

# Road Safety Analysis

Team Name: Aces

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## **I.Abstract:**

Road accidents remain a leading cause of fatalities worldwide,with a particularly raising impact on youth.In India, Ministry of Road Transports and Highways reported that every year, approximately 1.5 lakh people die on Indian roads, which translate, on an average, into 1130 accidents and 422 deaths every day or 47 accidents and 18 deaths every hour.

This report focuses on addressing the pressing issue by performing a comprehensive road safety analysis.The primary objective to find locations where rash driving is observed.In addition,predictive analysis is performed to predict real time alerts for drivers which allows drivers to exercise caution while driving in high risk alerts.

## **II.Introduction:**

Maintaining road safety is paramount while driving in the road.Unfortunately, reckless driving,drinking while driving,failure to adhere to traffic regulations and incident of speeding has led to undesirable outcomes.These outcomes could be ranging from injuries or in the worst cases,fatalities.Additionally,road accidents can be attributed to poor road conditions,driver fatigue and vehicle

defects. However, a significant portion of accidents can be traced back to reckless driving and human error.

This report is dedicated to addressing these critical issues by focusing on two key objectives. Firstly, we aim to develop a system for predicting real-time alerts for drivers, thereby reducing the likelihood of human errors while on the road. Secondly, our report seeks to pinpoint specific locations where drivers tend to exceed speed limits or engage in high-risk driving behavior. By identifying these areas, we hope to raise awareness and encourage greater caution among motorists when navigating through these zones.

### **III. Related Work**

[1] Provides a comprehensive analysis of the current development trends of roadside safety based on a literature review from multiple perspectives. The study covers the period from 1980 to 2020 and includes 3612 relevant studies extracted from 5 databases. The research status of roadside safety is summarized in terms of three aspects: frequency of roadside accidents, severity of roadside accidents, and practice of roadside safety design. The paper identifies existing problems and future research directions, reviews the development process of different prediction methods and evaluation models for the frequency and severity of roadside accidents, and statistically analyzes the risk factors that lead to frequent and fatal roadside accidents.

[2] Focuses on improving road infrastructure to implement road safety at an intersection of military hospital roads. The authors conducted a study to identify the geometrical plan deficiencies on existing streets that can lead to accidents, such as sharp bends, layered asphalt conditions, and dangerous asphalt surface. They proposed improvements to the road infrastructure to address these issues and improve road safety.

## IV.Data Sources

The data sources utilized in the analysis were intel\_unnati\_phase\_revised dataset and OpenCode API which was utilized to find the addresses of places based on geographical coordinates.

Link to the dataset:

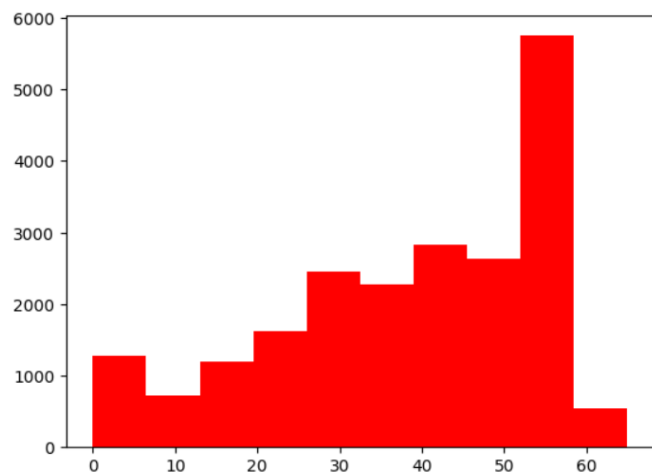
<https://drive.google.com/file/d/15VFRIWP5QuSEFylmGWWuoxu9-FTnViS6/view?usp=sharing>

## V.Analysis

### a)Rash driving areas:

1. Compute maximum, minimum, average, and standard deviation of speeds.**Distribution of speeds** is plotted in a **histogram**
2. Identify geographical coordinates for areas with **maximum(rash driving)** and minimum speeds using masking.
3. Eliminate duplicate location data.
4. Create an **OpenCode** API and import the necessary **OpenCode** module.
5. Pass the geographical coordinates of maximum(rash driving) and minimum speed areas to the OpenCode function, accompanied by an **API key**.
6. Request location information using the **API key** and retrieve formatted addresses for the specified coordinates.

```
Maximum Speed: 65
Minimum Speed: 0
Average Speed: 38.4038
Standard Deviation of Speeds: 16.8476
Max speed areas:
      Lat      Long
4555 12.886609 80.076814
9061 12.907908 80.097278
Min speed areas:
      Lat      Long
38    12.795046 80.020296
57    13.024305 80.228471
124   12.516883 79.887983
134   12.543551 79.904835
198   12.697172 79.972959
...    ...    ...
```



## Address of locations:

```
Minimum speed area  
Formatted Address: Madurantakam - Vennangupet Road, Chengalpattu District, Maduranthakam - 603306, Tamil Nadu, India  
Maximum speed area  
Formatted Address: Outer Ring Road, Vandalur, - 603210, Tamil Nadu, India
```

### b) Predictive alert analysis:

1. Input Features: Select **latitude (Lat)**, **longitude (Long)**, **speed (Speed)**, and **vehicle (Vehicle)** as input features. You choose "Alert" as the output feature.
2. Data Splitting: Divide the dataset into training and testing sets. This is crucial for assessing the model's performance.
3. Machine Learning Models: Train three different machine learning models - **Logistic Regression**, **Decision Tree**, and **Gradient Boost** - using the input features to predict the output feature ("Alert").
4. Evaluation Metrics: After training the models, you compute several evaluation metrics, including **accuracy**, **classification report**, and **confusion matrix**. These metrics will help you assess how well each model performs.
5. Real-Life Testing: You test the models with **real-world data instances**. This involves providing the model with new input data and comparing its predictions to the actual outcomes in the real world.

```
Accuracy score of Decision Tree Classifier: 0.71  
Accuracy score of Logistic Regression: 0.691  
Accuracy score of Gradient Boosting Classifier: 0.765
```

```
Predicted Alert Decision Tree: cas_hmw  
Predicted Alert Logistic Regression: cas_ldw  
Predicted Alert Gradient Boost: cas_hmw
```

## VI. References:

- [1] Research on Highway Road Safety, Gouzho Cheng, Rui Cheng, Yulong Pei, Juan Han
- [2] Improvement of road infrastructure to implement road safety, Shaista Hamid, Nithin Arora

## VII. Results:

[https://colab.research.google.com/drive/1W\\_glyQeliSToXfGNgOw\\_Z6LsZXE\\_PiLRW?usp=drive\\_link](https://colab.research.google.com/drive/1W_glyQeliSToXfGNgOw_Z6LsZXE_PiLRW?usp=drive_link)