New-York-Aribnb-Price-Analysis.R

kadie

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```
library(dummies)
```

```
## dummies-1.5.6 provided by Decision Patterns
```

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 3.6.2
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --
```

```
## <U+2713> ggplot2 3.2.1     <U+2713> purrr   0.3.3
## <U+2713> tibble  2.1.3     <U+2713> dplyr   0.8.4
## <U+2713> tidyr   1.0.0     <U+2713> stringr 1.4.0
## <U+2713> readr   1.3.1     <U+2713> forcats 0.4.0
```

```
## Warning: package 'ggplot2' was built under R version 3.6.2
```

```
## Warning: package 'dplyr' was built under R version 3.6.2
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(infotheo)
library(gbm)
```

```
## Warning: package 'gbm' was built under R version 3.6.2
```

```
## Loaded gbm 2.1.5
```

```
library(plotly)
```

```
## Warning: package 'plotly' was built under R version 3.6.2
```

```
##
## Attaching package: 'plotly'
```

```
## The following object is masked from 'package:ggplot2':
##
##     last_plot
```

```
## The following object is masked from 'package:stats':
##
##     filter
```

```
## The following object is masked from 'package:graphics':
##
##     layout
```

```
library(FNN)
```

```
##
## Attaching package: 'FNN'
```

```
## The following object is masked from 'package:infotheo':
##
##     entropy
```

```
library(ggplot2)

########## import dataset #############
df <- read.csv("AB_NYC_2019.csv")
df$last_review <- as.character(df$last_review)
df$last_review <- as.Date(df$last_review) #format of date should be mm-dd-yyyy
df$last_review <- difftime(as.POSIXct(Sys.Date()),
                           as.POSIXct(df$last_review),
                           units="days")
df$last_review <- as.numeric(df$last_review)
names(df)[13] <- "days_since_last_review"

## check which columns have missing values
for (i in seq(ncol(df))){
        print(sum(is.na(df[,i])))
}
```

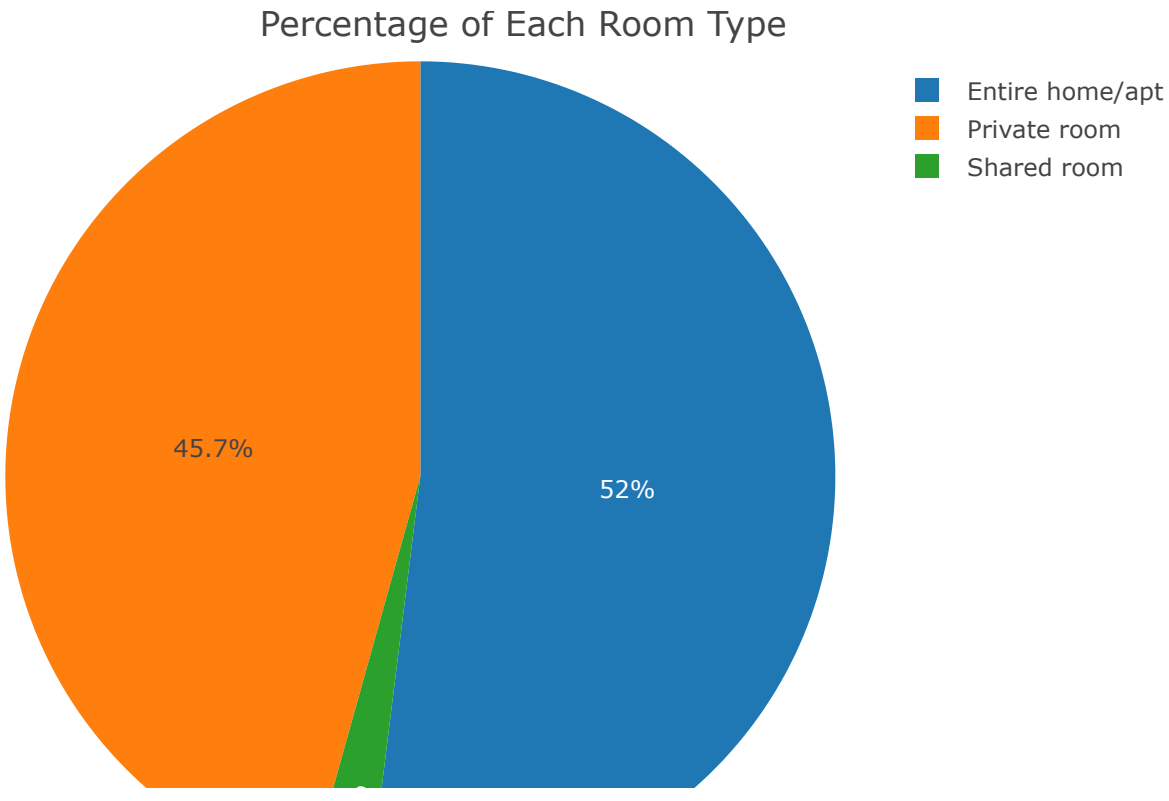
```
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 0
## [1] 10052
## [1] 10052
## [1] 0
## [1] 0
```

```
colnames(df[c(13,14)]) # Check which features have NA values
```

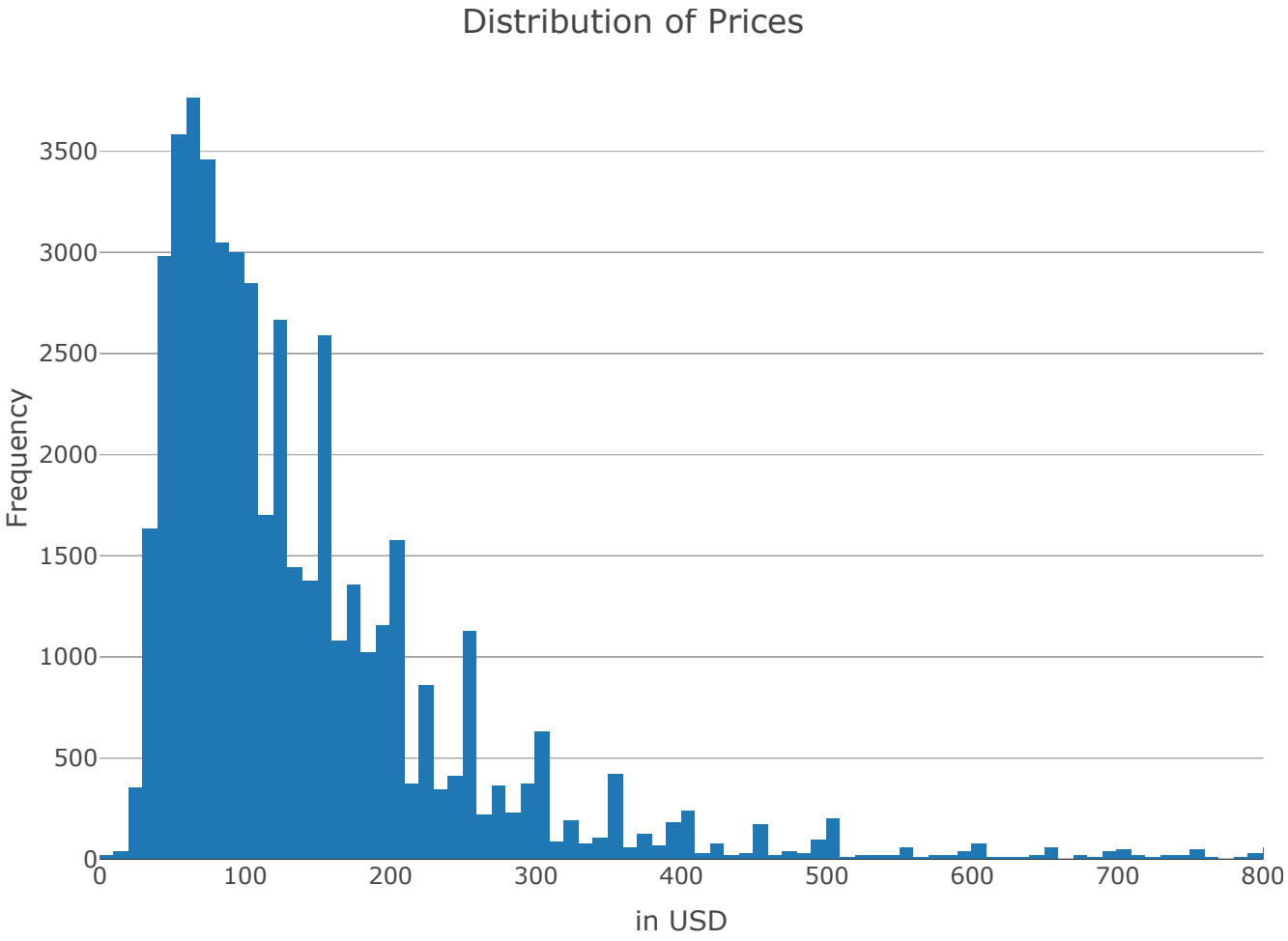
```
## [1] "days_since_last_review" "reviews_per_month"
```

```
df[is.na(df)] <- 0   # Assign 0 to all blank cells

########## Descriptive Stats #############
plot_ly(df, labels = count(df, vars = df$room_type)$vars,
        values = count(df, vars = df$room_type)$n, type = 'pie') %>%
        layout(title = 'Percentage of Each Room Type',
               xaxis = list(showgrid = FALSE, zeroline = FALSE, showticklabels = FALSE),
               yaxis = list(showgrid = FALSE, zeroline = FALSE, showticklabels = FALSE))
```

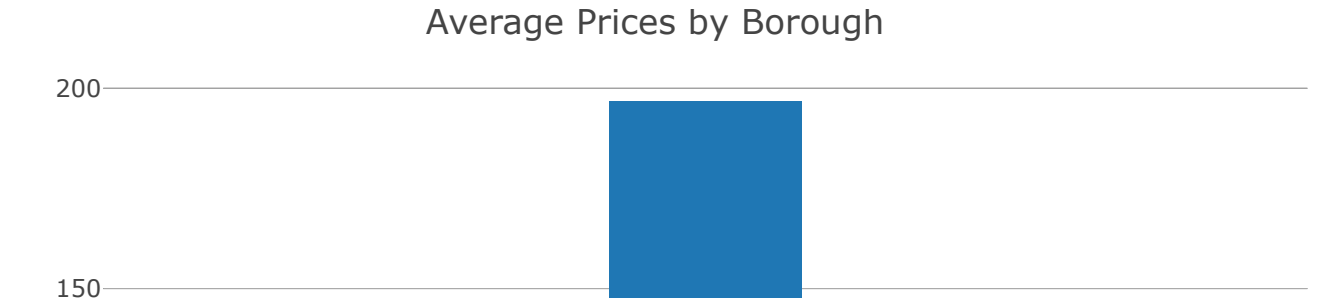


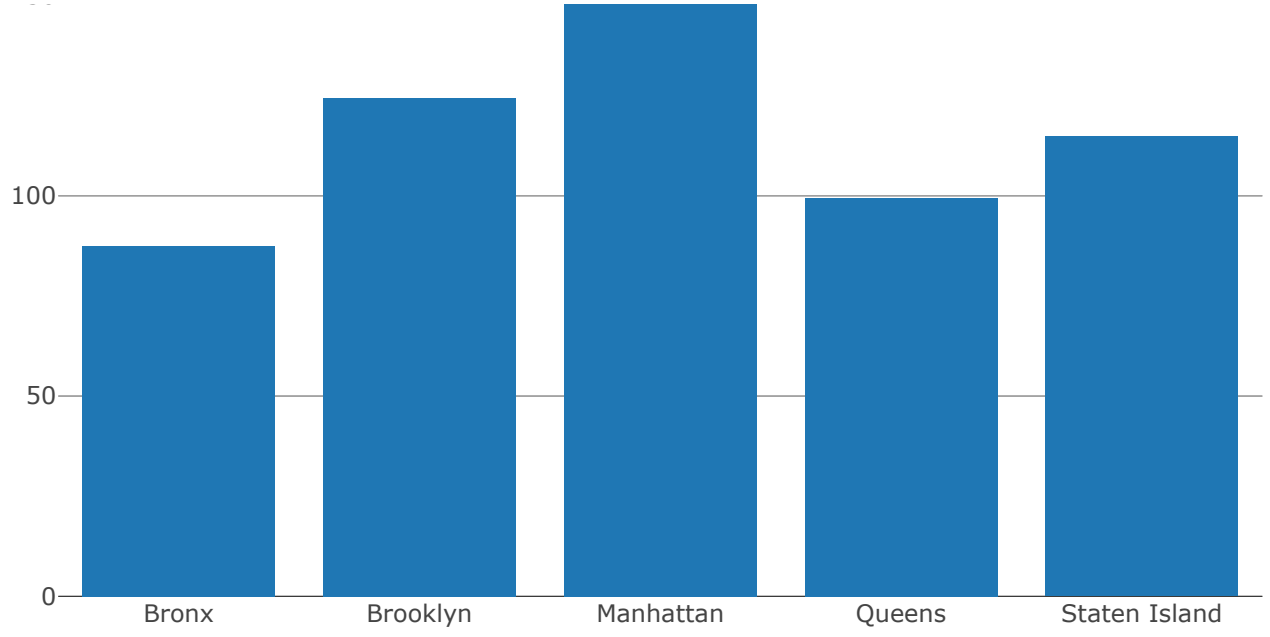

```
plot_ly(x= df$price, type = "histogram") %>%
        layout(title = "Distribution of Prices",
               xaxis = list(range = c(0, 800),title = "in USD"),
               yaxis = list(title = "Frequency"))
```



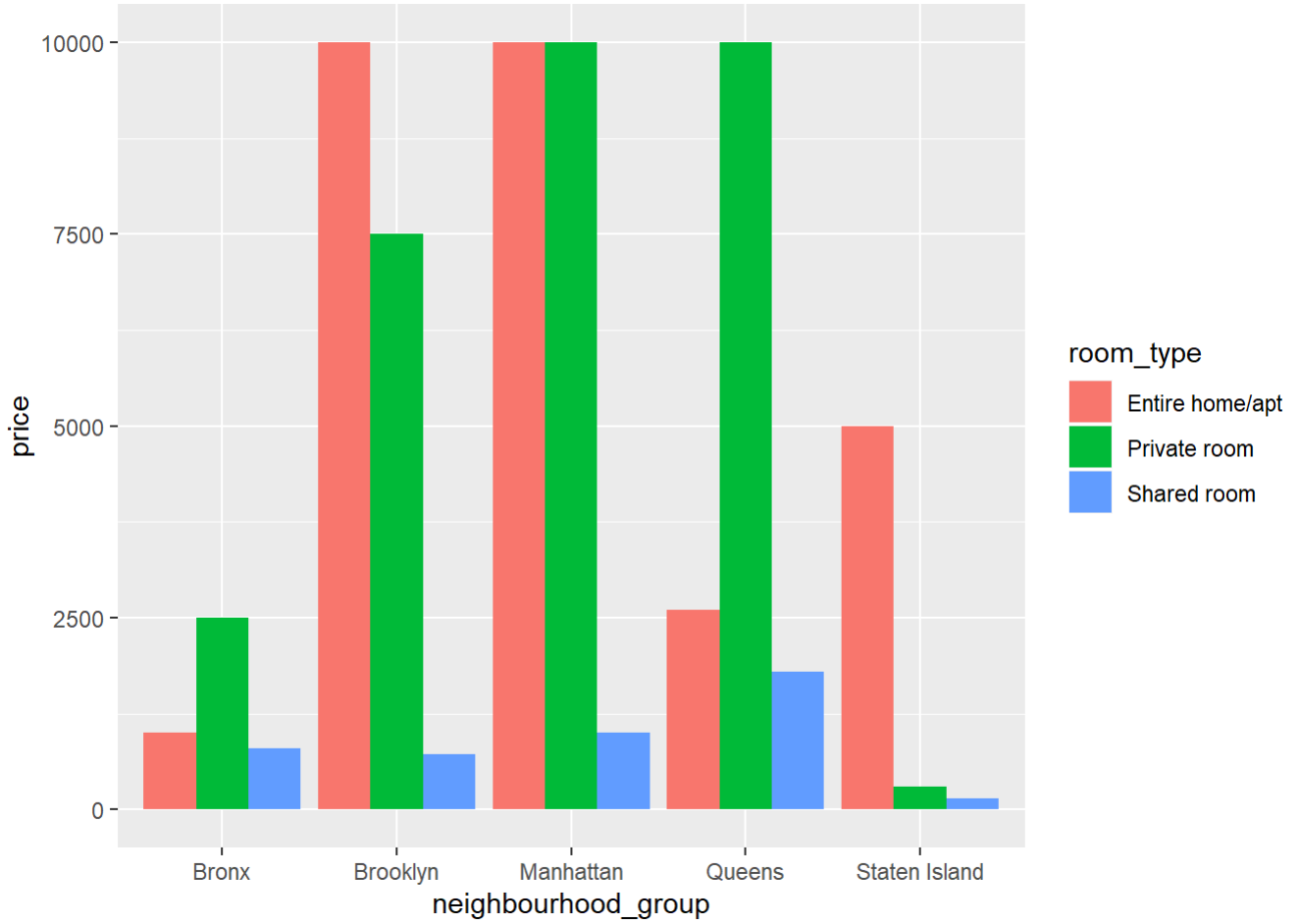

```
boroughs <- as.character(unique(df$neighbourhood_group))

plot_ly(x = boroughs,y = sapply(boroughs,function(x){
        mean(df$price[df$neighbourhood_group == x])}),type = "bar") %>%
        layout(title = "Average Prices by Borough")
```

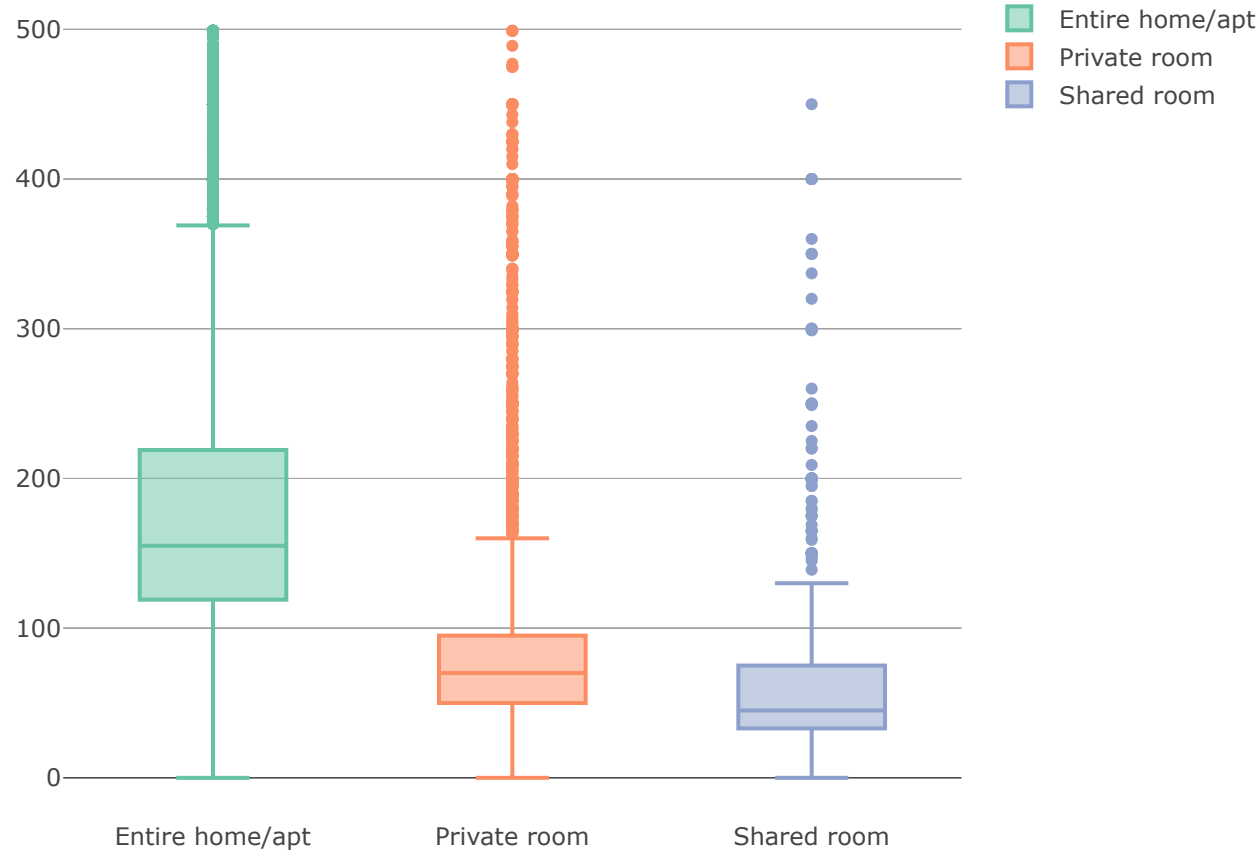




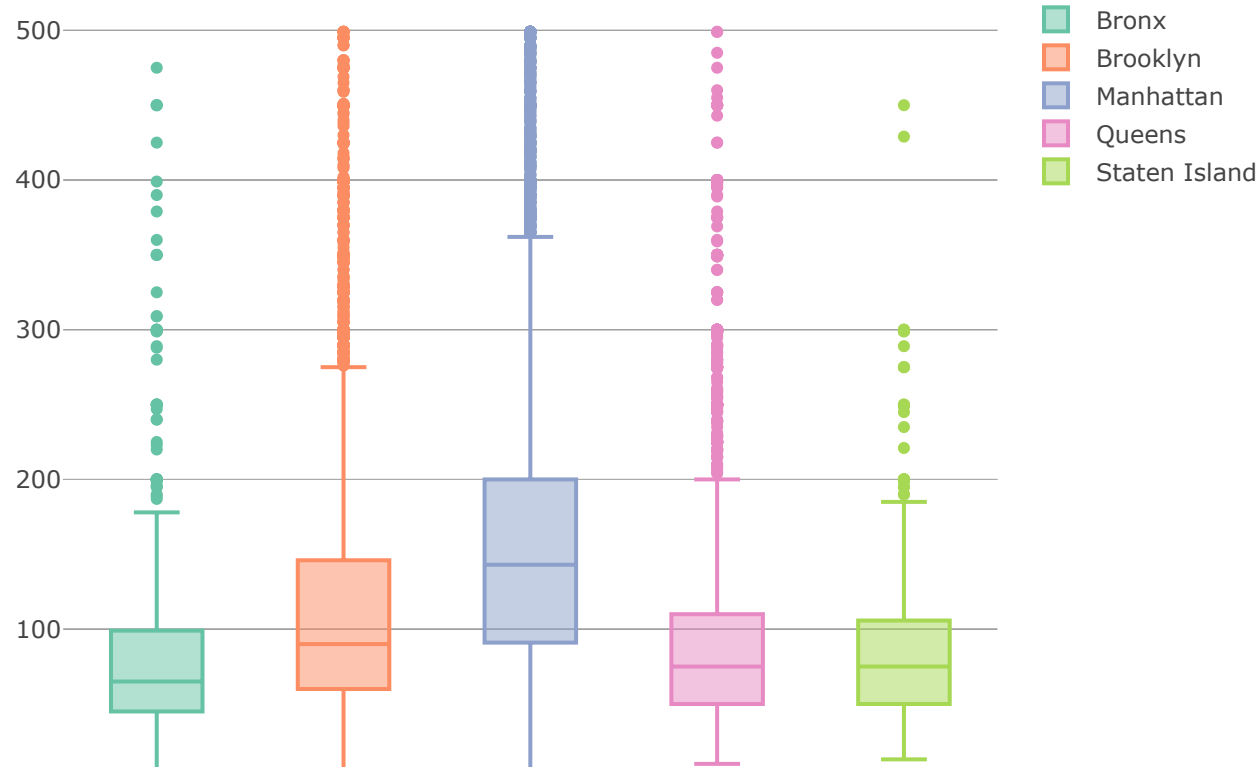

```
ggplot(df, aes(x=neighbourhood_group, y=price)) +
       geom_bar(aes(fill = room_type),position = "dodge", stat = "identity")
```




```
plot_ly(df, y = df$price[df$price<500],
             color = df$room_type[df$price<500], type = "box")
```




```
plot_ly(df, y = df$price[df$price<500],
        color = df$neighbourhood_group[df$price<500], type = "box")
```




```
########## Cleaning #############

# MinMax Scaling
scaler <- function(x){
        return((x-min(x))/(max(x)-min(x)))
}

colnames(df) # check column names
```

```
##  [1] "id"                            "name"
##  [3] "host_id"                       "host_name"
##  [5] "neighbourhood_group"           "neighbourhood"
##  [7] "latitude"                      "longitude"
##  [9] "room_type"                     "price"
## [11] "minimum_nights"                "number_of_reviews"
## [13] "days_since_last_review"        "reviews_per_month"
## [15] "calculated_host_listings_count" "availability_365"
```

```
for (i in c(7,8,11,12,13,14,15,16)){
        df[,i] <- scaler(df[,i])
}

# Create dummy variables
neighborhood_dummy <- dummy(df$neighbourhood,sep = "_",verbose = T)
```

```
## Warning in model.matrix.default(~x - 1, model.frame(~x - 1), contrasts = FALSE):
## non-list contrasts argument ignored
```

```
##   C:/Users/kadie/Desktop/Kadie's File/JHU/FALL 2/Data Analytics/Group/New York Aribnb Price A
nalysis.R : 221 dummy varibles created
```

```
room_dummy <- dummy(df$room_type,sep = "_",verbose = T)
```

```
## Warning in model.matrix.default(~x - 1, model.frame(~x - 1), contrasts = FALSE):
## non-list contrasts argument ignored
```

```
##   C:/Users/kadie/Desktop/Kadie's File/JHU/FALL 2/Data Analytics/Group/New York Aribnb Price A
nalysis.R : 3 dummy varibles created
```

```
df <- cbind(df,neighborhood_dummy,room_dummy) # combine the dataframes

# Delete Outliers
a <- sort(df$price)[round(nrow(df)*0.01, 0)]
b <- sort(df$price)[round(nrow(df)*0.99, 0)]
df <- subset(df, price>a & price<b)
nrow(df) # Check current row numbers
```

```
## [1] 47744
```

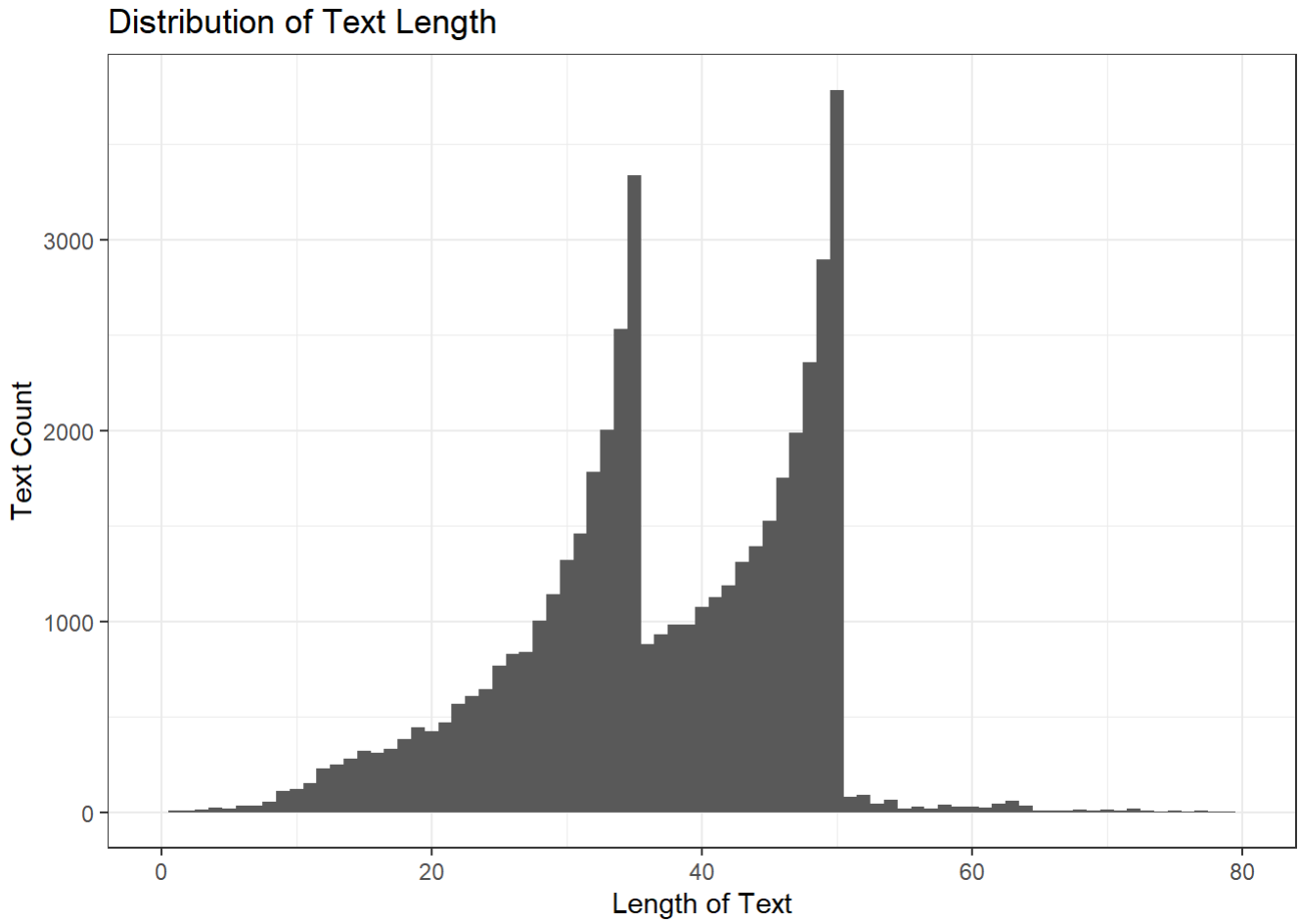
```
########## Text Analytics #############
df_text <- data.frame(name=as.character(df$name),stringsAsFactors = FALSE)
df_text$length <- nchar(df_text$name)
summary(df_text$length)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00   31.00   37.00   37.08   46.00  179.00
```

```
ggplot(df_text, aes(x=length)) +
        theme_bw()+
        geom_histogram(binwidth = 1)+
        labs(y = "Text Count", x = "Length of Text",
             title = "Distribution of Text Length")+
        xlim(0,80)
```

```
## Warning: Removed 26 rows containing non-finite values (stat_bin).
```

```
## Warning: Removed 2 rows containing missing values (geom_bar).
```



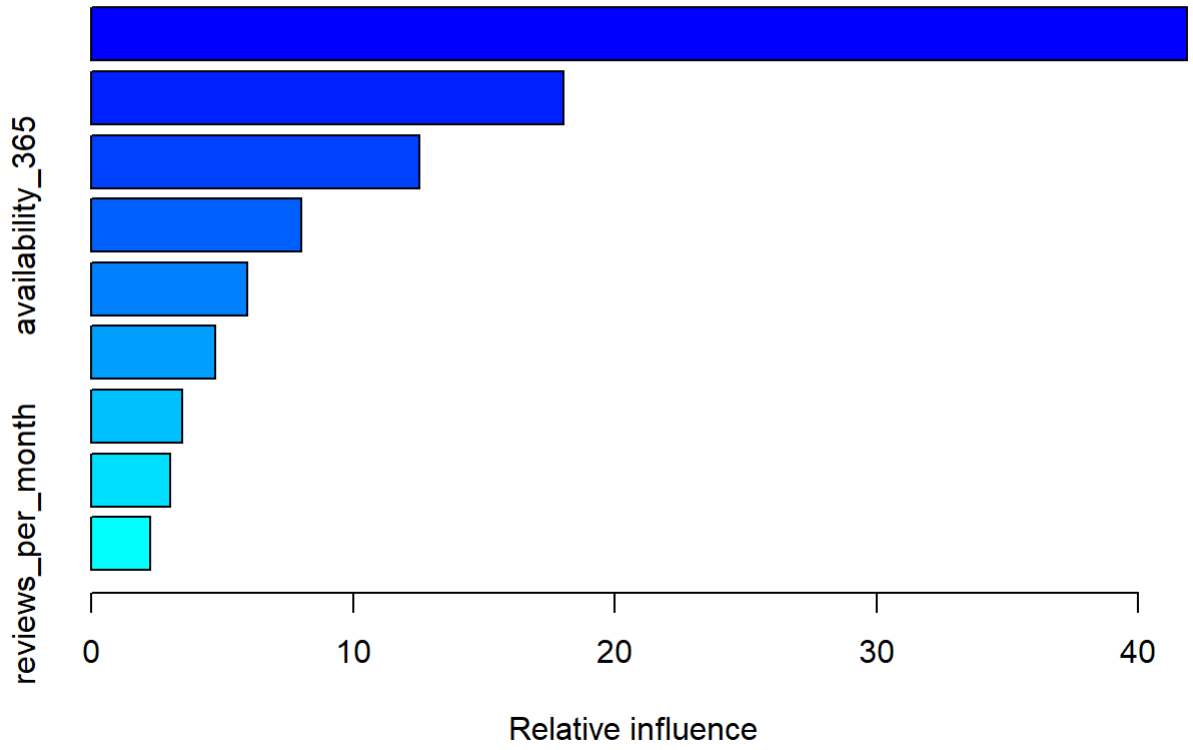

```
########## KNN Regression #############
set.seed(123)
train_index <- sample(1:nrow(df),0.8*nrow(df))
x_train <- df[train_index,11:ncol(df)] # Only columns 11-240 are used
x_test <- df[-train_index,11:ncol(df)] # Only columns 11-240 are used
y_train <- df[train_index,10]
y_test <- df[-train_index,10]
for (i in c(10,25,50,100)){
        knn_pred <- knn.reg(train=x_train, y=y_train, test=x_test, k=i)
        print(sqrt(mean((knn_pred$pred - y_test)^2)))
}
```

```
## [1] 79.55545
## [1] 78.94545
## [1] 79.55915
## [1] 80.32846
```

```
########## Gradient Boosting Machine ##########
set.seed(123)
gbm_df <- df[,7:16]
x_train_gbm <- sample(1:nrow(gbm_df),0.8*nrow(gbm_df))
gbm <- gbm(price~., data = gbm_df[x_train_gbm,],distribution = "gaussian",
           n.trees = 150,shrinkage = 0.1, interaction.depth = 17)
print(gbm)
```

```
## gbm(formula = price ~ ., distribution = "gaussian", data = gbm_df[x_train_gbm,
##     ], n.trees = 150, interaction.depth = 17, shrinkage = 0.1)
## A gradient boosted model with gaussian loss function.
## 150 iterations were performed.
## There were 9 predictors of which 9 had non-zero influence.
```

```
summary(gbm)
```




```
##                                                     var   rel.inf
## room_type                                     room_type 41.848913
## longitude                                     longitude 18.057069
## latitude                                       latitude 12.540113
## availability_365                         availability_365  8.035680
## minimum_nights                             minimum_nights  5.974985
## calculated_host_listings_count calculated_host_listings_count  4.759926
## number_of_reviews                       number_of_reviews  3.468975
## days_since_last_review           days_since_last_review  3.040707
## reviews_per_month                       reviews_per_month  2.273631
```

```
predicprice <- predict(gbm, newdata = gbm_df[-x_train_gbm,], n.trees = 150)
sqrt(mean((predicprice-gbm_df[-x_train_gbm,]$price)^2))
```

```
## [1] 74.07903
```