Normalization

The table design ensures data consistency, minimizes redundancy, and adheres to good database normalization practices. Each table in the movie rental database satisfies the requirements for 3NF.

First Normal Form (1NF)

- The tables are in 1NF because they contain atomic values.
    - **Movies:** Each movie has an atomic value for title, release_year, genre, and director. No column contains multiple values.
    - **Customers:** Each customer has atomic values for first_name, last_name, email, and phone_number. These are unique and do not contain multiple values in one field.
    - **Rentals:** Each rental row refers to a single customer, a single movie, a rental_date, and a return_date. No column contains multiple values.

Second Normal Form (2NF)

- They are in 2NF because all non-key attributes depend on the entire primary key.
    - **Movies:** The primary key is movie_id, and all other attributes (title, release_year, genre, director) depend on the entire primary key, as each of these attributes describes the movie itself.
    - **Customers:** The primary key is customer_id, and all other attributes (first_name, last_name, email, phone_number) are fully dependent on the customer_id since each customer is uniquely identified by their customer_id.
    - **Rentals:** The primary key could be rental_id, and the attributes movie_id, customer_id, rental_date, and return_date are all dependent on the entire primary key. The rental_id uniquely identifies each rental transaction.

Third Normal Form (3NF)

- They are in 3NF because there are no transitive dependencies between non-key attributes.
    - **Movies:** The attributes title, release_year, genre, and director are not dependent on each other, only on the movie_id (the primary key). There are no transitive dependencies.

- **Customers:** The attributes first_name, last_name, email, and phone_number are independent of each other and only depend on the primary key, customer_id. There are no transitive dependencies.
- **Rentals:** The foreign keys movie_id and customer_id are linked to the Movies and Customers tables respectively. The rental_date and return_date are dependent only on the primary key rental_id and not on any other non-key attributes. There are no transitive dependencies between the columns in the Rentals table.

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