**Report:5**

**Date: 24rd to 29th March 2025**

**Group-1**

**Project Title: Hard stop and momentary stop using vehicle trajectory dataset**

**Target: DBSCAN**

**Team Members:**

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## **Introduction**

This report details the progress made in Week 5 of our project. In this report, we have focused on enhancing the preprocessed dataset by incorporating two additional columns: Acceleration and Jerk. These new parameters provide deeper understanding about motion characteristics. Further, we grouped trackIDs based on their respective time frames and plotted Acceleration and Jerk in the same excel file to analyze their variations overtime. Additionally, we applied DBSCAN on all parameters that includes Velocity, Acceleration and Jerk graphs to identify potential patterns and anomalies or clusters in dataset.

**Acceleration**

Acceleration is defined as rate of change of velocity over time. It helps in understanding how quickly object speeds up or slows down within a given time frame.

* Hard Stop: A significant and rapid drop in velocity within a short duration.
* Momentary stop: A temporary reduction in speed that is not intense as a hard stop.

Mathematically represented as :

where,

a is Acceleration

Δv is Change in Velocity

Δt is Change in Time

## **Jerk**

Jerk is represented as change of acceleration and provides insights into sudden change in motion, which can be useful for detecting irregular movement patterns.

* Hard stop: A sudden drop in acceleration with a shard spike in jerk suggests an aggressive breaking event.
* Momentary stop: A gradual reduction in acceleration with a lower jerk value indicates a smoother stop.

Mathematically represented as :

where,

j is Jerk

Δa is Change in Acceleration

Δt is Change in Time

**Future Work**

1. Moving forward, we plan to visualize motion trends more effectively. Specifically, we will create a line plot of Velocity, Acceleration and Jerk against the time frame to analyze variation in motion.
2. This scatter plot will then be superimposed on a video to get better understanding the movement pattens and anomalies effectively.