

# MINNESOTA TRAFFIC MONITORING DASHBOARD

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Client: Minnesota Department of Transportation (MnDOT)

## PROJECT OVERVIEW

This project was developed for the Minnesota Department of Transportation (MnDOT). The client requested an interactive dashboard that would allow them to analyze and compare traffic volume over time and examine how weather and holidays influence road activity across Minnesota.

MnDOT's goals were to:

- Explore traffic patterns across multiple timescales (yearly, monthly, daily, hourly)
- Evaluate how weather and holidays affect overall road usage
- Provide accessible insights for team members

After feedback from MnDOT's representative, the dashboard was refined to:

- Include dropdown menus for intuitive navigation
- Add a Download to PDF button for easy report sharing
- Focus on 2017–2018 data to prioritize recent records

The final dashboard provides an interactive, easy-to-use visualization of how traffic volume changes throughout the year under different conditions.



[Ctrl+click to follow the link to the dashboard!](#)

## KEY FINDINGS AND METRICS

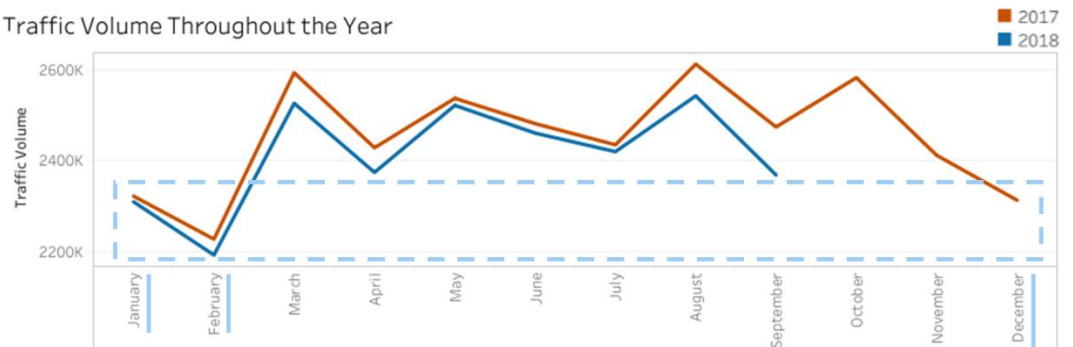
### Core Metrics:

- Total and average traffic volume by hour, day, month, and year
- Total traffic volume by weather condition
- Average traffic volume by holiday
- Counts of incomplete (646 days) or missing days (330 days) from original dataset

### Seasonal Trends:

- Traffic volume drops sharply during December–February, reflecting reduced travel and possible weather-related slowdowns.

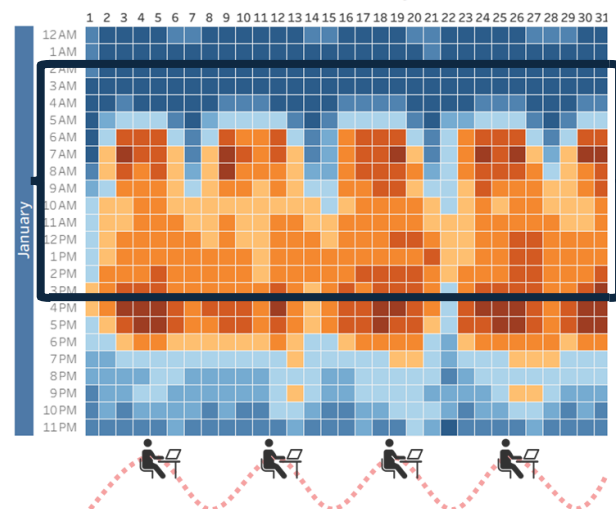
Traffic Volume Throughout the Year



## Weekly and daily cycles:

- Traffic follows expected patterns with higher traffic during weekdays, and peak hours between 6 AM and 6 PM, consistent with commuter schedules.

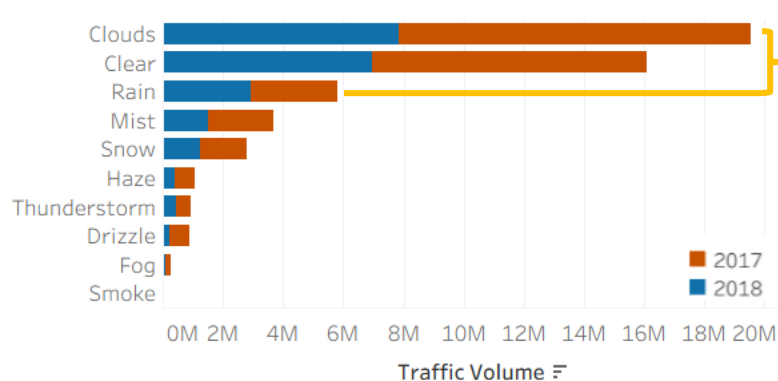
Traffic Volumes: Hours of the Day



## Weather Impact:

- Traffic volume during rain is ~70% lower than during cloudy conditions, showing a clear link between poor weather and reduced travel.
- Lowest traffic volumes occur in low visibility conditions

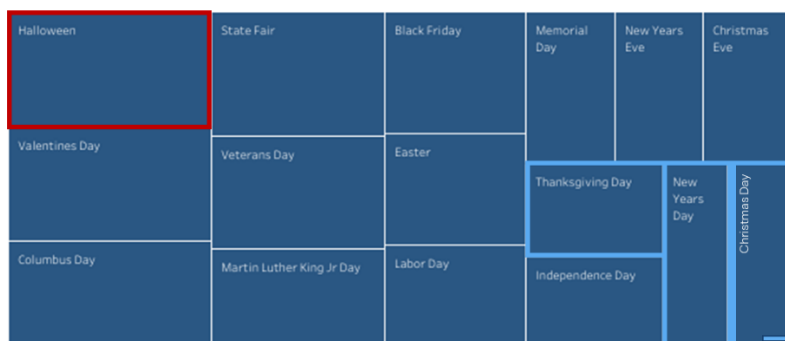
Traffic volume: weather pattern



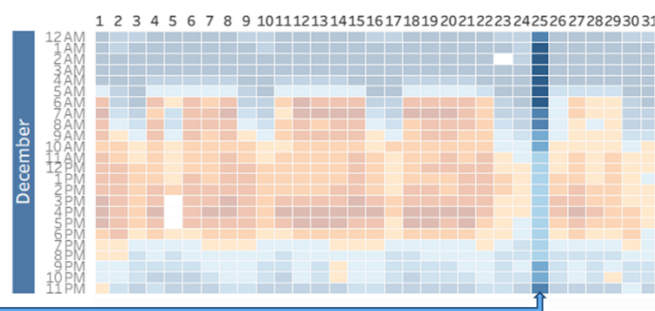
## Holiday and event patterns:

- Halloween shows the highest average traffic volumes
- New Year's Day, Christmas Day, and Thanksgiving Day have low traffic volumes that don't align with general weekday and daily trends

Average Traffic Volume by Holiday



Hourly Traffic Volume



## IMPACT AND RECOMMENDATIONS

This dashboard gives MnDOT a clear, user-friendly way to visualize traffic behavior across multiple contexts. It supports data-informed decisions about:

- Maintenance scheduling and staffing during high or low traffic periods
- Planning around major events like the State Fair
- Evaluating the impact of adverse weather on travel patterns

Based on these insights, several recommendations emerge:

- **Reduce daily operational activity during low-traffic winter months** and reallocate resources to higher-demand periods in spring and summer.
- **Prioritize large construction and infrastructure projects during winter** when appropriate, as reduced traffic minimizes public disruption and improves project efficiency.
- **Implement adaptive signal timing or temporary traffic control during high-volume events** like the state fair and Halloween.
- **Enhance communication systems and signage** during forecasted rain, snow or low visibility weather events, ensuring safety and continuity during low-volume, adverse weather conditions.
- **Continue consistent data monitoring and validation** to improve future predictive modelling for traffic management and infrastructure planning.

From a design perspective, the project emphasized clarity, accessibility, and interactivity — ensuring even users without Tableau experience can quickly extract key insights.

## METHODS AND DATA PREPARATION

### Data source:

- Minnesota Department of Transportation traffic volume records (2012–2018) – Google Business Intelligence Coursera Course
- Cleaned data: [Metro Interstate Traffic Volume Cleaned.csv](#)

### Tools used:

- Excel (data cleaning) • Python (date-time parsing) • Tableau Public (visualization)

### Cleaning steps:

**TLDR:** The cleaned dataset includes flagged first instances of each hourly record, accurate weather and holiday labeling, correctly extended holiday dates, and is fully prepared for hourly, daily, and weather-based analysis in Tableau with transparent documentation of missing or incomplete data.

### Excel

- Removed 17 duplicate rows
- Verified and standardized entries in weather\_main using a pivot table to review all unique values, and confirmed consistent spelling and capitalization
- Dropped weather\_description column since it duplicated information from weather\_main and was too granular for the dashboard.
- Reviewed and Corrected Holidays: flagged non-“None” entries, extended labels across full dates, verified calendar accuracy, and replaced “None” with nulls for Tableau compatibility.

- Created an *hour flag* column that marks the first occurrence of each unique timestamp to ensure that when multiple weather conditions exist for the same hour, only one traffic-volume value is counted in aggregations.

### Jupyter Notebooks

- Processed and validated time data: imported the cleaned CSV into a pandas DataFrame, parsed date\_time into separate date and hour fields, identified 646 incomplete dates and 330 missing dates. Analysis was completed to ensure transparency and cautious interpretation of traffic patterns by stakeholders.

### Tableau Public

- Used the calculated field YEAR([Date Time]) >= 2017 in Tableau to limit visualizations to 2017–2018, ensuring alignment with stakeholder requests and focusing analyses on the most recent data.

## DASHBOARD DESIGN

The dashboard layout and interactivity were designed to prioritize **clarity, accessibility, and insight discovery**.

### Visual elements

- **Line Chart:** Total traffic volume by month per year (auto-switches to daily view when a month is selected)
- **Heatmap:** Total traffic volume by hour of the day
- **Horizontal Bar Chart:** Total traffic volume by weather condition
- **Treemap:** Average traffic volume by holiday

### Interactivity and features

- **Year and Month Filters:** Drop-down menus at the top of the dashboard allow users to focus on specific time periods.
  - Selecting a month highlights the holidays that occur in that month within the treemap.
- **Highlight Action:** Clicking on a holiday in the treemap highlights the corresponding day(s) in the heatmap
- **Download to PDF Button:** Makes sharing visual insights simple for non-technical users

This combination of visuals allows MnDOT to view long-term trends, daily fluctuations, and context-specific impacts (such as weather and events) within one cohesive interface.