**Modeling and predicting traffic congestion levels and pedestrian crossings at different times of the day.**

***Overview:***

The urban mobility and transportation sector is vital for the functioning of modern cities, enabling the movement of people and goods efficiently. Within this industry, traffic management and pedestrian safety are crucial components that directly impact the quality of life in urban areas. Effective traffic pattern analysis and prediction can help mitigate congestion, enhance safety, and improve overall urban mobility.

Well managed traffic leads to minimized economic losses , improved quality of life especially on the side of pedestrians.

***Challenges***:  
There are so many problems that are encountered especially in most urban towns whose vehicle and pedestrian population continues to grow everyday. One of the problems is the traffic congestion which leads to higher traffic volumes which in turn brings about economic losses due to wasted time and fuel, increased pollution. Another key challenge is the pedestrian safety where High pedestrian traffic in urban areas increases the risk of accidents. A challenge to also note is collecting accurate and real-time data from various sources is challenging which would make accurate traffic and pedestrian predictions challenging.  
  
***Proposed solutions***:

To solve some of these challenges would include measures such as advocating for sustainable urban mobility policies and invest in supportive infrastructure. Use of Use machine learning models to analyze and predict traffic patterns and pedestrian crossings at different times of the day. In order to gather real-time data on traffic and pedestrian movement would require use of high technology like IoT devices.

***Conclusion***:

The analysis and prediction of traffic congestion levels and pedestrian crossings are essential for enhancing urban mobility and safety. Successful implementation of these solutions can lead to reduced congestion, fewer accidents, and an overall improvement in the quality of urban life.

***Problem Statement***:

Urban areas continue to face significant challenges in managing their traffic congestion and ensuring pedestrian safety. The changing nature of these areas together with the increasing volume of both vehicle and pedestrian traffic, makes it hard for one to predict traffic patterns affectively.

***Objective:***

Our primary objective is to create an accurate time series model(s) that can model, analyze and predict traffic congestion levels and pedestrian crossings at different times of the day.

***Specific objectives:***

1. To identify key factors that influence traffic and pedestrian movement

2. To develop predictive models for forecasting future traffic congestion and pedestrian crossing patterns.

3. To provide recommendations for urban planners and traffic management authorities to improve traffic flow and pedestrian safety.

***Data understanding:***

The data to use in this study is sourced from the UC Irvine Machine Learning Repository. It has 4760 rows and 14 data features.

* 'oid': This column represents a unique identifier for each object record in the dataset.
* 'timestamp': This column stores the exact time of each record
* 'date': This column extracts the date portion from the 'timestamp' column, providing the day without the time information.
* 'hour': This column extracts the hour of the day (0-23) from the 'timestamp' column.
* 'x': This column represents the X-coordinate of each object in our data.
* 'y': This column represents the Y-coordinate of each object in our data.
* 'vehicle\_count': This column indicates the number of vehicles observed in the vicinity of each object record.
* 'pedestrian\_count': This column reflects the number of pedestrians observed in the vicinity of each object record.
* 'congestion\_level': This column categorizes the traffic congestion level at the time of each record.
* Environmental Columns:
* 'weather\_condition': This column represents the weather condition at the time of each record
* 'temperature': This column holds the temperature recorded at the time of each data point.
* 'location': This column specifies the specific region or intersection where the data was collected.
* 'body\_roll': This column is intended to hold data related to the body roll angle (in degrees) of an object.
* 'body\_pitch': Similar to body\_roll hold data related to the body pitch angle (in degrees) of an object.
* 'body\_yaw': Likewise, could be used for data on the body yaw angle (in degrees) of an object.
* 'head\_roll': could be used for data on the head roll angle (in degrees) of an object.
* 'head\_pitch': Similar to head\_roll, could be used for data on the head pitch angle (in degrees) of an object.
* 'head\_yaw': Similar to head\_roll and head\_pitch, this column holds NaN values and could be used for data on the head yaw angle (in degrees) of an object.

Other datasets to use is object class dataset :   
id class   
0 EGO CAR   
1 BUS   
2 TRAIN   
3 CAR  
 4 PEDESTRIAN   
5 TRUCK   
6 MOTORCYCLIST  
 7 CYCLIST