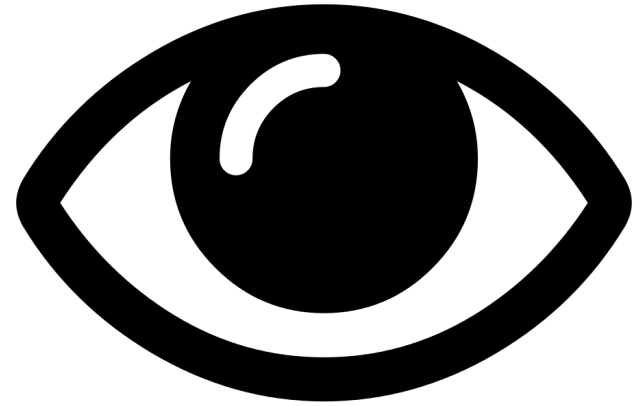


DAY 5

Database Fundamentals

Overview

- Database and DBMS
- Why is Database important?
- Types of Databases
- Database Tables
- Database as a programming language
- Database Models Implementation



Database and DBMS

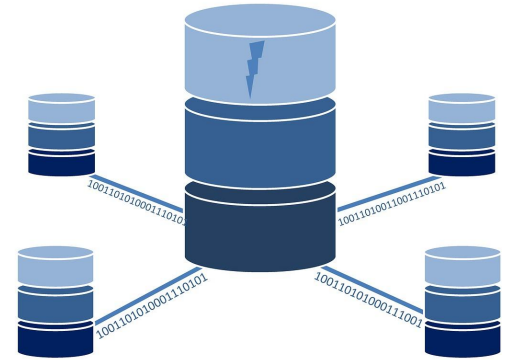
What is a database?

- A database is a collection of information that is organized so that it can be easily accessed, managed, and updated.
- Just the storage of data in easily accessible form



What is a DBMS?

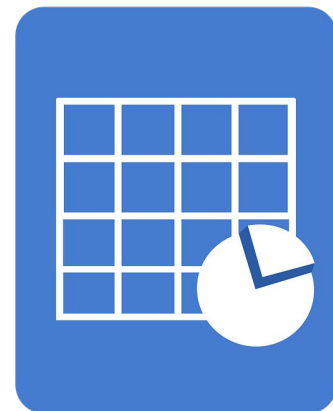
- DBMS stands for Database Management System
- Its is an interface between the database and its end users or programs, allowing users to retrieve, update, and manage how the information is organized and optimized.
- A DBMS also facilitates oversight and control of databases, enabling a variety of administrative operations such as performance monitoring, tuning, and backup and recovery.
- Examples: MySQL, Microsoft Access, Microsoft SQL Server, PostgreSQL, SQLite



Why DBMS?

Why not spreadsheet?

- Spreadsheets are great for a single user or small number of users who don't need to do a lot of incredibly complicated data manipulation.
- Databases are designed to hold much larger collections of organized information—massive amounts, sometimes.
- Databases allow multiple users at the same time to quickly and securely access and query the data using highly complex logic and language.



Other Advantages

- Variety of techniques to store and retrieve data
- Efficient handler to balance the needs of multiple applications using the same data
- Consistent data that complies with regulations
- Data Integrity and Security
- High level of protection against prohibited access to data through integrity constraints
- Increase in productivity of the end user



Database Types

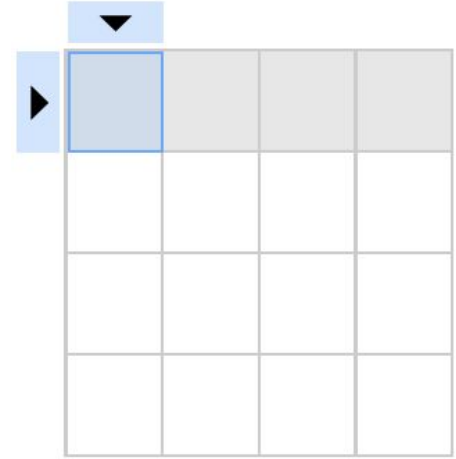
- SQL
 - Relational
 - Object-Oriented
- NoSQL

We will use relational database model and ORM in the programming side.



Database Tables

- Database Tables are just the type of entities that have certain common properties
- The entity type may or may not resemble directly to a real world object
- Often it is easier to start modelling the database using real world entities and refine them later on.
- Entity Relationship Database (ERD) is used to model databases.





Rows and Columns

- Tables are divided into rows and columns
- Columns are properties of entities with a definite type
- Rows represent a entity or a datum.
- Every table must have at least one column.
- Table may have no rows (during initialization).



Relationships

- Just like real world entities, tables also have relationships
- Any association between any two entity types or tables.
- Types
 - One to One
 - Many to One
 - One to Many
 - Many to Many



Keys

- Superkey
 - Also known as only keys
 - A single column or a combination of them that uniquely identifies a row in a table
 - If we have a primary key, we can find the corresponding data uniquely.
- Primary Key
 - A minimal super key (candidate key) chosen by database administrator
- Foreign Key
 - A key that refers to the primary key of another table or the same table (example?)



How are relationships stored in a database?

- Relationships are maintained in databases using the foreign key
- One to One
 - Foreign key at an arbitrary table with unique constraint
- One to Many
 - Foreign key at the many side
- Many to Many
 - A new table holding foreign key both tables as a primary key, maybe with some extra attributes



Table Joins

- Joining two tables (at a time) to form a new table
- A column or its combination in one table is equated with similar columns in other tables
- Normally, foreign key and primary key are used to join two tables
- Joins are useful to get a useful information from normalized tables
- Types of join is out of the scope of this session



Database as a Programming Language

SQL

- SQL stands for Structured Query Language
- Database language by the use of which we can perform certain operations on the existing database.
- Syntax may differ slightly from one DBMS to another



SQL Commands

SQL Command Types

DDL Data Definition Language

CREATE

ALTER

DROP

RENAME

TRUNCATE

COMMENT

DQL Data Query Language

SELECT

DML Data Manipulation Language

INSERT

UPDATE

DELETE

MERGE

CALL

EXPLAIN PLAN

LOCK TABLE

DCL Data Control Language

GRANT

REVOKE



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Data Types

- There are many data types in a DBMS, differing slightly from one another
- Some of them are listed below.
 - CHAR
 - VARCHAR
 - TEXT
 - INT and its variants
 - DECIMAL
 - DATE
 - DATETIME

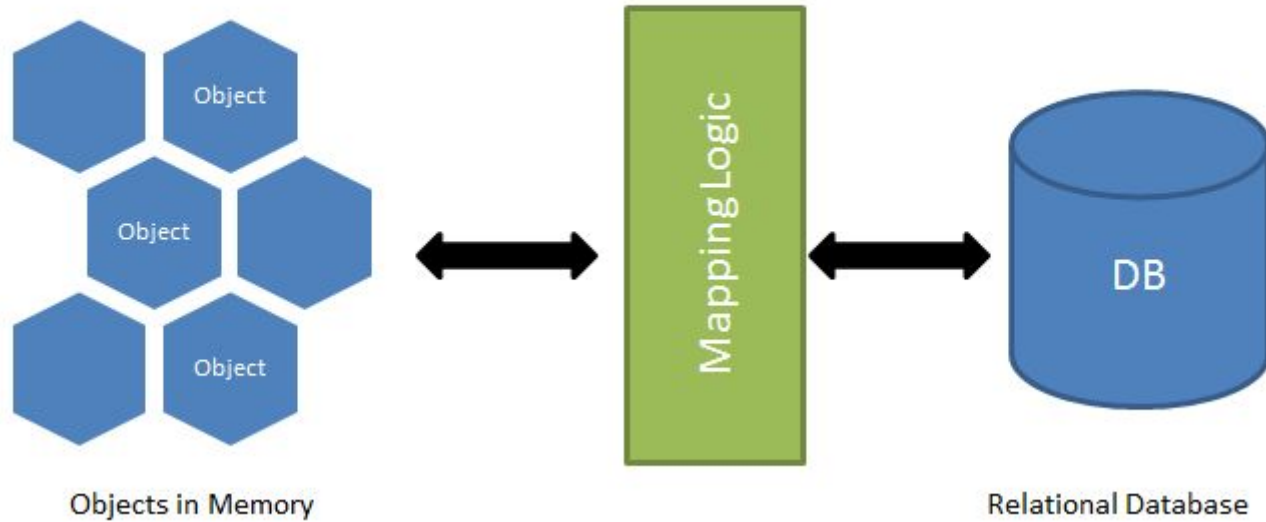


ORM

- ORM stands for Object Relational Mapping
- Mapping between objects in a programming language and a relational database
- Makes running SQL commands easier
- Good for beginners but less efficient for a complex database query
- Examples: Django's Internal ORM, SQLAlchemy



How ORM Works?



Implementation

- We will make some tables and with relationships among them
- We will use Flask as a web server
- Flask-SQLAlchemy is a wrapper to SQLAlchemy for easy binding with Flask

IMPLEMENTATION

