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“Predicting High-Risk Traffic Periods in Metro Manila Using MMDA Incident Data”

SDG: 11 Sustainable Cities and Communities

Dataset: Manila Traffic Incident Data

The dataset titled “Manila Traffic Incident Data”, created by esparko on Kaggle, provides detailed reports of traffic incidents across Metro Manila. The information was gathered from the official MMDA (Metro Manila Development Authority) Twitter account and compiled into a structured format. Each entry represents a unique traffic-related event, such as accidents, stalled vehicles, or road obstructions, along with details like the location, type of incident, time, and number of lanes affected. The dataset contains 17,312 records and 13 attributes, covering several cities including Quezon City, Makati, Mandaluyong, Pasig, and San Juan. It is particularly useful for analyzing traffic patterns, identifying congestion hotspots, and understanding the common causes of road disruptions in Metro Manila.

Attribute Description:

Column Name	Description	Data type
Date	Date when the incident was reported	Object (string)
Time	Time of the incident	Object (string)
City	Metro Manila city where the incident occurred	Object (string)
Location	Specific location or road segment	Object (string)
Latitude/Longitude	Geospatial coordinates of the incident	Float
High_Accuracy	Indicates accuracy of location (1 = high)	Integer
Direction	Traffic direction (e.g., NB, SB, EB, WB)	Object (string)
Type	Type of incident (e.g., VEHICULAR ACCIDENT, STALLED VEHICLE)	Object (string)

Lanes_Blocked	Number of lanes affected	Float
Involved	Vehicles involved in the incident	Object (string)
Tweet	Original MMDA tweet text	Object (string)
Source	URL to MMDA tweet	Object (string)

Problem Statement:

Metro Manila faces persistent traffic congestion and frequent road incidents that cause delays, safety hazards, and economic losses. Many of these incidents occur during specific hours of the day, yet there is limited research utilizing available data to identify or predict these high-risk time periods. The MMDA traffic incident dataset contains valuable temporal information such as the date, time, city, and type of incident that can be analyzed to uncover accident trends and patterns. However, without a predictive framework, authorities and commuters remain reactive rather than proactive in addressing traffic risks.

This lack of time-based predictive insights hinders effective traffic management and urban mobility planning. By applying machine learning techniques to analyze temporal patterns in MMDA data, it becomes possible to predict high-risk traffic periods, allowing policymakers and drivers to anticipate congestion, improve road safety, and plan more efficient travel. This research supports Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities, which emphasizes creating safe, inclusive, and sustainable urban transport systems.

Computer Application Overview:

The proposed system is a data-driven web application prototype designed to help users visualize and predict high-risk traffic periods across Metro Manila using historical MMDA traffic incident data. It applies machine learning predictions and interactive data visualization to identify when and where road incidents are most likely to occur.

Purpose of the System

The main purpose of this prototype is to provide a visual and predictive tool that can guide both commuters and traffic authorities in making better travel and management decisions. By showing patterns of traffic incidents over time, users can anticipate congestion-prone hours and locations, improving safety and mobility.

Key Features (for Figma Prototype)

1. **Dashboard Overview**
    - Displays a summary of recent traffic incidents by city and type.
    - Visual charts showing total incidents and severity trends.
2. **Interactive Map Visualization**
    - Plots incident locations using latitude and longitude data.
    - Color-coded markers indicate severity or frequency of incidents per area.
3. **Time-Based Risk Prediction**
    - Allows users to select a specific time range (e.g., morning rush hour).
    - Displays predicted high-risk periods based on historical patterns.
4. **Filter and Search Tools**
    - Filter by city, type of incident, or number of lanes blocked.
    - Search specific roads or intersections for detailed reports.
5. **Insights Page**
    - Displays graphs of incidents per hour, day, or city.
    - Provides recommendations such as “Avoid EDSA northbound between 6–9 AM due to frequent vehicular accidents.”
6. **About Section**
    - Includes project background, SDG alignment, and dataset source (MMDA data from Kaggle).

Expected Output

A Figma prototype of a web-based dashboard that visually presents traffic data and predicts high-risk time periods. This prototype will simulate the potential functionality of an intelligent traffic monitoring and prediction system.