mla

venkat reddy

2024-07-14

```
library(knitr)
flipkart<-read.csv("/Users/venkatreddyaeluka/Desktop/flipkart.csv")
summary(flipkart)
```

```
##     brand              model            base_color         processor
##  Length:430         Length:430         Length:430         Length:430
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##  screen_size             ROM             RAM          display_size
##  Length:430         Min.   :  8.0   Min.   : 1.000   Min.   :4.70
##  Class :character   1st Qu.: 64.0   1st Qu.: 4.000   1st Qu.:6.30
##  Mode  :character   Median :128.0   Median : 4.000   Median :6.50
##                     Mean   :105.7   Mean   : 5.321   Mean   :6.37
##                     3rd Qu.:128.0   3rd Qu.: 6.000   3rd Qu.:6.50
##                     Max.   :512.0   Max.   :12.000   Max.   :7.60
##  num_rear_camera num_front_camera battery_capacity    ratings
##  Min.   :1.000   Min.   :1.000    Min.   :1800     Min.   :3.000
##  1st Qu.:2.000   1st Qu.:1.000    1st Qu.:4000     1st Qu.:4.300
##  Median :3.000   Median :1.000    Median :4500     Median :4.300
##  Mean   :2.905   Mean   :1.044    Mean   :4529     Mean   :4.339
##  3rd Qu.:4.000   3rd Qu.:1.000    3rd Qu.:5000     3rd Qu.:4.400
##  Max.   :4.000   Max.   :3.000    Max.   :7000     Max.   :4.600
##  num_of_ratings    sales_price     discount_percent     sales
##  Min.   :     4   Min.   :  5742   Min.   :0.010    Min.   :  0.000
##  1st Qu.:   745   1st Qu.: 11999   1st Qu.:0.060    1st Qu.:  1.640
##  Median :  5198   Median : 16990   Median :0.090    Median :  9.655
##  Mean   : 23568   Mean   : 25433   Mean   :0.108    Mean   : 29.752
##  3rd Qu.: 21089   3rd Qu.: 28999   3rd Qu.:0.160    3rd Qu.: 29.718
##  Max.   :642373   Max.   :157999   Max.   :0.440    Max.   :550.190
```

```
str(flipkart)
```

```
## 'data.frame':    430 obs. of  16 variables:
##  $ brand           : chr  "Apple" "Apple" "Apple" "Apple" ...
##  $ model           : chr  "iPhone SE" "iPhone 12 Mini" "iPhone SE" "iPhone XR" ...
##  $ base_color      : chr  "Black" "Red" "Red" "Others" ...
##  $ processor       : chr  "Water" "Ceramic" "Water" "iOS" ...
##  $ screen_size     : chr  "Very Small" "Small" "Very Small" "Medium" ...
##  $ ROM             : int  64 64 64 64 128 64 128 64 128 128 ...
##  $ RAM             : int  2 4 2 3 4 4 4 4 4 4 ...
##  $ display_size    : num  4.7 5.4 4.7 6.1 6.1 6.1 6.1 6.1 6.1 6.1 ...
##  $ num_rear_camera : int  1 2 1 1 2 2 2 2 2 2 ...
##  $ num_front_camera: int  1 1 1 1 1 1 1 1 1 1 ...
##  $ battery_capacity: int  1800 2815 1800 2942 2815 2815 2815 2815 2815 2815 ...
##  $ ratings         : num  4.5 4.5 4.5 4.6 4.6 4.6 4.6 4.6 4.6 4.6 ...
##  $ num_of_ratings  : int  38645 244 38645 5366 745 745 745 745 745 745 ...
##  $ sales_price     : int  32999 57149 32999 42999 69149 64149 69149 64149 69149 69
149 ...
##  $ discount_percent: num  0.17 0.04 0.17 0.1 0.02 0.02 0.02 0.02 0.02 0.02 ...
##  $ sales           : num  127.52 1.39 127.52 23.07 5.15 ...
```

```
names(flipkart)
```

```
##  [1] "brand"            "model"            "base_color"       "processor"
##  [5] "screen_size"      "ROM"              "RAM"              "display_size"
##  [9] "num_rear_camera"  "num_front_camera" "battery_capacity" "ratings"
## [13] "num_of_ratings"   "sales_price"      "discount_percent" "sales"
```

```
#check for missingness of the data
library(DataExplorer)
library(ggplot2)
is.na(flipkart)
```

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##       brand model base_color processor screen_size   ROM   RAM display_size
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## [385,]            FALSE        FALSE        FALSE  FALSE         FALSE
## [386,]            FALSE        FALSE        FALSE  FALSE         FALSE
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## [388,]            FALSE        FALSE        FALSE  FALSE         FALSE
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## [392,]            FALSE        FALSE        FALSE  FALSE         FALSE
## [393,]            FALSE        FALSE        FALSE  FALSE         FALSE
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## [402,]            FALSE        FALSE        FALSE  FALSE         FALSE
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## [406,]            FALSE        FALSE        FALSE  FALSE         FALSE
## [407,]            FALSE        FALSE        FALSE  FALSE         FALSE
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## [408,]         FALSE            FALSE            FALSE  FALSE           FALSE
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## [420,]         FALSE            FALSE            FALSE  FALSE           FALSE
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## [428,]         FALSE            FALSE            FALSE  FALSE           FALSE
## [429,]         FALSE            FALSE            FALSE  FALSE           FALSE
## [430,]         FALSE            FALSE            FALSE  FALSE           FALSE
##        sales_price discount_percent sales
##   [1,]       FALSE            FALSE FALSE
##   [2,]       FALSE            FALSE FALSE
##   [3,]       FALSE            FALSE FALSE
##   [4,]       FALSE            FALSE FALSE
##   [5,]       FALSE            FALSE FALSE
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##  [32,]       FALSE            FALSE FALSE
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## [88,]      FALSE          FALSE FALSE
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## [367,]        FALSE              FALSE FALSE
## [368,]        FALSE              FALSE FALSE
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## [369,]       FALSE             FALSE FALSE
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## [422,]       FALSE             FALSE FALSE
## [423,]       FALSE             FALSE FALSE
## [424,]       FALSE             FALSE FALSE
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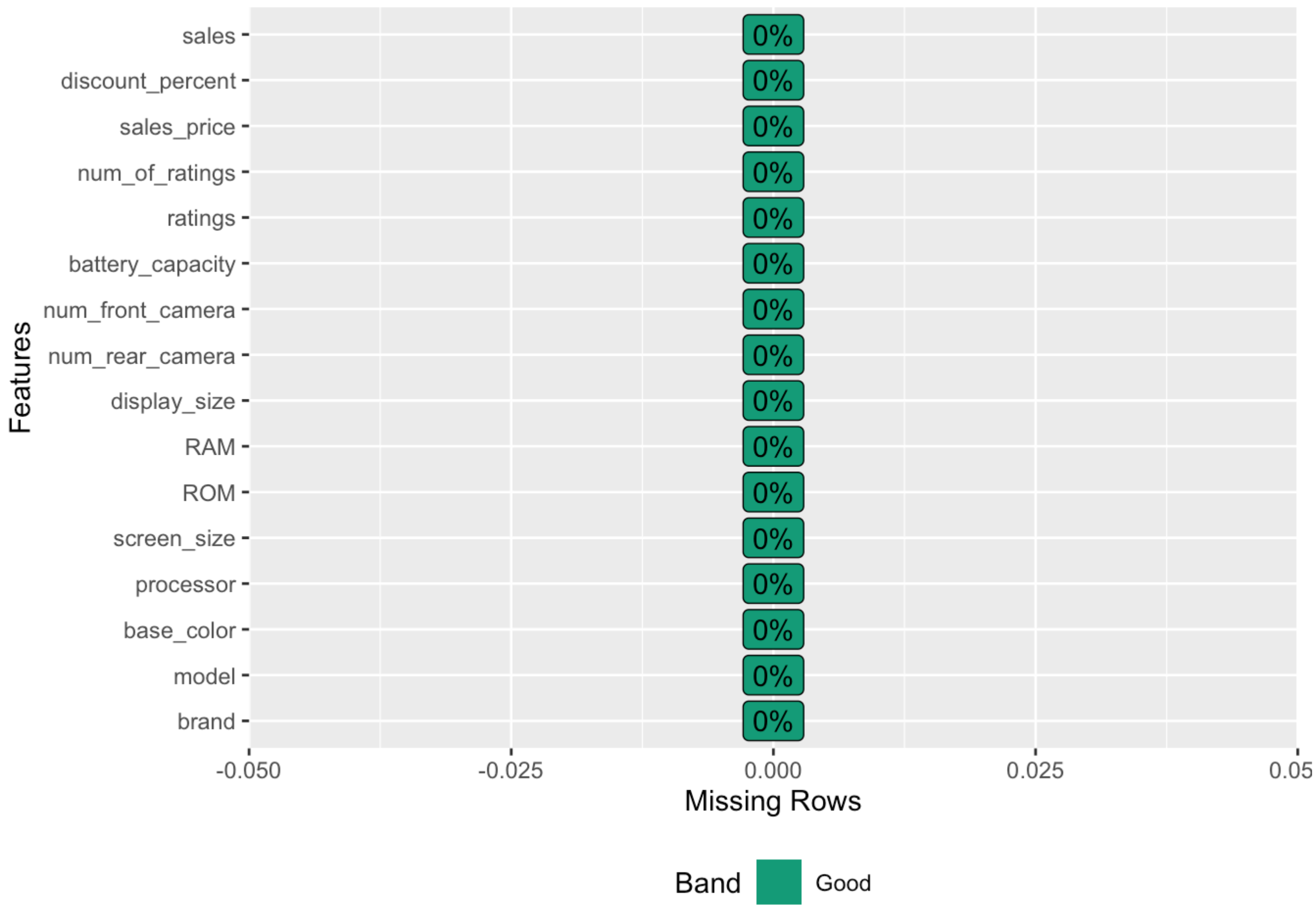
## [425,]       FALSE            FALSE FALSE
## [426,]       FALSE            FALSE FALSE
## [427,]       FALSE            FALSE FALSE
## [428,]       FALSE            FALSE FALSE
## [429,]       FALSE            FALSE FALSE
## [430,]       FALSE            FALSE FALSE
```

```
plot_missing(flipkart)
```




```
#Importing libraries
library(DataExplorer)
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
```

```
library(corrplot)
```

```
## corrplot 0.92 loaded
```

```
library(ggcorrplot)
library(glmnet)
```

```
## Loading required package: Matrix
```

```
## Loaded glmnet 4.1-8
```

```
library(lmtest)
```

```
## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
library(tidyverse)
```

```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──
## ✔ forcats   1.0.0     ✔ stringr   1.5.1
## ✔ lubridate 1.9.3     ✔ tibble    3.2.1
## ✔ purrr     1.0.2     ✔ tidyr     1.3.1
## ✔ readr     2.1.5
```

```
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✖ tidyr::expand() masks Matrix::expand()
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
## ✖ tidyr::pack()   masks Matrix::pack()
## ✖ tidyr::unpack() masks Matrix::unpack()
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflic
ts to become errors
```

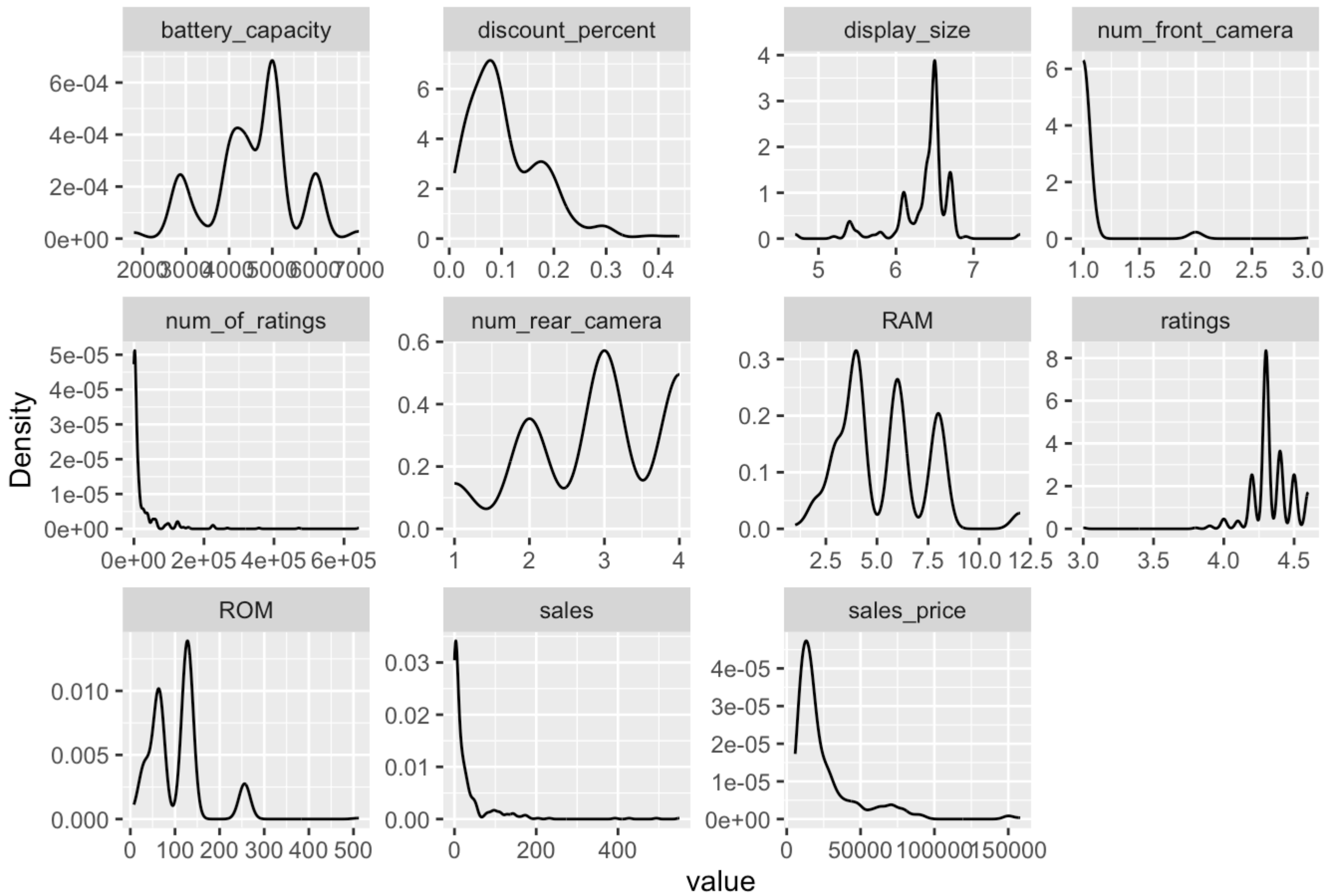
```
library(caret)
```

```
## Loading required package: lattice
##
## Attaching package: 'caret'
##
## The following object is masked from 'package:purrr':
##
##     lift
```

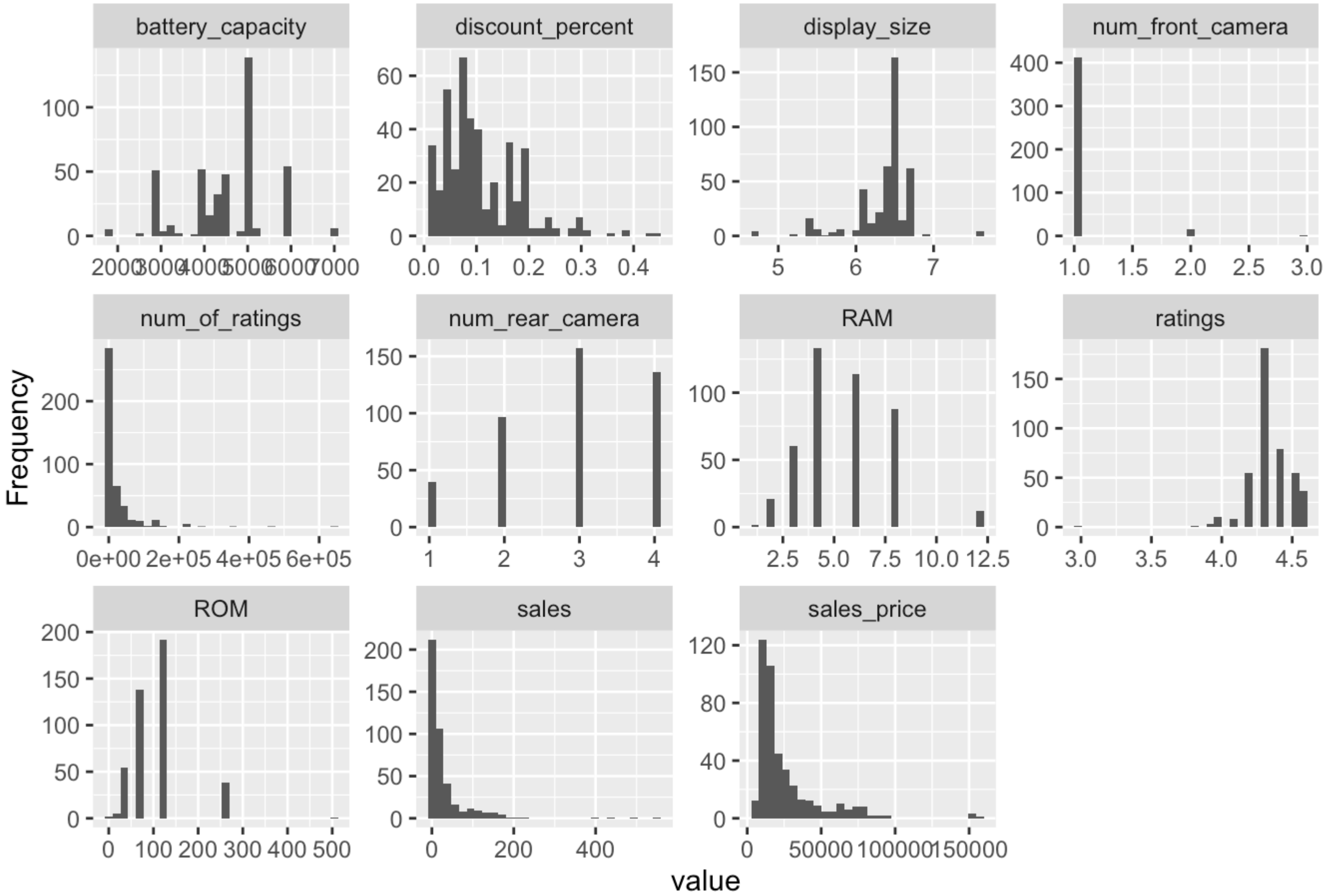
```
library(MASS)
```

```
##
## Attaching package: 'MASS'
##
## The following object is masked from 'package:dplyr':
##
##     select
```

```
#perform basic EDA
plot_density(flipkart)
```

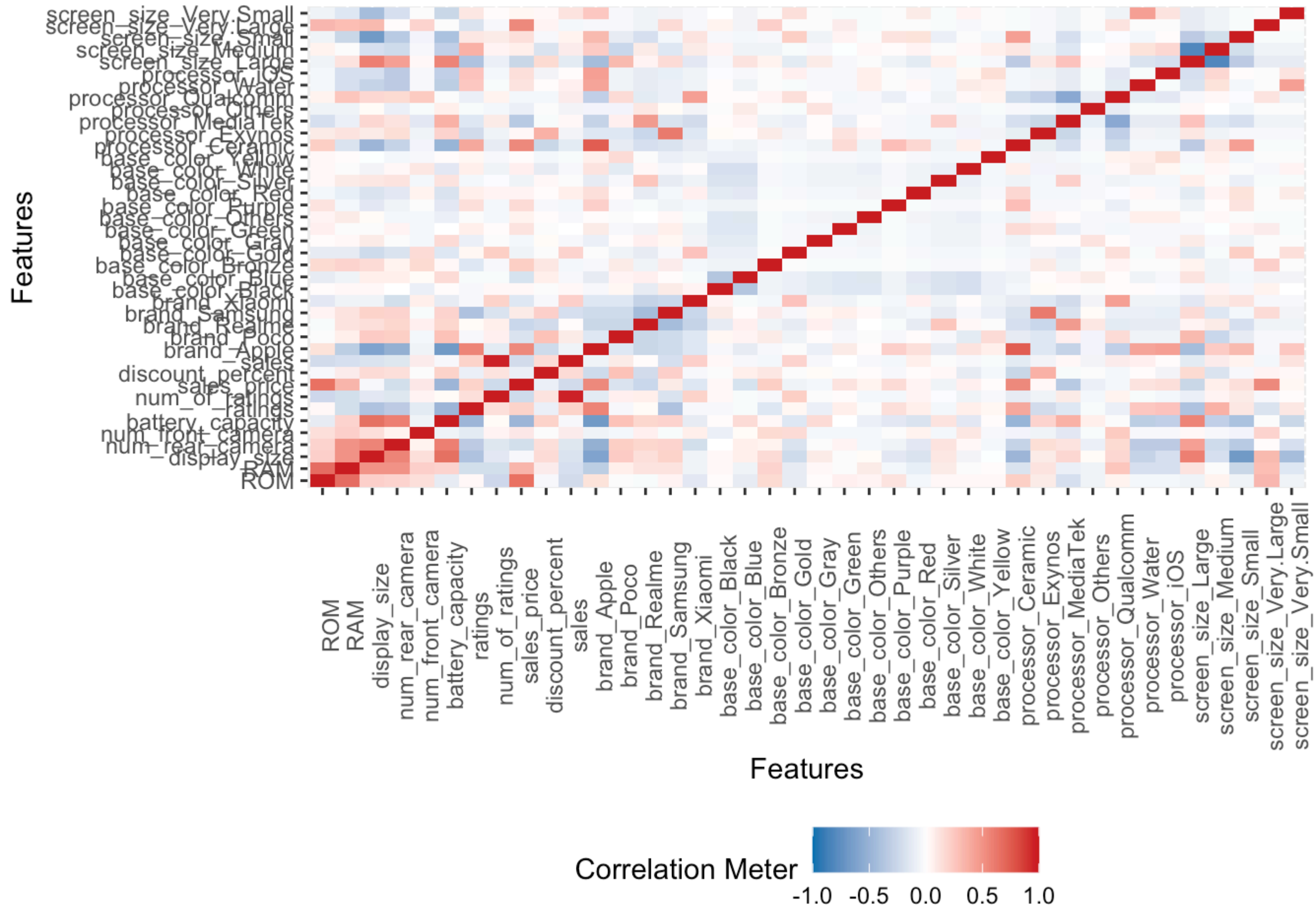



```
plot_histogram(flipkart)
```




```
plot_correlation(flipkart)
```

```
## 1 features with more than 20 categories ignored!
## model: 119 categories
```




```
head(flipkart)
```

```
##   brand          model base_color processor screen_size ROM RAM display_size
## 1 Apple       iPhone SE      Black     Water  Very Small  64   2          4.7
## 2 Apple iPhone 12 Mini        Red   Ceramic       Small  64   4          5.4
## 3 Apple       iPhone SE        Red     Water  Very Small  64   2          4.7
## 4 Apple       iPhone XR     Others       iOS      Medium  64   3          6.1
## 5 Apple       iPhone 12        Red   Ceramic      Medium 128   4          6.1
## 6 Apple       iPhone 12       Blue   Ceramic      Medium  64   4          6.1
##   num_rear_camera num_front_camera battery_capacity ratings num_of_ratings
## 1               1                1             1800     4.5          38645
## 2               2                1             2815     4.5            244
## 3               1                1             1800     4.5          38645
## 4               1                1             2942     4.6           5366
## 5               2                1             2815     4.6            745
## 6               2                1             2815     4.6            745
##   sales_price discount_percent  sales
## 1       32999             0.17 127.52
## 2       57149             0.04   1.39
## 3       32999             0.17 127.52
## 4       42999             0.10  23.07
## 5       69149             0.02   5.15
## 6       64149             0.02   4.78
```

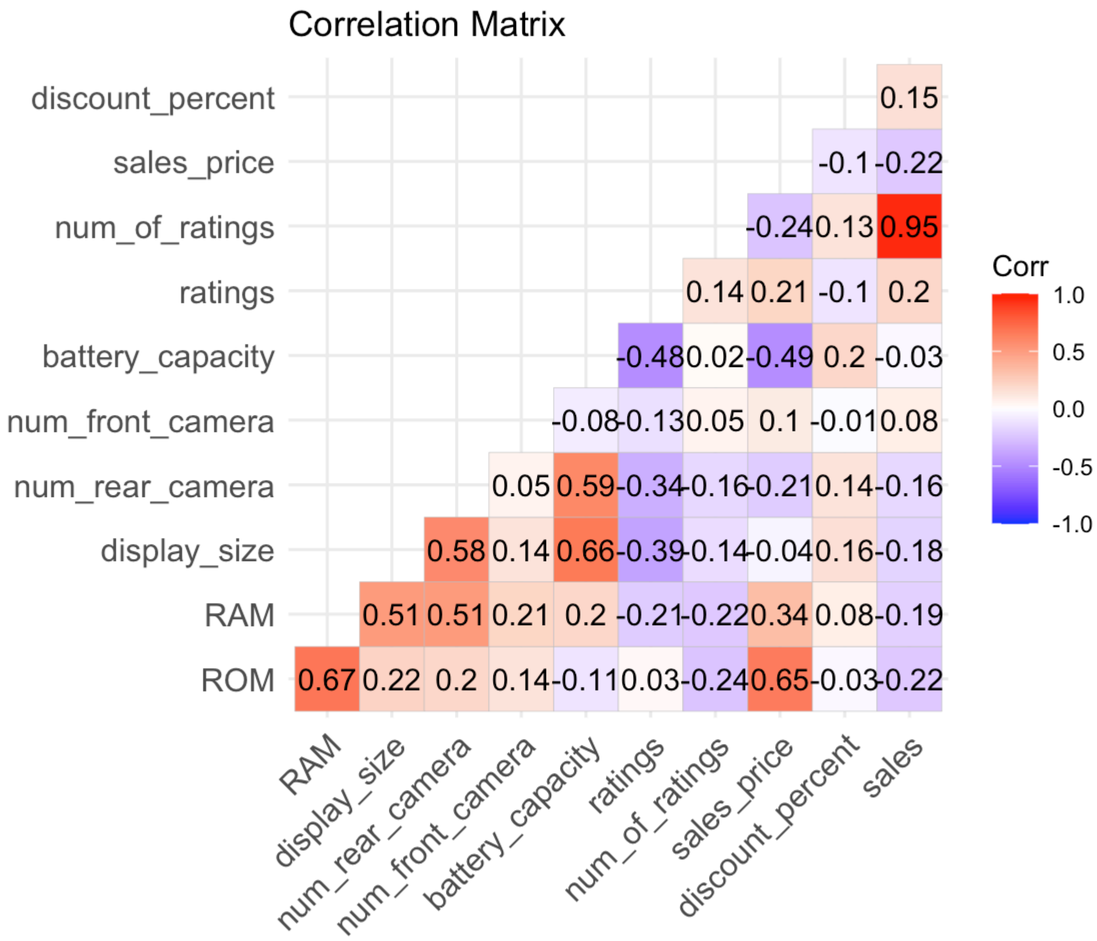
```
tail(flipkart)
```

```
##      brand         model base_color processor screen_size ROM RAM display_size
## 425 Xiaomi       Redmi 5       Blue  Qualcomm       Small  16   2          5.7
## 426 Xiaomi   Redmi 6 Pro      Black  Qualcomm       Small  32   3          5.8
## 427 Xiaomi   Redmi 6 Pro        Red  Qualcomm       Small  64   4          5.8
## 428 Xiaomi    Mi 11 Lite     Others  Qualcomm       Large 128   6          6.5
## 429 Xiaomi Redmi 8A Dual       Blue  Qualcomm      Medium  32   3          6.2
## 430 Xiaomi   Redmi 6 Pro       Blue  Qualcomm       Small  32   3          5.8
##     num_rear_camera num_front_camera battery_capacity ratings num_of_ratings
## 425               1                1             3300     4.3           4267
## 426               2                1             4000     4.3           1870
## 427               2                1             4000     4.3           1783
## 428               3                1             4250     4.2           1554
## 429               2                1             5000     4.2           8161
## 430               2                1             4000     4.3           1870
##     sales_price discount_percent sales
## 425        6890             0.18  2.94
## 426        7999             0.30  1.50
## 427        9699             0.28  1.73
## 428       21999             0.12  3.42
## 429        8299             0.07  6.77
## 430        8190             0.36  1.53
```

```
# Correlation matrix
numeric_vars <- flipkart %>%
  select_if(is.numeric)

correlation_matrix <- cor(numeric_vars, use = "complete.obs")

# Plot the correlation matrix
ggcorrplot::ggcorrplot(correlation_matrix,
                       lab = TRUE,
                       type = "lower",
                       title = "Correlation Matrix")
```




```
# Load necessary libraries
library(tidyverse)
library(reshape2)
```

```
##
## Attaching package: 'reshape2'
```

```
## The following object is masked from 'package:tidyr':
##
##     smiths
```

```
library(ggplot2)

# Load the dataset
flipkart <- read.csv("/Users/venkatreddyaeluka/Desktop/flipkart.csv")

# Remove duplicate values
flipkart<- flipkart %>% distinct()

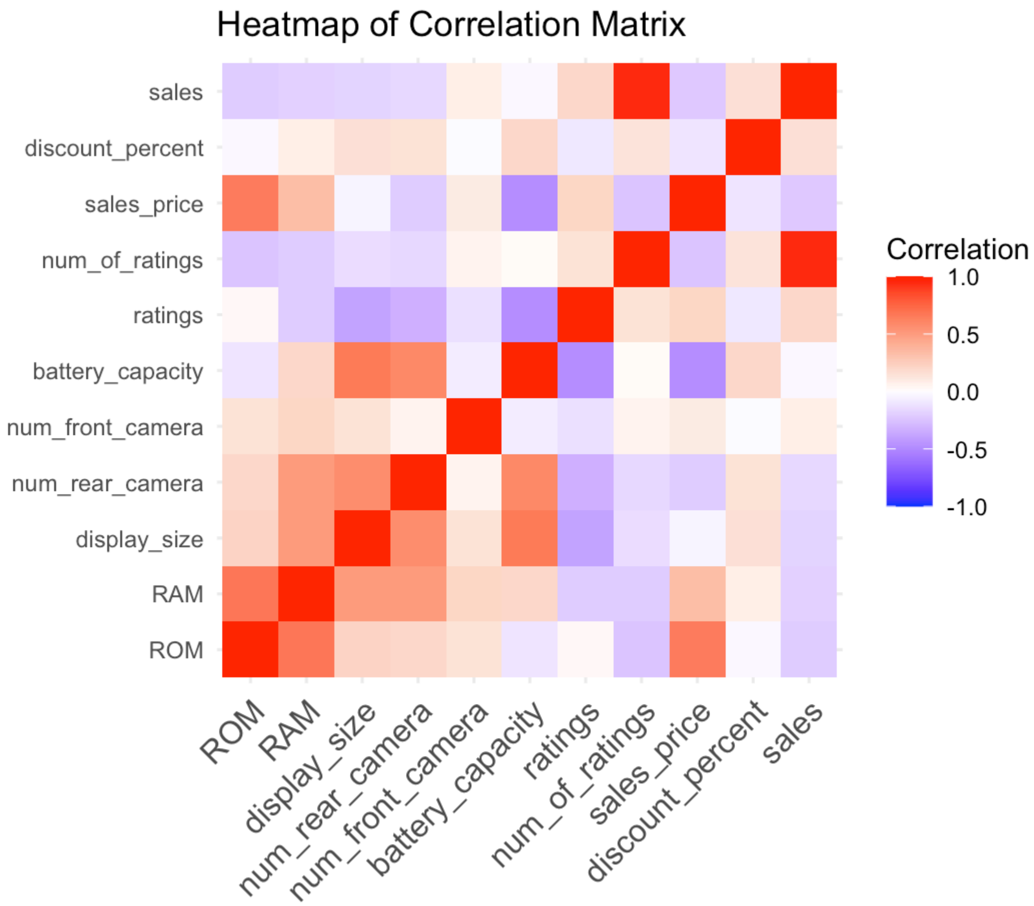
# Ensure column names are correct
colnames(flipkart)
```

```
##  [1] "brand"            "model"            "base_color"       "processor"
##  [5] "screen_size"      "ROM"              "RAM"              "display_size"
##  [9] "num_rear_camera"  "num_front_camera" "battery_capacity" "ratings"
## [13] "num_of_ratings"   "sales_price"      "discount_percent" "sales"
```

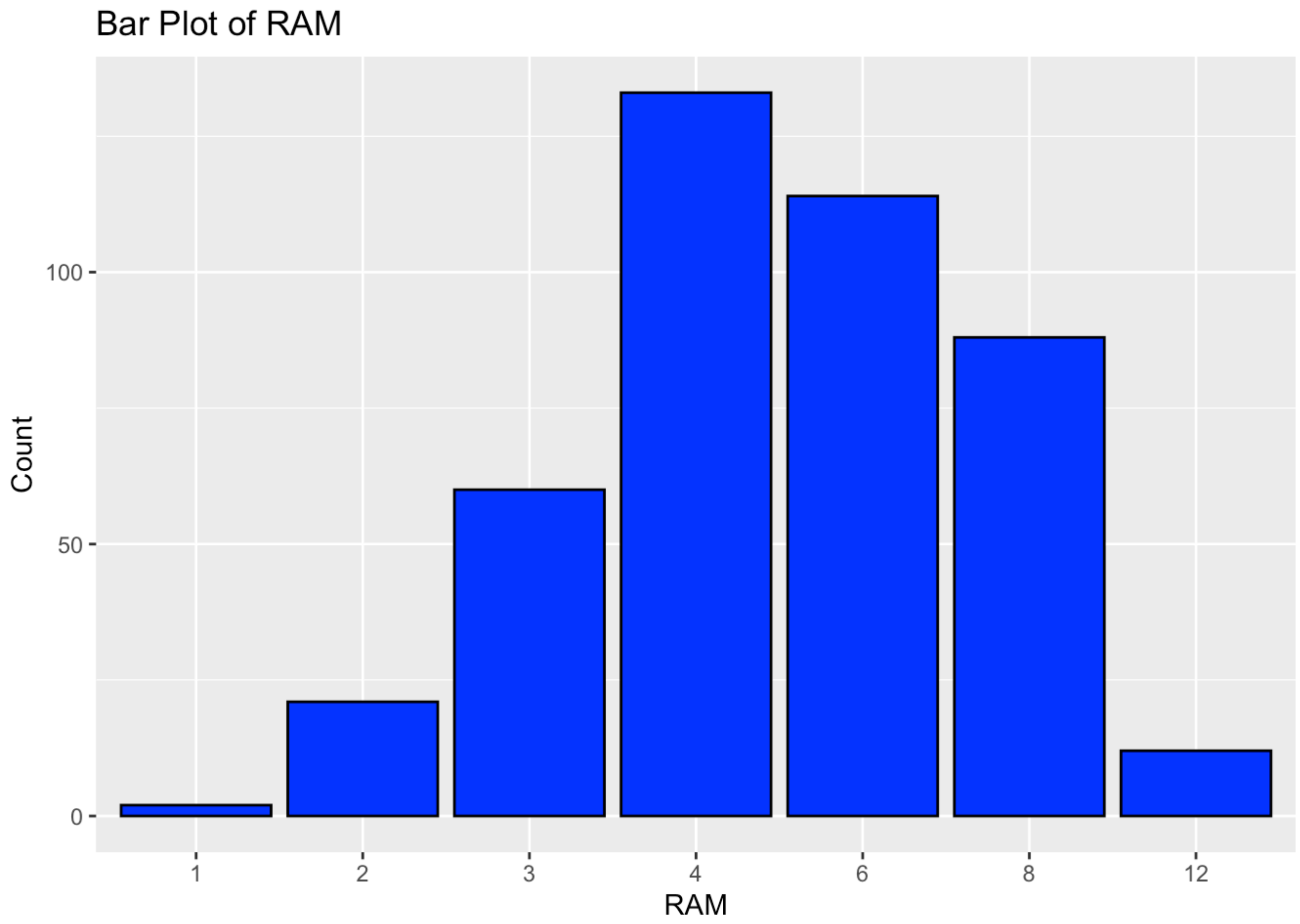
```
# Calculate the correlation matrix
# Make sure to select only numeric columns, and exclude any non-numeric columns like
'sales_price'
cor_matrix <- cor(flipkart %>% select_if(is.numeric))

# Melt the correlation matrix into a long format
melted_cor_matrix <- melt(cor_matrix)

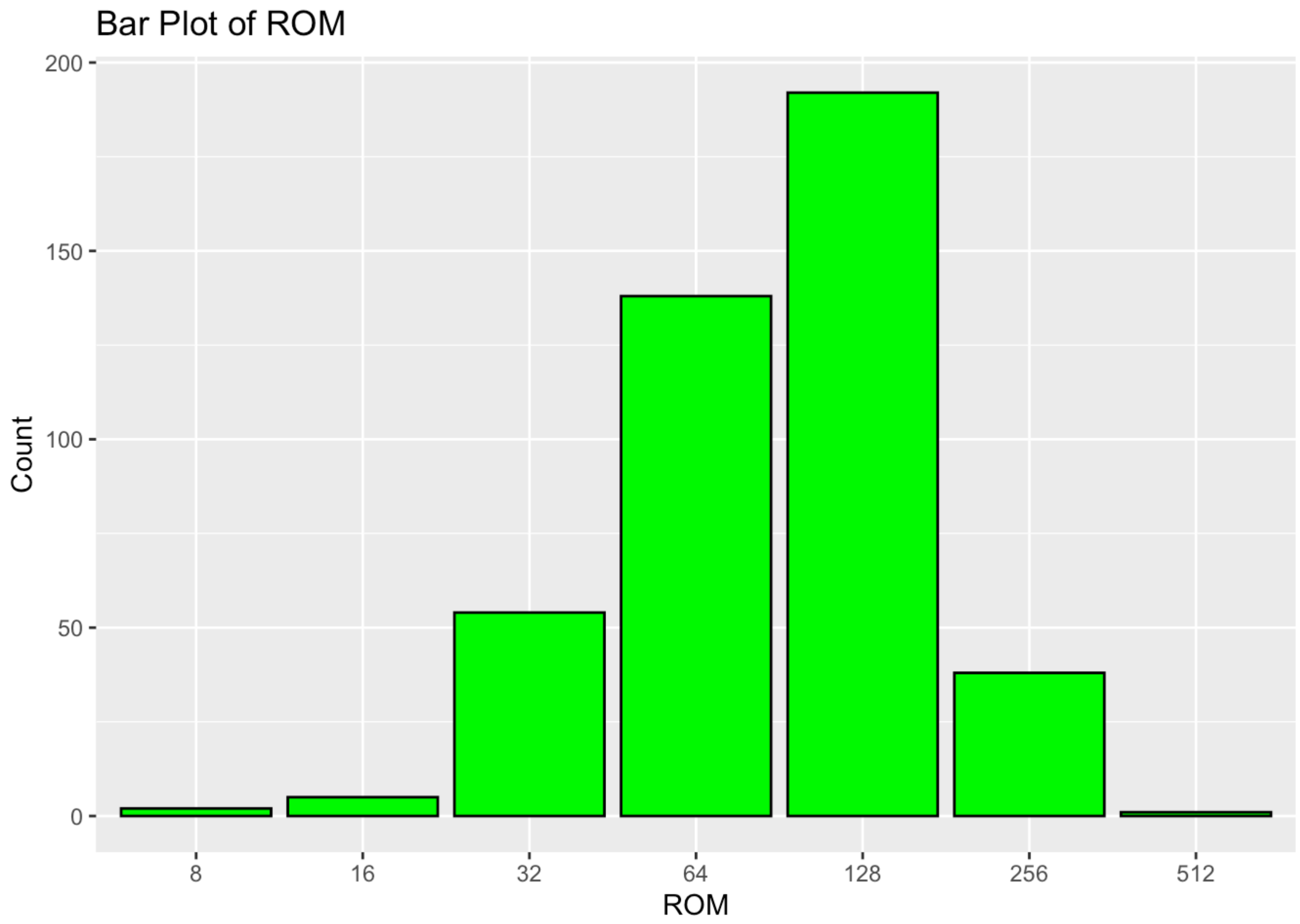
# Create the heatmap
ggplot(data = melted_cor_matrix, aes(x = Var1, y = Var2, fill = value)) +
  geom_tile() +
  scale_fill_gradient2(low = "blue", high = "red", mid = "white",
                       midpoint = 0, limit = c(-1, 1), space = "Lab",
                       name="Correlation") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, vjust = 1, size = 12, hjust = 1)) +
  coord_fixed() +
  ggtitle("Heatmap of Correlation Matrix") +
  xlab("") +
  ylab("")
```




```
# Bar plot for RAM
ggplot(flipkart, aes(x = as.factor(RAM))) +
  geom_bar(fill = 'blue', color = 'black') +
  ggtitle('Bar Plot of RAM') +
  xlab('RAM') +
  ylab('Count')
```

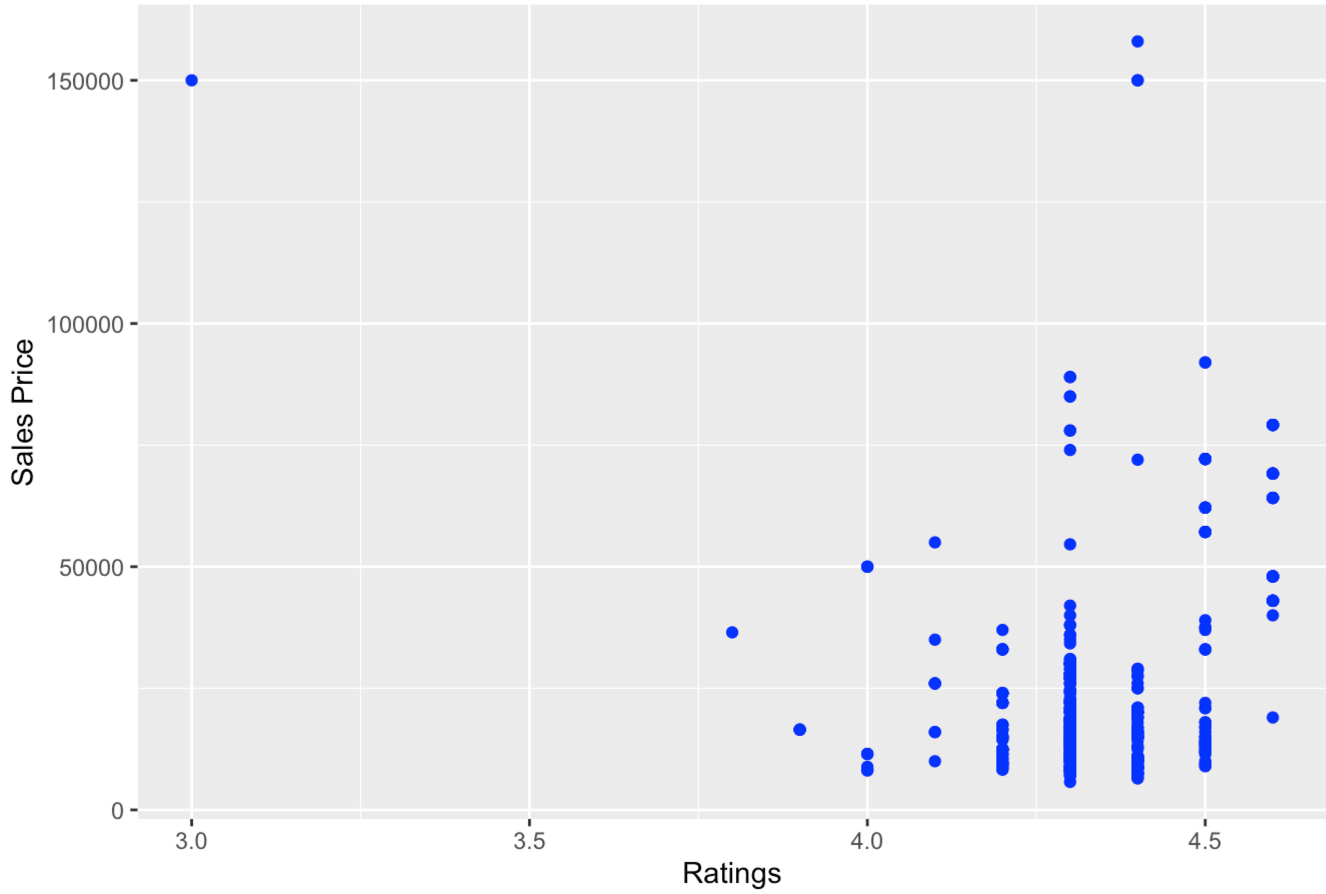



```
# Bar plot for ROM
ggplot(flipkart, aes(x = as.factor(ROM))) +
  geom_bar(fill = 'green', color = 'black') +
  ggtitle('Bar Plot of ROM') +
  xlab('ROM') +
  ylab('Count')
```

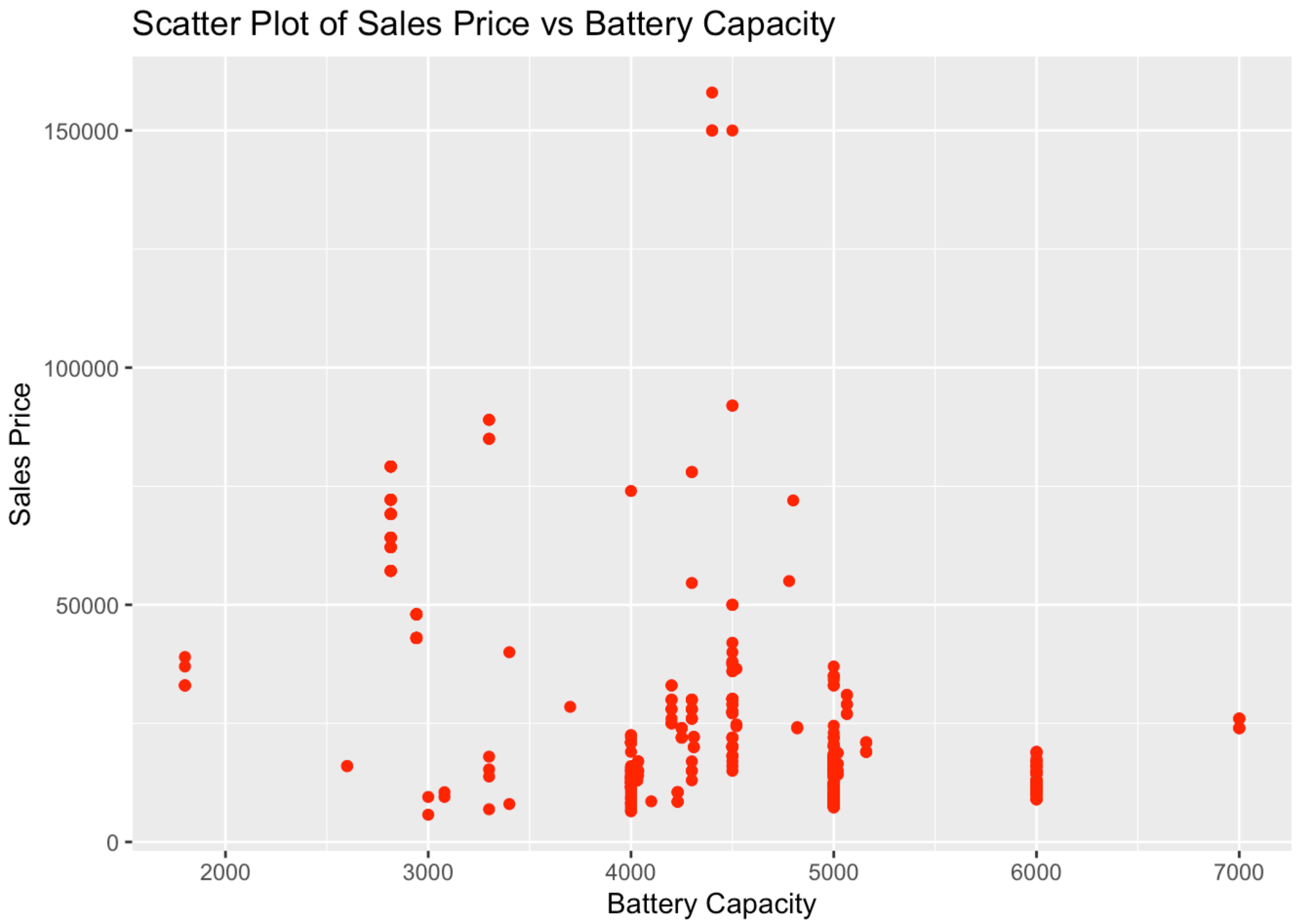



```r
# Scatter plot of sales_price vs ratings
ggplot(flipkart, aes(x = ratings, y = sales_price)) +
  geom_point(color = 'blue') +
  ggtitle('Scatter Plot of Sales Price vs Ratings') +
  xlab('Ratings') +
  ylab('Sales Price')
```

Scatter Plot of Sales Price vs Ratings

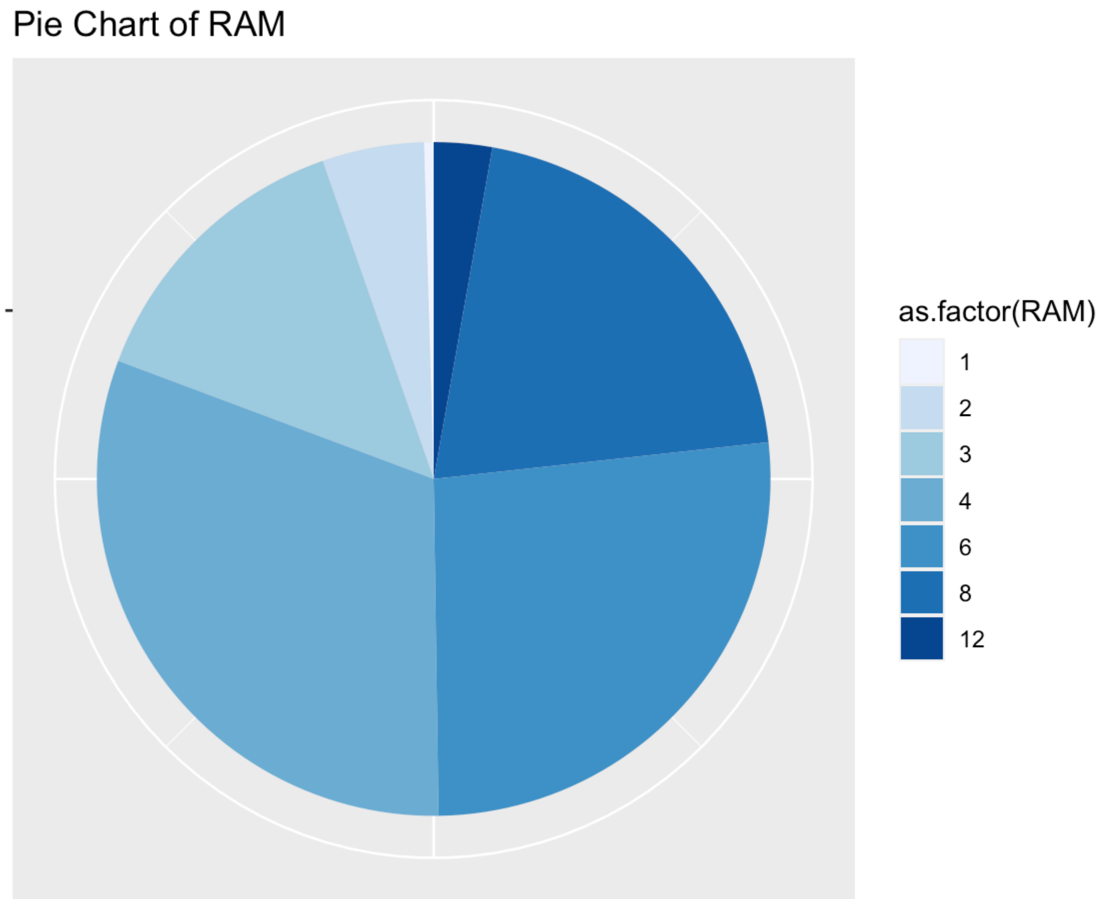



```
# Scatter plot of sales_price vs battery_capacity
ggplot(flipkart, aes(x = battery_capacity, y = sales_price)) +
  geom_point(color = 'red') +
  ggtitle('Scatter Plot of Sales Price vs Battery Capacity') +
  xlab('Battery Capacity') +
  ylab('Sales Price')
```



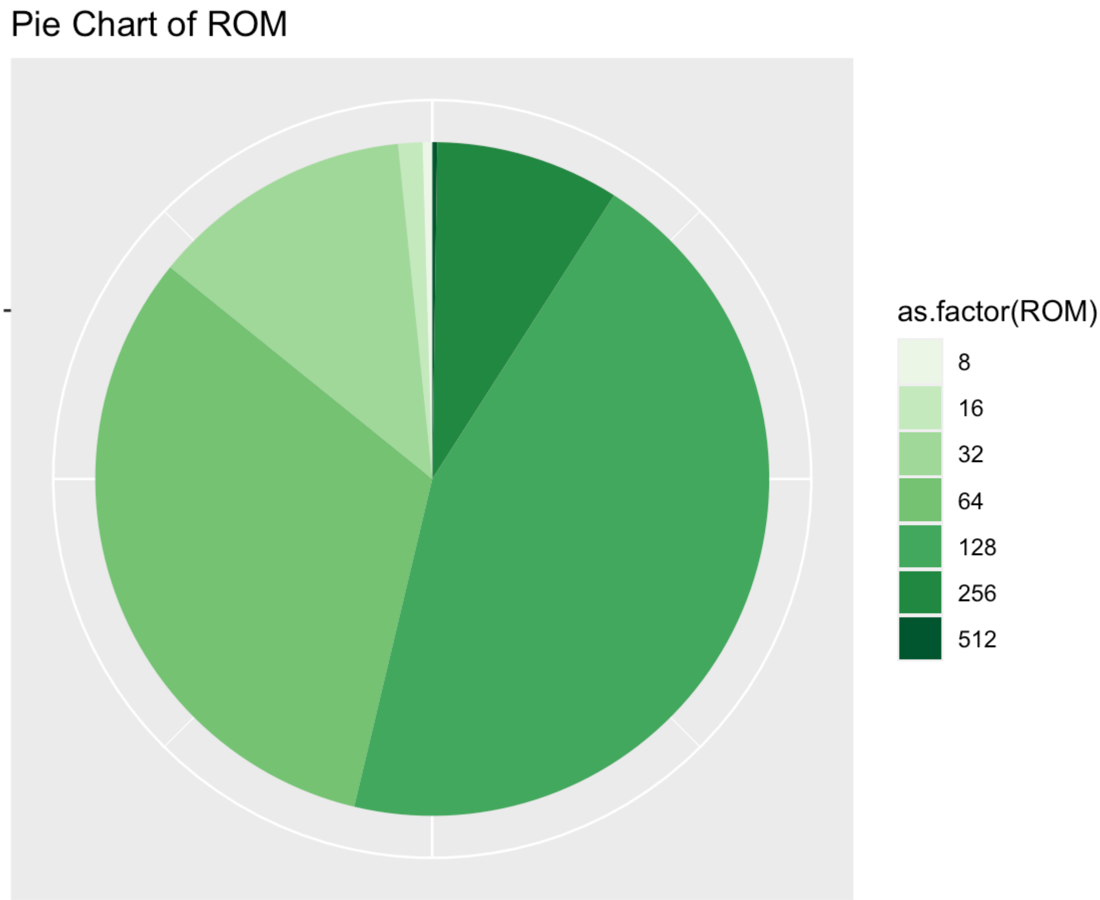

```
ram_distribution <- flipkart %>%
  count(RAM) %>%
  mutate(percentage = n / sum(n) * 100)

ggplot(ram_distribution, aes(x = "", y = percentage, fill = as.factor(RAM))) +
  geom_bar(width = 1, stat = "identity") +
  coord_polar(theta = "y") +
  ggtitle('Pie Chart of RAM') +
  ylab('') +
  xlab('') +
  theme(axis.text.x = element_blank()) +
  scale_fill_brewer(palette = "Blues")
```




```
# Pie chart for ROM
rom_distribution <- flipkart %>%
  count(ROM) %>%
  mutate(percentage = n / sum(n) * 100)

ggplot(rom_distribution, aes(x = "", y = percentage, fill = as.factor(ROM))) +
  geom_bar(width = 1, stat = "identity") +
  coord_polar(theta = "y") +
  ggtitle('Pie Chart of ROM') +
  ylab('') +
  xlab('') +
  theme(axis.text.x = element_blank()) +
  scale_fill_brewer(palette = "Greens")
```




```
# Split data into training and testing sets
set.seed(123)
train_index <- createDataPartition(flipkart$sales_price, p = 0.8, list = FALSE)
train_data <- flipkart[train_index, ]
test_data <- flipkart[-train_index, ]
```

```
# Simple Linear Regression
simple_model <- lm(sales_price ~ ratings, data = train_data)
summary(simple_model)
```

```
##
## Call:
## lm(formula = sales_price ~ ratings, data = train_data)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -20769 -12769  -7561   3439 159296
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -87428      34237  -2.554  0.01109 *
## ratings        26044       7886   3.302  0.00106 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 22880 on 343 degrees of freedom
## Multiple R-squared:  0.03082,    Adjusted R-squared:  0.02799
## F-statistic: 10.91 on 1 and 343 DF,  p-value: 0.001059
```

```
# Predict and calculate R-squared on test data
simple_pred <- predict(simple_model, test_data)
simple_r2 <- cor(test_data$sales_price, simple_pred)^2

# Calculate Mean Squared Error (MSE)
simple_mse <- mean((test_data$sales_price - simple_pred)^2)

# Print R-squared and MSE
print(paste("Simple Linear Regression R-squared:", round(simple_r2, 4)))
```

```
## [1] "Simple Linear Regression R-squared: 0.1685"
```

```
print(paste("Simple Linear Regression MSE:", round(simple_mse, 4)))
```

```
## [1] "Simple Linear Regression MSE: 327537719.1635"
```

```
# Multiple Linear Regression
multiple_model <- lm(sales_price ~ ratings + num_of_ratings + RAM + ROM + display_siz
e + battery_capacity + num_front_camera + num_rear_camera, data = train_data)
summary(multiple_model)
```

```
##
## Call:
## lm(formula = sales_price ~ ratings + num_of_ratings + RAM + ROM +
##     display_size + battery_capacity + num_front_camera + num_rear_camera,
##     data = train_data)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -44070  -7605  -2253   4130  76006
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -2.400e+04  3.167e+04  -0.758   0.4492
## ratings          -1.258e+03  5.608e+03  -0.224   0.8226
## num_of_ratings   -3.114e-02  1.303e-02  -2.390   0.0174 *
## RAM               7.177e+02  5.769e+02   1.244   0.2144
## ROM               1.998e+02  1.703e+01  11.734  < 2e-16 ***
## display_size      1.608e+04  3.182e+03   5.054 7.12e-07 ***
## battery_capacity -1.125e+01  1.293e+00  -8.701  < 2e-16 ***
## num_front_camera -4.290e+03  3.443e+03  -1.246   0.2136
## num_rear_camera  -5.581e+03  1.111e+03  -5.025 8.19e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 13720 on 336 degrees of freedom
## Multiple R-squared:  0.6588, Adjusted R-squared:  0.6507
## F-statistic: 81.11 on 8 and 336 DF,  p-value: < 2.2e-16
```

```
# Predict and calculate R-squared on test data
multiple_pred <- predict(multiple_model, test_data)
multiple_r2 <- cor(test_data$sales_price, multiple_pred)^2

# Calculate Mean Squared Error (MSE)
multiple_mse <- mean((test_data$sales_price - multiple_pred)^2)

# Print R-squared and MSE
print(paste("Multiple Linear Regression R-squared:", round(multiple_r2, 4)))
```

```
## [1] "Multiple Linear Regression R-squared: 0.6503"
```

```
print(paste("Multiple Linear Regression MSE:", round(multiple_mse, 4)))
```

```
## [1] "Multiple Linear Regression MSE: 146311377.5869"
```

```
# Prepare data for Lasso Regression
x_train <- model.matrix(sales_price ~ ratings + num_of_ratings + RAM + ROM + display_
size + battery_capacity + num_front_camera + num_rear_camera - 1, data = train_data)
y_train <- train_data$sales_price
x_test <- model.matrix(sales_price ~ ratings + num_of_ratings + RAM + ROM + display_s
ize + battery_capacity + num_front_camera + num_rear_camera - 1, data = test_data)
y_test <- test_data$sales_price

# Lasso Regression
lasso_model <- cv.glmnet(x_train, y_train, alpha = 1)
lasso_pred <- predict(lasso_model, s = "lambda.min", newx = x_test)
lasso_r2 <- 1 - sum((y_test - lasso_pred)^2) / sum((y_test - mean(y_test))^2)

# Calculate Mean Squared Error (MSE)
lasso_mse <- mean((y_test - lasso_pred)^2)

# Print R-squared and MSE
print(paste("Lasso Regression R-squared:", round(lasso_r2, 4)))
```

```
## [1] "Lasso Regression R-squared: 0.6251"
```

```
print(paste("Lasso Regression MSE:", round(lasso_mse, 4)))
```

```
## [1] "Lasso Regression MSE: 138267939.4104"
```

```
# Prepare data for Ridge Regression
x_train <- model.matrix(sales_price ~ ratings + num_of_ratings + RAM + ROM + display_
size + battery_capacity + num_front_camera + num_rear_camera - 1, data = train_data)
y_train <- train_data$sales_price
x_test <- model.matrix(sales_price ~ ratings + num_of_ratings + RAM + ROM + display_s
ize + battery_capacity + num_front_camera + num_rear_camera - 1, data = test_data)
y_test <- test_data$sales_price

# Ridge Regression
ridge_model <- cv.glmnet(x_train, y_train, alpha = 0)
ridge_pred <- predict(ridge_model, s = "lambda.min", newx = x_test)
ridge_r2 <- 1 - sum((y_test - ridge_pred)^2) / sum((y_test - mean(y_test))^2)

# Calculate Mean Squared Error (MSE)
ridge_mse <- mean((y_test - ridge_pred)^2)

# Print R-squared and MSE
print(paste("Ridge Regression R-squared:", round(ridge_r2, 4)))
```

```
## [1] "Ridge Regression R-squared: 0.6188"
```

```
print(paste("Ridge Regression MSE:", round(ridge_mse, 4)))
```

```
## [1] "Ridge Regression MSE: 140575091.114"
```