Accident Detection from Dash cam footage as well as telemetry data

Approach 1 [With only dash cam footage]:

Since dash-cam footage shows a 180 degree view from the cars front window, determining crash as a binary classification is quite problematic for the car which is recording the data, however which is possible with the second approach.
Of the three task mentioned, only binary classification of accident or not can be classified from the dash-cam footage as it provides very little information about the environment and condition of the car. For that task the work needs to be divides in three part:

- Data Collection:

Short video clips of dash-cam footage with balanced dataset.
Source:

1. https://www.getnexar.com/challenge-2/upload/ From NEXAR global dataset
2. https://aliensunmin.github.io/project/dashcam/ From VSLab

Model Formalization:

- For Training:

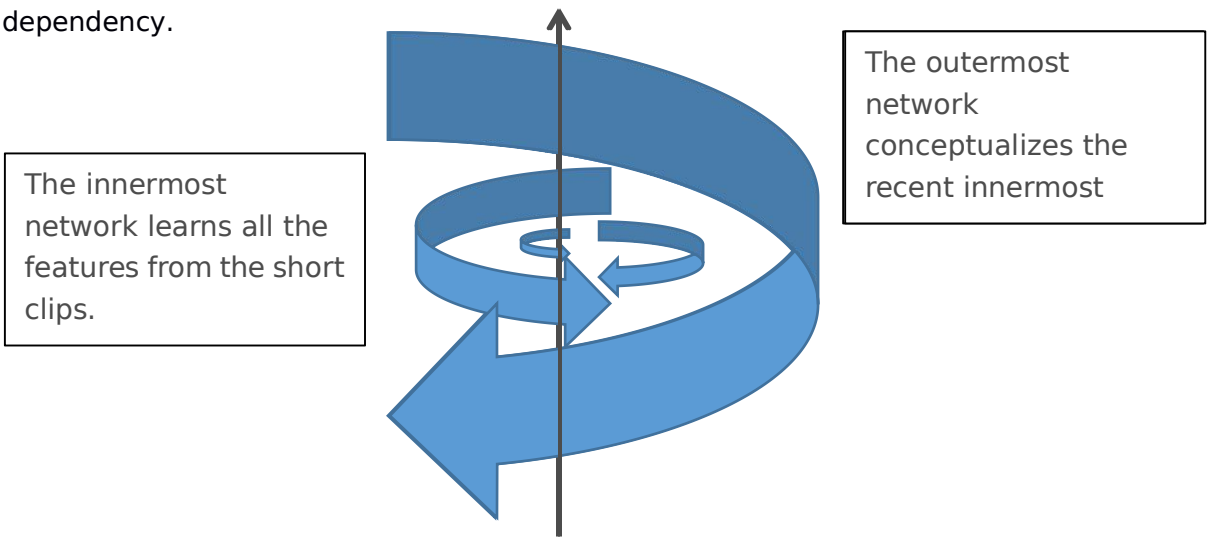
1) For training purposes, the datasets needs to be balanced in case it is imbalanced at first. The use of two datasets provides the kind of variation the model needs to handle under-fitting in the face of data scarcity.
2) For the sake of simplified and less resourceful processing the video clips needs to be converted to 2-D greyscale from 3-D RGB and also down-sampled by 2 to 3 factors of pixel size.

- Model Conceptualization:

For effective results, the model needs to capture effects from frame to frame with reference to time, as a video is a collection of image data frames. To achieve that reference backtracking between frame, H-RNN is proposed.

H-RNN or Hierarchical Recurrent Neural Network, is an recurrent neural net wrapped around another RNN. The inner most network analyses the video clips in a time frequency manner and learns all the features in the whole clip, and the outermost or second RNN takes input from the innermost network and accumulates those to tell in which of the clips, accidents occurred.

With the help of GPU resources available, H-RNN can run paralleling to reduce time dependency.



Approach 2 [With dash-cam footage and Telemetry data]:

In approach 2, along with dash cam clip, some vehicle telemetry data are also available such as accelerometer, GPS, and such.
Here the problem can be solved a ensemble way: the video footage using H-RNN and telemetry data using naive bayes classifier. Here the second part of the classification is a multilayer categorical classification.

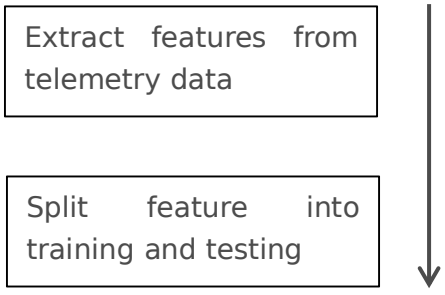
The deciding factors in these case are determining certain sudden change in velocity, extreme sound impact from radio also known as ‘jerk’.

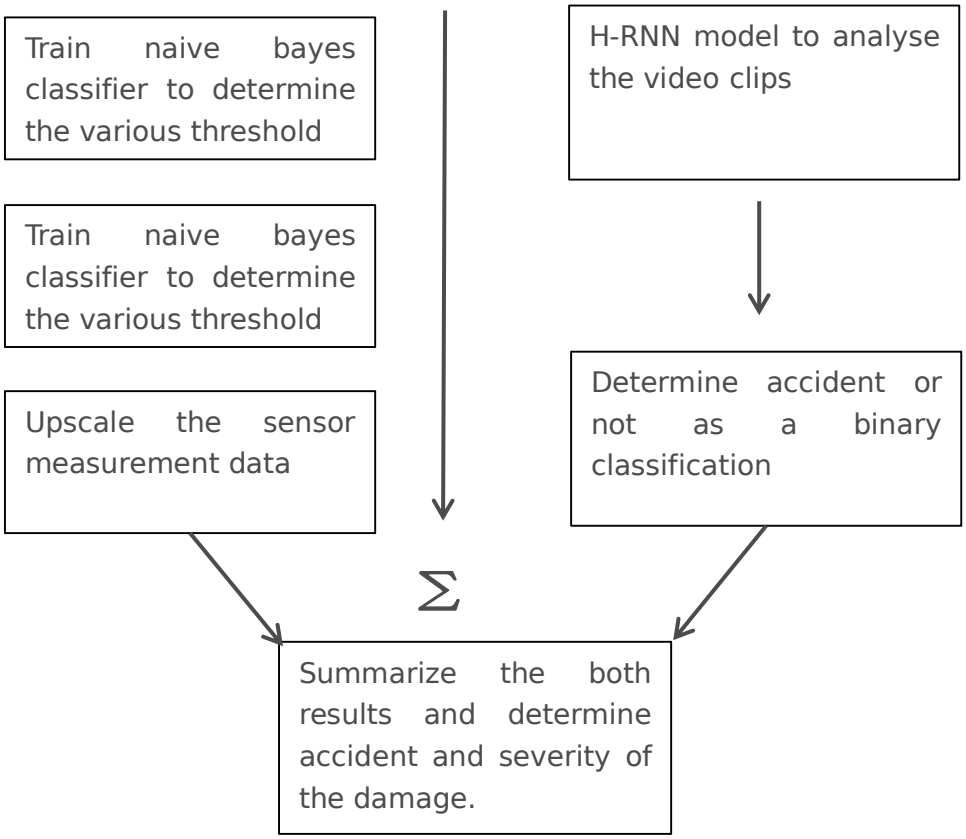
If the telemetry data crosses certain threshold value or multiple threshold in case multiple classes, accident is determined and upon the level of threshold crossed severity of the damage is assessed.

- Source of Data:

VANeT data set for telemetry data.

- Model Conceptualization:




Train naive bayes classifier to determine the various threshold
Train naive bayes classifier to determine the various threshold
Upscale the sensor measurement data
H-RNN model to analyse the video clips
Determine accident or not as a binary classification
Σ
Summarize the both results and determine accident and severity of the damage.