Experiment No.8	
Data Visualization using Hive/PIG/R/Tableau/.	
Date of Performance:30/9/2023	
Date of Submission:9/10/2023	

Aim: Data Visualization using Hive/PIG/R/Tableau/.

Theory:

Data visualization is the technique used to deliver insights in data using visual cues such as graphs, charts, maps, and many others. This is useful as it helps in intuitive and easy understanding of the large quantities of data and thereby make better decisions regarding it. Data Visualization in R Programming Language

The popular data visualization tools that are available are Tableau, Plotly, R, Google Charts, Infogram, and Kibana. The various data visualization platforms have different capabilities, functionality, and use cases. They also require a different skill set . This article discusses the use of R for data visualization.

R is a language that is designed for statistical computing, graphical data analysis, and scientific research. It is usually preferred for data visualization as it offers flexibility and minimum required coding through its packages.

Consider the following *airquality* data set for visualization in R:

Ozone	Solar R.	Wind	Temp	Month	Day
41	190	7.4	67	5	1
36	118	8.0	72	5	2
12	149	12.6	74	5	3
18	313	11.5	62	5	4
NA	NA	14.3	56	5	5
28	NA	14.9	66	5	6

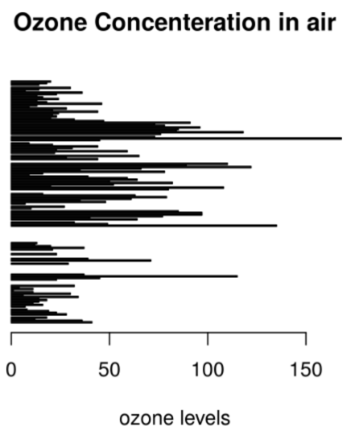
1.Bar Plot

There are two types of bar plots- horizontal and vertical which represent data points as horizontal or vertical bars of certain lengths proportional to the value of the data item. They are generally used for continuous and categorical variable plotting. By setting the horiz parameter to true and false, we can get horizontal and vertical bar plots respectively.

Example 1:

```
# Horizontal Bar Plot for
# Ozone concentration in air
barplot(airquality$Ozone,
        main = 'Ozone Concenteration in air',
        xlab = 'ozone levels', horiz = TRUE)
```

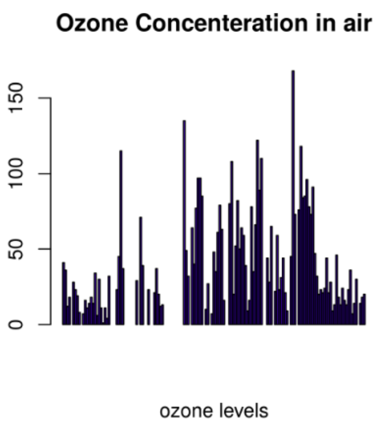
Output:



Example 2:

```
# Vertical Bar Plot for
# Ozone concentration in air
```

```
barplot(airquality$Ozone, main = 'Ozone Concenteration in air',
        xlab = 'ozone levels', col ='blue', horiz = FALSE)
```



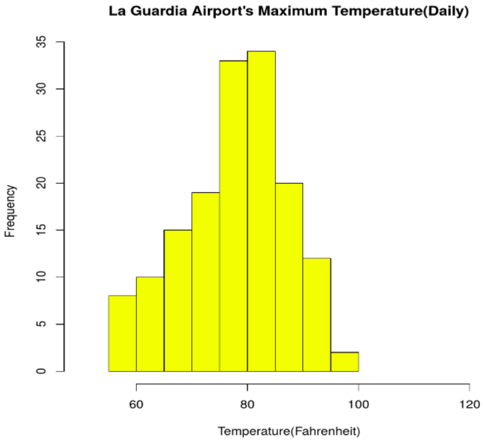
2. Histogram

A histogram is like a bar chart as it uses bars of varying height to represent data distribution. However, in a histogram values are grouped into consecutive intervals called bins. In a Histogram, continuous values are grouped and displayed in these bins whose size can be varied.

Example:

```
# Histogram for Maximum Daily Temperature

data(airquality)


hist(airquality$Temp, main ="La Guardia Airport's\

Maximum Temperature(Daily)",

   xlab ="Temperature(Fahrenheit)",

   xlim = c(50, 125), col ="yellow",

   freq = TRUE)
```

Output:



3. Box Plot

The statistical summary of the given data is presented graphically using a boxplot. A boxplot depicts information like the minimum and maximum data point, the median value, first and third quartile, and interquartile range.

Example:

Box plot for average wind speed

data(airquality)

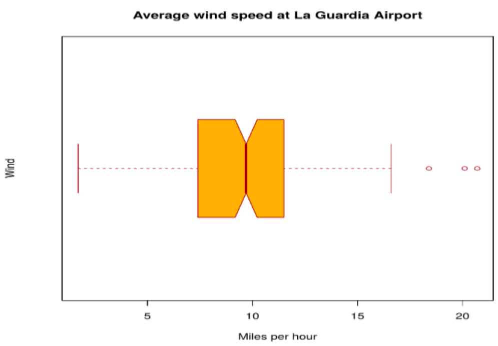
boxplot(airquality$Wind, main = "Average wind speed\

at La Guardia Airport",

xlab = "Miles per hour", ylab = "Wind",

col = "orange", border = "brown",

horizontal = TRUE, notch = TRUE)



4. Scatter Plot

A scatter plot is composed of many points on a Cartesian plane. Each point denotes the value taken by two parameters and helps us easily identify the relationship between them.

Example:.

Scatter plot for Ozone Concentration per month

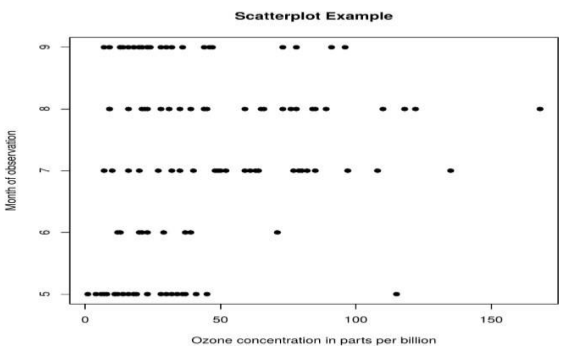
data(airquality)

plot(airquality$Ozone, airquality$Month,

main ="Scatterplot Example",

xlab ="Ozone Concentration in parts per billion",

ylab =" Month of observation ", pch = 19)



5. Heat Map

Heatmap is defined as a graphical representation of data using colors to visualize the value of the matrix. heatmap() function is used to plot heatmap.

Syntax: heatmap(data)

Parameters: data: It represent matrix data, such as values of rows and columns

Return: This function draws a heatmap.

Set seed for reproducibility

set.seed(110)

Create example data

data <- matrix(rnorm(50, 0, 5), nrow = 5, ncol = 5)

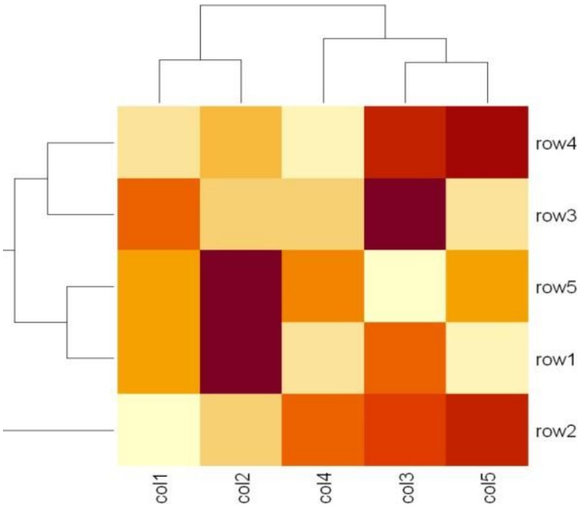
Column names

colnames(data) <- paste0("col", 1:5)

rownames(data) <- paste0("row", 1:5)

Draw a heatmap

heatmap(data)



6. Map visualization in R

Here we are using maps package to visualize and display geographical maps using an R programming language.

Read dataset and convert it into

Dataframe

data <- read.csv("worldcities.csv")

df <- data.frame(data)

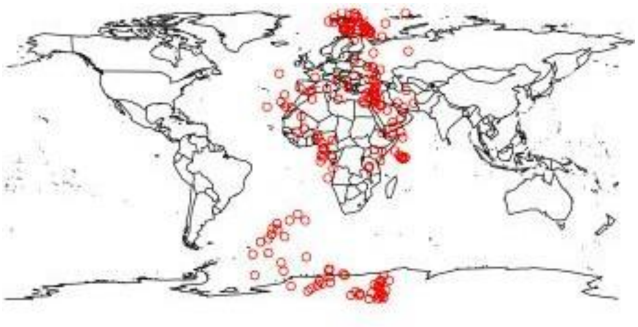
Load the required libraries

library(maps)

map(database = "world")

marking points on map

points(x = df$lat[1:500], y = df$lng[1:500], col = "Red")install.packages("maps")



7. 3D Graphs in R

Here we will use preps() function, This function is used to create 3D surfaces in perspective view. This function will draw perspective plots of a surface over the x–y plane.

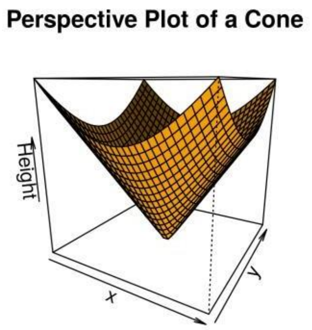
Syntax: persp(x, y, z)

Parameter: This function accepts different parameters i.e. x, y and z where x and y are vectors defining the location along x- and y-axis. z-axis will be the height of the surface in the matrix z.

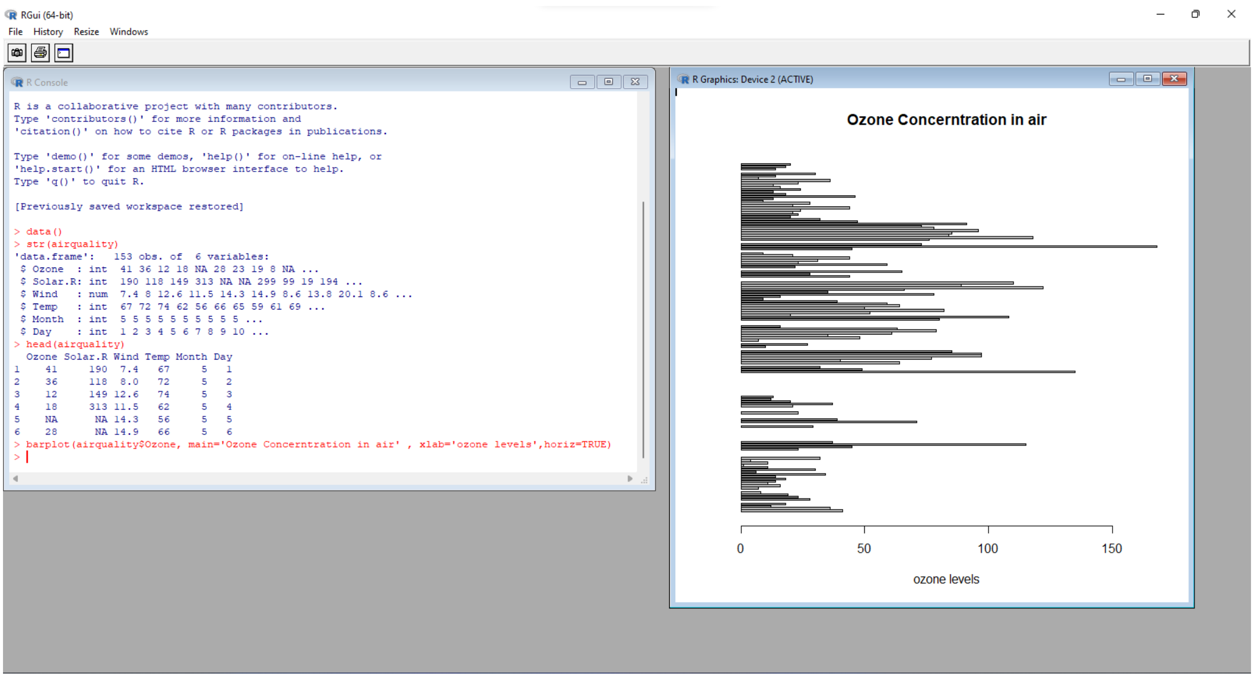
Return Value: persp() returns the viewing transformation matrix for projecting 3D coordinates (x, y, z) into the 2D plane using homogeneous 4D coordinates (x, y, z, t).

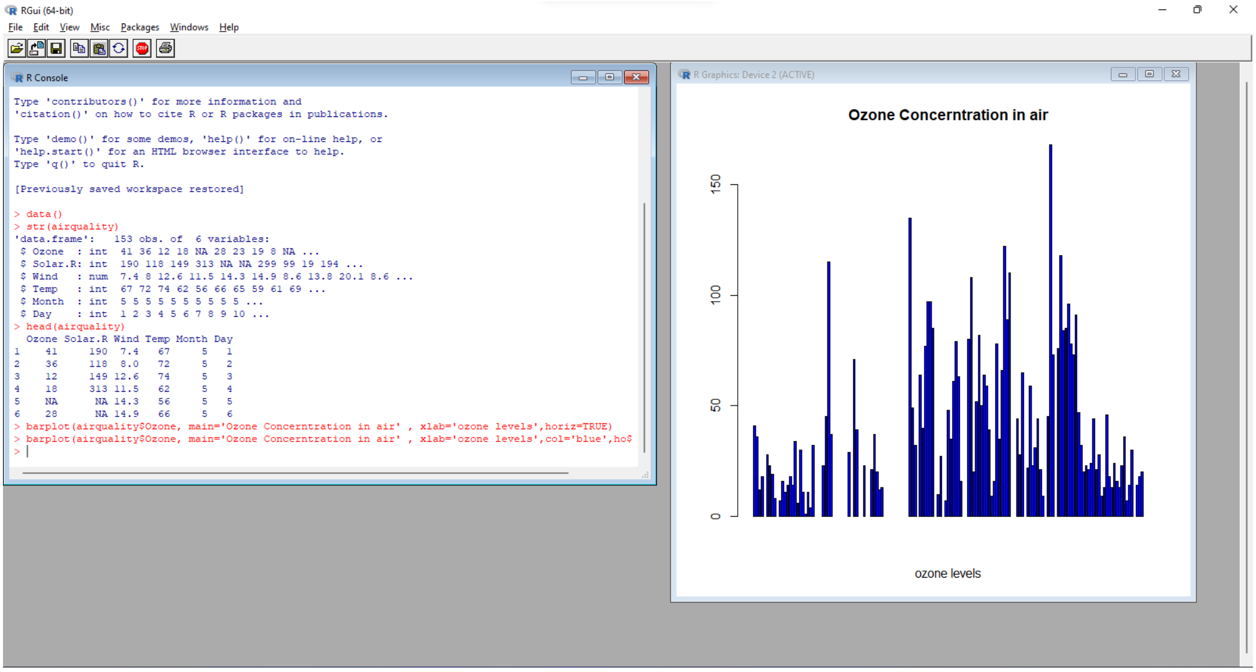
```
# Adding Titles and Labeling Axes to Plot

cone <- function(x, y){

sqrt(x ^ 2 + y ^ 2)

}

# prepare variables.

x <- y <- seq(-1, 1, length = 30)

z <- outer(x, y, cone)


# plot the 3D surface
```

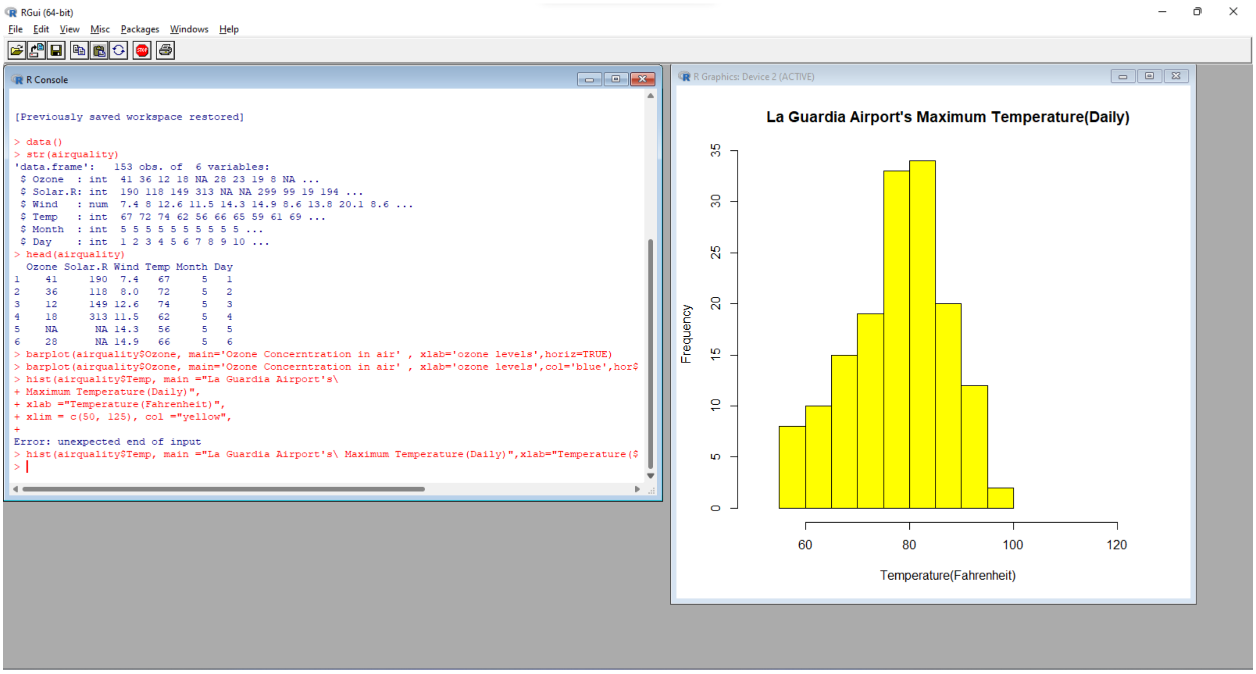
```
# Adding Titles and Labeling Axes to Plot
persp(x, y, z,
main="Perspective Plot of a Cone",
zlab = "Height",
theta = 30, phi = 15,
col = "orange", shade = 0.4)
```

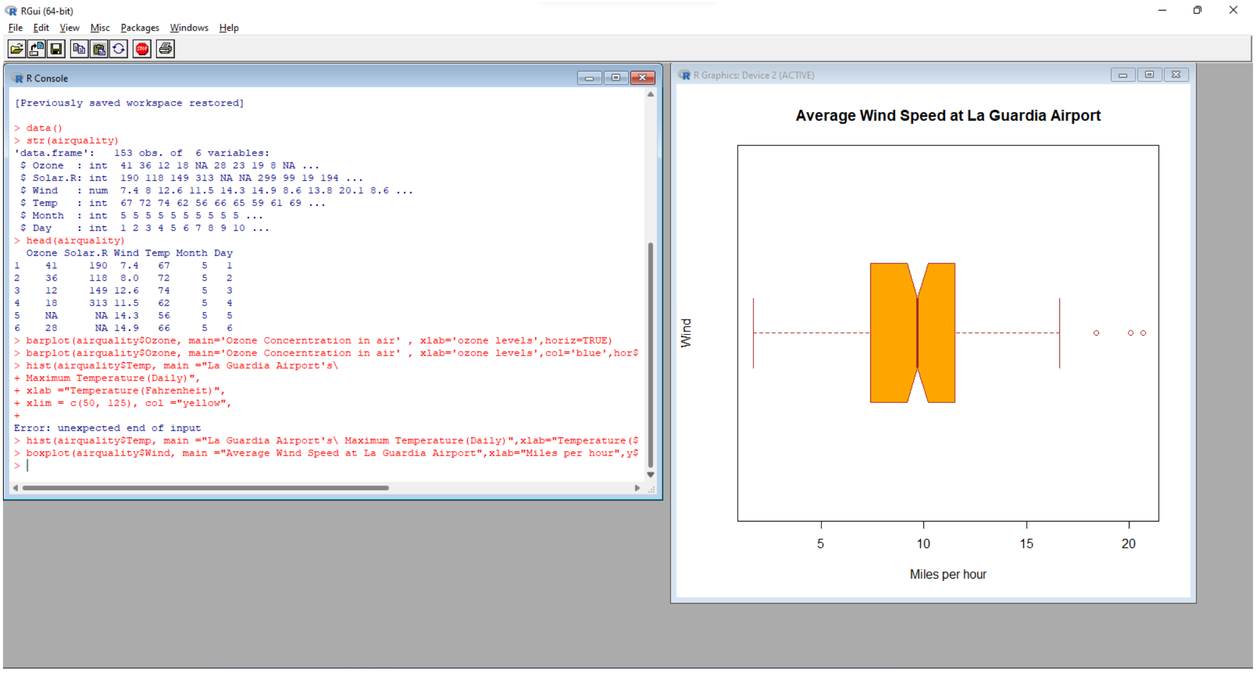


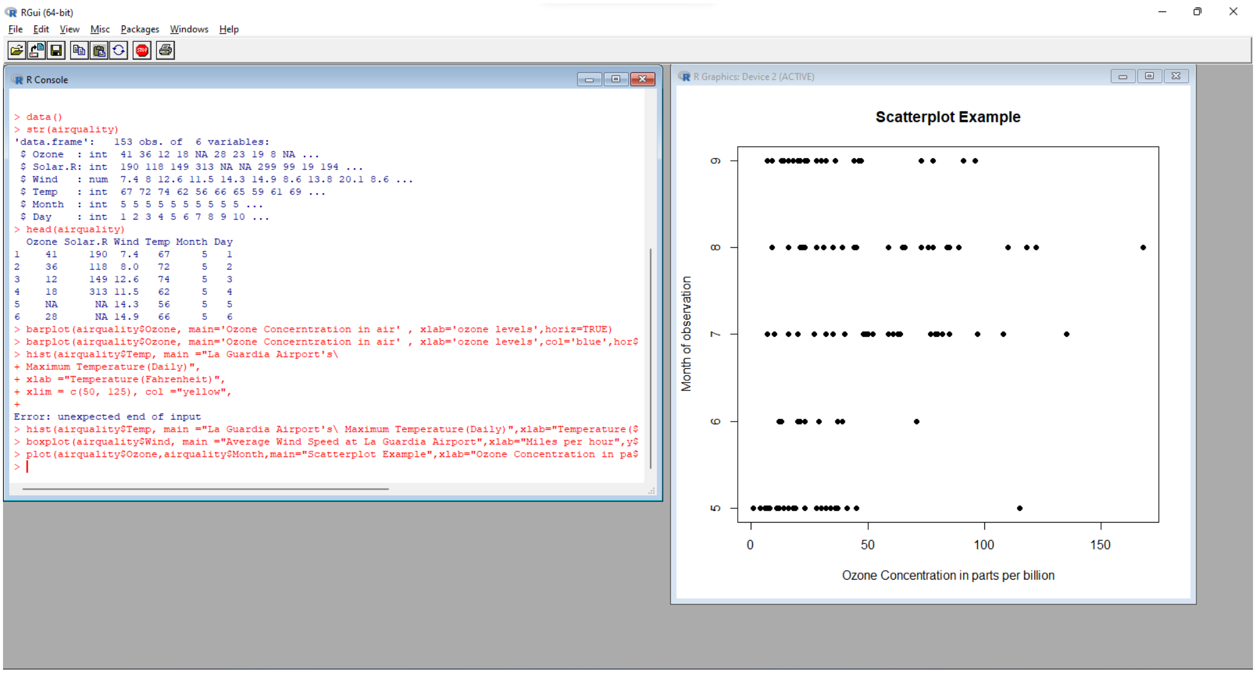
OUTPUT:








RGui (64-bit)
File Edit View Misc Packages Windows Help
R Console
[Previously saved workspace restored]
> data()
> str(airquality)
'data.frame': 153 obs. of 6 variables:
$ Ozone : int 41 36 12 18 NA 28 23 19 8 NA ...
$ Solar.R: int 190 118 149 313 NA NA 299 99 19 194 ...
$ Wind : num 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
$ Temp : int 67 72 74 62 56 66 65 59 61 69 ...
$ Month : int 5 5 5 5 5 5 5 5 5 5 ...
$ Day : int 1 2 3 4 5 6 7 8 9 10 ...
> head(airquality)
Ozone Solar.R Wind Temp Month Day
1 41 190 7.4 67 5 1
2 36 118 8.0 72 5 2
3 12 149 12.6 74 5 3
4 18 313 11.5 62 5 4
5 NA NA 14.3 56 5 5
6 28 NA 14.9 66 5 6
> barplot(airquality$Ozone, main='Ozone Concerntration in air' , xlab='ozone levels',horiz=TRUE)
> barplot(airquality$Ozone, main='Ozone Concerntration in air' , xlab='ozone levels',col='blue',hor$
> hist(airquality$Temp, main ="La Guardia Airport's\
+ Maximum Temperature(Daily)",
+ xlab ="Temperature(Fahrenheit)",
+ xlim = c(50, 125), col ="yellow",
+
Error: unexpected end of input
> hist(airquality$Temp, main ="La Guardia Airport's\ Maximum Temperature(Daily)",xlab="Temperature($
> boxplot(airquality$Wind, main ="Average Wind Speed at La Guardia Airport",xlab="Miles per hour",y$
R Graphics: Device 2 (ACTIVE)
Average Wind Speed at La Guardia Airport
Wind
5
10
15
20
Miles per hour


RGui (64-bit)
File Edit View Misc Packages Windows Help
R Console
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> str(airquality)
'data.frame': 153 obs. of 6 variables:
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$ Wind : num 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
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3 12 149 12.6 74 5 3
4 18 313 11.5 62 5 4
5 NA NA 14.3 56 5 5
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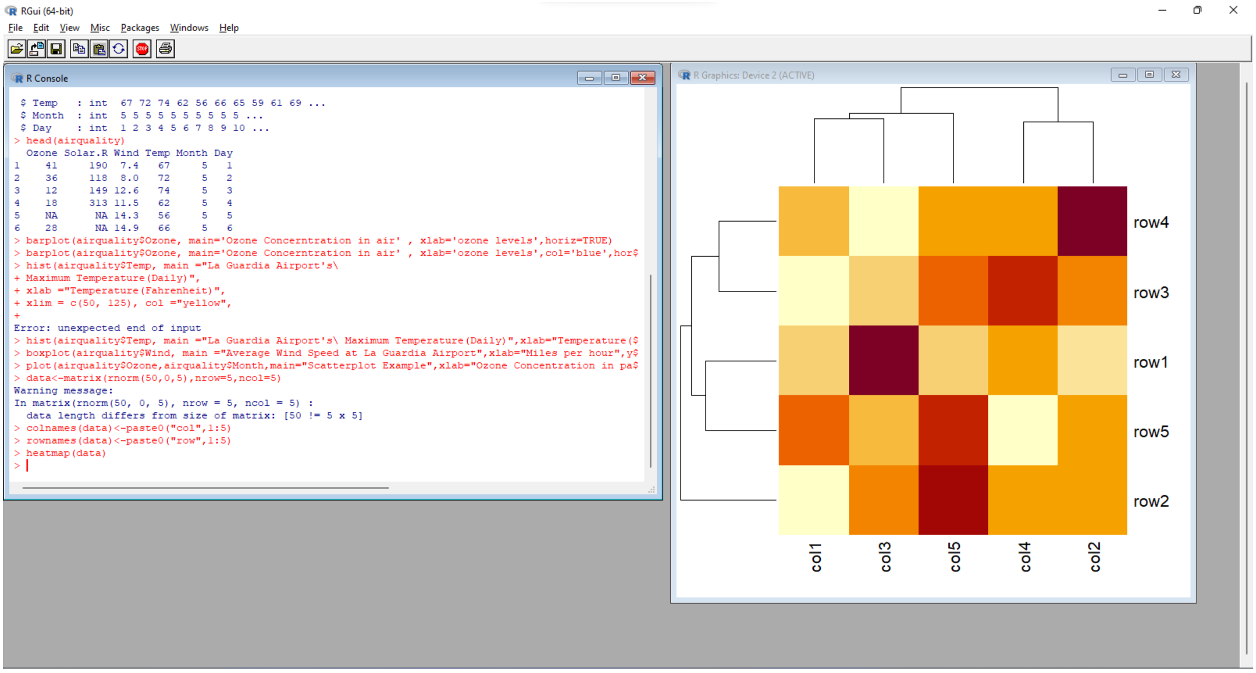
> barplot(airquality$Ozone, main='Ozone Concerntration in air' , xlab='ozone levels',col='blue',hor$
> hist(airquality$Temp, main ="La Guardia Airport's\
+ Maximum Temperature(Daily)",
+ xlab ="Temperature(Fahrenheit)",
+ xlim = c(50, 125), col ="yellow",
+
Error: unexpected end of input
> hist(airquality$Temp, main ="La Guardia Airport's\ Maximum Temperature(Daily)",xlab="Temperature($
> boxplot(airquality$Wind, main ="Average Wind Speed at La Guardia Airport",xlab="Miles per hour",y$
> plot(airquality$Ozone,airquality$Month,main="Scatterplot Example",xlab="Ozone Concentration in pa$
R Graphics: Device 2 (ACTIVE)
Scatterplot Example
Month of observation
5
6
7
8
9
0
50
100
150
Ozone Concentration in parts per billion


RGui (64-bit)
File Edit View Misc Packages Windows Help
R Console
$ Temp : int 67 72 74 62 56 66 65 59 61 69 ...
$ Month : int 5 5 5 5 5 5 5 5 5 5 ...
$ Day : int 1 2 3 4 5 6 7 8 9 10 ...
> head(airquality)
Ozone Solar.R Wind Temp Month Day
1 41 190 7.4 67 5 1
2 36 118 8.0 72 5 2
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4 18 313 11.5 62 5 4
5 NA NA 14.3 56 5 5
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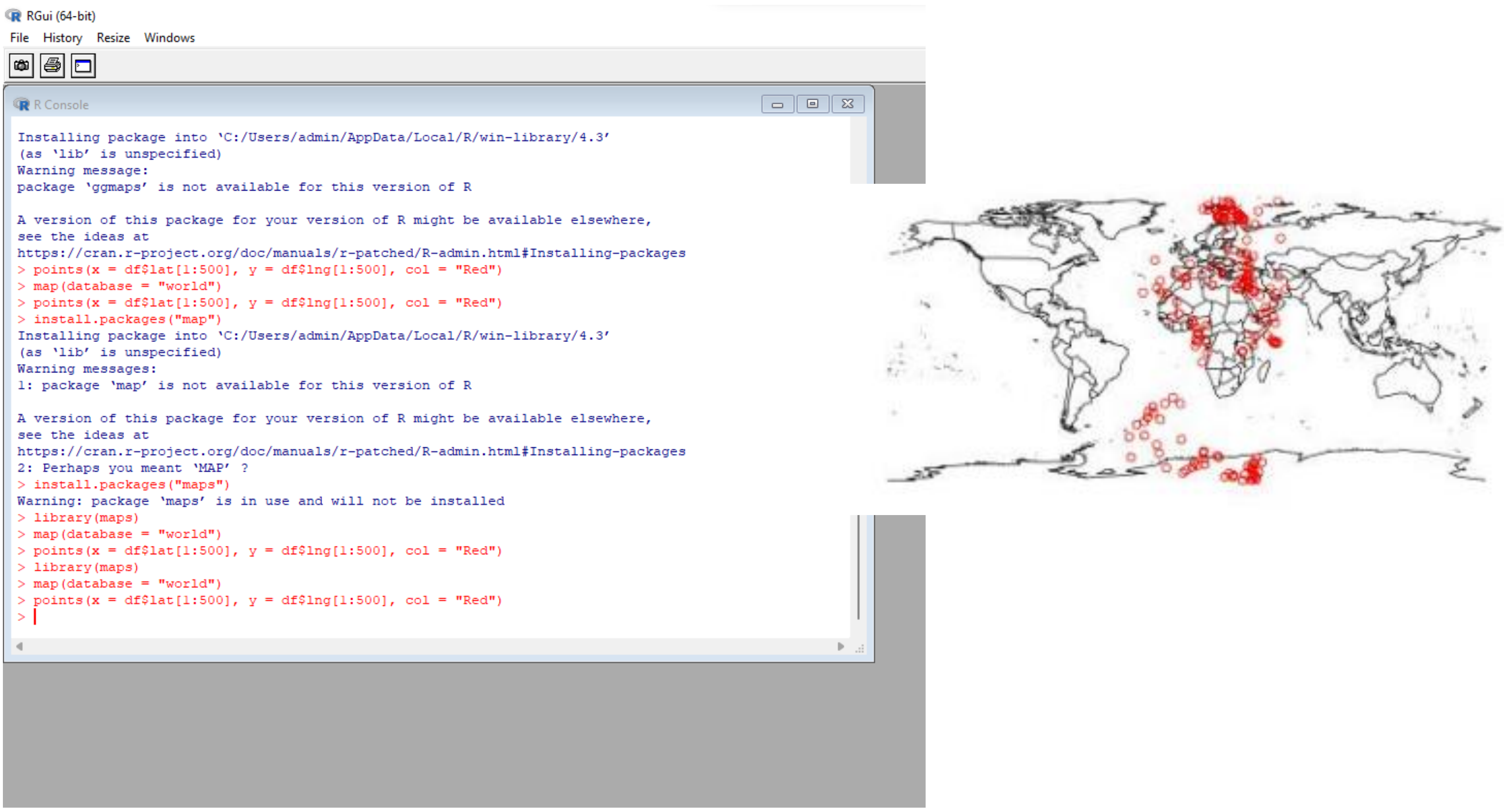
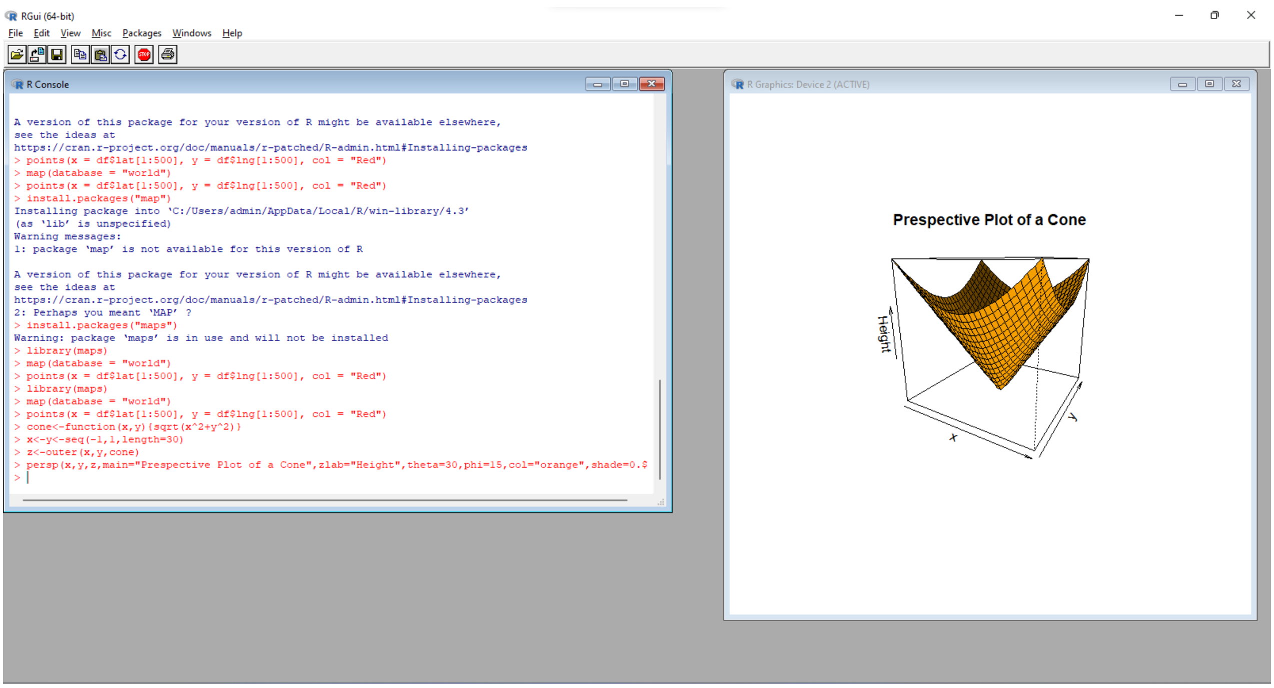
+ Maximum Temperature(Daily)",
+ xlab ="Temperature(Fahrenheit)",
+ xlim = c(50, 125), col ="yellow",
+
Error: unexpected end of input
> hist(airquality$Temp, main ="La Guardia Airport's\ Maximum Temperature(Daily)",xlab="Temperature($
> boxplot(airquality$Wind, main ="Average Wind Speed at La Guardia Airport",xlab="Miles per hour",y$
> plot(airquality$Ozone,airquality$Month,main="Scatterplot Example",xlab="Ozone Concentration in pa$
> data<-matrix(rnorm(50,0,5),nrow=5,ncol=5)
Warning message:
In matrix(rnorm(50, 0, 5), nrow = 5, ncol = 5) :
data length differs from size of matrix: [50 != 5 x 5]
> colnames(data)<-paste0("col",1:5)
> rownames(data)<-paste0("row",1:5)
> heatmap(data)
>
R Graphics: Device 2 (ACTIVE)
row4
row3
row1
row5
row2
col1
col3
col5
col4
col2


RGui (64-bit)
File History Resize Windows
R Console
Installing package into 'C:/Users/admin/AppData/Local/R/win-library/4.3'
(as 'lib' is unspecified)
Warning message:
package 'ggmaps' is not available for this version of R

A version of this package for your version of R might be available elsewhere,
see the ideas at
https://cran.r-project.org/doc/manuals/r-patched/R-admin.html#Installing-packages
> points(x = df$lat[1:500], y = df$lng[1:500], col = "Red")
> map(database = "world")
> points(x = df$lat[1:500], y = df$lng[1:500], col = "Red")
> install.packages("map")
Installing package into 'C:/Users/admin/AppData/Local/R/win-library/4.3'
(as 'lib' is unspecified)
Warning messages:
1: package 'map' is not available for this version of R

A version of this package for your version of R might be available elsewhere,
see the ideas at
https://cran.r-project.org/doc/manuals/r-patched/R-admin.html#Installing-packages
2: Perhaps you meant 'MAP' ?
> install.packages("maps")
Warning: package 'maps' is in use and will not be installed
> library(maps)
> map(database = "world")
> points(x = df$lat[1:500], y = df$lng[1:500], col = "Red")
> library(maps)
> map(database = "world")
> points(x = df$lat[1:500], y = df$lng[1:500], col = "Red")
>



CONCLUSION:

The experiment on air quality data visualization in R highlighted the importance of visualizing complex environmental data. Through various plots and charts, the study revealed seasonal patterns, spatial distribution, and correlations in air quality parameters. It also aided in identifying data quality issues. This approach enhances data comprehension and facilitates effective communication for both technical and non-technical audiences. The experiment's reproducibility and documentation ensure future analysis and modeling. Overall, data visualization in R proves invaluable for informed decision-making in air quality management and sets the stage for advanced predictive modeling and policy development.