

## Experiment based on graphs and charts

### AIM:

Experiment based on graphs and charts

### THEORY:

Graphs and charts are essential tools for data visualization, allowing us to represent complex data in a more understandable and interpretable format. R provides a variety of packages and functions for creating high-quality visualizations. The most commonly used packages for data visualization in R are:

1. **Base R Graphics:** The built-in plotting functions in R that allow for basic plotting capabilities.
2. **ggplot2:** A powerful and flexible package based on the Grammar of Graphics, which allows for the creation of complex multi-layered graphics.

### PRACTICAL 7 :

#### **CODE :-**

```
library(ggplot2)
library(ggthemes)
library(readr)
library(tidyr)

# Load the dataset
data_url <- "https://people.sc.fsu.edu/~jburkardt/data/csv/airtravel.csv"
airtravel <- read_csv(data_url)

# Transform data to long format for better visualization
airtravel_long <- pivot_longer(airtravel, cols = -Month, names_to = "Year", values_to =
"Passengers")

ggplot_theme <- theme_minimal() + theme(plot.title = element_text(hjust = 0.5))
```

```
# Line Graph
```

```
line_plot <- ggplot(airtravel_long, aes(x = Month, y = Passengers, group = Year, color = Year)) +  
  geom_line(size = 1) +  
  labs(title = "Monthly Air Travel Passengers", x = "Month", y = "Passengers") +  
  ggplot_theme  
print(line_plot)
```

```
# Scatter Plot
```

```
scatter_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, color = Year)) +  
  geom_point(size = 3) +  
  labs(title = "Air Travel Passengers by Year", x = "Year", y = "Passengers") +  
  ggplot_theme  
print(scatter_plot)
```

```
# Box Plot
```

```
box_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, fill = Year)) +  
  geom_boxplot() +  
  labs(title = "Distribution of Passengers by Year", x = "Year", y = "Passengers") +  
  ggplot_theme  
print(box_plot)
```

```
# Pie Chart (Using Aggregate Data)
```

```
pie_data <- aggregate(Passengers ~ Year, airtravel_long, sum)  
pie_chart <- ggplot(pie_data, aes(x = "", y = Passengers, fill = Year)) +  
  geom_bar(stat = "identity", width = 1) +  
  coord_polar(theta = "y") +  
  labs(title = "Total Air Travel Passengers by Year") +
```

```
ggplot_theme  
print(pie_chart)
```

```
# Box-and-Whisker Plot Combined with Scatter Plot
```

```
box_scatter_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, fill = Year)) +  
  geom_boxplot(alpha = 0.5) +  
  geom_jitter(aes(color = Year), width = 0.2, size = 2) +  
  labs(title = "Passengers Distribution and Scatter", x = "Year", y = "Passengers") +  
  ggplot_theme  
print(box_scatter_plot)
```

```
# Histogram
```

```
histogram <- ggplot(airtravel_long, aes(x = Passengers, fill = Year)) +  
  geom_histogram(binwidth = 50, alpha = 0.7, position = "dodge") +  
  labs(title = "Histogram of Air Travel Passengers", x = "Passengers", y = "Count") +  
  ggplot_theme  
print(histogram)
```

```
# Applying Themes from ggthemes
```

```
styled_line_plot <- line_plot + theme_economist() + scale_color_economist()  
print(styled_line_plot)
```

```
# Saving the plots
```

```
ggsave("line_plot.png", line_plot)  
ggsave("scatter_plot.png", scatter_plot)  
ggsave("box_plot.png", box_plot)  
ggsave("pie_chart.png", pie_chart)  
ggsave("box_scatter_plot.png", box_scatter_plot)  
ggsave("histogram.png", histogram)
```

```
ggsave("styled_line_plot.png", styled_line_plot)
```

```
# Load necessary libraries
library(ggplot2)
library(ggthemes)
library(readr)
library(tidyr)
library(dplyr)

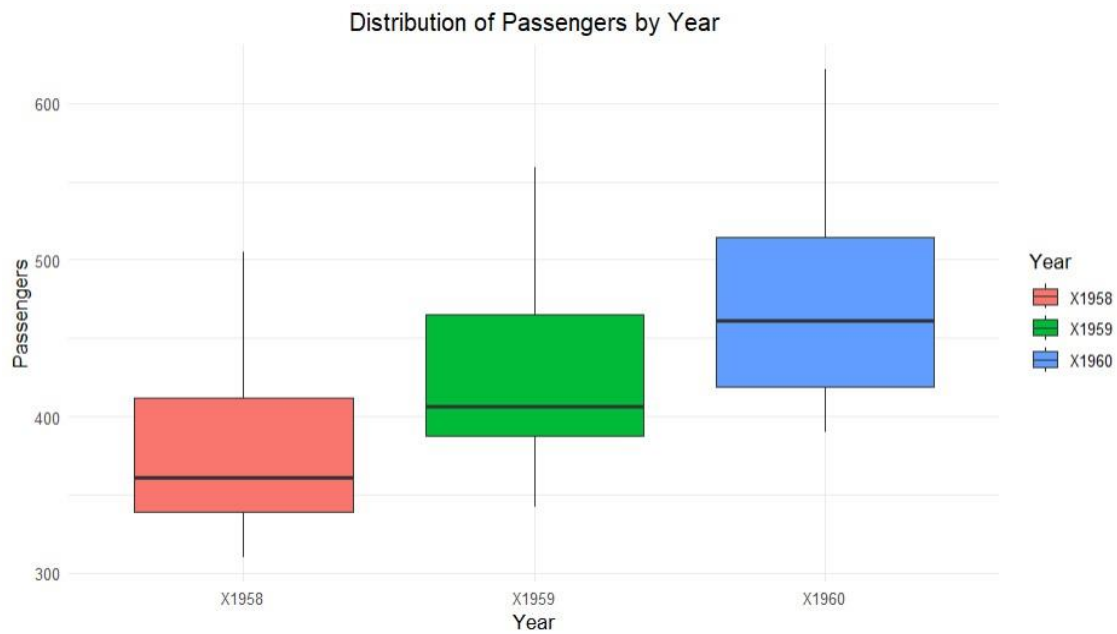
> # Load dataset
> data_url <- "https://people.sc.fsu.edu/~jburkardt/data/csv/airtravel.csv"
> airtravel <- read.csv(data_url, stringsAsFactors = FALSE)
>
> # Convert column names to valid format
> colnames(airtravel) <- make.names(colnames(airtravel))
>
> # Transform data to long format for visualization
> airtravel_long <- pivot_longer(airtravel, cols = -Month,
+                               names_to = "Year", values_to = "Passengers")
>
> # Convert Year to factor for better visualization
> airtravel_long$Year <- as.factor(airtravel_long$Year)
>
> # Set theme for all plots
> ggplot_theme <- theme_minimal() + theme(plot.title = element_text(hjust = 0.5))
> # Line Graph
> line_plot <- ggplot(airtravel_long, aes(x = Month, y = Passengers, group = Year, color = Year)) +
+   geom_line(size = 1) +
+   labs(title = "Monthly Air Travel Passengers", x = "Month", y = "Passengers") +
+   ggplot_theme
Warning message:
Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
i Please use `linewidth` instead.
This warning is displayed once every 8 hours.
Call `lifecycle::last_lifecycle_warnings()` to see where this warning was generated.
> print(line_plot)
```



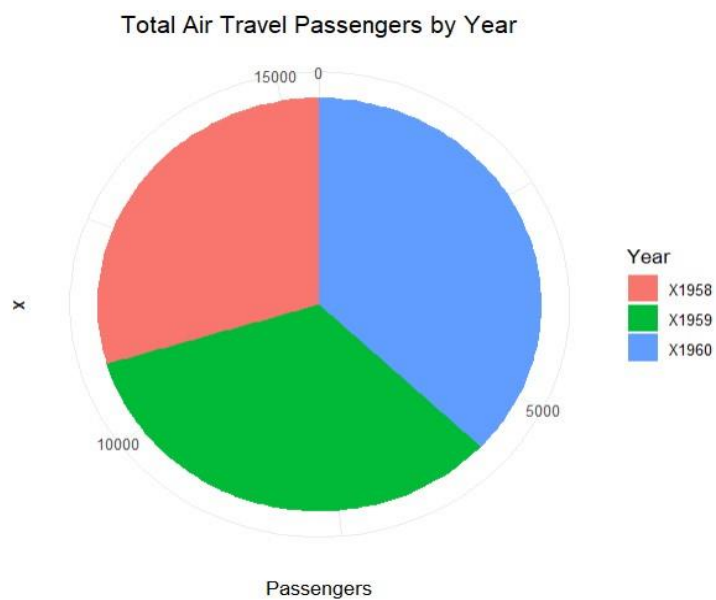
```
> # Scatter Plot
> scatter_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, color = Year)) +
+   geom_point(size = 3) +
+   labs(title = "Air Travel Passengers by Year", x = "Year", y = "Passengers") +
+   ggplot_theme
> print(scatter_plot)
```



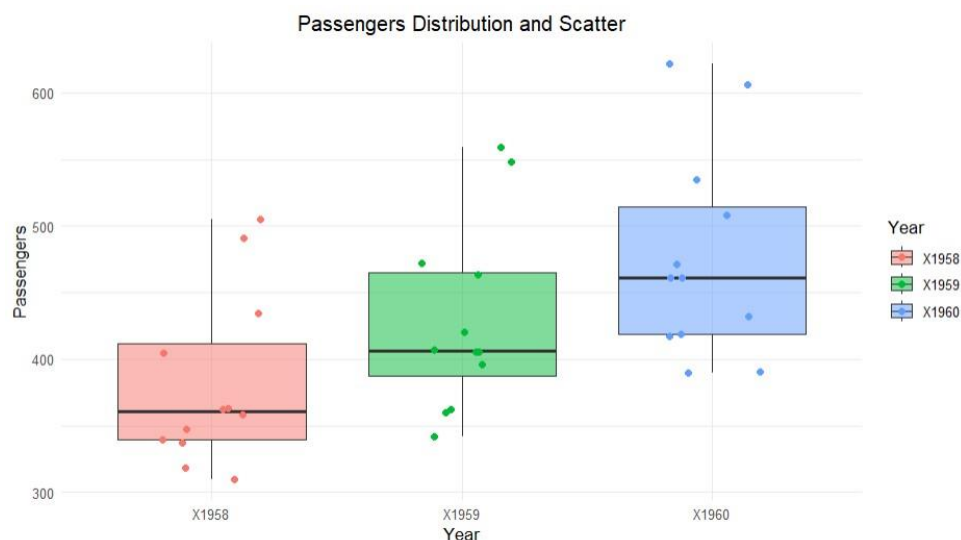
```
> # Box Plot
> box_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, fill = Year)) +
+   geom_boxplot() +
+   labs(title = "Distribution of Passengers by Year", x = "Year", y = "Passengers") +
+   ggplot_theme
> print(box_plot)
```



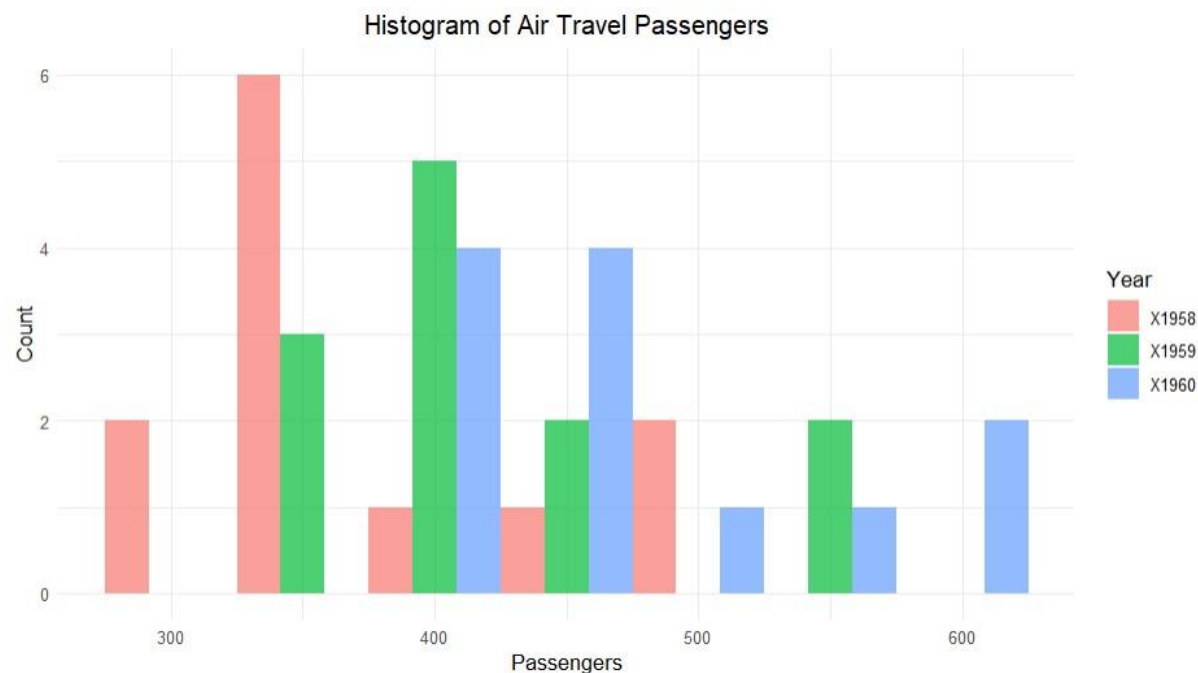
```
> # Pie Chart (Using Aggregate Data)
> pie_data <- airtravel_long %>%
+   group_by(Year) %>%
+   summarise(Passengers = sum(Passengers))
>
> pie_chart <- ggplot(pie_data, aes(x = "", y = Passengers, fill = Year)) +
+   geom_bar(stat = "identity", width = 1) +
+   coord_polar(theta = "y") +
+   labs(title = "Total Air Travel Passengers by Year") +
+   ggplot_theme
> print(pie_chart)
```



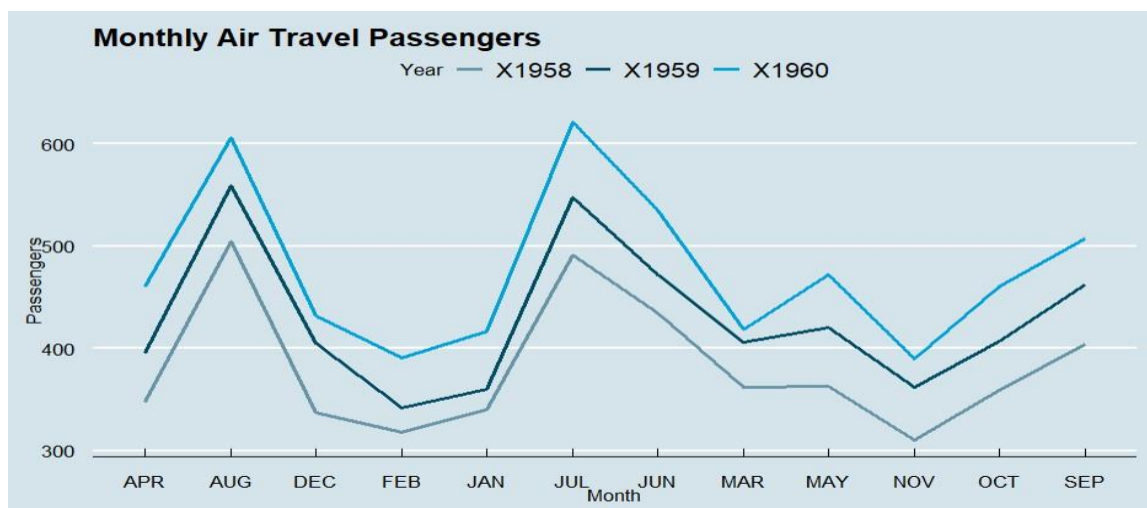
```
> # Box-and-Whisker Plot with Scatter Plot
> box_scatter_plot <- ggplot(airtravel_long, aes(x = Year, y = Passengers, fill = Year)) +
+   geom_boxplot(alpha = 0.5) +
+   geom_jitter(aes(color = Year), width = 0.2, size = 2) +
+   labs(title = "Passengers Distribution and Scatter", x = "Year", y = "Passengers") +
+   ggplot_theme
> print(box_scatter_plot)
```



```
> # Histogram
> histogram <- ggplot(airtravel_long, aes(x = Passengers, fill = Year)) +
+   geom_histogram(binwidth = 50, alpha = 0.7, position = "dodge") +
+   labs(title = "Histogram of Air Travel Passengers", x = "Passengers", y = "Count") +
+   ggplot_theme
> print(histogram)
```



```
> # Applying Themes from ggthemes
> styled_line_plot <- line_plot + theme_economist() + scale_color_economist()
> print(styled_line_plot)
```



```
> # Saving the plots
> ggsave("line_plot.png", line_plot)
Saving 7.7 x 4.31 in image
> ggsave("scatter_plot.png", scatter_plot)
Saving 7.7 x 4.31 in image
> ggsave("box_plot.png", box_plot)
Saving 7.7 x 4.31 in image
> ggsave("pie_chart.png", pie_chart)
Saving 7.7 x 4.31 in image
> ggsave("box_scatter_plot.png", box_scatter_plot)
Saving 7.7 x 4.31 in image
> ggsave("histogram.png", histogram)
Saving 7.7 x 4.31 in image
> ggsave("styled_line_plot.png", styled_line_plot)
Saving 7.7 x 4.31 in image
```

## Conclusion :

This experiment demonstrated various data visualization techniques using **ggplot2** in R. The graphs helped analyze air travel trends over different years. The **line plot** showed increasing passenger numbers, while the **box plot** and **scatter plot** highlighted variations. The **histogram** depicted the frequency distribution of passengers, and the **pie chart** represented proportions. These visualizations effectively summarize data trends and distributions, making analysis more insightful and easier to interpret.

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