Week 6 Report: Seasonal and Cancellation Analysis

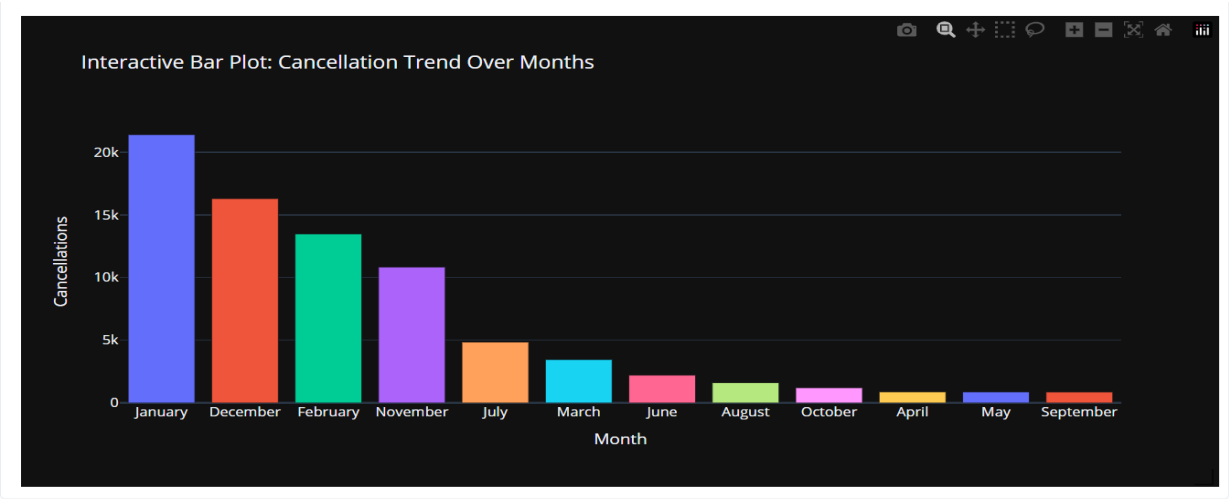
Overview

This week's task focused on analyzing flight cancellation trends with respect to **seasonal patterns** and **types of cancellation reasons**. The goal was to identify when and why cancellations occur most frequently, assess the impact of winter months and holidays, and suggest data-driven measures to minimize disruptions.

The analysis used multiple visualizations — including bar charts, heatmaps, and comparative graphs — to uncover insights into monthly trends, major causes of cancellations, and airline-specific patterns across different seasons.

1. Monthly Cancellation Trends

Process:
An interactive bar chart was used to examine the number of cancellations across each month.



Insight:

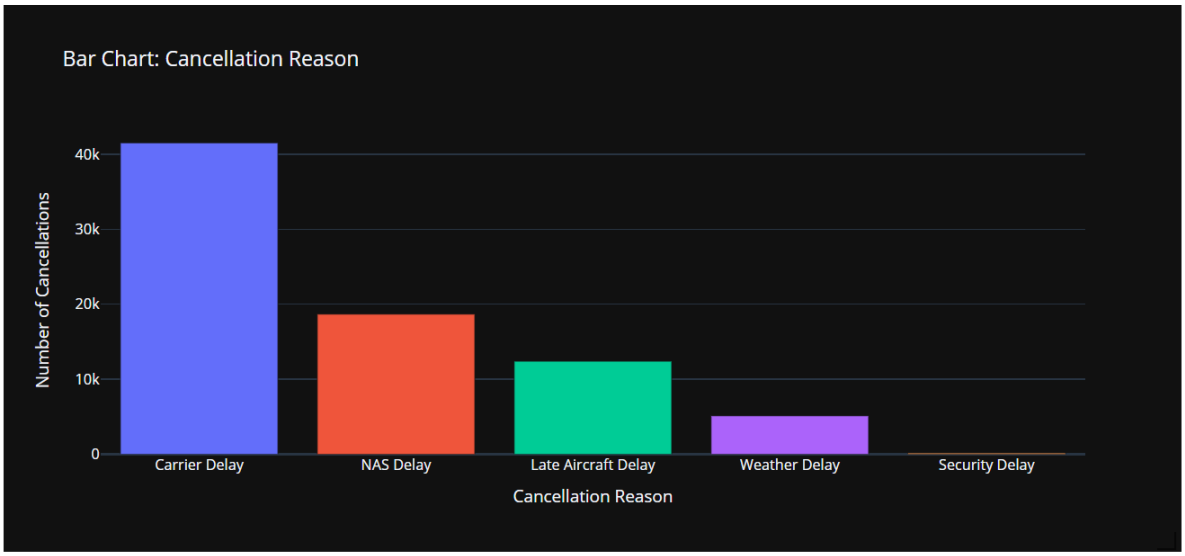
- **January** recorded the highest cancellations (over **20,000**), followed by **December** (~16,000) this can be due to snowfall in many areas.
- **September** showed the lowest number, with cancellations just above zero.
- Cancellations were concentrated in **winter months (December, January, February, November)**, while **spring and late-year months** had the fewest.

Measures:

- Investigate root causes for high cancellations during winter (e.g., weather conditions, post-holiday travel stress, or operational strain).
- Launch **retention and reliability campaigns** during high-risk months.
- Collect and analyze **customer feedback** to identify recurring issues.

2. Cancellation Reasons

Process:
A bar chart visualized the number of cancellations by reason to determine the most frequent causes.



Insight:

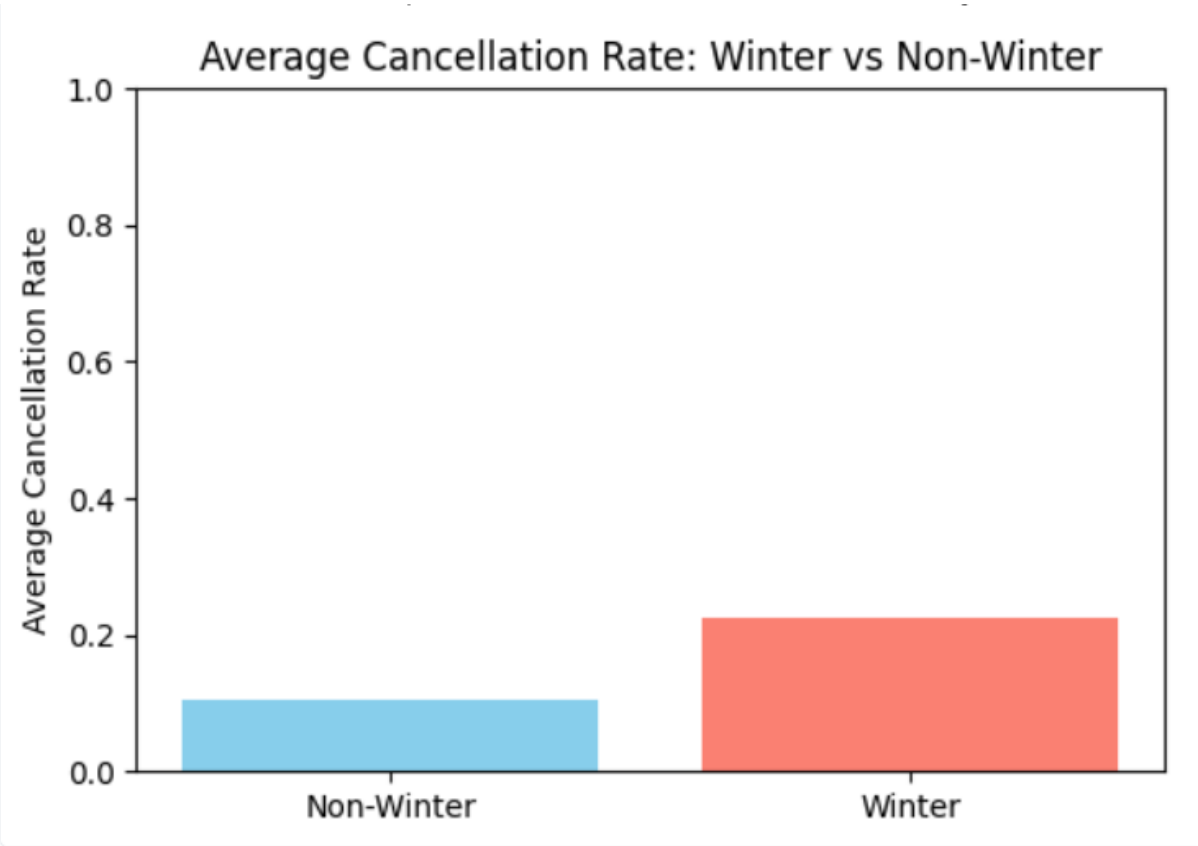
- **Carrier Delay** was the **top reason**, accounting for over **40,000 cancellations**.
- **NAS Delays** followed (~18,000–20,000), often linked to air traffic or system issues.
- **Late Aircraft Delays** contributed around **12,000**, while **Weather** and **Security** delays had minimal impact.

Measures:

- Improve **carrier-level efficiency** through better maintenance, crew, and scheduling.
- Collaborate with **air traffic authorities** to minimize NAS-related delays.
- Strengthen **weather monitoring systems** and implement **operational contingencies**.

3. Average Cancellation Rate: Winter vs Non-Winter

Process:
A comparative bar chart was used to measure average cancellation rates between winter and non-winter seasons.



Insight:

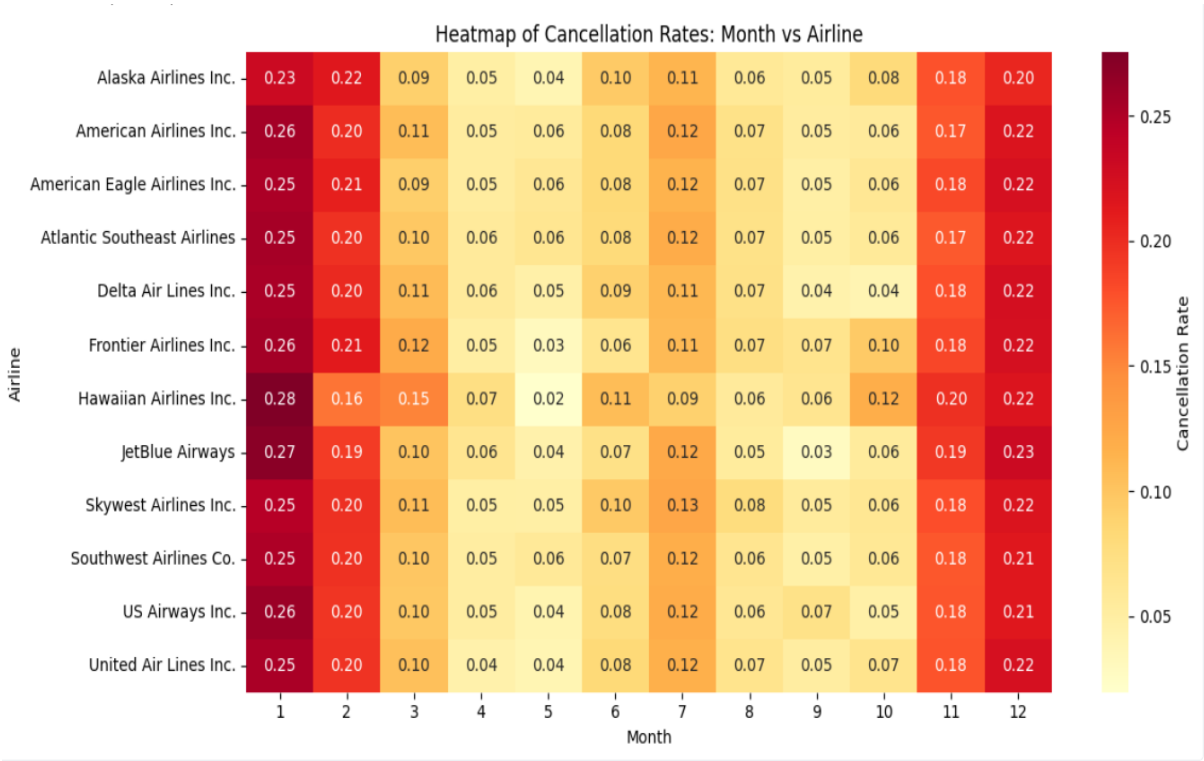
- **Winter** showed a **higher average cancellation rate (≈0.23)** than **non-winter (≈0.10)**.
- The difference indicates that weather disruptions and seasonal travel surges strongly affect operations.

Measures:

- Enhance **winter preparedness**, including de-icing and weather response systems.
- Adjust **flight schedules and staffing** for flexibility during peak disruption months.
- Provide **proactive communication** to passengers during winter months.

4. Heatmap of Cancellation Rates: Month vs Airline

Process:
A heatmap was used to analyze cancellation rates by airline across each month.



Insight:

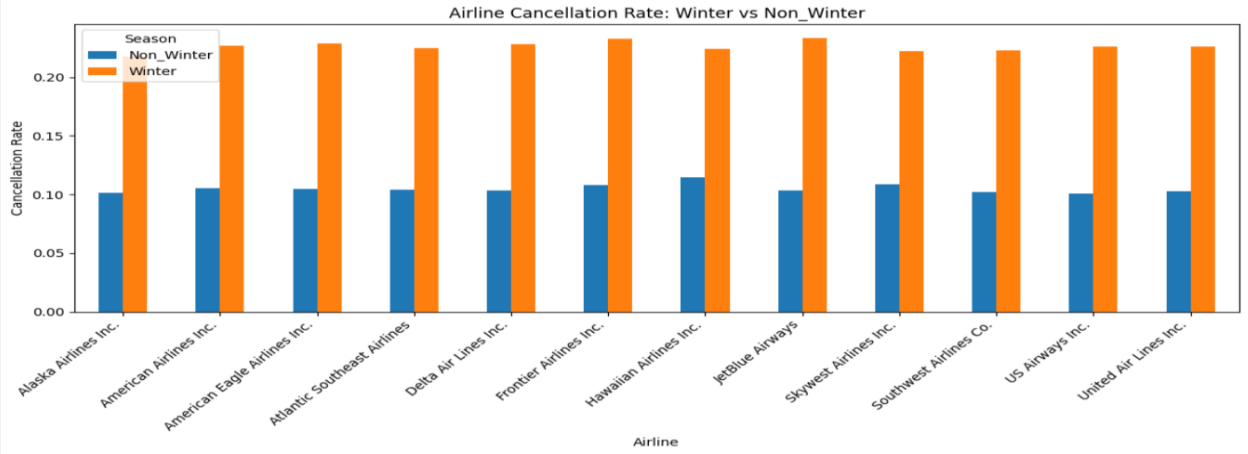
- **January and February** consistently had the **highest cancellation rates** across all airlines (0.23–0.28).
- **Mid-year months (April–September)** showed the **lowest rates**, below 0.1.
- Airlines such as **Hawaiian Airlines** and **JetBlue Airways** had slightly higher winter peaks than others.
- Rates increased again during **November and December**, showing clear **seasonal repetition**.

Measures:

- Improve **winter operation planning** across all airlines.
- Conduct **airline-specific performance analysis** to address internal issues.
- Ensure **preventive maintenance and resource allocation** before high-risk months.

5. Airline Cancellation Rate: Winter vs Non-Winter

Process:
A grouped bar chart compared cancellation rates for each airline during winter and non-winter seasons.



Insight:

- All airlines experienced **higher cancellation rates during winter**, averaging **0.20–0.23**, versus **0.10** in non-winter months.
- The pattern was consistent across all major carriers, confirming that **seasonal weather** is a key disruption factor.

Measures:

- Implement **comprehensive winter-readiness strategies**, including staff training and equipment checks.
- Optimize **flight scheduling** to include buffer time during high-risk months.
- Use **predictive analytics** to anticipate and mitigate cancellation risks.

Conclusion

The analysis clearly demonstrates that **seasonal factors—especially during winter months—have a major impact on flight cancellations.** January and December consistently show the highest cancellation rates, driven primarily by **carrier-related issues** and **weather conditions**.

To reduce future cancellations, airlines should focus on:

- **Improving operational efficiency** through maintenance and scheduling enhancements.
- **Strengthening winter preparedness** and coordination with air traffic control.
- **Leveraging data analytics** to predict and proactively respond to disruption risks.

By addressing these areas, airlines can improve reliability, enhance customer satisfaction, and ensure smoother operations throughout the year.