

## Task #

Normalizing Databases using functional dependencies upto BCNF

1. Apply the Functional Dependency and Normalize to 1NF.

Step 1: Identify functional dependency (FDs)

OrderTable (Order\_ID, cust\_ID, Order\_date, Order\_Total, Payment\_status)

- FD1: Order\_ID → Cust\_ID, Order\_date, Order\_Total, Payment\_status.

Customer (Cust\_ID, Cust\_Name, Cust\_contact, Cust\_email, Cust\_Address)

- FD2: Item\_ID → Item\_Name, Price, Category, Rest\_ID

Menu\_Item (Item\_ID, Item\_Name, Price, Category, Rest\_ID)

- FD3: Item\_ID → Item\_Name, Price, Category, Rest\_ID.

Normalization to 1NF (first normal form)

- Ensure that each column contains only atomic values.
- Removes any repeating groups.

Normalization the Relations using FD+ and  $\alpha^+$

- Compute FD+ using Armstrong's Axioms.
- Identify minimal keys and remove redundant FDs.

Closure for OrderTable :

- FD+ : { Order\_ID → cust\_ID, Order\_Date, Order\_Total, Payment\_Status }

### 3. Find the Minimal Cover and Canonical Cover

#### Minimal Cover

- FD1 : Order\_ID → Cust\_ID, Order\_date, Order\_Total, Payment\_Status
- FD2 : Cust\_ID → Cust\_Name, Cust\_Contact, Cust\_Email, Cust\_Address
- FD3 : Item\_ID → Item\_Name, Price, Category, Rest\_ID

#### Canonical Cover :

- No redundancy detected

### 4. Normalize to 2NF.

- A relation is in 2NF if it is in 1NF and has no partial dependencies.
- Remove partial dependencies by creating separate relations.

#### Normalization to 2NF :

- OrderTable (Order\_ID, Order\_date, Order\_Total, Payment\_Status)
- Customer (Cust\_ID, Cust\_Name, Cust\_Contact, Cust\_Email, Cust\_Address)
- Menu\_Item (Item\_ID, Item\_Name, Price, Category, Rest\_ID)

### 5. Normalize to 3NF

- A relation is in 3NF if it is in 2NF and has no transitive dependencies.
- Ensure non-prime attributes depend only on primary keys.

Normalization to 3NF :

- Restaurant (Rest\_ID, Rest\_Name, Rest\_Location, Rest\_Contact)
- Menu\_Item (Item\_ID, Item\_Name, Price, Category, Rest\_ID)

6. Normalization to BCNF

- A relation is in BCNF if, for every function dependency ( $X \rightarrow Y$ ),  
 $X$  is a superkey.
- Identify and remove transitive dependencies.

• Normalization to 3NF :

- OrderTable (Order\_Id, Cust\_Id, Order\_date, Order\_Total, Payment\_Status)
- Customer (Cust\_ID, Cust\_Name, Cust\_Contact, Cust\_Email, Cust\_Address)
- Menu\_Item (Item\_ID, Item\_Name, Price, Category, Rest\_ID)