



# Introduction to DBMS

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# Data

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- **Data are knows facts that could be record and stored in some computer media”**
- Facts about a person, a place, a thing or events.
- In different domain, data have different facts.
- In business domain, data include facts about an employee, customers, vendors, products and so on.
- The employee data may include employee name, employee address, employee phone number etc.

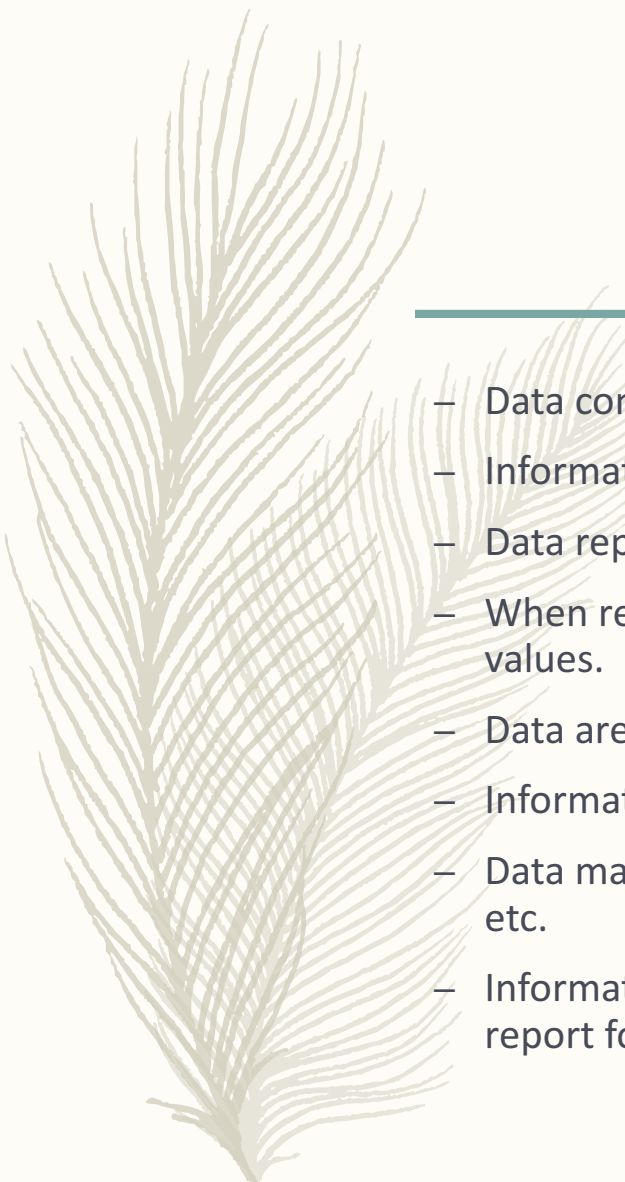
# Data vs Information



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- Data constitute the raw materials from which the information is derived.
- Information is usually defined as processed data.

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- Data consist of raw facts.
  - Information is the facts organized in a meaningful manner.
  - Data represents real world things.
  - When real world facts are linked then it becomes information of some values.
  - Data are sort of values that need to be processed.
  - Information may directly link to decision makers to achieve their goals.
  - Data may be any images, numeric values, text values or videos, sounds etc.
  - Information is generally in the form of a layout like tabular format or some report format.



# Database

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- an **organized** collection of **related** data
  - *By organized means that data are structured so as to be easily stored, manipulated and retrieved by users.*
  - *By related means that within a particular domain of interest, the user can use data to answer the questions relating to that domain.*



# Single user database

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- A single person can use a database for his/her own business on personal compute is called single user database.
- For example, Mr. XYZ is a professional insurance consultant who owns and operates a small business. The database for his business stores records regarding customer, their policies and etc.
  - Customer (Name, Address, Phone No, age ...)
  - Policies (Policy plan, Policy number, Amount of policy ...)
  - Service (Benefits accruing, Claims setting, new policy ...)



# Multuser database

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- Different people can access the database simultaneously from the multiple computers is called multi-user database.
- For example, a college may have a database which may be accessed by persons concerned with library, by account staff, by teaching staff and so on.
- A database can be of any size and of varying a complexity.
- The huge amount of information must be organized and manage so that user can search for, retrieve and update the data as needed.
- E.g. centralized air ticket reservation system



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- **A database is a collection of interrelated, shared and controlled data that is used for multiple purposes**





# Database management system (DBMS)

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- “The database management system is general purpose software system that facilitate the process of **defining, constructing, manipulating, and sharing database** among various users and application”
- **Defining** a database means specifying a data types, structures and constructions of the data to be stored in the database.
- **Constructing** the database is a process of storing the data on some storage medium that is controlled by the DBMS.
- **Manipulating** a database means, it involves functions or query that support to retrieve data, manipulate data and also generate report.
- **Sharing** a database means it allows multiple users and programs to access the database concurrently.

# University database

- Student (name, srollno, class, city)
- Course (cname, cno, credithours)
- Department (dname, dno)
- Grade\_Report (srollno, deptno, cno, grade)
- The database is organized as four files, each of which stores data records of the same type.
- The Student file stores data on each student, Course file stores data on each Course, Department file stores data on each Department, Grade\_Report file stores data on grades that each student have received.
- To **define** this database, we must specify the structure of the record of each file by specifying the different types of data elements to be stored in each record.
- We must also specify the **data type** for each data element within a record.
- To **construct** the UNIVERSITY database, we store data to represent each Student, Course, Department, and Grade\_Report.
- Database **manipulation** involves querying and updating data.

# Relational DBMS



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- Based on Relational Mathematics principles
- Data is represented in terms of rows and columns of a table
- Addresses all types of relations
- Easy to design
- No anomalies for insert/delete/update



# Relational Terminology

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Tuple (Row)

Attribute (Column)

Relation (Table)

## Integrity Constraints

Primary Key

Alternate Key

Foreign Key



# Goals of DBMS

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- Data storage, retrieval, and update (while hiding the internal physical implementation details)
- A user-accessible catalog
- Transaction support
- Concurrency control services (multi-user update functionality)
- Recovery services (damaged database must be returned to a consistent state)
- Authorization services (security)
- Support for data communication Integrity services (i.e. constraints)
- Services to promote data independence
- Utility services (i.e. importing, monitoring, performance, record deletion, etc.)



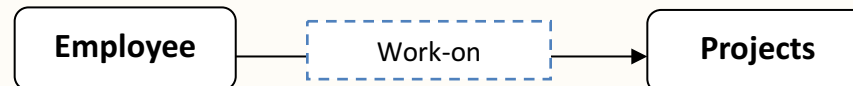
# Data models

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- A data model is a collection of concepts that can be used to describe the structure of a database.
- By structure of a database means the data types, relationships and constraints that should be applied for the data.


# Categories of data model

- **High-level or conceptual data models** provide concepts that are close to the way many users perceive data.
- Conceptual data models use the concepts such as entities, attributes, and relationship
- Entity: An entity represents a real-world objects or concept, such as an “employee” or a “project”.
- Attribute: An attribute represents some properties of interest that further describes an entity, such as the employee’s name or salary.
- Relationship: A relationship among two or more entities represents an association among two or more entities,
- For example: a ‘work-on’ relationship between an employee and a project






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- **Low-level or physical data models** provide concepts that describe the details of how data is stored in computer. It describes how data is stored as files in the computer by representing information such as record formats, record orderings.

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- **Representational/implementation data model** is the middle data models which provide concepts that may be understood by end-users.
  - It hides some details of data storage.
  - These types of models are used most frequently in traditional commercial DBMS.
  - It includes the widely used relational data model, as well as the so called legacy data models – the network and the hierarchy models.
  - Representational data models represents data by using record structures and hence are sometimes called record-base data models



# MySQL

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- the most popular Open Source SQL database management system
- is developed, distributed, and supported by Oracle Corporation.
- **MySQL**
  - *is a database management system*
  - *databases are relational*
  - *software is Open Source*
  - *Database Server is very fast, reliable, scalable, and easy to use*
  - *Server works in client/server or embedded systems*



# MySQL Datatypes

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- signed/unsigned integers 1, 2, 3, 4, and 8 bytes long
- float, double,
- char, varchar
- binary, varbinary
- text, blob
- date, time, datetime, timestamp, year,
- set, enum