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Information on the open-source data

What is On-Street Parking?
On-street parking refers to designated parking spaces along public streets, typically regulated by time limits, fees, or permits. These parking spots are crucial in urban areas, balancing accessibility for drivers while ensuring smooth traffic flow. Proper management of on-street parking helps reduce congestion, improves road safety, and optimizes space utilization.

Purpose of the Dataset
The dataset provides key insights into various aspects of on-street parking, including occupancy levels, parking violations, session durations, and trends across different locations. By analyzing this data, policymakers and city planners can make informed decisions to improve parking management, enhance accessibility, and optimize revenue collection.

Why This Dataset Matters
Effective parking management is vital for urban infrastructure. This dataset helps:

- **City planners make data-driven decisions** to improve parking policies.
- **Identify peak hours and high-demand zones**, allowing better allocation of resources.
- **Enhance enforcement strategies** by detecting frequent violation areas.

Understanding parking trends through data analysis can lead to better regulations, reduced congestion, and an overall improved urban experience for residents and visitors.

Expected Insights from the Data
By studying the dataset, several key insights can be derived:

- **Occupancy Patterns:** Identifying how parking demand fluctuates based on time and location.
- **Violation Hotspots:** Recognizing areas with frequent parking violations to improve enforcement.
- **Regulation Impact:** Assessing how different rules, such as time limits and pricing, influence parking behavior.

Purpose and/or Goals:

Purpose of Analyzing On-Street Parking Trends

With rapid urbanization, parking congestion has become a growing challenge for many cities. A well-structured dataset provides key insights into how parking spaces are utilized across different zones, enabling authorities to optimize parking regulations effectively. The primary objectives of analyzing parking trends include:

1. Understanding Parking Trends in Different City Zones

Every city has areas where parking demand fluctuates based on time, day, and local events. By analyzing parking data, city officials can determine:

- Which zones experience the highest parking occupancy.
- How demand changes throughout the day.
- Whether certain areas require additional parking infrastructure or policy adjustments.

2. Identifying Peak Parking Hours and Revenue Potential

Parking usage is not uniform throughout the day. Understanding when parking demand peaks can help cities:

- Adjust parking fees dynamically based on demand.
- Allocate enforcement resources effectively to reduce violations.
- Maximize revenue collection by optimizing pricing strategies.

3. Optimizing Parking Policies for Efficiency and Cost-Effectiveness

One of the biggest challenges in parking management is striking a balance between accessibility and regulation. Using data insights, policymakers can:

- Implement fair pricing models that encourage turnover and prevent long-term occupation of high-demand spots.
- Designate specific zones for different types of parking (e.g., short-term, long-term, and accessible parking).
- Improve enforcement by identifying areas prone to frequent violations.

Goals of Parking Data Analysis

By leveraging data-driven insights, city planners aim to create a more efficient and accessible parking system. The key goals include:

1. Providing Insights on Revenue Generation from Parking

Parking fees contribute significantly to city revenue. Analyzing the dataset allows authorities to:

- Identify which zones generate the most revenue.
- Optimize fee structures to balance affordability and profitability.
- Forecast future revenue potential based on parking trends.

2. Identifying High-Demand Parking Areas

Some areas consistently experience parking shortages due to high demand. Through data analysis, planners can:

- Determine where additional parking spaces or infrastructure may be needed.
- Introduce smart parking solutions, such as digital payment systems and reservation-based parking.
- Adjust policies to distribute demand more evenly across different areas.

3. Improving Accessibility and Reducing Congestion

Congested parking areas contribute to traffic buildup and inefficiency. Effective parking management helps:

- Reduce the time drivers spend searching for parking, thereby lowering traffic congestion.
- Ensure that accessible parking spots are available for those who need them.
- Enhance the overall user experience by making parking more convenient and organized.

KEY QUESTIONS ON THE DATA

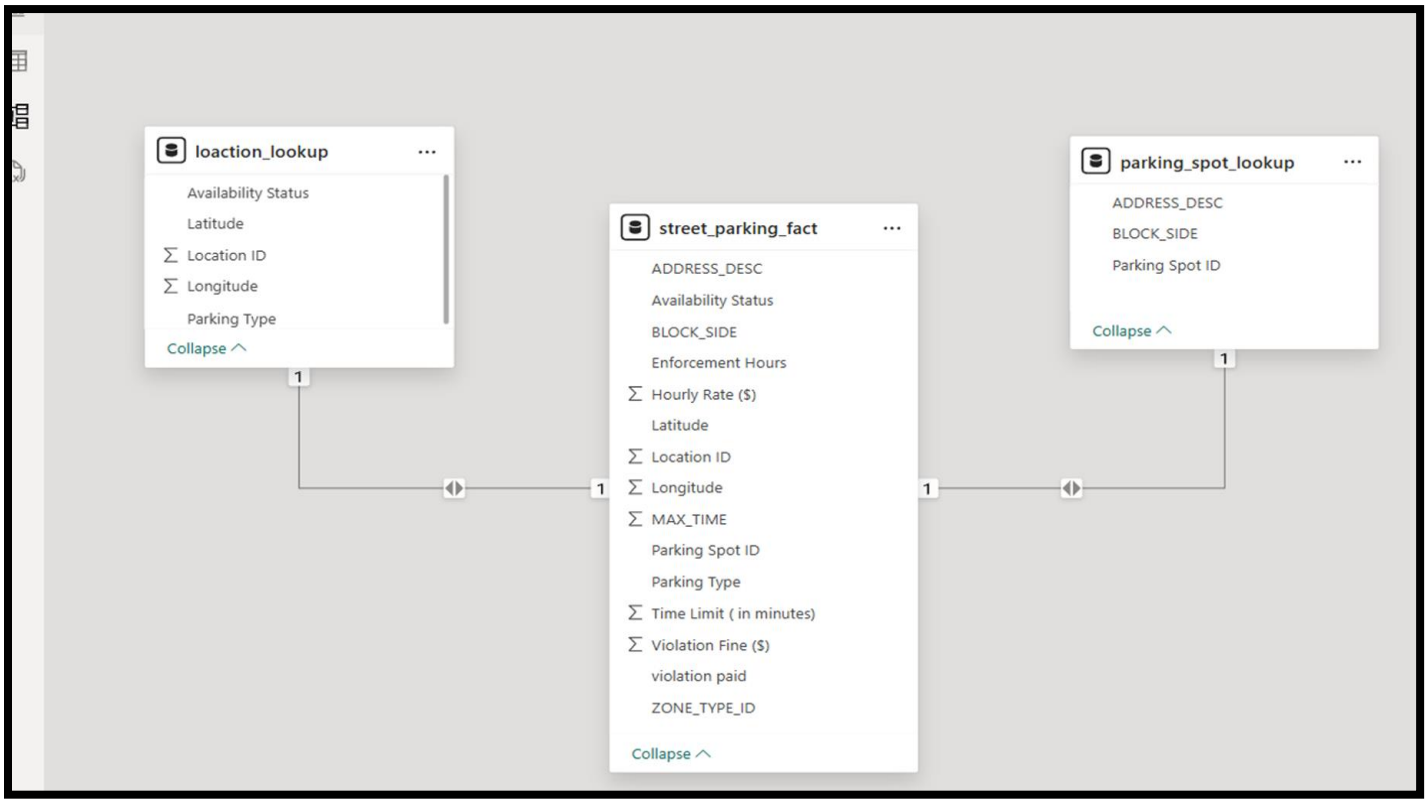
•What are the peak hours for parking usage?

•How do parking rates vary by zone and time of day?

•Are there underutilized parking areas?

•How does parking availability impact congestion in different areas?

MODEL VIEW:



Overview of the Parking Data Model

The data model consists of three primary tables:

1. **location_lookup** – Stores details of parking locations.
2. **street_parking_fact** – Central fact table containing key parking metrics and transactions.
3. **parking_spot_lookup** – Stores parking spot details and their respective addresses.

These tables are connected via **primary and foreign key relationships**, ensuring data consistency and enabling efficient queries for analysis.

2. Breakdown of the Tables and Their Attributes

a) Location Lookup Table (location_lookup)

This table serves as a reference for various parking locations in the city. It contains:

- **Availability Status** – Indicates whether a parking spot is currently occupied or available.
- **Latitude & Longitude** – Geographic coordinates for spatial analysis.
- **Location ID** – A unique identifier for each location, serving as a primary key.
- **Parking Type** – Specifies the type of parking available (e.g., metered, permit-based, or free).

Purpose: Helps analyze parking availability trends across different locations and parking types.

b) Street Parking Fact Table (street_parking_fact)

This is the **core fact table** containing all key metrics related to parking. It includes:

- **ADDRESS_DESC** – Describes the specific address of the parking spot.
- **Availability Status** – Current status of parking occupancy.
- **BLOCK_SIDE** – Defines the street side (E, W, N, S) for spatial segmentation.
- **Enforcement Hours** – Specifies hours when parking regulations are enforced.
- **Hourly Rate ($)** – The charge per hour for parking in a given location.
- **Latitude & Longitude** – Helps in mapping and spatial analysis.
- **Location ID** – Foreign key linking to location_lookup.
- **MAX_TIME** – Maximum time allowed for a vehicle to be parked.
- **Parking Spot ID** – Unique identifier for each parking spot.
- **Parking Type** – Identifies whether the spot is a general parking zone, a loading zone, or a handicapped zone.
- **Time Limit (minutes)** – Defines the permitted parking duration.
- **Violation Fine ($)** – The penalty amount charged for violating parking regulations.
- **Violation Paid** – Indicates whether a parking violation fine has been settled.
- **ZONE_TYPE_ID** – Identifies the type of parking zone (e.g., commercial, residential, restricted, etc.).

Purpose: This table serves as the primary source for analyzing parking patterns, enforcement effectiveness, revenue generation, and violation trends.

c) Parking Spot Lookup Table (parking_spot_lookup)

This table provides details about specific parking spots, including:

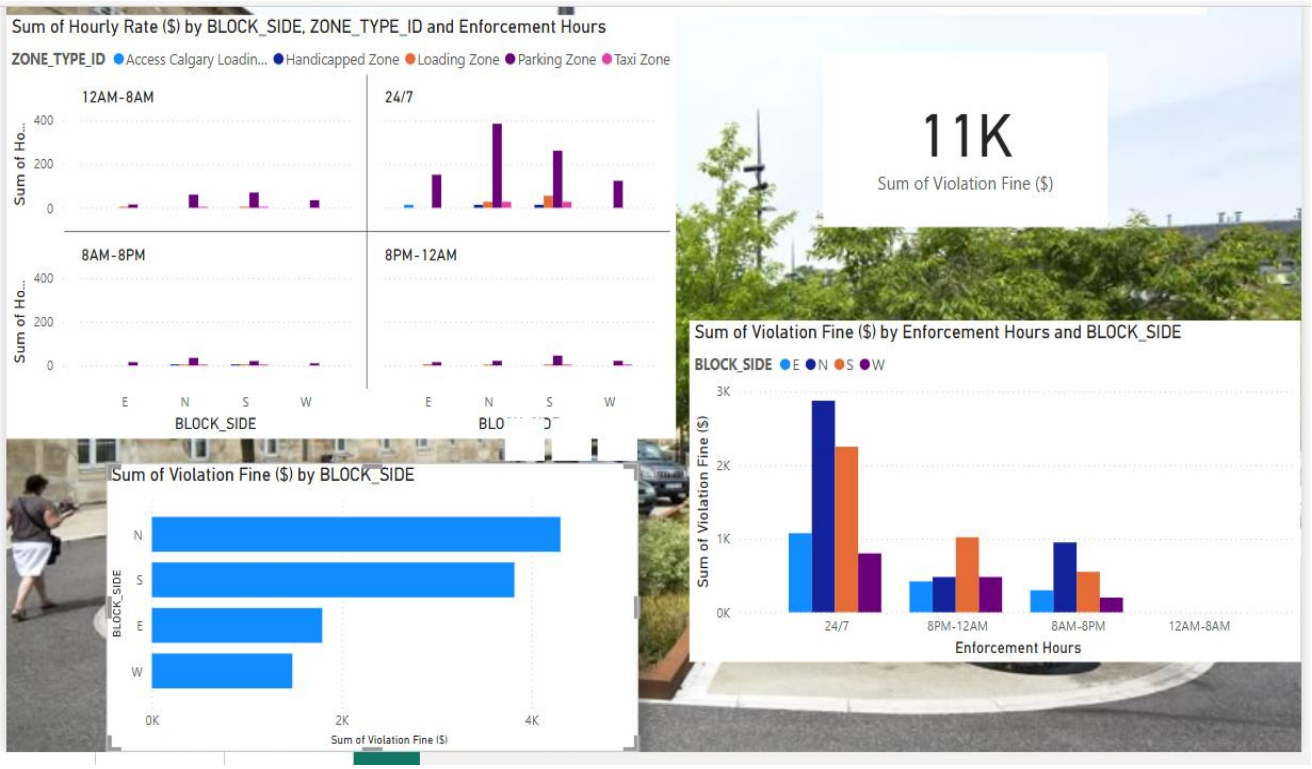
- **ADDRESS_DESC** – Descriptive address of the parking spot.
- **BLOCK_SIDE** – Specifies the street side where the parking spot is located.
- **Parking Spot ID** – The unique identifier for each parking spot, linking it to the street_parking_fact table.

Purpose: Ensures easy identification of parking spaces, aiding in real-time tracking and parking allocation.

3. How This Data Model Supports Decision-Making

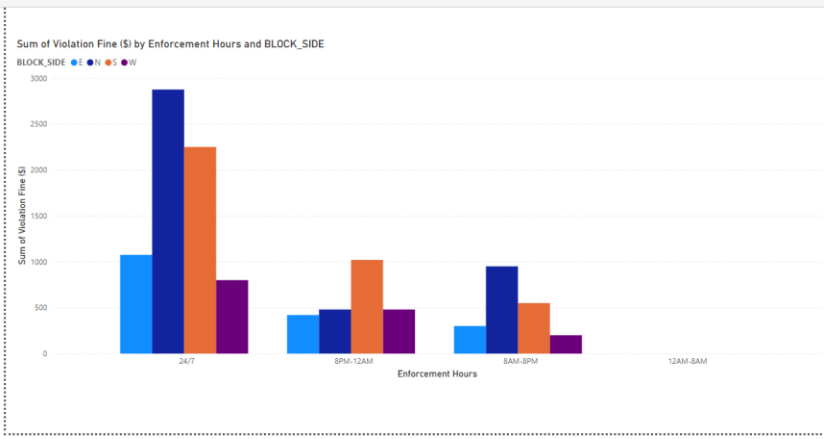
1. **Optimizing Parking Allocation** – By analyzing availability status and occupancy trends, authorities can identify underutilized and high-demand areas to optimize space allocation.
2. **Revenue Analysis** – The Hourly Rate ($), Violation Fine ($), and Violation Paid fields help in assessing revenue streams from paid parking and fines.
3. **Traffic Congestion Control** – Understanding peak parking hours and MAX_TIME limits enables better traffic planning and congestion reduction.
4. **Enhancing Compliance & Reducing Violations** – By tracking violation fines and payment compliance, authorities can adjust enforcement policies to improve compliance rates.
5. **Strategic Pricing Models** – Dynamic pricing strategies can be implemented based on occupancy rates, peak hours, and demand fluctuations.
6. **Urban Planning & Sustainability** – The dataset supports city planners in designing smart parking solutions, reducing unnecessary vehicle circulation, and lowering carbon emissions.

REPORT VIEW:



- **Peak Parking Demand & Violations:** Most violations occur in high-demand areas with **24/7 enforcement**.
- **Strategic Policy Adjustments:** Authorities could adjust pricing and enforcement to **reduce violations** and **optimize revenue**.
- **Targeted Enforcement:** More focus on **North and South block sides** may help improve compliance and parking efficiency.

Analysis of Violation Fines by Enforcement Hours and Block Side:

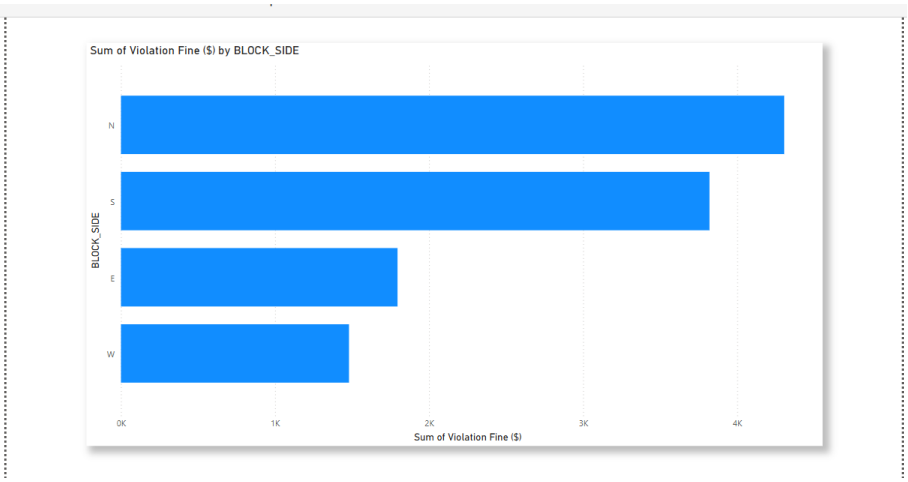


This bar chart visualizes the **sum of violation fines ($) across different enforcement hours** and block sides (East, North, South, West).

Key Insights:

1. **Highest Violation Fines Occur in 24/7 Enforcement Zones**
    - The **North (Dark Blue) and South (Orange) block sides** have the highest fines.
    - North side has the **highest overall violations**, exceeding **$2,500**.
    - This suggests that areas with **24/7 parking enforcement** see the most non-compliance.
2. **Evening Violations (8 PM - 12 AM) are Noticeable**
    - The **South block side** still accumulates a significant amount in fines, reaching around **$1,200**.
    - Other block sides (East and West) show moderate violations.
3. **Daytime (8 AM - 8 PM) Fines Are Lower Compared to 24/7 Zones**
    - The **North side** again records the highest fines, followed by the South side.
    - This period might have better compliance due to increased monitoring or driver awareness.
4. **Minimal Violations in Late Night (12 AM - 8 AM)**
    - Very few fines are recorded in this period, indicating **low parking demand or better adherence to rules**.

Violation Fines by Block Side Analysis:



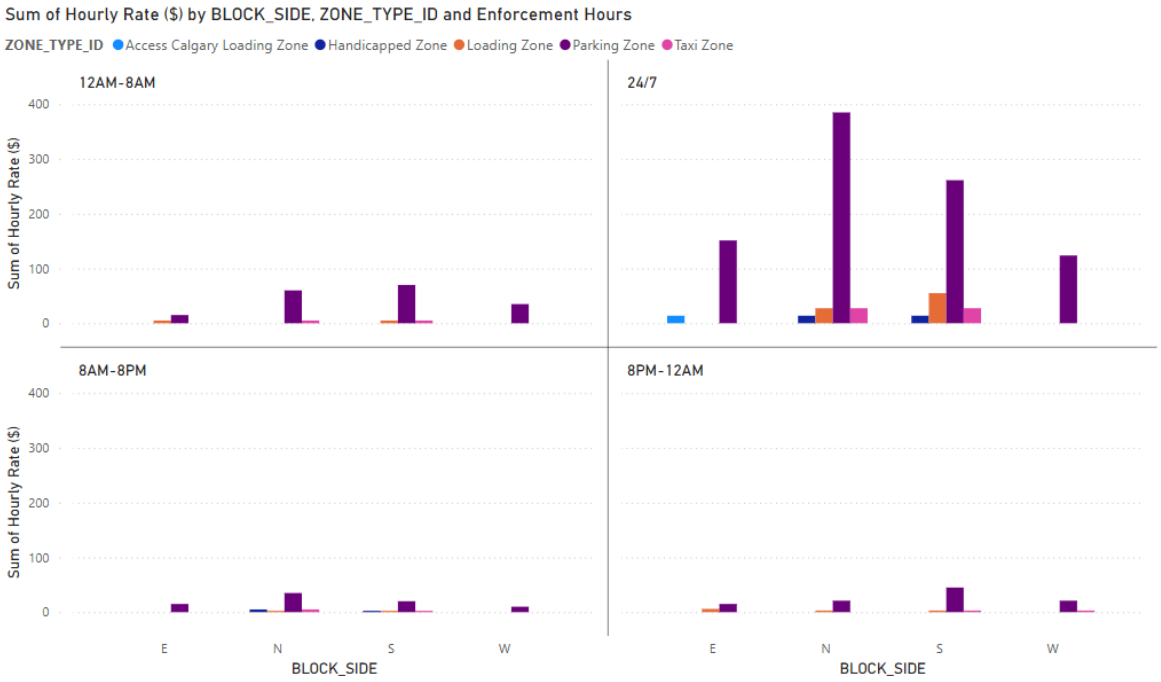
Violation Fines by Block Side Analysis

This horizontal bar chart displays the **sum of violation fines ($) distributed across different block sides (North, South, East, and West).**

Key Insights:

1. **Highest Violation Fines on the North (N) Block Side**
    - The **North side** has the most fines, exceeding **$3,000**, indicating **frequent parking violations** in this area.
    - Likely causes: high parking demand, strict enforcement, or poor compliance.
2. **South (S) Block Side Also Has High Violations**
    - The **South side** follows closely behind, with fines around **$2,500-$3,000**.
    - Suggests another hotspot for parking infractions.
3. **Lower Fines on East (E) and West (W) Sides**
    - **East side** has moderate violations, likely due to fewer restrictions or better compliance.
    - **West side** records the lowest fines, suggesting either **less enforcement or lower parking activity.**

Sum of hourly rate by blockside, zonetype and enforcement hours:



- 24/7 enforcement zones bring in the most revenue, primarily from Parking Zones.
- Revenue is highest during business hours (8 AM - 8 PM) and lowest overnight.
- Handicapped, Loading, and Taxi Zones generate significantly lower revenue compared to Parking Zones.
- Some block sides (likely in busy areas) contribute more revenue than others.

Conclusion

The analysis of parking violation fines across different block sides and enforcement hours reveals significant trends in compliance and enforcement effectiveness. The North and South block sides accumulate the highest violation fines, indicating a higher demand for parking, possible lack of compliance, or insufficient enforcement measures. In contrast, the East and West block sides show lower violation fines, suggesting either better compliance or less traffic congestion. The data also highlights that 24/7 enforcement zones experience the most fines, reinforcing the need for continuous monitoring in these areas. Additionally, violations during the 8 PM – 12 AM timeframe are noticeably high, pointing to potential gaps in enforcement during late hours. To address these issues, authorities could enhance enforcement efforts in high-violation areas, improve signage and awareness programs, and consider revising parking policies in 24/7 zones. Implementing data-driven strategies, such as dynamic pricing and real-time monitoring, can help optimize parking management, reduce violations, and improve urban mobility.