Phase-1

ENHANCING ROAD SAFETY WITH AI-DRIVEN TRAFFIC ACCIDENT ANALYSIS AND PREDICTION

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1. Problem Statement

Road accidents are a major global concern, causing significant loss of life and property. Despite advancements in traffic management, the ability to predict and prevent accidents remains limited. This project addresses the problem by leveraging AI techniques to analyze traffic data and predict accident-prone zones or conditions, ultimately aiming to enhance road safety.

2. Objectives of the Project

Analyze historical traffic accident data to identify key factors contributing to accidents.Build predictive models that can forecast the likelihood of accidents based on time, weather, location, and other features.Provide actionable insights to improve traffic management and safety measures.

3. Scope of the Project

The project will focus on developing a predictive system using machine learning models. It will include data preprocessing, exploratory data analysis, model development, and evaluation. Limitations may include data availability, accuracy of external factors like weather APIs, and model generalization across regions.

4. Data Sources

Dataset Source: Kaggle and city traffic departments (e.g., NYC Open Data).

Type: Public datasets.

Nature: Static (downloaded once)

Features: Date, time, location, weather conditions, vehicle type, severity, etc.

5. High-Level Methodology

Data Collection: Download datasets from Kaggle and open city data portals. Supplement with weather data via API.

Data Cleaning: Handle missing values, remove duplicates, and standardize formats.

Exploratory Data Analysis (EDA): Use plots and statistical summaries to find correlations and patterns.

Feature Engineering: Create new features such as accident frequency per hour, weather severity index, etc.

Model Building: Train models like Logistic Regression, Random Forest, and XGBoost.

Model Evaluation: Use accuracy, precision, recall, F1-score, and ROC-AUC to evaluate performance.

Visualization & Interpretation: The key findings and predictions from the model will be presented through intuitive visualizations, including:

* Heatmaps to highlight high-risk zones for accidents.``AAAA* Time-series plots to show accident trends over time.

* Bar and pie charts to break down causes, vehicle types, or weather influences.

* Interactive dashboards using tools like Plotly or Streamlit to allow dynamic exploration of insights by stakeholders such as traffic authorities or urban planners.

* These visualizations will help users quickly understand critical risk factors and identify patterns, enabling informed decision-making for road safety improvements.

Deployment: The final model and dashboard will be deployed as a web application using Streamlit or Flask. This platform will:

* Allow users (e.g., traffic departments) to input real-time data and receive risk predictions.

* Display visual insights dynamically based on user queries (e.g., location, time, weather conditions).

* Ensure scalability for larger datasets and flexibility for future integration with traffic monitoring systems or city APIs.

* If time permits, deployment on cloud platforms like Heroku or Render will be explored for broader accessibility.

6. Tools and Technologies

Programming Language: Python – due to its extensive libraries and community support in data science and machine learning.

Notebook/IDE: Google Colab – enables easy collaboration and access to GPU for faster model training.

Libraries: For Data Processing & EDA: pandas, numpy, seaborn, matplotlib

For Modeling: scikit-learn, xgboost, lightgbm

For Deployment (if applicable): Streamlit or Flask

Optional Tools for Deployment: If the model is to be presented through an interactive dashboard or application, Streamlit will be used to deploy a web-based interface showing real-time predictions and insights.

7. Team Members and Roles

1. S.Sadiya - Team Leader
2. R.Sharmila - ppt presentator
3. V.K.Brinda - ppt presentator
4. J.Sudha -ppt presentator
5. P.Suwetha -ppt presentator