Qu.:2364.06   3rd Qu.: 37570
                    Max.   :103269362   Max.   :8690.75   Max.   :639375
 Average.viewers    Followers       Followers.delta    Views.gained
 Min.   :   235   Min.   :   3660   Min.   : -15772   Min.   :   175788
 1st Qu.:  1458   1st Qu.: 170546   1st Qu.:  43758   1st Qu.:  3880602
 Median :  2425   Median : 318063   Median :  98352   Median :  6456324
 Mean   :  4781   Mean   : 570054   Mean   : 205519   Mean   : 11668166
 3rd Qu.:  4786   3rd Qu.: 624332   3rd Qu.: 236131   3rd Qu.: 12196762
 Max.   :147643   Max.   :8938903   Max.   :3966525   Max.   :670137548
  Partnered            Mature            Language
 Length:1000        Length:1000        Length:1000
 Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character
```

These values provide an overview of the range, central tendency, and distribution of the metrics in the data set. Further analysis can provide deeper insights into relationships, trends, and patterns within the data.

One thing we can also already notice is that we have both numerical and nominal values. As such we can already split them up for convenience.

```r
numeric <- twitch_data %>%
  select_if(is.numeric)

nominal <- twitch_data %>%
  select_if(negate(is.numeric))

head(numeric)
```

```
  Watch.time.hours Stream.time.hours Peak.viewers Average.viewers Followers
1        103269363           3587.50       222720           27716   3246298
2        101527955           3530.75       310998           25610   5310163
3         94076515           8588.00       387315           10976   1767635
4         66171969           8629.00       300575            7714   3944850
5         61183335           2061.00       285644           29602   8938903
6         61146651           1371.00       263720           42414   1563438
  Followers.delta Views.gained
1         1734810     93036735
2         1370184     89705964
3         1023779    102611607
4          703986    106546942
5         2068424     78998587
6          554201     61715781
```

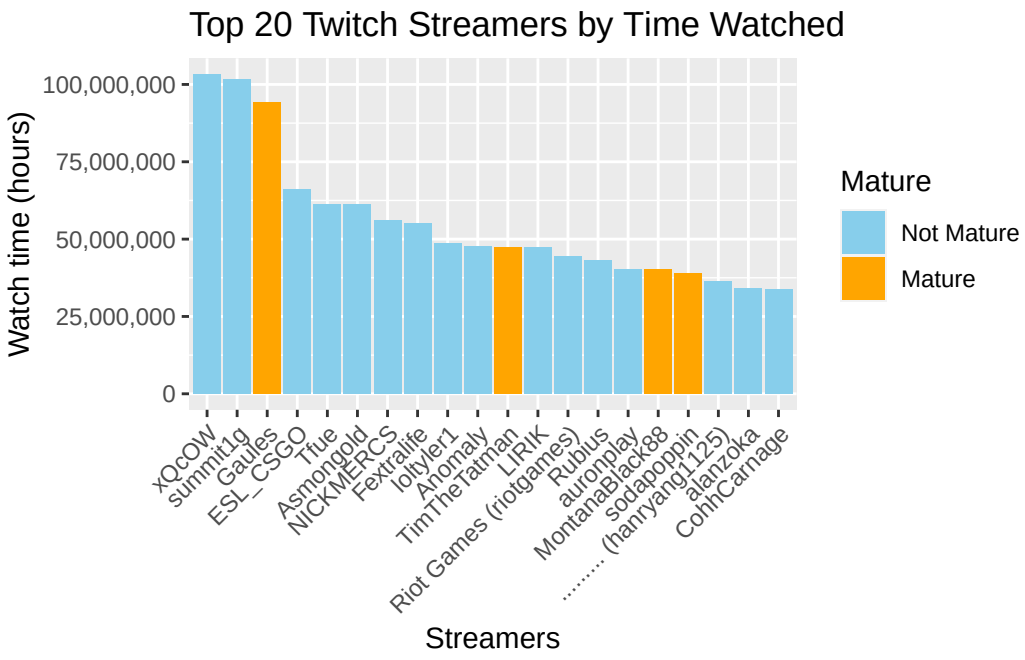
```r
head(nominal)
```

```
    Channel Partnered Mature   Language
1     xQcOW      True  False    English
2  summit1g      True  False    English
3    Gaules      True   True Portuguese
4  ESL_CSGO      True  False    English
5      Tfue      True  False    English
6 Asmongold      True  False    English
```

To gain some initial insight into the top performing Streamers on the platform, we can take a look at the top 10 Streamers by watch-time, as well as showing whether they are Mature or not.

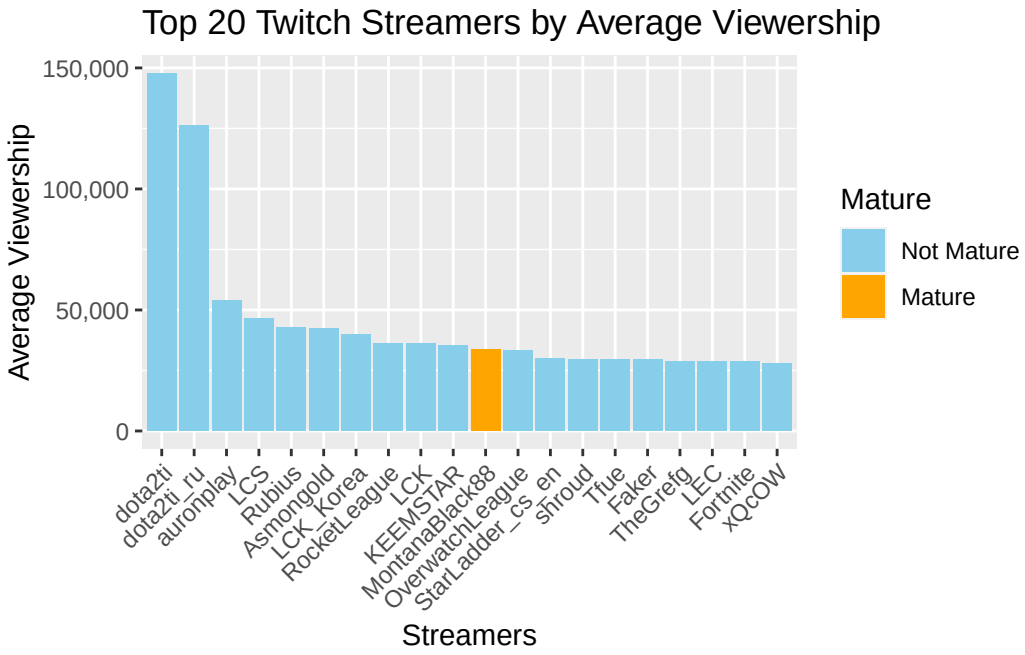
```r
top_20_streamers_watch_time <- twitch_data %>%
  arrange(desc(Watch.time.hours)) %>%
  head(20)
```

```r
suppressWarnings({
 ggplot(top_20_streamers_watch_time, aes(x = reorder(Channel, -Watch.time.hours), y = Watc
  scale_y_continuous(labels = scales::comma) +
  geom_bar(stat = "identity", position = "dodge") +
  scale_fill_manual(values = c("skyblue", "orange"), labels = c("Not Mature", "Mature")) +
  ggtitle("Top 20 Twitch Streamers by Time Watched") +
  xlab("Streamers") +
  ylab("Watch time (hours)") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
})
```




```r
top_20_streamers_avg_viewers <- twitch_data %>%
  arrange(desc(Average.viewers)) %>%
  head(20)

suppressWarnings({
 ggplot(top_20_streamers_avg_viewers, aes(x = reorder(Channel, -Average.viewers), y = Aver
  scale_y_continuous(labels = scales::comma) +
  geom_bar(stat = "identity", position = "dodge") +
  scale_fill_manual(values = c("skyblue", "orange"), labels = c("Not Mature", "Mature")) +
```

```
  ggtitle("Top 20 Twitch Streamers by Average Viewership") +
  xlab("Streamers") +
  ylab("Average Viewership") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
})
```




```
sprintf(
  "%.2f%% of streamers in the top 1000 stream to a mature audience.",
  nrow(twitch_data %>% filter(Mature == 'True')) / nrow(twitch_data) * 100
)
```

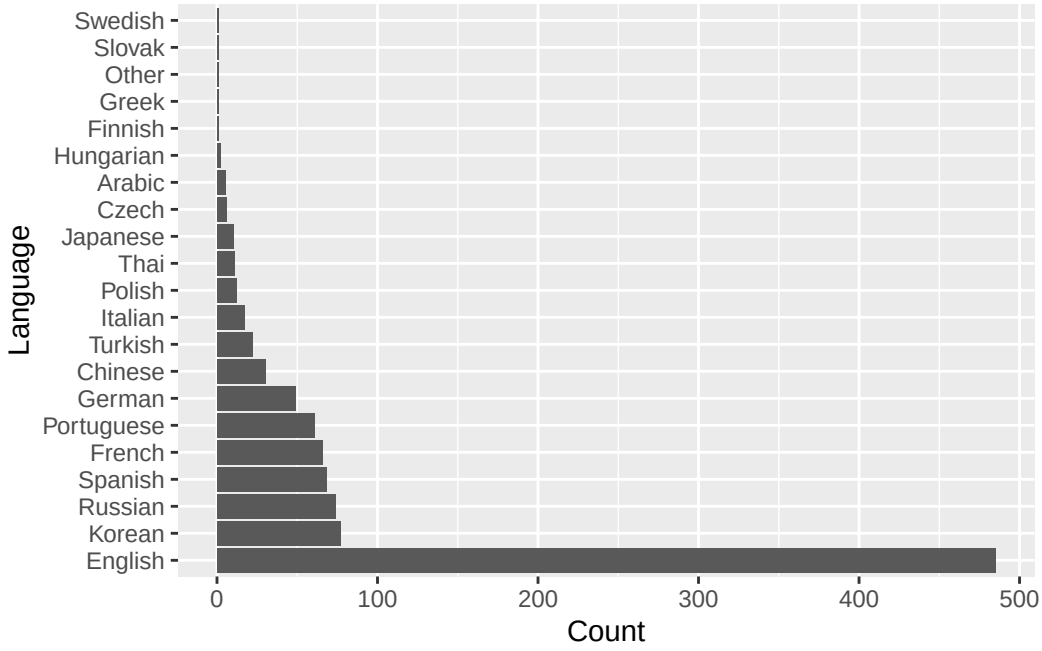
```
[1] "23.00% of streamers in the top 1000 stream to a mature audience."
```

```
sprintf(
  "Of that 23%%, %.2f%% of streamers that stream to a mature audience are also partnered."
  nrow(twitch_data %>% filter(Mature == 'True', Partnered == 'True')) / nrow(twitch_data %
)
```

```
[1] "Of that 23%, 97.83% of streamers that stream to a mature audience are also partnered."
```

Another important nominal variable to explore is, one of language in which the streamer streams:

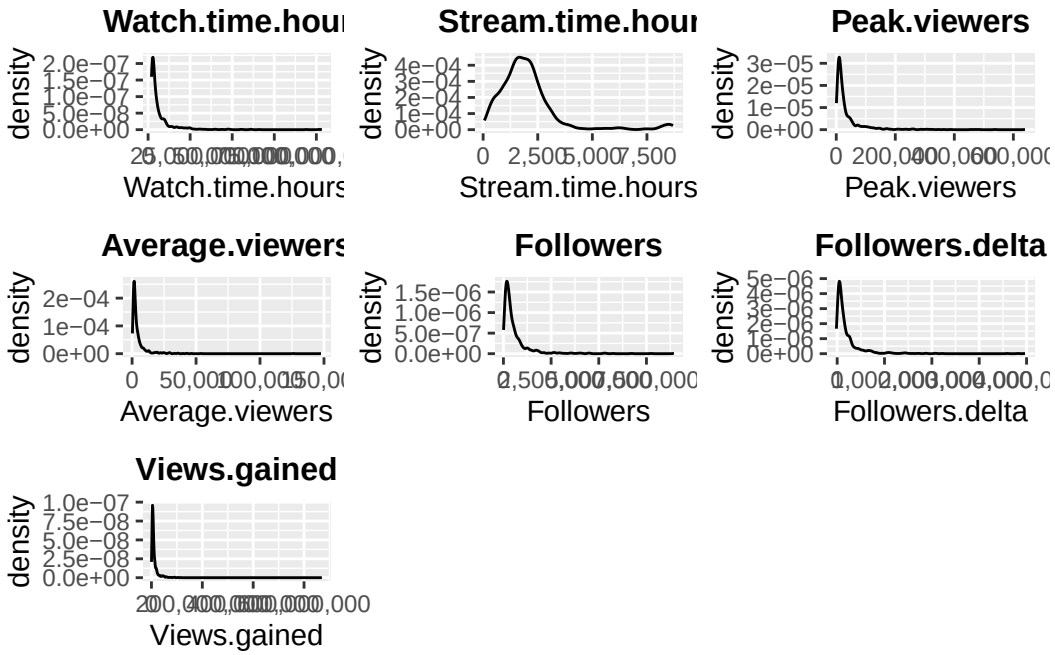
```
twitch_data %>%
  group_by(Language) %>%
  summarize(Count = n()) %>%
  ggplot(aes(x = reorder(Language, -Count), y = Count)) +
  geom_bar(stat = "identity") +
  labs(x = "Language", y = "Count") +
  coord_flip()
```



From this, we can see that nearly half of the top 1000 streamers, stream in the English language. This can be potentially an important indicator of success. This however can be immediately seen two ways, in one, more English speaking channels make it to the top 1000. This also means that there may be a lot more competition in this language!

```
# create a list of ggplot objects for each column
plots <- lapply(names(numeric), function(col) {
  ggplot(numeric, aes(x = !!sym(col))) +
    geom_density() +
    ggtitle(col) +
```

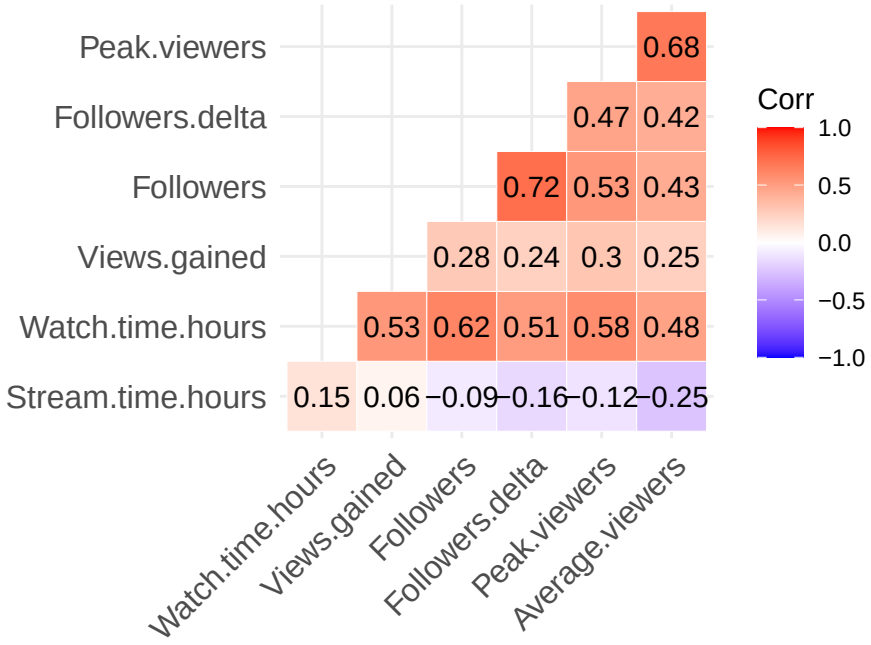
```
    theme(plot.title = element_text(size = 12, face = "bold", hjust = 0.5)) +
    scale_x_continuous(labels = scales::comma)
})

# plot the list of ggplot objects in a grid
grid.arrange(grobs = plots, ncol = 3)
```



From the plots above, we can clearly see that all of our data is extremely positively skewed, which means that our Mode and Median are quite a bit larger than the Mean. This can be explained by the fact that there are not that many streamers with extremely high values (e.g., watch time, viewers, or followers) compared to the majority of other channels. This can be observed in all wakes of society, for example income.

We may also take a look at the correlation between our numerical variables to see if there is any relationship we can observe.

```
ggcorrplot(cor(numeric), lab = TRUE, type = "lower", outline.col = "white",
           hc.order = TRUE)
```



We can consider the following 3 interesting insights gained from the matrix, though it must be kept in mind that correlation does not necessarily imply causation.

- Watch time hours have a strong positive correlation with followers (0.6202), meaning as watch time increases, follower count tends to increase as well.
- Peak viewers have a strong positive correlation with average viewers (0.6826), suggesting that higher peak viewership is associated with higher average viewership.
- Followers have a strong positive correlation with followers delta (0.7156), indicating that as the number of followers increases, the growth rate in followers also tends to increase.

5. Statistical Analysis

```
# Convert 'Language' columns to factor type
twitch_data$Language <- as.factor(twitch_data$Language)

# Check the updated types of all columns
sapply(twitch_data, class)
```

```
        Channel  Watch.time.hours Stream.time.hours      Peak.viewers
    "character"         "numeric"         "numeric"         "integer"
Average.viewers         Followers   Followers.delta      Views.gained
```

```
      "integer"         "integer"         "integer"         "integer"
      Partnered            Mature          Language
    "character"       "character"          "factor"
```

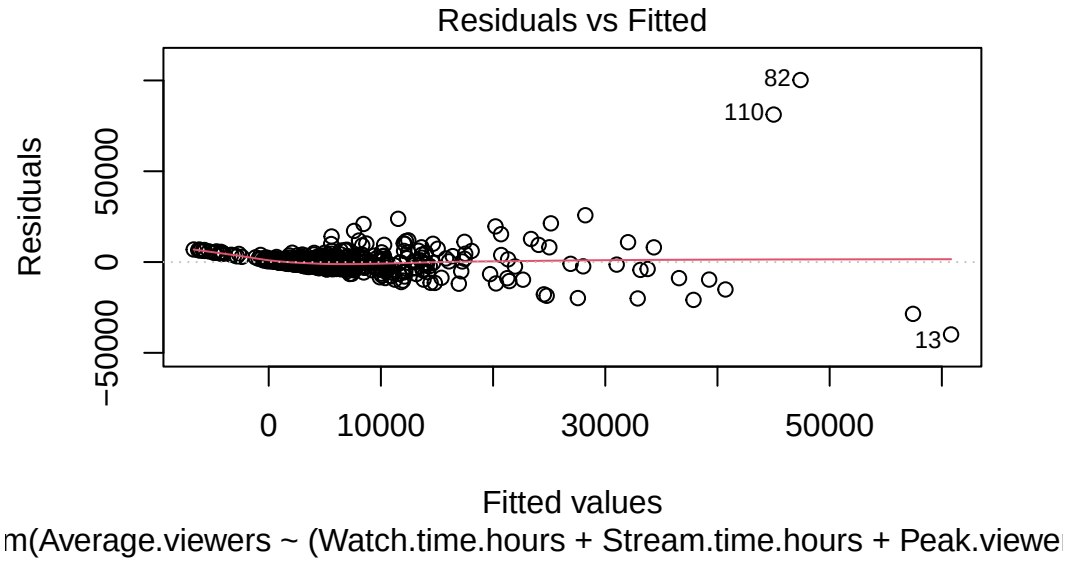
```r
model <- lm(
  Average.viewers ~ (Watch.time.hours + Stream.time.hours +
                       Peak.viewers + Followers + Followers.delta +
                       Views.gained + Partnered + Language) * Mature,
  data = twitch_data
)

summary(model)
```

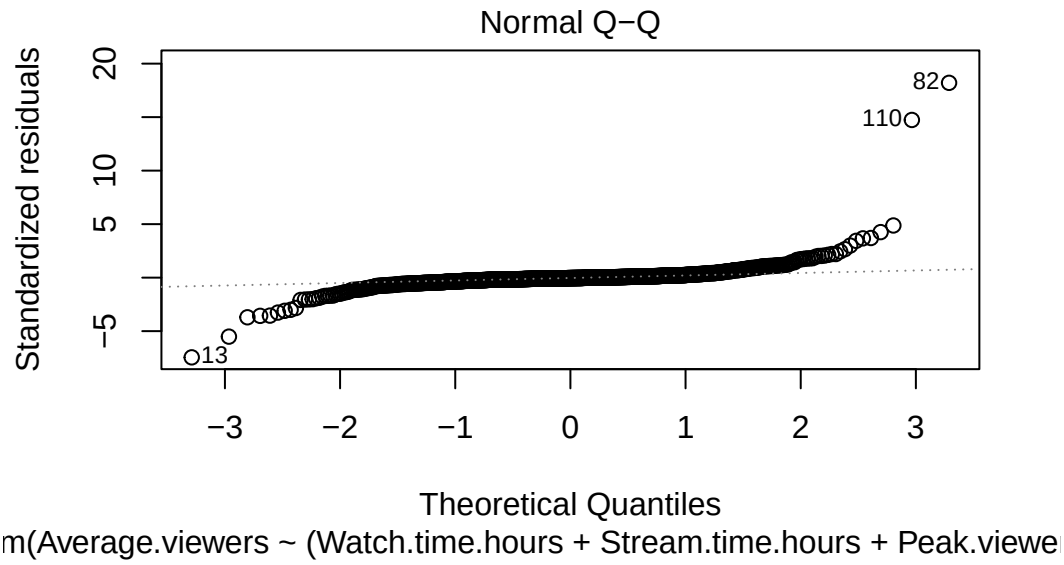
```
Call:
lm(formula = Average.viewers ~ (Watch.time.hours + Stream.time.hours +
    Peak.viewers + Followers + Followers.delta + Views.gained +
    Partnered + Language) * Mature, data = twitch_data)

Residuals:
   Min     1Q Median     3Q    Max
-39862  -1076   -235    703 100240

Coefficients: (7 not defined because of singularities)
                               Estimate Std. Error t value Pr(>|t|)
(Intercept)                   2.485e+03  3.019e+03   0.823  0.41063
Watch.time.hours              1.718e-04  3.654e-05   4.701 2.97e-06 ***
Stream.time.hours            -1.156e+00  1.557e-01  -7.426 2.49e-13 ***
Peak.viewers                  8.731e-02  4.336e-03  20.134  < 2e-16 ***
Followers                    -1.146e-03  4.065e-04  -2.820  0.00490 **
Followers.delta               2.687e-03  8.894e-04   3.022  0.00258 **
Views.gained                 -3.038e-06  8.915e-06  -0.341  0.73337
PartneredTrue                -1.959e+03  1.501e+03  -1.305  0.19214
LanguageChinese               4.012e+03  2.928e+03   1.370  0.17092
LanguageCzech                 2.213e+03  4.254e+03   0.520  0.60301
LanguageEnglish               2.353e+03  2.633e+03   0.894  0.37175
LanguageFinnish               4.505e+03  7.014e+03   0.642  0.52083
LanguageFrench                1.888e+03  2.737e+03   0.690  0.49043
LanguageGerman                2.212e+03  2.793e+03   0.792  0.42858
LanguageGreek                 2.572e+03  6.368e+03   0.404  0.68637
LanguageHungarian             7.518e+02  6.367e+03   0.118  0.90603
```

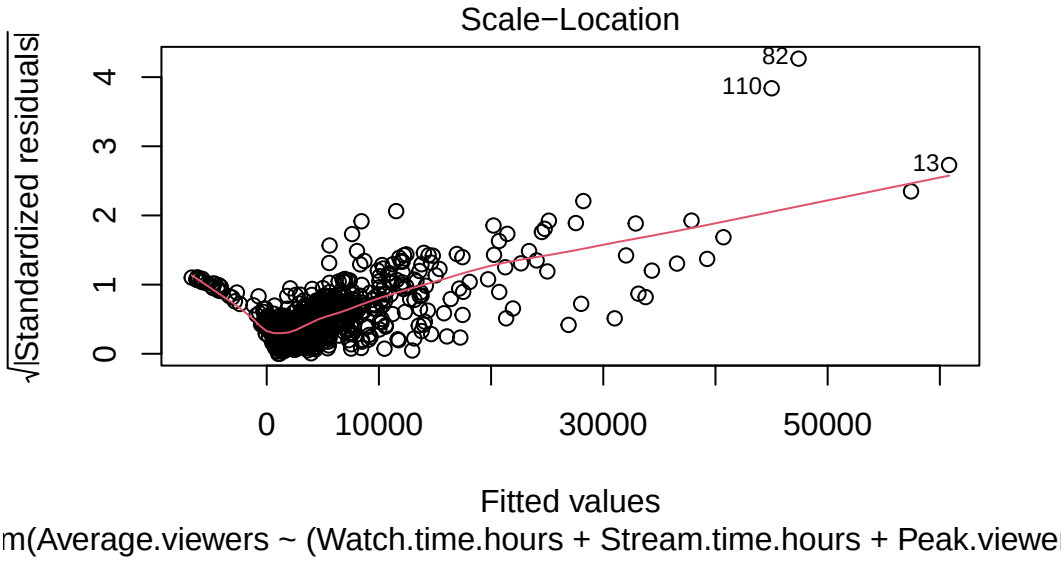
```
LanguageItalian                 1.668e+03  2.987e+03   0.558  0.57676
LanguageJapanese                3.923e+03  3.204e+03   1.224  0.22107
LanguageKorean                  3.099e+03  2.703e+03   1.147  0.25185
LanguageOther                   1.426e+03  6.568e+03   0.217  0.82821
LanguagePolish                  2.215e+03  3.148e+03   0.704  0.48186
LanguagePortuguese              1.680e+03  2.752e+03   0.610  0.54175
LanguageRussian                 2.735e+03  2.715e+03   1.007  0.31398
LanguageSlovak                  2.940e+03  6.371e+03   0.461  0.64455
LanguageSpanish                 7.574e+02  2.711e+03   0.279  0.78003
LanguageSwedish                 3.125e+03  6.987e+03   0.447  0.65477
LanguageThai                    2.714e+03  3.331e+03   0.815  0.41545
LanguageTurkish                 2.454e+03  2.983e+03   0.823  0.41079
MatureTrue                     -5.989e+02  4.328e+03  -0.138  0.88998
Watch.time.hours:MatureTrue     2.033e-04  1.554e-04   1.308  0.19114
Stream.time.hours:MatureTrue    9.146e-02  4.179e-01   0.219  0.82684
Peak.viewers:MatureTrue        -6.848e-02  1.290e-02  -5.307 1.38e-07 ***
Followers:MatureTrue            3.864e-03  1.278e-03   3.025  0.00256 **
Followers.delta:MatureTrue      7.383e-04  3.611e-03   0.204  0.83803
Views.gained:MatureTrue        -2.273e-04  1.497e-04  -1.518  0.12936
PartneredTrue:MatureTrue        3.573e+02  3.137e+03   0.114  0.90934
LanguageChinese:MatureTrue      6.311e+02  3.701e+03   0.171  0.86463
LanguageCzech:MatureTrue        9.852e+02  5.544e+03   0.178  0.85900
LanguageEnglish:MatureTrue     -1.013e+02  3.025e+03  -0.034  0.97328
LanguageFinnish:MatureTrue             NA         NA      NA       NA
LanguageFrench:MatureTrue       6.897e+02  3.346e+03   0.206  0.83675
LanguageGerman:MatureTrue       1.170e+03  3.457e+03   0.339  0.73497
LanguageGreek:MatureTrue               NA         NA      NA       NA
LanguageHungarian:MatureTrue    2.098e+03  8.690e+03   0.241  0.80926
LanguageItalian:MatureTrue      9.997e+02  6.656e+03   0.150  0.88065
LanguageJapanese:MatureTrue            NA         NA      NA       NA
LanguageKorean:MatureTrue       1.871e+03  6.554e+03   0.285  0.77533
LanguageOther:MatureTrue               NA         NA      NA       NA
LanguagePolish:MatureTrue       1.364e+03  6.726e+03   0.203  0.83938
LanguagePortuguese:MatureTrue   1.372e+03  3.418e+03   0.401  0.68830
LanguageRussian:MatureTrue      1.737e+03  3.559e+03   0.488  0.62558
LanguageSlovak:MatureTrue              NA         NA      NA       NA
LanguageSpanish:MatureTrue      1.223e+03  3.501e+03   0.349  0.72701
LanguageSwedish:MatureTrue             NA         NA      NA       NA
LanguageThai:MatureTrue         1.256e+03  4.884e+03   0.257  0.79705
LanguageTurkish:MatureTrue             NA         NA      NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

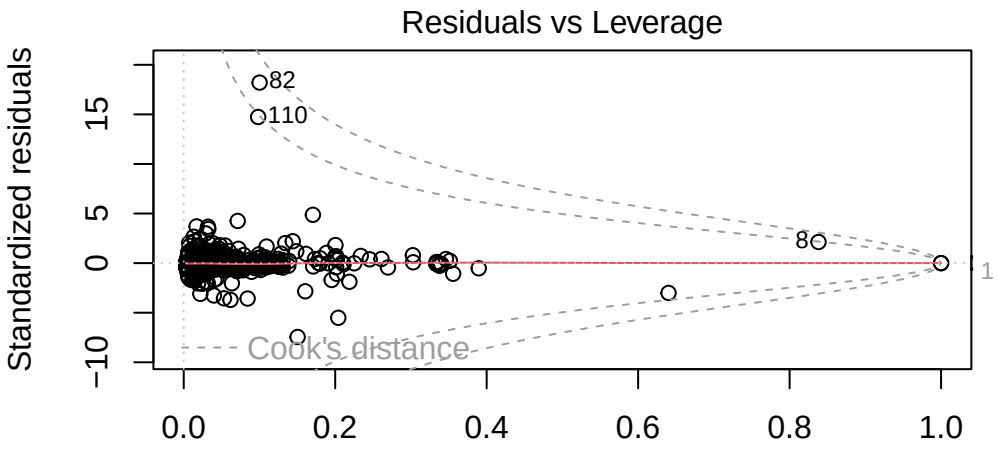
```
Residual standard error: 5804 on 951 degrees of freedom
Multiple R-squared:  0.5512,    Adjusted R-squared:  0.5286
F-statistic: 24.34 on 48 and 951 DF,  p-value: < 2.2e-16
```

```r
plot(model)
```




Normal Q−Q
Standardized residuals
20
10
5
−5
82
110
13
−3
−2
−1
0
1
2
3
Theoretical Quantiles
m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe

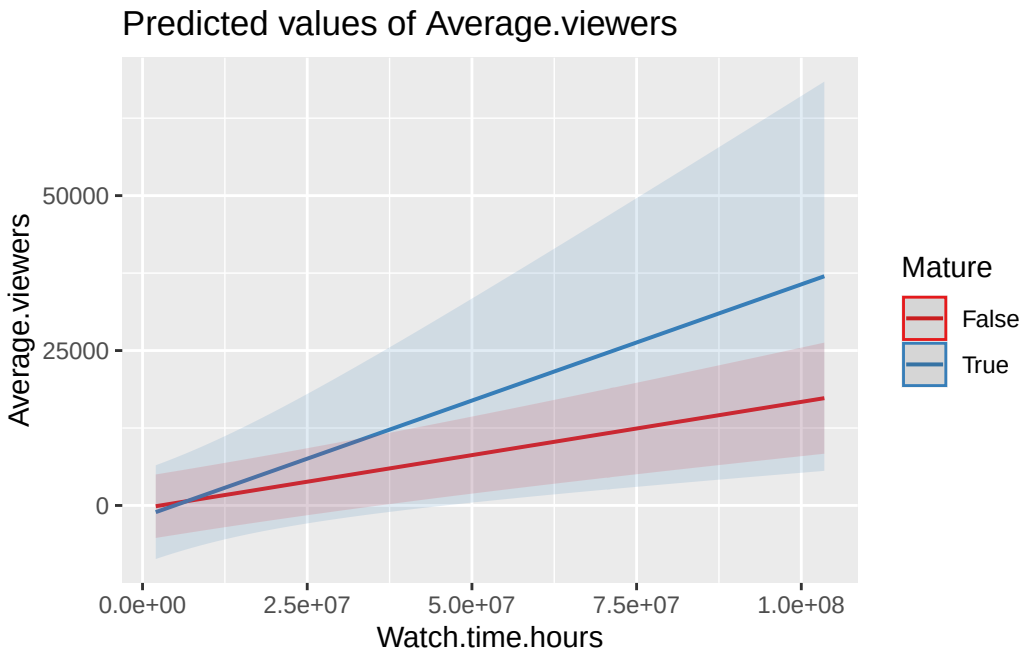

Scale−Location
√|Standardized residuals|
4
3
2
1
0
82
110
13
0
10000
30000
50000
Fitted values
m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe



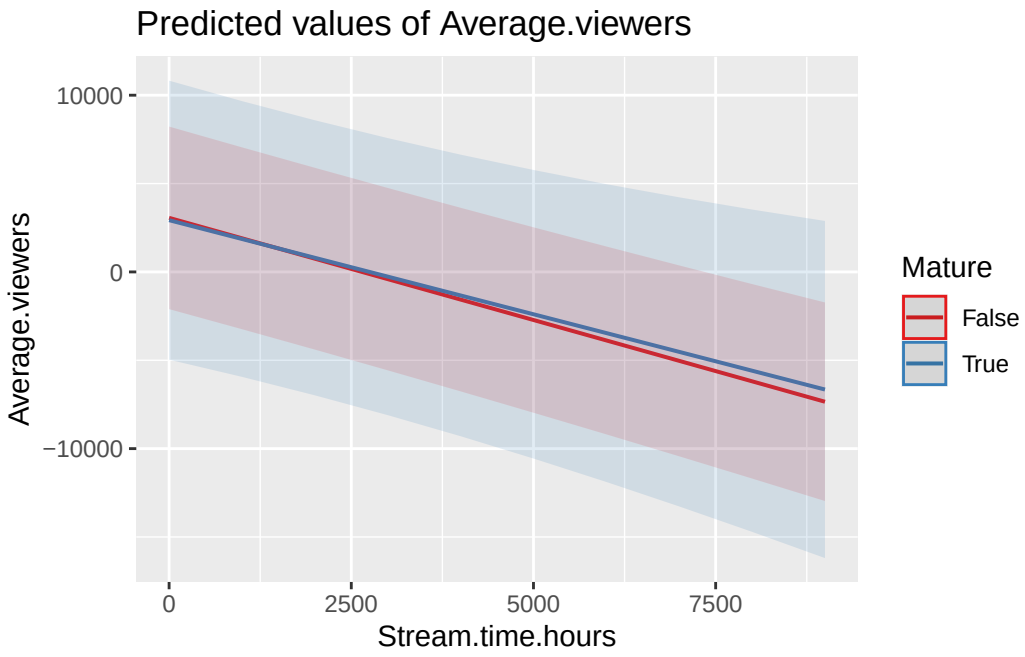
m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe

```
plot_model(model, type="int")
```

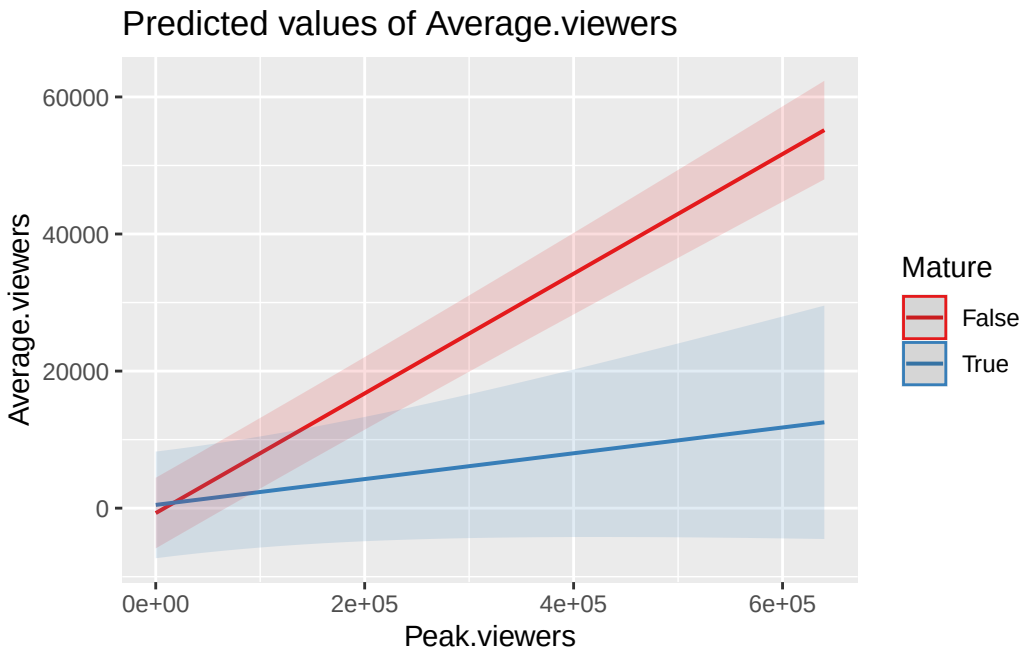
```
[[1]]
```


Predicted values of Average.viewers
Average.viewers
50000
25000
0
0.0e+00
2.5e+07
5.0e+07
7.5e+07
1.0e+08
Watch.time.hours
Mature
False
True

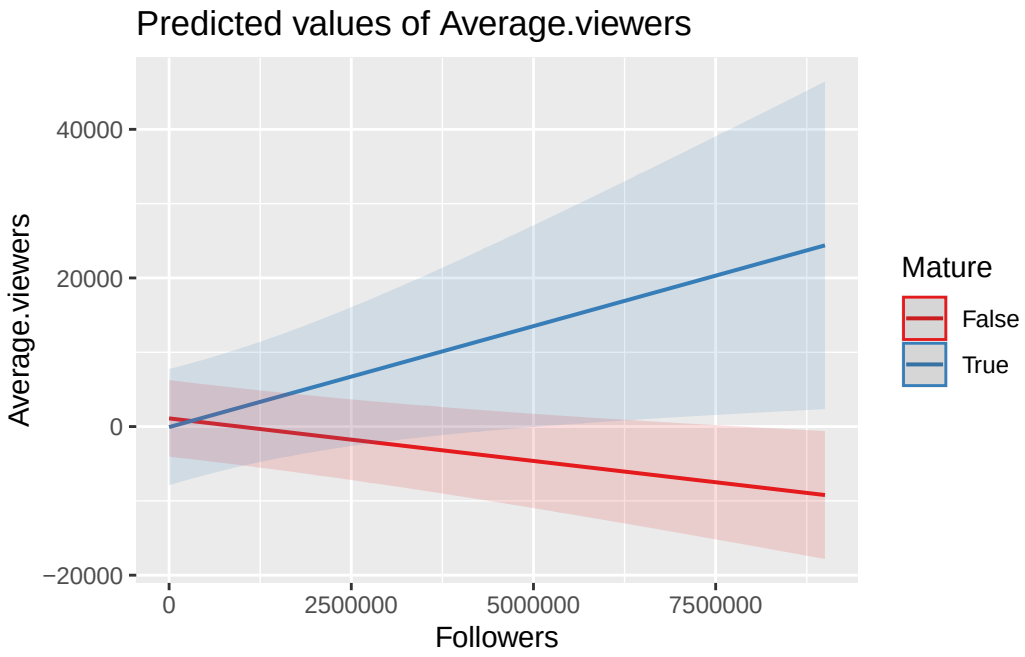
```
[[2]]
```


Predicted values of Average.viewers
Average.viewers
10000
0
−10000
0
2500
5000
7500
Stream.time.hours
Mature
False
True

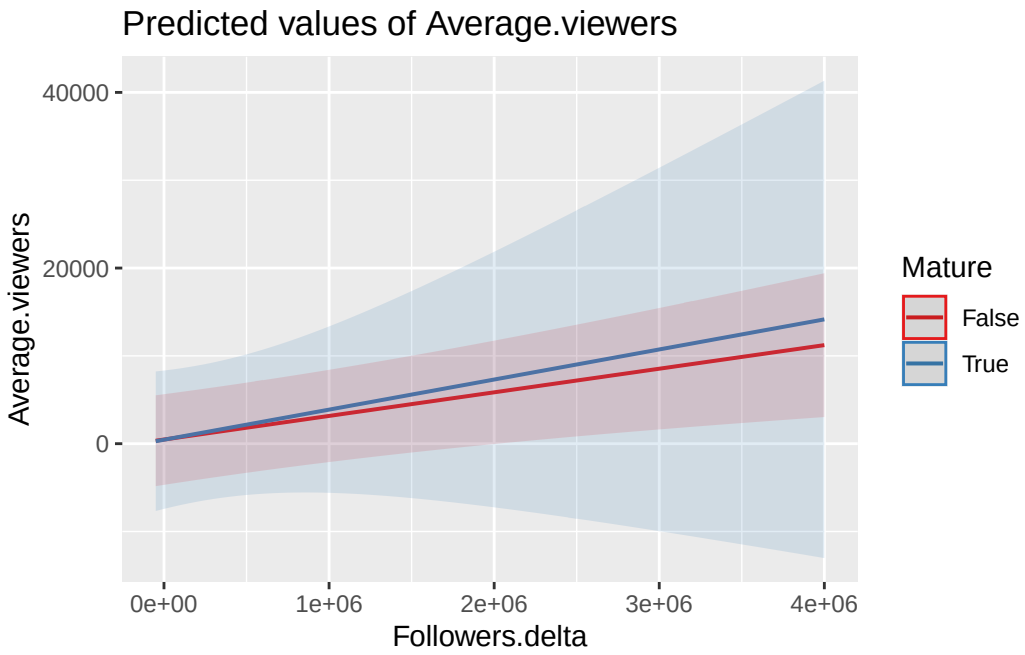
[[3]]


Predicted values of Average.viewers
60000
40000
20000
0
Average.viewers
0e+00
2e+05
4e+05
6e+05
Peak.viewers
Mature
False
True

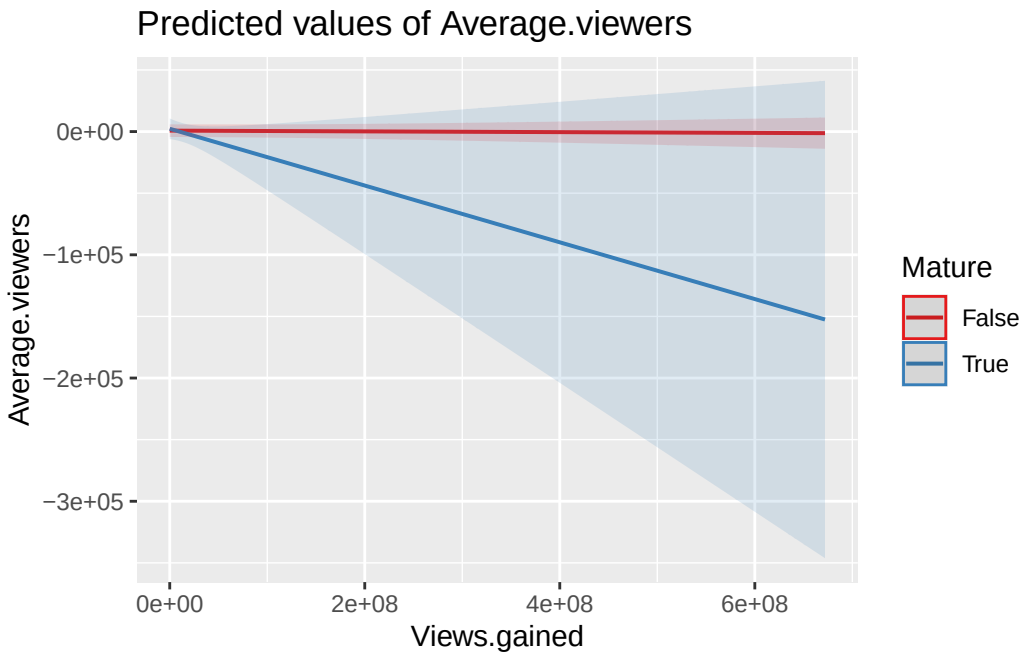
[[4]]


Predicted values of Average.viewers
40000
20000
0
−20000
Average.viewers
0
2500000
5000000
7500000
Followers
Mature
False
True

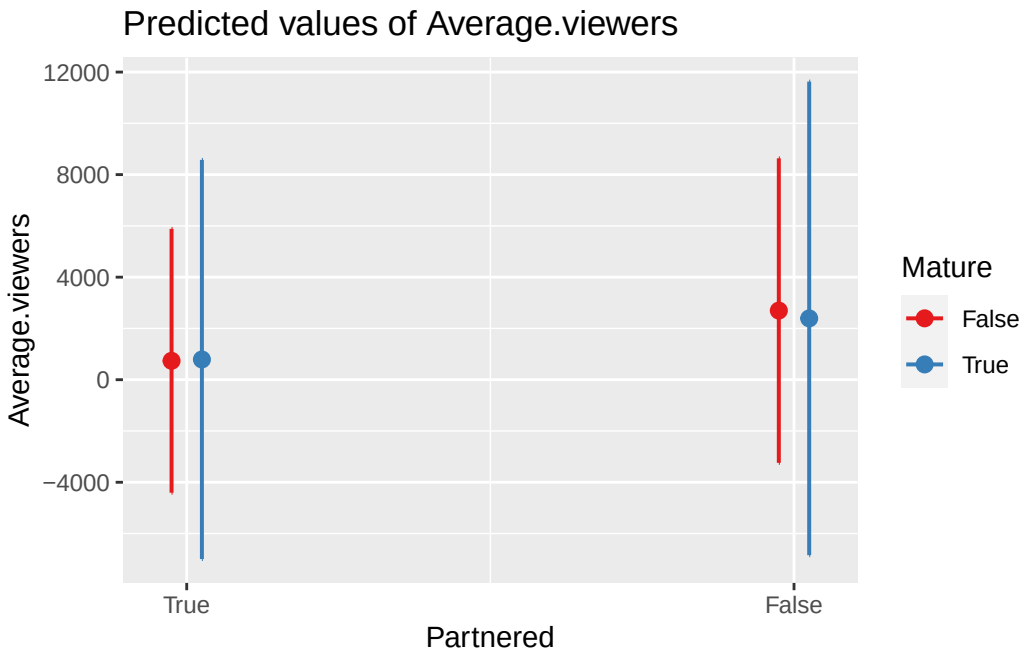
```
[[5]]
```


Predicted values of Average.viewers
40000
20000
0
Average.viewers
0e+00
1e+06
2e+06
3e+06
4e+06
Followers.delta
Mature
False
True

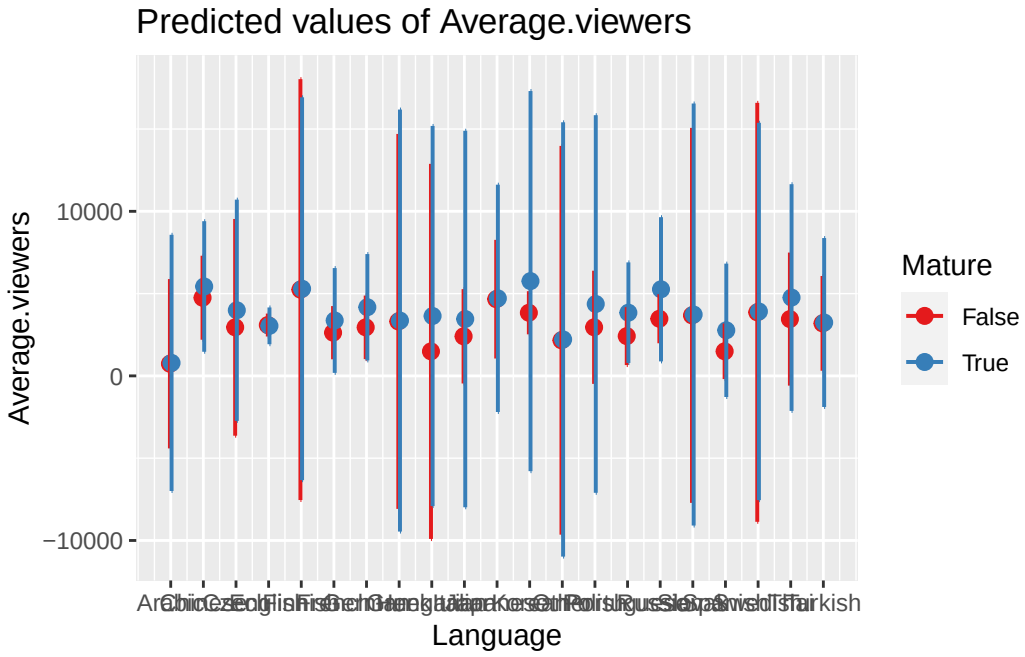
[[6]]


Predicted values of Average.viewers
Average.viewers
0e+00
−1e+05
−2e+05
−3e+05
0e+00
2e+08
4e+08
6e+08
Views.gained
Mature
False
True

[[7]]


Predicted values of Average.viewers
12000
8000
4000
0
−4000
Average.viewers
True
False
Partnered
Mature
False
True

```
[[8]]
```


Predicted values of Average.viewers
10000
0
−10000
Average.viewers
Turkish
Language
Mature
False
True

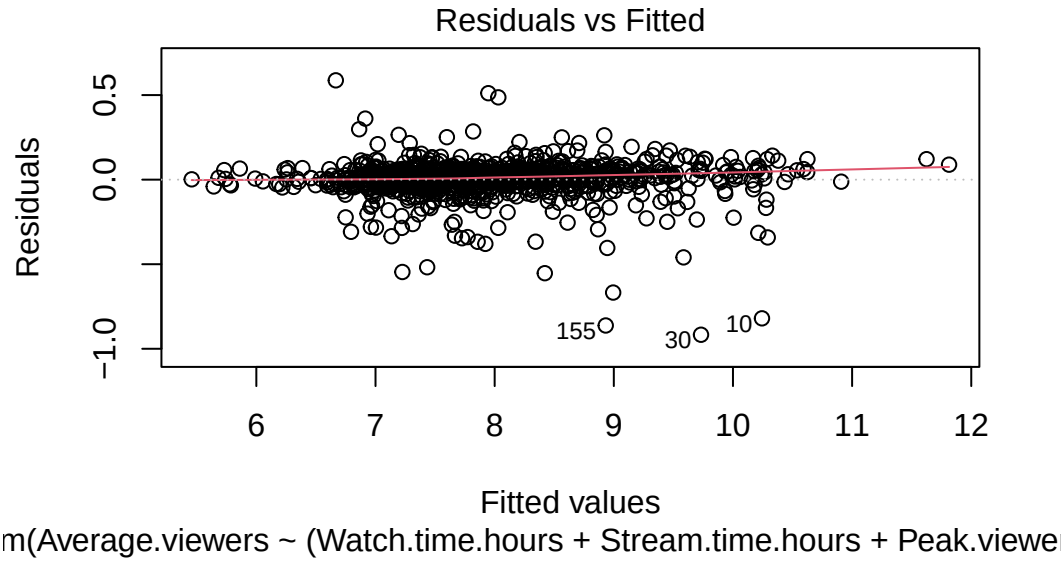
```r
log_twitch_data <- data.frame(
  Watch.time.hours = log(twitch_data$Watch.time.hours),
  Stream.time.hours = log(twitch_data$Stream.time.hours),
  Peak.viewers = log(twitch_data$Peak.viewers),
  Followers = log(twitch_data$Followers),
  Followers.delta = log(twitch_data$Followers.delta),
  Views.gained = log(twitch_data$Views.gained),
  Average.viewers = log(twitch_data$Average.viewers),
  Partnered = twitch_data$Partnered,
  Mature = twitch_data$Mature,
  Language = twitch_data$Language,
  Channel = twitch_data$Channel
)

model <- lm(
  Average.viewers ~ (Watch.time.hours + Stream.time.hours +
                       Peak.viewers + Followers + Followers.delta +
                       Views.gained + Partnered + Language) * Mature,
  data = log_twitch_data
)

summary(model)
```

```
Call:
lm(formula = Average.viewers ~ (Watch.time.hours + Stream.time.hours +
    Peak.viewers + Followers + Followers.delta + Views.gained +
    Partnered + Language) * Mature, data = log_twitch_data)

Residuals:
     Min       1Q   Median       3Q      Max
-0.91704 -0.02713  0.01053  0.04635  0.58728

Coefficients: (7 not defined because of singularities)
                              Estimate Std. Error  t value Pr(>|t|)
(Intercept)                   0.003442   0.100937    0.034  0.97281
Watch.time.hours              1.002415   0.010676   93.898  < 2e-16 ***
Stream.time.hours            -0.986327   0.007869 -125.346  < 2e-16 ***
Peak.viewers                 -0.027230   0.006521   -4.176 3.25e-05 ***
Followers                     0.020898   0.006612    3.160  0.00162 **
Followers.delta              -0.010013   0.005368   -1.865  0.06244 .
Views.gained                  0.004537   0.007213    0.629  0.52953
```

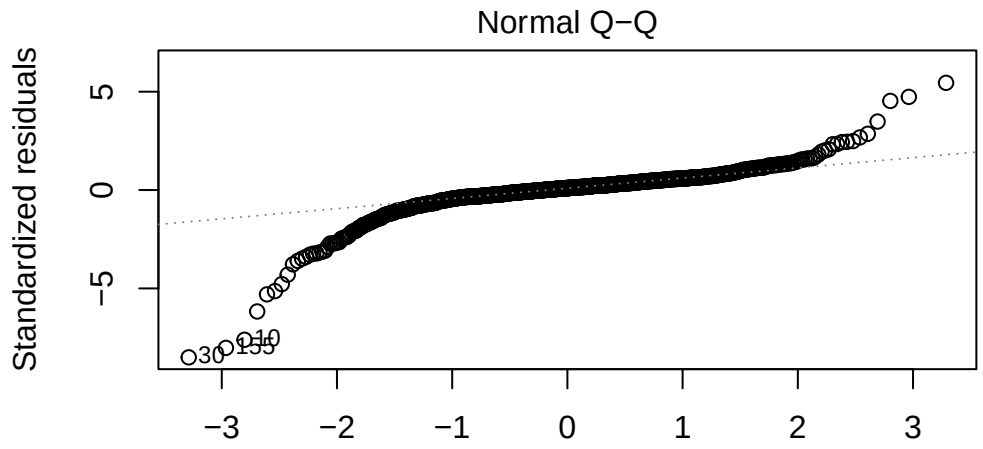
```
PartneredTrue                  -0.014760   0.028728   -0.514  0.60752
LanguageChinese                -0.113268   0.056970   -1.988  0.04708 *
LanguageCzech                  -0.350775   0.080641   -4.350 1.51e-05 ***
LanguageEnglish                -0.150572   0.049985   -3.012  0.00266 **
LanguageFinnish                -0.201777   0.132330   -1.525  0.12764
LanguageFrench                 -0.116418   0.051850   -2.245  0.02498 *
LanguageGerman                 -0.160582   0.053095   -3.024  0.00256 **
LanguageGreek                  -0.040560   0.120010   -0.338  0.73546
LanguageHungarian              -0.164053   0.119592   -1.372  0.17046
LanguageItalian                -0.138368   0.056781   -2.437  0.01500 *
LanguageJapanese               -0.136639   0.061303   -2.229  0.02605 *
LanguageKorean                 -0.106602   0.051901   -2.054  0.04026 *
LanguageOther                  -0.204952   0.125298   -1.636  0.10223
LanguagePolish                 -0.171919   0.059962   -2.867  0.00423 **
LanguagePortuguese             -0.112324   0.052143   -2.154  0.03148 *
LanguageRussian                -0.130038   0.052216   -2.490  0.01293 *
LanguageSlovak                 -0.100749   0.120053   -0.839  0.40157
LanguageSpanish                -0.120803   0.051257   -2.357  0.01864 *
LanguageSwedish                -0.234400   0.132519   -1.769  0.07725 .
LanguageThai                   -0.089289   0.063717   -1.401  0.16144
LanguageTurkish                -0.149492   0.056751   -2.634  0.00857 **
MatureTrue                     -0.310535   0.221428   -1.402  0.16112
Watch.time.hours:MatureTrue     0.041448   0.025677    1.614  0.10682
Stream.time.hours:MatureTrue    0.002393   0.018493    0.129  0.89706
Peak.viewers:MatureTrue        -0.038470   0.013438   -2.863  0.00429 **
Followers:MatureTrue           -0.003272   0.014666   -0.223  0.82352
Followers.delta:MatureTrue      0.019661   0.010280    1.912  0.05611 .
Views.gained:MatureTrue        -0.002898   0.025592   -0.113  0.90987
PartneredTrue:MatureTrue       -0.013863   0.058751   -0.236  0.81351
LanguageChinese:MatureTrue     -0.110172   0.071317   -1.545  0.12272
LanguageCzech:MatureTrue        0.111143   0.103943    1.069  0.28522
LanguageEnglish:MatureTrue     -0.077658   0.056415   -1.377  0.16898
LanguageFinnish:MatureTrue            NA         NA       NA       NA
LanguageFrench:MatureTrue      -0.103414   0.062384   -1.658  0.09771 .
LanguageGerman:MatureTrue      -0.059605   0.064026   -0.931  0.35212
LanguageGreek:MatureTrue              NA         NA       NA       NA
LanguageHungarian:MatureTrue    0.003629   0.162868    0.022  0.98223
LanguageItalian:MatureTrue     -0.133748   0.124552   -1.074  0.28317
LanguageJapanese:MatureTrue           NA         NA       NA       NA
LanguageKorean:MatureTrue      -0.108195   0.125428   -0.863  0.38857
LanguageOther:MatureTrue              NA         NA       NA       NA
LanguagePolish:MatureTrue      -0.041295   0.126446   -0.327  0.74406
LanguagePortuguese:MatureTrue -0.105210   0.062829   -1.675  0.09435 .
```

```
LanguageRussian:MatureTrue    -0.093421   0.067091   -1.392  0.16411
LanguageSlovak:MatureTrue            NA         NA       NA       NA
LanguageSpanish:MatureTrue    -0.108317   0.064636   -1.676  0.09411 .
LanguageSwedish:MatureTrue           NA         NA       NA       NA
LanguageThai:MatureTrue       -0.115995   0.092193   -1.258  0.20864
LanguageTurkish:MatureTrue           NA         NA       NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1087 on 948 degrees of freedom
  (3 observations deleted due to missingness)
Multiple R-squared:  0.9867,    Adjusted R-squared:  0.986
F-statistic:  1467 on 48 and 948 DF,  p-value: < 2.2e-16
```

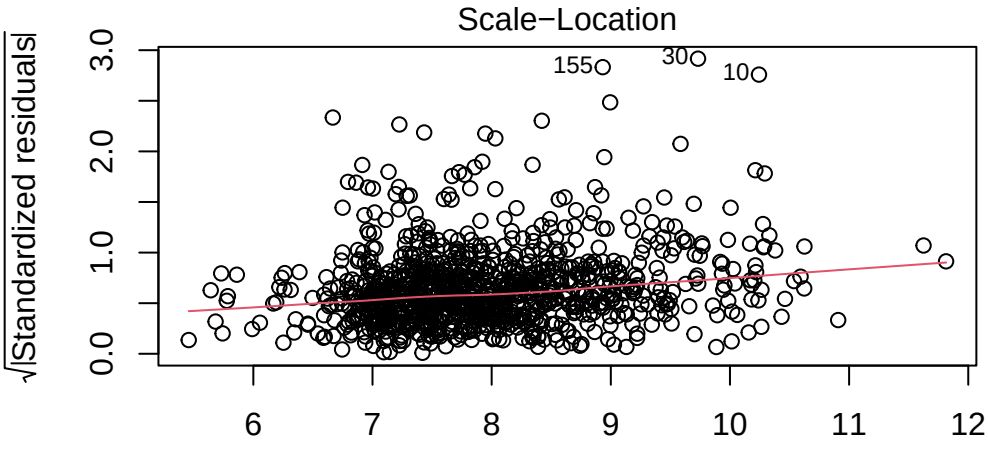
```
plot(model)
```



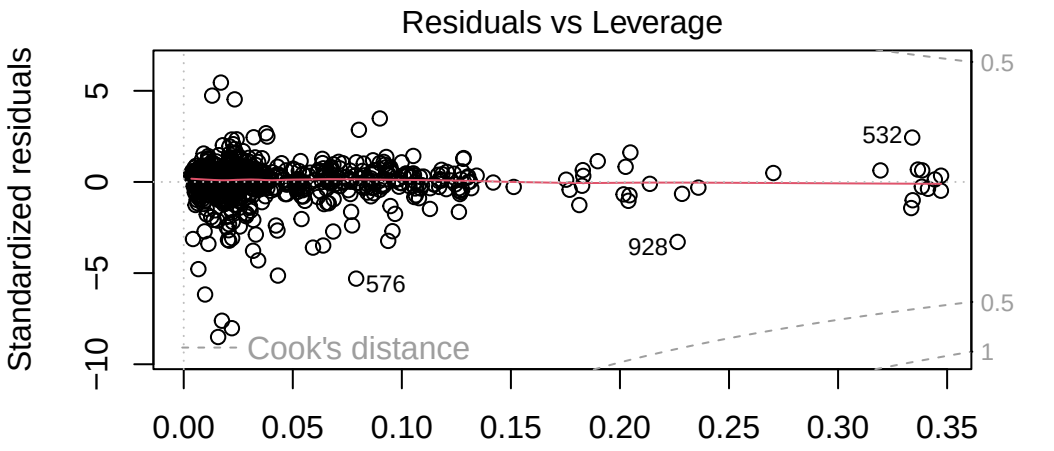
m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe



m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe



m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe



m(Average.viewers ~ (Watch.time.hours + Stream.time.hours + Peak.viewe

6. Results

7. Conclusion

8. Appendix