Final Analysis Report

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Introduction

Urban traffic management is critical to city planning, impacting daily commutes, economic activities, and environmental conditions. Understanding the factors influencing traffic volume can help devise strategies to improve traffic flow and reduce congestion. This report presents an analysis of traffic volume and weather conditions in New York City for the year 2012. The objective is to investigate the relationship between traffic volume and weather parameters such as temperature, snowfall, precipitation, and wind speed. By exploring these relationships, we aim to provide insights that can assist urban planners, traffic managers, and policymakers in making informed decisions.

Used Data: Traffic Data

The traffic data is sourced from New York City's open data portal, specifically from the dataset titled "Traffic Volume Counts (2012)." This dataset contains daily traffic counts collected from various traffic monitoring points throughout the city. For this analysis, the data was filtered to include only the counts for the year 2012 and then aggregated to obtain monthly traffic volumes.

Data Structure

Table: traffic

	id	month	traffics
	Filter	Filter	Filter
1	1	Jan	8565423
2	2	Feb	10736608
3	3	Sep	2437667.82
4	4	Oct	43076812.32

month: The month when the traffic count was recorded. **traffics**: The number of vehicles recorded on that month.

Weather Data

The weather data is sourced from Meteostat, which provides historical weather data from various weather stations. The dataset includes hourly measurements of temperature (tavg), snowfall (snow), precipitation (prcp), and wind speed (wspd) for the year 2012.

Data Structure

Table: weather

	id	month	tavg	snow	prcp	wspd
	Filter	Filter	Filter	Filter	Filter	Filter
1	1	Jan	-6.05	55.29	0.1	17.47
2	2	Feb	-5.06	50.93	0.05	16.29
3	3	Mar	0.58	55.54	0.04	15.93
4	4	Apr	-0.98	43.1	0.13	18.45

month: The month of the weather observation. **Temperature (tavg)**: The average temperature recorded in degrees Celsius. **Snowfall (snow):** The amount of snowfall recorded in millimeters.

Precipitation (prcp): The amount of precipitation recorded in millimeters. **Wind Speed (wspd):** The wind speed recorded in kilometers per hour.

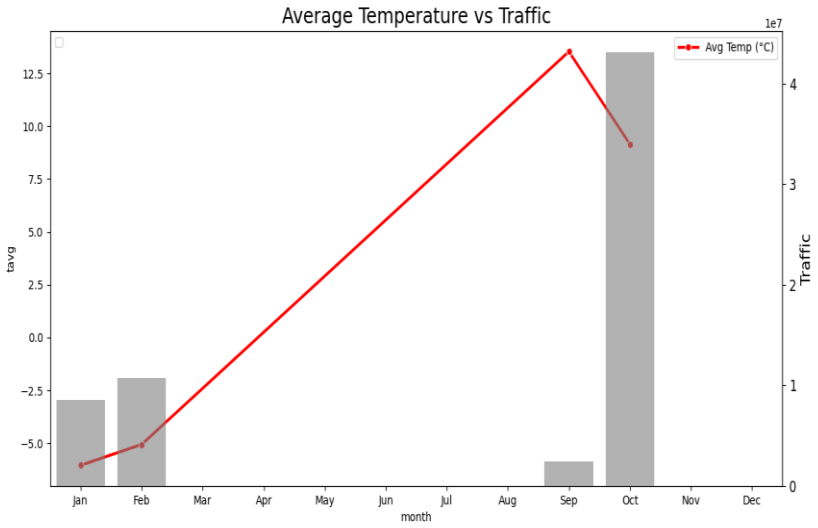
Data Processing

The data was processed using a custom pipeline, which involved the following steps:
1. Retrieval: Downloading the data from the respective sources.
2. Filtering: Selecting data for the year 2012.
3. Aggregation: Summarizing the traffic data to monthly totals and averaging the weather data to monthly means.
4. Storage: Storing the processed data in a SQLite database for efficient retrieval and analysis.

The processed data provides a comprehensive view of monthly traffic volumes and weather conditions for New York City in 2012.

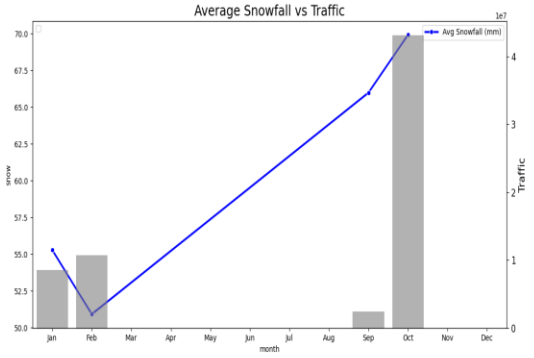
Analysis

The analysis aims to explore the relationship between traffic volume and weather conditions. The following sections detail the methods, results, and interpretations of the analysis, supported by various visualizations.

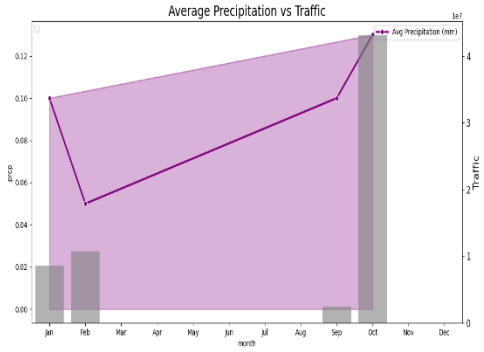


Monthly Average Temperature (tavg)

The graph above shows the monthly average temperature for New York City in 2012. When the temperature is low in January and February month, at that time traffic volume is also low. On the other hand, when the summer season started, that time traffic volume suddenly fell in September. But in October the number of total traffic reach its peak point. If it is compared with monthly data, it can easily be that there is a major connection between temperature and traffic volume.



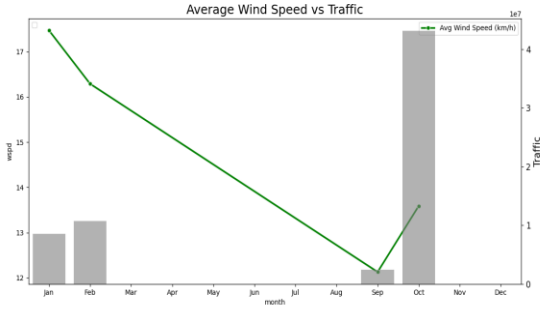
Monthly Snowfall



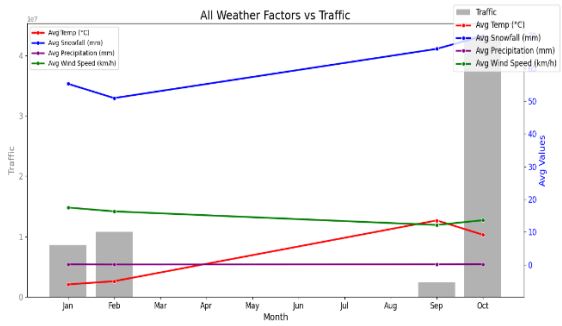
Monthly Precipitation

The left side graph illustrates the monthly snowfall in 2012. Snowfall is highest in October and September, with minimal snowfall during the warmer months. This pattern is consistent with the temperate climate of New York City, where snowfall predominantly occurs in the daytime.

The monthly precipitation graph shows that rainfall is fairly evenly distributed throughout the year, with slight peaks in January and October. This suggests that precipitation events are not strongly seasonal, though certain months may experience higher rainfall due to specific weather systems.



Monthly Wind Speed

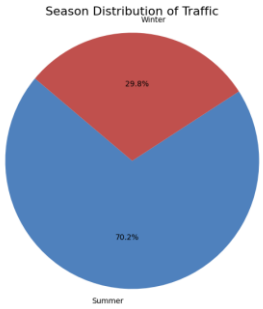


Combined Analysis

The wind speed graph indicates that wind speeds are high in the winter season. Basically in the January and February months, with a slight increase these months. This pattern could be attributed to seasonal weather systems that bring stronger winds in the colder months. When the wind speed is low at that time the traffic volume is high.

This combined graph shows the relationship between traffic volume and all-weather values. Traffic volume appears to increase with higher temperatures, peaking in the summer months. This correlation suggests that warmer weather encourages more vehicular movement, possibly due to favorable driving conditions and increased outdoor activities.

Season-wise Traffic Distribution



Season-wise Traffic Distribution

The pie chart shows the distribution of traffic volume by season. Traffic volume is highest in the summer; the percentage is almost 70% of the total traffic for the year. On the other hand, Winter has lower traffic volumes which is almost 30%, which could be attributed to harsher weather conditions and shorter daylight hours.

Final Theorem

To manage urban traffic effectively, urban planners, traffic managers, and policymakers should focus on enhancing road infrastructure and public transportation options during the summer months when traffic volumes are at their peak. Measures such as optimizing traffic signal timings, expanding bike lanes, and promoting alternative transportation methods can help alleviate congestion during these high-traffic periods.

Conclusions

The analysis indicates significant seasonal variations in traffic volume, with higher volumes during the warmer months (Summer season). This trend suggests that favorable weather conditions contribute to increased traffic activity. Additionally, there is a notable correlation between traffic volume and average temperature, as higher temperatures coincide with higher traffic volumes. The relationship between traffic volume and other weather parameters, such as snowfall and precipitation, is less clear. This analysis provides a foundational understanding of how weather conditions impact traffic patterns in New York.

Reflections

While the analysis offers valuable insights, there are limitations to consider:

Additional Factors: The analysis does not account for other factors that could influence traffic volume, such as holidays, special events, or roadworks. Including these variables could enhance the robustness of the findings.

Causal Relationships: Establishing causal relationships requires more sophisticated statistical techniques and experimental designs. This analysis provides correlational insights but does not establish causality.