Analysing Traffic Accidents by Time of Day and Visualizing the Trends

A PROJECT REPORT

Submitted by

YOGAPPRIYAN S (2303811724321125)

in partial fulfillment of requirements for the award of the course

AGI1252-FUNDAMENTALS OF DATA SCIENCE USING R

in

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY

(An Autonomous Institution, affiliated to Anna University Chennai and Approved by AICTE, New Delhi)

SAMAYAPURAM – 621 112

JUNE- 2025

K. RAMAKRISHNAN COLLEGE OF TECHNOLOGY (AUTONOMOUS)

SAMAYAPURAM – 621 112

BONAFIDE CERTIFICATE

Certified that this project report on **"ANALYSING TRAFFIC ACCIDENTS BY TIME OF DAY AND VISUALIZING THE TRENDS"** is the bonafide work of **YOGAPPRIYAN S (2303811724321125)** who carried out the project work during the academic year 2024 - 2025 under my supervision.

SIGNATURE

Dr.T. AVUDAIAPPAN, M.E.,Ph.D.,

HEAD OF THE DEPARTMENT

PROFESSOR

Department of Artificial Intelligence

K.Ramakrishnan College of Technology (Autonomous)

Samayapuram–621112.

SIGNATURE

Ms.S.Murugavalli., M.E.,(Ph.D).,

SUPERVISOR

ASSISTANT PROFESSOR

Department of Artificial Intelligence

K.Ramakrishnan College of Technology (Autonomous)

Samayapuram–621112.

Submitted for the viva-voce examination held on **02.06.2025**.

INTERNAL EXAMINER

EXTERNAL EXAMINER

DECLARATION

I declare that the project report on **"ANALYSING TRAFFIC ACCIDENTS BY TIME OF DAY AND VISUALIZING THE TRENDS"** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **"ANNA UNIVERSITY CHENNAI"** for the requirement of Degree of **BACHELOR OF TECHNOLOGY**. This project report is submitted on the partial fulfilment of the requirement of the completion of the course **AGI1252 – FUNDAMENTALS OF DATA SCIENCE USING R.**

.

Signature

YOGAPPRIYAN S

Place: Samayapuram

Date: 02.06.2025

ACKNOWLEDGEMENT

It is with great pride that I express our gratitude and in-debt to our institution "**K.Ramakrishnan College of Technology (Autonomous)**", for providing us with the opportunity to do this project.

I glad to credit honourable chairman **Dr. K. RAMAKRISHNAN**, **B.E.,** for having provided for the facilities during the course of our study in college.

I would like to express our sincere thanks to our beloved Executive Director **Dr. S. KUPPUSAMY, MBA, Ph.D.,** for forwarding to our project and offering adequate duration in completing our project.

I would like to thank **Dr. N. VASUDEVAN, M.Tech., Ph.D.,** Principal, who gave opportunity to frame the project the full satisfaction.

I whole heartily thanks to **Dr. T. AVUDAIAPPAN, M.E.,Ph.D.,** Head of the department, **ARTIFICIAL INTELLIGENCE** for providing his encourage pursuing this project.

I express our deep expression and sincere gratitude to our project supervisor **Ms.S.Murugavalli., M.E.,(Ph.D).,** Department of **ARTIFICIAL INTELLIGENCE,** for her incalculable suggestions, creativity, assistance and patience which motivated us to carry out this project.

I render our sincere thanks to Course Coordinator and other staff members for providing valuable information during the course.

I wish to express our special thanks to the officials and Lab Technicians of our departments who rendered their help during the period of the work progress.

INSTITUTE

Vision:

- To serve the society by offering top-notch technical education on par with global standards.

Mission:

- Be a center of excellence for technical education in emerging technologies by exceeding the needs of industry and society.
- Be an institute with world class research facilities.
- Be an institute nurturing talent and enhancing competency of students to transform them as all – round personalities respecting moral and ethical values.

DEPARTMENT

Vision:

- To excel in education, innovation, and research in Artificial Intelligence and Data Science to fulfil industrial demands and societal expectations.

Mission

- To educate future engineers with solid fundamentals, continually improving teaching methods using modern tools.
- To collaborate with industry and offer top-notch facilities in a conducive learning environment.
- To foster skilled engineers and ethical innovation in AI and Data Science for global recognition and impactful research.
- To tackle the societal challenge of producing capable professionals by instilling employability skills and human values.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

- **PEO1:** Compete on a global scale for a professional career in Artificial Intelligence and Data Science.
- **PEO2:** Provide industry-specific solutions for the society with effective communication and ethics.
- **PEO3** Enhance their professional skills through research and lifelong learning initiatives.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1:** Capable of finding the important factors in large datasets, simplify the data, and improve predictive model accuracy.
- **PSO2:** Capable of analyzing and providing a solution to a given real-world problem by designing an effective program.

PROGRAM OUTCOMES (POs)

Engineering students will be able to:

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals, and an engineering specialization to develop solutions to complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

5. **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

6. **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

8. **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

ABSTRACT

Analyzing traffic accidents by time of day and visualizing the trends is crucial for enhancing road safety and optimizing traffic management. Studies have consistently shown that accident rates fluctuate throughout the day, with specific time windows posing higher risks. For instance, research utilizing space-time analysis techniques has identified that the highest number of vehicle crashes often occur during weekday afternoons, particularly between 3:00 p.m. and 5:00 p.m. These peaks are associated with increased traffic volume during workweek commutes. Moreover, certain locations, such as US Route 1 just north of Florida State Road 404, have been pinpointed as statistically significant hotspots for accidents during these hours, despite not being high-crash areas overall . These insights underscore the importance of temporal analysis in traffic accident studies. By leveraging data visualization and spatial-temporal analysis, stakeholders can identify critical periods and locations for targeted interventions, ultimately aiming to reduce accident rates and enhance road safety.

.

ABSTRACT WITH POs AND PSOs MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
Analyzing traffic accidents by time of day and visualizing the trends is crucial for enhancing road safety and optimizing traffic management. Studies have consistently shown that accident rates fluctuate throughout the day, with specific time windows posing higher risks. For instance, research utilizing space-time analysis techniques has identified that the highest number of vehicle crashes often occur during weekday afternoons, particularly between 3:00 p.m. and 5:00 p.m. These peaks are associated with increased traffic volume during workweek commutes. Moreover, certain locations, such as US Route 1 just north of Florida State Road 404, have been pinpointed as statistically significant hotspots for accidents during these hours, despite not being high-crash areas overall . These insights underscore the importance of temporal analysis in traffic accident studies. By leveraging data visualization and spatial-temporal analysis, stakeholders can identify critical periods and locations for targeted interventions, ultimately aiming to reduce accident rates and enhance road safety.	**PO1 -3** **PO2 -3** **PO3 -3** **PO4 -3** **PO6 -3** **PO9 -2**	**PSO1 -3** **PSO2 -3**

Note: 1- Low, 2-Medium, 3- High

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

In Population demographics play a fundamental role in shaping the socioeconomic and political landscape of any nation. Among various demographic parameters, **age distribution** serves as a critical indicator for understanding population structure and planning public services such as education, healthcare, employment, and social welfare. With the advancement of data science and analytical tools, the ability to derive insights from demographic datasets has become more accessible and powerful.This project titled " **Analysing Traffic Accidents by Time of Day and Visualizing the Trends"** aims to explore how R, a versatile statistical programming language, can be used to process, analyze, and visualize age-related population data effectively. The analysis involves segmenting the population into meaningful age groups (e.g., children, youth, adults, elderly) and deriving statistical summaries and visual patterns that reveal the underlying structure of the population.Using R libraries such as ggplot2, dplyr, and readr, the project focuses on data preprocessing, transformation, and graphical representation. The approach helps identify trends such as population aging, youth bulges, or balanced demographics, which are essential for informed decision-making by policymakers, researchers, and urban planners.The interactive nature of the tool, developed using R Shiny, allows users to upload custom datasets, filter data based on age categories, and view insights dynamically. This makes the application flexible and applicable to various population datasets—local, regional, or national.Overall, the project demonstrates how open-source tools like R can be employed not only for statistical computation but also for real- world applications in social and demographic analysis.

1.1 OBJECTIVE

The primary objective of the project "Analyzing Traffic Accidents by Time of Day and Visualizing the Trends" is to systematically examine temporal patterns in traffic accidents to identify high-risk periods and inform targeted road safety interventions.

- **Temporal Pattern Identification:**
  Analyze traffic accident data to uncover patterns and trends related to the time of day, pinpointing peak hours with elevated accident frequencies.
- **Contributing Factor Analysis:**
  Investigate how variables such as road conditions, weather, and traffic density correlate with accident occurrences at different times, enhancing the understanding of underlying causes.
- **Data Visualization:**
  Develop interactive visualizations (e.g., heatmaps, time-series charts) to effectively communicate temporal accident trends, facilitating easier interpretation by stakeholders.
- **Hotspot Detection:**
  Identify and visualize accident hotspots during specific time frames to assist in prioritizing areas for safety improvements.
- **Policy and Strategy Development:**
  Provide data-driven insights to support the formulation of targeted traffic management policies and safety strategies aimed at reducing accident rates during identified high-risk periods.

1.2 OVERVIEW

Traffic accidents are not uniformly distributed throughout the day; certain time periods exhibit higher frequencies due to factors like traffic volume, driver fatigue, and environmental conditions. For instance, studies have shown that weekday afternoons, particularly between 3:00 p.m. and 5:00 p.m., experience a significant uptick in accidents, correlating with increased traffic during workweek commutes . Advanced data visualization techniques, such as space-time cube models and heatmaps, allow for the identification of accident hotspots and temporal patterns. Tools like LightningChart in Python have been utilized to demonstrate that evening hours, characterized by peak traffic density and higher vehicle counts, are strongly correlated with an increase in accident rates. By leveraging these analytical methods, stakeholders can develop targeted strategies to enhance road safety. This includes implementing traffic calming measures during high-risk periods, optimizing traffic signal timings, and conducting public awareness campaigns focused on specific times of the day. In summary, the analysis of traffic accidents by time of day, coupled with effective visualization of trends, provides invaluable insights for policymakers, urban planners, and traffic management authorities aiming to reduce accident rates and improve overall road safety.

1.3 R PROGRAMMING CONCEPTS USED

In the project "Analyzing Traffic Accidents by Time of Day and Visualizing the Trends", several R programming concepts and packages are instrumental in processing, analyzing, and visualizing the data effectively.

1. Data Import and Cleaning

- **readr and data.table**: Efficiently read large datasets, such as CSV or Excel files, into R for analysis.
- **dplyr**: Facilitates data manipulation tasks like filtering, selecting, and summarizing data.
- **tidyr**: Helps in tidying data, ensuring it's in the right format for analysis.

2. Temporal Data Handling

- **lubridate**: Simplifies the parsing and manipulation of date-time data, allowing for easy extraction of components like hour, day, or month.
- **hms**: Handles time-of-day values, especially useful when analyzing accidents based on specific times.

3. Exploratory Data Analysis (EDA)

- **ggplot2**: A powerful visualization package based on the Grammar of

Graphics, enabling the creation of diverse plots to identify patterns and trends.

- **summary() and str() functions**: Provide quick insights into the structure and summary statistics of the dataset.

4. Spatial Data Analysis

- **sf (Simple Features)**: Manages and analyzes spatial data, allowing for the mapping of accident locations.
- **tmap**: Creates thematic maps, useful for visualizing spatial distributions of accidents.

5. Interactive Dashboards

- **shiny**: Builds interactive web applications directly from R, enabling users to interact with data visualizations dynamically.

6. Specialized Packages

- **stats19**: Designed for working with UK road traffic accident data, providing functions to download and process standardized datasets.
- **stplanr**: Assists in transport planning and analysis, including route analysis and desire lines.

CHAPTER 2

PROJECT METHEDOLOGY

2.1 PROPOSED WORK

Traffic accidents are a significant public safety concern worldwide. Analyzing the temporal patterns of these accidents can provide insights into high-risk periods, enabling the development of targeted interventions to enhance road safety. This project aims to systematically examine traffic accident data concerning the time of day and visualize emerging trends to inform policy decisions..

- **Data Collection and Ingestion**
  - Data Sources: Acquire traffic accident datasets from reliable sources such as government databases, transportation departments, or open data platforms.
  - Data Formats: Ensure compatibility with various data formats (e.g., CSV, Excel, JSON) for seamless integration.
  - Data Fields: Focus on essential fields like date and time of the accident, location, severity, weather conditions, and road type.
- **Data Preprocessing**
  - Data Cleaning: Handle missing values, remove duplicates, and correct inconsistencies.
  - Time Conversion: Convert date and time fields into appropriate formats for temporal analysis.
  - Feature Engineering: Derive new features such as hour of the day, day of the week, and categorize time into intervals (e.g., morning, afternoon, evening, night).
- **Exploratory Data Analysis (EDA)**
  - Statistical Analysis: Compute descriptive statistics to understand the distribution of accidents over different times.
  - Temporal Patterns: Identify peak hours and days with the highest accident frequencies.
  - Correlation Analysis: Examine relationships between accident occurrences and factors like weather conditions or road types.
- **Data Visualization**

- Time-Series Plots: Visualize accident counts over time to identify trends and anomalies.
- Heatmaps: Create heatmaps to show accident densities across different hours and days.
- Interactive Dashboards: Develop dashboards using tools like R Shiny or Tableau for dynamic exploration of the data.

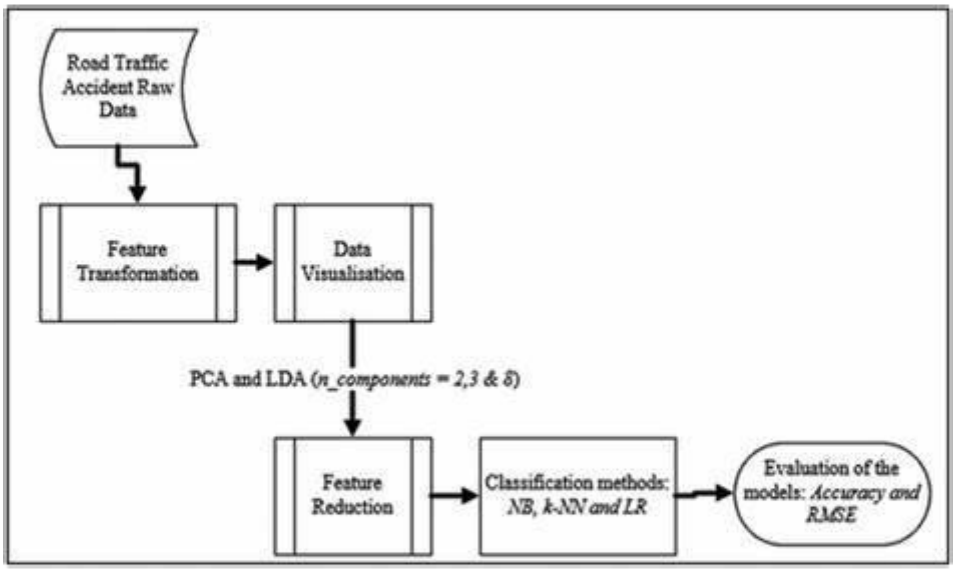
- **Interpretation and Reporting**
  - Insights Generation: Summarize key findings from the analysis and visualizations.
  - Recommendations: Provide suggestions for targeted interventions during high-risk periods.
  - Documentation: Prepare comprehensive reports detailing methodologies, findings, and recommendations.

This proposed work enables users whether students, researchers, or policy planners to derive insights from population data without deep technical knowledge. The tool's flexibility, interactivity, and intuitive design make it a valuable resource for demographic analysis and decision-making support.

The highlight of this methodology lies in its:

➔ **Portability** (can be run locally on any R-compatible system),
➔ **Flexibility** (accepts any company dataset), and
➔ **Scalability** (can be enhanced later with features like comparison between two companies, adding moving averages, etc.).

2.2 BLOCK DIAGRAM



CHAPTER 3
MODULE DESCRIPTION

3.1 FILE UPLOAD & DATA INGESTION MODULE

This module serves as the **entry point** for the application, allowing users to upload population datasets in **CSV format**. It ensures that the input data is correctly loaded into the system for further processing and analysis.

Key Functions:

- File Input Control: Utilize the fileInput() function to allow users to upload CSV files containing traffic accident data.
- File Validation: Implement checks to ensure the uploaded file is in the correct format (e.g., CSV) and contains the necessary columns for analysis.
- Reactive File Handling: Use reactive() expressions to monitor and respond to file uploads, ensuring the application reacts appropriately to new data.

Expected CSV Columns:

- Facilitates the seamless upload and ingestion of traffic accident datasets in CSV format, ensuring data integrity and compatibility for subsequent analysis

Data Cleaning:

Ensures the accuracy and consistency of traffic accident data by identifying and rectifying errors, handling missing values, and standardizing formats.

3.2 USER INPUT SELECTION MODULE

TThis module provides an **interactive interface** for users to control how they want to analyze the population data. It allows users to select parameters such as age group ranges and the type of visualization to be generated.

UI Components:

- Age Group Filter:A sliderInput() or selectInput() widget in Shiny enables users to specify:
- Age range to focus on (e.g., 0–14, 15–24, etc.)

Functionality:

- The selected inputs are passed reactively to the backend to:
- Filter the dataset according to the selected age range.
- Bin ages according to the chosen interval.
- Render the selected chart type dynamically.

Ensures a **customizable experience** where users can explore data based on their specific analytical needs.

3.3 DATA PROCESSING AND REACTIVE LOGIC MODULE

Dynamic Input Controls:

- **Select Input:** Use selectInput() to allow users to choose specific variables or categories (e.g., time of day, accident severity).
- **Multiple Selections:** Enable multiple selections where applicable to allow users to filter by multiple criteria simultaneously.
- **Dynamic Updates:** Implement updateSelectInput() to dynamically update available choices based on previous selections or uploaded data.
- **Conditional Inputs:**
- **Conditional Panels:** Utilize conditionalPanel() to display input controls based on the selection of other inputs, ensuring a clean and responsive UI.
- **Reactive Expressions:** Employ reactive() expressions to update input choices and outputs in real-time as user selections change.
- **User Feedback:**
- **Validation:** Implement input validation to ensure that user selections are valid and meaningful.
- **Error Handling:** Provide clear error messages or guidance when invalid selections are made.
- **Default Values:** Set sensible default values for inputs to guide users and streamline the selection process.

3.4 VISUALIZATION MODULE

Objective: To provide interactive and insightful visual representations of traffic accident data, enabling users to explore patterns, trends, and correlations effectively.

Key Components:

- **Time Series Analysis:** Utilize line charts or bar plots to display accident counts and severity over different times of the day, highlighting peak accident periods.
- **Geospatial Mapping:** Implement interactive maps (e.g., using leaflet or plotly) to visualize accident hotspots and severity distributions across geographic regions.
- **Categorical Data Visualization:** Employ bar charts or pie charts to represent accident counts by categories such as weather conditions, road types, and accident causes.
- **Heatmaps:** Develop heatmaps to visualize accident density across different times of day and days of the week, aiding in identifying high- risk periods.
- **User Interaction:** Incorporate input controls like sliders, dropdowns, and date pickers to allow users to filter and customize visualizations based on specific criteria.

Best Practices:

- **Modularity:** Structure visual components into reusable modules to maintain clean and maintainable code.
- **Performance:** Optimize rendering processes to handle large datasets efficiently and ensure smooth user experience.
- **Accessibility:** Ensure that visualizations are accessible, including appropriate color schemes for colorblind users and keyboard navigation support.

CHAPTER 4

CONCLUSION AND FUTURE SCOPE

CONCLUSION

Analyzing traffic accidents by time of day offers valuable insights into temporal patterns and risk factors, enabling targeted interventions to enhance road safety. By identifying peak accident periods, such as rush hours and late- night hours, authorities can implement preventive measures like increased surveillance, public awareness campaigns, and optimized traffic signal timings. This approach contributes to reducing accident frequency and severity, ultimately improving public safety

FUTURE SCOPE

The future of traffic accident analysis lies in integrating advanced technologies and data sources to create more accurate and real-time predictive models. Potential developments include:

- Integration of Real-Time Data: Incorporating real-time traffic data from sources like GPS, traffic cameras, and crowd-sourced platforms (e.g., Waze) to monitor and predict accident-prone periods dynamically.
- Advanced Predictive Modeling: Employing machine learning algorithms, such as Random Forests and Neural Networks, to predict accident risk and severity based on various factors, including time of day, weather conditions, and traffic volume.
- Adaptive Traffic Control Systems: Developing adaptive traffic signal systems that respond to real-time traffic conditions, optimizing flow and reducing congestion during high-risk periods.
- Enhanced Visualization Tools: Creating interactive dashboards and heatmaps that allow authorities and the public to visualize accident trends and hotspots, facilitating informed decision-making.

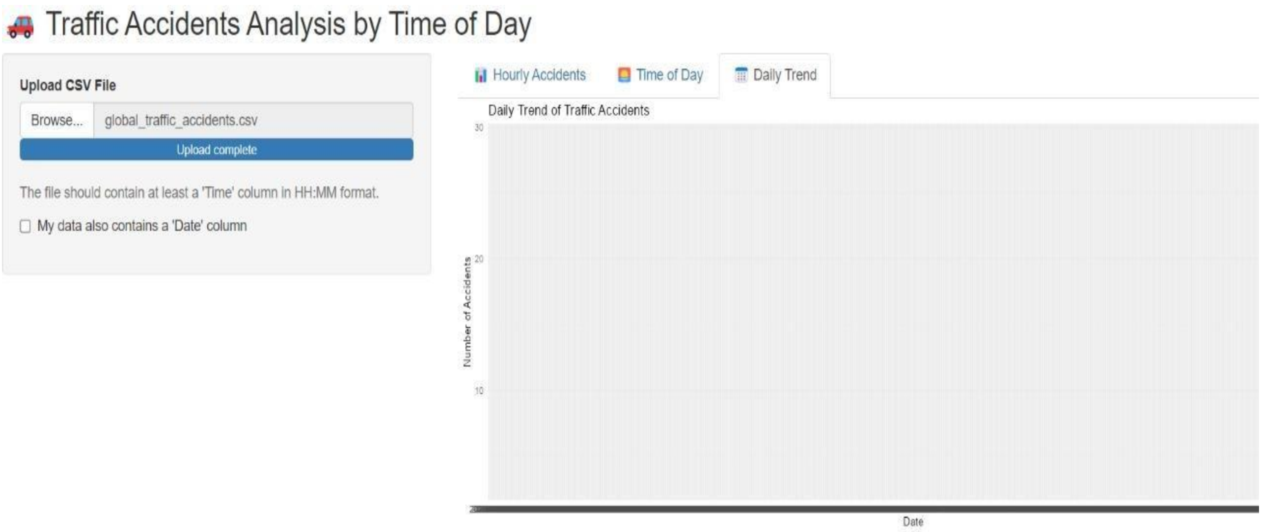
CHAPTER 5
APPENDIX A SOURCE CODE

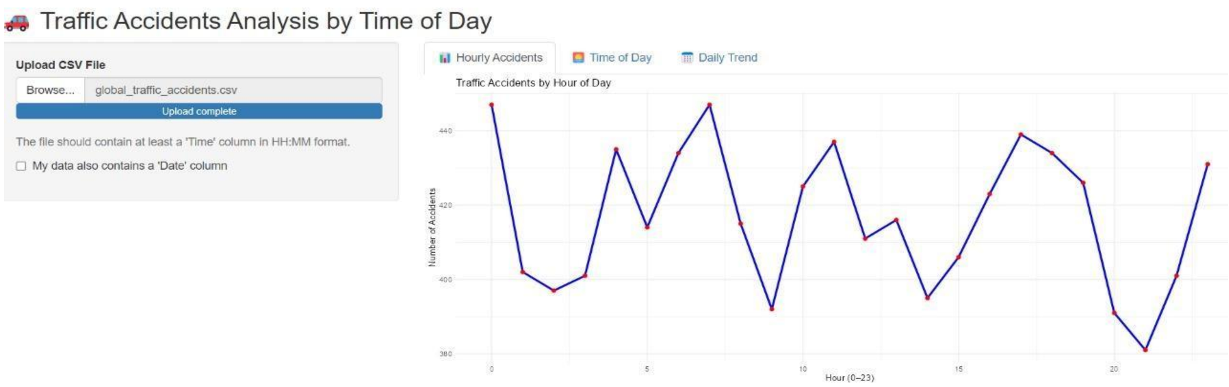
```
# app.R


# Load required libraries
library(shiny)
library(tidyverse)
library(lubridate)

# UI
ui <- fluidPage(
  titlePanel("Traffic Accidents Analysis by Time of Day"),

  sidebarLayout(
    sidebarPanel(
      fileInput("file", "Upload CSV File",
                accept = c(".csv")),
      helpText("The file should contain at least a 'Time' column in HH:MM
format."),
      checkboxInput("has_date", "My data also contains a 'Date' column",
FALSE)
    ),

    mainPanel(
      tabsetPanel(
        tabPanel("Hourly Accidents", plotOutput("hourlyPlot")),
        tabPanel(" Time of Day", plotOutput("todPlot")),
        tabPanel(" Daily Trend", plotOutput("dailyPlot"))
      )
    )
  )
)

# Server
server <- function(input, output) {

  # Reactive data after processing
  accident_data <- reactive({
  req(input$file)
    df <- read.csv(input$file$datapath, stringsAsFactors = FALSE)

    # Parse time and extract hour
    df$Time <- parse_time(df$Time, format = "%H:%M")
```

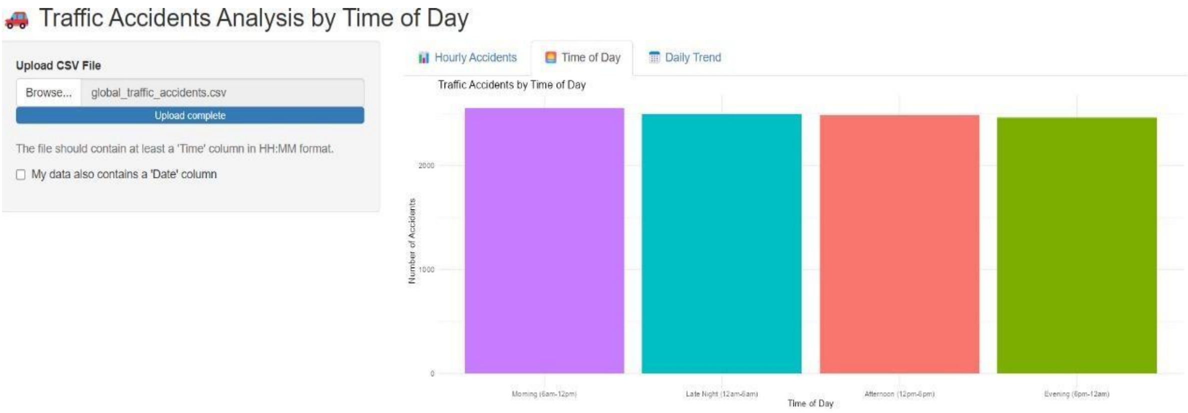
```
  df$Hour <- hour(df$Time)

  # Time of day categories
  df$TimeOfDay <- case_when(
    df$Hour >= 0 & df$Hour < 6 ~ "Late Night (12am-6am)",
    df$Hour >= 6 & df$Hour < 12 ~ "Morning (6am-12pm)",
    df$Hour >= 12 & df$Hour < 18 ~ "Afternoon (12pm-6pm)",
    df$Hour >= 18 & df$Hour <= 23 ~ "Evening (6pm-12am)"
  )

  # Parse date if checkbox is selected
  if (input$has_date && "Date" %in% names(df)) {
    df$Date <- as.Date(df$Date)
  }

  return(df)
 })

 # Plot: Hourly Accidents
 output$hourlyPlot <- renderPlot({
 df <- accident_data()
  hourly <- df %>%
    group_by(Hour) %>%
    summarise(Count = n())

  ggplot(hourly, aes(x = Hour, y = Count)) +
    geom_line(color = "blue", size = 1.2) +
    geom_point(color = "red", size = 2) +
    labs(title = "Traffic Accidents by Hour of Day",
         x = "Hour (0–23)",
         y = "Number of Accidents") +
    theme_minimal()
 })

 # Plot: Time of Day
 output$todPlot <- renderPlot({
 df <- accident_data()
  tod <- df %>%
    group_by(TimeOfDay) %>%
    summarise(Count = n())

  ggplot(tod, aes(x = reorder(TimeOfDay, -Count), y = Count, fill =
TimeOfDay)) +
    geom_bar(stat = "identity") +
    labs(title = "Traffic Accidents by Time of Day",
```

```
        x = "Time of Day",
        y = "Number of Accidents") +
      theme_minimal() +
      theme(legend.position = "none")
  })

  # Plot: Daily Trend (if Date exists)
  output$dailyPlot <- renderPlot({
  df <- accident_data()
    if (!("Date" %in% names(df))) return(NULL)

    daily <- df %>%
      group_by(Date) %>%
      summarise(Count = n())

    ggplot(daily, aes(x = Date, y = Count)) +
      geom_line(color = "darkgreen") +
      labs(title = "Daily Trend of Traffic Accidents",
        x = "Date",
        y = "Number of Accidents") +
      theme_minimal()
  })
}

# Run the application
shinyApp(ui = ui, server = server)
```

APPENDIX B SCREENSHOTS






Traffic Accidents Analysis by Time of Day
Upload CSV File
Browse...
global_traffic_accidents.csv
Upload complete
The file should contain at least a 'Time' column in HH:MM format.
My data also contains a 'Date' column
Hourly Accidents
Time of Day
Daily Trend
Traffic Accidents by Time of Day
Number of Accidents
Time of Day

REFERENCES

1. Chang, W. (2021). *Shiny: Web application framework for R*. RStudio, PBC. https://shiny.rstudio.com
2. Grolemund, G., & Wickham, H. (2011). Dates and times made easy with lubridate. *Journal of Statistical Software*, *40*(3), 1–25. https://www.jstatsoft.org/article/view/v040i03
3. James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning: With applications in R*. Springer.
4. R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.r-project.org
5. Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org