

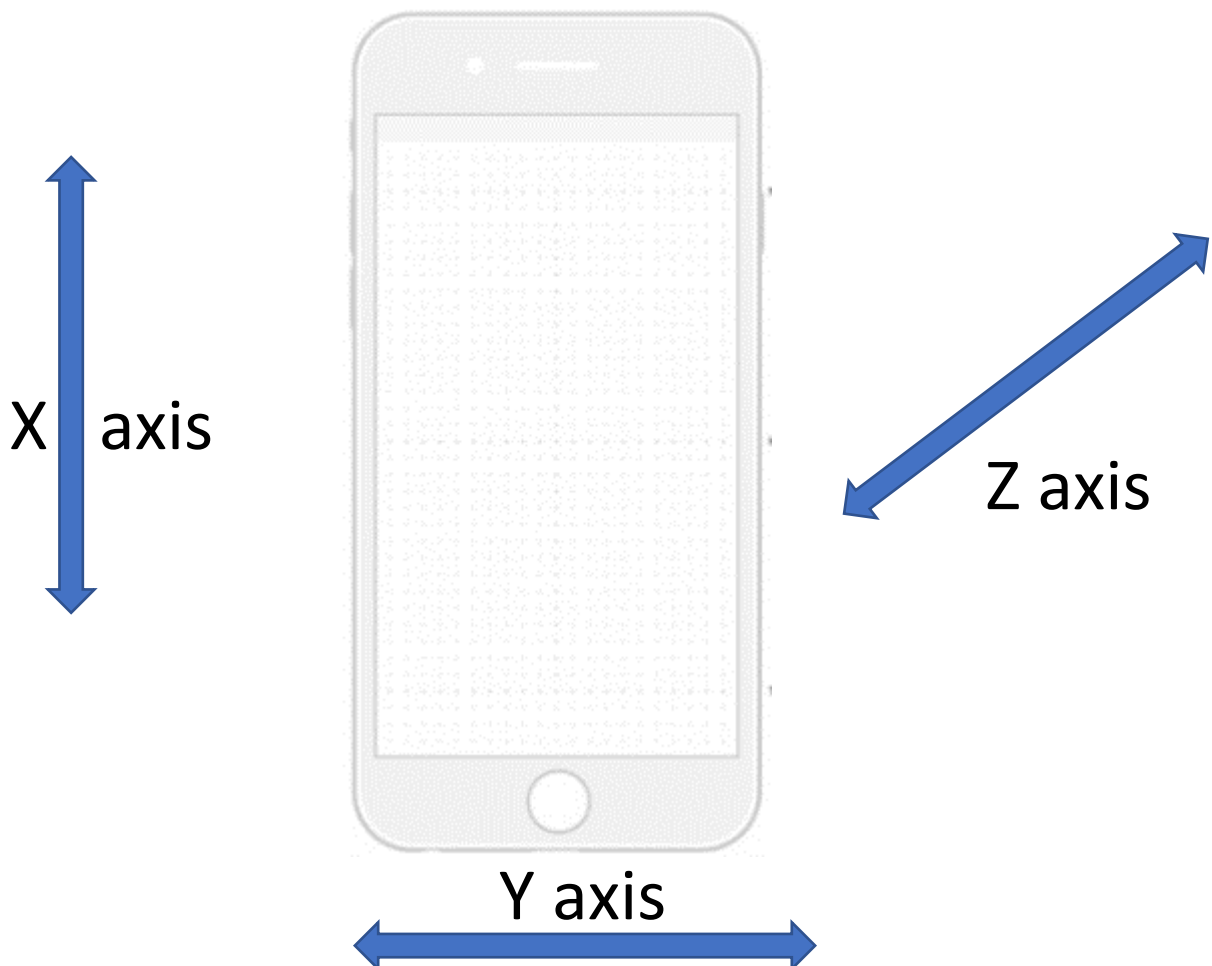
Safe Trip Model and approach explanation

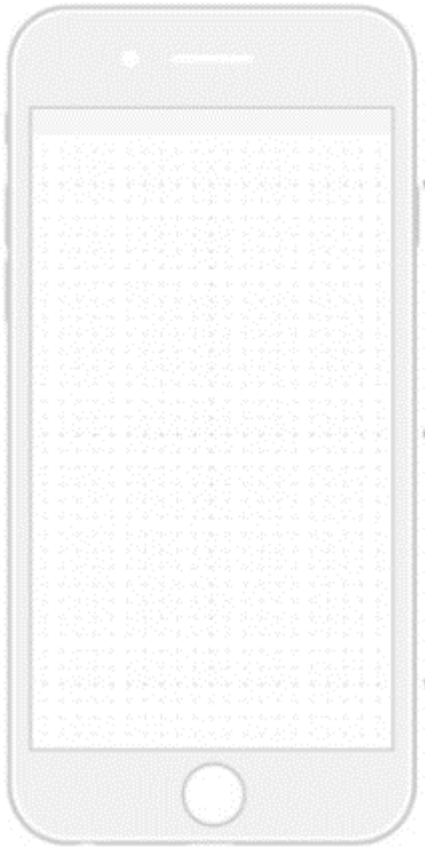
Objective : Find whether the given trip is safe or not safe, based on the given attributes like accelerometer, gyroscope etc

Data format : For a given trip there are many telematics data points, hence trip is safe or not, has to be arrived by consolidating all telematics data of a trip.

Assumption :

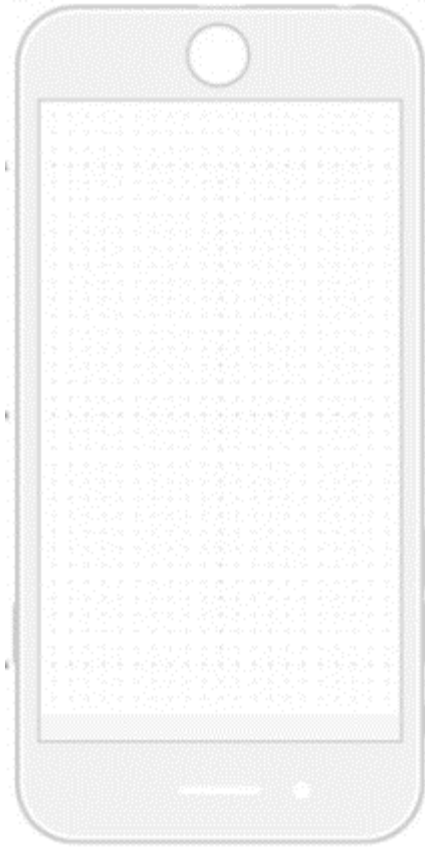
- a) This data is collected from mobile phone of the driver
- b) Mobile phone is kept at vertical position, screen perpendicular to the direction of driving
- c) For acceleration_y reading many reading are around 9.8 values, which gives the indication that mobile phone is kept vertically
- d) Also on many reading of acceleration_y is around -9.8, which indicates the mobile is kept upside down. Normally in a phone, whichever direction along the direction gravity will have 9.8 m/s² reading.
- e) Hence we should subtract the 9.8 from the acceleration_y, to get the real acceleration_y





Normal position phone

acceleration_y = 9.8 m/s²(approx)



Upside down phone

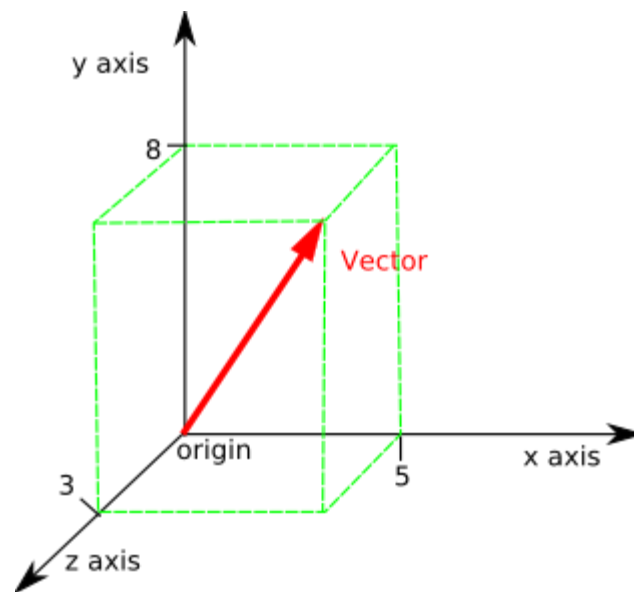
acceleration_y = -9.8 m/s²(approx)

Every trip have so many data points, only one label (Safe or not safe), how do we proceed.

Consider each accelerator meter reading a 3D vector (x,y,z) . In practical sense, the magnitude of the vector is more then it indicates there is sudden increase/decrease of speed in any of the direction.

If the trip contains, more number of these large vectors, it means more sudden movement, which in inturn implies, trip is not smooth or safe.

So lets add all the vectors of trip and arrive single vector.



How to represent 3 acceleration into one,

Acceleration = $\sqrt{(\text{acceleration}_x * \text{acceleration}_x) + (\text{acceleration}_y * \text{acceleration}_y) + (\text{acceleration}_z * \text{acceleration}_z)}$

Speed - is one of the attributes in the data file.

How does speed influences the driving is rash driving or not.

- Assume, if car moving at 30 km/hr is suddenly decelerated 20 km/s² and reaches 10 km/hr with a second
- And another car moving at 130 km/hr is decelerated 20 km/s² and reaches 110 km/hr with a second

In the scenario a) and b) which case, passenger will feel more uncomfortness
Definitely case a)

This implies that rashness of drive proportional to ratio acceleration/speed.

So I created a new feature, speed factor = $\text{acceleration} / (1 + \text{abs}(\text{speed}))$

When speed is 0, this formula will give infinity, to avoid that add 1 to the denominator

Steps done in the code

- Imports
- Read one by one file
 - For each file
 - Calculated the accerlation
 - Speed factor (as explained above)
 - Find mean of each factors, group by booking id

- Write to file/dataframe
- b) Read each dataframe and again group booking id (because, same bookingID may span across files)
- c) Append to the master dataframe
- 3. Process master dataframe using different Machine learning algorithms
- 4. Choose the Algorithm that gives better accuracy
- 5. Hypertune the model and save the model
To test un seen data
- 6. Read the model from file and load data and display the predictions