

# Exploring Insights From Synthetic Airline Data Analysis With Qlik

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# Exploring Insights From Synthetic Airline Data Analysis With Qlik

1. **INTRODUCTION:** we delve into the realm of synthetic airline data analysis, aiming to extract valuable insights and trends from meticulously crafted datasets. The primary purpose of this exploration is to uncover hidden patterns, enhance decision-making processes, and ultimately optimize various aspects of the airline industry. Synthetic data plays a pivotal role in this analysis, offering a unique set of advantages that traditional datasets may not provide. One of the key reasons for utilizing synthetic data in this context is privacy preservation. By generating artificial data that mirrors the characteristics of real data without containing any sensitive information, organizations can conduct in-depth analyses without compromising individual privacy. Moreover, synthetic data enables analysts to model a wide range of scenarios, facilitating the exploration of diverse what-if situations and potential outcomes. This versatility empowers stakeholders to make informed decisions based on a comprehensive understanding of various possibilities, ultimately leading to more robust strategies and solutions within the airline industry.

1.1. **OVERVIEW:** Synthetic data refers to artificially generated data that mimics the characteristics and statistical properties of real-world data without containing any actual information from individuals or entities. This type of data is created using various methodologies to simulate realistic datasets for analysis and research purposes. In this exploration of synthetic airline data analysis, we aim to uncover patterns and insights that can help airlines optimize their operations and enhance the passenger experience. Through advanced data analytics techniques. By this project we can visualize the high end dataset into simple visualization by taking the key aspects.

**Passenger Information:** This includes demographic details, travel preferences, booking history, and other relevant information that can provide insights into passenger behavior and preferences.

**Flight Schedules:** Data regarding flight routes, timings, frequencies, and aircraft assignments are collected to analyze operational efficiency and optimize scheduling.

- First Name - First name of the passenger
- Last Name - Last name of the passenger
- Gender - Gender of the passenger
- Age - Age of the passenger
- Nationality - Nationality of the passenger
- Airport Name - Name of the airport where the passenger boarded
- Airport Country Code - Country code of the airport's location

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- Country Name - Name of the country the airport is located in
- Airport Continent - Continent where the airport is situated
- Continents - Continents involved in the flight route
- Departure Date - Date when the flight departed etc.

1.2. **PURPOSE:** The aviation industry is a complex and dynamic sector that relies heavily on data to drive efficiency, safety, and customer satisfaction. Analyzing airline data can provide valuable insights into various aspects such as flight operations, passenger behavior, revenue management, and maintenance schedules. However, working with real-world airline data often poses challenges due to its sensitivity and privacy concerns. This is where synthetic airline data, combined with powerful data visualization and analysis tools like Qlik, becomes invaluable.

Qlik is a leading data analytics and business intelligence platform that offers robust tools for data visualization, exploration, and storytelling. By leveraging Qlik for synthetic airline data analysis, we aim to achieve the following purposes:

1. **Enhanced Data Visualization:** Qlik provides intuitive and interactive dashboards that enable users to visualize complex data sets easily. With synthetic airline data, Qlik can help stakeholders see patterns and trends that are not immediately obvious in raw data.
2. **Informed Decision-Making:** Through Qlik's advanced analytics capabilities, users can perform detailed analyses of synthetic data to derive actionable insights. This helps airline management make informed decisions regarding operations, marketing, and strategic planning.
3. **Operational Efficiency:** By analyzing synthetic data on flight schedules, delays, and turnaround times, Qlik can help identify bottlenecks and inefficiencies in flight operations. This leads to improved scheduling, resource allocation, and overall operational efficiency.
4. **Customer Insights:** Qlik's ability to analyze passenger behavior and preferences using synthetic data allows airlines to tailor their services and marketing strategies effectively. Understanding booking patterns and demographic trends

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## 1.3. TECHNICAL ARCHITECTURE:



The technical architecture we can easily analyse and visualize the vast amount of data into an easy and understandable format. The first thing we should collect the required data from the different types of sources like Kaggle, Data-warehouse, excel, SQL etc. And this collected data should be loaded into the Qlik cloud analytic service but before loading the data we have to analyze the data properly what the data is containing after loading the data in Qlik we have to pre-process the data that means we have to clean the data like null values or dividing the rows and columns etc. After completion of pre-process we have to go to sheet and then start the visualization process according to the need. Completion of visualization process the Qlik dashboard gets ready and the access should be given to the administration or organisation to access.

### Data Loading and Transformation:

- **Qlik Data Load Editor:** The Data Load Editor in Qlik Sense or QlikView is used to script the loading and transformation of synthetic data. This includes data cleaning, merging datasets, and creating necessary associations between tables.
- **Data Transformation:** Key transformations involve normalizing data formats,

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handling missing values, and creating derived metrics. For instance, calculating flight delays, passenger load factors, and maintenance intervals.

**2. DEFINE PROBLEM / PROBLEM UNDERSTANDING :** The aviation industry is a high-stakes field that relies on intricate data analysis to maintain and improve its operations. From managing flight schedules and optimizing revenue to ensuring passenger satisfaction and safety, airlines deal with enormous amounts of data daily. However, using real-world data for analysis can be fraught with privacy issues and regulatory constraints. This is where synthetic data becomes invaluable.

**2.1. SPECIFY THE BUSINESS PROBLEM:** The primary objective is to utilize synthetic airline data within Qlik to uncover insights that can help airlines improve various aspects of their operations. Specifically, we aim to address the following areas:

- Airlines need to minimize delays and optimize turnaround times.
- Understanding passenger preferences and behavior is critical for enhancing customer satisfaction and loyalty.
- Airlines must optimize their pricing strategies to balance supply and demand effectively.
- Ensuring the safety and reliability of aircraft through effective maintenance is paramount.

**2.2. BUSINESS REQUIREMENTS:** Will guide the development and implementation of analytical processes, ensuring that the analysis aligns with organizational goals and delivers valuable outcomes.

- Use synthetic data to identify patterns in flight schedules, delays, and turnaround times. Determine bottlenecks and areas for improvement.
- Analyze booking trends, travel preferences, and demographic data to customize services and marketing strategies.
- Examine maintenance records, incident reports, and aircraft utilization data to predict maintenance needs and improve safety protocols.
- **Flight Schedule and Delay Analysis:** Create dashboards and reports that highlight flight schedules, delays, and turnaround times. Use visualizations to identify operational bottlenecks and inefficiencies.
- **Booking Pattern Analysis:** Develop tools to analyze booking trends, including peak booking times, popular destinations, and booking lead times.
- **Fare Class and Pricing Analysis:** Use Qlik to visualize fare class performance,

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pricing trends, and revenue generation. Identify opportunities for dynamic pricing strategies.

**2.3. LITERATURE SURVEY:** This literature survey reviews existing research and applications of synthetic data in data analysis, with a focus on the use of Qlik for deriving actionable insights in the airline industry.

- Several studies have examined the application of data analytics in airline operations. Kafle and Zou (2016) explore how data analysis can optimize flight schedules and reduce delays, while Barnhart and Cohn (2004) focus on improving turnaround times.
- In the realm of revenue management, Talluri and Van Ryzin (2004) discuss the critical role of data analysis in demand forecasting and pricing strategies. Their findings suggest that leveraging data analytics can significantly impact an airline's profitability.
- Understanding passenger behavior and preferences is crucial for airlines aiming to improve customer satisfaction. Research by Wittman and Swelbar (2013) analyzes booking patterns and travel preferences, highlighting the value of data in personalizing services and marketing efforts.

## References

- Barnhart, C., & Cohn, A. (2004). Airline Schedule Planning: Accomplishments and Opportunities. *Manufacturing & Service Operations Management*, 6(1), 3-22.
- Chawla, N. V., Bowyer, K. W., Hall, L. O., & Kegelmeyer, W. P. (2002). SMOTE: Synthetic Minority Over-sampling Technique. *Journal of Artificial Intelligence Research*, 16, 321-357.
- Forsberg, K., Mooz, H., & Cotterman, H. (1991). Visualizing Project Management. *Wiley*.
- Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., ... & Bengio, Y. (2014). Generative Adversarial Nets. *Advances in Neural Information Processing Systems*, 27, 2672-2680.

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**3. DATA COLLECTION:** In the quest to optimize airline operations and enhance the passenger experience, data analysis plays a critical role. However, the use of real-world data is often limited by privacy concerns and regulatory constraints.

**3.1. COLLECT THE DATASET:** Airline data holds immense importance as it offers insights into the functioning and efficiency of the aviation industry. Researchers and analysts use airline data to study market trends, assess environmental impacts, and develop strategies for sustainable growth within the industry. In essence, airline data serves as a foundation for informed decision-making, operational efficiency, and the overall advancement of the aviation sector.

**Identifying Data Requirements:** To begin, it is crucial to determine the specific data requirements for the analysis. This includes identifying the types of data needed to address various operational, customer, revenue, and maintenance insights. The main categories of data required are:

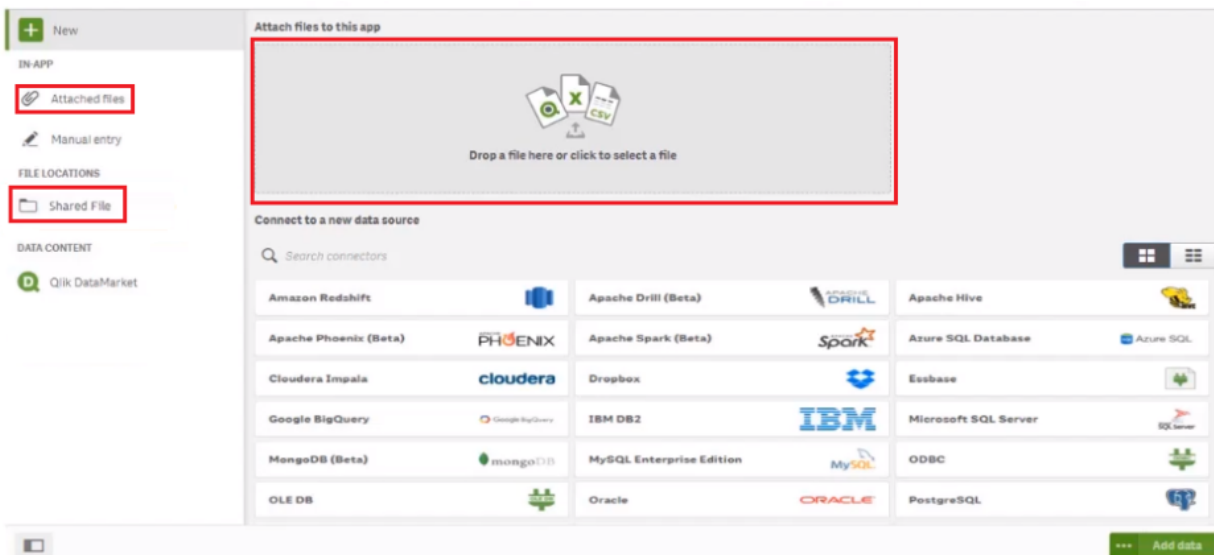
- Flight operations data: schedules, delays, turnaround times.
- Passenger data: booking patterns, travel preferences, demographics.
- Revenue data: pricing strategies, fare classes, demand forecasts.
- Maintenance data: maintenance logs, incident reports, aircraft utilization

**Data Preparation for Analysis:** Before performing the analysis, the data must be prepared and cleaned.

- Normalizing and standardizing data formats.
- Handling missing values and outliers.
- Creating calculated fields and aggregations as needed.

**3.2. CONNECT DATA WITH QLIK SENSE:** The aviation industry generates vast amounts of data daily, which can be analyzed to enhance operational efficiency, customer satisfaction, and safety. However, analyzing real-world airline data can pose significant privacy and regulatory challenges. Synthetic data, which mimics the characteristics of real data without exposing sensitive information, provides a valuable alternative for such analyses.

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## Access Qlik Sense

1. **Login:** Open Qlik Sense and log in with your credentials.
2. **Create a New App:** Click on "Create a new app" on the Qlik Sense hub. Provide a name for your app and click "Create."

## Open the App

1. **Open App:** After creating the app, click on it to open.
2. **Add Data:** Click on the "Add data" button on the main screen of the app.

## Choose Data Source

1. **Select Data Source:** Qlik Sense supports various data sources. Choose from options such as Excel, CSV files, databases (e.g., SQL Server, Oracle), cloud services (e.g., Google Analytics, Salesforce), and more.
2. **Connect:** For this example, let's connect an Excel file. Click on "Excel" under the "Connect my data" section.

## Upload Data File

1. **Preview Data:** Qlik Sense will display a preview of the data. Check the data to ensure it looks correct.



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## Load Data

1. **Data Tables:** Qlik Sense will detect the tables within your Excel file. Select the tables you want to load.
2. **Load Data:** Click on "Load data" to import the selected tables into your Qlik Sense app.
4. **DATA PERPARATION:** Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete.

## Data Collection and Generation:

- **Generate Synthetic Data:** Create datasets that mimic real-world airline data. Ensure the data includes key attributes such as flight schedules, passenger information, booking patterns, pricing details, and maintenance records.
- **Data Sources:** If synthetic data is provided, ensure it encompasses various aspects of airline operations like flight performance, passenger demographics, revenue metrics, and maintenance logs.

## Data Cleaning and Transformation:

- **Data Cleaning:** Identify and correct any inaccuracies or inconsistencies in the data. This includes removing duplicates, handling missing values, and ensuring data is in a usable format.
- **Data Transformation:** Convert data into a format suitable for analysis. This may involve normalization, aggregation, and creating calculated fields that can aid in the analysis.

**Data Integration:** Integrate different datasets to create a comprehensive view. For example, link flight schedules with passenger data and revenue information to analyze the impact of flight delays on revenue and customer satisfaction.

# Exploring Insights From Synthetic Airline Data Analysis With Qlik

Airline Dataset Updated - v2 Airline Dataset Updated - v2.csv

Fields: 15

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
0A1y0a	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



**5. DATA VISUALIZATION:** Using Qlik, a powerful data analytics and visualization platform, we can explore synthetic airline data to uncover valuable insights. This document outlines the approach to analyzing synthetic airline data with Qlik, detailing the data used for visualization and the insights we aim to derive.

## Data for Visualization

The synthetic airline data used for this analysis includes various datasets that mimic the structure and attributes of real airline data. The key datasets are:

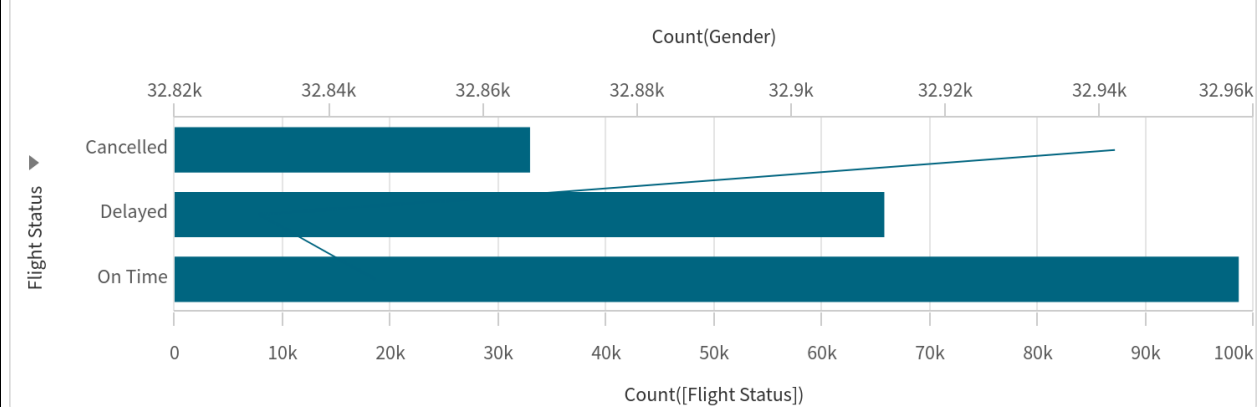
### Flight Data:

- Flight schedules, departure and arrival times
- Flight durations, delays, and cancelations
- Booking information (dates, times, and routes)
- Passenger demographics (age, gender, loyalty status)

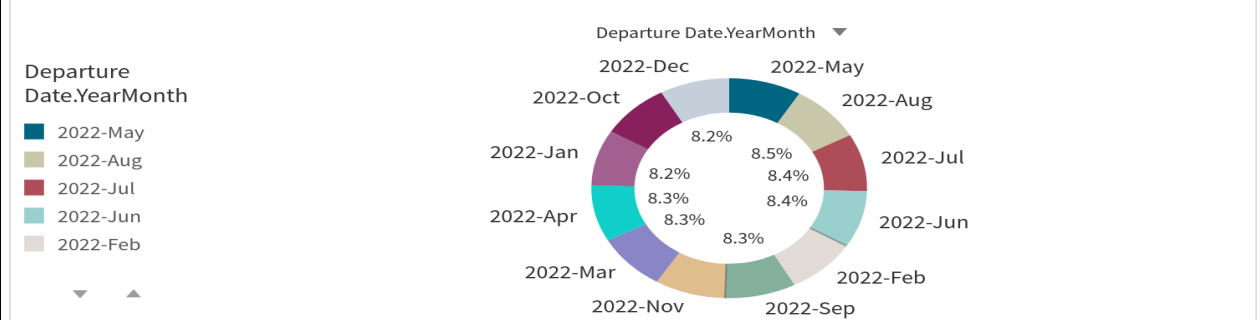
**Flight Schedule and Delays Visualization:** Gantt charts and heat maps to identify peak delay times and bottlenecks in flight operations.

# Exploring Insights From Synthetic Airline Data Analysis With Qlik

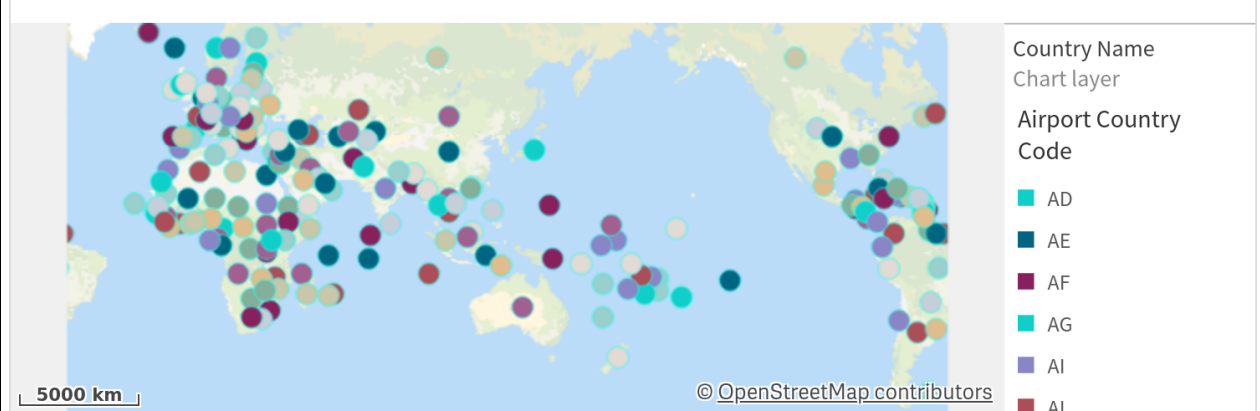
## Flight Status



## Total Departure By Gender Wise And Year Month

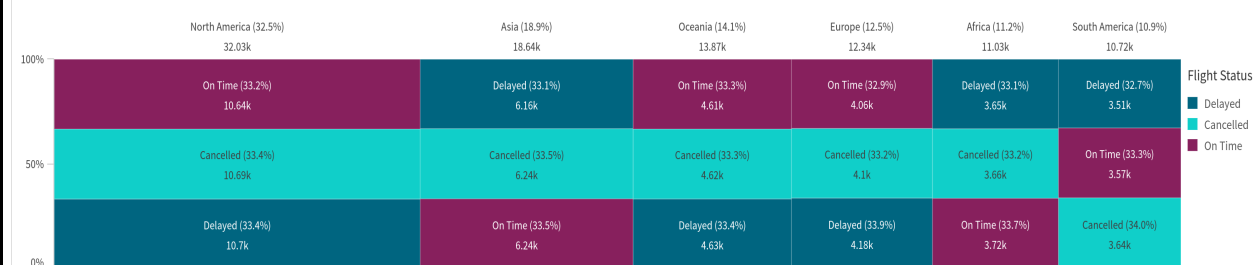


## Pilot Travelled To Countries



# Exploring Insights From Synthetic Airline Data Analysis With Qlik

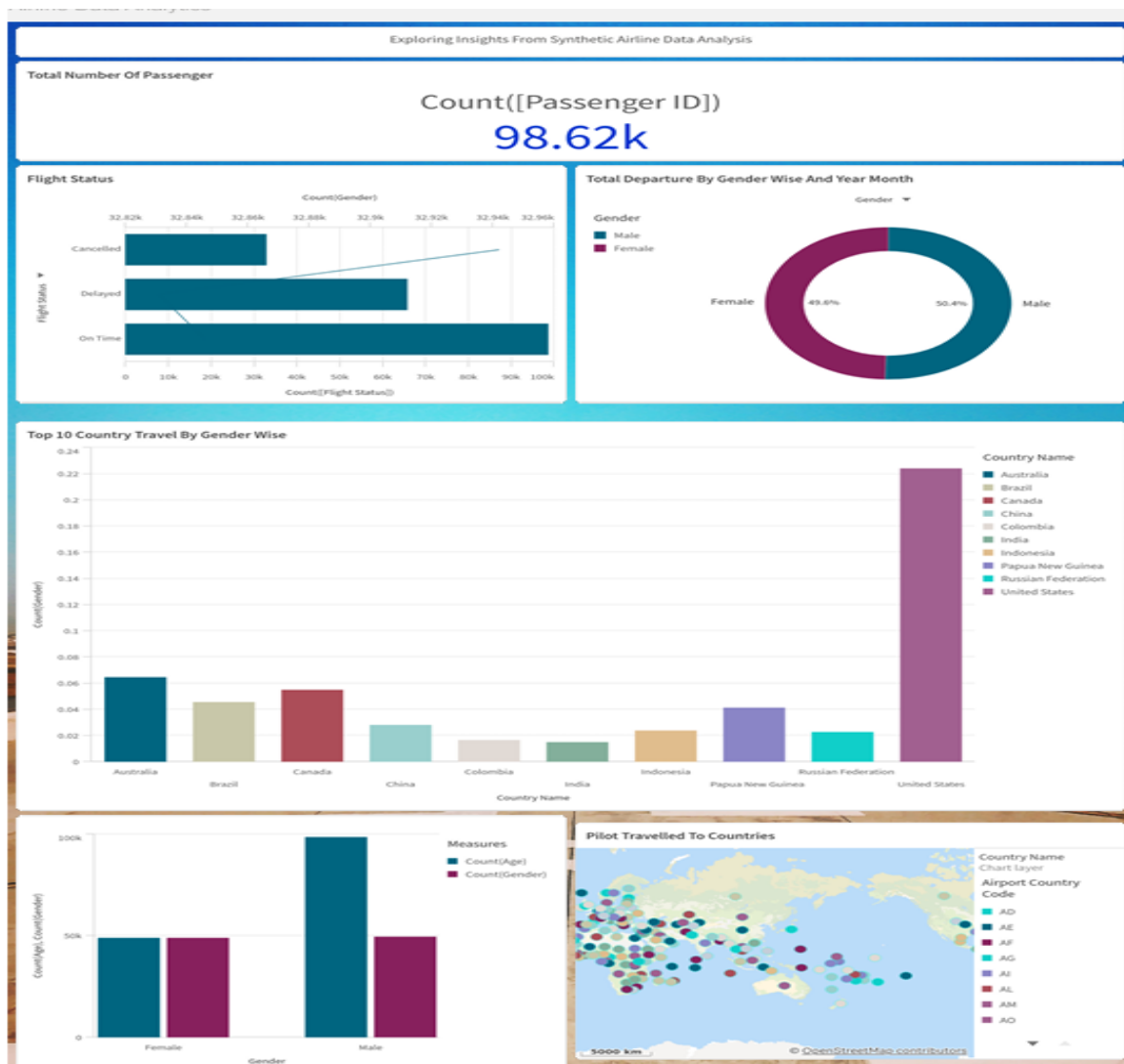
Continents Flight Status Of Nationality



## 6. DASHBOARD:

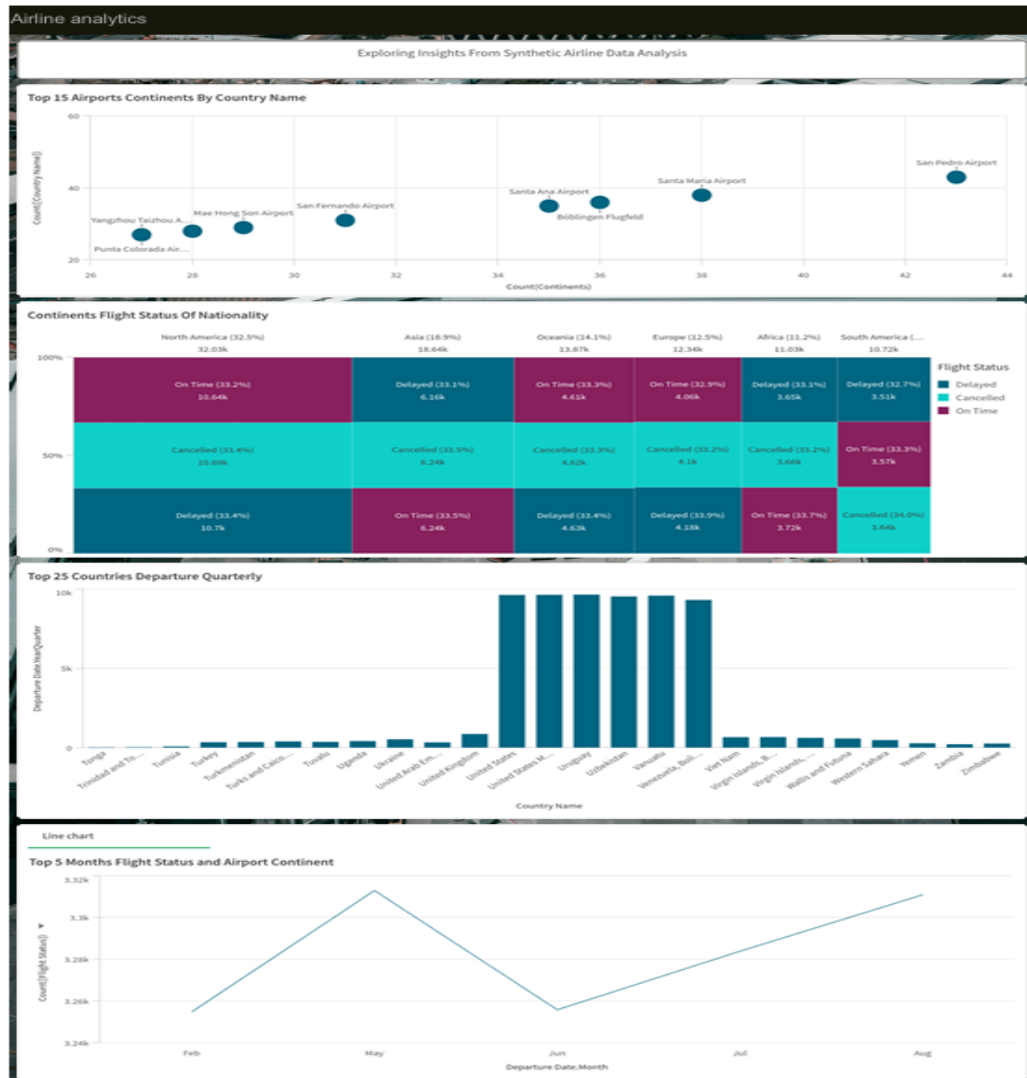
### 6.1. RESPONSIVE AND DESIGN OF DASHBOARD:

Dashboard : 1



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Dashboard : 2



- Provide a user-friendly interface for exploring insights from synthetic airline data.
- Ensure responsiveness across different devices and screen sizes.

## Design Principles:

- Clean and intuitive layout with clear navigation.

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- Consistent color scheme and typography for cohesive visual aesthetics.
- Interactive elements for dynamic exploration of data insights.
- Adaptive design to ensure optimal viewing experience across devices

7. **REPORT:** A feature that enables users to create compelling narratives around their data insights. This functionality combines data visualization with descriptive text, images, and interactive elements to present a coherent and engaging story that helps stakeholders understand and act upon the data.

7.1. **REPORT CREATION:** The aviation industry is a vital and complex sector that relies heavily on data to improve operational efficiency, passenger experience, and safety. However, working with real-world airline data often involves significant privacy and security challenges. Synthetic data, which mimics the structure and characteristics of real data while protecting sensitive information, offers a promising solution. Using Like, a powerful data analytics platform, we can transform synthetic airline data into a compelling data story that provides actionable insights.

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Exploring Insights From Synthetic Airline Data Analysis

## Total Number Of Passenger

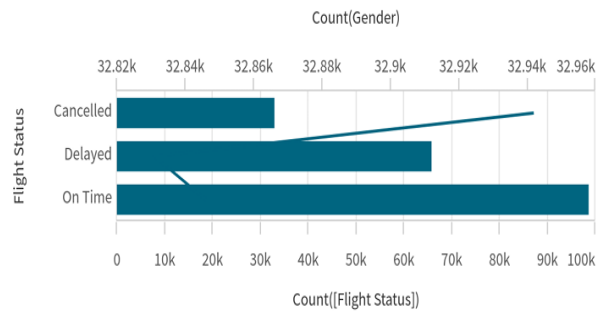
Count([Passenger ID])  
98.62k

Number of male & female passenger

Male - [Click here](#)

Female- [Click here](#)

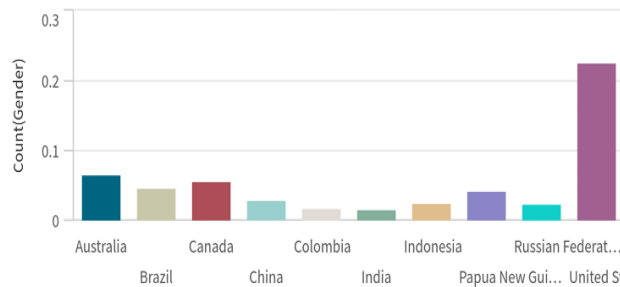
## Flight Status



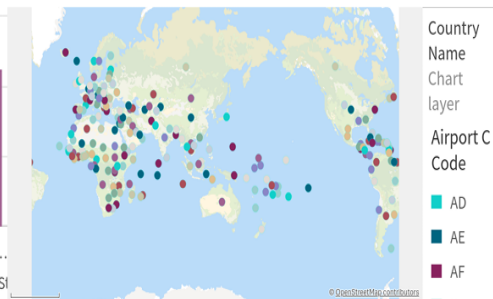
## Total Departure By Gender Wise And Year Month



## Top 10 Country Travel By Gender Wise

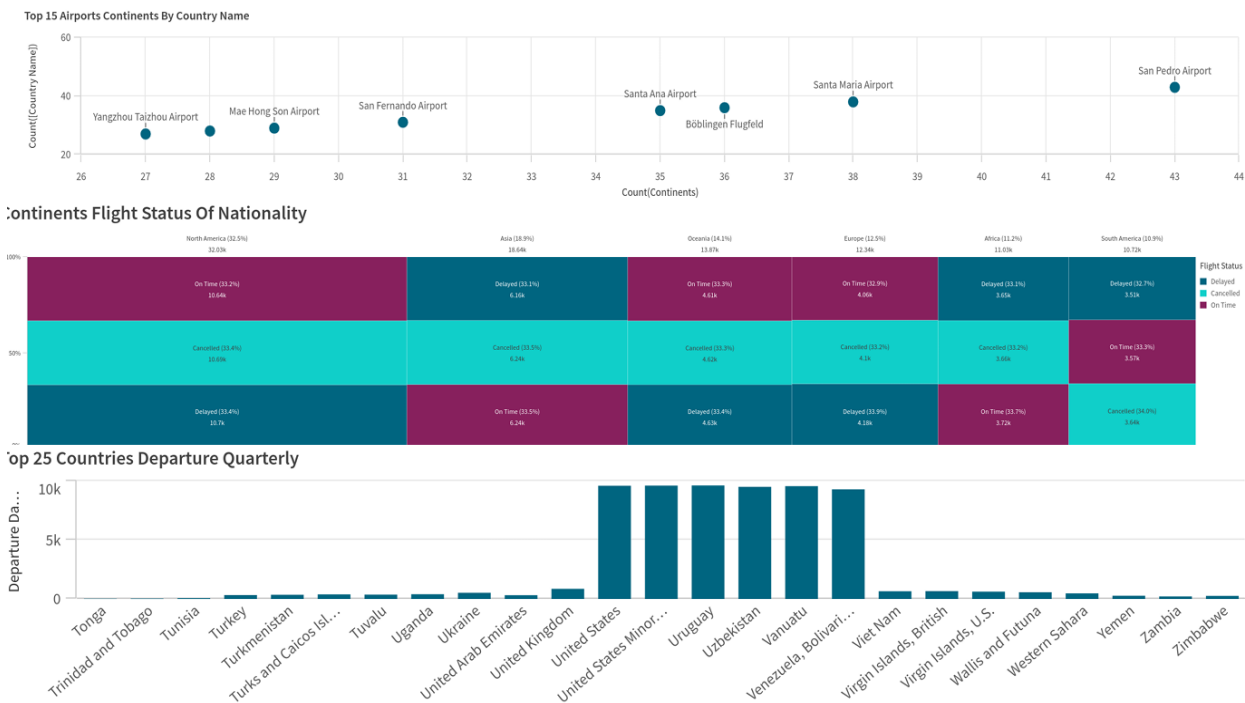


## Pilot Travelled To Countries



# Exploring Insights From Synthetic Airline Data Analysis With Qlik

## Exploring Insights From Synthetic Airline Data Analysis



## 8. PERFORMANCE TESTING:

**8.1. AMOUNT OF DATA RENDERED:**Amount of Data Loaded" refers to the volume or quantity of data that has been imported, retrieved, or uploaded into a system, software application, database, or any other data storage or processing environment. It indicates how much data has been successfully processed and is ready for analysis, manipulation, or use within the system.

Pass...	First ...	Last ...	Gender	Age	Natio...	Airpo...	Airpo...	Coun...	Airpo...	Conti...
ABVWlg	Edithe	Leggis	Female	62	Japan	Coldfoot Airport	US	United States	NAM	North America
jkXXAX	Elwood	Catt	Male	62	Nicaragua	Kugluktuk Airpor	CA	Canada	NAM	North America
CdUz2g	Darby	Felgate	Male	67	Russia	Grenoble-Isère Ai	FR	France	EU	Europe
BRS38V	Dominica	Pyle	Female	71	China	Ottawa / Gatineau	CA	Canada	NAM	North America
9kvTLo	Bay	Pencost	Male	21	China	Gillespie Field	US	United States	NAM	North America
nMJKVh	Lora	Durbann	Female	55	Brazil	Coronel Horácio	BR	Brazil	SAM	South America
8IPFPE	Rand	Bram	Male	73	Ivory Coast	Duxford Aerodrom	GB	United Kingdom	EU	Europe
pqixbY	Perceval	Dallosso	Male	36	Vietnam	Maestro Wilson F	BR	Brazil	SAM	South America
QNAz2R	Aleda	Pigram	Female	35	Palestinian Territ	Venice Marco Poli	IT	Italy	EU	Europe



# Exploring Insights From Synthetic Airline Data Analysis With Qlik



**8.2. UTILIZATION OF DATA FILTERS:** The implementation or application of filters within a system, software application, or data processing pipeline to selectively extract, manipulate, or analyze data according to specific criteria or conditions. Filters help to refine the data scope, concentrating only on the pertinent information that matches the predefined criteria.

In the data filter use the gender category by clicking of male we get all male data and by clicking female we get all female data.

**FILTERS USED:**

- GENDER CATEGORY(M/F)
- DEPARTURE (YEAR/MONTH)
- GENDER AND AGE COUNT

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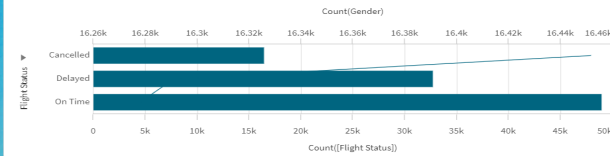
Airline Data Analytics

Exploring Insights From Synthetic Airline Data Analysis

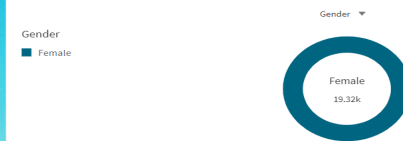
Total Number Of Passenger

Count([Passenger ID])  
49.02k

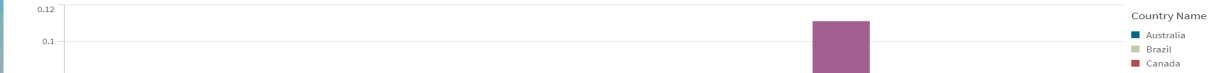
Flight Status



Total Departure By Gender Wise And Year Month



Top 10 Country Travel By Gender Wise

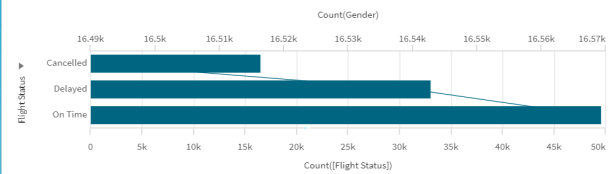


Exploring Insights From Synthetic Airline Data Analysis

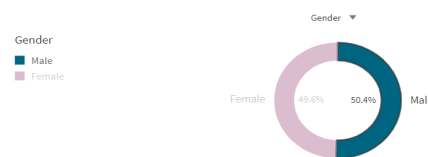
Total Number Of Passenger

Count([Passenger ID])  
49.6k

Flight Status



Total Departure By Gender Wise And Year Month



Top 10 Country Travel By Gender Wise

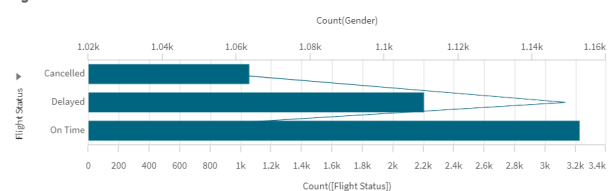


Exploring Insights From Synthetic Airline Data Analysis

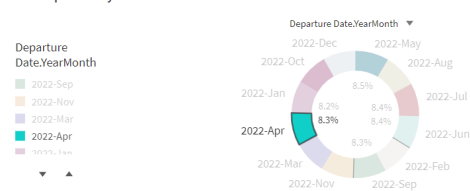
Total Number Of Passenger

Count([Passenger ID])  
3.23k

Flight Status



Total Departure By Gender Wise And Year Month



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## NUMBER OF VISUALIZATION AND GRAPHICS:

- Total Number of Passengers
- Flight Status
- Total Departure By Gender Wise Year Month
- Top 10 Countries Travel Gender Wise
- Pilot Travelled To Number Of Countries