CAT 1

Database Design

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Exercise 1

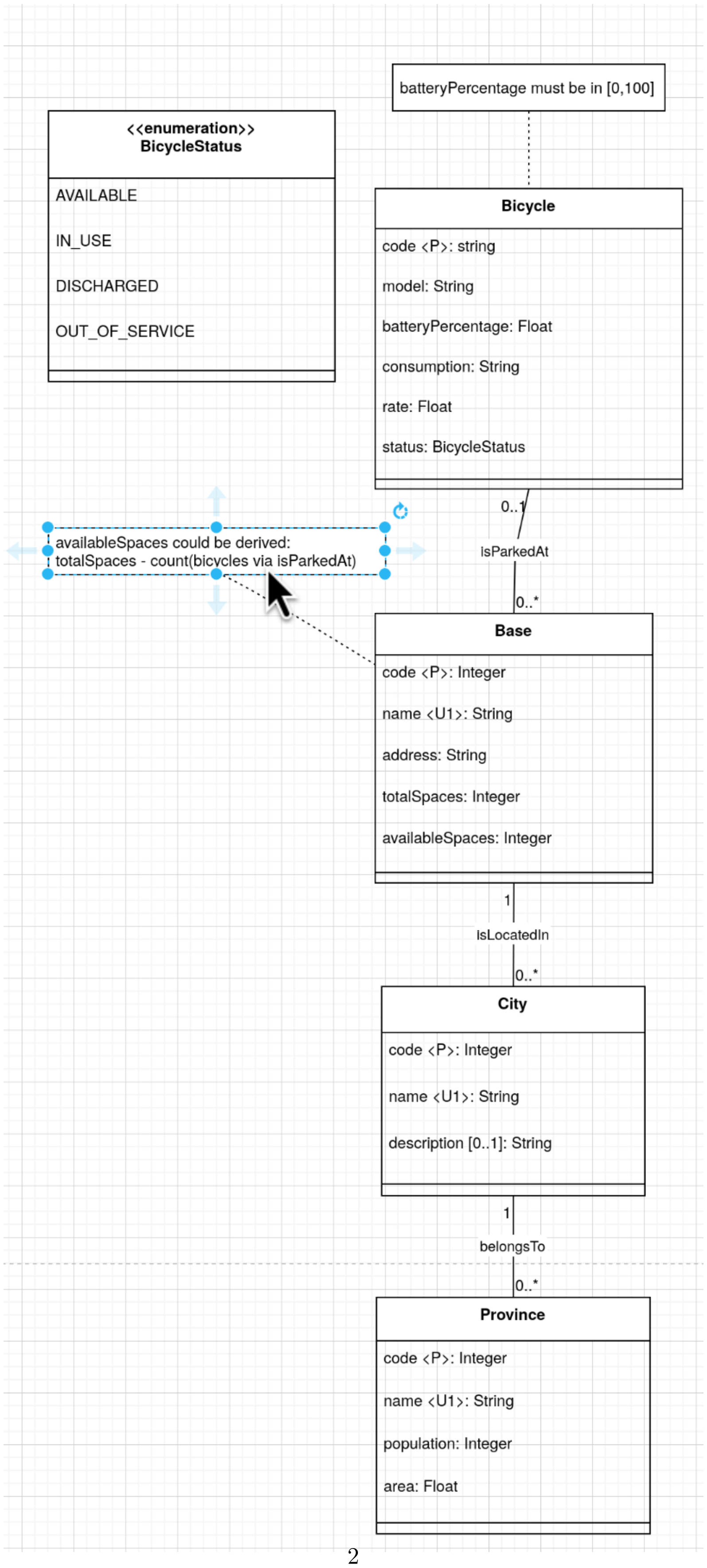


Figure 1: UML Class Diagram

Following the class diagram, here are a few assumptions made:

- The `name` attribute for all the classes that have it has been assumed to be unique, that is why in the diagram all of them are marked with `<U1>`.
- As stated in the diagram, the number of available spaces in a `Base` could be calculated from existing properties.

Exercise 2

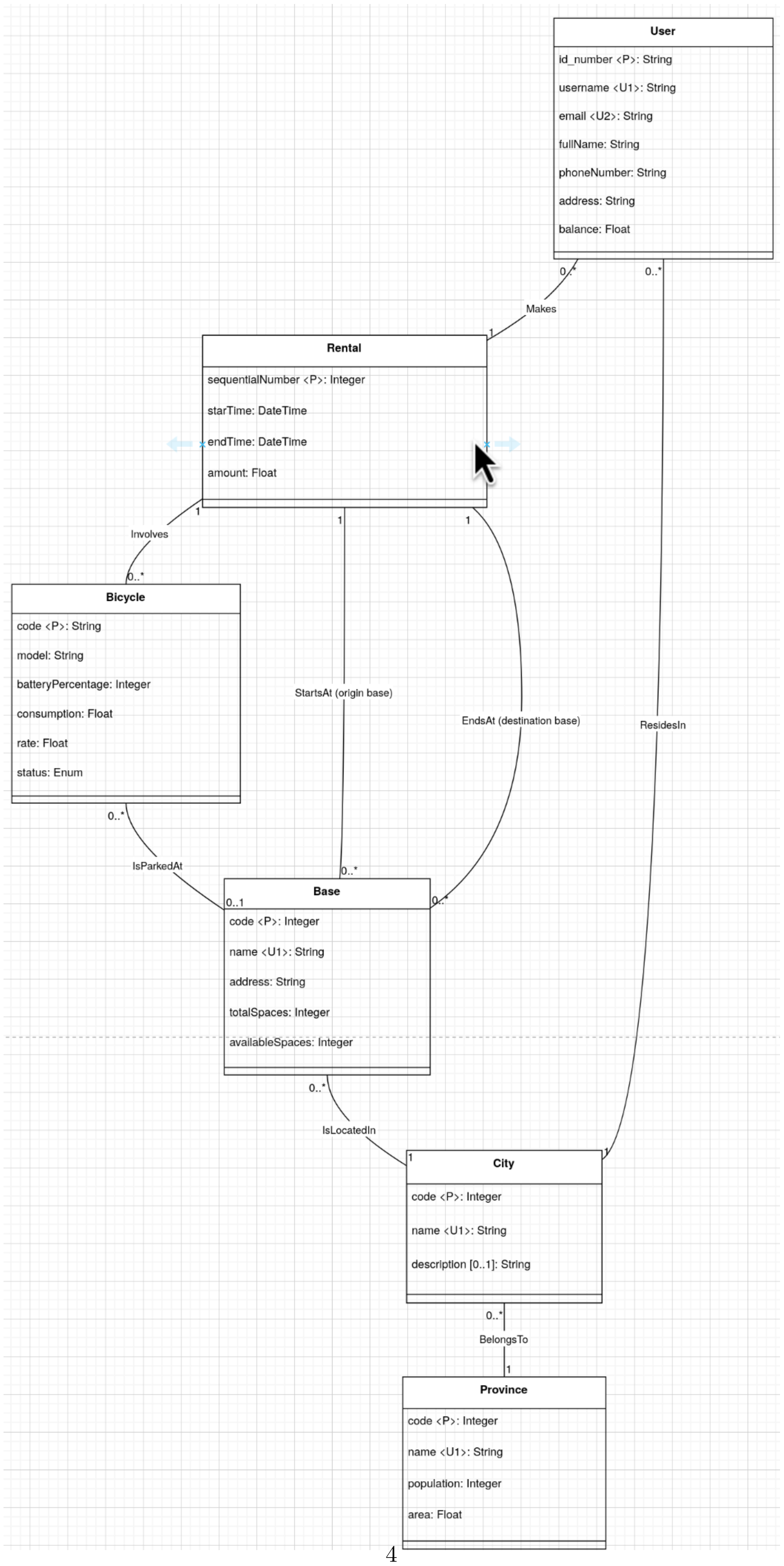


Figure 2: UML Class diagram

Assumptions made for this updated diagram:

- The `Rental` entity is a weak entity because its instances are identified by a partial key (`sequentialNumber`) and their relationship to a `User` entity.
- The `User` entity has two candidate keys `username` and `email`, both of which must be unique across all users.
- The cardinalities reflect that a `User` may have never made a rental, a `Bicycle` may have never been rented, and a `Base` may have never been the origin or destination of any rental.

Exercise 3

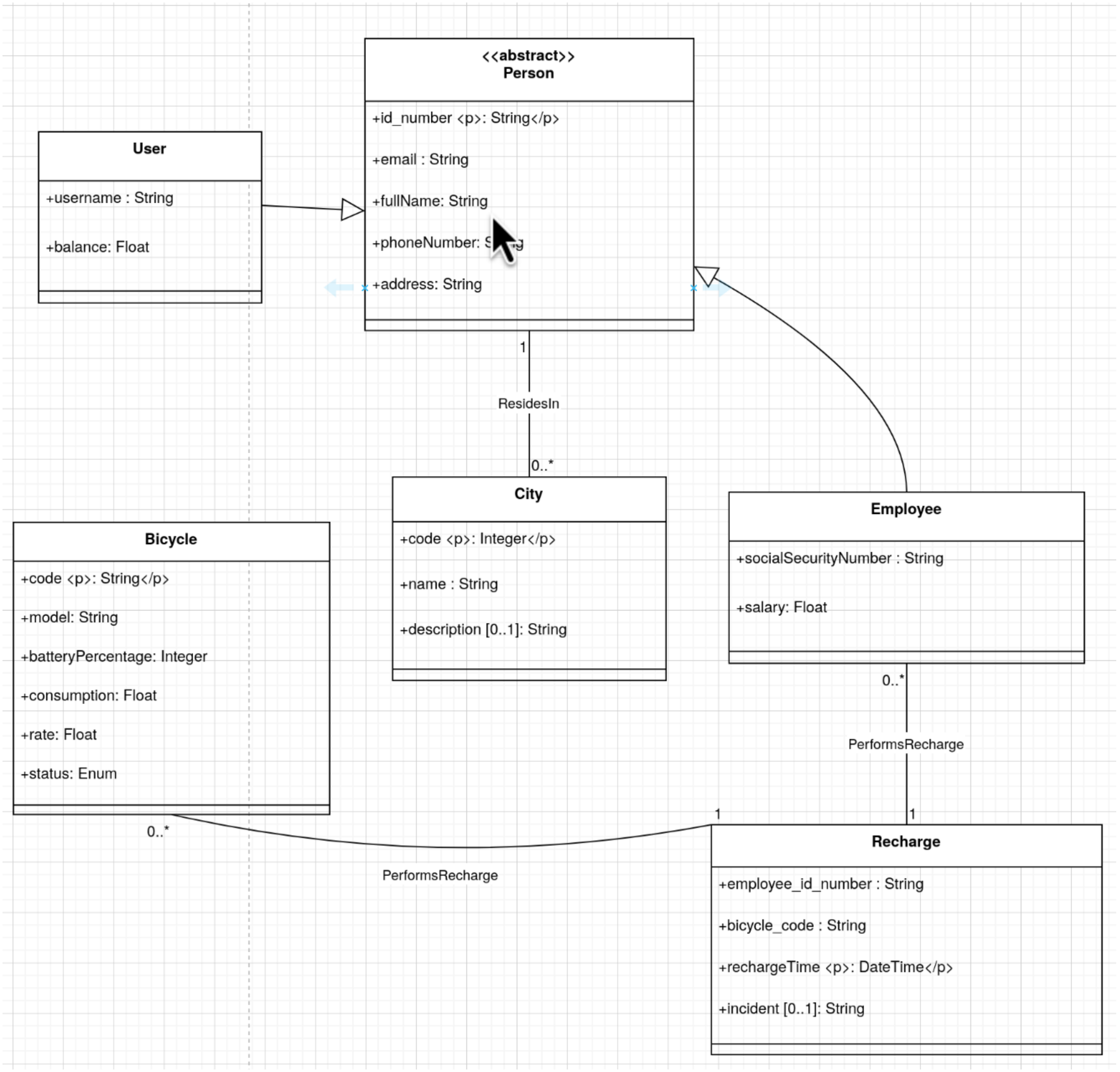


Figure 3: UML Class Diagram

Assumptions made:

- The mauin change is the introduction of the `Person` superclass to avoid redundancy and correctly model the domain, where both users and employees are types of people with shared characteristics.
- The composite primary key for `Recharge` (`employee_id_number`, `bicycle_code`, `rechargeTime`) follows the constraint that at any given moment a bicycle can only be recharged by a single employee, and an employee at any given moment can only perform the recharge of one bicycle. This structure ensures that the combination of `bicycle_code` and `rechargeTime` is unique, as is the combination of `employee_id_number` and `rechargeTime`.

Exercise 4

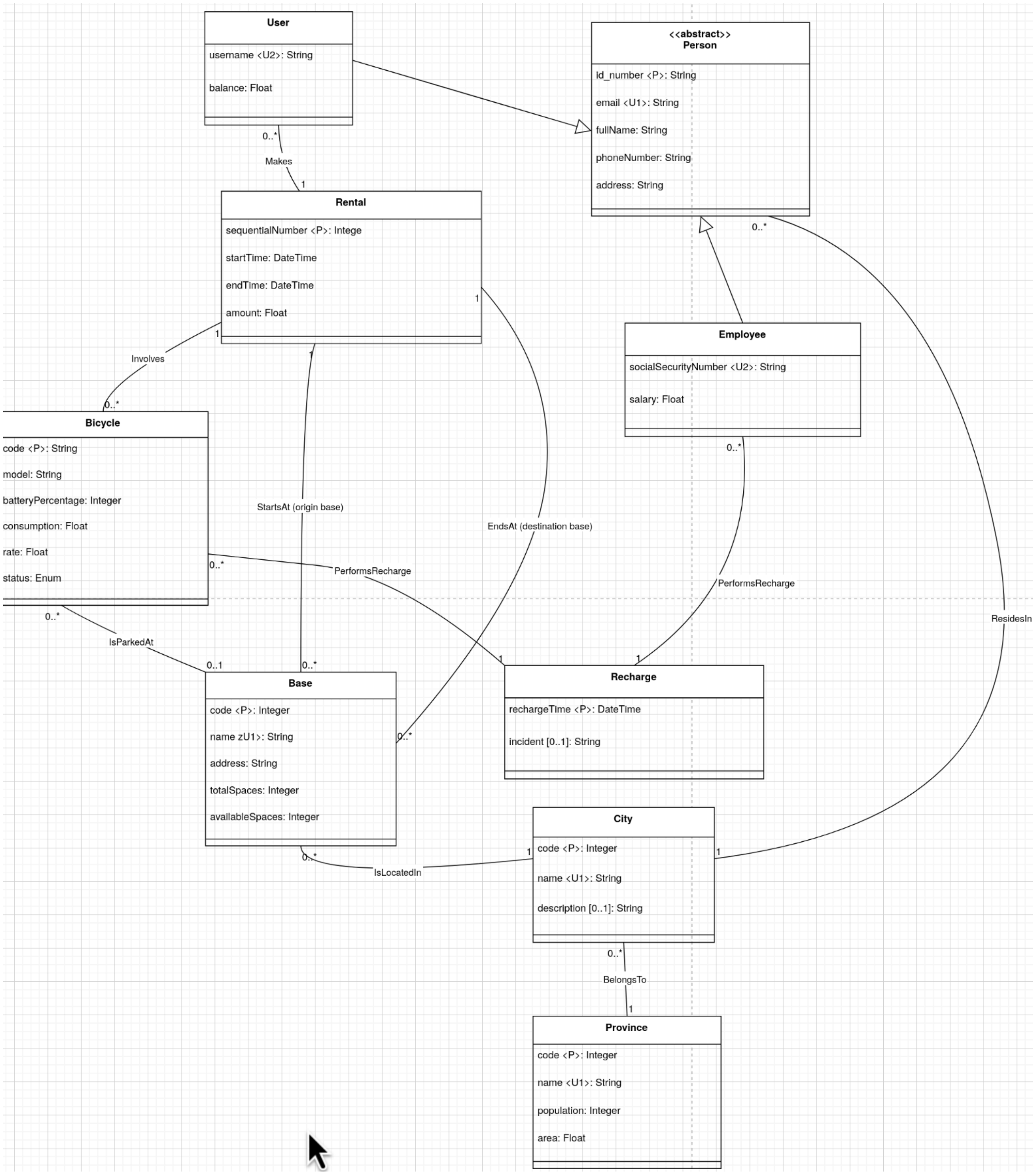
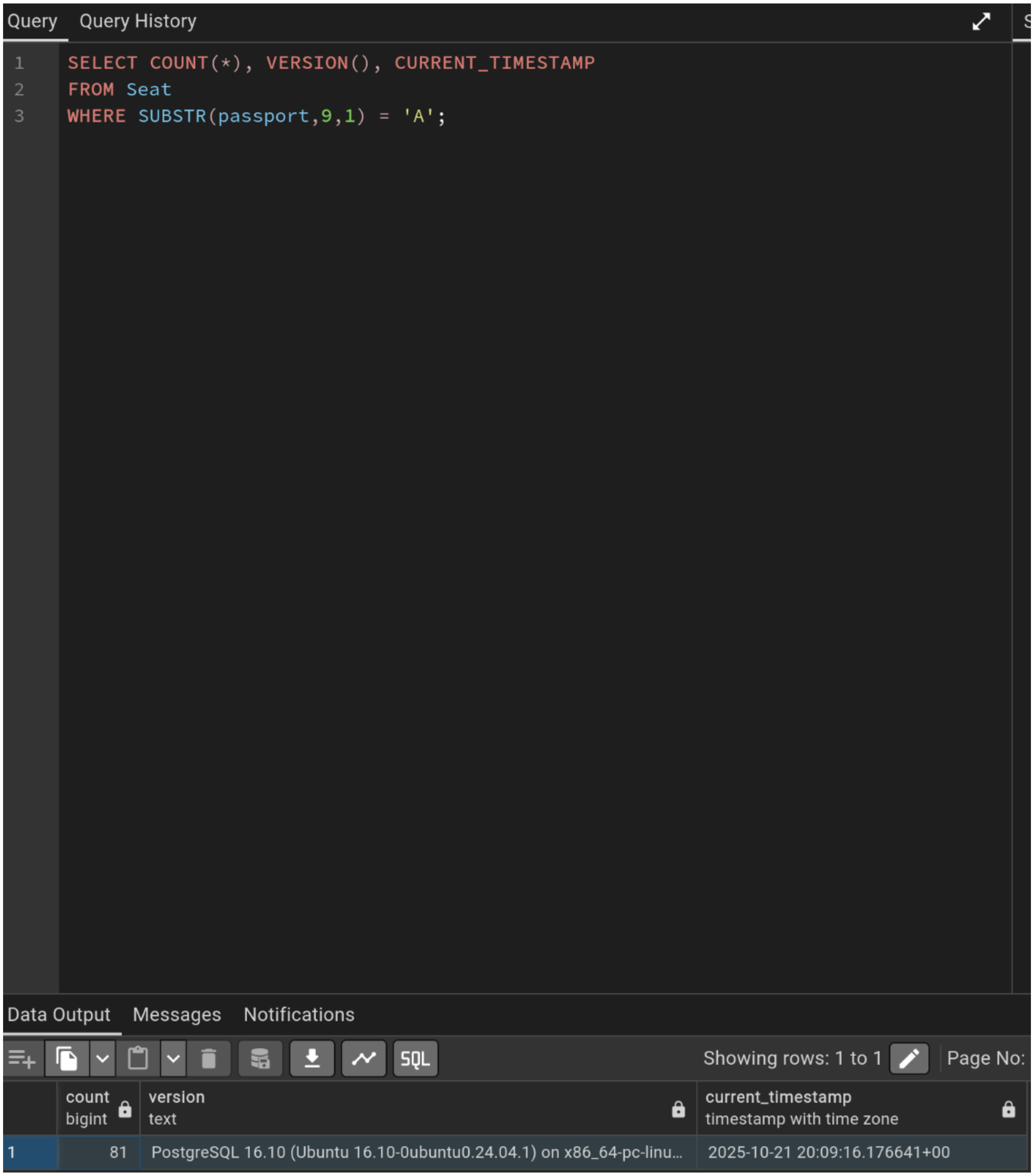


Figure 4: UML Class Diagram

Exercise 5

Here is a screenshot proving the setup is properly installed:



```sql
SELECT COUNT(*), VERSION(), CURRENT_TIMESTAMP
FROM Seat
WHERE SUBSTR(passport,9,1) = 'A';
```

	count bigint	version text	current_timestamp timestamp with time zone
1	81	PostgreSQL 16.10 (Ubuntu 16.10-0ubuntu0.24.04.1) on x86_64-pc-linu...	2025-10-21 20:09:16.176641+00

Figure 5: pgAdmin 4 Query Result