**Traffic Safety and Compliance Analysis**

**Insights from Tickets Issued Data**

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# Overview

Traffic violations and their subsequent ticketing are critical components of urban management and public safety. Effective monitoring and analysis of ticket issuance patterns are essential for understanding traffic behavior, identifying problem areas, and developing targeted interventions to improve road safety and compliance with traffic laws. A model to capture the association between the outcome rate and demographic, socioeconomic, health and welfare variables.

This report aims to:

Analyze trends in traffic ticket issuance over time.

Identify high-incident areas and times for traffic violations.

Understand demographic patterns in ticket issuance.

Provide data-driven recommendations for traffic enforcement strategies.

# The approach combines statistical analysis and data visualization techniques to extract meaningful insights. We will employ methods such as time series analysis, categorical analysis, and geospatial analysis to dissect the data across various dimensions.

# Potential Impact: The insights derived from this analysis can significantly impact traffic management and public safety policies. By understanding patterns in ticket issuance, authorities can optimize enforcement strategies, allocate resources more efficiently, and implement targeted educational campaigns to reduce traffic violations. Furthermore, this analysis can aid in urban planning and the development of smarter, safer transportation systems.

# Outcomes estimated

2.1 early Trends in Ticket Issuance: Understanding how ticket issuance varies by year.

2.2 Division-wise Ticket Distribution: Analyzing the distribution of tickets across different police divisions.

2.3 Offence Category Prevalence: Identifying the most common types of offences leading to ticket issuance.

2.4 Age Group Targeting: Examining which age groups receive the most tickets.

2.5 Neighborhood Hotspots: Identifying neighborhoods with high incidences of traffic violations.

# Model

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To analyze this data, we use a combination of statistical and data visualization techniques. Our approach includes:

Descriptive Statistics: To understand basic trends and distributions in the data.

Time Series Analysis: For understanding how ticket issuance changes over time.

Categorical Analysis: To examine how tickets are distributed across various categories like police divisions, offence types, and age groups.

Geospatial Analysis: To identify neighborhoods with high ticket issuance.

3.1 Descriptive Statistics

**Mean (Average Ticket Count):**

Formula: 

The mean is calculated to determine the average number of tickets issued. It is computed by summing all ticket counts () and dividing by the total number of observations 

This metric provides an initial understanding of the data's central tendency.

**Standard Deviation (Variability in Ticket Count):**

Formula: 手机屏幕的截图

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This measures the amount of variation or dispersion in ticket counts. A high standard deviation indicates a wide spread of values, highlighting areas with inconsistent enforcement.

**3.2 Time Series Analysis**

**Yearly Trend Slope (Linear Regression):**

Formula: 

We apply linear regression to assess the trend of ticket issuance over time. The slope of the regression line indicates whether there is an increase or decrease in ticket counts over the years.

**3.3 Categorical Analysis**

Proportion of Tickets per Category:

Formula: 

This calculation provides insight into the distribution of tickets across different categories (e.g., offence types, police divisions). It helps in identifying which categories have higher incidences of violations.

**3.4 Geospatial Analysis**

Hotspot Identification (Density Estimation):

Formula: 

We use kernel density estimation to identify areas with a high concentration of traffic violations. This technique helps in pinpointing geographical hotspots for targeted enforcement.

**3.5 Age Group Analysis**

**Age Group Risk Ratio:**

Formula: 

Proportion of Tickets in Age Group

By comparing the proportion of tickets issued to different age groups against their population proportions, we can identify which age groups are disproportionately affected by traffic enforcement.

**3.6 Division-Based Performance Metrics**

**Division Ticket Rate:**

Formula: 

This metric evaluates the performance of different police divisions by calculating the rate of ticket issuance relative to the population in their respective areas.

**3.7 Temporal Distribution Analysi**s

**Monthly Variation Index:**

Formula:



This index assesses the monthly fluctuation in ticket issuance, helping to understand seasonal or monthly patterns in traffic violations.

**3.8 Offence Category Severity Scoring**

**Severity Score:**

Formula: 

This score assigns a weighted severity to different types of offences. It helps in quantifying the seriousness of violations and prioritizing enforcement efforts.