



Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

Experiment No.7
Data Visualization using Hive/PIG/R/Tableau/.
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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.

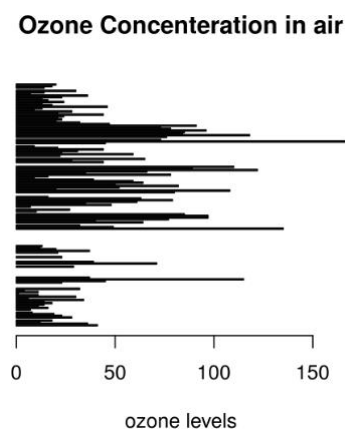
Example 1:

```
# Horizontal Bar Plot for
```

```
# Ozone concentration in air
```

```
barplot(airquality$Ozone,  
        main = 'Ozone Concentration in air',  
        xlab = 'ozone levels', horiz = TRUE)
```

Output:



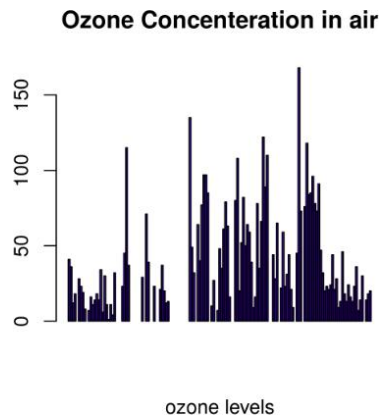
Example 2:

```
# Vertical Bar Plot for
```

```
# Ozone concentration in air
```



```
barplot(airquality$Ozone, main = 'Ozone Concentration 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\
```

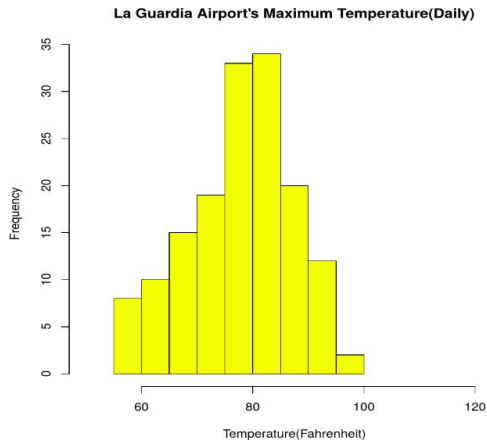
```
Maximum Temperature(Daily)",
```

```
    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)
```

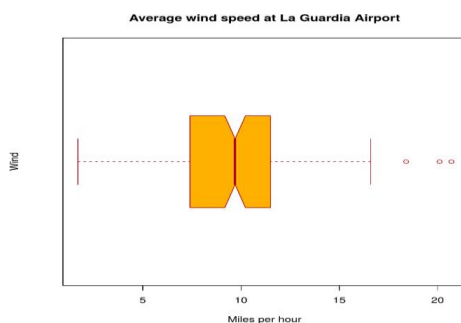
```
boxplot(airquality$Wind, main = "Average wind speed\
```

```
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
```

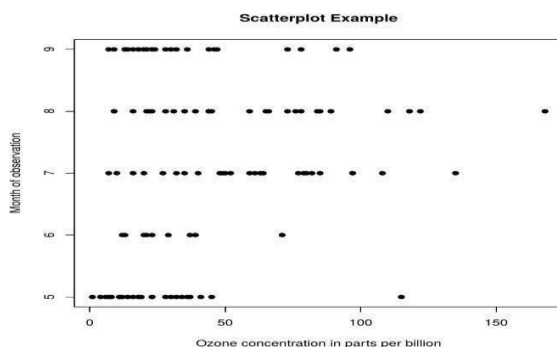
```
data(airquality)
```

```
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)
```



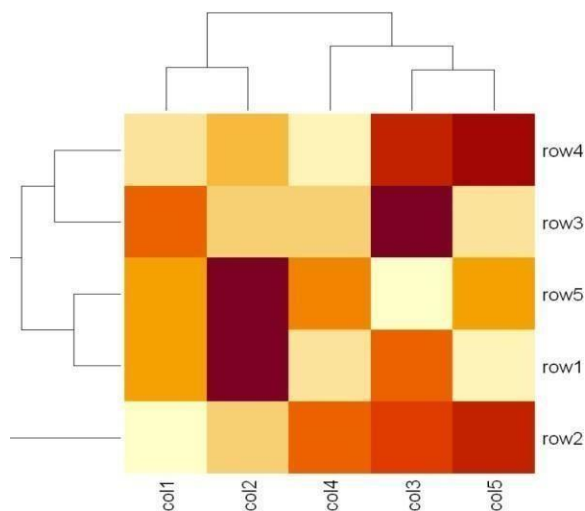
```
# Column names
```

```
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 therequired libraries
```

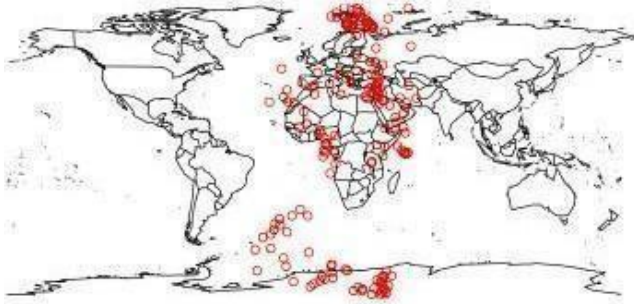
```
library(maps)
```

```
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 `persp()` 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,

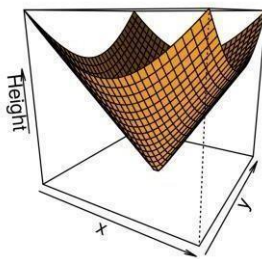
main="Perspective Plot of a Cone",

zlab = "Height",

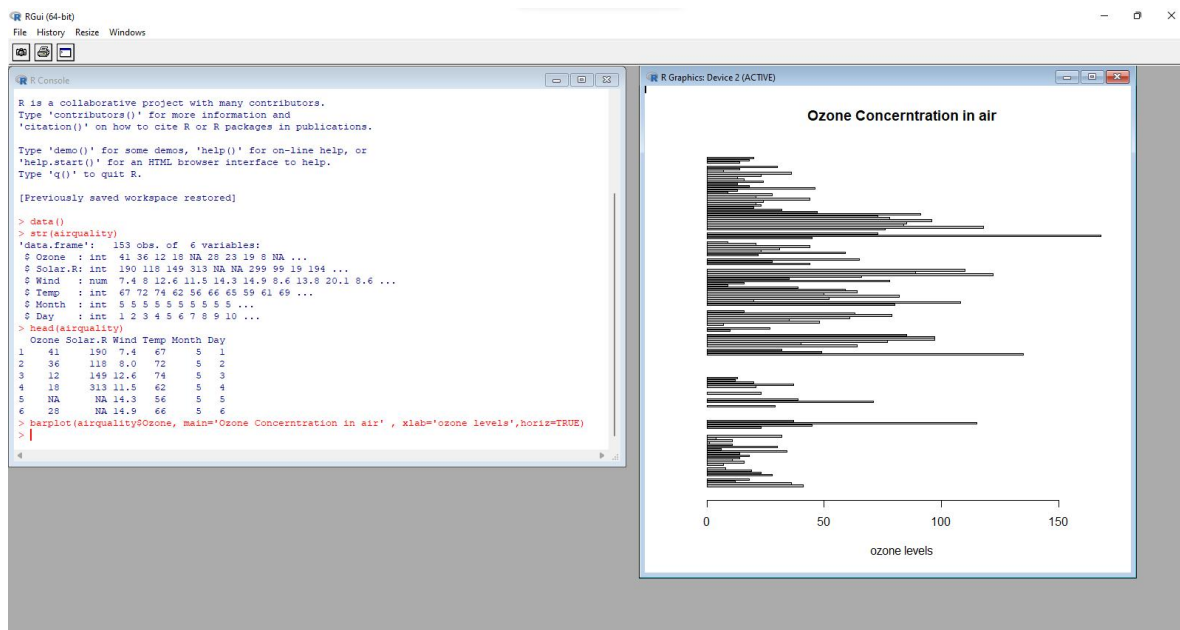
theta = 30, phi = 15,

col = "orange", shade = 0.4)

Perspective Plot of a Cone



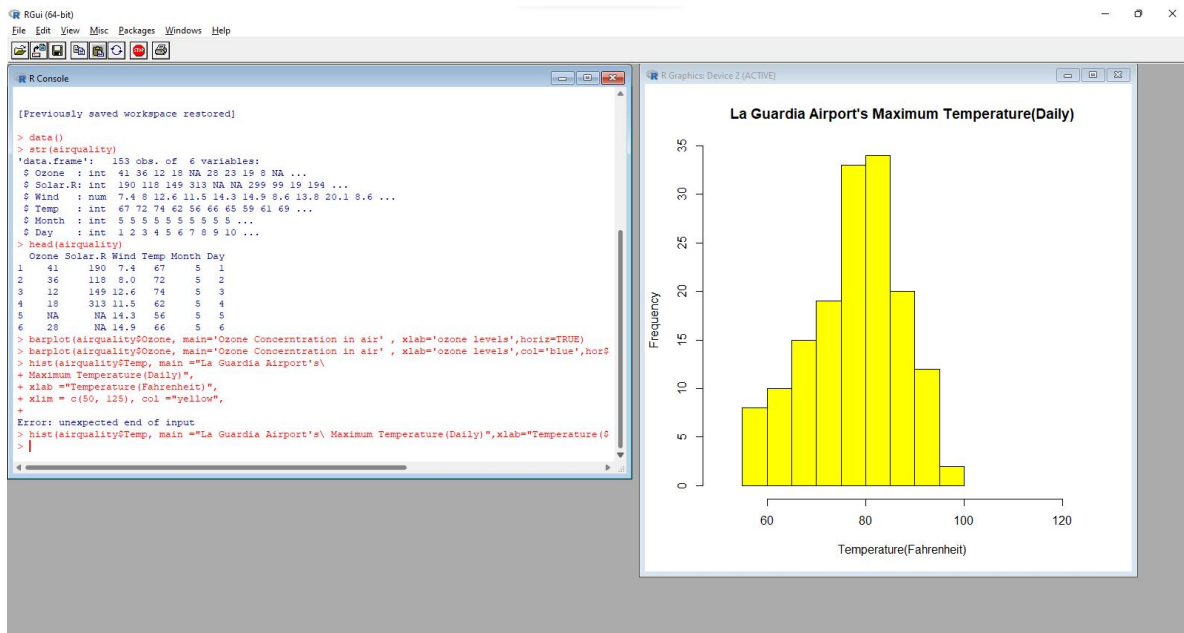
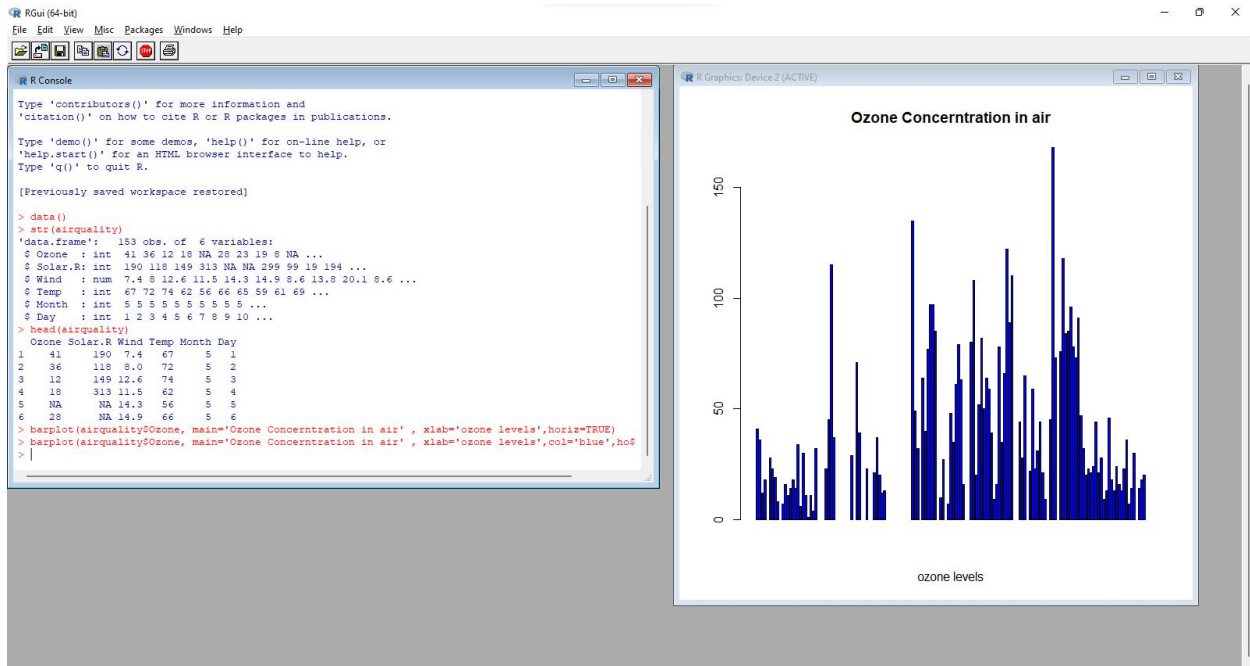
OUTPUT:





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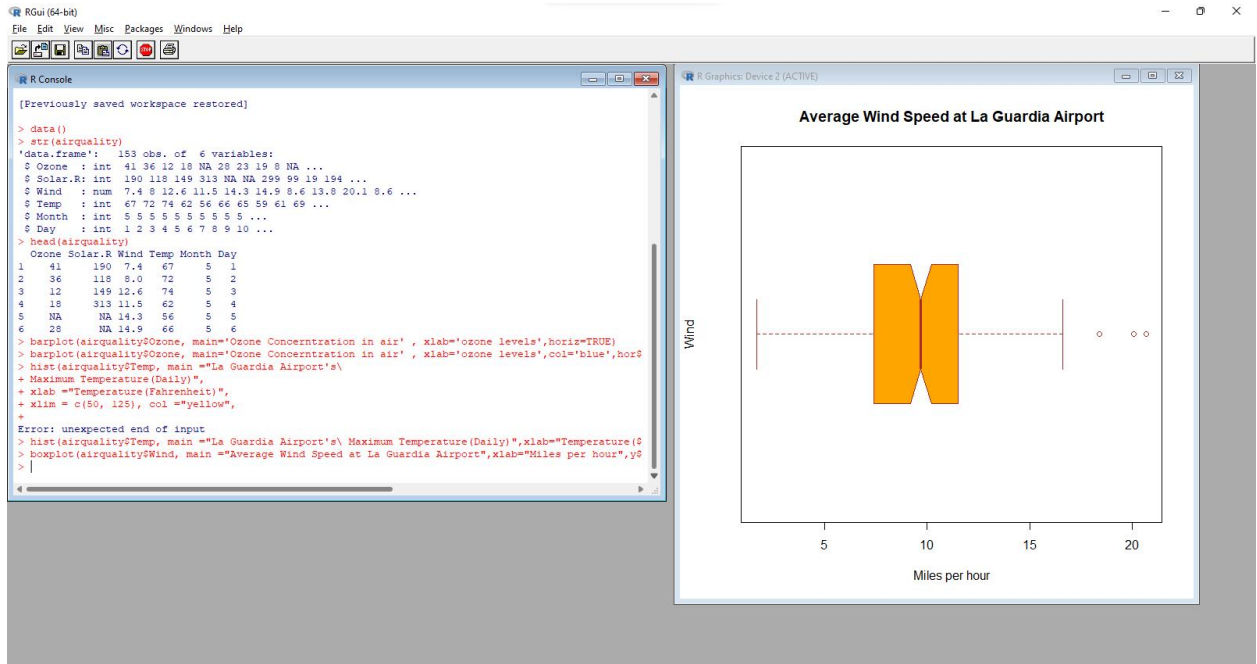
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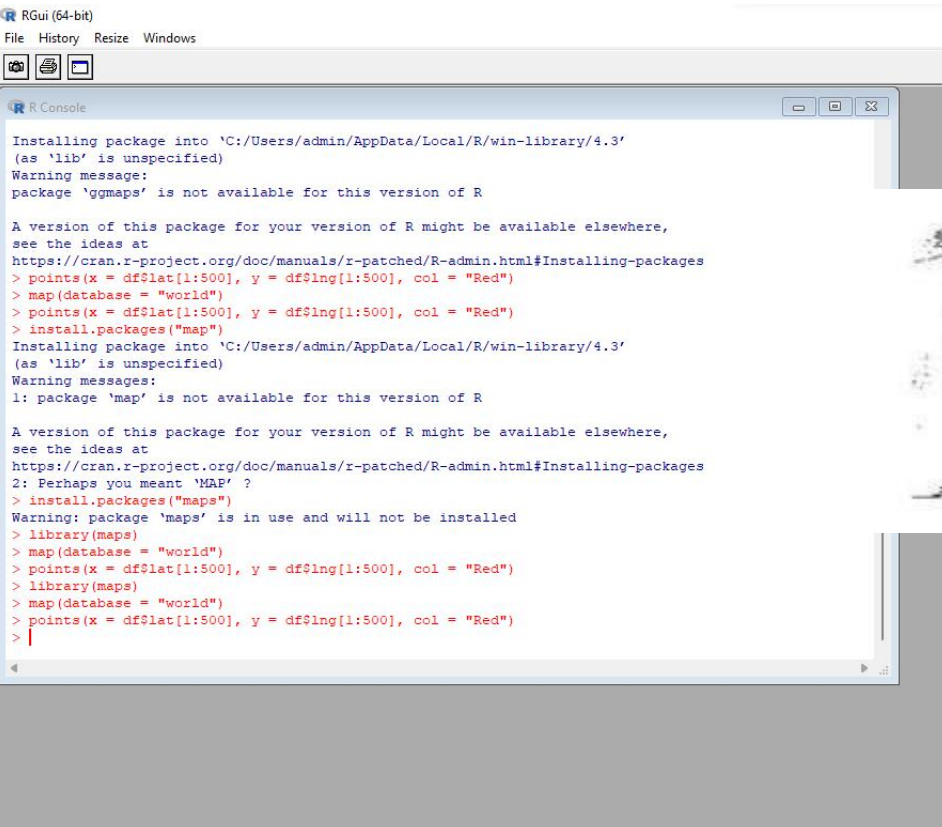
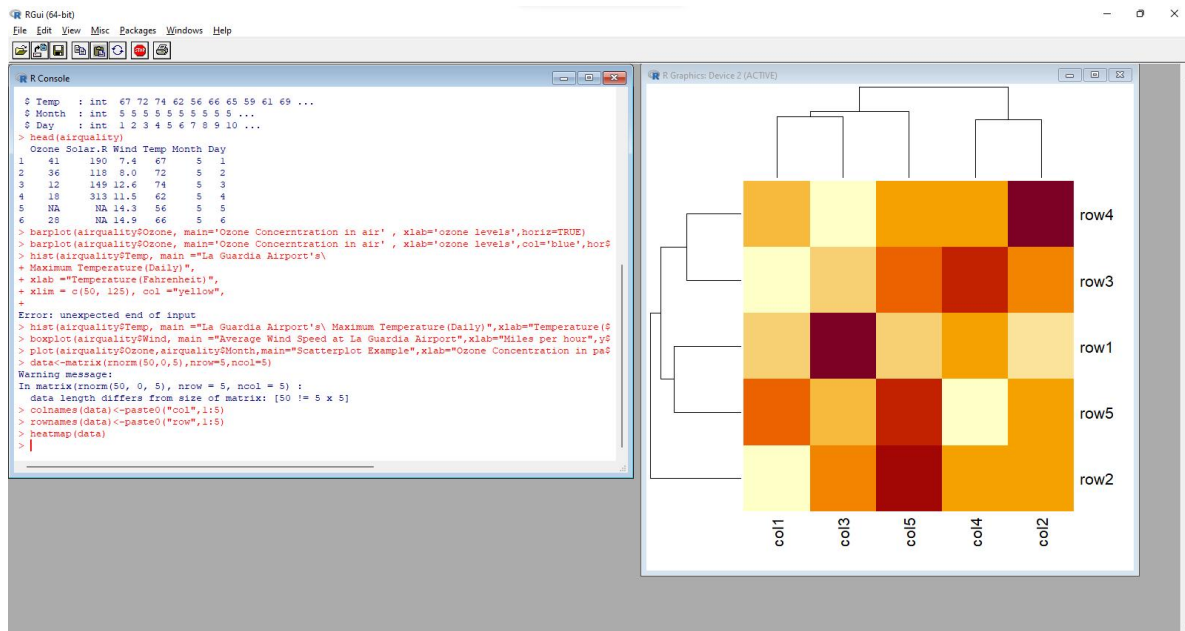
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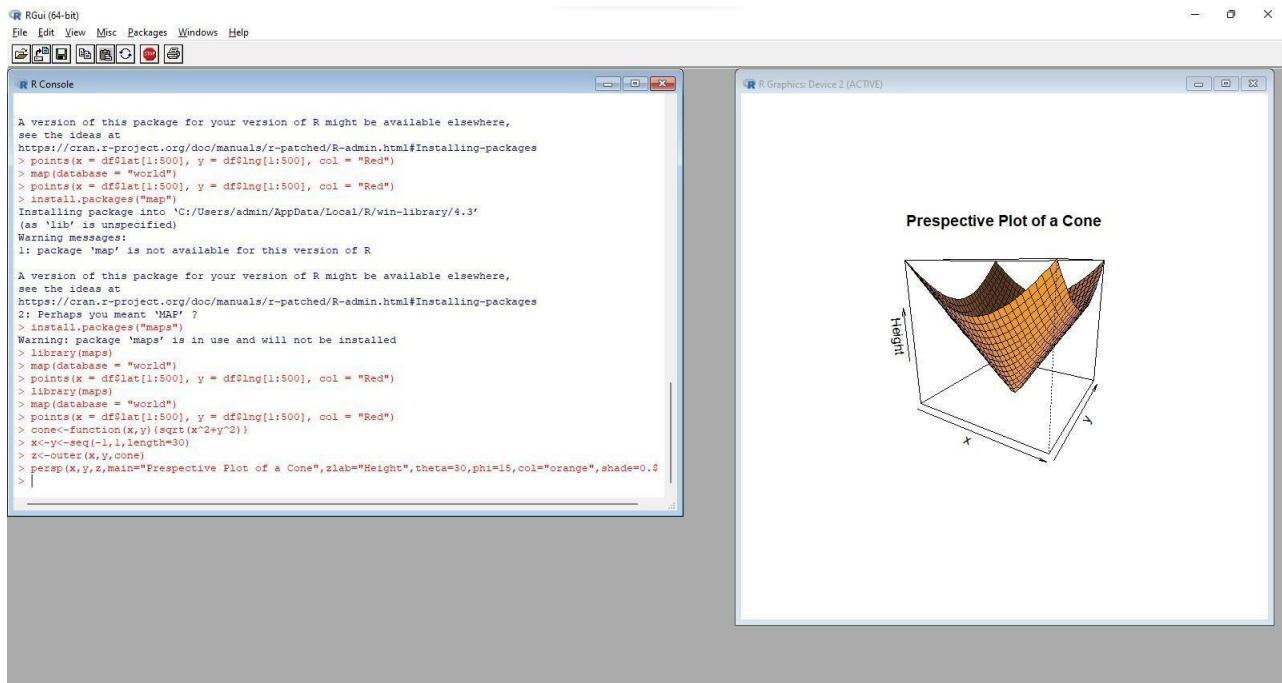




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CONCLUSION:

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. Data visualization in R is a powerful tool for enhancing data comprehension and communication. It enables professionals to create visually appealing and informative graphics, aiding in data exploration, presentation, and decision-making across various domains, from business analytics to scientific research.