DRIVER BEHAVIOR PROFILING

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Overview

Driving behavior impacts traffic safety, fuel consumption and gas emissions. In this context, the project aims to analyze the results of different classification models to characterize the driving behavior in terms of aggressiveness using the driving data collected by using Android smartphone sensors.

Use Cases

- Insurance companies can make car insurance cheaper by rewarding drivers with good driving scores, along with personal details.
- Freight management firms and traffic police can use it to monitor and exercise steps to decrease accidents, increase vehicle lifetime and hence increase economy.
- Public cab service firms can utilize it to ensure passenger safety by rewarding the drivers.

Goals

- To classify driving behavior into aggressive and non-aggressive classes.
- To analyze the effects of different time windows on the classification accuracy.
- To study the effects of different classification algorithms and combination of attributes taken to build the mentioned models.

Dataset Background

- The dataset is collection of smartphone sensor readings [Linear acceleration, Accelerometer, Magnetometer and Gyroscope] along 3-axes, for driving events recorded over 4 trips, each of approximate duration of 13minutes.

- An android app running over Motorola XT1058 model with Android 5.1, mounted on the car dashboard, was used to collect the data, with a real time timer calibrated with milliseconds precision. The driving events are manually labelled by an assistant, who recorded video of the driver's movements, the car steering wheel, speedometer, tachometer and smartphone.

- The data comprises of evenly distributed event samples and is slightly unbalanced.

Driving Event Type	**# of samples**
Aggressive Breaking	12
Aggressive Acceleration	12
Aggressive left turn	11
Aggressive right turn	11
Aggressive left lane change	4
Aggressive right lane change	5
Non-Aggressive event	14

Identified Tasks

- Review research papers to understand how to analyze multi sensor data.
- Converting the sensor readings from device's coordinate system into earth's coordinate system to achieve device position independence.
- Generating plots to depict the time series of the translated sensor data
- Generation of attribute vectors corresponding to the translated sensor data.
- Setting up data according to the evaluation assembly which comprises of all combinations of (ML models) * (Sensors).
- Train, test and tuning the hyper-parameters associated with the classification models of ML theory.
- Representation and analysis of the evaluation results.

Milestones

- **Mid-term**: Reviewing research papers for multi sensor data analysis and generation of attribute vectors corresponding to the translated sensor data.

- **End-term:** Identifying the best combination of number of frames and classification algorithms and provide quantitative evaluation against them. Also, determining the sensor data parameters which have high contribution coefficient in the detection of aggressive driving events.