

Week 3 Report

Univariate and Bivariate Visual Analysis

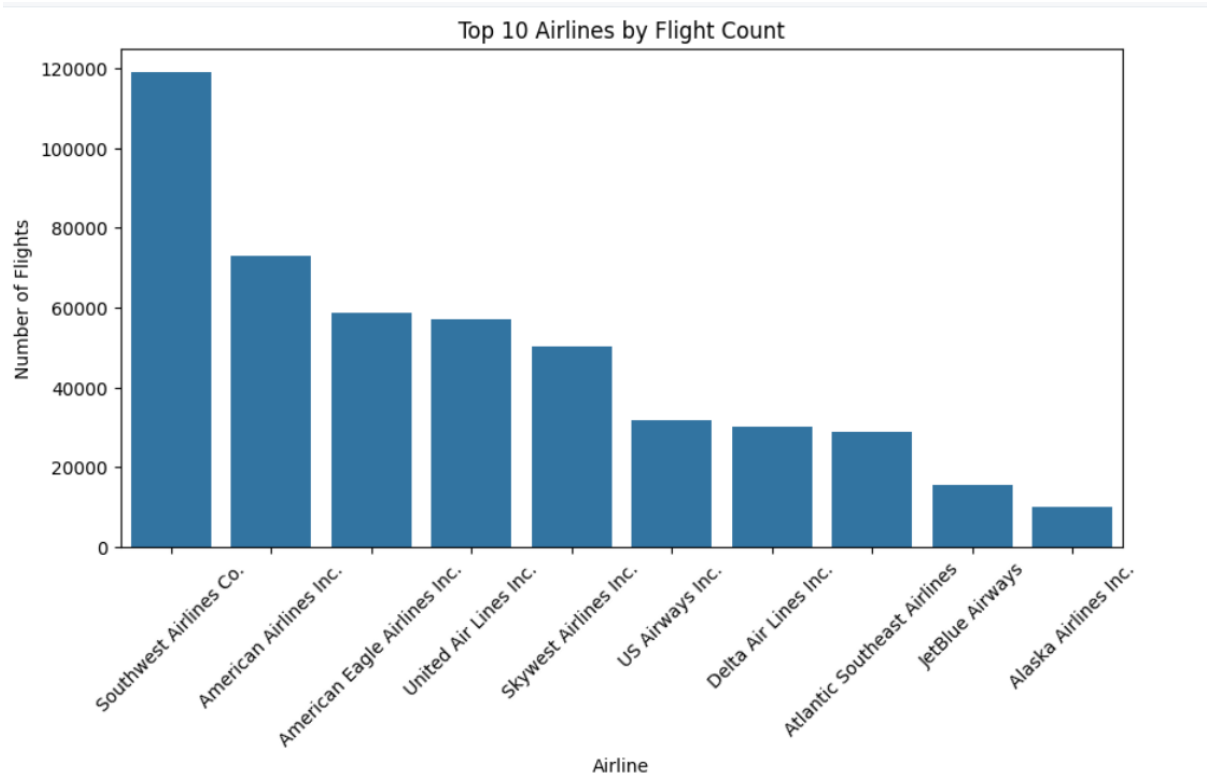
Week 3: Univariate and Bivariate Visual Analysis

- Top airlines, routes, and busiest months
- Flight distribution by day, time, and airport
- Plot bar charts, histograms, boxplots, and line plots

1. Top Airlines, Routes, and Busiest Months

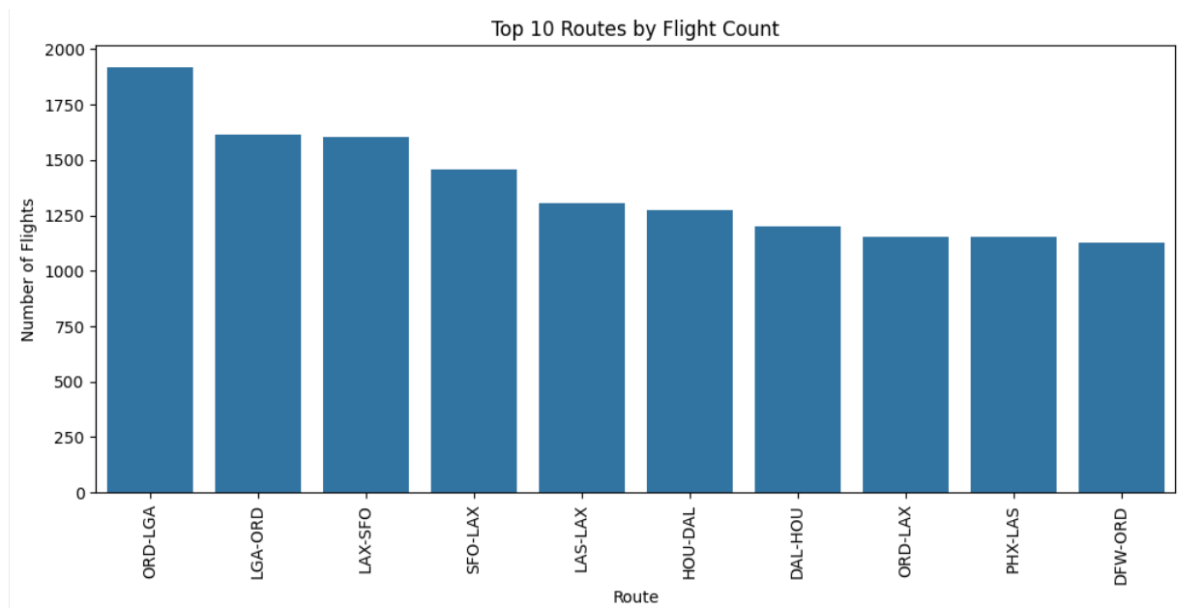
Key Insights:

- Top Airline:



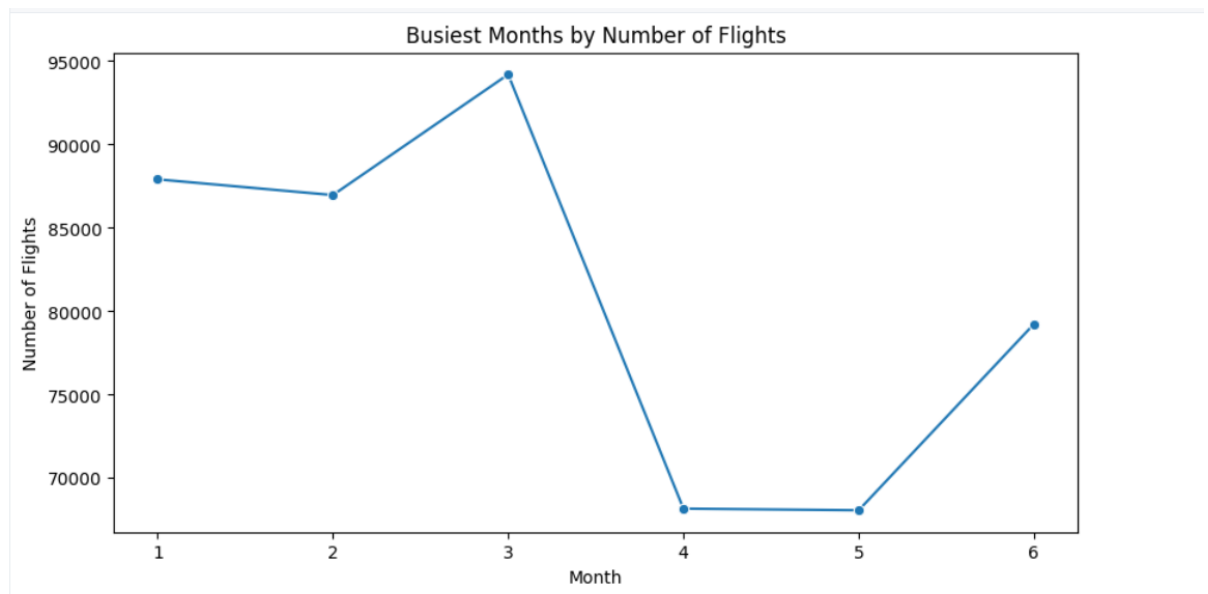
Southwest Airlines Co. has the most flights (~120,000), much more than any other airline.

- Top Route:



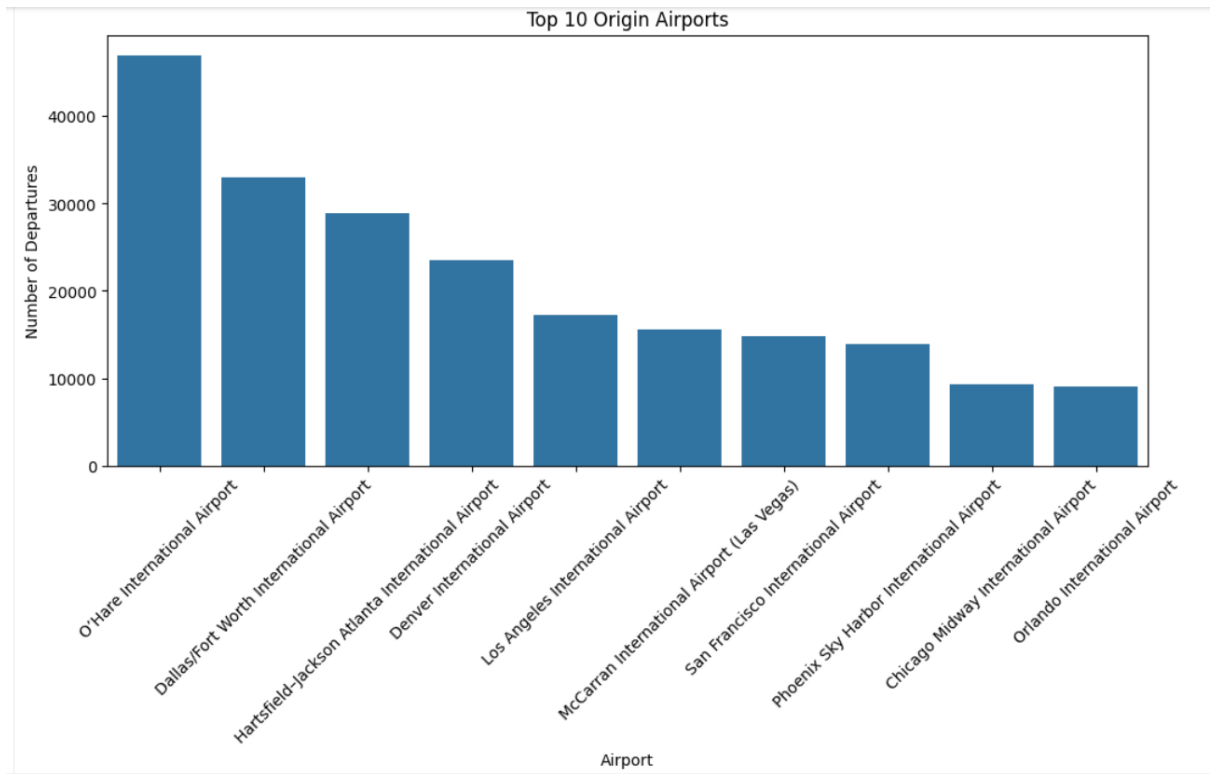
The busiest flight path is O'Hare (ORD) → LaGuardia (LGA).

- Busiest Month:



March (Month 3) has the most flights (around 94,500). Flight numbers drop sharply in April and May.

- Top Origin Airport:



O'Hare International Airport (ORD) has the highest number of departing flights.

- Pattern:
Air traffic is highest in early spring and focused around major city routes.

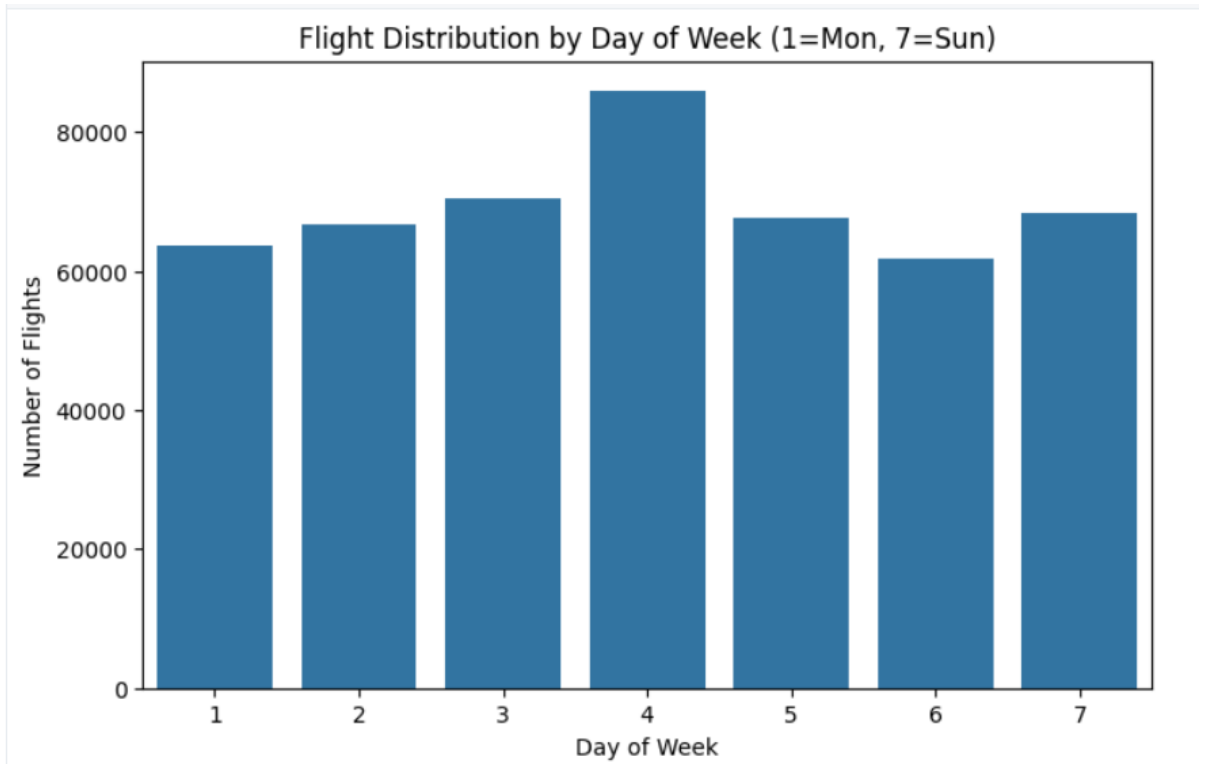
Possible Measures:

- Add more flights or larger aircraft on popular routes (like ORD–LGA).
- Plan for extra staff and airport operations during March.
- Use quieter months (April–May) for maintenance or training.

2. Flight Distribution by Day, Time, and Airport

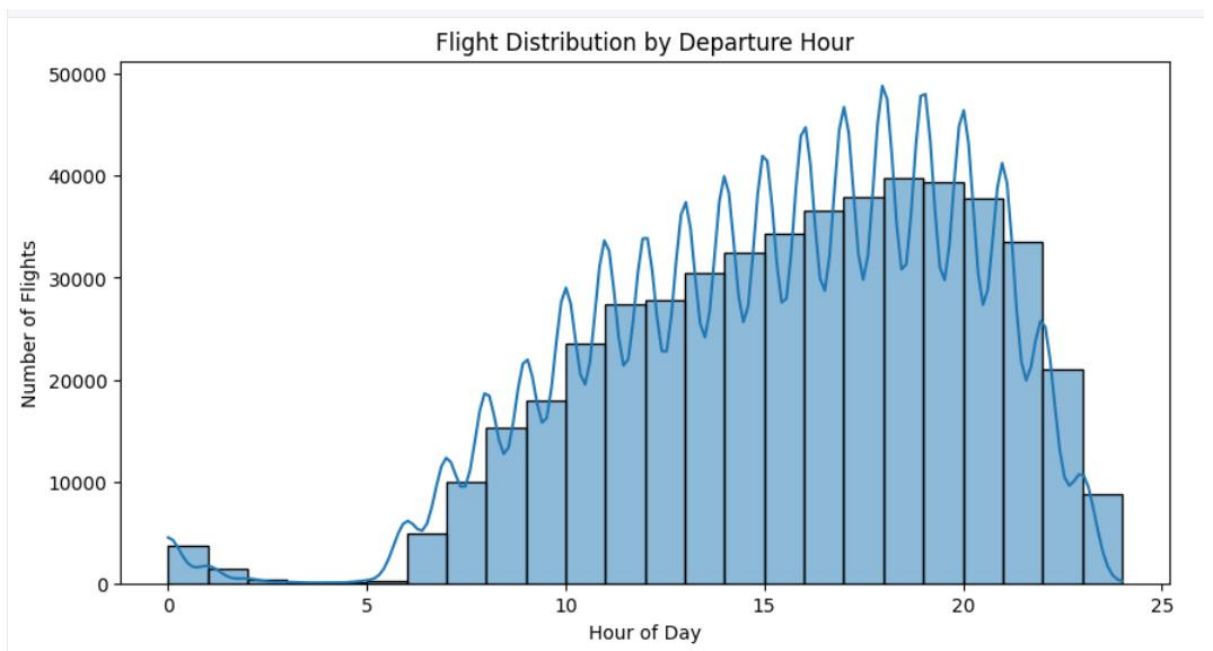
Key Insights:

- Busiest Day:



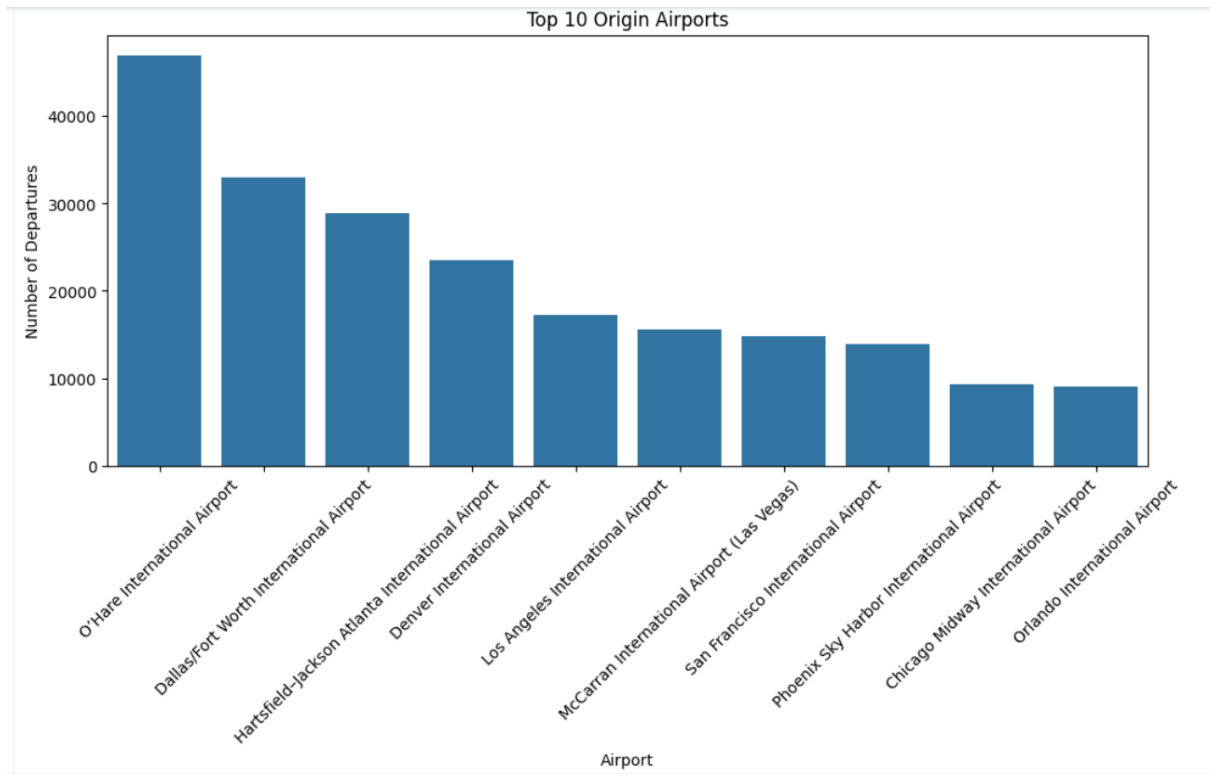
Thursday (Day 4) has the highest number of flights.

- Busiest Time:



Flights mostly depart between late afternoon and early evening, peaking around 7 PM (19th hour).

- Busiest Origin Airport:



O'Hare (ORD) again leads with the most departures.

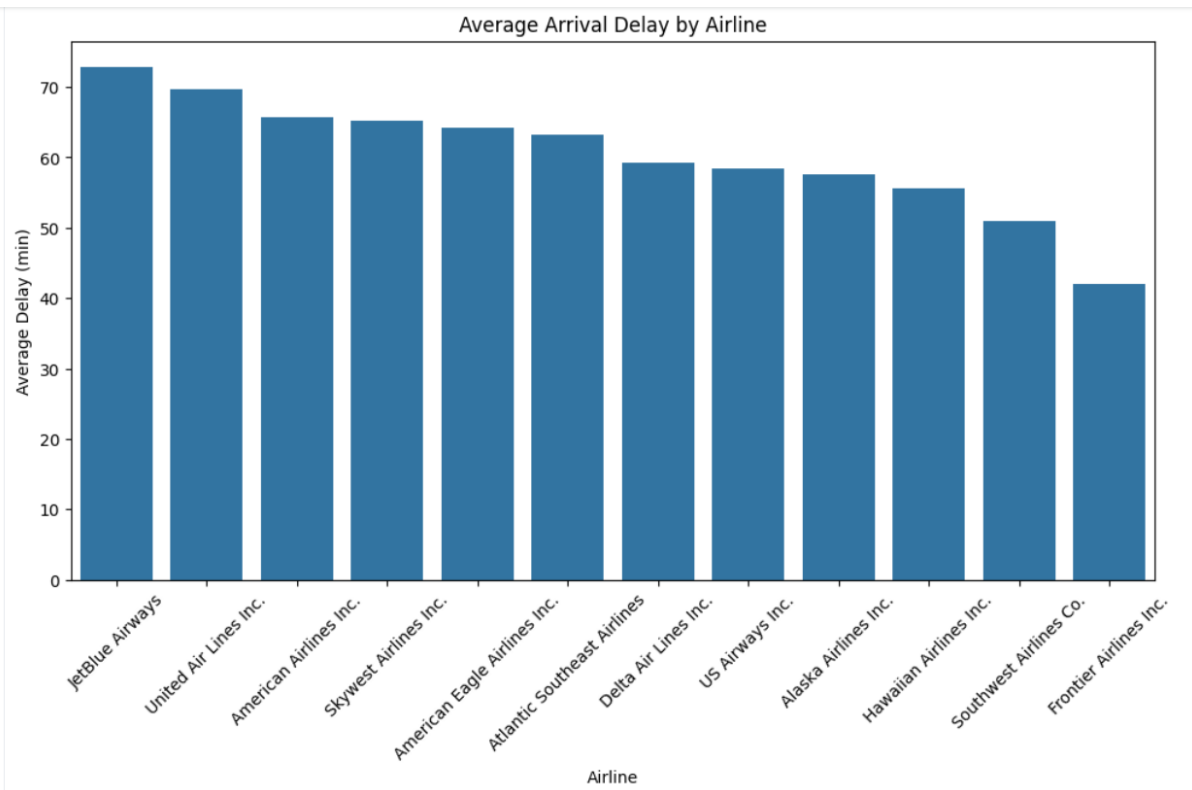
- Pattern:
Weekdays, especially mid-to-late week, are busier than weekends.

Possible Measures:

- Increase airport and ground crew capacity during Thursday evenings.
- Spread flight schedules to reduce evening congestion.
- Provide more passenger support and services during peak hours.

3. Delays and Performance

Key Insights:



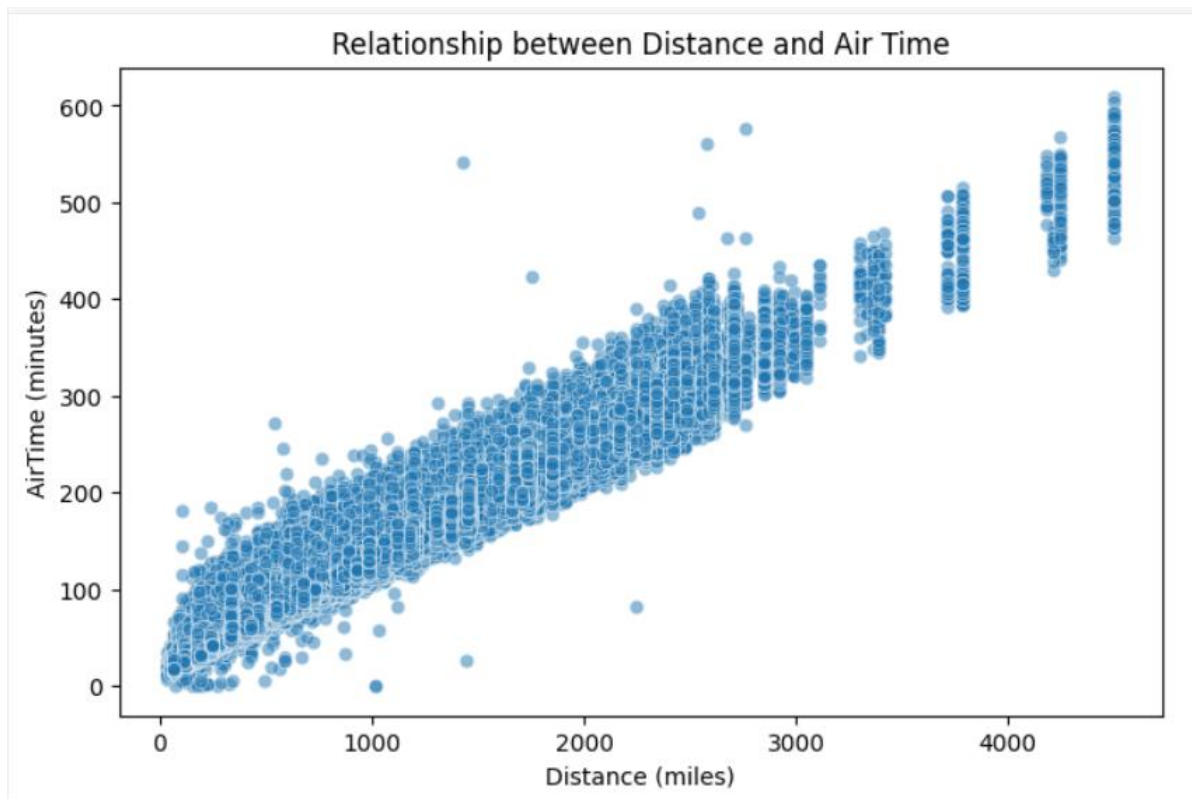
- Most Delayed Airline:
JetBlue Airways – highest average arrival delay (over 70 minutes).
- Best Performer:
Frontier Airlines Inc. – lowest average arrival delay (~42 minutes).
- Efficient Large Airline:
Southwest Airlines manages the most flights but still has low delays.
- Delay Patterns:
Average delays stay between 0–100 minutes, but some flights have extreme delays (up to 3,000 minutes).

Possible Measures:

- Airlines like JetBlue should review crew, maintenance, and turnaround processes.
- Reduce flight congestion by spreading departure times.
- Study efficient airlines (like Southwest) to apply their best practices.

4. Distance and Air Time

Key Insights:



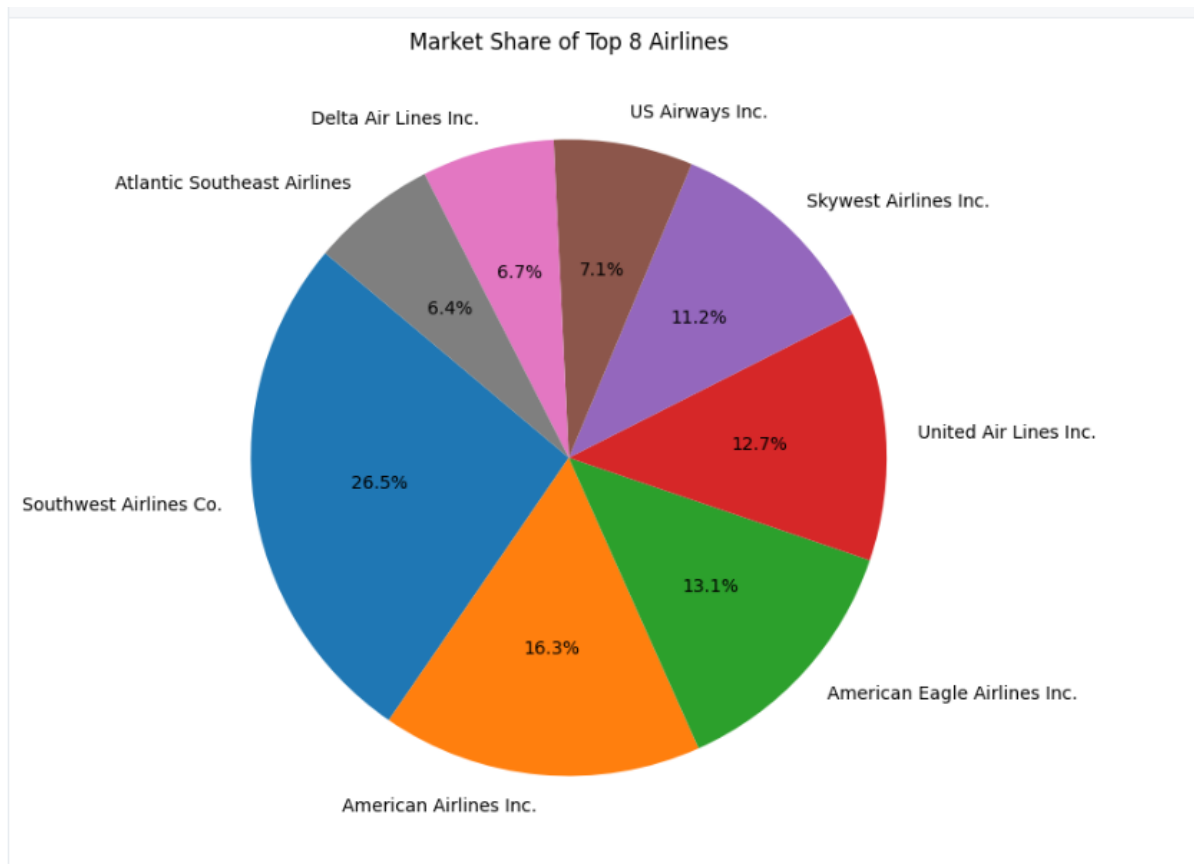
- **Strong Relationship:**
The scatter plot shows a clear positive correlation — longer distances mean longer air times.
- **Data Quality:**
The close pattern of points along a line shows reliable data with no major errors.

Possible Measures:

- Use this relationship to predict flight times more accurately.
- Check future data against this trend to catch possible data entry issues.

5. Market Share and Airport Activity

Key Insights:



- **Largest Market Share:**
Southwest Airlines holds about 26.5% of total flights.
- **Second Place:**
American Airlines holds around 16.3%.
- **Busiest Arrival Airport:**
O'Hare (ORD) again is the busiest destination airport.
- **Distance Distribution:**
Most flights are short-haul (200–300 miles); a smaller group are medium-haul (1,500–2,000 miles).
- **Flight Duration:**
Short flights (50–100 minutes) are most common.

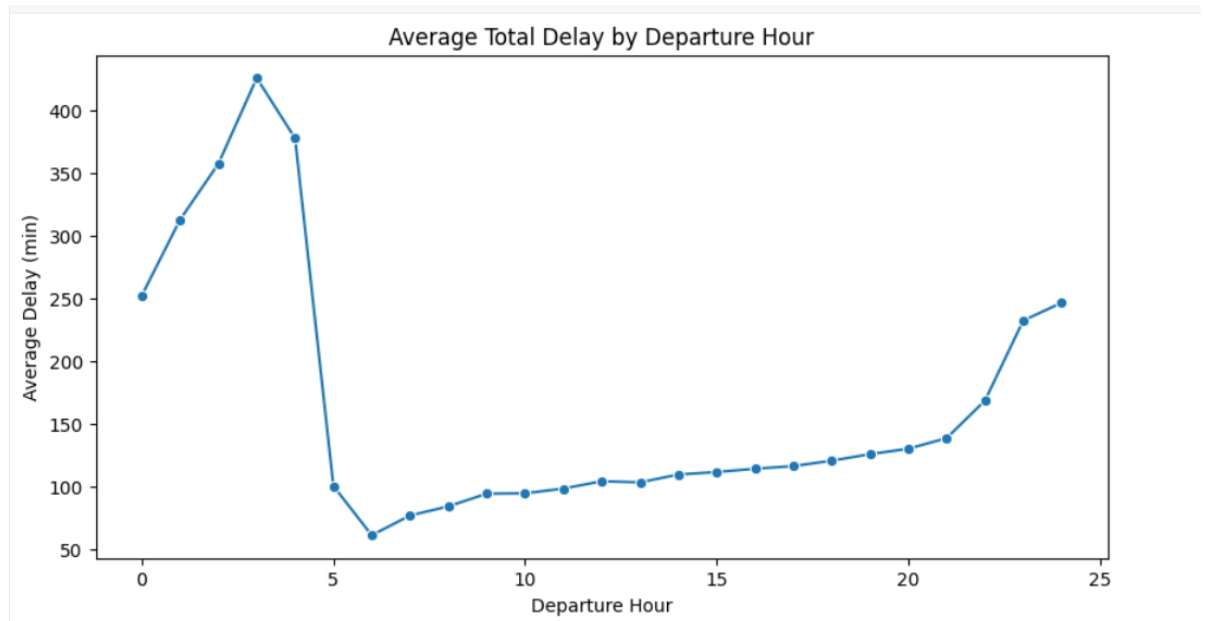
Possible Measures:

- Expand medium-haul routes to balance traffic.
- Improve infrastructure and scheduling at O'Hare.
- Smaller airlines could focus on niche or underserved routes.

6. Delays and Flight Timing

Key Insights:

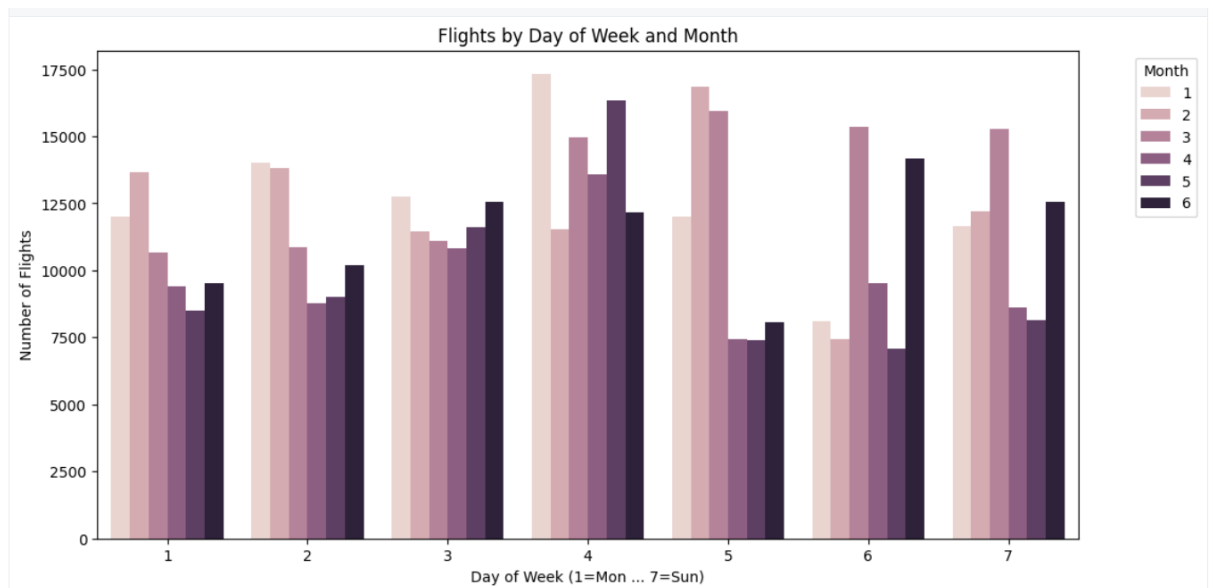
- Peak Delay Times:



Flights at 4 AM have the highest delays (~400 minutes).

Delays drop around 6 AM (60 minutes) and then slowly rise during the day.

- Volume Patterns:



- March (Month 3) has the highest flight activity every week.
- Fridays (Day 5) are generally busy across all months.
- Thursdays (Day 4) show strong activity in April and May.

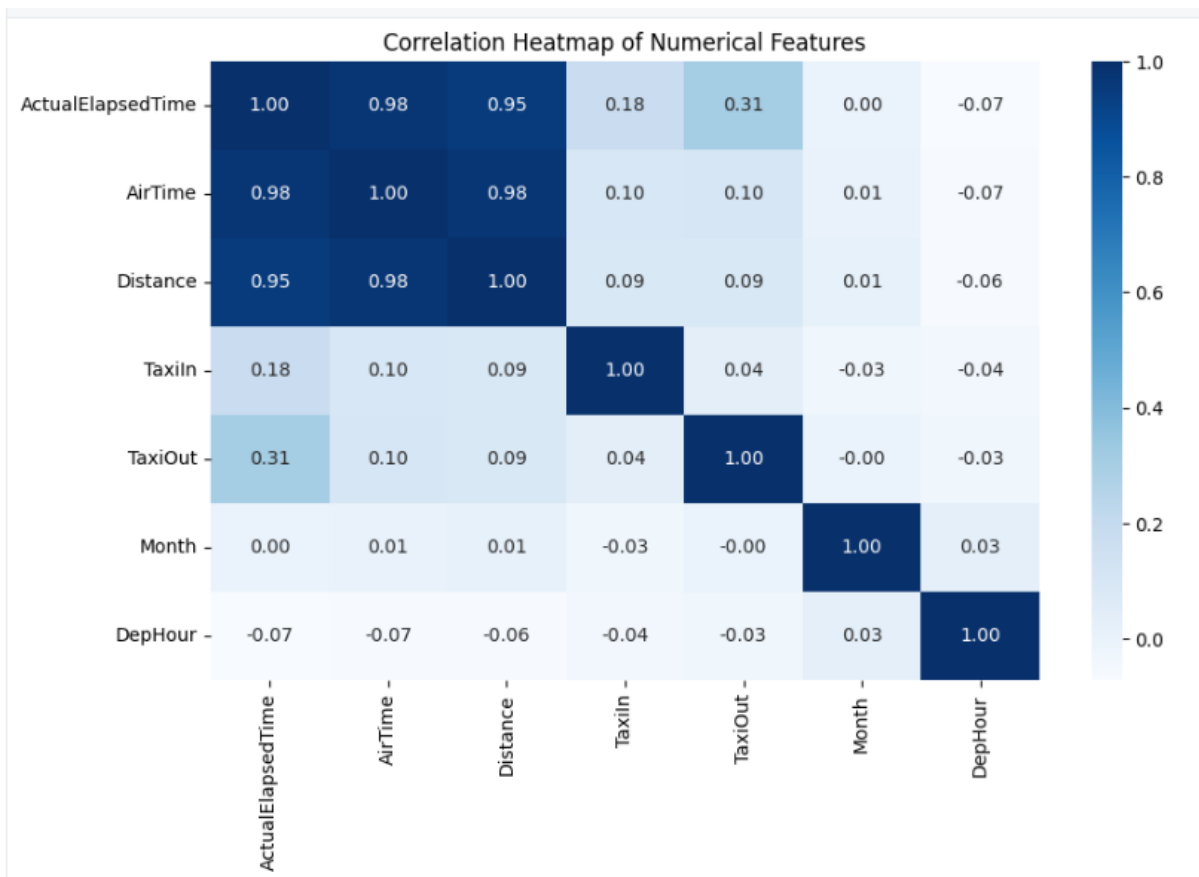
Possible Measures:

- Avoid scheduling many flights between 2–5 AM, when delays are longest.

- Spread flights evenly throughout the day.
- Increase air traffic control and ground support during busy periods (Thursdays, Fridays).

7. Flight Duration and Correlation

Key Insights:



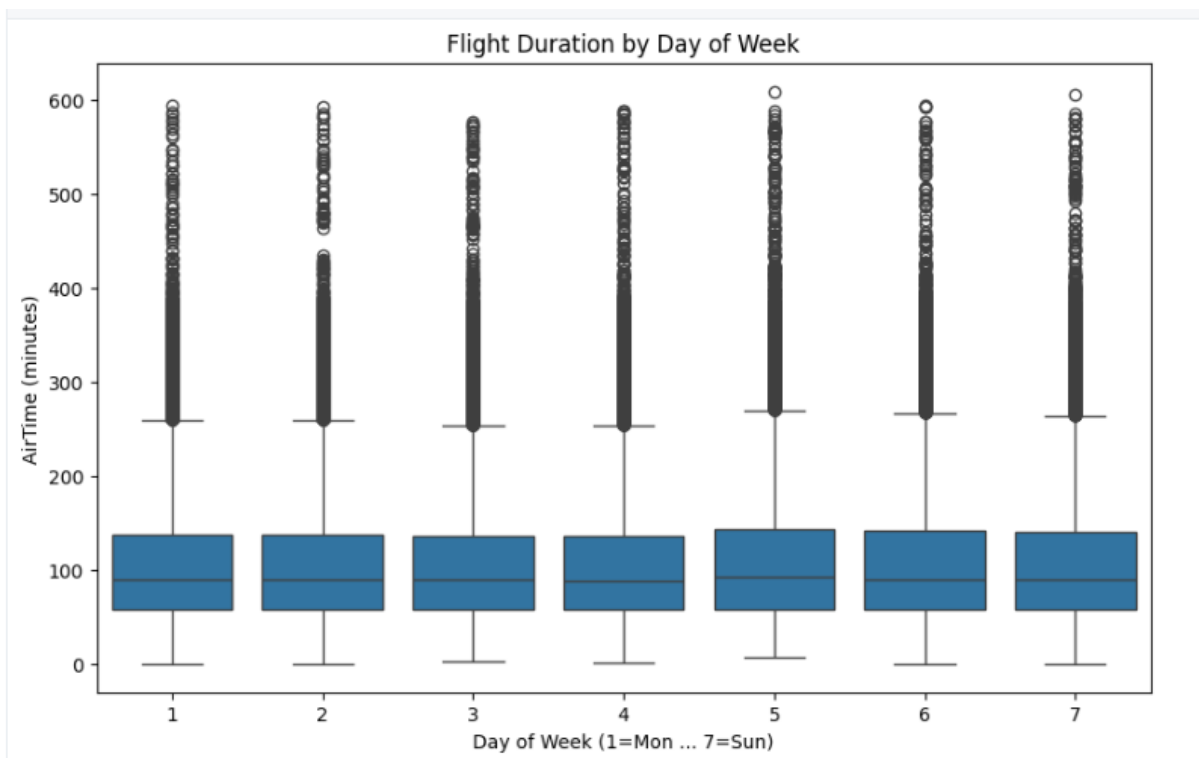
- Longest Average Duration:
JetBlue Airways (~175 minutes).
- Shortest Average Duration:
SkyWest Airlines Inc. (~100 minutes).
- Longest Routes:
HNL–ATL (Honolulu–Atlanta) and ATL–HNL, both over 4,250 miles.
- Strong Correlation:
Flight time depends mainly on distance (high correlation).
- Moderate Correlation:
Small link between TaxiOut time and total duration (0.31).
- Weak Correlation:
Month and departure hour don't affect flight time much.

Possible Measures:

- Use correlation data to forecast travel time and plan connections.
- Review taxiing processes to reduce ground time.
- Analyze long-haul flights (like Hawaii routes) for fuel and crew efficiency.

8. Flight Duration by Day of Week

Key Insights:



- Consistency:
Flight durations are about the same every day (~100 minutes).
- No Major Changes:
Median times and outliers are stable across all days, meaning day of week doesn't affect flight length.

Possible Measures:

- Keep uniform staffing and scheduling across all days — demand is steady.
- Use this stability for predictable crew rotations and maintenance planning.

9. Overall Summary

Key Takeaways:

- Thursdays, evenings, and March are the busiest times for flights.
- Southwest Airlines leads in both flight count and efficiency.
- O'Hare (ORD) is the central hub for both departures and arrivals.
- Most flights are short-haul and consistent across days.
- Delays are time-dependent (especially early morning) but not day-specific.
- Flight data shows strong internal consistency between distance and air time.

Overall Recommendations:

- Adjust schedules to avoid early-morning congestion.
- Focus resources on busy routes, airports, and months.
- Adopt efficiency strategies from low-delay airlines.
- Continue monitoring patterns seasonally for better planning.