Normalization

#database

Overview

Normal Forms are a series of guidelines that helps to ensure that the design of a database is efficient, organized, and free from data anomalies.

Normal Forms

First Normal Form

- most basic level of normalization.
- each table cell should contain only a single value.
- each column should have a unique name.
- helps to eliminate duplicate data and simplify queries.

Second Normal Form

- eliminates redundant data
- requires each non-key attributes be dependent on the primary key.
- each column should be directly related to the primary key, and to other columns.

Third Normal Form

- builds on second normal form
- each column should be related to the primary key, and not to any other columns IN THE SAME TABLE.

Boyce-Codd Normal form

- stricter form of third normal form.
- ensures that determinant in a table is a candidate key.
- ensures that non-key attributes is dependent only on the candidate key.

Fourth Normal Form

- further refinement of Boyce-Codd Normal form

- ensures t hat a table does not contain any multi-valued dependencies.

Fifth Normal Form

- highest level of normalization
- involves decomposing a table into smaller table to remove data redundancy and improve data integrity.

Hint

Care must be taken to distinguish between duplicated data and redundant data. Duplicated data is present when an attribute has two (or more) identical values. A data value is redundant if you can delete it without information being lost. In other words, redundancy is unnecessary duplication.

Pros of normal forms

Reduce data redundancy

Eliminate duplicate data in tables, reducing the amount of storage space needed and improving database efficiency.

Improved data consistency

Data is stored in a consistent and organized manner, reducing the risk of data inconsistencies and errors.

Simplified database design

Provides guidelines for organizing tables and data relationships, making it easier to design and maintain a database.

Improved query performance

Easier to search and retrieve data from, resulting in faster query performance.

Easier database maintenance

Reduce the complexity of a database by breaking it down into smaller, more manageable tables, making it easier to add, modify and delete data.

Applications of normal forms

Data consistency

Ensure that data is consistent and does not contain redundant info. Prevents inconsistencies and errors in the database.

Data redundancy

Minimized data redundancy by organizing data into tables that contain only unique data. Reduce the amount of storage space required for the database and makes it easier to manage.

Query Performance

Improve query performance by reducing the number for joins required to retrieve data. Speeds up query processing and improved overall system performance.

Database maintenance

Making it easier to maintain by reducing the amount of redundant data that needs to be updated, deleted, or modified. Improve the database management and reduce risk of errors or inconsistencies.