Comprehensive Report on Peak Hour Traffic Analysis

1. Scope:

- This report analyses traffic volume patterns across different hours, days, months, and conditions for each Junction, based on historical vehicle count data. The aim is to identify peak congestion hours, understand influencing factors, and recommend actionable steps for traffic management.

2. Hourly Congestion Metrics:

- Peak Traffic hours are typically from 10AM to 2PM and again from 6PM to 8PM.
- Lowest Traffic hours are from 2AM to 6AM.

Junctions	Morning Peak Hours	Evening Peak Hours	Observations
J1	9AM – 11AM	6PM – 8PM	Most congested throughout the day.
J2	10AM – 12PM	5PM – 7PM	Sharper Drop at night.
J3	8AM – 11AM	6PM – 9PM	Longer evening congestion.
J4	9AM – 12PM	6PM – 8PM	Least congested junction.

3. Temporal Pattern Analysis:

i. Weekday vs Weekend:

- Weekday (0-4) have stronger and more extended congestion during office hours.
- Weekend (5-6) have flatter patterns with slightly late peak hours (11AM – 3PM)

ii. Monthly Variations:

- **High traffic months:** June (6), September (9), October (10).
- **Low traffic months:** December (12), possibly due to holidays.
- Despite monthly variations, the overall daily traffic pattern remains consistent, typically showing a sharp increase in the morning followed by a steady plateau in the evening.

4. External Factors Analysis:

i. Weather Influence:

- Temperature shows mild correlation: Moderate-to-high temperatures (25–35°C) see higher vehicle counts.
- Humidity negatively affects volume slightly.
- Precipitation and wind show no significant impact on volume.

ii. Event & Holiday Influence:

- Public holidays show no major deviation from typical volumes.
- Concerts, sports events, and demonstrations also have minimal to no impact, likely due to limited frequency or well-managed routing.

5. Regression Analysis Summary:

i. Key Metrics:

- **R^2 = 0.942** — very strong model fit.

ii. Top predictors:

- **Lag_1hr (**Coefficient ~ 0.84)
- **Lag_24hr (Coefficient ~ 0.14)**
- **Hour (0.048)**
- **IsWeekend (-0.588)**

iii. Insights:

- Past traffic (Lag features) is the strongest indicator of present volume.
- Weekend flag is a strong negative predictor — confirms less congestion.
- Event variables are statistically insignificant — they can be ignored unless doing event-specific forecasting.

6. Actionable Insights and Recommendations:

i. Traffic Management by time:

- Deploy dynamic signal optimization during 10 AM–2 PM and 6–8 PM**.**
- Use automated alerts to reroute vehicles during these congestion windows.

ii. Targeted Scheduling:

- Consider flexible work hours promotion to reduce weekday rushes (especially for Junctions 1 & 3).

iii. Weather-Aware Adjustments:

- Increase awareness and readiness on humid days, when traffic tends to slightly reduce — possibly due to discomfort or slower driving.
- Temperature triggers can help forecast upticks in vehicle counts.

iv. Junction-Specific Actions:

- **J1:** Monitor for weekend congestion and optimize accordingly.
- **J3:** Watch evening peaks, consider additional outbound routing post 6 PM.
- **J4:** Midday congestion suggests need for lunch-hour signal timing tweaks.