

CS Fundamentals

DBMS → SQL
 OS → Concurrency
 CN → Socket Prog

DB

Agenda

- Intro to DBMS
- Relational Model
- Keys
- Intro to SQL
- Creating and Deleting DB/Tables
- SQL Data Types

DBMS

- ① Intro to DBMS and SQL
- ② Schema Design & Normalization
- ③-7 SQL Queries, Subqueries, Joins, Aggregates
- ④ Indexing
- ⑤ Transactions \rightarrow ACID

Naman Bhalla

Ex Google, Criteo, Shopsy

JOIN WHATS APP Group

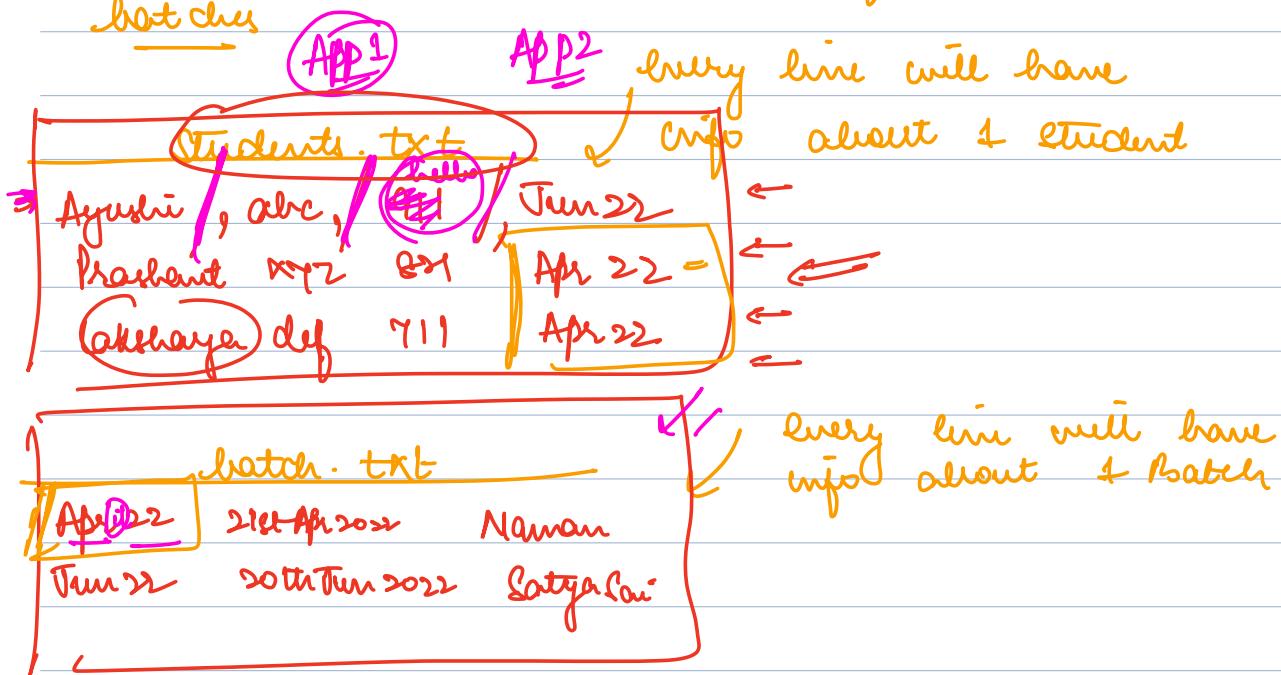
DBMS → Database Management Systems

Collection of inter related data
 Collection of information

DBMS: Software System that allow to store, manage, fetch data

Why do we need a DBMS

Scalier had to store data of student and batches



Disadv of storing data on files

① Fetching data → Manually write code to extract data
→ less efficient

② Manually handle concurrency

③ Data integrity issue
→ diff values at diff places
→ no data validation

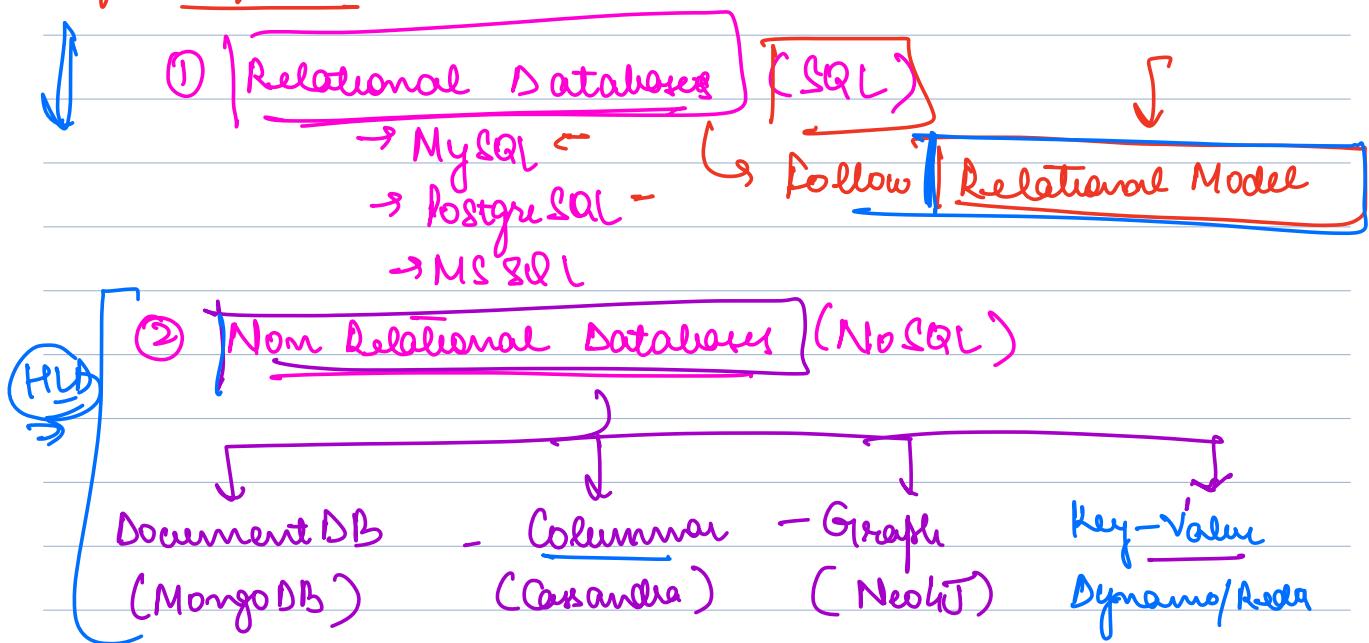
④ Data Security
→ Privacy → Access Control

CSV → Comma Separated Values

DBMS

- ① Efficient access to data
- ② Security and Access
- ③ Concurrency
- ④ Backups

Types of DBMS



WhatsApp

→ Is SQL going to work

→ No

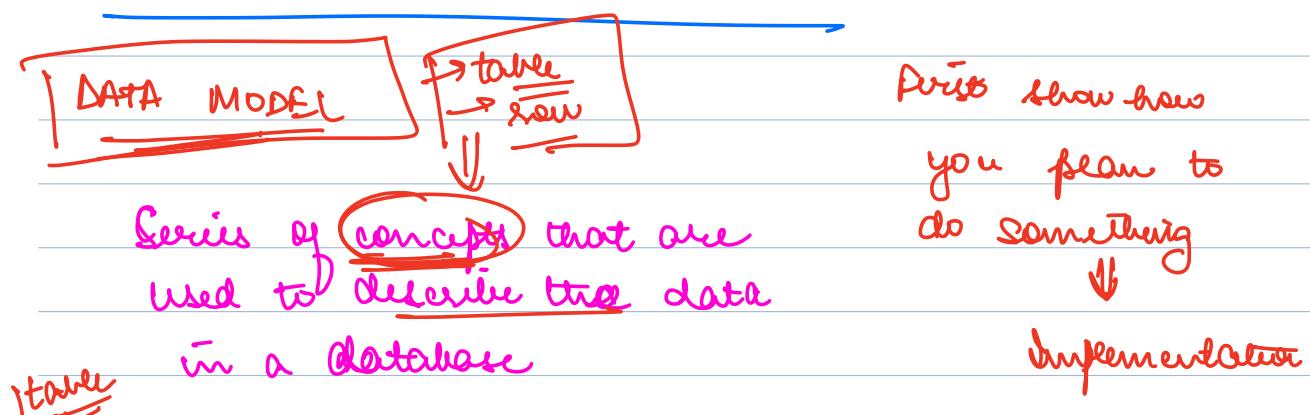
→ Too many writes

→ Then which DB?

→ Cassandra

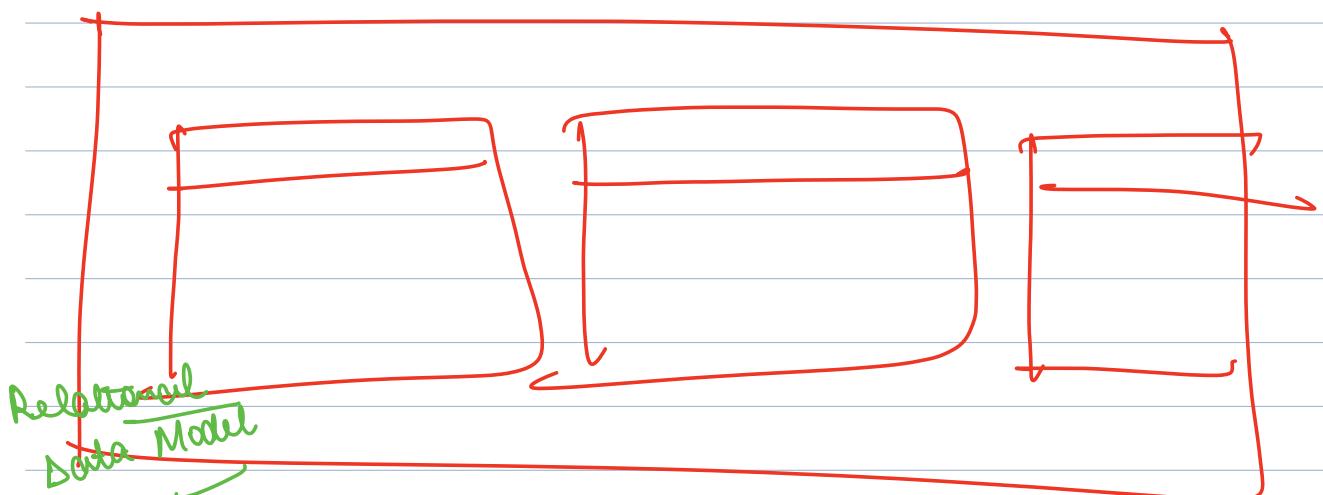
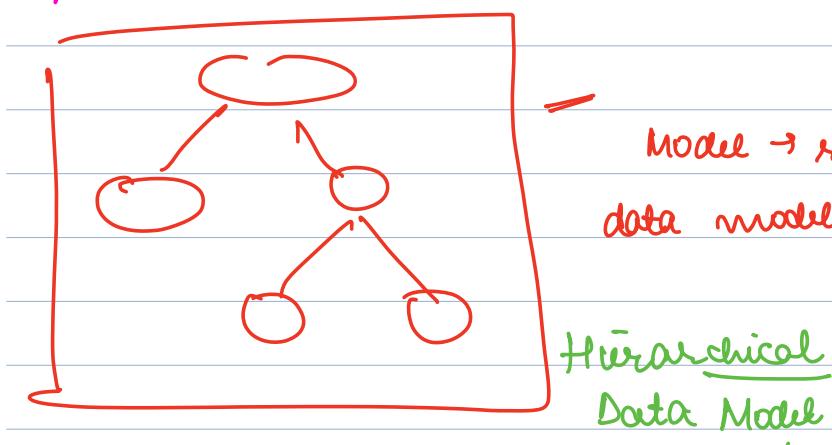
⇒ HLD

WHAT IS RELATIONAL MODEL



Users		
id	Name	Email
1	John	john@example.com

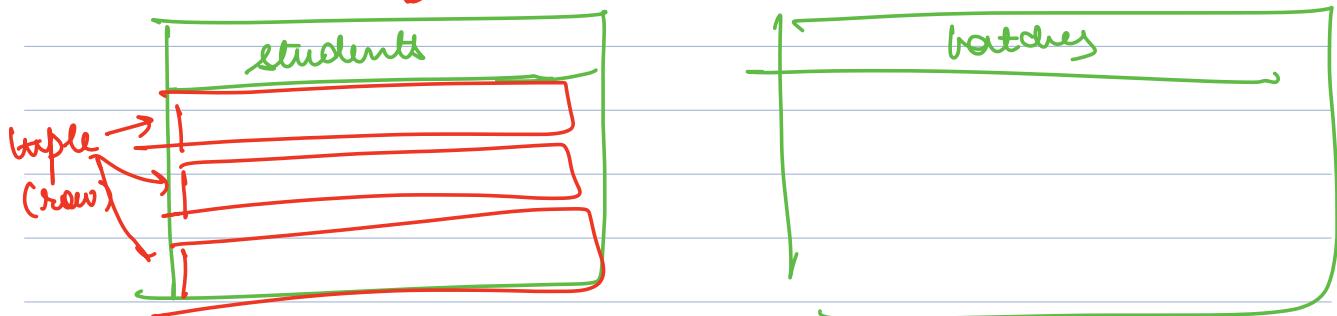
Books	
id	Title
1	Python



Relational Data Model

Mathematician

- ① Complete data is represented as multiple relations that are related to each other. (table), each relation rep a particular entity.



Relation = a SET of TUPLES

Set v/s list

- ① In set order doesn't matter
- $$\{a, b\} == \{b, a\}$$
- set
[a, b] \neq [b, a] list
- ② A set doesn't have duplicates
- $$\{a, b, a\} == \{a, b\}$$
- [a, b, a] \neq [a, b]

→ NEVER ASSUME THE ORDERING

→ you might get rows in any particular order

when you query

→ Whenever writing any SQL query, never assume the order

② Order of columns also doesn't matter

③ Value in each cell is atomic. No multivalue
values are allowed → ~~No lists~~
~~No Sets~~
~~No JSON~~

Students		
id	name	phone-members
		[abc, defg] abc, defg

(4) Each row is unique.

Students	
firstname	batch
Naman	Jun2 sem2
Naman	Jun2 sem2

Not unique

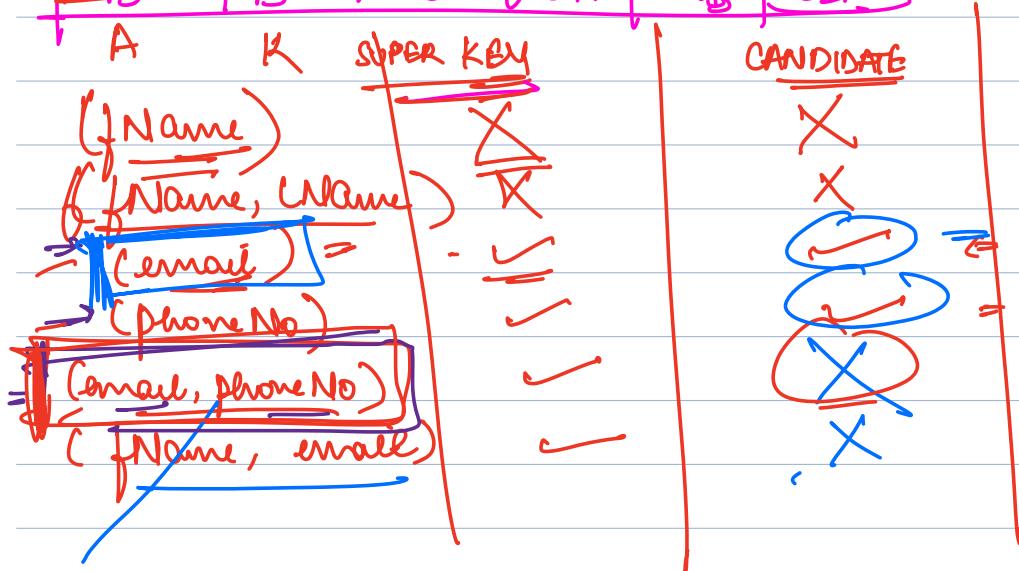
batches	
name	curInstances

KEYS

→ A set of columns whose value helps to uniquely identify a row in a table.

→ If & match value of those col^{mn} → ONLY 1 ROW WILL COME

Students					
fName	cName	email	phNo	psp	batch
A	B	abc@xyz	123	71	ABC
A	K	abc@xyz	157	72	ABC
B	B	abc@abc	211	73	DEF



TYPES OF KEYS

SUPER

Any set of col^m whose value can uniquely identify a single row in a table.

CANDIDATE

Key of min^m size. If we remove any of the col^m from key it will no longer be a key.

PRIMARY

One of the candidate keys that is declared in the table to order data by.

CANDIDATE KEY

A set of col^m whose no subset is a super key.

proper

$$\{ \underline{\text{fName}}, \underline{\text{email}} \} \subseteq \{ \underline{\text{email}} \} \quad \times$$

Primary Key \Rightarrow Declared set of col^m to the database whose value will be unique.

[Whenever we create a table, we have to assign a primary key.]

\Rightarrow DB by default order the table based on primary key.

Students		
name	email	phoneNo

PK \rightarrow (name, email)



(email)

Primary Key \Rightarrow Any one of the
super keys

IN PRACTICE Any one of candidate keys

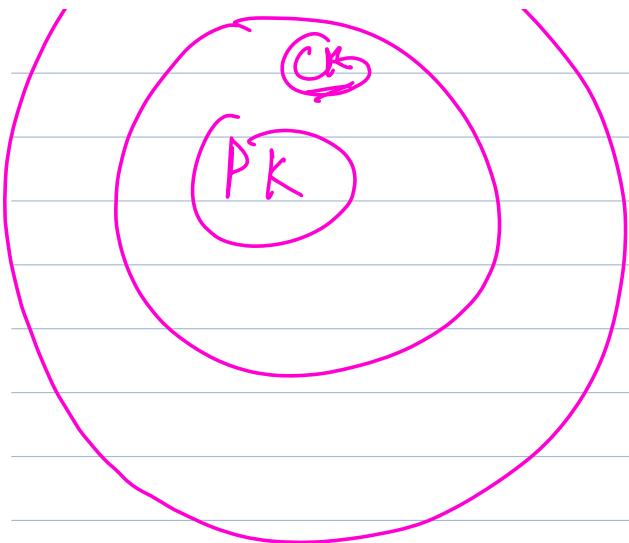
Students		
id	firstName	batch
①		
②		
③		

will always have unique vals. WHO WILL GIVE:

- ① DB \leftrightarrow AUTOINCREMENT
- ② ID Generator \leftarrow HLD



When we are not able to identify a primary key / if we don't want to constraint a column, we create a new column to just act like primary key.

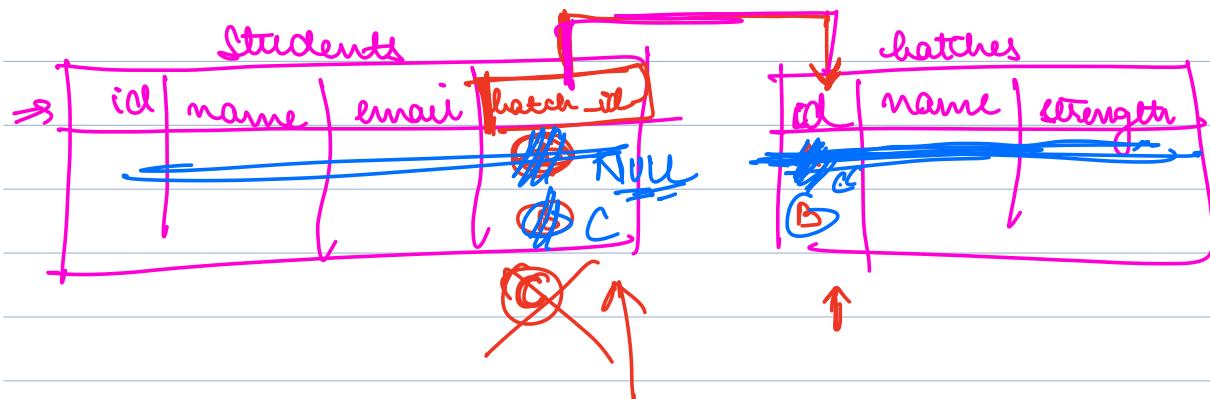


All PK are CK

All CK are SL

If you are a CK
you will definitely be SL

FOREIGN KEYS



⇒ Whatever is a value in the Students table 'batch_id' must be the value in one of the cell in batches table in 'id'

⇒ batch ID ⇒ foreign key ⇒ someone that uniquely identifies someone else

In relational DB we specifically mention it so that DBs can enforce integrity constraints

Eg ① If someone deletes the row in the referred table :

- ① Not allow it
- ② Cascade (also delete student)
- ③ Set NULL

② If someone updates id in teacher, do following in student

- ① Not allow it =
- ② Cascade =

INTRO TO SQL

= SQL : Structured Query Language
= Mechanism or syntax to query a relational DB

① SQL Key
② SQL No
= Sequel

- ① Data Manipulation (Store / Fetch)
- ② Data Control (Access control)
- = ③ Data Definition (Declaring Tables)