NC STATE UNIVERSITY

ISE 519: Database Applications in Industrial and Systems Engineering

PROJECR REPORT ON

Airbnb Market Analysis & Real Estate Sales Analysis

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I. Project Description:

1. DATASET INFORMATION

Dataset: Airbnb Market Analysis and Real Estate Sales Data (2019)

Link: https://www.kaggle.com/datasets/computingvictor/zillow-market-analysis-and-real-estate-sales-data/data

2. DATASET DESCRIPTION

The dataset provides a granular view of the Airbnb rental and real estate markets in specific regions of California, namely Big Bear and Joshua Tree. It encapsulates detailed monthly data from 2019 for properties within the zip codes 92314, 92315, 92284, and 92252. This dataset is organized into several key files: one detailing market analysis with listing-level data, including unique property identifiers, revenue, availability, occupancy rates, nightly rates, lead times, and average stays. Another file catalogs amenities, indicating the presence (denoted as 'Yes') or absence (denoted as 'No') of features such as pools or hot tubs in each property. There's also a geolocation file that provides exact latitude and longitude for each listing, which is crucial for spatial analysis and mapping. For the real estate sales aspect, it includes data on properties for sale.

3. PROJECT DESCRIPTION

This project leverages the "Airbnb Market Analysis and Real Estate Sales Data (2019)" dataset to conduct a detailed analysis of Airbnb rental markets and property sales in California. Utilizing Microsoft Access and Power BI, the project aims to clean and structure the dataset, creating a comprehensive database that includes tables, queries, macros, and forms. By employing IDEFo and IDEF1X modeling techniques, the project will design and develop various MS Access Forms, enhancing the data's accessibility and manageability. The Power BI component focuses on visualizing key market trends and extracting valuable insights through detailed statistical reports. These reports will cover metrics such as average revenue, occupancy rates, and property amenities, aiding stakeholders in making informed decisions. Further, the project includes developing dynamic forms for continuous updates on property prices, conditions, and amenities based on prevailing market trends. Overall, this initiative is geared towards providing a robust analytical tool that facilitates data-driven decision-making and offers a deep dive into the competitive real estate and rental landscapes in California.

II. Application description and idef models:

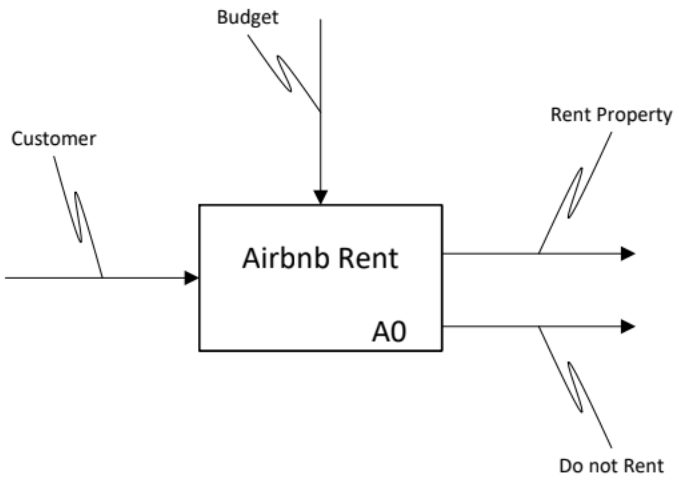
1. IDEF0

Brief description:

The IDEF0 model provided in the document outlines the process for an Airbnb rental application, designed to facilitate user decisions on renting properties. The model is structured around the main function, A0, titled "Rent Property," which branches into various sub-functions that guide the user through the rental process. This includes:

- A1 Airbnb Search: Allows users to search for properties based on predefined criteria.
- A2 Rental Requirements: Users select specific rental requirements such as price, number of bedrooms and bathrooms, living area, home type, and additional features like pools.
- A3 List of Rented Property: Displays properties that meet the user's specifications.
- A4 Location: Provides location details of the selected properties to assist in decision-making.
- A5 Customer Details: Collects and processes customer details necessary for the rental process.

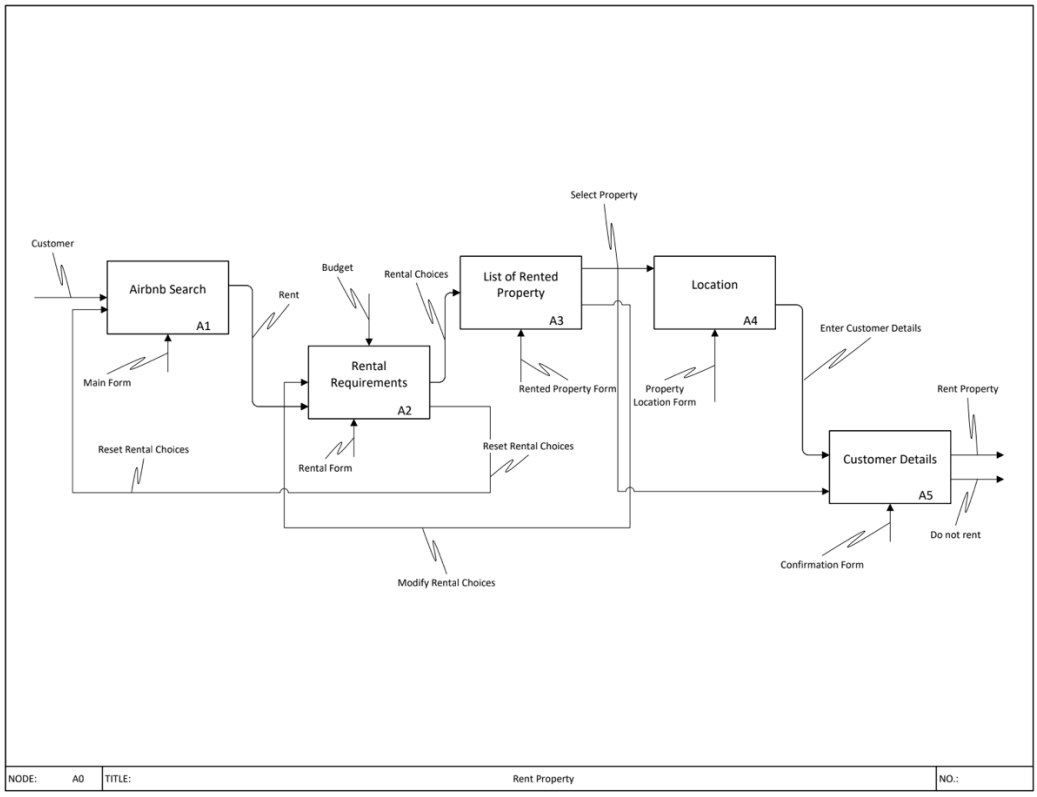
The document also describes additional forms and interactive elements such as the Rental Form, Property Location Form, and Confirmation Form, which are integral to refining search criteria and finalizing rental decisions. This IDEF0 model serves as a comprehensive guide for users, from entering their rental preferences to making an informed rental choice, thereby enhancing the overall efficiency and user experience of the Airbnb rental application.



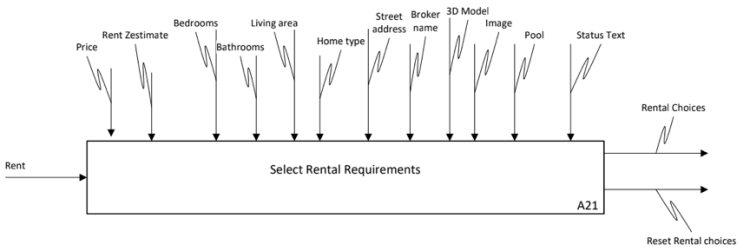
Context: Airbnb Sales/Rent Application

Viewpoint: Upon receiving the user's rental preferences, including specific requirements, choices, and budget, a carefully selected list of available properties meeting the criteria will be presented. The user can review these listings and explore their locations to make an informed decision regarding rental suitability.

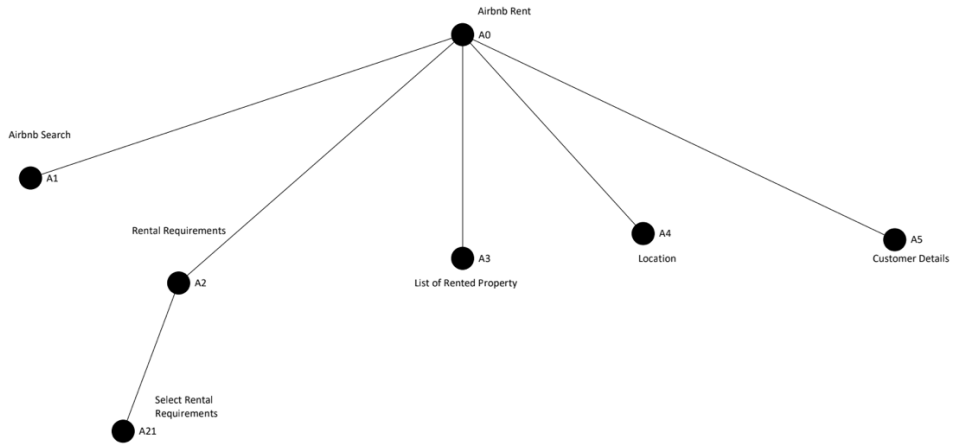
Purpose: This application will outline the steps involved in choosing to rent a property. It will also identify the forms the user needs to complete at each stage of the process.



NODE: A0	TITLE: Rent Property	NO.:



NODE: A2	TITLE: Rental Requirement	NO.:

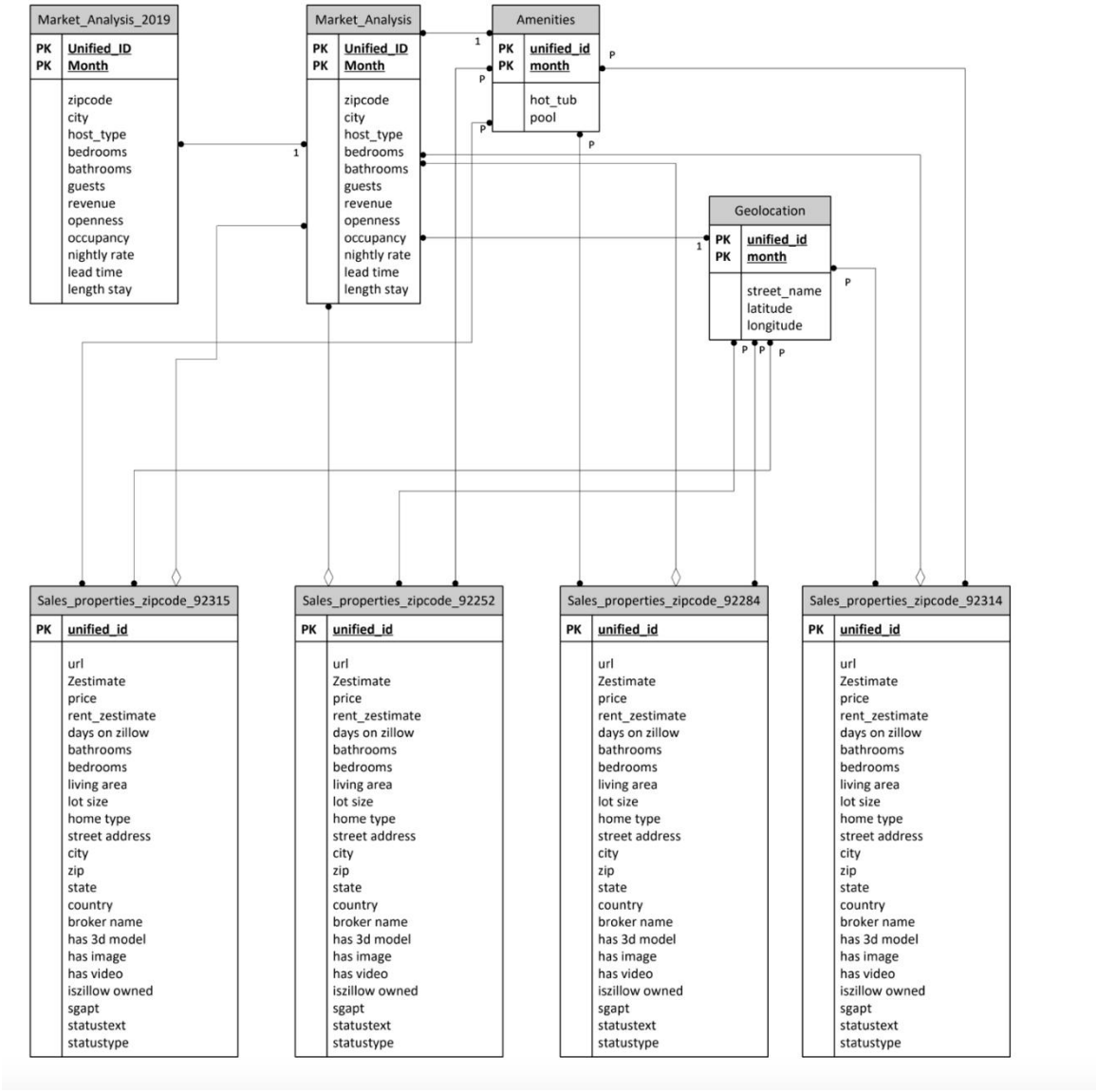


2. IDEF1:

The IDEF1X model described in the document outlines the database schema for a comprehensive analysis of the Airbnb market and real estate sales data for the year 2019. It organizes the data into several related tables that capture distinct aspects of the market:

- Market_Analysis: This primary table stores monthly aggregated data per listing with fields for a unified identifier (Unified_ID), month, location details (zipcode, city), host type, and key rental metrics such as the number of bedrooms, bathrooms, guests capacity, revenue generated, occupancy rates, nightly rates, lead time, and the average length of stay.
- Amenities: Linked to the Market Analysis table via the unified_id and month, this table tracks amenities like hot tubs and pools associated with each listing, enhancing data on property features.
- Geolocation: This table provides detailed geographic data for each property, including street names and precise latitude and longitude coordinates, facilitating spatial analysis and mapping.
- Sales_Properties: Organized by different zip codes (92314, 92315, 92252, 92284), these tables include detailed sales data for properties within those areas, such as URLs, Zestimate values, listed price, rent Zestimate, time listed on Zillow, property size, and type, among others.

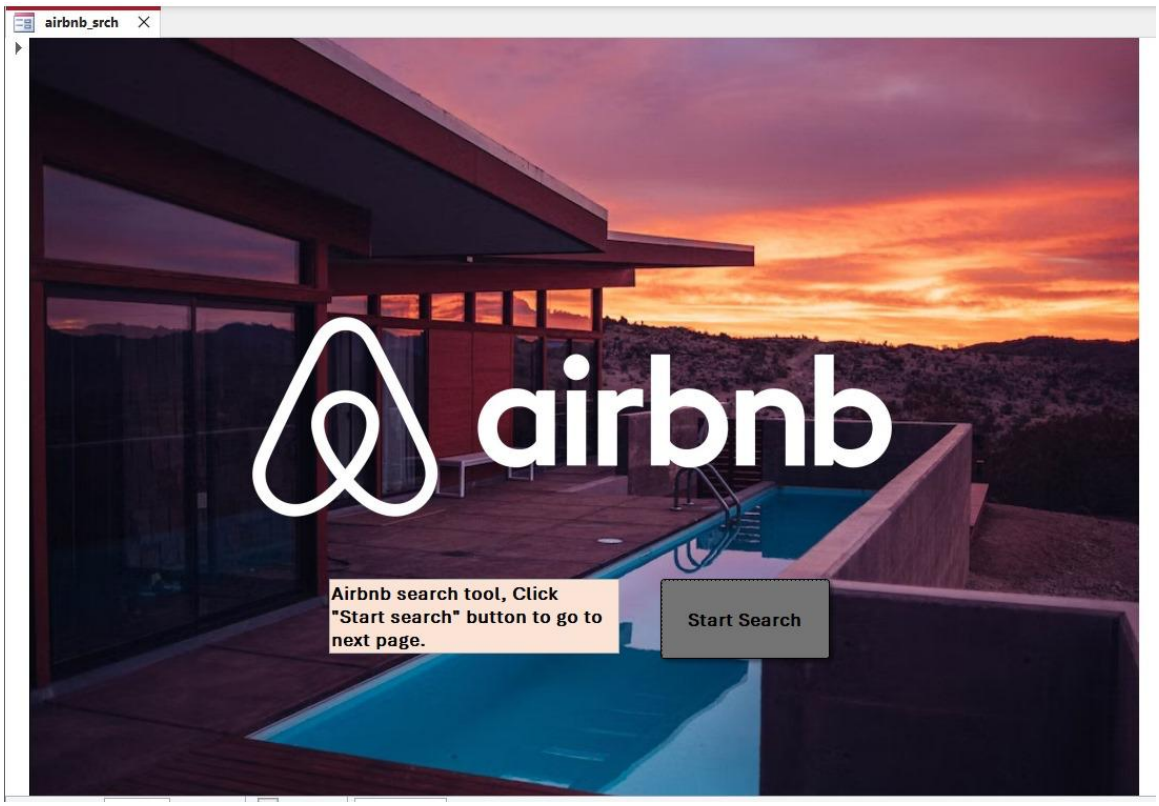
Each table in the schema uses a primary key (PK) to ensure uniqueness and integrity of data, supporting robust queries and relational integrity, crucial for accurate analysis and reporting in a real estate context.



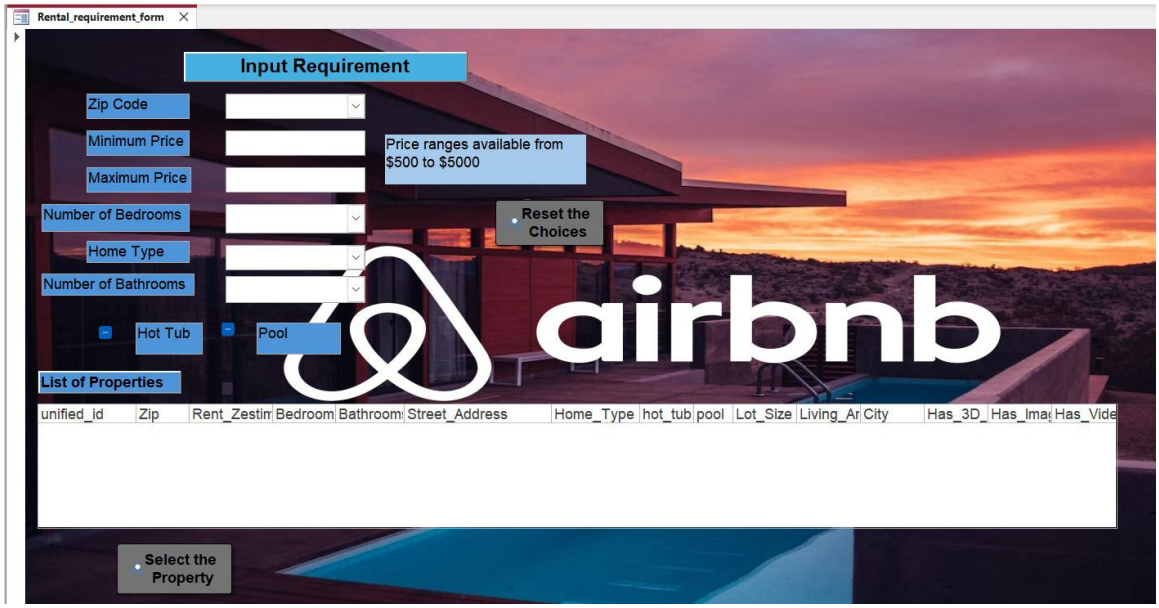
III. Screen Printouts of forms

1. Queries, Macros and Forms

AIRBNB_SRCH FORM:



RENTAL_REQUIREMENT_FORM:



This form is a user interface designed for inputting rental requirements in a property search application. The top section, labeled "Input Requirement," provides a series of fields where users can specify their search criteria for rental properties. Users can enter preferences for the property's Zip Code, set a Minimum and Maximum Price range (with an indicative note that prices range from $500 to $5000), select the Number of Bedrooms and Bathrooms desired, and choose the Home Type from dropdown menus. Additionally, there are checkboxes for whether a Hot Tub or Pool is a required amenity.

Below the input fields, there's a button labeled "Reset the Choices," which clears all the user selections to start a new search. The bottom section of the form, "List of Properties, is a table designed to display the search results based on the input criteria. This area would populate with properties, displaying various columns such as unified_id, Zip, Rent Zestimate, number of Bedrooms, Bathrooms, Street Address, Home Type, amenities like hot tub and pool, Lot Size, Living Area, City, and other factors like whether the property has 3D images, photos, or videos available.

Finally, there is a button to "Select the Property," which users can use after finding a suitable listing from the populated search results in the "List of Properties" section. This form is a comprehensive tool for users to filter and select properties that match their specific rental needs.

CONFIRMATION_FORM:

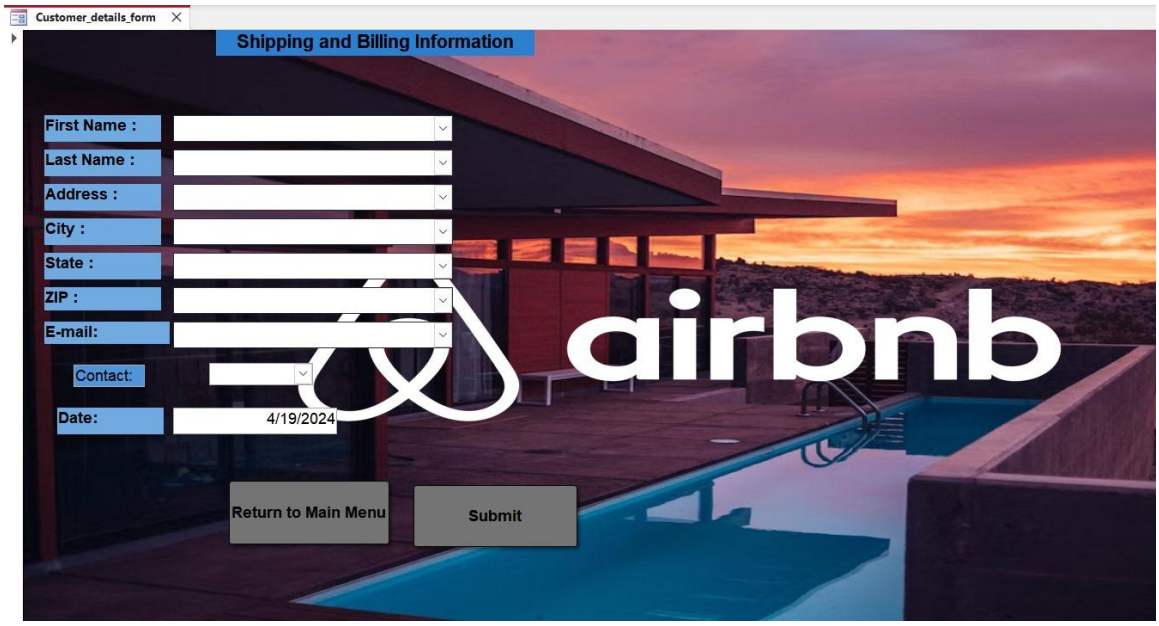
The form is designed to display the details of a property that a user has selected. It has multiple fields that summarize the chosen property's characteristics, including "Street Address," "Bedrooms," "Bathrooms," "Rent Price," "Home Type," and "Lot Size." Additional

amenities such as a "Hot Tub" and "Pool" also have their designated fields, suggesting that these details are pertinent to the user's selection process.

Three fields — "3D Model," "Image," and "Video" — are highlighted, indicating the availability of multimedia resources for the property. These would enable users to gain a more comprehensive understanding of the property's appearance and layout.

Two action buttons are provided at the bottom of the form. The "ReturnBack" button is for users to go back to the previous step in the application, while the "Proceed to the Next Step" button suggests moving forward in the transaction to the next form. This structured layout facilitates user verification of the selected property's details before final confirmation, ensuring that all information meets their requirements.

CUSTOMER_DETAILS_FORM:



The form is sectioned for ease of use and features a series of labeled text fields for inputting personal and contact information. The fields include:

- First Name:
- Last Name:
- Address:
- City:
- State:
- ZIP:
- Contact:

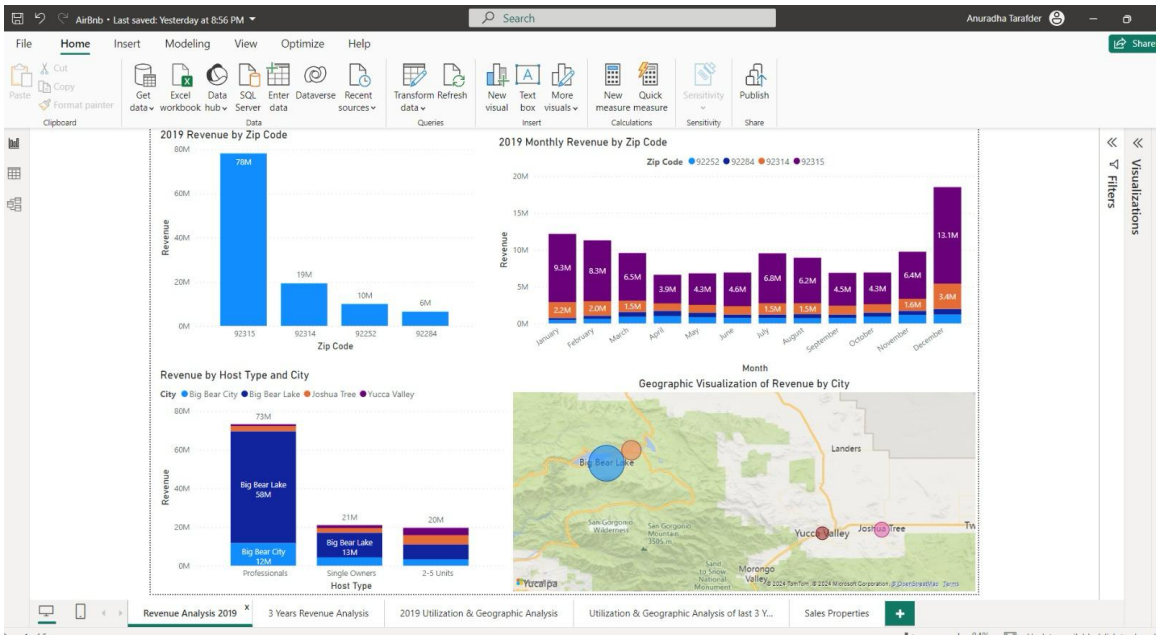
- E-mail:

At the bottom of the form, there's a pre-populated field for the date, which indicates the current date. Below the data entry fields, two buttons are available: "Return to Main Menu," which navigates the user back to the main form, and "Submit," which would be used to send the entered information for processing to a customer table.

The form's straightforward layout, with clearly marked fields and dropdown arrows indicating selectable options, ensures that the user can quickly and efficiently complete their shipping and billing details with minimal confusion.

IV. Power Bi

Revenue Analysis of 2019:



A comprehensive dashboard from a business analytics software showcasing various visualizations pertaining to Airbnb revenue data for the year 2019. This interactive dashboard includes:

2019 Revenue by Zip Code: A bar chart that shows a significant variance in revenue among different zip codes. One zip code appears to be generating a substantially higher revenue compared to the others.

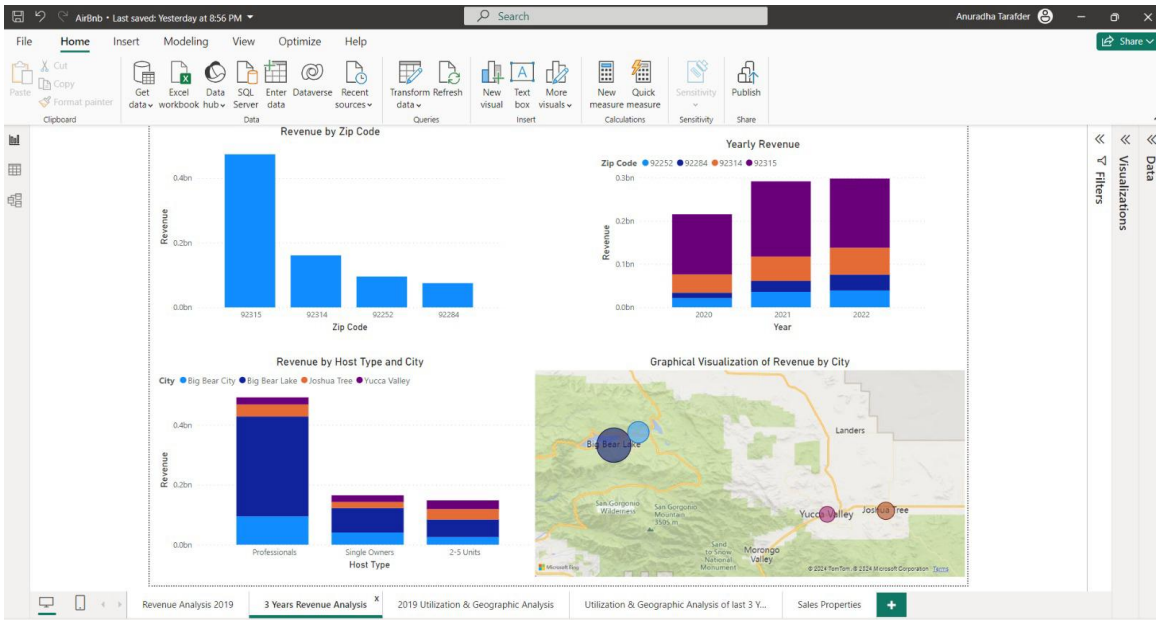
2019 Monthly Revenue by Zip Code: A colorful stacked bar chart that represents the monthly revenue distribution for each zip code. This visual aid allows for an at-a-glance comparison of how revenue trends change month-to-month across different areas.

Revenue by Host Type and City: Below the first bar chart, there's another bar chart that differentiates revenue based on the type of host (professionals or those with 2-5 units) for different cities such as Big Bear City and Joshua Tree.

Geographic Visualization of Revenue by City: In the lower right portion, a geographical map augmented with proportional symbols illustrates the revenue across different cities. This map provides a spatial analysis of revenue, with larger circles indicating higher revenue.

The dashboard is designed for in-depth analysis, enabling the exploration of revenue patterns by location and time. It serves as a tool for identifying high-performing areas and understanding seasonal variations in revenue, which can inform strategic business decisions for stakeholders in the Airbnb market

3 YEARS REVENUE ANALYSIS (2020-2022)



This dashboard from a data analytics platform, presumably showcasing an array of visualizations related to Airbnb's revenue data.

Revenue by Zip Code: The primary visualization is a bar chart reflecting the revenue generated in various zip codes. A particular zip code prominently outperforms others in terms of revenue, as indicated by a markedly taller bar.

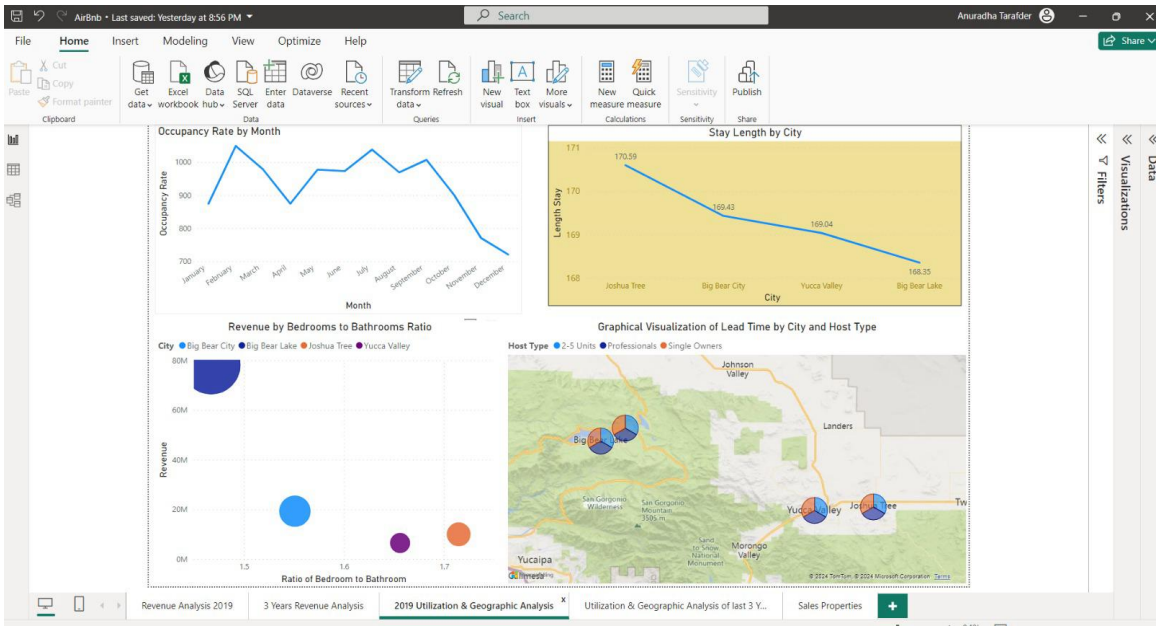
Yearly Revenue: Adjacent to this is a grouped bar chart displaying the yearly revenue, comparing the financial performance across different zip codes over three consecutive years. This visual is particularly useful for understanding annual growth or decline in revenue within each zip code.

Revenue by Host Type and City: Below the first chart, a bar chart segments revenue by host type—professionals, single owners, and those with 2-5 units—across several cities. The distinctions between host types in each city are clearly depicted through varied color coding.

Graphical Visualization of Revenue by City: To the right, a map enriched with proportional circles illustrates the distribution of revenue across different cities. The size of the circles represents the magnitude of revenue, providing a geographic perspective on where the highest revenues are concentrated.

This dashboard serves as a robust analytical tool for stakeholders to dissect revenue streams within Airbnb's marketplace. It provides a multi-faceted view of the revenue data, facilitating a geographical and temporal analysis that is crucial for strategic decision-making.

2019 UTILIZATION & GEOGRAPHIC ANALYSIS:



This dashboard has several visualizations depicting different aspects of Airbnb rental data.

Occupancy Rate by Year: A line graph showing a positive trend in occupancy rates over a period of years, indicating a potential increase in property utilization over time.

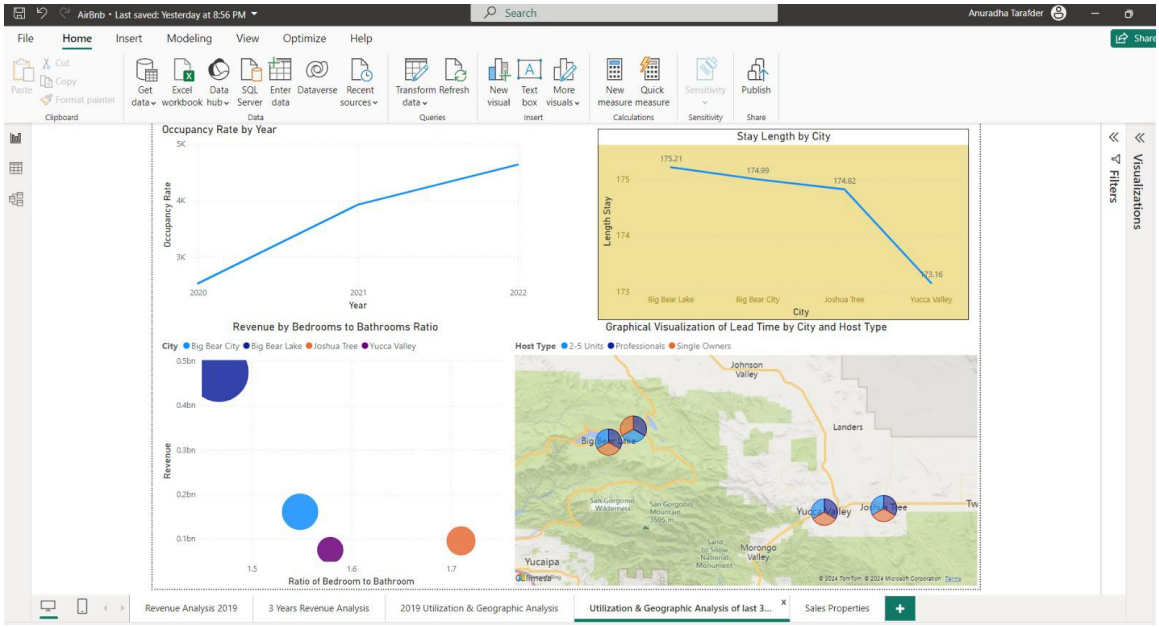
Revenue by Bedrooms to Bathrooms Ratio: This bubble chart correlates the revenue with the ratio of bedrooms to bathrooms in different cities, represented by bubbles of varying sizes. A larger bubble suggests higher revenue, and the position along the axis indicates the bedroom-to-bathroom ratio.

Stay Length by City: A line chart compares the average stay length in days across different cities. The graph indicates some variance in stay length, with one city showing a longer average duration than others.

Graphical Visualization of Lead Time by City and Host Type: A map overlaid with pie charts positioned over several cities shows the lead time for bookings, segmented by host type, including single owners, professionals, and those with 2-5 units. The size of each pie chart segment visually represents the proportion of lead time associated with each host type.

Together, these visualizations offer a multi-dimensional view of the Airbnb rental market, covering the efficiency of property usage, revenue analysis, guest preferences in terms of stay length, and booking lead times, providing valuable insights for market strategy and operations.

UTILIZATION & GEOGRAPHIC ANALYSIS OF LAST 3-YEAR DATA



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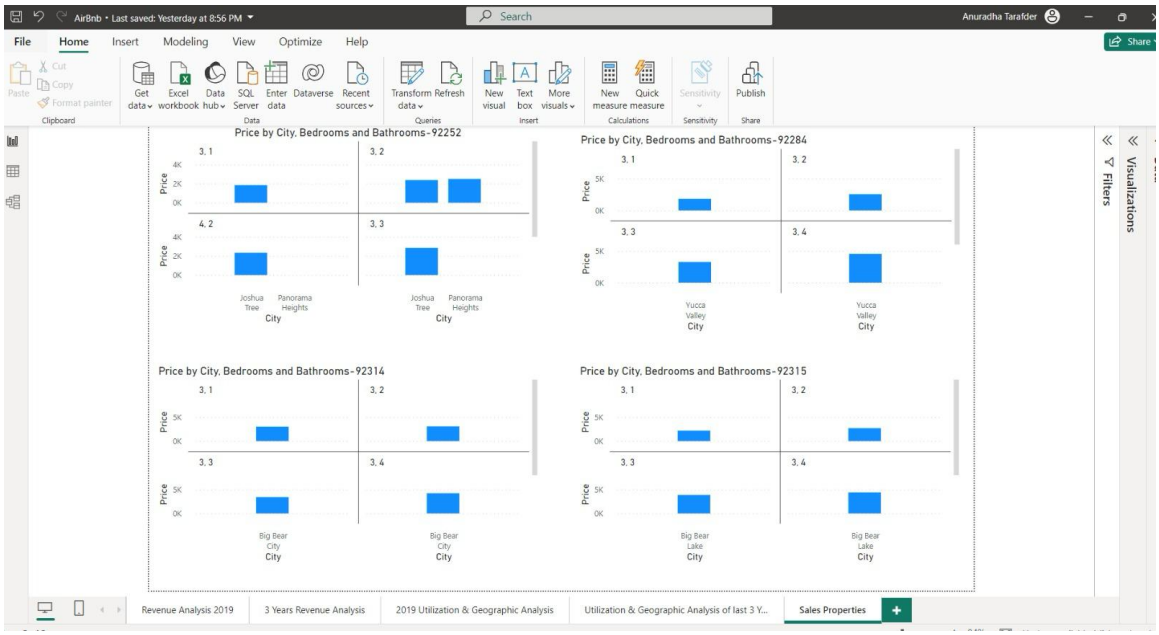
SALES PROPERTY



The dashboard consists of multiple bar charts, each representing the price distribution of properties in various cities, segmented by the number of bedrooms and bathrooms. Each chart is titled "Price by City, Bedrooms and Bathrooms," followed by a zip code, indicating that the data is specific to that postal area.

The charts plot the average price on the vertical axis against cities on the horizontal axis, with bars grouped by categories labeled with combinations of bedrooms and bathrooms, such as "3,1" (3 bedrooms, 1 bathroom), "3,2", and so on. This categorization provides a clear visual comparison of how prices vary not just between different cities within the same zip code but also how the number of bedrooms and bathrooms within properties influences pricing.

The structure of these visualizations allows for an analysis of the real estate market in terms of price points across different types of accommodations in specific locations. This type of dashboard is valuable for potential renters or buyers looking to understand the market, as well as for sellers and real estate professionals who need to set competitive pricing or identify market trends.

3. REFERENCES :

1.Kaggle Data set source link: https://www.kaggle.com/datasets/computingvictor/zillow-market-analysis-and-realestate-sales-data