Ahmedabad University

CSE523 Machine Learning

Weekly Report

Project 5: Identify Hard stop and momentary stop using vehicle trajectory dataset.

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1. Introduction:

The effective monitoring and analysis of vehicle behavior have become paramount in various domains such as transportation management, fleet optimization, and safety enhancement. In this context, the identification of stops, both hard (abrupt stops) and soft (gradual decelerations), plays a crucial role. Hard stops can indicate sudden braking events, possibly signaling unsafe driving behavior or emergencies, while soft stops may indicate regular stops or traffic slowdowns. Traditional methods for identifying stops often rely on simplistic heuristics or thresholds, which may lack accuracy and fail to capture nuanced patterns.

Machine learning techniques, particularly time series analysis and boosting algorithms, offer promising avenues for improving the identification of stops in vehicle tracking data. By leveraging the temporal dynamics and ensemble learning capabilities of these methods, it becomes possible to discern between different stop types more accurately.

2. AIM:

The aim of this study is to explore the application of time series analysis and boosting algorithms for the precise identification of hard and soft stops in vehicle tracking data. Specifically, we seek to:

- Develop a robust methodology for distinguishing between hard and soft stops based on machine learning techniques.
- Evaluate the performance of various time series and boosting algorithms in stop identification tasks.
- Investigate the potential benefits of employing ensemble learning techniques for improving stop detection accuracy.
- Provide insights into the real-world implications of accurate stop identification, such as enhancing driver safety, optimizing route planning, and improving overall transportation efficiency.

3. Approach:

3.1 Data Collection and Preprocessing:

- Acquire real-world vehicle tracking data containing time-stamped GPS coordinates, speed, and acceleration information.
- Preprocess the raw data by cleaning outliers, interpolating missing values, and standardizing features.

3.2 Feature Engineering:

- Extract relevant features from the preprocessed data, including velocity profiles, acceleration patterns, and temporal characteristics.
- Incorporate additional contextual features such as road type, traffic conditions, and weather conditions, if available.

Future work:

Train and fine-tune the models using labeled data, where hard and soft stops are annotated based on predefined criteria using time series algorithms.