# Emotions in social media

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## 1. Load dataset

[Dataset link]{https://www.kaggle.com/code/saadatkhalid/social-media-vs-emotions-eda-model-99-acc/input?select=train.csv}

```
tryCatch({
  data <- read.csv("train.csv", header = TRUE)
  print("File read successfully")
}, error = function(e) {
  cat("ERROR when loading the dataset",conditionMessage(e), "\n")
})
```

```
## [1] "File read successfully"
```

## 2. Preprocessing data

### 2.1 Delete blank lines (if needed):

```
cat("Rows before:", nrow(data), "\n")
```

```
## Rows before: 2004
```

```
data <- data[rowSums(is.na(data) | data == "") != ncol(data), ]
cat("Rows after:", nrow(data))
```

```
## Rows after: 1000
```

### 2.2 Check variable types and column names

```
columns <- names(data)
types <- sapply(data, class)
for (i in seq_along(columns)) {
  cat("Column name:", columns[i], " Type:", types[i], "\n")
}
```

```
## Column name: User_ID  Type: integer
## Column name: Age  Type: integer
## Column name: Gender  Type: character
## Column name: Platform  Type: character
## Column name: Daily_Usage_Time..minutes.  Type: integer
## Column name: Posts_Per_Day  Type: integer
## Column name: Likes_Received_Per_Day  Type: integer
## Column name: Comments_Received_Per_Day  Type: integer
## Column name: Messages_Sent_Per_Day  Type: integer
## Column name: Dominant_Emotion  Type: character
```

Transformations:

- Column “Age” will become an integer
- Column “Daily_Usage_Time..minutes” will be renamed as “Minutes_Per_Day”

```
data_transformed <- transform(data,
                              Age = as.integer(Age))
colnames(data_transformed)[colnames(data_transformed) == "Daily_Usage_Time..minutes."] <- "Minutes_Per_
```

```
types <- sapply(data_transformed, class)
for (i in seq_along(columns)) {
  cat("Column name:", columns[i], " Type:", types[i], "\n")
}
```

```
## Column name: User_ID  Type: integer
## Column name: Age  Type: integer
## Column name: Gender  Type: character
## Column name: Platform  Type: character
## Column name: Daily_Usage_Time..minutes.  Type: integer
## Column name: Posts_Per_Day  Type: integer
## Column name: Likes_Received_Per_Day  Type: integer
## Column name: Comments_Received_Per_Day  Type: integer
## Column name: Messages_Sent_Per_Day  Type: integer
## Column name: Dominant_Emotion  Type: character
```

### 2.3 Check if there’s NA values

```
any(is.na(data_transformed))
```

```
## [1] FALSE
```

# 3. Descriptive analysis and inferential

## 3.1 Data distribution per gender, platform, age and dominant emotion

### 3.1.1 Data distribution per gender

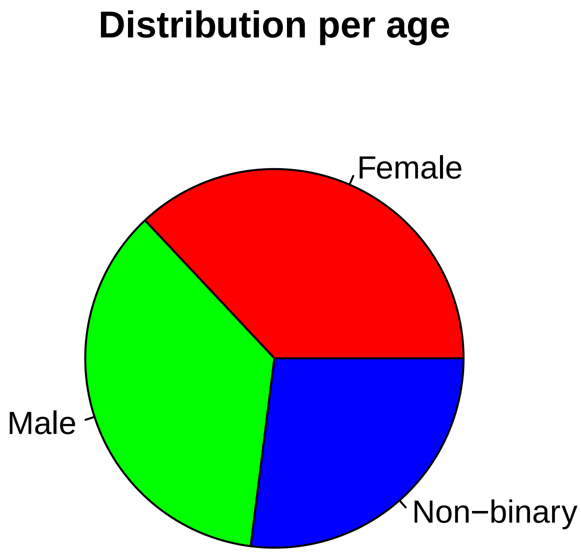
```
genders <- unique(data_transformed$Gender)
print(genders)
```

```
## [1] "Female"     "Male"       "Non-binary"
```

```
percentages_gender <- round(prop.table(table(data_transformed$Gender)) * 100, 2)
for (i in seq_along(genders)) {
  cat("Gender:",  genders[i], "- Percentage:", percentages_gender[i],"%\n")
}
```

```
## Gender: Female - Percentage: 37 %
## Gender: Male - Percentage: 36 %
## Gender: Non-binary - Percentage: 27 %
```

```
pie(table(data_transformed$Gender), main = "Distribution per age",
    col = rainbow(length(unique(data_transformed$Gender))))
```



```
    labels = genders
```

### 3.1.2 Data distribution per platform

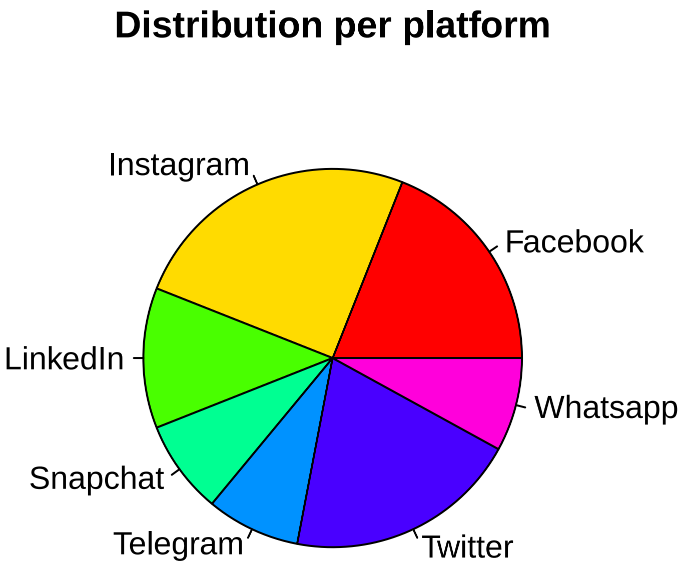
```
platforms <- unique(data_transformed$Platform)
print(platforms)
```

```
## [1] "Instagram" "Twitter"   "Facebook"  "LinkedIn"  "Whatsapp"  "Telegram"
## [7] "Snapchat"
```

```
percentages_platform <- round(prop.table(table(data_transformed$Platform)) * 100, 2)
for (i in seq_along(platforms)) {
  cat("Gender:",  platforms[i], "- Percentage:", percentages_platform[i],"%\n")
}
```

```
## Gender: Instagram - Percentage: 19 %
## Gender: Twitter - Percentage: 25 %
## Gender: Facebook - Percentage: 12 %
## Gender: LinkedIn - Percentage: 8 %
## Gender: Whatsapp - Percentage: 8 %
## Gender: Telegram - Percentage: 20 %
## Gender: Snapchat - Percentage: 8 %
```

```
pie(table(data_transformed$Platform), main = "Distribution per platform",
    col = rainbow(length(unique(data_transformed$Platform))))
```



```
    labels = platforms
```

### 3.1.3 Data distribution per age

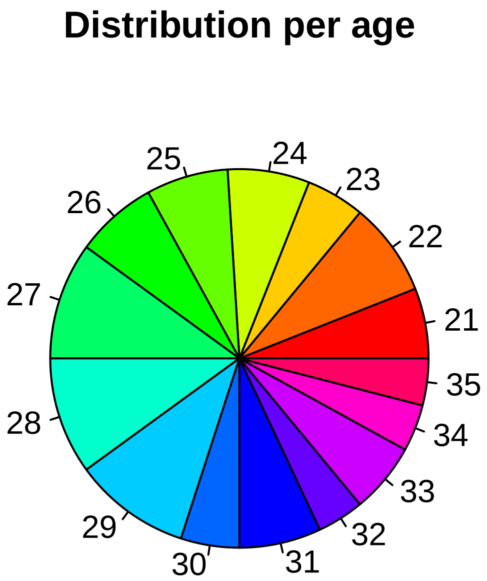
```
ages <- unique(data_transformed$Age)
print(ages)
```

```
##  [1] 25 30 22 28 33 21 27 24 29 31 23 26 34 35 32
```

```
percentages_ages <- round(prop.table(table(data_transformed$Age)) * 100, 2)
for (i in seq_along(ages)) {
  cat("Gender:",  ages[i], "- Percentage:", percentages_ages[i],"%\n")
}
```

```
## Gender: 25 - Percentage: 6 %
## Gender: 30 - Percentage: 8 %
## Gender: 22 - Percentage: 5 %
## Gender: 28 - Percentage: 7 %
## Gender: 33 - Percentage: 7 %
## Gender: 21 - Percentage: 7 %
## Gender: 27 - Percentage: 10 %
## Gender: 24 - Percentage: 10 %
## Gender: 29 - Percentage: 10 %
## Gender: 31 - Percentage: 5 %
## Gender: 23 - Percentage: 7 %
## Gender: 26 - Percentage: 4 %
## Gender: 34 - Percentage: 6 %
## Gender: 35 - Percentage: 4 %
## Gender: 32 - Percentage: 4 %
```

```
pie(table(data_transformed$Age), main = "Distribution per age",
    col = rainbow(length(unique(data_transformed$Age))))
```



```
    labels = ages
```

### 3.1.3 Data distribution per dominant emotion

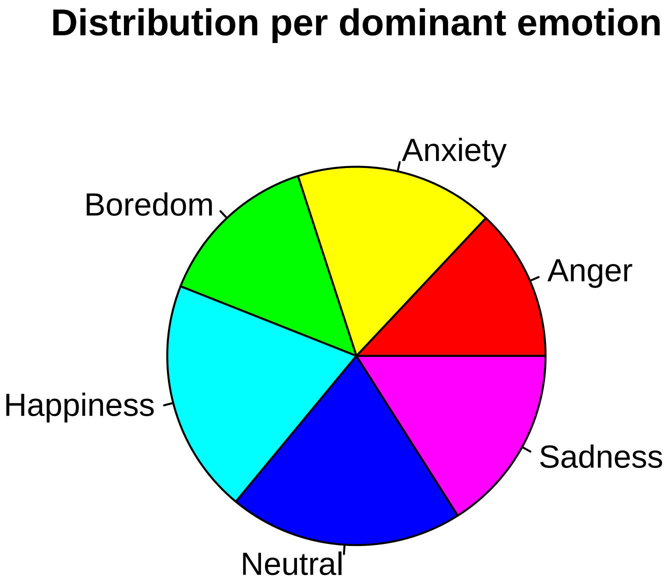
```
emotions <- unique(data_transformed$Dominant_Emotion)
print(emotions)
```

```
## [1] "Happiness" "Anger"     "Neutral"   "Anxiety"   "Boredom"   "Sadness"
```

```
percentages_emotions <- round(prop.table(table(data_transformed$Dominant_Emotion)) * 100, 2)
for (i in seq_along(emotions)) {
  cat("Gender:",  emotions[i], "- Percentage:", percentages_emotions[i],"%\n")
}
```

```
## Gender: Happiness - Percentage: 13 %
## Gender: Anger - Percentage: 17 %
## Gender: Neutral - Percentage: 14 %
## Gender: Anxiety - Percentage: 20 %
## Gender: Boredom - Percentage: 20 %
## Gender: Sadness - Percentage: 16 %
```

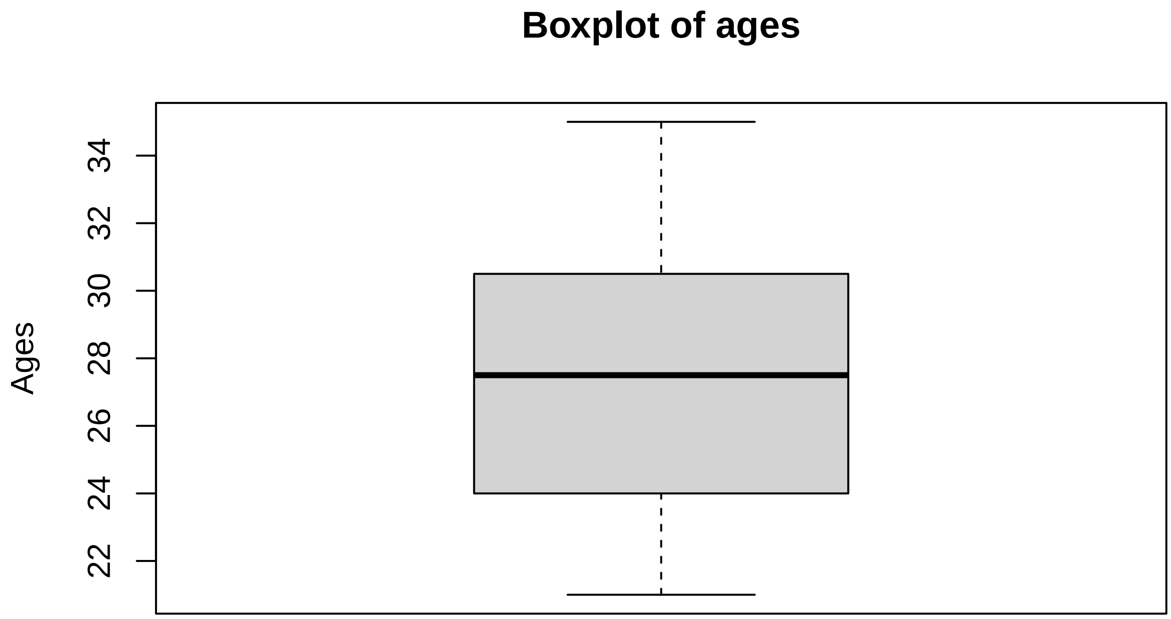
```
pie(table(data_transformed$Dominant_Emotion), main = "Distribution per dominant emotion",
    col = rainbow(length(unique(data_transformed$Dominant_Emotion))))
```



```
    labels = emotions
```

### 3.2 Check if there are extreme ages

```
boxplot(data_transformed$Age, main = "Boxplot of ages",
        ylab = "Ages")
```



```
cat("Median: ",median(data_transformed$Age),"\n")
```

```
## Median:  27.5
```

```
cat("Quantiles 25%, 50%, 75%: ",quantile(data_transformed$Age, probs = c(0.25, 0.5, 0.75)))
```

```
## Quantiles 25%, 50%, 75%:  24 27.5 30.25
```

Median line -> Closer to Q3 (not too much) -> More people has less than 27 YO.

Box -> Q1 = 24 and Q3 = 30.25 ~ 30 -> 50% of the people has between 24 and 30 YO.

Whiskers -> Top whisker is longer than bottom whisker -> Ages above median are more dispersed

Outliers -> There are no outliers

### 3.3 Relation between used platform and dominant emotion

H0 -> There's no significant association between both variables

H1 -> There's significant association between both variables

```
chisq_data <- table(data_transformed$Platform, data_transformed$Dominant_Emotion)
chisq_data
```

```
##
##             Anger Anxiety Boredom Happiness Neutral Sadness
##   Facebook      0      50      40         0      70      30
##   Instagram    10      30       0       170      20      20
##   LinkedIn      0      20      70         0      20      10
##   Snapchat      0       20       0         10       20       30
##   Telegram     10       10      10          0       30       20
##   Twitter      80       20      20         10       20       50
##   Whatsapp     30       20       0         10       20        0
```

```r
# Alpha = 0.05 -> CL = 95%
chisq.test(chisq_data, correct = FALSE)
```

```
##
##  Pearson's Chi-squared test
##
## data:  chisq_data
## X-squared = 1003.9, df = 30, p-value < 2.2e-16
```

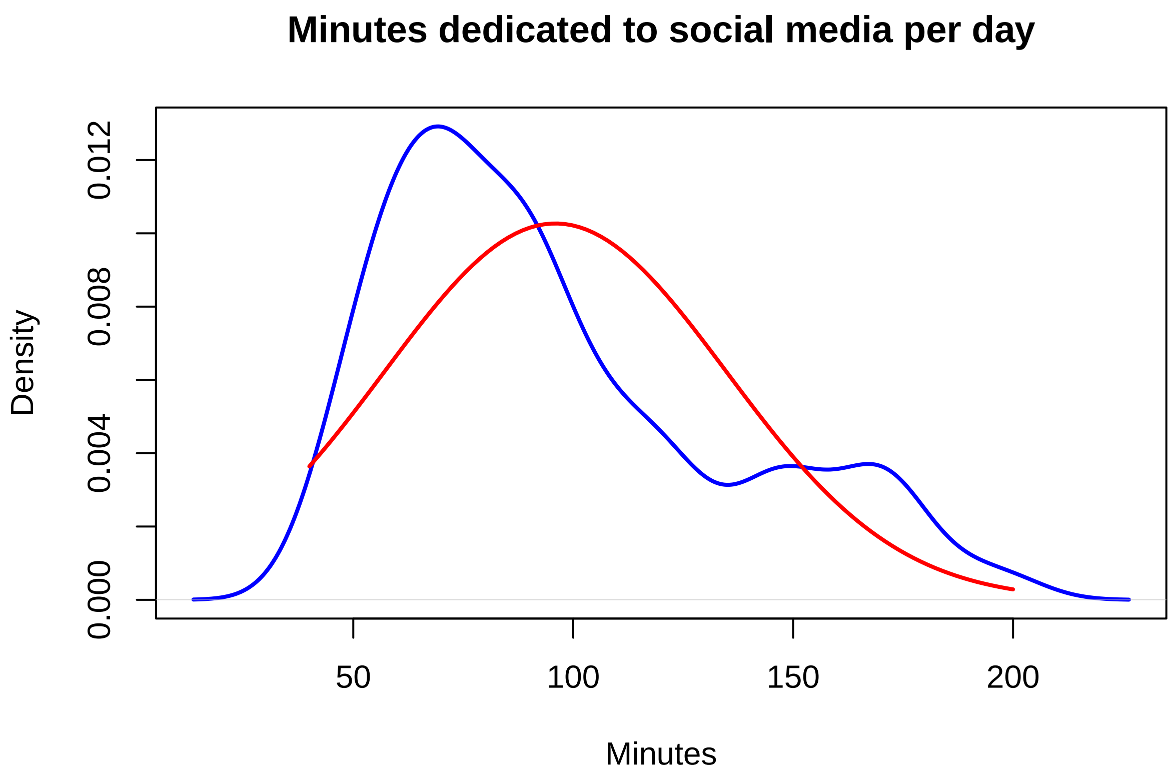
The p value < 0.05(alpha) -> There's enough evidence to refuse H0 with a 95% confidence level

### 3.4 Relation between minutes per day and dominant emotion

H0 -> The spent time on social media is the same regardless of the dominant emotion

H1 -> At least one emotion spends more/less time on social media

```r
plot(density(data_transformed$Minutes_Per_Day),
     main = "Minutes dedicated to social media per day",
     xlab = "Minutes",
     ylab = "Density",
     col = "blue",
     lwd = 2)
values_normal_distribution <- seq(min(data_transformed$Minutes_Per_Day), max(data_transformed$Minutes_Pe
                                  length = 100)
normal_distribution <- dnorm(values_normal_distribution, mean = abs(mean(data_transformed$Minutes_Per_Da
                             sd = sd(data_transformed$Minutes_Per_Day))
lines(values_normal_distribution, normal_distribution, col = "red", lwd = 2)
```



Variable Minutes_Per_Day -> No normal distribution -> ANOVA no possible

```
kruskal <- kruskal.test(Minutes_Per_Day ~ Dominant_Emotion, data = data_transformed)
kruskal
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  Minutes_Per_Day by Dominant_Emotion
## Kruskal-Wallis chi-squared = 475.45, df = 5, p-value < 2.2e-16
```

$p < 0.05$ -> There's enough evidence to refuse H0 with a 95% confidence level -> Suggests relation

```
library(dunn.test)
```

```
results_dunn <- dunn.test(data_transformed$Minutes_Per_Day, data_transformed$Dominant_Emotion, method =
```

```
##   Kruskal-Wallis rank sum test
##
## data: x and group
## Kruskal-Wallis chi-squared = 475.4502, df = 5, p-value = 0
##
##
##                             Comparison of x by group
##                                   (Bonferroni)
## Col Mean-|
## Row Mean |      Anger    Anxiety    Boredom   Happines    Neutral
## ---------+-------------------------------------------------------
##  Anxiety |   0.609369
##          |     1.0000
##          |
##  Boredom |   8.552439   8.505242
##          |    0.0000*    0.0000*
##          |
## Happines |  -10.06400  -11.54933  -19.74230
##          |    0.0000*    0.0000*    0.0000*
##          |
##  Neutral |   4.740492   4.438969  -4.606576   16.67876
##          |    0.0000*    0.0001*    0.0000*    0.0000*
##          |
##  Sadness |   2.720632   2.271944  -6.225303   13.71841  -2.006476
##          |     0.0489     0.1732    0.0000*    0.0000*     0.3360
##
## alpha = 0.05
## Reject Ho if p <= alpha/2
```

```
print(results_dunn)
```

```
## $chi2
## [1] 475.4502
##
## $Z
##  [1]   0.6093694   8.5524400   8.5052428 -10.0640024 -11.5493378 -19.7423090
##  [7]   4.7404926   4.4389697  -4.6065762  16.6787652   2.7206324   2.2719444
## [13]  -6.2253040  13.7184142  -2.0064764
##
## $P
##  [1] 2.711398e-01 6.025671e-18 9.060798e-18 3.984555e-24 3.719570e-31
##  [6] 4.670510e-87 1.065996e-06 4.519528e-06 2.046765e-06 9.352266e-63
## [11] 3.257859e-03 1.154493e-02 2.403117e-10 3.938471e-43 2.240272e-02
##
## $P.adjusted
##  [1] 1.000000e+00 9.038506e-17 1.359120e-16 5.976832e-23 5.579356e-30
##  [6] 7.005765e-86 1.598994e-05 6.779291e-05 3.070148e-05 1.402840e-61
## [11] 4.886788e-02 1.731740e-01 3.604675e-09 5.907706e-42 3.360408e-01
##
## $comparisons
##  [1] "Anger - Anxiety"     "Anger - Boredom"     "Anxiety - Boredom"
##  [4] "Anger - Happiness"   "Anxiety - Happiness" "Boredom - Happiness"
##  [7] "Anger - Neutral"     "Anxiety - Neutral"   "Boredom - Neutral"
## [10] "Happiness - Neutral" "Anger - Sadness"     "Anxiety - Sadness"
## [13] "Boredom - Sadness"   "Happiness - Sadness" "Neutral - Sadness"
```

Significant difference = Between both emotions, one of them spends more/less time on social media than the other emotion.

Considering significance = 0.05 -> CL = 95%: - “Anger - Boredom” - “Anxiety - Boredom” - “Anger - Happiness” - “Anxiety - Happiness” - “Boredom - Happiness” - “Anger - Neutral” - “Anxiety - Neutral” - “Boredom - Neutral” - “Happiness - Neutral” - “Anger - Sadness”

```
library(ggplot2)
library(dplyr)
```

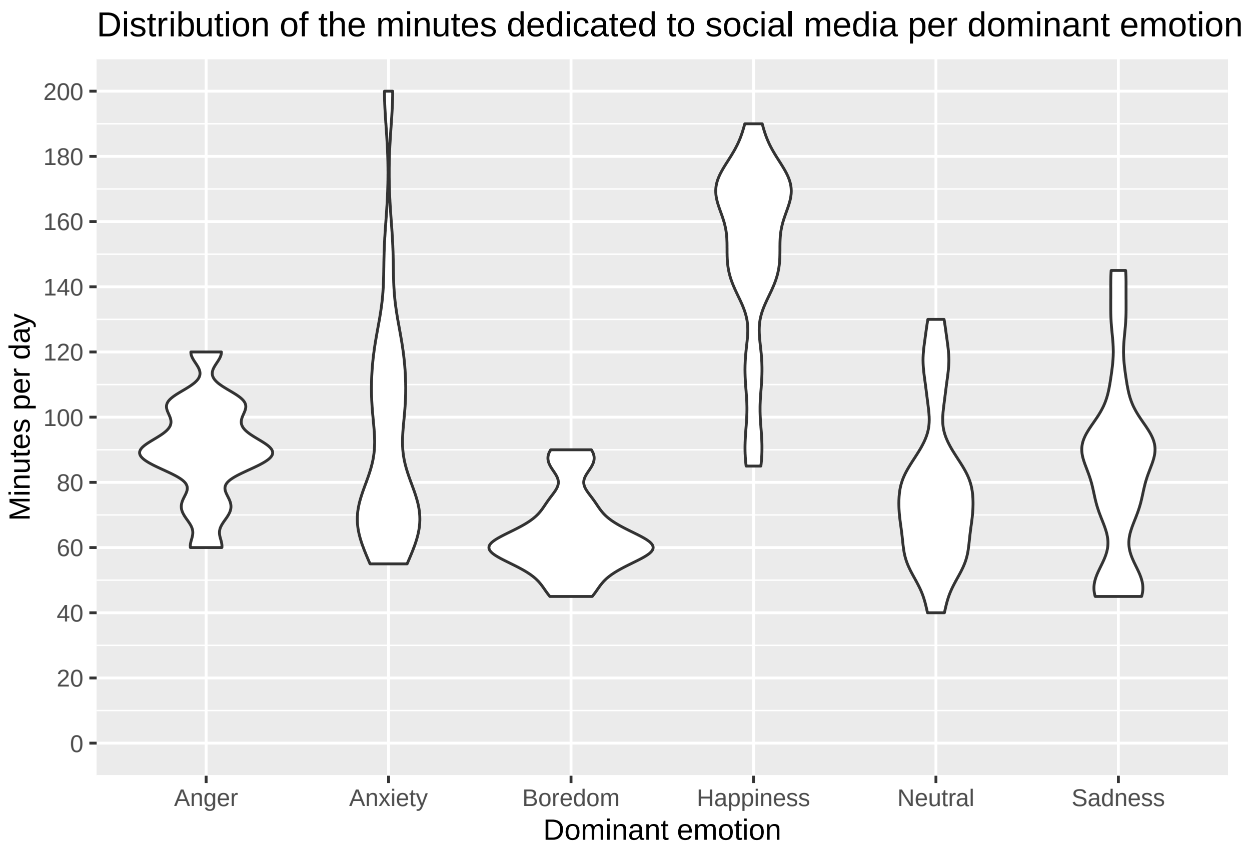
```
##
```

```
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
ggplot(data_transformed, aes(x = Dominant_Emotion, y = Minutes_Per_Day)) +
  geom_violin() +
  scale_y_continuous(limits = c(0, 200),
                     breaks = seq(0, 200, by = 20)) +
  labs(title = "Distribution of the minutes dedicated to social media per dominant emotion",
       x = "Dominant emotion",
       y = "Minutes per day")
```



Taking a look at the graphic above, H1 is confirmed.

```r
minutes_platform <- data_transformed %>%
  group_by(Platform) %>%
  summarise(suma = sum(Minutes_Per_Day)) %>%
  arrange(desc(suma))
print(minutes_platform)
```

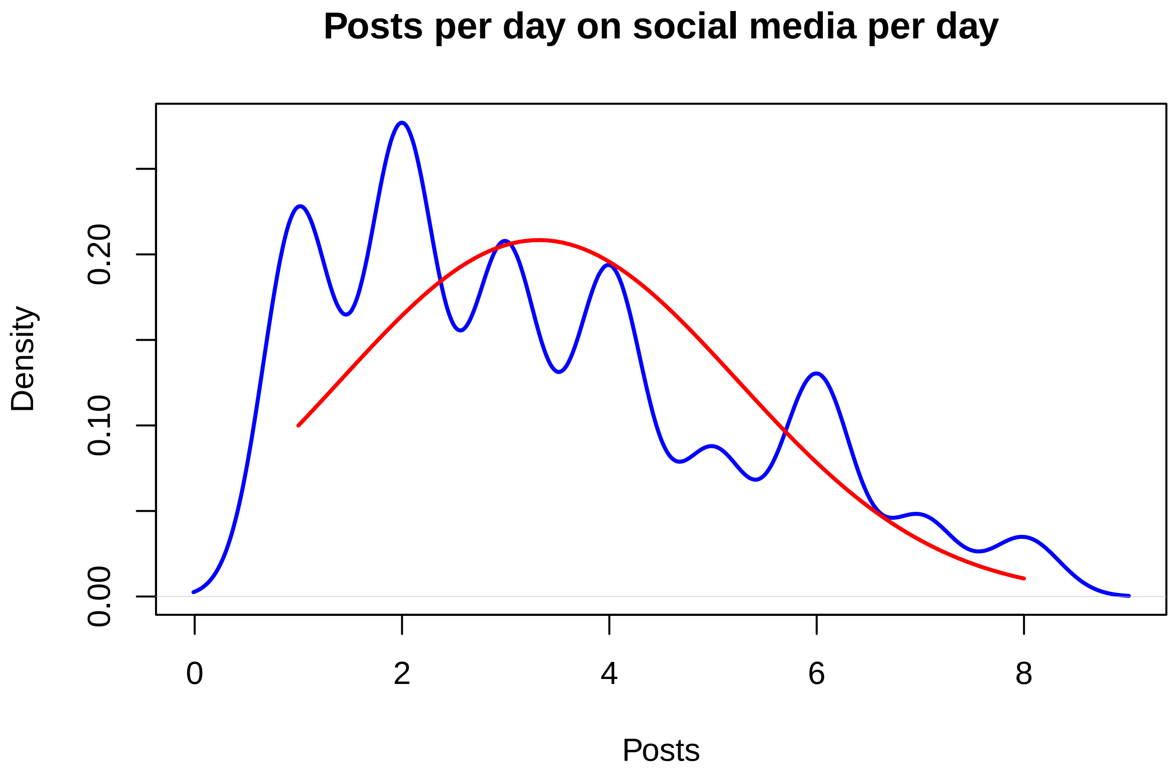
```
## # A tibble: 7 x 2
##   Platform   suma
##   <chr>     <int>
## 1 Instagram 38350
## 2 Twitter   16750
## 3 Facebook  13700
## 4 Snapchat   7200
## 5 Whatsapp   7000
## 6 LinkedIn   6700
## 7 Telegram   6250
```

### 3.5 Relation between posts per day and dominant emotion

H0 -> The daily posts are the same regardless of the dominant emotion

H1 -> At least one emotion has more/less daily posts

```
plot(density(data_transformed$Posts_Per_Day),
     main = "Posts per day on social media per day",
     xlab = "Posts",
     ylab = "Density",
     col = "blue",
     lwd = 2)
values_normal_distribution <- seq(min(data_transformed$Posts_Per_Day), max(data_transformed$Posts_Per_Da
                                  length = 100)
normal_distribution <- dnorm(values_normal_distribution, mean = abs(mean(data_transformed$Posts_Per_Day
                             sd = sd(data_transformed$Posts_Per_Day))
lines(values_normal_distribution, normal_distribution, col = "red", lwd = 2)
```



Variable Posts_Per_Day -> No normal distribution -> ANOVA no possible

```
kruskal <- kruskal.test(Posts_Per_Day ~ Dominant_Emotion, data = data_transformed)
kruskal
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  Posts_Per_Day by Dominant_Emotion
## Kruskal-Wallis chi-squared = 474.09, df = 5, p-value < 2.2e-16
```

$p < 0.05$ -> There’s enough evidence to refuse H0 with a 95% confidence level -> Suggests relation

```
results_dunn <- dunn.test(data_transformed$Posts_Per_Day, data_transformed$Dominant_Emotion, method = "
```

```
##   Kruskal-Wallis rank sum test
##
## data: x and group
## Kruskal-Wallis chi-squared = 474.0937, df = 5, p-value = 0
##
##
##                            Comparison of x by group
##                                  (Bonferroni)
## Col Mean-|
## Row Mean |      Anger    Anxiety    Boredom   Happines    Neutral
## ---------+-------------------------------------------------------
##  Anxiety |   4.530421
##          |    0.0000*
##          |
##  Boredom |   11.31303   7.448500
##          |    0.0000*    0.0000*
##          |
## Happines |  -7.023301  -12.64480  -19.68489
##          |    0.0000*    0.0000*    0.0000*
##          |
##  Neutral |   7.200801   2.716701  -5.142541   16.02489
##          |    0.0000*     0.0495    0.0000*    0.0000*
##          |
##  Sadness |   3.894544  -0.617199  -7.932991   11.79552  -3.312889
##          |    0.0007*     1.0000    0.0000*    0.0000*    0.0069*
##
## alpha = 0.05
## Reject Ho if p <= alpha/2
```

```
print(results_dunn)
```

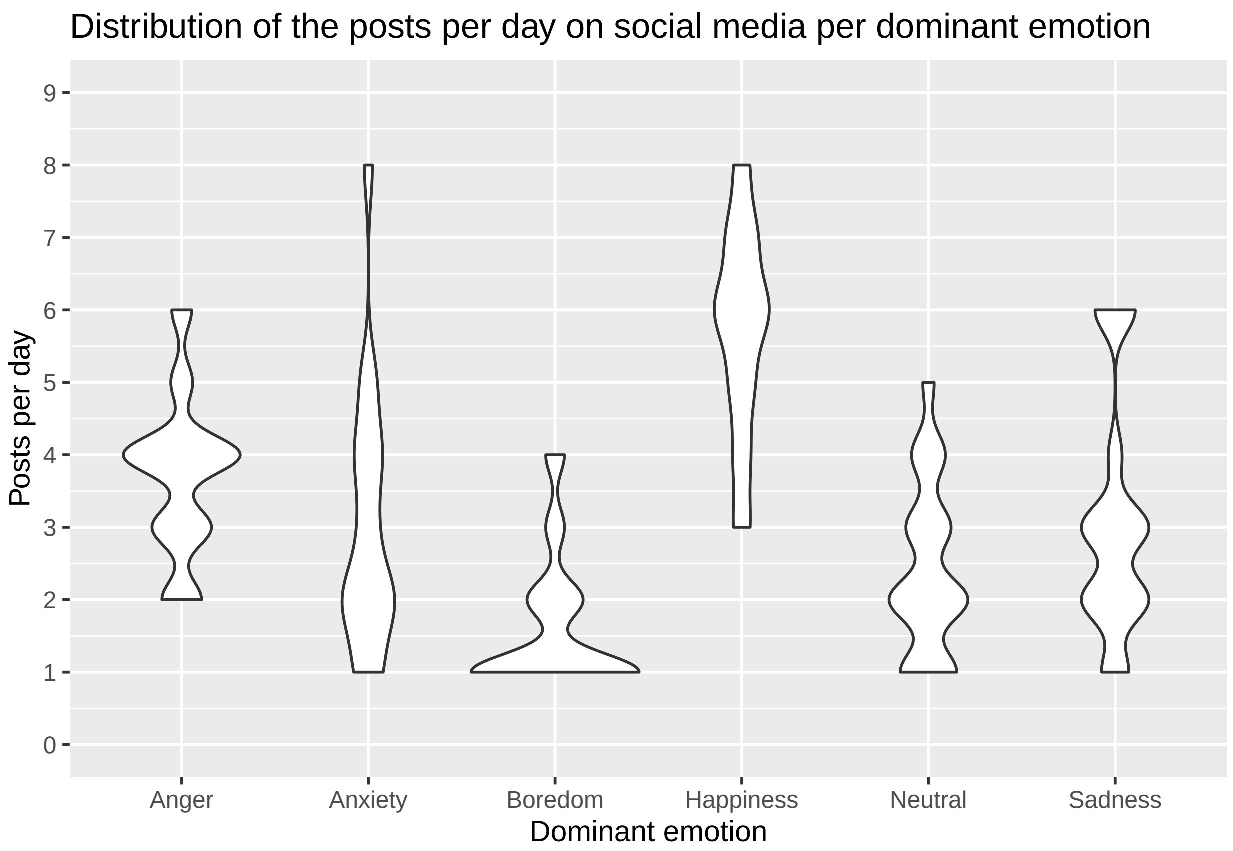
```
## $chi2
## [1] 474.0937
##
## $Z
##  [1]   4.5304217  11.3130314   7.4485001  -7.0233013 -12.6448033 -19.6848957
##  [7]   7.2008010   2.7167015  -5.1425414  16.0248939   3.8945449  -0.6171998
## [13]  -7.9329919  11.7955258  -3.3128891
##
## $P
##  [1] 2.943303e-06 5.655637e-30 4.720368e-14 1.083431e-12 5.976165e-37
##  [6] 1.452671e-86 2.992992e-13 3.296802e-03 1.355233e-07 4.281844e-58
## [11] 4.919163e-05 2.685515e-01 1.069642e-15 2.058108e-32 4.616879e-04
```

```
##
## $P.adjusted
##  [1] 4.414955e-05 8.483455e-29 7.080553e-13 1.625147e-11 8.964247e-36
##  [6] 2.179007e-85 4.489488e-12 4.945204e-02 2.032850e-06 6.422766e-57
## [11] 7.378745e-04 1.000000e+00 1.604463e-14 3.087163e-31 6.925319e-03
##
## $comparisons
##  [1] "Anger - Anxiety"     "Anger - Boredom"     "Anxiety - Boredom"
##  [4] "Anger - Happiness"   "Anxiety - Happiness" "Boredom - Happiness"
##  [7] "Anger - Neutral"     "Anxiety - Neutral"   "Boredom - Neutral"
## [10] "Happiness - Neutral" "Anger - Sadness"     "Anxiety - Sadness"
## [13] "Boredom - Sadness"   "Happiness - Sadness" "Neutral - Sadness"
```

Significant difference = Between both emotions, one of them posts more/less on social media than the other emotion.

Considering significance = 0.05 -> CL = 95%: - “Anger - Anxiety” - “Anger - Boredom” - “Anxiety - Boredom” - “Anger - Happiness” - “Anxiety - Happiness” - “Boredom - Happiness” - “Anger - Neutral” - “Anxiety - Neutral” - “Boredom - Neutral” - “Happiness - Neutral” - “Anger - Sadness” - “Boredom - Sadness” - “Happiness - Sadness” - “Neutral - Sadness”

```r
ggplot(data_transformed, aes(x = Dominant_Emotion, y = Posts_Per_Day)) +
  geom_violin() +
  scale_y_continuous(limits = c(0, 9),
                     breaks = seq(0, 9, by = 1)) +
  labs(title = "Distribution of the posts per day on social media per dominant emotion",
       x = "Dominant emotion",
       y = "Posts per day")
```



Taking a look at the graphic above, H1 is confirmed.

```
posts_platform <- data_transformed %>%
  group_by(Platform) %>%
  summarise(suma = sum(Posts_Per_Day)) %>%
  arrange(desc(suma))
print(posts_platform)
```

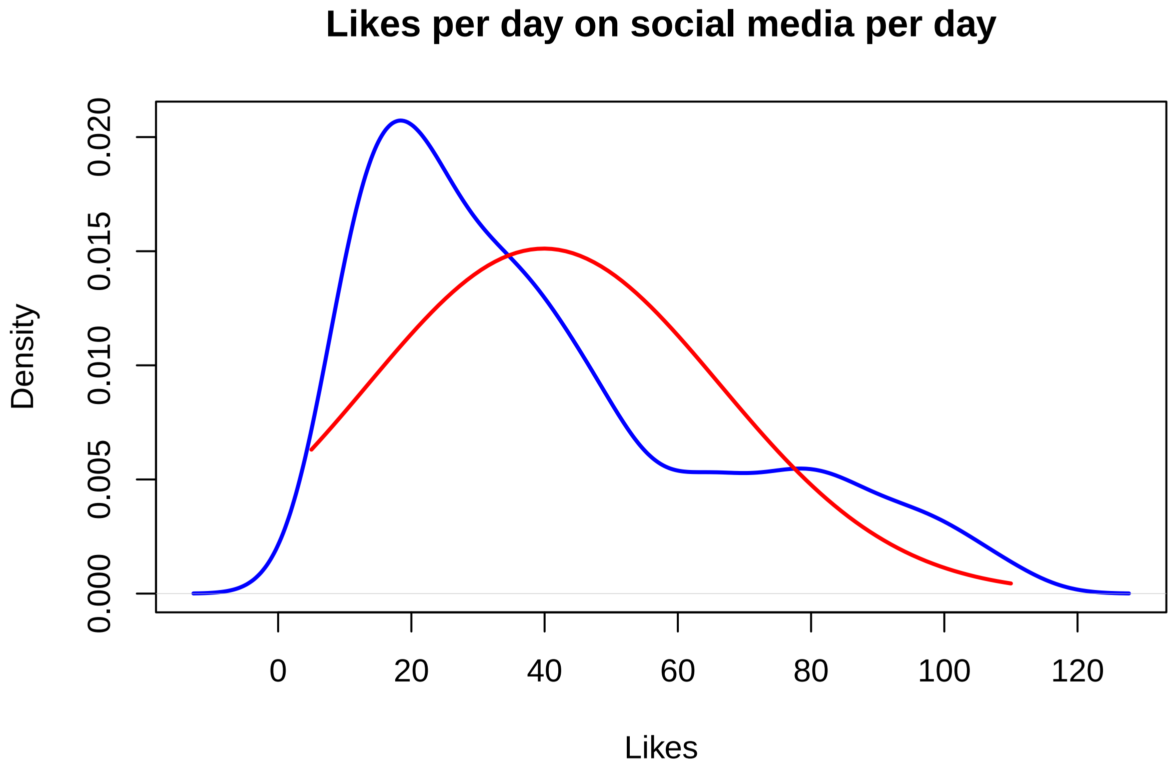
```
## # A tibble: 7 x 2
##   Platform   suma
##   <chr>     <int>
## 1 Instagram  1450
## 2 Twitter     681
## 3 Facebook    370
## 4 Whatsapp    240
## 5 Telegram    220
## 6 Snapchat    210
## 7 LinkedIn    150
```

### 3.6 Relation between likes received per day and dominant emotion

H0 -> The likes received are the same regardless of the dominant emotion

H1 -> At least one emotion has more/less likes

```
plot(density(data_transformed$Likes_Received_Per_Day),
     main = "Likes per day on social media per day",
     xlab = "Likes",
     ylab = "Density",
     col = "blue",
     lwd = 2)
values_normal_distribution <- seq(min(data_transformed$Likes_Received_Per_Day), max(data_transformed$Li
                                  length = 100)
normal_distribution <- dnorm(values_normal_distribution, mean = abs(mean(data_transformed$Likes_Receive
                             sd = sd(data_transformed$Likes_Received_Per_Day))
lines(values_normal_distribution, normal_distribution, col = "red", lwd = 2)
```



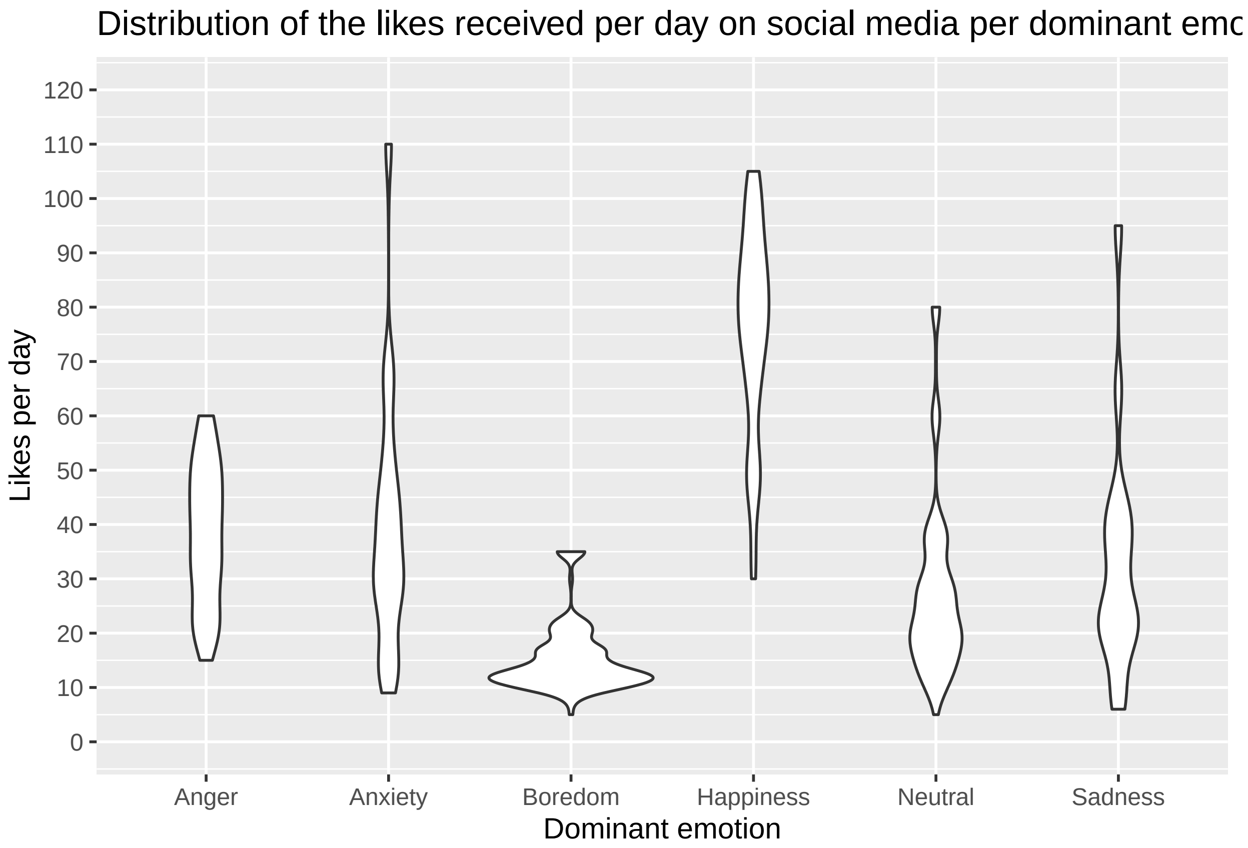
Variable Likes_Received_Per_Day -> No normal distribution -> ANOVA no possible

```
kruskal <- kruskal.test(Likes_Received_Per_Day ~ Dominant_Emotion, data = data_transformed)
kruskal
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  Likes_Received_Per_Day by Dominant_Emotion
## Kruskal-Wallis chi-squared = 529.6, df = 5, p-value < 2.2e-16
```

p < 0.05 -> There’s enough evidence to refuse H0 with a 95% confidence level -> Suggests relation

```
ggplot(data_transformed, aes(x = Dominant_Emotion, y = Likes_Received_Per_Day)) +
  geom_violin() +
    scale_y_continuous(limits = c(0, 120),
                     breaks = seq(0, 120, by = 10)) +
  labs(title = "Distribution of the likes received per day on social media per dominant emotion",
       x = "Dominant emotion",
       y = "Likes per day")
```



Taking a look at the graphic above, H1 is confirmed.

```
likes_platform <- data_transformed %>%
  group_by(Platform) %>%
  summarise(suma = sum(Likes_Received_Per_Day)) %>%
  arrange(desc(suma))
print(likes_platform)
```

```
## # A tibble: 7 x 2
##   Platform   suma
##   <chr>     <int>
## 1 Instagram 19818
## 2 Twitter    7049
## 3 Facebook   3748
## 4 Whatsapp   2916
## 5 Snapchat   2436
## 6 Telegram   2386
## 7 LinkedIn   1545
```