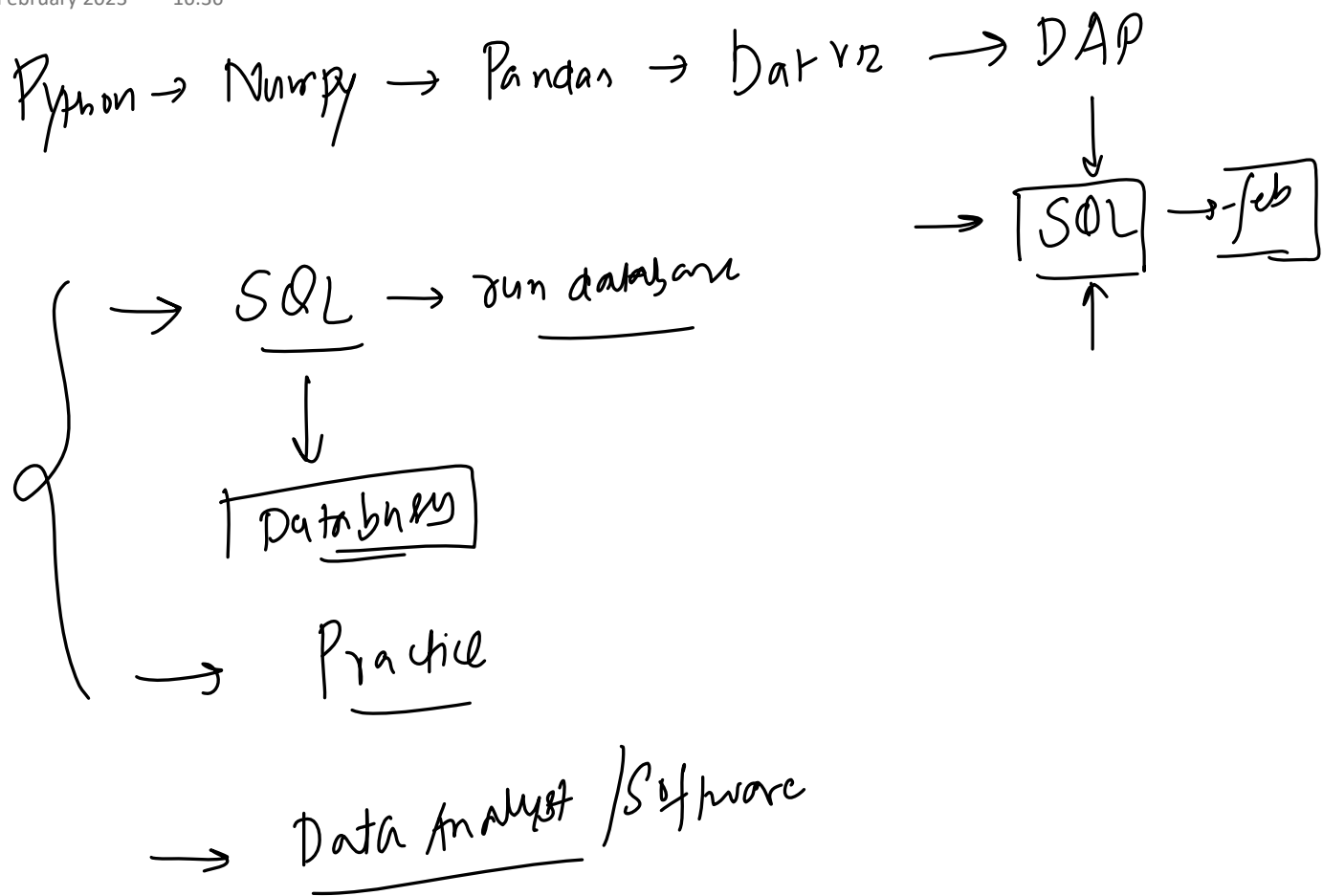


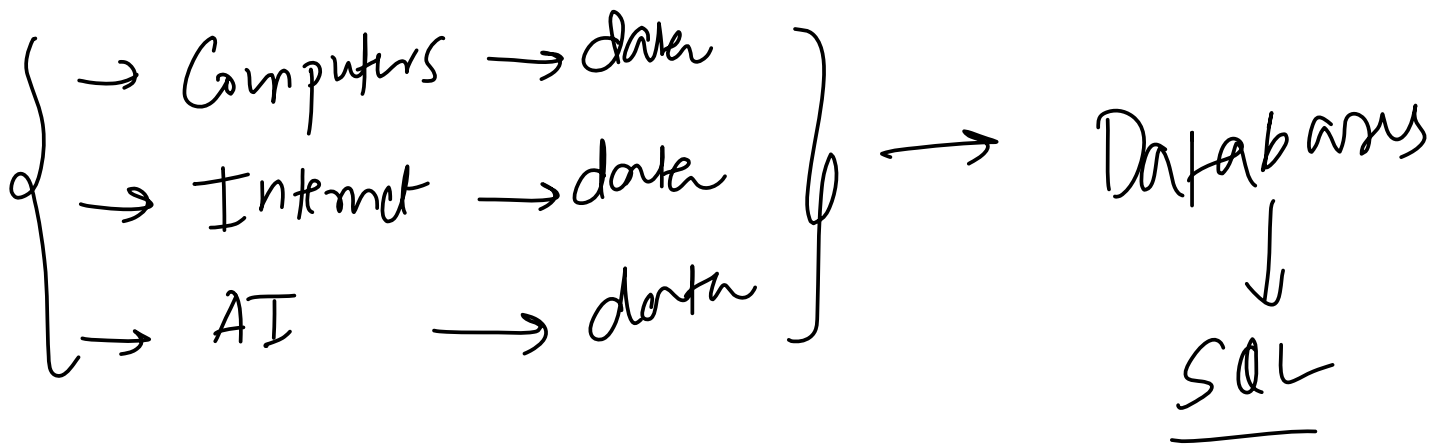
1. Before starting

06 February 2023 16:36



2. Importance of Data

06 February 2023 16:36



3. What are Databases?

06 February 2023 16:37

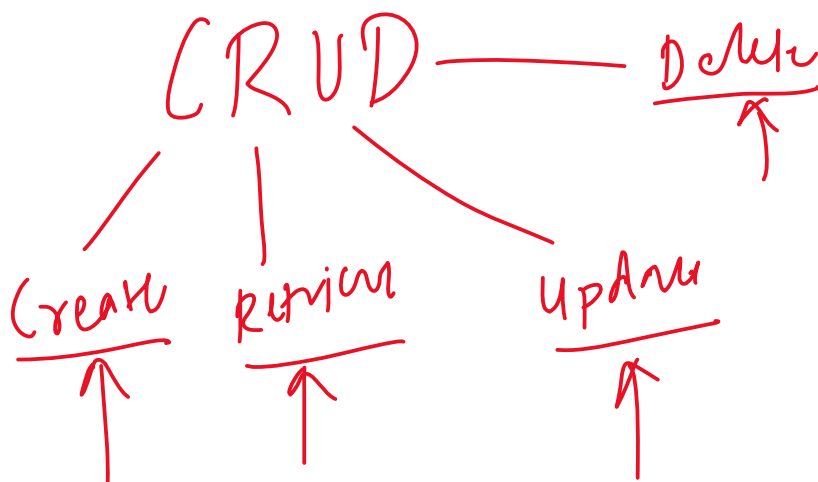
A Database is a shared collection of logically related data and description of these data, designed to meet the information needs of an organization

Data Storage: A database is used to store large amounts of structured data, making it easily accessible, searchable, and retrievable.

Data Analysis: A database can be used to perform complex data analysis, generate reports, and provide insights into the data.

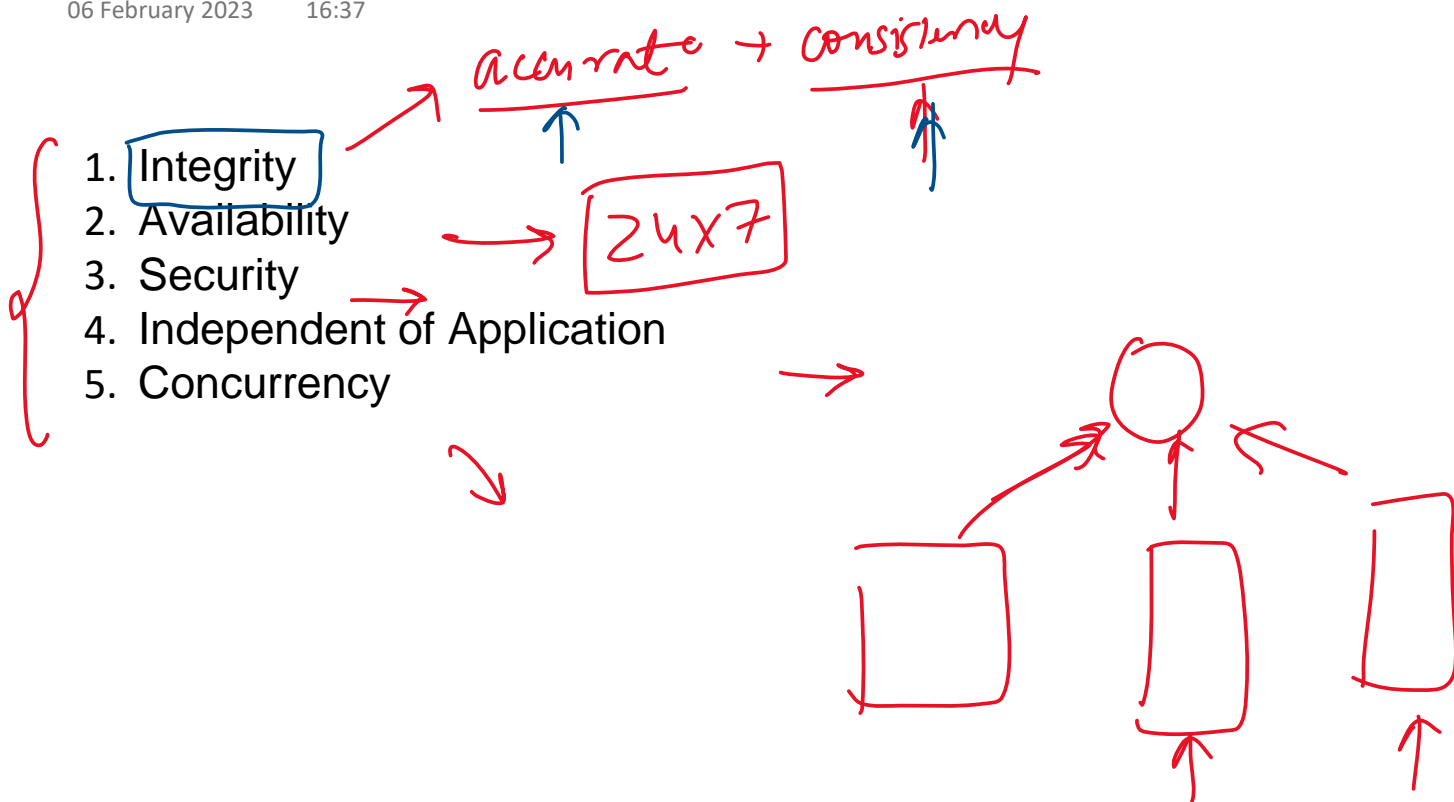
Record Keeping: A database is often used to keep track of important records, such as financial transactions, customer information, and inventory levels.

Web Applications: Databases are an essential component of many web applications, providing dynamic content and user management.



4. Properties of an Ideal Database

06 February 2023 16:37



5. Types of Databases

06 February 2023 16:42

1. Relational Databases - (row)

Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.

2. NoSQL Databases -

These databases are designed to handle large amounts of unstructured or semi-structured data, such as documents, images, or videos. (MongoDB)

3. Column Databases -

These databases store data in columns rather than rows, making them well-suited for data warehousing and analytical applications. (Amazon Redshift, Google BigQuery)

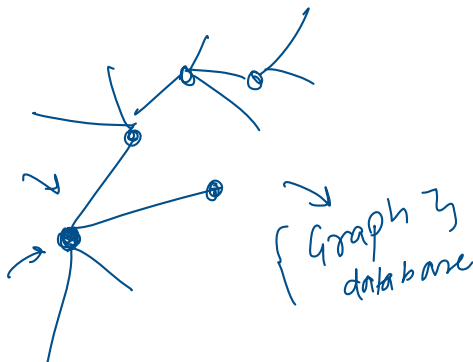
4. Graph Databases -

These databases are used to store and query graph-structured data, such as social network connections or recommendation systems. (Neo4j, Amazon Neptune)

5. Key-value databases -

These databases store data as a collection of keys and values, making them well-suited for caching and simple data storage needs (Redis and Amazon DynamoDB)

Which one should you use?



1000 students

→	nishu	EE	6.6
→			
→			

cgpa → mean

row → relation

nishu	EE	6.6	Ankit	CE	9.2
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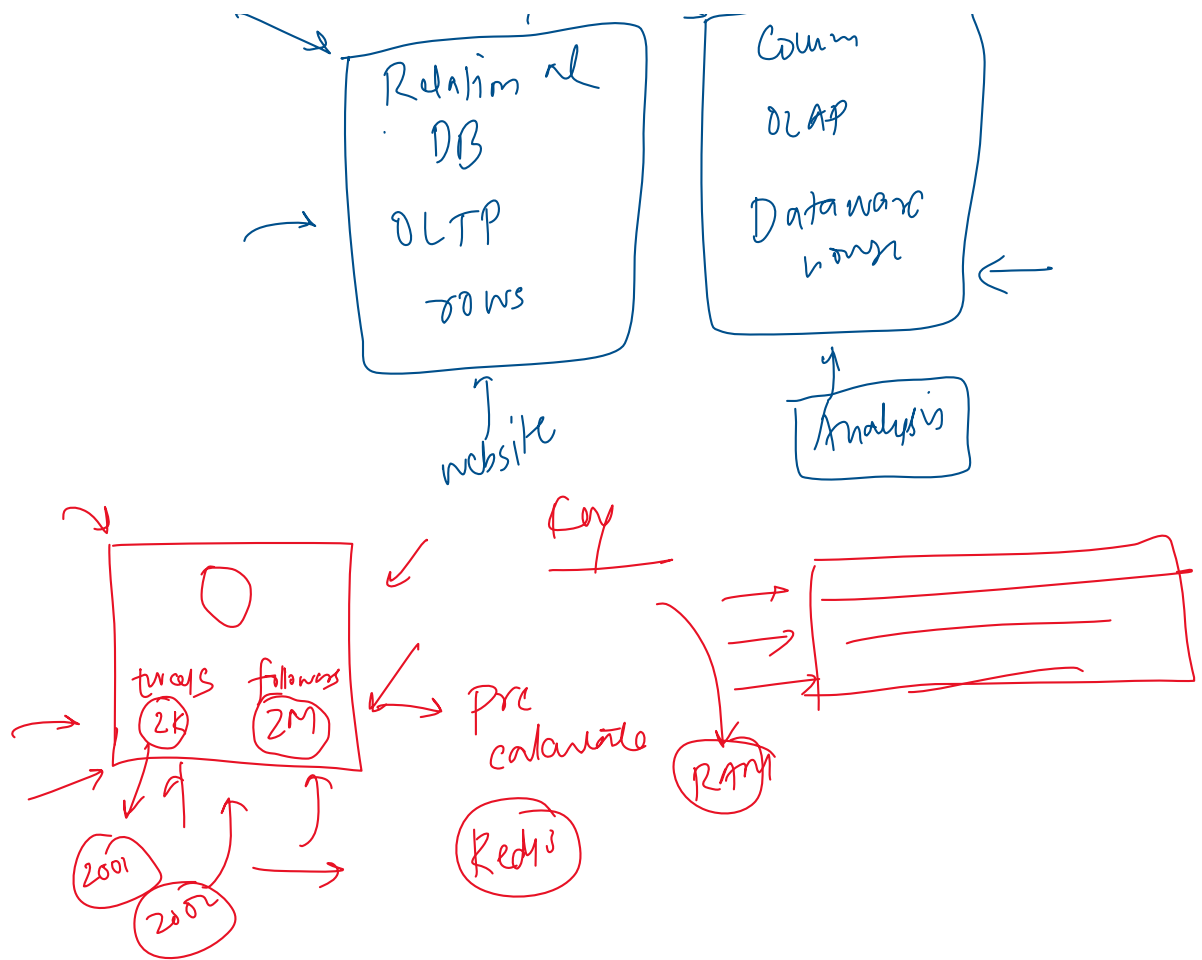
Sid name
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nishu ankit nishu ... EE CE ... 6.6 9.2 ...

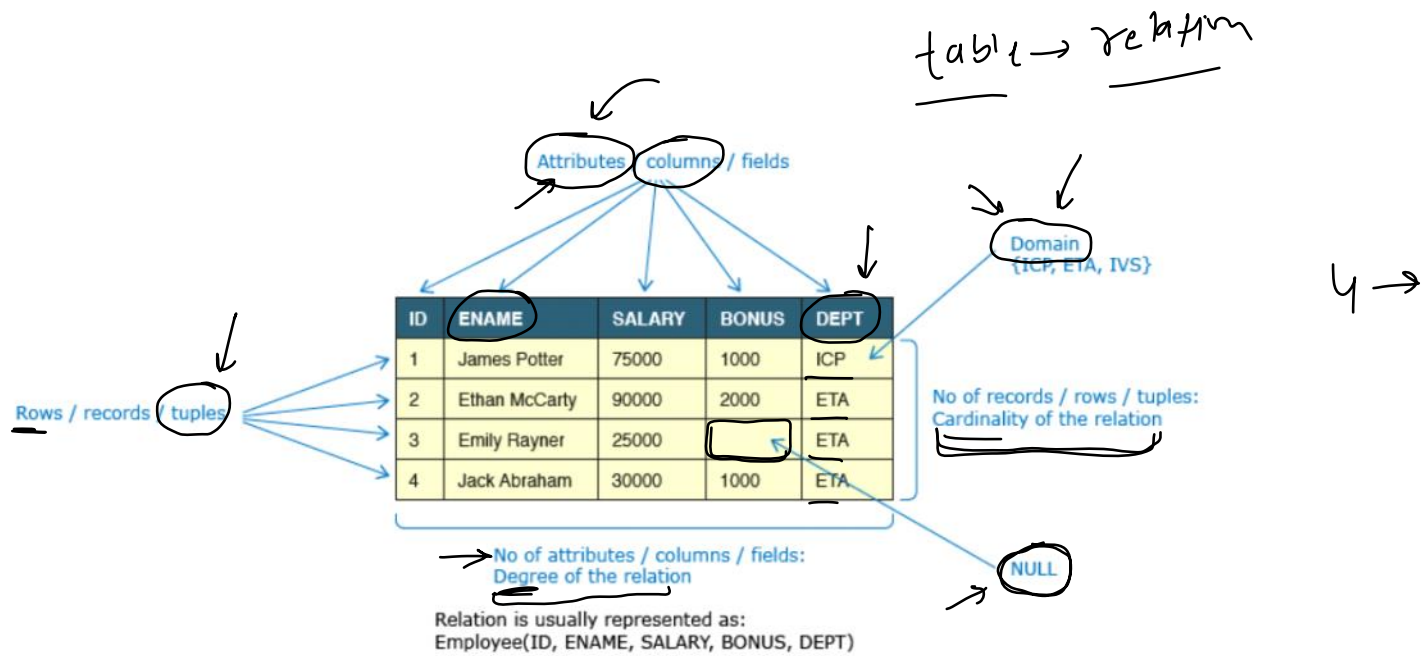




6. Relational Databases

06 February 2023 16:42

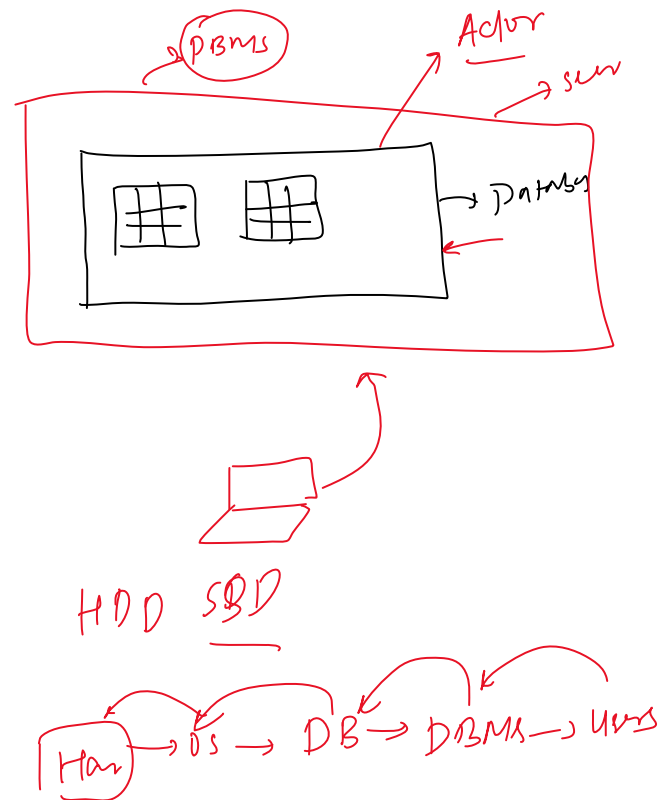
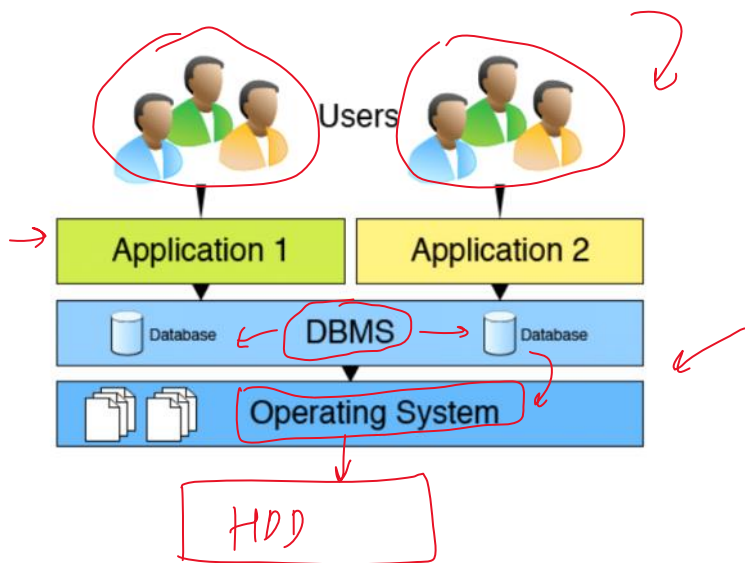
Also known as SQL databases, these databases use a relational model to organize data into tables with rows and columns.



7. What is a DBMS

06 February 2023 16:41

A database management system (DBMS) is a software system that provides the interfaces and tools needed to store, organize, and manage data in a database. A DBMS acts as an intermediary between the database and the applications or users that access the data stored in the database.



Functions of DBMS

Data Management - Store, retrieve and modify data

Integrity - Maintain accuracy of data

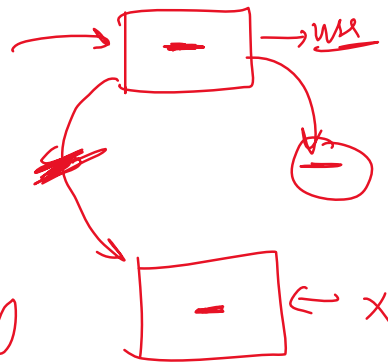
Concurrency - Simultaneous data access for multiple users

Transaction - Modification to database must either be successful or must not happen at all

Security - Access to authorized users only

Utilities - Data import/export, user management, backup, logging

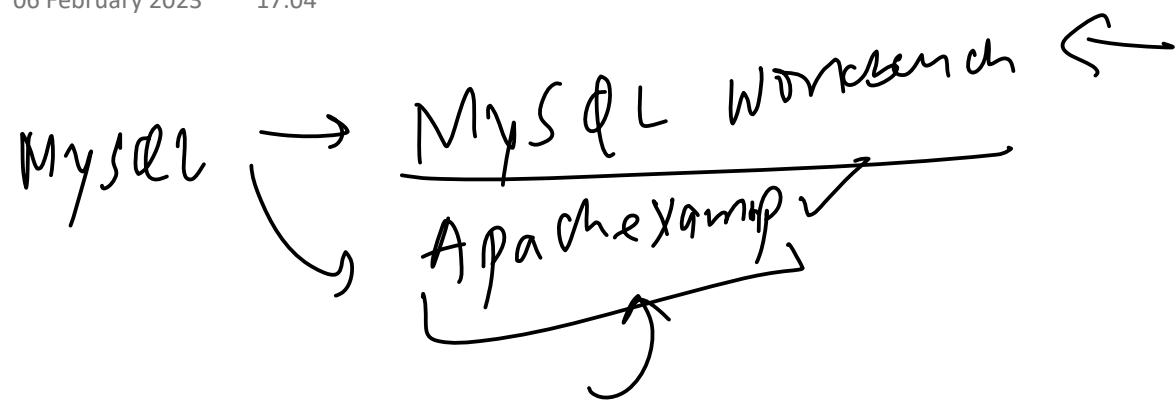
→ CRUD



9. Practical

06 February 2023

17:04



10. Database Keys

06 February 2023 17:07

A key in a database is an attribute or a set of attributes that uniquely identifies a tuple (row) in a table. Keys play a crucial role in ensuring the integrity and reliability of a database by enforcing unique constraints on the data and establishing relationships between tables.

1. Super Key

A Super key is a combination of columns that uniquely identifies any row within a relational database management system (RDBMS) table

2. Candidate key

A candidate key is a minimal Super key, meaning it has no redundant attributes. In other words, it's the smallest set of attributes that can be used to uniquely identify a tuple (row) in the table

3. Primary Key

A primary key is a unique identifier for each tuple in a table. There can only be one primary key in a table, and it cannot contain null values.

4. Alternate Key

An alternate key is a candidate key that is not used as the primary key.

5. Composite Key

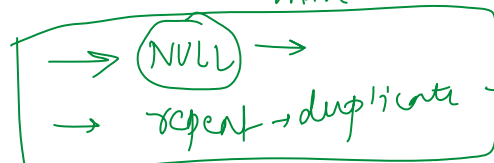
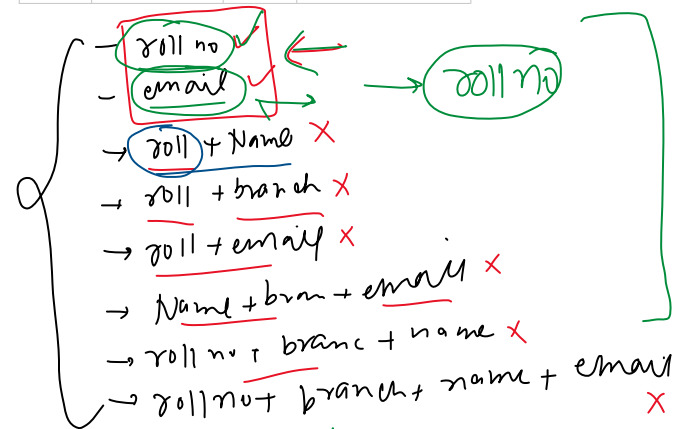
A composite key is a primary key that is made up of two or more attributes. Composite keys are used when a single attribute is not sufficient to uniquely identify a tuple in a table.

6. Surrogate Key

7. Foreign Key

A foreign key is a primary key from one table that is used to establish a relationship with another table.

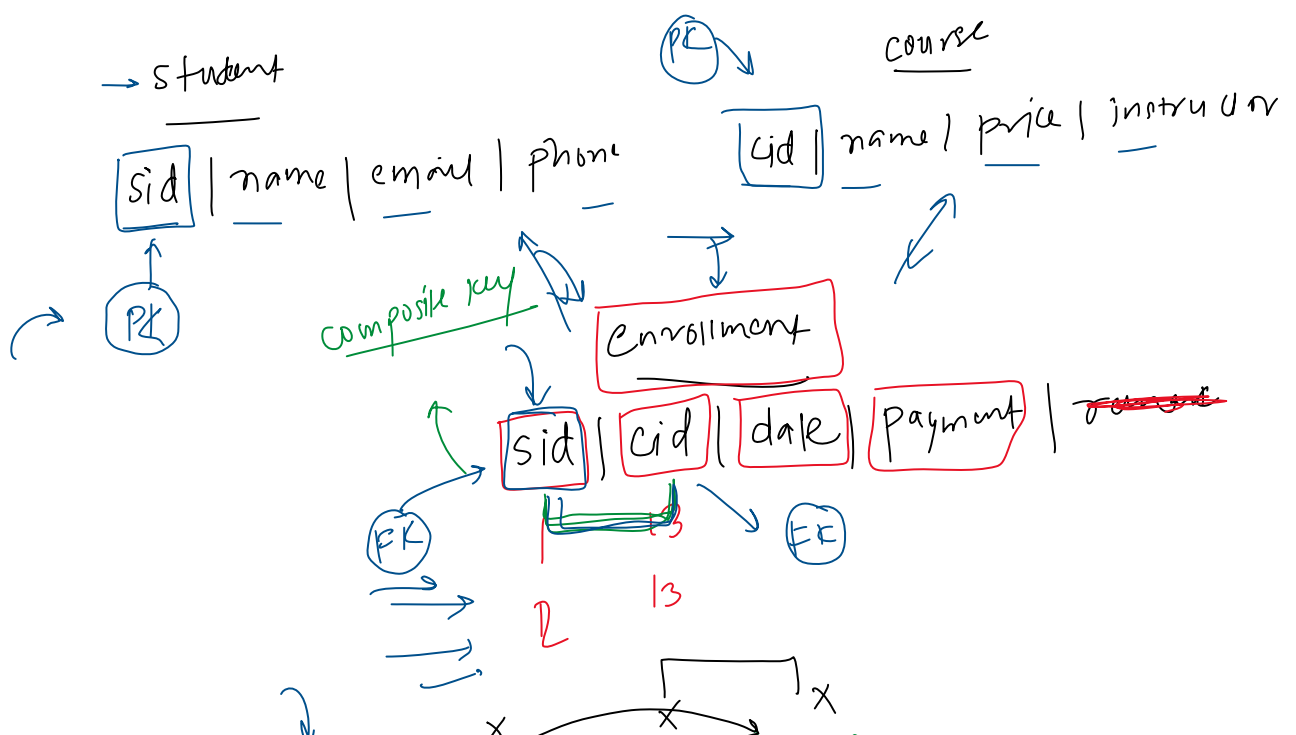
Roll no	Name	Branch	Email
1	Nitish Singh	CSE	nitish@gmail.com
2	Ankit Sharma	EEE	ankit@gmail.com
3	Neha Verma	ME	neha@gmail.com

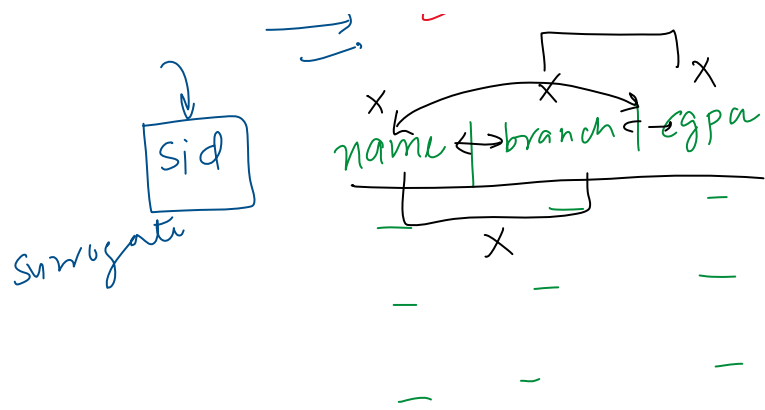


good to have

- numerical
- small
- constant

$$C K - P K = A K$$



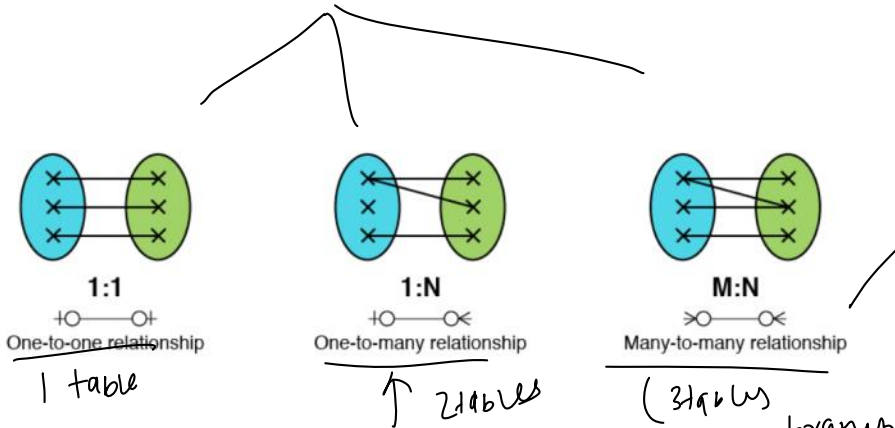


11. Cardinality of Relationships

06 February 2023 16:43

Cardinality in database relationships refers to the number of occurrences of an entity in a relationship with another entity. Cardinality defines the number of instances of one entity that can be associated with a single instance of the related entity.

Entity
↓
table



Examples

1. Person -> Driving License Number
2. Student -> college branch
3. Restaurants -> orders
4. Restaurants -> menu
5. Students -> courses

name	DL no

(3 tables)

branch	name	hud
1	csu	—
2	ee	—

Student

sid	name	(bid) ^{FK}
1	xib	1
2	mtz	2

sid | name

cid | course | pna

sid | cid | date

12. Drawbacks of Databases

06 February 2023 16:39

Complexity: Setting up and maintaining a database can be complex and time-consuming, especially for large and complex systems.

Cost: The cost of setting up and maintaining a database, including hardware, software, and personnel, can be high.

Scalability: As the amount of data stored in a database grows, it can become more difficult to manage, leading to performance and scalability issues.

Data Integrity: Ensuring the accuracy and consistency of data stored in a database can be a challenge, especially when multiple users are updating the data simultaneously.

Security: Securing a database from unauthorized access and protecting sensitive information can be difficult, especially with the increasing threat of cyber attacks.

Data Migration: Moving data from one database to another or upgrading to a new database can be a complex and time-consuming process.

Flexibility: The structure of a database is often rigid and inflexible, making it difficult to adapt to changing requirements or to accommodate new types of data.