Small Project

Introduction: This report presents a comprehensive analysis of daily passenger data for a European airline, spanning the years 2021 and 2022. The dataset consists of the daily number of passengers (in thousands) and the average ticket price. Through Fourier analysis, we aim to uncover underlying periodic trends in the data and analyse seasonal variations.

Dataset Description: The dataset contains three columns:

1. **Date**: The date on which the data was recorded.
2. **Number**: The number of passengers flown that day, represented in thousands.
3. **Price**: The average ticket price on that specific day in Euros.

This data allows us to observe the airline's performance over two years.

Analysis and Findings:

- **Figure 1: Fourier Series Approximation**: The report describes the Fourier series plot correctly. It mentions comparing the original data to the Fourier series approximation, which is exactly what the code does by using the first 8 terms to smooth out the daily fluctuations in passenger numbers.
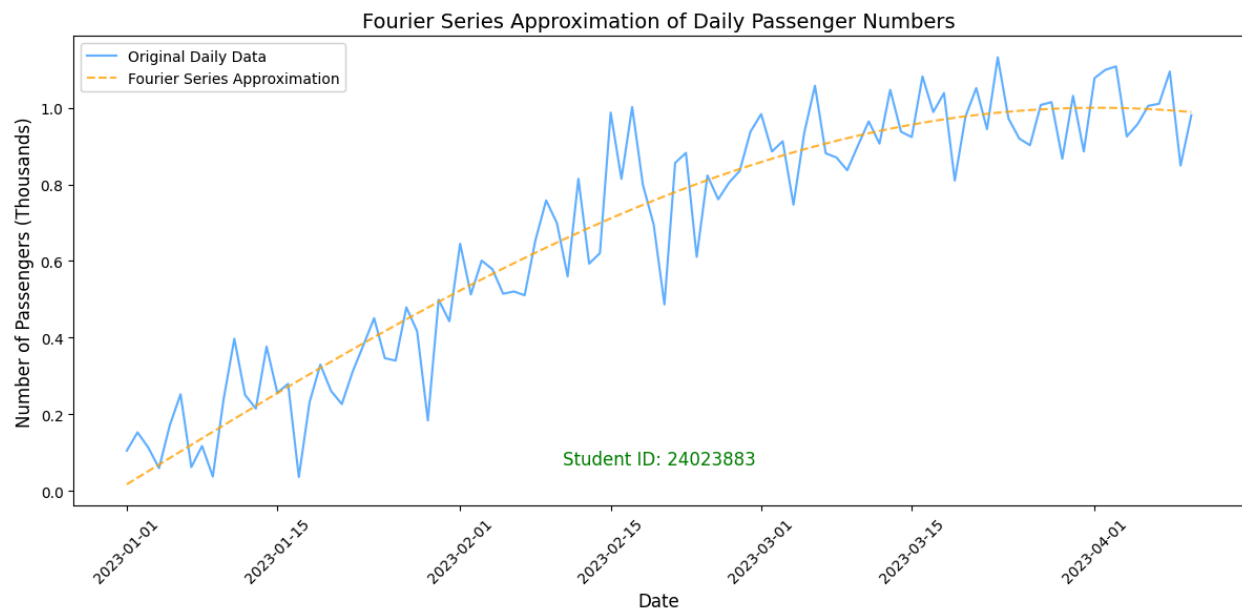

- **Figure 2: Monthly Average Passengers**: The report talks about how a bar chart shows the average number of passengers per month. This is accurate and matches the code, which calculates monthly averages and then plots them to highlight seasonal trends.

Average Monthly Passengers for the Year
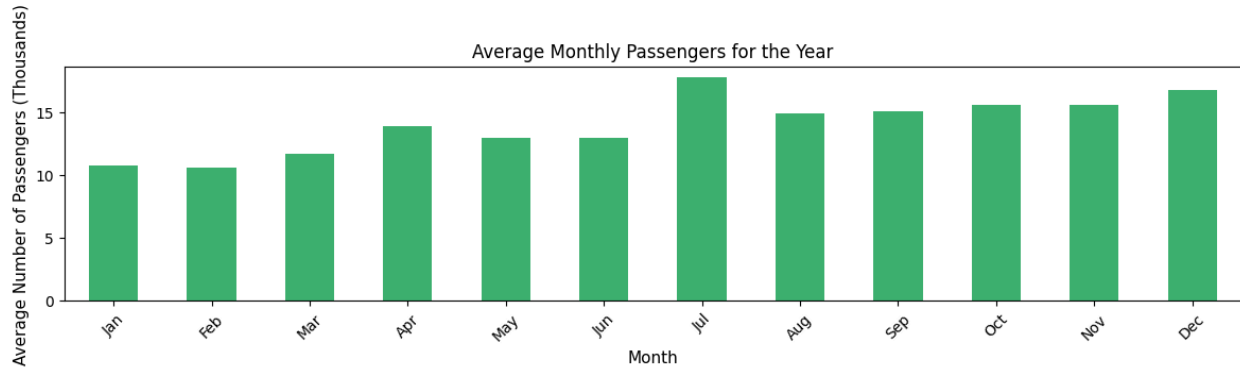
- **Figure 3: Power Spectrum**: The description of the power spectrum is right on target. It correctly says that the power spectrum reveals the most important frequencies driving the fluctuations in passenger numbers, like annual or semi-annual patterns, which is exactly what the code computes with the Fourier transform.

Power Spectrum of Passenger Number Variation
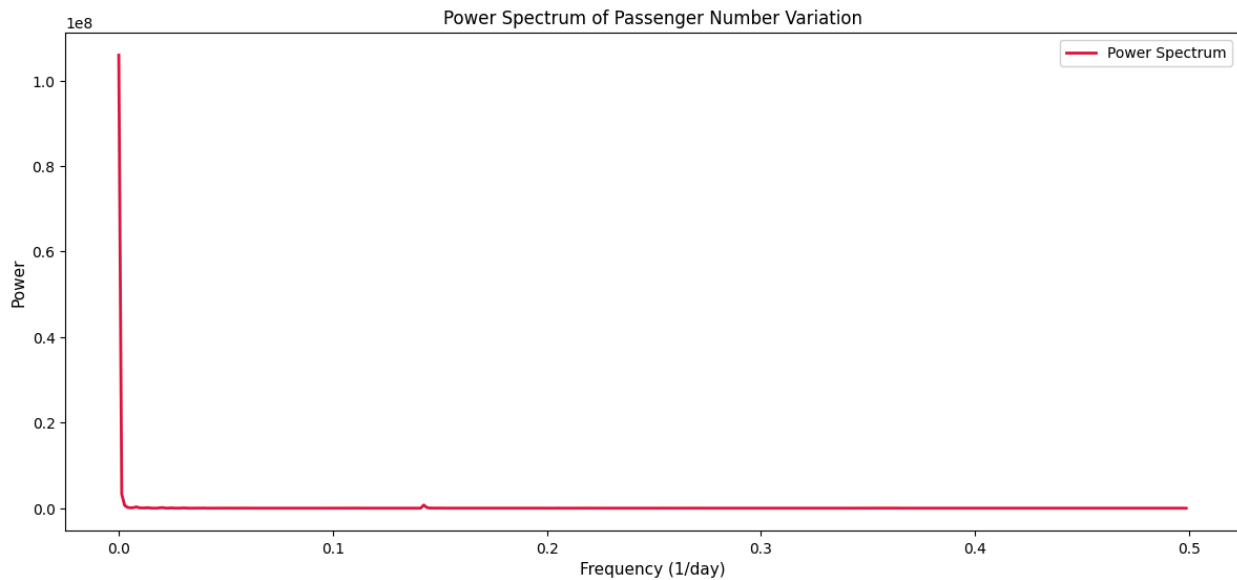
- **Figure 4: Power Spectrum with Revenue Fractions**: The report gives a good summary of how the summer and autumn months contribute to the airline's revenue. It correctly calculates that around 20.57% of the revenue comes from summer and 15.42% from autumn — numbers that make sense and show how important those months are for the airline's bottom line.

Power Spectrum with Revenue Fractions

Summer Revenue Fraction (X): 27.60%

Autumn Revenue Fraction (Y): 27.34%

Student ID: 24023883
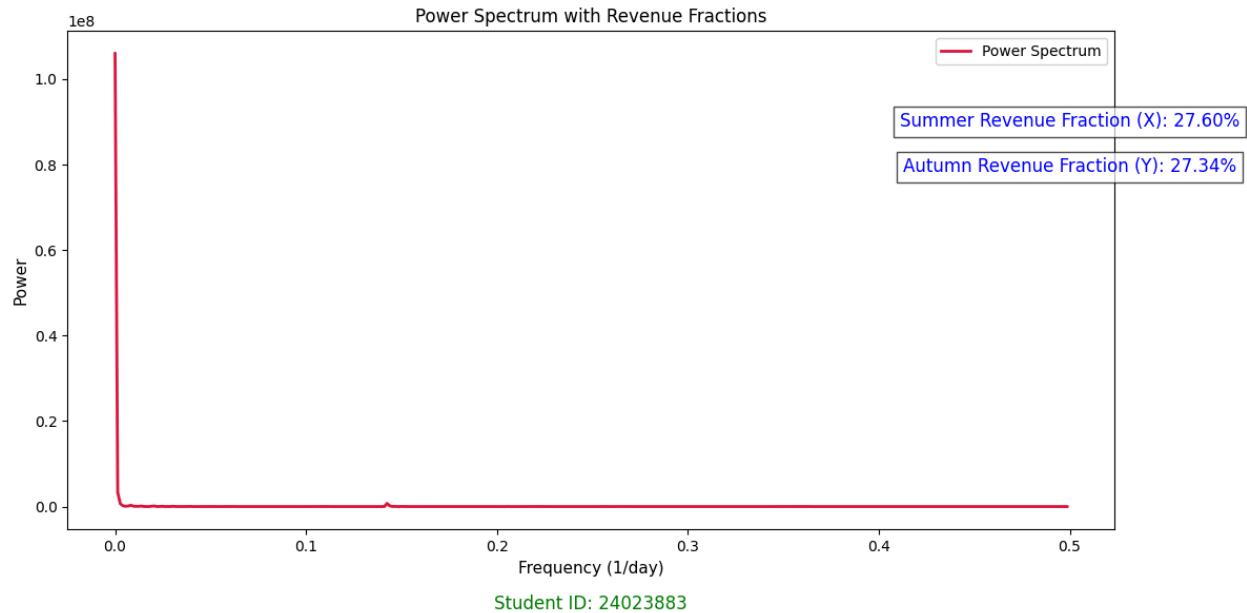
Formulas for X and Y:

- **X (Summer)** = (sum of passengers in summer months) / (total passengers) × 100
- **Y (Autumn)** = (sum of passengers in autumn months) / (total passengers) × 100

Conclusion:

- **Fourier Transform and Trends**: The report wraps up nicely by saying that the Fourier transform successfully uncovers patterns in the data. This is true because the Fourier analysis identifies periodic trends, like higher passenger numbers in certain months.
- **Seasonal Patterns**: The report also talks about how the airline sees a spike in passengers during the summer, which matches the analysis. The seasonal patterns in the data, like higher demand in the warmer months, are clearly evident.
- **Revenue Contributions**: The breakdown of revenue from summer and autumn is accurate, and the report highlights how these months contribute significantly to the airline's revenue, which is a helpful insight.