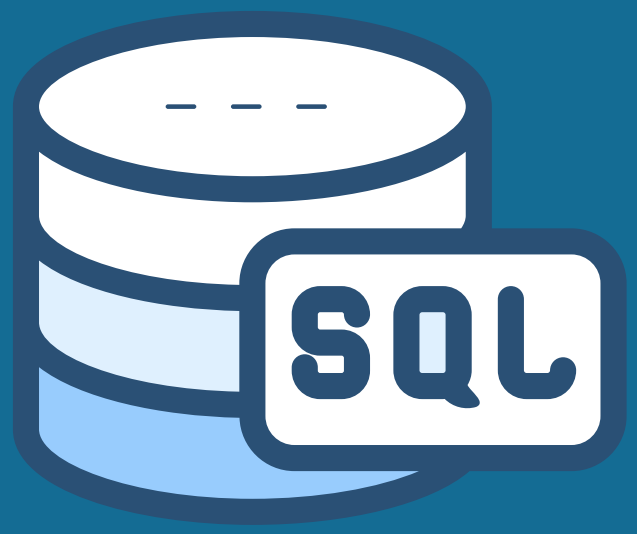
Normalization and its Types.



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What is Normalization?

Normalization is the process of organizing a database by dividing large tables into smaller related tables to reduce data redundancy, enhance data integrity and improve overall database performance.

Types of Normalization:

➔ 1NF:

Full Form: **First Normal Form**

Organize the data to eliminate repeating groups within the tables and ensure each cell holds a single value, thus making each row unique.

Rules for 1NF:

- **Atomic Values:** Each cell must contain only one value.
- **Primary key:** The table should have a primary key to identify each row uniquely.
- **Uniform Data type:** Each column should contain data of a single data type.
- **No duplication:** Each row or column should be unique.

1NF Example:

The table is not in 1NF, because Subject column contains multiple values

Employee_id	Name	Subject
1	Alice	Science,Maths
2	David	History, Social, Maths
3	Max	Music
4	James	Maths, History

Employee_id	Name	Subject
1	Alice	Science
1	Alice	Maths
2	David	History
2	David	Social
2	David	Maths
3	Max	Music
4	James	Maths
4	James	History

The table is in 1NF, as each cell holds single value.

➔ 2NF:

Full Form: **Second Normal Form.**

While 1NF removes repeating groups, it may allow redundancy.

- Hence the primary goal of 2NF is to eliminate partial dependencies, and reduce redundancy.

Rules for 2NF:

- Table must satisfy all 1NF rules.
- Every non-key attribute should be fully dependent on the primary key, not just part of it.

2NF Example:

The table is in 1NF.

Employee_id	course_id	Name	Subject
1	101	Alice	Science
1	102	Alice	Maths
2	103	David	Social
2	102	David	Maths
3	104	Max	Music
4	102	James	Maths

Employee_id	Name
1	Alice
2	David
3	Max
4	James

course_id	Subject
101	Science
102	Maths
103	Social
104	Music

Employee_id	course_id
1	101
1	102
2	103
2	102
3	104
4	102

Above 3 tables has been normalized to 2NF.

➔ 3NF:

Full Form: **Third Normal Form.**

While 2NF removes repeating groups and redundancy, but does not eliminate transitive partial dependency.

- The primary goal of 3NF is to remove the transitive dependencies and ensure data consistency.

Rules for 3NF:

- The table must satisfy all 2NF rules.
- No Non-key attributes should depend on other non-key attributes. (Every non key attribute must depend only on the primary key).

3NF Example:

The table is in 2NF.

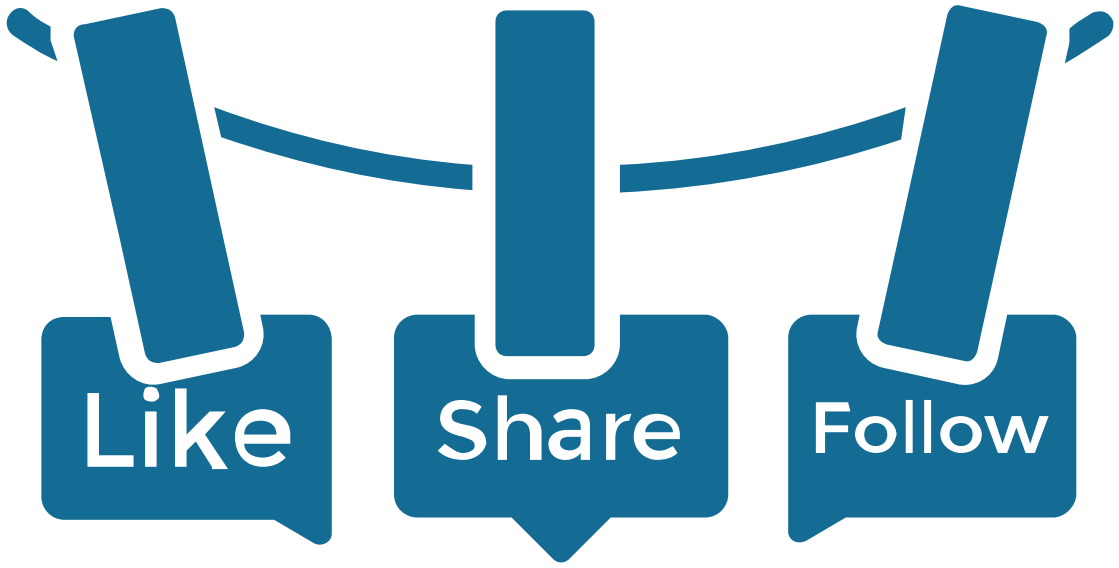
Employee_id	Employee_name	Department_id	Department_name
1	Alice	101	IT
2	David	102	Finance
3	Max	103	Support team
4	James	102	Finance
5	Alex	104	HR

Employee_id	Employee_name	Department_id
1	Alice	101
2	David	102
3	Max	103
4	James	102
5	Alex	104

Department_id	Department_name
101	IT
102	Finance
103	Support team
104	HR

Table has been normalized to 3NF.

Thank You



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