(Please Read Readme.md file first)

The dashboard link and data link are also mentioned there

Link for dashboard: https://nvajay.shinyapps.io/dashboard/

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Report

Analytical Dashboard on Statewise Road Accidents and Persons Killed/Injured

Introduction:

This comprehensive dashboard provides a detailed overview of the States/UTs-wise occurrences of Road Traffic Incidents from 2018 to 2021, with a specific focus on Fatal Road Accidents, Total Road Accidents, Persons Killed, and Persons Injured on Other Roads. The data is categorized into distinct metrics, including (FA) Fatal Accidents, (A) Total Accidents, (K) Persons Killed, and (I) Persons Injured. This visualization aims to facilitate a comprehensive understanding of the road safety landscape, aiding in the identification of trends and areas for potential interventions.

Summary of Dashboard:

Data Tab: The first tab covers a summary of the data, providing key metrics and insights into road traffic incidents.

Visualization Tab: The second tab presents interactive graphs, allowing users to explore and visualize the trends in Fatal Road Accidents, Total Road Accidents, Persons Killed, and Persons Injured over the specified years.

Analysis Tab: The third tab conducts ANOVA tests to check if Accidents, Persons Killed, and Persons Injured have shown significant changes over the years, providing statistical insights.

Credits:

Data: The data used in this dashboard is sourced from data.gov.in, ensuring transparency and reliability in the information presented.

This analytical dashboard serves as a valuable tool for policymakers, researchers, and the public to gain insights into the road safety scenario, fostering informed decision-making and

potential initiatives for enhancing road traffic safety.

Tab 1: Data

Part 1: Introduction

This part provides a brief introduction of dashboard and abbreviations used as provided earlier.

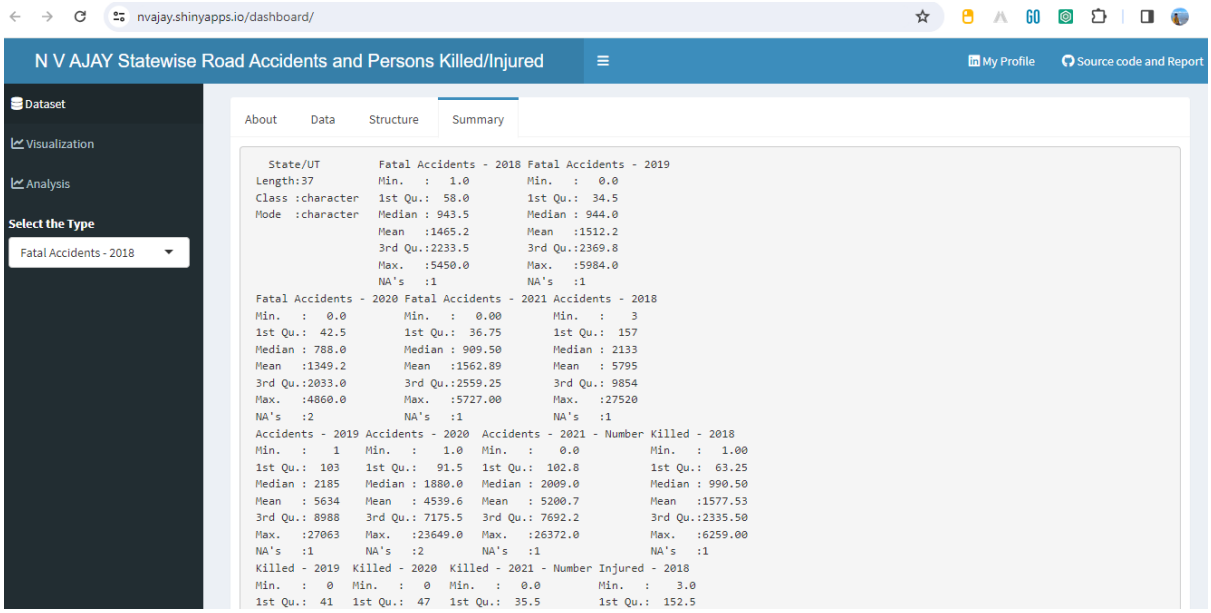
Part 2: Table

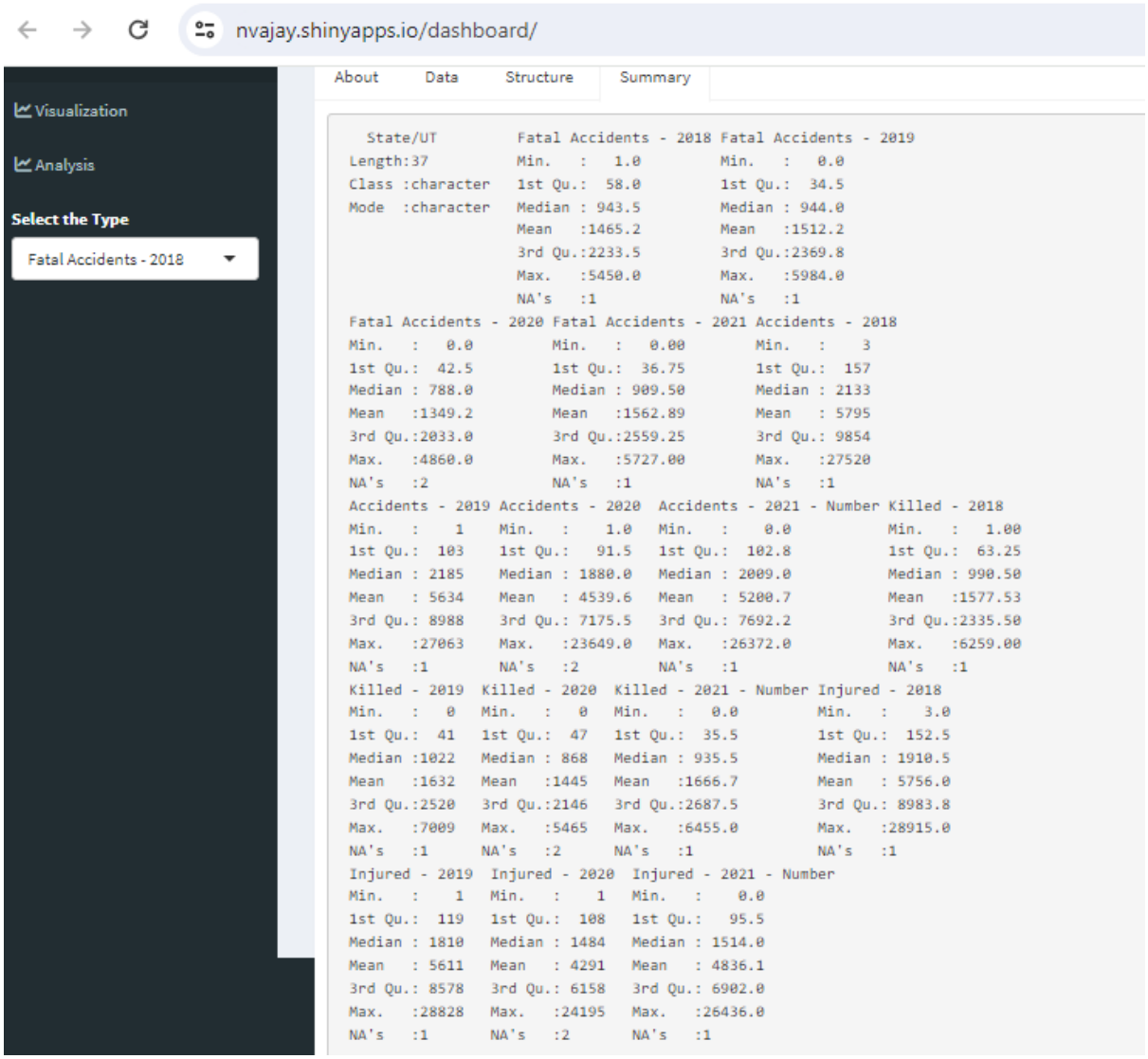
This part provides the data that is used in this in this dashboard. It is downloaded from data.gov.in, which is open-source website by government of India

Part 3: Structure

This part of the data provides detailed overview of different variables of the data. Variables are State/UT (Names of states) and number of fatal accidents, number of total accidents, number of persons Killed, number of persons injured over the years 2018, 2019, 2020, and 2021.

Part 4: Summary





Objective: To identify different statistical parameters like Min, max, median, mean, 1st Quartile, 3rd Quartile etc. of road traffic incidents, including Fatal Accidents, Total Accidents, Persons Killed, and Persons Injured over the years 2018, 2019, 2020, and 2021.

Analysis: Here summary function of R is used on all variables of data frame.
Analysis of the summary output for the data:

Result:

Fatal Accidents:

The number of fatal accidents shows an increasing trend from 2018 to 2021 but a dip in 2020.

The mean values indicate a rise in fatal accidents each year except 2020, reaching a peak in 2021.

Total Accidents:

While there is a fluctuation in median values, the means suggest a potential decrease in total accidents from 2018 to 2020 and again increased in 2021.

Persons Killed:

- The data on persons killed in accidents exhibits an upward trend but a dip in 2020
- The mean values show a steady increase but a dip in 2020, peaking in 2021.

Persons Injured:

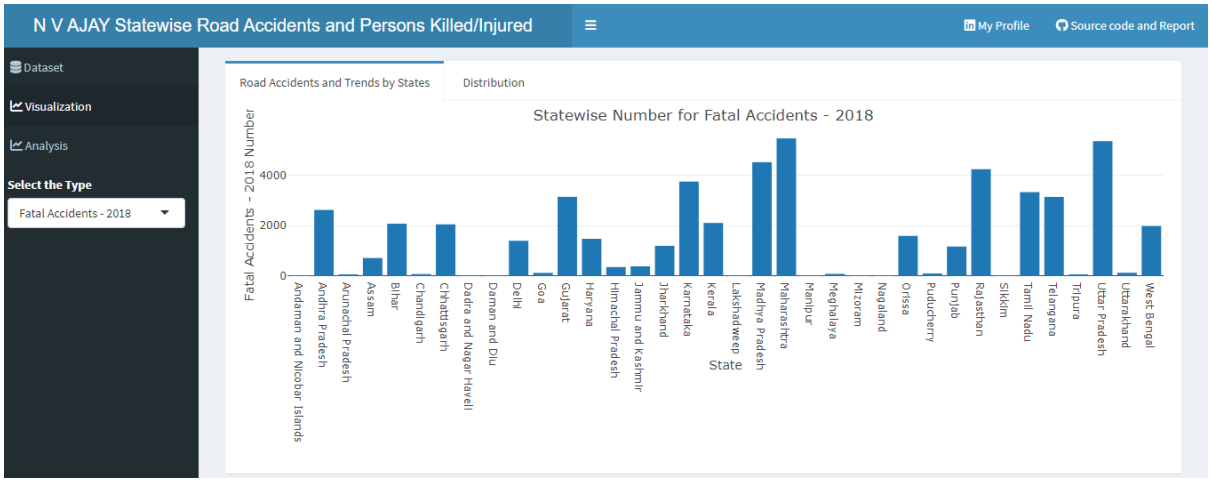
The number of persons injured in accidents demonstrates a consistent downward trajectory, but least in 2020.

Managerial Implication:

The data reveals that **the year 2020 consistently shows the lowest figures** across all four categories—Fatal Accidents, Total Accidents, Persons Killed, and Persons Injured. **This decline can be attributed to the global impact of the COVID-19 pandemic**, which led to unprecedented changes in daily life, including travel restrictions, lockdowns, and altered transportation patterns.
Fatal accidents display a concerning overall increase, notably dipping in 2020. Total accidents exhibit fluctuation, decreasing from 2018 to 2020 and increasing in 2021. Persons killed follow a similar trend, decreasing in 2020. Persons injured show a consistent decline, except for 2020. These trends emphasize the need for targeted interventions, adaptive safety measures, and reinforcement of effective initiatives to address evolving challenges.

The dashboard provides a comprehensive summary of numerical quantitative data, presenting detailed figures for various metrics.

Tab 2: Visualization
Part 1: Number of accidents or Persons killed/injured Trends by States



Objective: To show state wise number of accidents or Persons killed/injured and trend

Analysis: In this part of dashboard, I have used an interactive histogram which has states on X axis and different number of accidents or Persons killed/injured in different years on y axis.

Result:

Fatal Accidents:

Highest fatal accidents were in Maharashtra in 2018, Uttar Pradesh in 2019, Maharashtra in 2020, and again Maharashtra in 2021.

Total Accidents:

Madhya Pradesh reported the highest total accidents in 2018, 2019, 2020, and 2021.

Persons Killed:

Uttar Pradesh had the highest number of persons killed in 2018, 2019, 2020, and 2021.

Persons Injured:

Madhya Pradesh consistently recorded the highest number of persons injured in 2018, 2019, 2020, and 2021.

Recommendations and Managerial Implications:

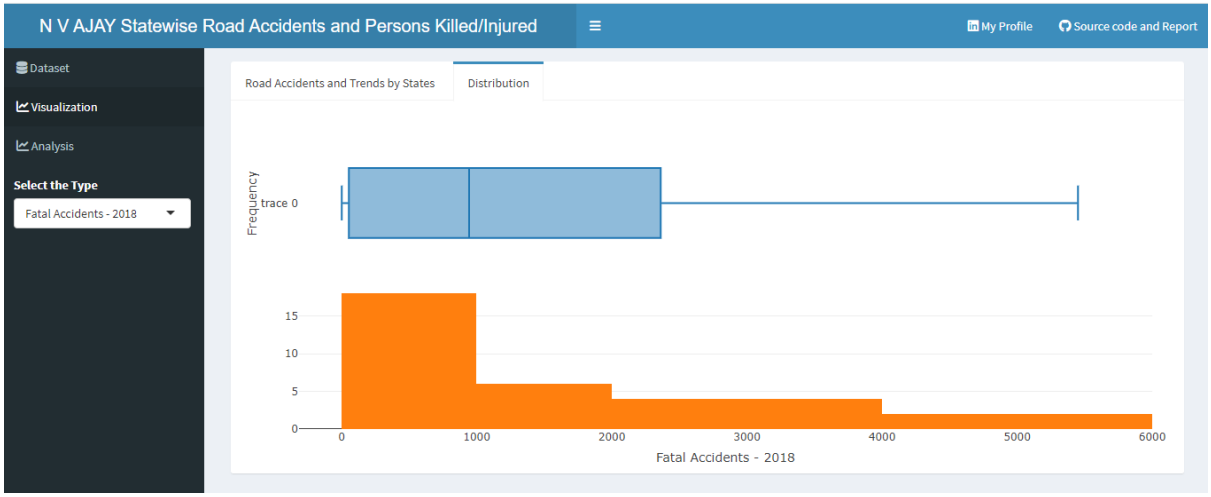
The consistently high fatal accidents in Maharashtra require targeted interventions and enhanced road safety measures to reduce the occurrences and associated casualties.

Madhya Pradesh's consistent top ranking in total accidents emphasizes the need for focused efforts on improving road infrastructure, traffic management, and public awareness in the state.

The alarming trend of Uttar Pradesh having the highest number of persons killed indicates the urgent need for stringent enforcement of traffic laws, enhanced emergency response systems, and road safety campaigns.

Addressing the persistently high number of persons injured in Madhya Pradesh should involve comprehensive measures such as improving medical facilities, enforcing speed limits, and promoting safe driving practices to reduce the impact of road incidents on human lives.

Part 2: Distribution and Box Plot



Objective: To show trend and distribution among number of accidents or Persons killed/injured in different states

Analysis: In this part of dashboard, I have used an interactive histogram and box plot which has name of type of accident on X axis and number of accidents in different states on y axis.

Result:

Most states experienced Fatal Accidents between 0 and 1000 in 2018, 2019, 2020, 2021

Total Accidents for most states were in the range of 0 to 5000 in 2018, 2019, 2020, 2021

Persons Killed varied from 0 to 1000 for most states and some significant number of states in the range of 2000 - 3000 in 2018, 2019, 2020, 2021

Most states recorded Persons Injured between 0 and 5000 in 2018, 2019, 2020, 2021.
We have also noticed instances of outliers within the distributions.

Managerial Implication:

The data suggests a moderate level of road safety across most states, with fatal accidents, total accidents, persons killed, and persons injured falling within manageable ranges. States experiencing higher values should prioritize targeted interventions, such as enhanced enforcement, awareness campaigns, and infrastructure improvements. A collaborative approach to sharing successful safety practices among states could lead to overall improvements in road safety. Continuous monitoring and evaluation are vital to assess the effectiveness of implemented interventions and guide future strategies for sustained and enhanced road safety.

Tab 3: Analysis

Part 1: Introduction

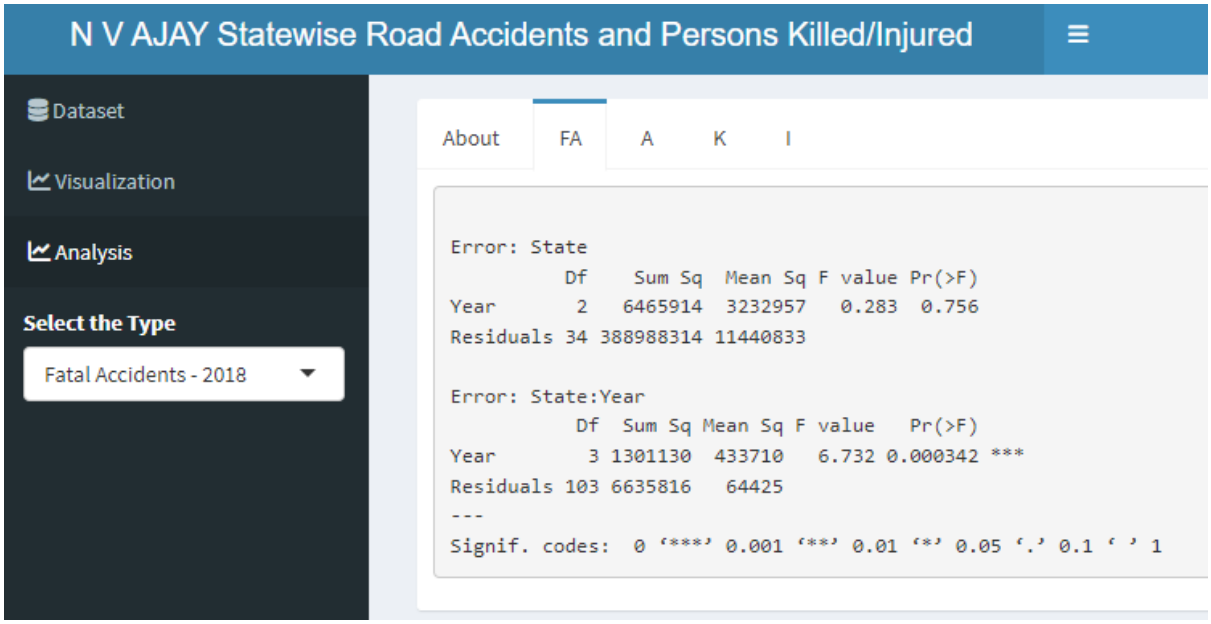
This part of Dashboard statistically compares different number of accidents or Persons killed/injured per state over years using test of Anova.
The null hypothesis assumes no significant relationship between variables, while the alternative hypothesis posits a significant relationship.

Part 2: Test for Fatal Accidents

Objective: To assess the impact of different states and years on fatal road accidents.

Analysis: An Analysis of Variance (ANOVA) was conducted using the formula Fatal Accidents ~ Year + Error(State / Year). This statistical test is appropriate for examining the influence of the variable 'Year' on the response variable 'Fatal Accidents,' while accounting for potential variations among states and across years within each state. The null hypothesis assumes no significant relationship between variables, while the alternative hypothesis posits a significant relationship.

Result:



The ANOVA results for fatal road accidents indicate that there is no significant relationship between the variable 'Year' and the response variable 'Fatal Accidents' (F value = 0.283, p-value = 0.756). Therefore, we do not reject the null hypothesis, suggesting that, on average, the number of fatal road accidents did not significantly change across the years.

However, when considering the interaction between 'State' and 'Year,' the ANOVA results reveal a significant relationship (p-value < 0.001), indicating that the impact of 'Year' on 'Fatal Accidents' varies across different states. This leads to the rejection of the null hypothesis for the interaction effect.

Managerial Implication:

While the overall analysis does not show a significant change in the number of fatal road accidents over the years, the significant interaction effect highlights the importance of a state-specific approach. Managers should conduct in-depth analyses for each state to understand the unique factors influencing road safety.

Strategies for road safety interventions should be tailored to address state-specific challenges, considering factors such as infrastructure, traffic regulations, and regional trends. Collaborations with local authorities and community engagement can play a crucial role in implementing targeted measures to reduce fatal road accidents effectively.

Part 3 : Test for Total Accidents

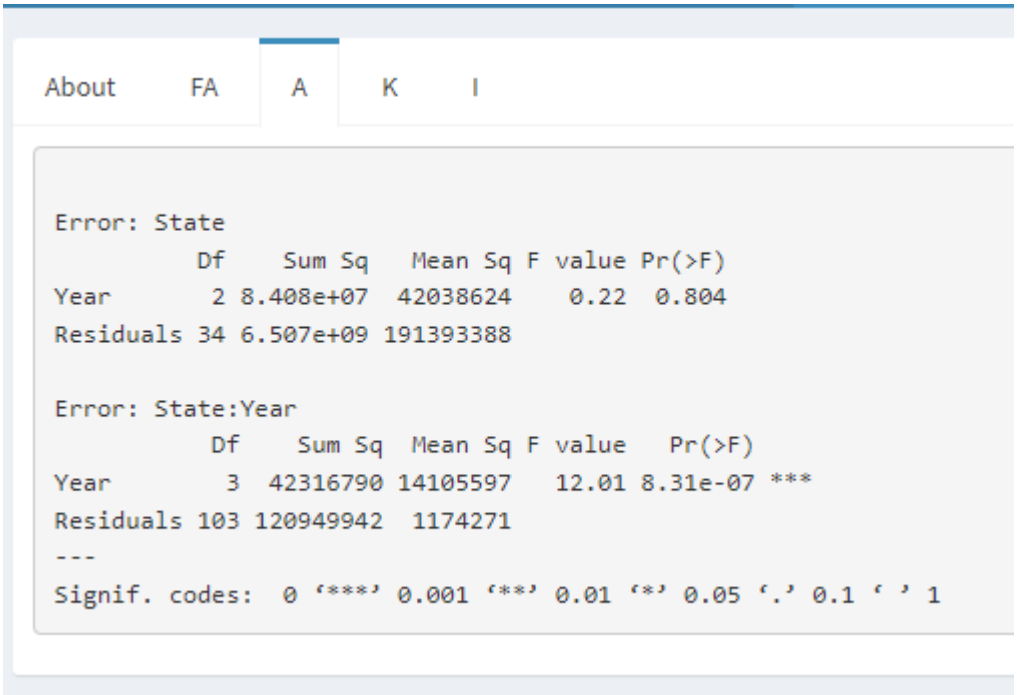
Objective:

The objective is to examine the impact of different states and years on total accidents using Analysis of Variance (ANOVA).

Analysis:

ANOVA was performed with the formula Total Accidents ~ Year + Error(State / Year). This analysis aims to assess the influence of the variable 'Year' on 'Total Accidents,' accounting for potential variations among states and across years within each state.

Result:



The overall ANOVA results for 'Total Accidents' indicate no significant relationship between the variable 'Year' and the response variable (F value = 0.22, p-value = 0.804). The null hypothesis is not rejected, suggesting that, on average, the number of total accidents did not significantly change across the years.

However, considering the interaction between 'State' and 'Year,' the ANOVA results show a significant relationship (p-value < 0.001). This suggests that the impact of 'Year' on 'Total Accidents' varies across different states, leading to the rejection of the null hypothesis for the interaction effect.

Managerial Implication:

While the overall analysis suggests no substantial change in the total number of accidents over the years, the significant interaction effect underscores the need for a nuanced, state-specific approach. Instead of adopting a one-size-fits-all strategy, managers should delve deeper into the unique characteristics and challenges of each state. This calls for a targeted and localized road safety intervention that considers the diverse traffic patterns, infrastructure conditions, and regulatory frameworks across states. By tailoring strategies to the specific needs of each region, stakeholders can enhance the impact of road safety initiatives and contribute to more effective accident prevention measures. Collaborative

efforts with state authorities and community engagement become crucial components in ensuring the success of state-specific interventions.

Part 4: Test for Persons Killed

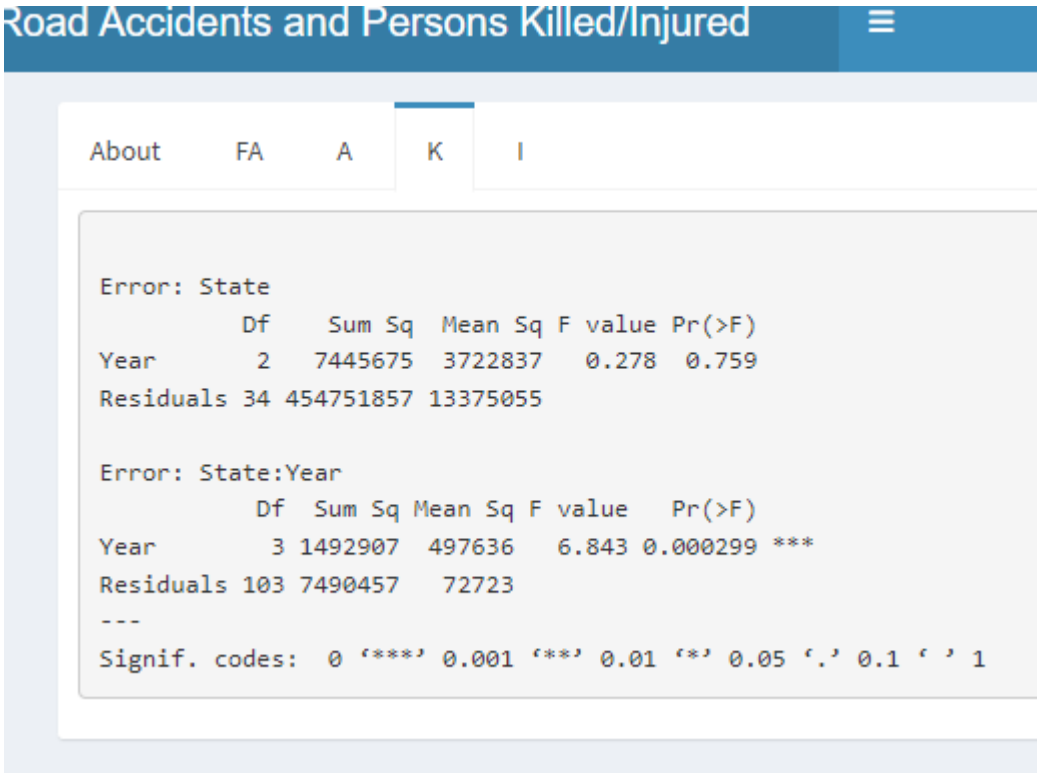
Objective:

The aim of this analysis is to assess the impact of different states and years on the number of persons killed in road traffic incidents.

Analysis:

A detailed analysis of variance (ANOVA) was performed using the formula Persons Killed ~ Year + Error(State / Year). This approach allows the examination of the influence of the 'Year' variable on the response variable 'Persons Killed,' considering potential variations among states and across years within each state. The null hypothesis suggests no significant relationship between variables, while the alternative hypothesis proposes a significant relationship.

Result:



The ANOVA results reveal a non-significant main effect for the variable 'Year' (F value = 0.278, p = 0.759) concerning its impact on the number of persons killed. However, the interaction effect for State and Year is statistically significant (F value = 6.843, p = 0.000299), indicating the rejection of the null hypothesis for the interaction effect.

Managerial Implication:

Although there is no significant change in the overall number of persons killed across years, the significant interaction effect emphasizes the importance of tailored interventions for each state. Implementing state-specific road safety measures and collaborating closely with state authorities can enhance the effectiveness of interventions. Customized strategies considering regional variations will be essential for targeted and impactful road safety improvements.

Part 5: Test for Persons Injured

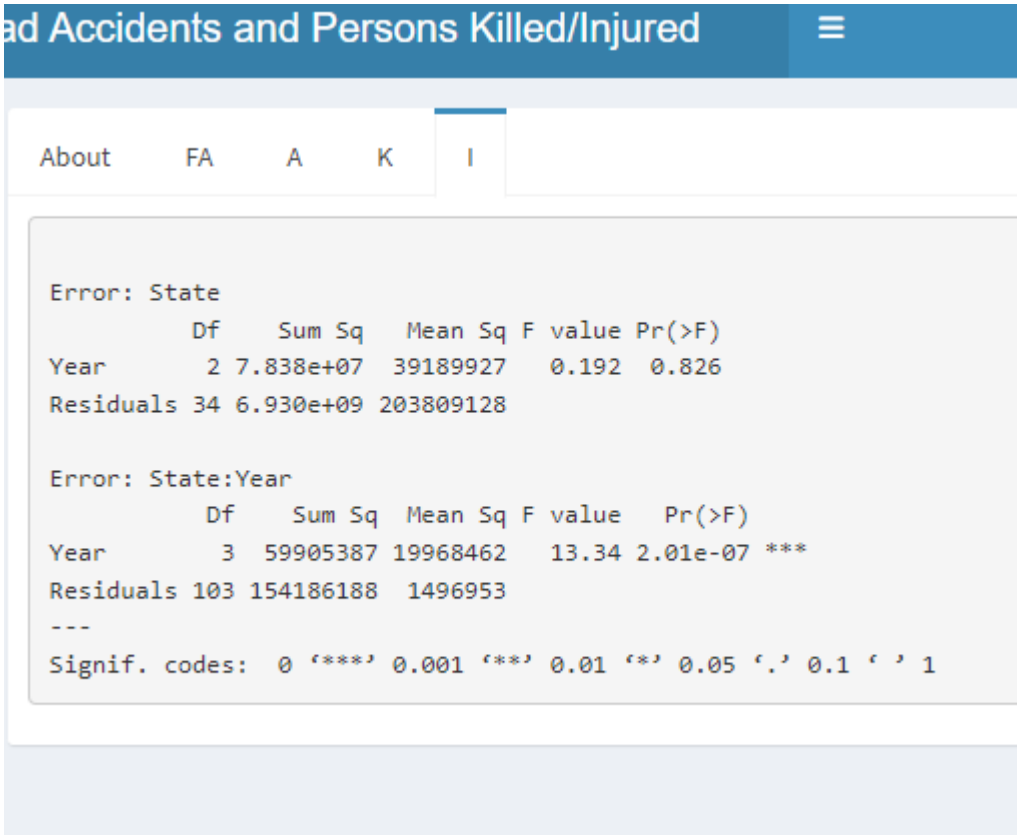
Objective:

The objective of this analysis is to examine the impact of different states and years on the number of persons injured in road traffic incidents.

Analysis:

An Analysis of Variance (ANOVA) was conducted using the formula Persons Injured ~ Year + Error(State / Year). This approach enables the investigation of the influence of the 'Year' variable on the response variable 'Persons Injured,' considering potential variations among states and across years within each state. The null hypothesis assumes no significant relationship between variables, while the alternative hypothesis suggests a significant relationship.

Result:



The ANOVA results indicate a non-significant main effect for the variable 'Year' (F value = 0.192, p = 0.826) regarding its impact on the number of persons injured. However, the interaction effect for State and Year is statistically significant (F value = 13.34, p = 2.01e-07), leading to the rejection of the null hypothesis for the interaction effect.

Managerial Implications:

Despite the overall stability in the number of persons injured, the notable interaction effect underscores the importance of recognizing diverse trends across states. In response, a proactive strategy involves conducting in-depth, state-specific assessments to identify the nuanced factors influencing road safety. Managers should adopt a personalized intervention approach, taking into account the unique characteristics and challenges of each state. By fostering robust collaborations with local authorities, implementing tailored measures, and emphasizing region-specific initiatives, road safety efforts can be optimized. This strategic approach ensures a more profound and impactful outcome, leading to a safer and more secure road environment.

Overall Managerial Implications:

State-Specific Analysis:

Recognize and analyze the state-specific factors influencing road safety, understanding that trends may vary across different regions.

Tailored Interventions:

Develop and implement interventions customized to the characteristics and challenges of each state, ensuring a targeted and effective approach.

Collaboration with Local Authorities:

Foster strong collaborations with local authorities to enhance the implementation of road safety measures and address specific issues at the grassroots level.

Nuanced Assessment:

Conduct nuanced assessments of each state to identify unique challenges and opportunities, providing a more comprehensive understanding of the road safety landscape.

Region-Specific Initiatives:

Emphasize region-specific initiatives to address the diverse needs of each state, contributing to a more impactful and meaningful improvement in road safety outcomes.