Road Safety Analysis

Team Name: Codex

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Abstract :

Road accidents are a serious problem on a global scale, particularly for young people. The Ministry of Road Transport and Highways in India claims that there are roughly 1.5 lakh road fatalities each year, with an average of 1130 accidents and 422 fatalities every day, or 47 accidents and 18 fatalities per hour. This report intends to address this issue by providing real-time alerts for careful driving in high-risk zones, identifying rash driving spots, and conducting a complete examination of road safety.

The major objective of this research is to conduct a thorough examination of road safety with the main objective of identifying areas with reckless driving. Additionally, it uses predictive research to send drivers immediate alerts so they can be cautious when approaching high-risk locations.

Introduction :

In order to avoid unpleasant consequences like injuries and fatalities, maintaining road safety is essential. Accidents are caused by reckless driving, driving after drinking, disobeying traffic laws, and speeding. Inadequate road conditions, driver weariness, and car problems are additional factors.

Emphasizes that a significant portion of accidents result from reckless driving and human error. It outlines two main objectives: 1) Developing a real-time alert system for drivers to reduce human errors, and 2) Identifying locations prone to speeding and high-risk behavior to promote caution among motorists in those areas.

This report's primary goals are to create a real-time alert system for drivers to minimize human errors and to identify high-risk driving areas, thereby increasing awareness and promoting caution among motorists in these zones.

Related works :

[1] This study incorporates 3612 pertinent studies from 5 databases to give a thorough overview of trends in the development of roadside safety from 1980 to 2020. It evaluates roadside safety from three angles, including accident frequency and severity as well as design standards for roadside safety. The report discusses present problems, suggests future research trajectories, and examines several accident prediction techniques and evaluation models. It also systematically examines the risk factors responsible for frequent and serious roadside accidents.

[2] Focuses on improving road infrastructure to increase safety where military hospital roads cross. The study identifies geometric design flaws that increase the risk of accidents on current streets, such as acute bends, layered asphalt conditions, and dangerous asphalt surfaces. To address these problems and increase road safety, the authors suggest infrastructural upgrades.

Data Set :

The “intel_unnati_phase_revised” dataset was used for the analysis, and the Open Code API, which uses coordinates to locate locations, was used to find addresses.

Dataset link :

https://drive.google.com/file/d/1PrwPnamfanZ-io6QN5eLo3qyDC_PsUeY/view

Analysis :

a) Dangerous Driving Zones:

1. To identify locations with reckless driving, calculate the maximum, minimum, average, and standard deviation of speeds. Then, make a histogram to see the distribution of speeds.

2. Use masking to pinpoint the locations with the highest (rash driving) and lowest speeds.

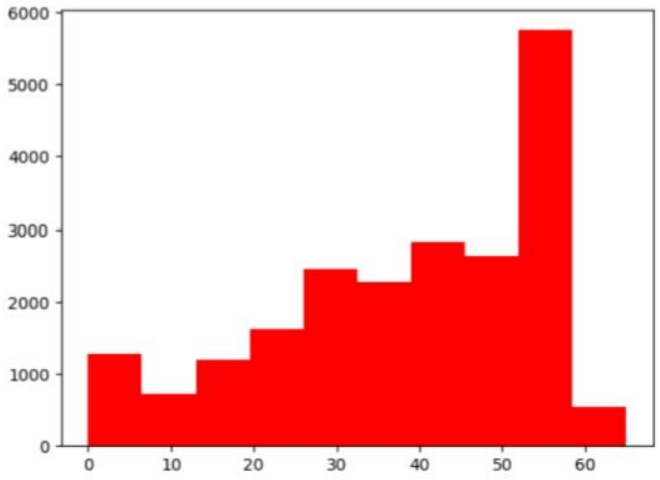
3. To ensure accuracy, remove any duplicate location information.

4. To retrieve location data, create an OpenCode API and import the required OpenCode module.

5. Provide an API key and the coordinates of the regions with the highest and lowest speeds to the OpenCode function.

6. To identify dangerous driving zones, request location data using the API key and receive formatted addresses for the given 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 analysis:

1.Input Features: Choose latitude, longitude, speed, and vehicle as input features for the predictivealertanalysis, with "Alert" as the output feature.

2. Data Splitting: To accurately assess the model's performance, separate the dataset into training and testing sets.

3. Machine Learning Models: Train three different machine learning models—Logistic Regression, Decision Tree, and Gradient Boost—to predict the "Alert" output using the features that have been chosen as inputs.

4. Evaluation Metrics: To evaluate the effectiveness of each model, compute several evaluation metrics such as accuracy, classification report, and confusion matrix after model training.

5. Real-World Testing: Test the models using real-world data examples by giving them fresh input data and contrasting their forecasts with actual results to access practical effectiveness

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

Result :

https://colab.research.google.com/drive/1iUVQ5dQ35u6w9CtM5Qq5GbL4_agw5hU3