Exploring Insights from Airlines Data Analysis using Qlik

1. INTRODUCTION

1.1 Overview:

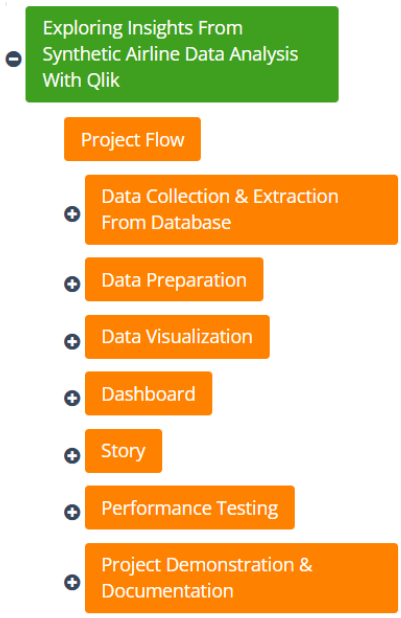
This project, "Exploring Insights from Synthetic Airline Data Analysis with Qlik," utilizes synthetic airline data to derive valuable insights and support decision-making for airlines, airports, and related stakeholders. The data encompasses various aspects of airline operations, including flight schedules, passenger demographics, ticket sales, and performance metrics. By leveraging Qlik's powerful analytical and visualization capabilities, we aim to uncover patterns, trends, and correlations within this data to address key business challenges.

1.2 Purpose:

The primary purpose of this project is to demonstrate how Qlik can be used to analyze and visualize synthetic airline data to achieve specific business objectives:

- **Revenue Optimization**: Analyzing historical ticket sales to identify peak travel times, popular destinations, and effective pricing strategies.
- **Operational Efficiency**: Enhancing airport operational efficiency by identifying bottlenecks and predicting peak traffic periods.
- **Customer Experience Enhancement**: Improving passenger experience by understanding customer preferences and pain points through sentiment analysis of feedback data.

1.3 Technical Architecture:



2. Define Problem / Problem Understanding

2.1 Specify the Business Problem:

The airline industry faces several challenges that can be addressed through data analysis:

1. **Revenue Optimization**: Airlines need to maximize profitability by identifying optimal pricing strategies and understanding sales trends.
2. **Operational Efficiency**: Airports must streamline operations to handle passenger flows and luggage handling effectively.
3. **Customer Experience**: Airlines aim to enhance customer satisfaction and loyalty by addressing service quality issues and personalizing experiences.

2.2 Business Requirements:

To address these problems, the following business requirements are identified:

- Detailed analysis of ticket sales data to identify revenue opportunities.
- Assessment of flight schedules and passenger flows to improve operational efficiency.
- Sentiment analysis of customer feedback to enhance service quality and customer experience.

2.3 Literature Survey:

A review of existing literature highlights the importance of data analytics in the airline industry. Previous studies have shown how data-driven decision-making can lead to significant improvements in revenue management, operational efficiency, and customer satisfaction. Here are a few relevant studies:

- **"Airline Data Analytics: An Overview" (Journal of Air Transport Management)**: This study provides a comprehensive overview of how airlines use data analytics to improve various aspects of their operations. It discusses the role of data in optimizing flight schedules, enhancing customer experience, and managing revenue. The findings emphasize that airlines leveraging data analytics can achieve significant competitive advantages.
- **"Predictive Analytics in Airline Operations: A Case Study" (Journal of Airline and Airport Management)**: This article explores the use of predictive analytics in airline operations. It highlights how airlines can use historical data to forecast demand, predict maintenance needs, and manage crew scheduling. The study demonstrates that predictive analytics can lead to more efficient operations and cost savings.

- **"Improving Airline Customer Loyalty Through Data Analysis" (Journal of Travel Research)**: This research focuses on how airlines can use customer data to enhance loyalty programs. By analyzing customer preferences and travel patterns, airlines can tailor their loyalty programs to better meet customer needs. The study shows that data-driven loyalty programs can increase customer satisfaction and retention.
- **"Revenue Management in Airlines: Data-Driven Approaches" (Annals of Operations Research)**: This paper discusses various data-driven approaches to revenue management in the airline industry. It examines how airlines use data to set dynamic pricing, manage seat inventory, and forecast demand. The findings suggest that data-driven revenue management strategies can significantly increase profitability.

These studies collectively illustrate the transformative potential of data analytics in the airline industry. They provide valuable insights into how airlines can leverage data to optimize operations, enhance customer experience, and drive revenue growth.

3. Data Collection

3.1 Collect the Dataset:

The dataset used for this project is sourced from Kaggle, specifically the "Airlines " dataset. This dataset includes detailed information on Airports and passengers across various states and Union Territories in India. The key features of the dataset include:

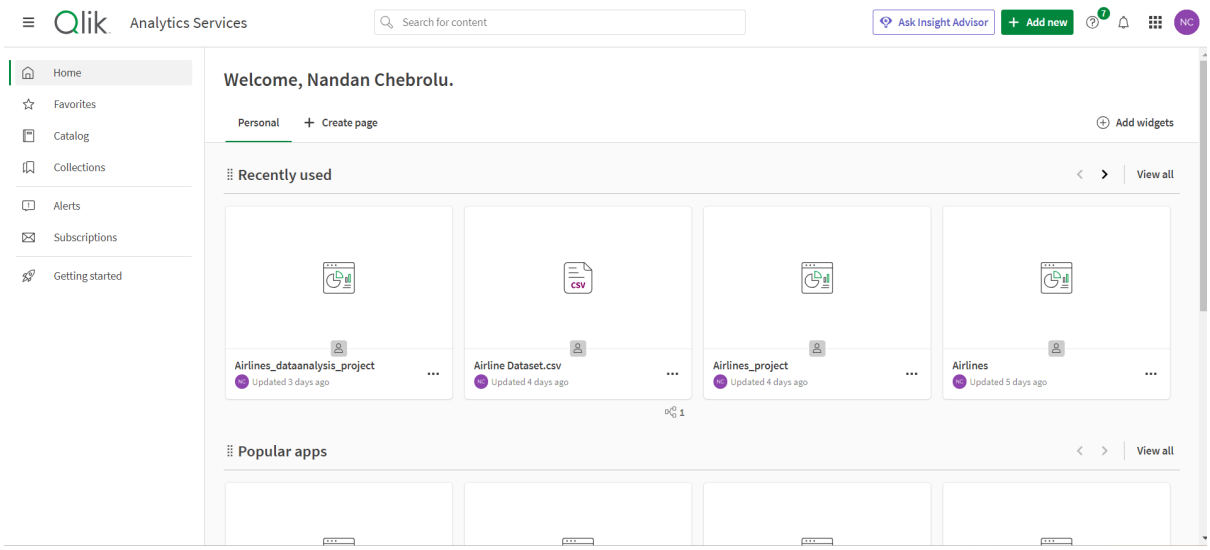
1. **Passenger ID**: A unique identifier for each passenger.
2. **First Name**: The first name of the passenger.
3. **Last Name**: The last name of the passenger.
4. **Gender**: The gender of the passenger (e.g., Male, Female, Other).
5. **Age**: The age of the passenger.
6. **Nationality**: The country of citizenship of the passenger.
7. **Airport Name**: The name of the airport from which the passenger departs or arrives.
8. **Airport Country Code**: The country code where the airport is located.
9. **Country Name**: The name of the country where the airport is located.
10. **Airport Continent**: The continent where the airport is located.
11. **Continents**: Continent of departure or arrival.
12. **Departure Date**: The date when the flight departs.
13. **Arrival Airport**: The airport where the flight arrives.
14. **Pilot Name**: The name of the pilot operating the flight.
15. **Flight Status**: The current status of the flight (e.g., On Time, Delayed, Cancelled).

3.2 Connect Data with Qlik Sense

To analyze the dataset using Qlik Sense, follow these steps:

1. **Extract the Dataset:**
   - After downloading the dataset, extract the files to a specific location on your device.
2. **Create a New Qlik Sense App:**
   - Open Qlik Sense and create a new app named "Exploring Insights from Synthetic Airline Data Analysis."
   - Open the newly created app.
3. **Add Data to Qlik Sense:**
   - Click on "Data Manager."
   - Click on "Add data" and select the dataset file from the location where it was extracted.
4. **Data Integration:**
   - Ensure that all relevant fields from the dataset are correctly mapped in Qlik Sense.
   - Check for any inconsistencies or missing values in the dataset and clean the data if necessary.
5. **Data Mapping:**
   - Map fields such as Passenger ID, First Name, Last Name, Gender, Age, Nationality, Airport Name, Airport Country Code, Country Name, Airport Continent, Departure Date, Arrival Airport, Pilot Name, Flight Status, and Age Group to ensure they are correctly recognized by Qlik Sense for analysis.

By following these steps, you can successfully integrate and prepare your synthetic airline dataset in Qlik Sense for comprehensive analysis and visualization.



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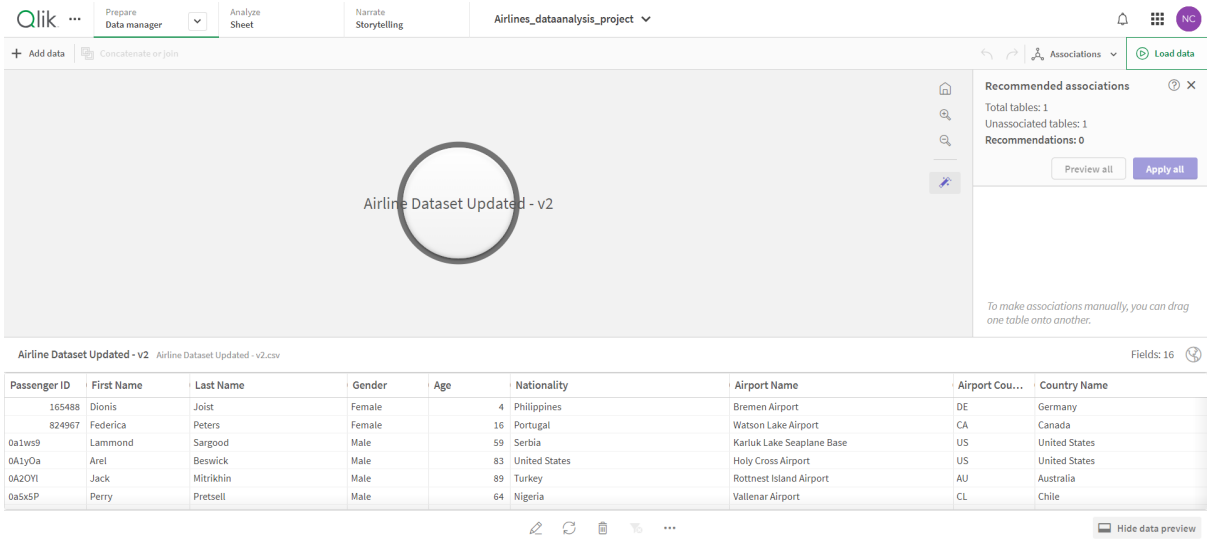
➤ we need to click on add data on left side top corner .



Passenger ID	First Name	Last Name	Gender	Age	Nationality	Airport Name	Airport Cou...	Country Name
165488	Dionis	Joist	Female	4	Philippines	Bremen Airport	DE	Germany
824967	Federica	Peters	Female	16	Portugal	Watson Lake Airport	CA	Canada
0a1ws9	Lammond	Sargood	Male	59	Serbia	Karluk Lake Seaplane Base	US	United States
0A1yOa	Arel	Beswick	Male	83	United States	Holy Cross Airport	US	United States
0A2OYl	Jack	Mitrikhin	Male	89	Turkey	Rottnest Island Airport	AU	Australia
0a5x5P	Perry	Pretsell	Male	64	Nigeria	Vallenar Airport	CL	Chile

4. Data Preparation

4.1 Prepare the Data for Visualization:

Clean the Data

- **Remove Inconsistencies:**
  - After downloading the dataset and converting it from CSV to Excel format, inspect the data for inconsistencies and anomalies.
  - Rectify any discrepancies in the data entries to ensure uniformity.
- **Handle Missing Values:**
  - Identify and address any missing values in the dataset.
  - Fill in missing data points with appropriate values or remove records with substantial missing information.

Transform the Data

- **Format for Analysis:**
  - Ensure the data is in a suitable format for analysis and visualization.
  - Check that dates, times, and numerical values are correctly formatted.
  - Ensure all fields are appropriately labeled.

4.2 Aggregate and Categorize Data

- **Remove Extra Columns:**
  - Identify and eliminate unnecessary columns such as 'others' and 'average' that are not relevant to the project's analysis.
  - During the data addition process in Qlik Sense, select only the columns

required for analysis and discard extraneous ones.

- **Remove 'Total' Rows:**
  - Identify rows that contain "total" values, which are direct additions of each column.
  - Remove these rows from the dataset to ensure that aggregate data does not skew the analysis.
- **Re-upload Cleaned Data:**
  - After cleaning the dataset by removing unwanted columns and rows, re-upload the cleaned files to Qlik Sense.

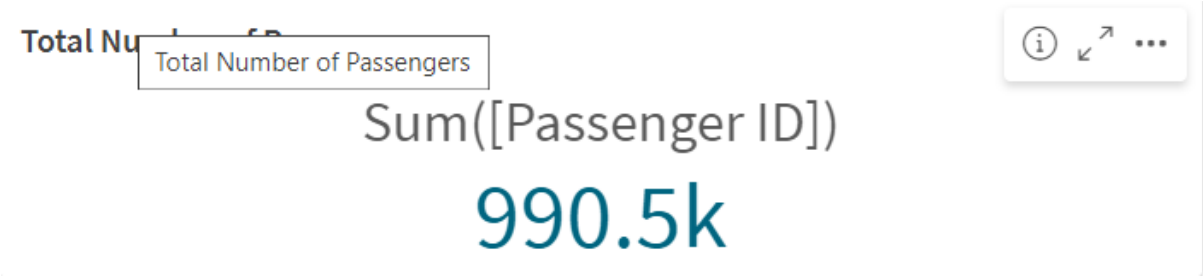
4.3 Data Association

- **Qlik Sense Recommendations:**
  - Utilize Qlik Sense's recommendations for data associations to link related data fields across different tables.
  - Ensure that the data is properly connected and ready for comprehensive analysis.

5.Data Visualizations:

5.1 Key Performance Indicators (KPIs):

- **Total Number of Airports:**
  - Key Performance Indicator (KPI) visualizations were created to display the total number of Airports.
  - This KPI provides a clear snapshot of the overall airports count, helping to understand the scale number of airports.



5.2 Bar Graph:

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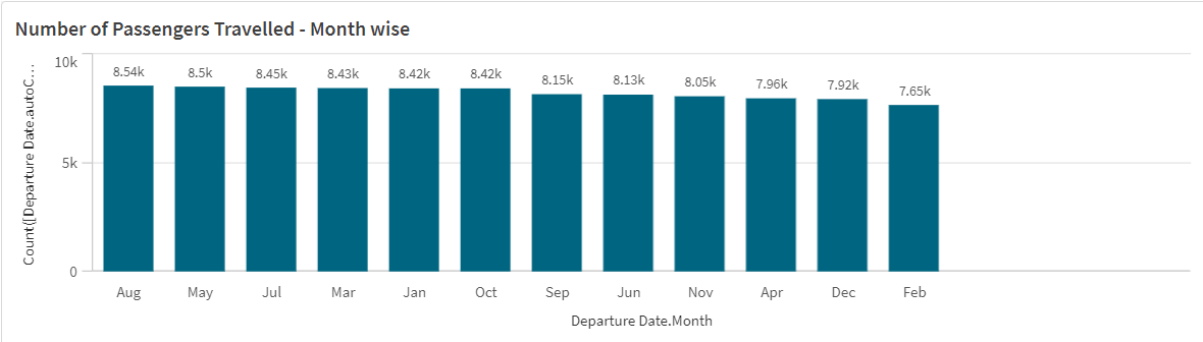
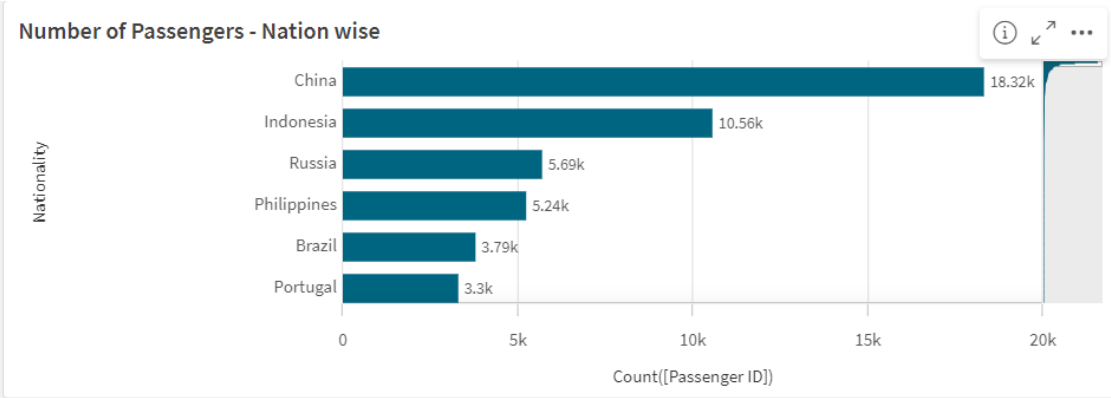
  - **Total Number of Passengers:**Another KPI visualization was created to highlight the total number of passengers travelled in aeroplane.
  - This KPI underscores the provides a clear overview of the total number of passengers.

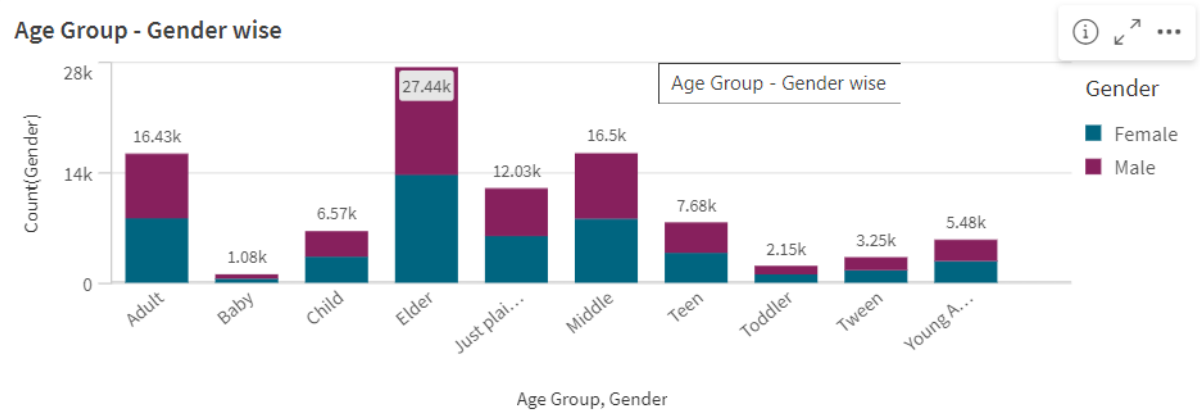


- **Number of Passengers Travelled - Month-wise**
  - The bar chart displays the count of passengers who have traveled each month. Months range from August to February. The y-axis shows the number of passengers, with values ranging from 0 to 10K. Some months have more than 8K passengers, while others have fewer. This visualization is relevant for analyzing seasonal travel patterns or assessing business performance in transportation services over these months.
  - **Insight**: Identifies seasonal travel patterns and business performance trends in transportation services across the specified months.
  - This bar chart helps stakeholders understand fluctuations in passenger travel volumes, enabling them to make informed decisions regarding capacity planning, marketing strategies, and resource allocation based on observed trends.



- **Number of Passengers Travelled - Nation wise**:
  - The horizontal bar chart displays the count of passengers by nationality.
  - The countries listed are China, Indonesia, Russia, Philippines, Brazil, and Portugal. China has the highest number of passengers (approximately 13.2k), followed by Indonesia (10.5k), Russia (5.7k), Philippines (5.2k), Brazil, and Portugal (both around 3.3k).
  - This visualization is useful for understanding passenger demographics and travel patterns.

5.3 Stacked bar:



- **Age Group - Gender wise**:
  - The horizontal bar chart compares the count of females and males across different age groups.
  - The age groups listed are Adult, Baby, Child, Elderly, Infant, Middle Age, Teen, Toddler, and Young Adult.
  - The highest count is in the Adult category for females (approximately 27.4k), followed by males (around 16.4k). This visualization is relevant for demographic studies or marketing analysis.

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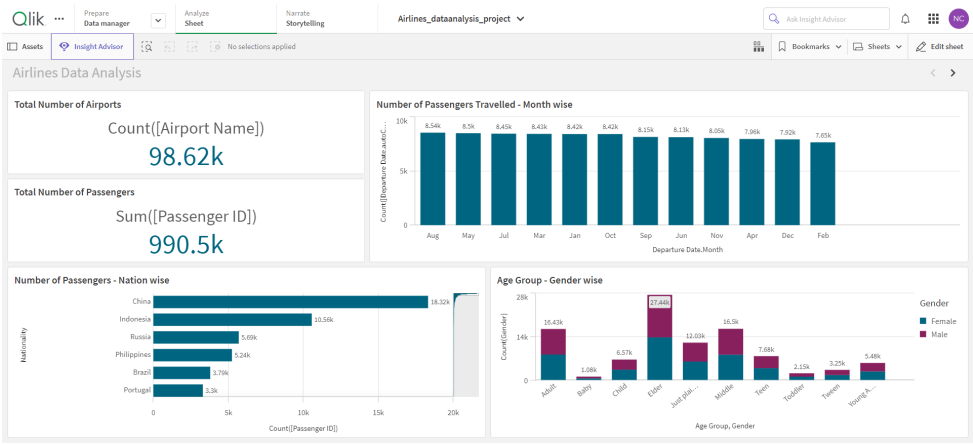
6.Dashboard:



1. **Total Number of Airports:** The dashboard displays a key performance indicator (KPI) showing the total count of airports, which stands at approximately 98.62k.
2. **Total Number of Passengers:** Another KPI indicates the total number of passengers, which is approximately 990.5k.
3. **Number of Passengers - Nation wise:**
   - This horizontal bar graph provides insights into passenger distribution by nationality. The bars represent different countries.
   - China has the highest number of passengers (around 13.2k), followed by Indonesia (10.5k), Russia (5.7k), Philippines (5.2k), Brazil, and Portugal (both around 3.3k).
4. **Number of Passengers Travelled - Month wise:**
   - A vertical bar graph shows passenger counts across different months.
   - August (Aug) and January (Jan) have the highest passenger numbers, while other months exhibit fluctuations.
5. **Age Group - Gender wise:**
   - This stacked bar chart categorizes passengers by age group and further breaks down the distribution by gender.
   - The Adult category has the highest count for both females (approximately 27.4k) and males (around 16.4k).

7. Report

7.1 Key Findings

1. **Total Number of Airports**:
   - The total number of airports is 98.62k. This indicates a wide network of airports that are part of the analysis.
2. **Total Number of Passengers**:
   - The total number of passengers is 990.5k, suggesting a high volume of

travel activity captured in the dataset.

3. **Number of Passengers Travelled - Month-wise**:
    - Passenger travel peaks during the months of August, May, and July, with each month seeing more than 8.4k passengers.
    - Other months have slightly lower passenger counts, ranging from 7.65k in February to 8.15k in September.
4. **Number of Passengers - Nation-wise**:
    - China leads significantly in passenger numbers with 18.32k passengers.
    - Indonesia follows with 10.56k passengers, and other notable nations include Russia (5.69k), Philippines (5.24k), Brazil (3.79k), and Portugal (3.3k).
5. **Age Group - Gender-wise**:
    - The elder age group (27.44k) has the highest travel frequency.
    - Adults (16.43k) and the middle-aged group (16.5k) also show high travel activity.
    - Noticeable gender differences exist within age groups, particularly in the elder and middle-aged categories where males are significantly more frequent travelers.

7.2 Recommendations

1. **Resource Allocation**:
    - Allocate additional resources during peak travel months (August, May, and July) to handle the increased passenger flow efficiently.
    - Ensure sufficient staffing and operational readiness at airports to accommodate high passenger volumes.
2. **Marketing Strategies**:
    - Develop targeted marketing campaigns for nations with lower passenger numbers (e.g., Brazil, Portugal) to boost travel interest and diversify passenger sources.
    - Explore partnerships or promotions to attract more passengers from these countries.
3. **Targeted Campaigns**:
    - Develop age-specific marketing campaigns, especially targeting the elder, adult, and middle-aged groups, considering their high travel frequency.
    - Tailor marketing messages and services to address the preferences and needs of different gender demographics within these age groups.

7.3 Actionable Insights

1. **Staffing and Scheduling**:
    - Prepare for increased demand in peak months by adjusting staffing

levels, ensuring equipment readiness, and optimizing scheduling to maintain efficient airport operations.

2. **Market Expansion**:
    - Investigate why China dominates passenger numbers and consider replicating successful strategies in other nations.
    - Implement marketing efforts and promotions to attract passengers from countries with lower travel numbers.
3. **Demographic Segmentation**:
    - Use demographic insights to develop targeted marketing campaigns for specific age groups, considering gender preferences and travel behaviors.
    - Personalize services and offers to better cater to the needs of the elder, adult, and middle-aged passengers, ensuring a positive travel experience that fosters loyalty.

By leveraging these key findings, recommendations, and actionable insights, airlines and airports can enhance their operational efficiency, optimize marketing efforts, and improve overall customer satisfaction.

8. Performance Testing:

8.1 Application Of Data Filters:

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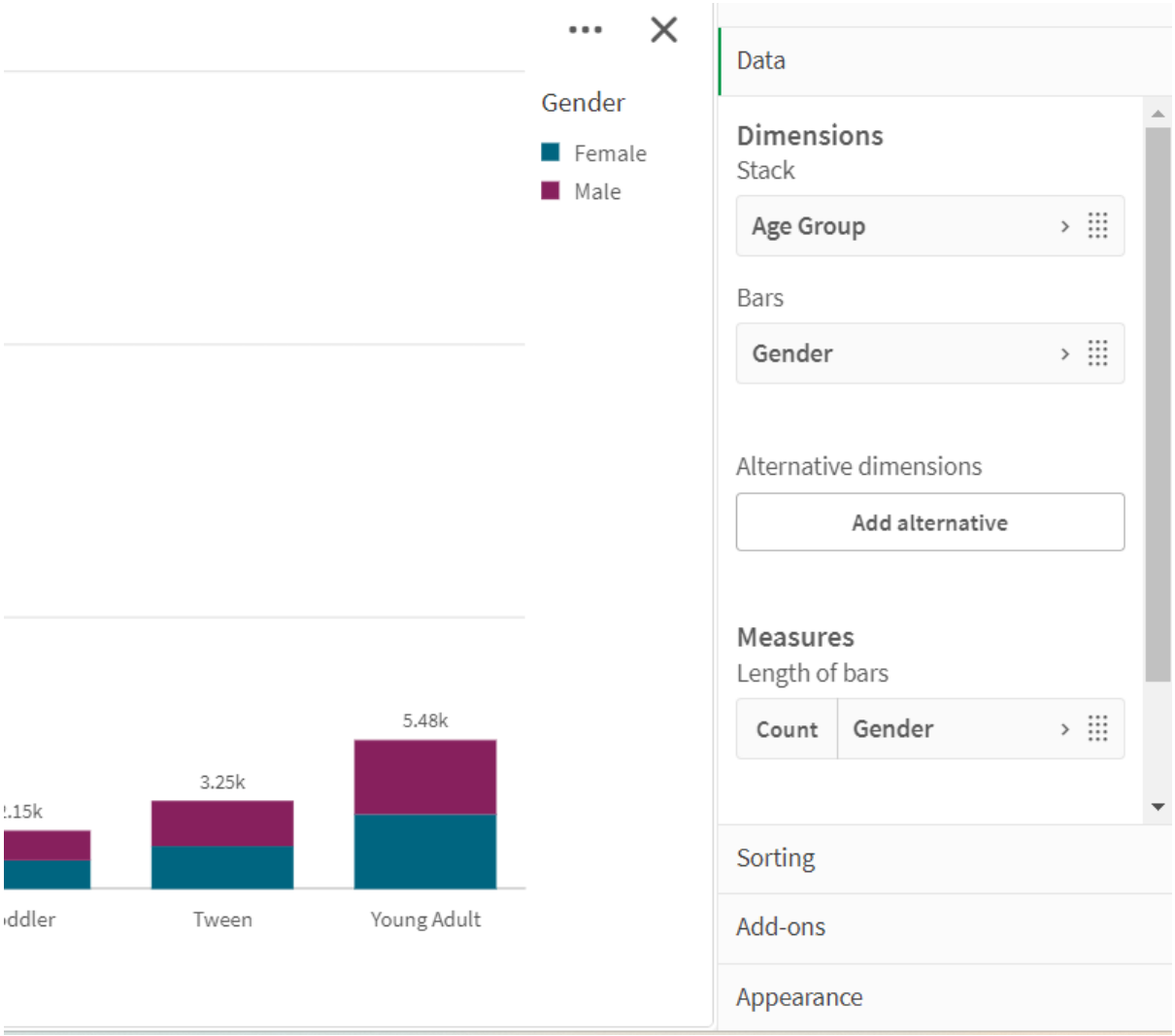

8.2 Calculated Fields:

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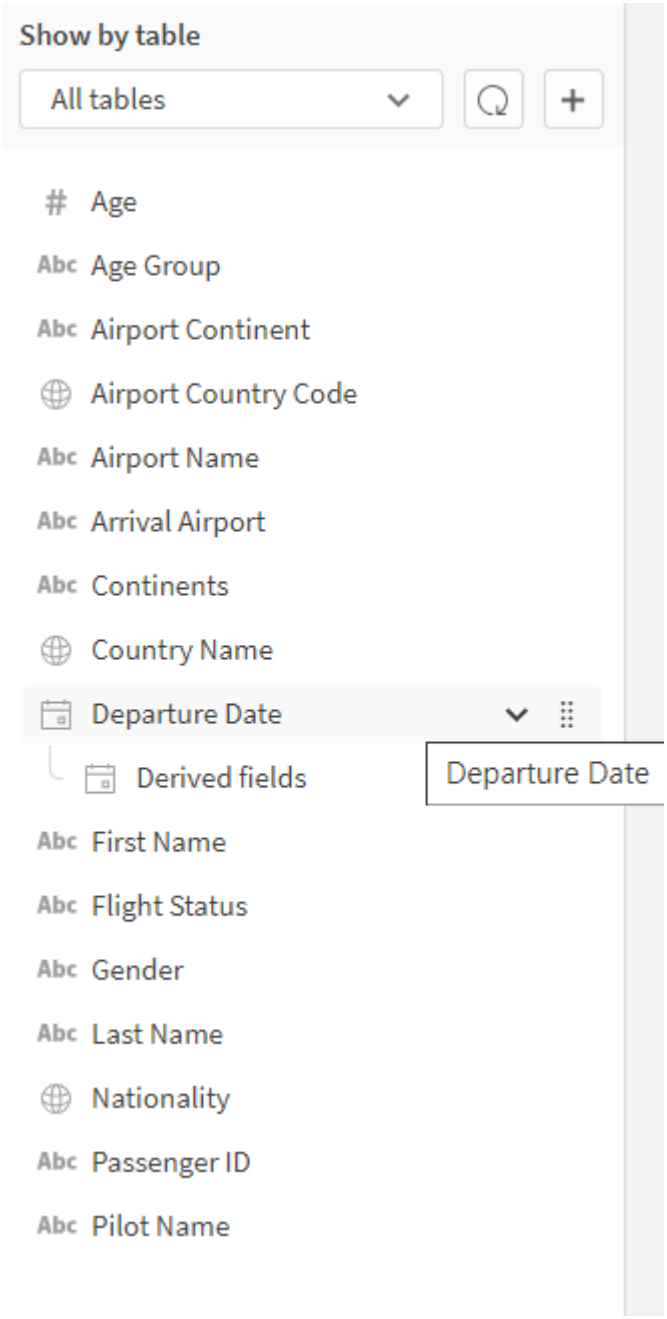

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0A1yOa	Arel	Beswick	Male	83	United States	Holy Cross Airport	US
0A2OYl	Jack	Mitrikhin	Male	89	Turkey	Rottnest Island Airp	AU
0a5x5P	Perry	Pretsell	Male	64	Nigeria	Vallenar Airport	CL

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By

CHEBROLU NANDAN