

# Comprehensive Report: Peak Hour Traffic Analysis

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## Task 1: Peak Hour Identification & Pattern Analysis

### 1.1. Congestion Metrics Definition & Calculation

To identify and quantify congestion, we used the following metrics:

- Average Vehicle Count/Hour: Total vehicle count grouped by each hour of the day.
- Standard Deviation: Measures fluctuation in hourly vehicle counts.
- Speed Reduction: Not available in dataset (assumed proxy via high volume).

Metrics were calculated by grouping data by Junction, Hour, Weekday, and Month.

### 1.2. Peak Hour Identification

Peak hours were identified using moving averages and standard deviation.

Hours with vehicle counts in the top 10% were flagged as peak hours.

Result: Peak hours typically occurred between 8–10 AM and 5–8 PM.

### 1.3. Temporal Pattern Analysis

Weekday and weekend traffic patterns showed clear differences.

Weekday peaks were more pronounced, while weekend traffic was evenly spread.

Monthly trends showed slightly higher traffic during festive months (Dec–Jan).

### 1.4. Influencing Factor Analysis

Correlation and regression analysis was used to evaluate influence of weather and events.

- Precipitation showed a slight negative correlation ( $r \approx -0.18$ ) with vehicle counts.
- Event and holiday days reduced peak traffic in the morning but increased it mid-day.
- Regression confirmed Hour and Is\_Holiday as significant predictors.

## **Task 2: Visualisation and Reporting**

### **2.1. Visualizations Created**

The following visualizations were generated:

- Heatmaps of hourly traffic by weekday.
- Line plots of monthly average traffic volume.
- Scatter plots of weather vs. traffic counts.
- Boxplots of hourly traffic per junction.

### **2.2. Reporting and Recommendations**

Per Junction Summary:

Junction 1: Peak 8–10 AM, 5–7 PM (near schools/market)

Junction 2: Peak 7–9 AM, 6–8 PM (office areas)

Junction 3: Peak 9–11 AM, 5–8 PM (rain-sensitive)

Junction 4: Peak 8–9 AM, 4–6 PM (event-sensitive)

Recommendations:

- Adjust signal timings during peak.
- Provide public congestion alerts.
- Promote staggered work timings.
- Use pre-emptive patrols/diversions on event days.

## **Conclusion**

This report provides insights into traffic congestion patterns by hour, day, and season.

External conditions such as weather and holidays influence traffic significantly.

Recommendations provided can support city traffic planning and congestion control.