

## SENG 550

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# Indian Road Analytics

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## Project Description

Our project analyzes the causes of road accidents in India by examining environmental and demographic data. We aim to detect patterns contributing to accidents using data analytics, considering when accidents occur, who is involved, and the conditions at the time.

Our primary focus is on identifying accident hotspots, the impact of road conditions on accident severity, and the link between drivers' education levels and accident incidence. These areas were selected for their direct impact on road safety. Additionally, we have set goals to predict vehicle malfunctions and assess vehicle risks, which we will pursue to maintain momentum in improving road safety once our main objectives are achieved.

## Key Objectives

We are primarily committed to fulfilling the first three key objectives of our project: analyzing accident hotspots, understanding the impact of road conditions on accident severity, and investigating the correlation between drivers' educational levels and accident involvement. These objectives have been prioritized based on their potential for immediate impact on road safety and the availability of data. However, we have also developed two additional objectives — predictive maintenance for vehicle safety and vehicle risk assessment — as backup plans. These will be pursued in the event that we are able to efficiently allocate resources or if the primary objectives are met ahead of schedule, ensuring that our project maintains momentum and continues to contribute to road safety.

### 1. Accident Hotspots Analysis

- **Objective:** To pinpoint specific **geographic** locations and **temporal** patterns where accidents occur most **frequently**, enabling targeted measures to enhance road safety.
- **Columns Needed:** Time, Day\_of\_week, Area\_accident\_occured, Number\_of\_casualties, Accident\_severity.

### 2. Impact of Road Conditions on Accident Severity

- **Objective:** To understand the contribution of **road design**, **surface conditions**, and **environmental** factors to the **severity** of accidents, which can inform infrastructure improvements.
- **Columns Needed:** Road\_alignment, Road\_surface\_type, Road\_surface\_conditions, Weather\_conditions, Accident\_severity.

### 3. Educational Level Effectiveness

- **Objective:** To investigate the relationship between the drivers' level of **education** and their propensity to be involved in or cause **accidents**, potentially shaping educational interventions.
- **Columns Needed:** Educational\_level, Accident\_severity, Cause\_of\_accident.

### 4. Predictive Maintenance for Vehicle Safety

- **Objective:** To predict which **vehicles** are at a higher risk of malfunction that could lead to **accidents**, aiming to prevent accidents through timely maintenance.
- **Columns Needed:** Service\_year\_of\_vehicle, Defect\_of\_vehicle, Accident\_severity.

### 5. Vehicle Risk Assessment

- **Objective:** To assess the risk associated with different types of vehicles and their conditions, aiding in identifying vehicles that may require safety enhancements or stricter regulation.

- **Columns Needed:** Type\_of\_vehicle, Service\_year\_of\_vehicle, Defect\_of\_vehicle, Accident\_severity.

## Tools and Technologies Required

- Github
- Python
- Spark
- Excel
- PowerBI

## Data Sources

[Road Accident Severity in India](#)

## Expected Outcome

1. **Accident Hotspots Analysis:**
  - **Outcome:** A map or list of places and times where accidents happen most. This could lead to more police patrols, better street lighting, or road repairs in those hotspots to prevent accidents.
2. **Impact of Road Conditions on Accident Severity:**
  - **Outcome:** A clear understanding of how the road environment affects how serious accidents are. This information could be used to prioritize fixing dangerous road conditions and improving road designs.
3. **Educational Level Effectiveness:**
  - **Outcome:** Insights into whether drivers with different education levels have more accidents. This might lead to new training programs for drivers or campaigns to raise awareness about road safety.
4. **Predictive Maintenance for Vehicle Safety:**

- **Outcome:** A system to tell which vehicles might break down and cause accidents. This could encourage more frequent vehicle checks and repairs, making cars safer on the road.

#### 5. **Vehicle Risk Assessment:**

- **Outcome:** A rating system for how risky different vehicles are, based on their type and condition. Riskier vehicles could be targeted for safety checks or new regulations to make sure they're safe to drive.

## Project Management Plan

### Task Assignment and Management

To ensure the successful completion of our project, we will leverage our group members' expertise and interests for task delegation, ensuring a streamlined workflow and balanced contributions. Our initial planning in the first week will define the project's scope, objectives, and deliverables, leading to a detailed timeline and task list. Tasks will be divided into smaller, manageable segments and assigned to group members:

- **Data Analysis and Modelling:** Kai Ho Chak, and Kusumpreet Kaur Heer
- **Big Data Engineering and Spark Implementation:** Mohammed Allam and Rayner Nyud
- **Visualization and Reporting (PowerBI and Excel):** Kusumpreet Kaur Heer and Mohammed Allam
- **Version Control and Documentation (GitHub):** Kai Ho Chak and Rayner Nyud

Bi-daily check-ins will facilitate progress reports, the addressing of roadblocks, and the necessary reallocation of tasks to maintain project momentum.

### Version Control Setup

We will maintain a central "production" repository. Contributors should create a separate branch for their code updates and submit a pull request to merge these changes into the "production" branch.

### Progress Tracking

- We will use Discord to chat, plan, and set our due dates.
- Expect a weekly check-in, but we'll meet up more if we need to.

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- We will have a set goal for each week to keep making progress.
- Work completed demo on each weekly meeting.
- We will approve Github Pull Requests together in our meetings or if agreed upon in Discord chat.