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## Introduction

The world's cities are in the throes of an unprecedented urbanization wave. With this burgeoning growth comes a host of transportation-related predicaments, from gridlocked streets to mounting safety hazards. Our initiative is an earnest response to these issues, emphasizing data analytics as the linchpin of our strategy. By forging a partnership with Intel and tapping into their technological prowess, we are equipped to undertake a journey that promises to revolutionize urban traffic management.

## Frequency of Different Types of Alerts

- **cas_hmw (Headway Monitoring and Warning):** Most frequent alert.
- **cas_ldw (Lane Departure Warning):** Second most frequent.
- **cas_pcw (Pedestrian Collision Warning)**: Third most frequent.
- **cas_fcw (Forward Collision Warning):** Least frequent alert

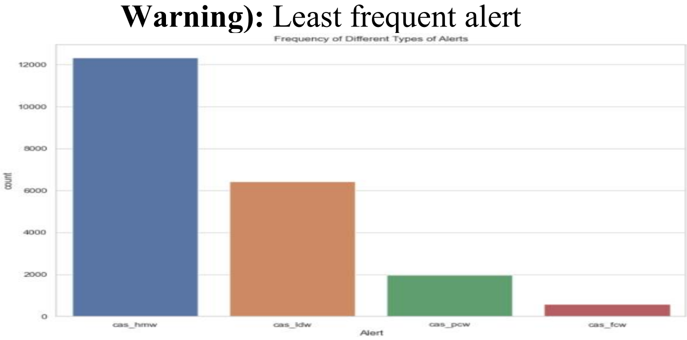



*Figure 1 – BAR PLOT (1)*

## Frequency of Alerts by Vehicle

- Vehicle ID 805 contains numerous amount of alerts
- Next to vehicle ID 805, vehicle ID 5339 contains more number of alerts
- Then comes vehicle ID 2846 followed by vehicle ID 3143

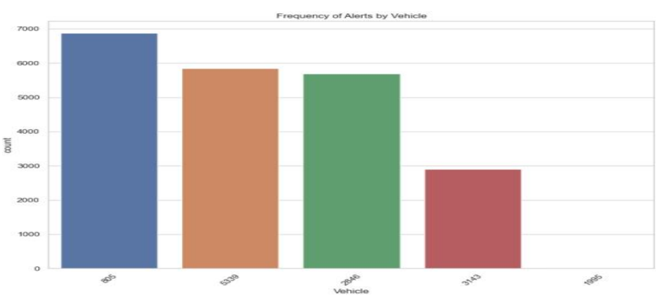



*Figure 2 – BAR PLOT (2)*

## Distribution of Speed During Events

- Event speeds show a normal distribution.
- Most events occur at 40-60 km/h.

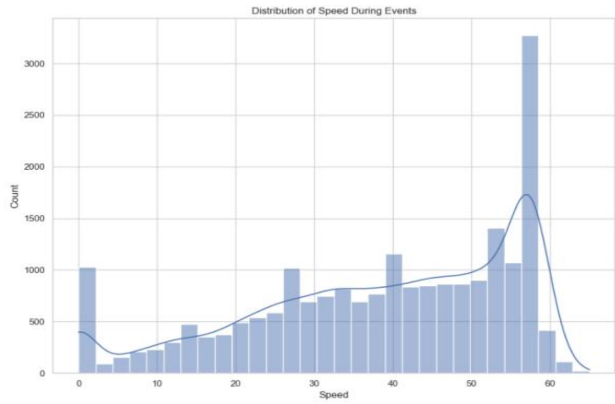



*Figure 3 – BAR PLOT (3)*

## Frequency of Alerts by Day of the Week

- Alert frequency is consistent throughout the week.
- Slight increase on Thursdays and Fridays probably since it's near weekend.

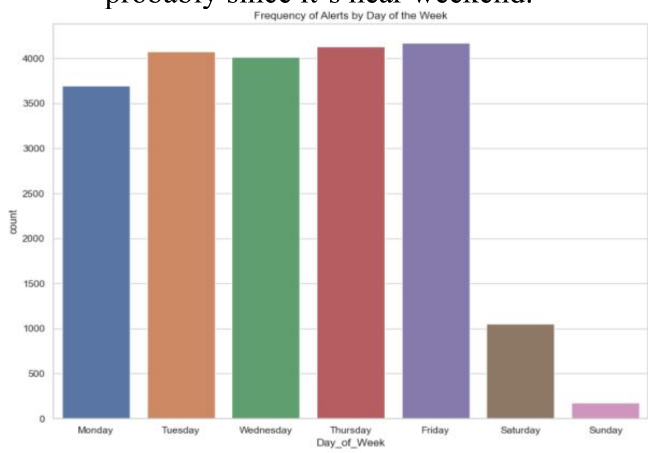



*Figure 4 – BAR PLOT (4)*

## 1. Temporal Analysis

First, we'll explore how the frequency of alerts changes over time. This will involve:

### 1.1 Distribution of Alerts by Hour of the Day

We'll begin by analyzing the variation in alert frequency throughout different hours.

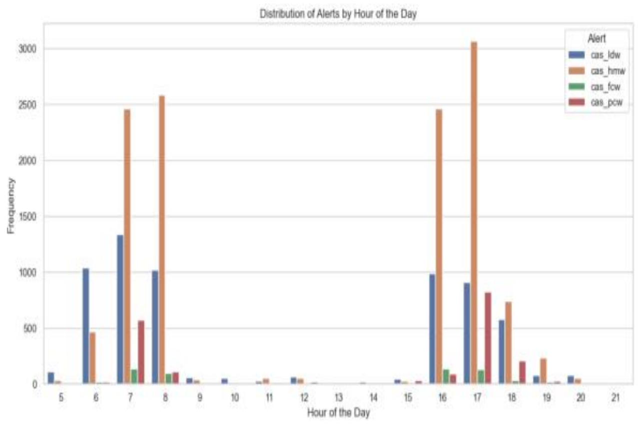


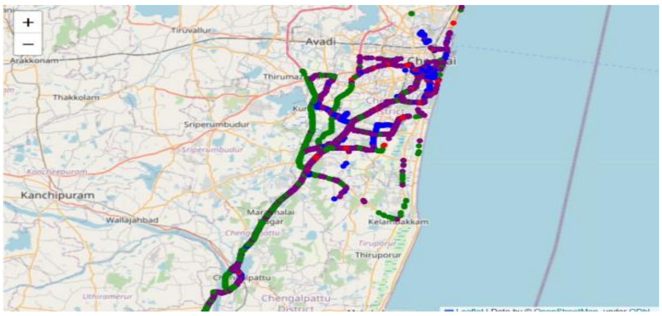

*Figure 5 – BAR PLOT (5)*

**Insights from Distribution of Alerts by Hour of the Day:**

- Alert frequency peaks during the morning (around 6-8 AM), many people are on the move, heading to their respective destinations, which can result in heavy traffic and crowded public transportation systems in urban areas and late afternoon (around 4-6 PM), potentially coinciding with rush hours.
- The most frequent alert type throughout the day is cas_hmw (Headway Monitoring Warning) especially during 4:30-5 PM, probably because many people are on the move, heading home after their work or academic commitments. The increased congestion on the roads and crowded public transportation during the late afternoon and early evening hours lead to more number of headway monitoring warnings.
- In the late evening hours (around 8 PM to midnight), there is a notable decrease in alert frequency, suggesting reduced traffic and potentially lower incident rates during this time.

**1.2 Trends in the Number of Alerts Over Time**

Next, we'll examine how the number of alerts has




changed over the two-month period.

*Figure 6 – ALL ALERTS*

**Insights from Geographical Distribution of Alerts:**

- Alert concentration in specific areas suggests possible "hotspots" prone to incidents.
- Alert types vary across locations; cas_ldw (Lane Departure Warning) remains prevalent.

**3. Vehicle-Based Analysis**

Moving forward, we'll delve into whether specific vehicles are more inclined to generate particular types of alerts.

**3.1 Frequency of Alerts by Vehicle Type**

Our analysis continues by examining the frequency of alerts categorized by vehicle type.

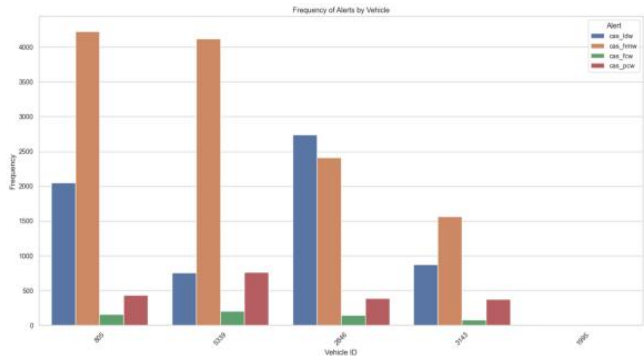



*Figure 7 – BAR PLOT (6)*

**Insights from Frequency of Alerts by Vehicle Type:**

- Certain vehicles show higher frequencies of specific alerts.
- Vehicle ID 2846 generates numerous cas_ldw (Lane Departure Warning) alert than the others.
- Vehicle ID 805 generates numerous cas_hmw (Headway Monitoring Warning) alert than the others.
- Vehicle ID 3143 generates the least frequency for cas_fcw (Forward Collision Warning) alert than the others.
- Vehicle ID 5339 generates numerous cas_pcw (Pedestrian Collision Warning) alert than the others.
- Overall cas_hmw (Headway Monitoring Warning) alert occurs the most.
- Alert distribution varies by vehicle, indicating factors such as vehicle condition or driving behavior.

## 4. Speed Analysis

Lastly, we'll investigate the connection between speed and the types of alerts generated.

### 4.1 Speed Distribution by Alert Type

Our investigation proceeds with examining speed distribution categorized by alert type.

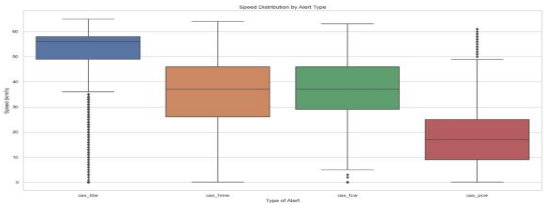


*Figure 8 – BOX PLOT (1)*

**Insights from Speed Distribution by Alert Type:**

- The median speed is highest for cas_fcw (Forward Collision Warning) and lowest for cas_pcw (Pedestrian Collision Warning).
- Each alert type has a wide range of associated speeds.
- cas_hmw (Headway Monitoring and Warning) exhibits the most variability in speed.

## 5.QGIS

QGIS functions as geographic information system (GIS) software, allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps. QGIS supports raster, vector and mesh layers. Vector data is stored as either point, line, or polygon features.

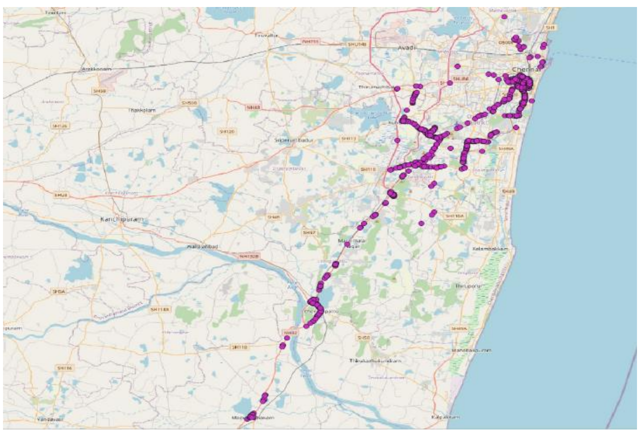


*Figure 9 - PCW*

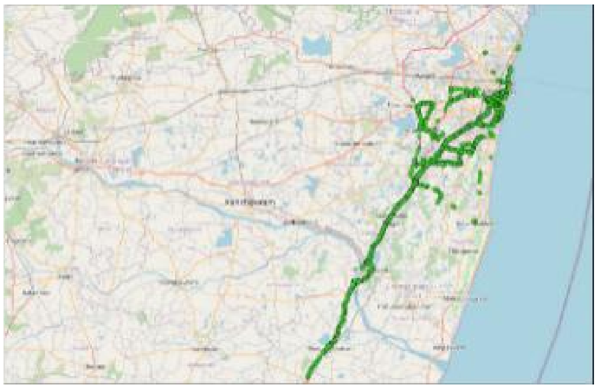


*Figure 10 - HMW*

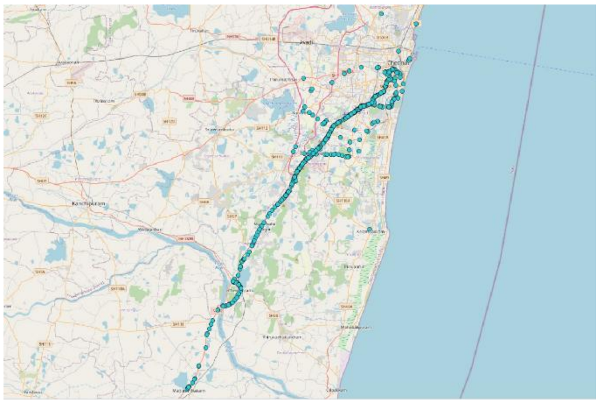


*Figure 11 - FCW*

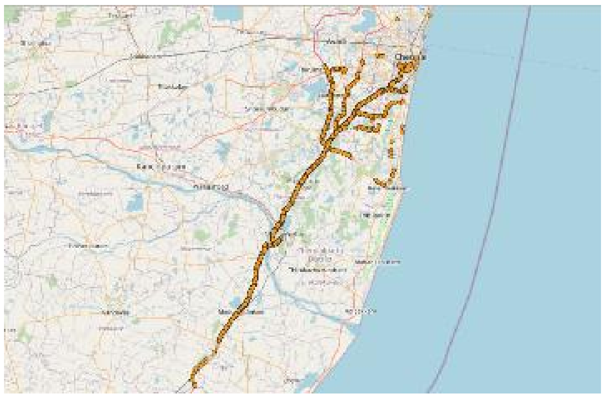


*Figure 12 - LDW*

cas_pcw

It is observed that Pcw alert is more on the following areas:

1. Peter’s road which leads to Marina Beach which is a tourist spot.
2. Triplican Road since it’s a shopping complex.
3. Adithanar road since it conatins Chief Metropolitan Magistrate Court, St.Anthony’s Anglo Indian High School and Pudupet market which attracts lots of pedestrians.
4. Pycrofts Garden Road since it has Apollo hospital and then Chennai corporation park.

5. Punammale Kundrathur Pallavaram road since it contains hospital, IT park and restaurants.
6. Pammal Poghichalur road since it contains government primary healthcare centre, women care clinic.

cas_pcw

It is observed that fcw alert is more on the following areas:

1. Grand southern trunk road since it leads to Chennai International airport
2. Maraimalaiadigal bridge
3. Sardhar Patel road since it leads to flyover

cas_pcw

It is observed that lcw alert is more on the following areas areas:

1. Grand southern trunk road since it leads to Chennai International airport
2. Outer ring road since it's a ring road the possibility of ldw alert is found more.
3. Chennai Bypass express way.

cas_pcw

It is observed that hmw alert is more on the following areas:

1. Grand southern trunk road since it leads to Chennai International airport
2. Velachery mudhanmai salai since it contains college, pharmacies, IOB.
3. Pallavaram Thirai road since it contains hospital, IT park and restaurants.
4. Anna salai since it leads to flyover.
5. Pantheon road flyover

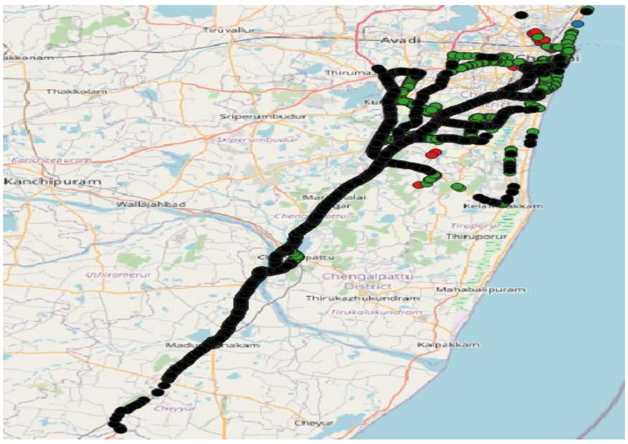



*Figure 13 – BLACK SPOT*

Overall, it is found that all the four alerts are more on Grand Southern Trunk Road.

**Future Work:**

Spatial Analysis: Investigate where alerts are most common to identify specific areas that need safety improvements.

Predictive Analytics: Create models to predict when and where alerts are likely to occur, helping manage traffic proactively.

Vehicle Analysis: Study how different vehicle types relate to alert frequencies to understand their impact on safety.

Driver Behavior: Explore how driver actions like aggressive or distracted driving affect the types of alerts generated, which can inform driver education programs.

Traffic Control Integration: Combine alert data with traffic control systems to make real-time adjustments, like changing traffic signals or warning drivers.

**Conclusion:**

Our project with Intel has given us valuable insights into traffic alerts. We've learned about the most common alerts, how they change over time, and how vehicles and speed influence them. We've also found "black spot" areas where safety improvements are crucial.

These insights provide a foundation for improving urban traffic safety. By using data and technology, we can enhance traffic management, encourage safer driving, and reduce accidents. This highlights the importance of data in solving modern transportation challenges.

**Citations:**

To explore further and to see interaction visualization, check out our GitHub repository

**https://github.com/ebin-alex/The-Elites-IGC.git**