

Modeling an Airbnb Use-Case Database for Room

Booking

Rahul Ragiri

Matriculation number: 32112978

Conception Phase

DLBDSPBDM01 - Project: Build a Data Mart in SQL

Tutor: Prof. Musharaf Doger

February 29, 2024

1. Project goals

The goal of this project is to provide a dependable, efficient, and user-friendly database for an app that operates similarly to Airbnb. This database will be used to handle and store data on properties, bookings, users, hosts, reviews, and other related entities. The database will be designed to support a variety of user roles and activities and will provide the information and capabilities these users require.

2. Requirement specification

2.1 Which roles exist among individuals or user groups?

Guests: These are the primary users of the platform who are trying to find accommodations. They can be locals going on a staycation, business travelers, or tourists. Their preferences range considerably, from low-cost to high-end accommodations, and from travelling alone to taking family trips.

Hosts: Hosts are people or organizations who list their houses for rent on the marketplace. These might be property managers overseeing several rental homes, or homeowners who rent out portions or their whole house. They provide a variety of lodging options, including luxurious and affordable lodging as well as unusual stays in yurts or treehouses.

Airbnb Admins: These are the people in charge of running the platform. They make sure that the platform functions properly, that all transactions are safe, and that hosts and guests abide by the company's policies. Their duties might range widely, including dispute settlement, platform security, and customer service.

2.2 What operations are carried out by these roles?

Guest: guests search for and book accommodation that meets their needs, and they have the option to filter properties according to several criteria. In addition, they may give evaluations and ratings after their visit and contact the hosts with any questions or concerns.

Hosts: The hosts reply to guest inquiries for reservations and list their homes with all the information required. After the stay, they might choose to rate guests and write a review. They are also accountable for maintaining the accuracy of their property listings.

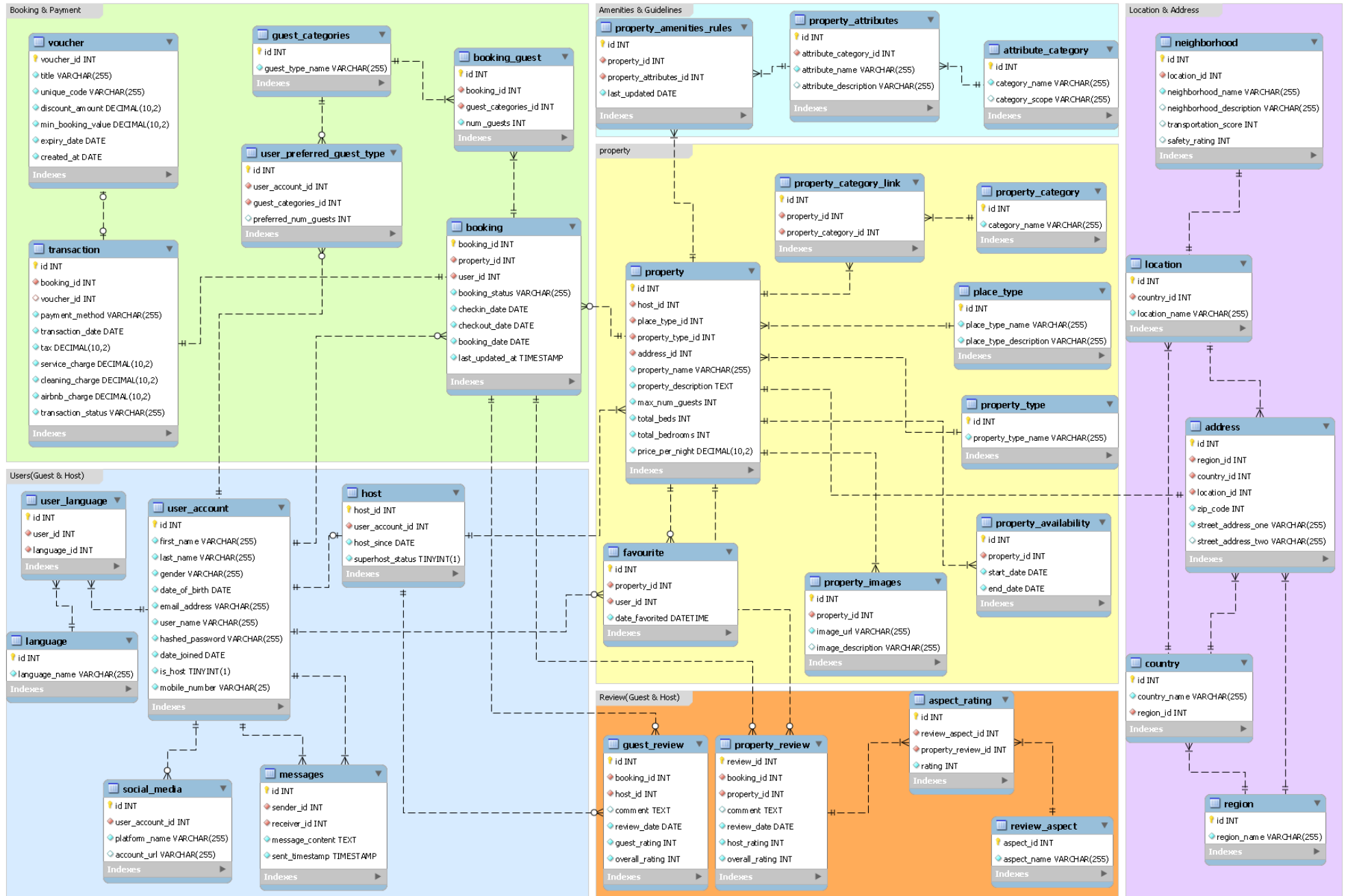
Airbnb admin: Admins manage platform activities, handle user accounts, settle conflicts, and impose regulations. To make wise decision-making for improving the platform, they examine platform data.

2.3 Which data and functionalities are necessary?

Data required: Information about users (both guests and hosts), properties, reservations, reviews, communications, and transactions must be stored on the platform. User favorite, account information, and personal data are examples of user data. Property information consists of specifics of the property, its features, availability, price, and property review. Information on the guest, the host, the property, and the booking are all included in the booking data. Review information consists of comments and ratings left by both hosts and guests. Guest and host communications are included in the message data. Information regarding the payment, the reservation, and the transaction's status are all included in the transaction data.

Functions required: Users must be able to manage their accounts, search, and filter properties, make and manage reservations, post reviews, interact with other users, and make payments via the platform. hosts should have the ability to list their properties, set availability, and communicate with potential guests. Guests should also be able to view host profiles, property images, and property reviews to make informed booking decisions. Additionally, Admins must also be able to manage user accounts, resolve conflicts, enforce platform guidelines, and do data analysis on the platform.

3. EER(Enhanced-Entity-Relationship)



Schema Report for Database: airbnb

Table List

- [aspect_rating](#)
- [booking](#)
- [booking_guest](#)
- [country](#)
- [attribute_category](#)
- [favourite](#)
- [guest_categories](#)
- [host](#)
- [guest_review](#)
- [language](#)
- [location](#)
- [messages](#)
- [place_type](#)
- [property](#)
- [property_availability](#)
- [property_category](#)
- [property_category_link](#)
- [property_attributes](#)
- [property_amenities_rules](#)
- [property_images](#)
- [property_review](#)
- [property_type](#)
- [region](#)
- [review_aspect](#)
- [social_media](#)
- [transaction](#)
- [user_account](#)
- [user_language](#)
- [voucher](#)
- [address](#)
- [neighborhood](#)
- [user_preferred_guest_type](#)

Table: aspect_rating

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|--------------------|-----------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier for each record |
| review_aspect_id | INT | Yes | No | Yes | | Identifier of the review aspect |
| property_review_id | INT | Yes | No | Yes | | Identifier of the property review |
| rating | INT | Yes | No | No | | Rating given to the aspect in the review |

Table: booking

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------|--------------|----------|-----|-----|-------------------|---|
| booking_id | INT | Yes | Yes | No | | Unique identifier of booking |
| property_id | INT | Yes | No | Yes | | Identifier of booked property |
| user_id | INT | Yes | No | Yes | | Identifier of user who made the booking |
| booking_status | VARCHAR(255) | Yes | No | No | | Status of booking |
| checkin_date | DATE | Yes | No | No | | Check-in date of guest |
| checkout_date | DATE | Yes | No | No | | Check-out date of guest |
| booking_date | DATE | Yes | No | No | | Date when booking was made |
| last_updated_at | TIMESTAMP | Yes | No | No | CURRENT_TIMESTAMP | tracks the last time a record was updated |

Table: booking_guest

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|------------|-----------|----------|-----|-----|---------|------------------------------------|
| Id | INT | Yes | Yes | No | | Unique identifier of booking guest |
| booking_id | INT | Yes | No | Yes | | identifier of associated booking |

| | | | | | | |
|---------------------|-----|-----|----|-----|--|---|
| guest_categories_id | INT | Yes | No | Yes | | Identifier of guest demographics (ex: adults, childrens, infants, pets, etc.) |
| num_guests | INT | Yes | No | No | | Number of guests of a specific guest type (ex: adult 2, children 2, infant 1, etc.) |

Table: country

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|--------------|--------------|----------|-----|-----|---------|---|
| Id | INT | Yes | Yes | No | | Unique identifier for each country |
| country_name | VARCHAR(255) | Yes | No | No | | Name of the country, must be unique |
| region_id | INT | Yes | No | Yes | | Identifier of the region of the country |

Table: attribute_category

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------|--------------|----------|-----|----|---------|---|
| id | INT | Yes | Yes | No | | Unique identifier for each detail category |
| category_name | VARCHAR(255) | Yes | No | No | | Name of the detail category |
| category_scope | VARCHAR(255) | No | No | No | NULL | Brief description of the attribute category's name (ex: "Amenities - Facilities within the property") |

Table: favourite

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------|-----------|----------|-----|-----|---------|--|
| Id | INT | Yes | Yes | No | | Unique identifier for each review |
| property_id | INT | Yes | No | Yes | | Identifier of the property |
| user_id | INT | Yes | No | Yes | | Identifier of the user |
| date_favorited | DATETIME | Yes | No | No | | Date and time the property was marked as favourite |

Table: guest_categories

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------|--------------|----------|-----|----|---------|---|
| Id | INT | Yes | Yes | No | | Unique identifier for each guest type |
| guest_type_name | VARCHAR(255) | Yes | No | No | | Name of the guest type(ex: adult, children, infant, etc.) |

Table: host

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|------------------|------------|----------|-----|-----|---------|---|
| host_id | INT | Yes | Yes | No | | Unique identifier of host |
| user_account_id | INT | Yes | No | Yes | | Identifier of user account associated with host |
| host_since | DATE | Yes | No | No | | Date when user became a host |
| superhost_status | TINYINT(1) | Yes | No | No | | Boolean indicating superhost status |

Table: guest_review

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------|-----------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier of the review |
| booking_id | INT | Yes | No | Yes | | Identifier of the booking associated with review |
| host_id | INT | Yes | No | Yes | | Foreign key referencing the host table |
| comment | TEXT | No | No | No | NULL | Text of the review written by the host |
| review_date | DATE | Yes | No | No | | Date when the review was posted |
| guest_rating | INT | Yes | No | No | | Numerical rating given to guest |
| overall_rating | INT | Yes | No | No | | Rating given by the host to the guest |

Table: language

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|---------------|--------------|----------|-----|----|---------|--------------------------------------|
| Id | INT | Yes | Yes | No | | Unique identifier for each language |
| language_name | VARCHAR(255) | Yes | No | No | | Name of the language, must be unique |

Table: location

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|---------------|--------------|----------|-----|-----|---------|---|
| Id | INT | Yes | Yes | No | | Unique identifier for each location |
| country_id | INT | Yes | No | Yes | | Identifier of the country of the location |
| location_name | VARCHAR(255) | Yes | No | No | | Name of the location, must be unique |

Table: messages

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------|-----------|----------|-----|-----|---------|---|
| Id | INT | Yes | Yes | No | | unique identifier for each message |
| sender_id | INT | Yes | No | Yes | | identifier of the user who sent the message |
| receiver_id | INT | Yes | No | Yes | | Identifier of the user who received the message |
| message_content | TEXT | Yes | No | No | | Content of the message |
| sent_timestamp | TIMESTAMP | Yes | No | No | | Time when the message was sent |

Table: place_type

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|------------------------|--------------|----------|-----|----|---------|---------------------------------|
| Id | INT | Yes | Yes | No | | Unique identifier of place type |
| place_type_name | VARCHAR(255) | Yes | No | No | | Name of place type |
| place_type_description | VARCHAR(255) | Yes | No | No | | Description of place type |

Table: property

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------------|---------------|----------|-----|-----|---------|---|
| id | INT | Yes | Yes | No | | Unique identifier for each record |
| host_id | INT | Yes | No | Yes | | Foreign key referencing the host table |
| place_type_id | INT | Yes | No | Yes | | Foreign key referencing the place_type table |
| property_type_id | INT | Yes | No | Yes | | Foreign key referencing the property_type table |
| address_id | INT | Yes | No | Yes | | Foreign Key referencing address table |
| property_name | VARCHAR(255) | Yes | No | No | | Name of the property |
| property_description | TEXT | Yes | No | No | | Description of the property |
| max_num_guests | INT | Yes | No | No | | Maximum number of guests that can be accommodated in a property |
| total_beds | INT | Yes | No | No | | Total number of beds, must be greater than 0 |
| total_bedrooms | INT | Yes | No | No | | Total number of bathrooms, must be greater than 0 |
| price_per_night | DECIMAL(10,2) | Yes | No | No | | Price per night, must be greater than 0 |

Table: property_availability

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------|-----------|----------|-----|-----|---------|---|
| Id | INT | Yes | Yes | No | | Unique identifier for each availability entry |
| property_id | INT | Yes | No | Yes | | Identifier of the property |
| start_date | DATE | Yes | No | No | | Start date of the availability period |
| end_date | DATE | Yes | No | No | | End date of the availability period |

Table: property_category

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|---------------|--------------|----------|-----|----|---------|---|
| id | INT | Yes | Yes | No | | Unique identifier for each property category |
| category_name | VARCHAR(255) | Yes | No | No | | Name of the property category, must be unique |

Table: property_category_link

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------------|-----------|----------|-----|-----|---------|-------------------------------------|
| id | INT | Yes | Yes | No | | Unique identifier for each record |
| property_id | INT | Yes | No | Yes | | Identifier of the property |
| property_category_id | INT | Yes | No | Yes | | Identifier of the property category |

Table: property_attributes

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------------|--------------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier of property details |
| attribute_category_id | INT | Yes | No | Yes | | Identifier of attribute category table |
| attribute_name | VARCHAR(255) | Yes | No | No | | Name of attribute (ex: amenities-swimming pool, house rules-no smoking, safety & property-fire extinguisher) |
| attribute_description | VARCHAR(255) | No | No | No | NULL | Description of the attribute |

Table: property_amenities_rules

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------|-----------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier for each property feature link |
| property_id | INT | Yes | No | Yes | | Identifier of the property |

| | | | | | | |
|------------------------|------|-----|----|-----|--|---|
| property_attributes_id | INT | Yes | No | Yes | | Identifier of the property attributes |
| last_updated | DATE | Yes | No | No | | Date the amenities/guidelines record was last updated |

Table: property_images

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------------|--------------|----------|-----|-----|---------|---|
| id | INT | Yes | Yes | No | | Unique identifier of the image |
| property_id | INT | Yes | No | Yes | | Foreign key referencing unique id of the property table |
| image_url | VARCHAR(255) | Yes | No | No | | URL of the image |
| image_description | VARCHAR(255) | No | No | No | NULL | Description of the image |

Table: property_review

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------|-----------|----------|-----|-----|---------|--|
| review_id | INT | Yes | Yes | No | | Unique identifier for each review |
| booking_id | INT | Yes | No | Yes | | Foreign key referencing the booking table |
| property_id | INT | Yes | No | Yes | | identifier of the property being reviewed by booking(user) |
| comment | TEXT | No | No | No | NULL | Comment written by the user in the review |
| review_date | DATE | Yes | No | No | | Date when the review was written |
| host_rating | INT | Yes | No | No | | Numerical rating given to host |
| overall_rating | INT | Yes | No | No | | Overall rating given by the user in the review, between 1 to 5 |

Table: property_type

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|--------------------|--------------|----------|-----|----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier for each property type |
| property_type_name | VARCHAR(255) | Yes | No | No | | Name of the property type |

Table: region

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------|--------------|----------|-----|----|---------|------------------------------------|
| id | INT | Yes | Yes | No | | Unique identifier for each region |
| region_name | VARCHAR(255) | Yes | No | No | | Name of the region, must be unique |

Table: review_aspect

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------|--------------|----------|-----|----|---------|---|
| aspect_id | INT | Yes | Yes | No | | Unique identifier for each review aspect |
| aspect_name | VARCHAR(255) | Yes | No | No | | Name of the review aspect, must be unique |

Table: social_media

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------|--------------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier for each social media |
| user_account_id | INT | Yes | No | Yes | | Identifier of the user who owns the social media |
| platform_name | VARCHAR(255) | Yes | No | No | | Name of the social media platform |
| account_url | VARCHAR(255) | No | No | No | NULL | URL of the social media account, must be unique |

Table: transaction

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|------------|-----------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier for each transaction |
| booking_id | INT | Yes | No | Yes | | Identifier of the booking related to the transaction |

| | | | | | | |
|--------------------|---------------|-----|----|-----|------|---|
| voucher_id | INT | No | No | Yes | NULL | Identifier of the voucher used in the transaction |
| payment_method | VARCHAR(255) | Yes | No | No | | Payment method used in the transaction |
| transaction_date | DATE | Yes | No | No | | Date when the transaction was made |
| tax | DECIMAL(10,2) | Yes | No | No | | Tax amount in the transaction |
| service_charge | DECIMAL(10,2) | Yes | No | No | | Service charge in the transaction |
| cleaning_charge | DECIMAL(10,2) | Yes | No | No | | Cleaning charge in the transaction |
| airbnb_charge | DECIMAL(10,2) | Yes | No | No | | Airbnb charge in the transaction |
| transaction_status | VARCHAR(255) | Yes | No | No | | Status of the transaction |

Table: user_account

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-----------------|--------------|----------|-----|----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier of user account |
| first_name | VARCHAR(255) | Yes | No | No | | First name of the user |
| last_name | VARCHAR(255) | Yes | No | No | | Last name of the user |
| gender | VARCHAR(255) | Yes | No | No | | Gender of the user |
| date_of_birth | DATE | Yes | No | No | | Date of birth of the user |
| email_address | VARCHAR(255) | Yes | No | No | | Email address of the user |
| user_name | VARCHAR(255) | Yes | No | No | | Username chosen by the user |
| hashed_password | VARCHAR(255) | Yes | No | No | | Hashed and salted representation of the users password |
| date_joined | DATE | Yes | No | No | | Date when the user joined |
| is_host | TINYINT(1) | Yes | No | No | | Boolean indicating if the user is a host |
| mobile_number | VARCHAR(25) | Yes | No | No | | Contact number for communication and verification |

Table: user_language

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------|-----------|----------|-----|-----|---------|---|
| id | INT | Yes | Yes | No | | Unique identifier of user-language link |
| user_id | INT | Yes | No | Yes | | Identifier of associated user |
| language_id | INT | Yes | No | Yes | | Identifier of associated language |

Table: voucher

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|-------------------|---------------|----------|-----|----|---------|---|
| voucher_id | INT | Yes | Yes | No | | Unique identifier of voucher |
| title | VARCHAR(255) | Yes | No | No | | Title of voucher |
| unique_code | VARCHAR(255) | Yes | No | No | | Unique code of voucher |
| discount_amount | DECIMAL(10,2) | Yes | No | No | | Discount amount provided by voucher |
| min_booking_value | DECIMAL(10,2) | Yes | No | No | | Minimum booking value for voucher applicability |
| expiry_date | DATE | Yes | No | No | | Expiry date of voucher |
| created_at | DATE | Yes | No | No | | Creation Date of voucher |

Table: address

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|--------------------|--------------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | unique identifier for each address record. |
| region_id | INT | Yes | No | Yes | | Region or administrative division |
| country_id | INT | Yes | No | Yes | | Country associated with the address |
| location_id | INT | Yes | No | Yes | | Specific location (e.g., city) |
| zip_code | INT | Yes | No | No | | Postal code or ZIP code. |
| street_address_one | VARCHAR(255) | Yes | No | No | | Primary part of the address (street name and house/building number). |
| street_address_two | VARCHAR(255) | No | No | No | NULL | secondary part of the address, can be NULL |

Table: neighborhood

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|--------------------------|--------------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier of neighborhood |
| location_id | INT | Yes | No | Yes | | Foreign key referencing the location table |
| neighborhood_name | VARCHAR(255) | Yes | No | No | | Name of the neighborhood |
| neighborhood_description | VARCHAR(255) | No | No | No | NULL | Optional description of the neighborhood |
| transportation_score | INT | No | No | No | NULL | Optional score for the availability and convenience of public transport, rated out of 10 (integer) |
| safety_rating | INT | No | No | No | NULL | Optional rating for the perceived safety of the neighborhood, rated out of 10 (integer) |

Table: user_preferred_guest_type

| Name | Data Type | Not Null | PK | FK | Default | Comment |
|----------------------|-----------|----------|-----|-----|---------|--|
| id | INT | Yes | Yes | No | | Unique identifier of user preferred guests type |
| user_account_id | INT | Yes | No | Yes | | Foreign key referencing the user in user account table |
| guest_categories_id | INT | Yes | No | Yes | | Foreign key referencing the guest categories table (ex: adult, children, infant) |
| preferred_num_guests | INT | No | No | No | NULL | Number of guests of the preferred type |

3. Challenges and Solutions in Database Design

In this project, we undertook the task of creating a database for a hotel booking business inspired by Airbnb. The primary challenge was distinguishing between guests and hosts, as users could fulfill both roles. To address this, we established a separate table for hosts to manage their roles independently from guest accounts.

Host reviews played a crucial role, setting Airbnb apart from other rental booking services. To ensure accuracy, we linked reviews directly to individual guest bookings through the booking table. Initially, there was a dilemma regarding whether to connect the `property_reviews` and `guest_reviews` tables to either the booking or the property table. However, connecting them to the property table would have led to redundancy and inconsistency. This decision ensured that hosts could only review guests who had stayed at their property.

To maintain data integrity, we implemented trigger functions. These functions prevented hosts from self-booking or self-reviewing their own properties, thus ensuring fair and accurate reviews.

Regarding the calculation of the total price, there was uncertainty about whether a `total_price` attribute was necessary in the booking table. Upon further examination of the schema, it became evident that we could dynamically compute the total price using additional relevant attributes. This approach not only guaranteed consistency but also reduced redundancy within the database structure.