University of Central Florida
CGS 2545
Database Concepts

DEPARTMENT OF ELECTRICAL ENGINEERING & COMPUTER SCIENCE
COMPUTER SCIENCE DIVISION

Entity Relationship Model
Basic Concepts

ER Model Basic Concepts

- ER Model
  - The ER model defines the conceptual view of a database.
  - It works around real-world entities and the associations among them.
  - At view level, the ER model is considered a good option for designing databases.

ER Model Basic Concepts

- Entity
  - An entity can be a real-world object, either animate or inanimate, that can be easily identifiable.
  - For example, in a school database, students, teachers, classes, and courses offered can be considered as entities.
  - All these entities have some attributes or properties that give them their identity.

ER Model Basic Concepts

- Entity
  - An entity set is a collection of similar types of entities.
  - An entity set may contain entities with attribute sharing similar values.
  - For example, a Students set may contain all the students of a school; likewise a Teachers set may contain all the teachers of a school from all faculties.
  - Entity sets need not be disjoint.

ER Model Basic Concepts

- Attributes
  - Entities are represented by means of their properties, called **attributes**.
  - All attributes have values.
  - For example, a student entity may have name, class, and age as attributes.
  - There exists a domain or range of values that can be assigned to attributes.
  - For example, a student's name cannot be a numeric value. It has to be alphabetic. A student's age cannot be negative, etc.

ER Model Basic Concepts

- Types of Attributes
  - **Simple attribute**
    - Simple attributes are atomic values, which cannot be divided further.
    - For example, a student's phone number is an atomic value of 10 digits.
  - **Composite attribute**
    - Composite attributes are made of more than one simple attribute.
    - For example, a student's complete name may have first_name and last_name.

ER Model Basic Concepts

- Types of Attributes
  - **Derived attribute**
    - Derived attributes are the attributes that do not exist in the physical database, but their values are derived from other attributes present in the database.
    - For example, average_salary in a department should not be saved directly in the database, instead it can be derived. For another example, age can be derived from data_of_birth.

ER Model Basic Concepts

- Types of Attributes
  - **Single-value attribute**
    - Single-value attributes contain single value.
    - For example − Social_Security_Number.
  - **Multi-value attribute**
    - Multi-value attributes may contain more than one values.
    - For example, a person can have more than one phone number, email_address, etc.

ER Model Basic Concepts

- Types of Attributes
  - These attribute types can come together in a way like
    - simple single-valued attributes
    - simple multi-valued attributes
    - composite single-valued attributes
    - composite multi-valued attributes

ER Model Basic Concepts

- Entity-Set and Keys
  - Key is an attribute or collection of attributes that uniquely identifies an entity among entity set.
  - For example, the roll_number of a student makes him/her identifiable among students.

ER Model Basic Concepts

- Entity-Set and Keys
  - **Super Key**
    - A set of attributes (one or more) that collectively identifies an entity in an entity set.
  - **Candidate Key**
    - A minimal super key is called a candidate key.
    - An entity set may have more than one candidate key.
  - **Primary Key**
    - A primary key is one of the candidate keys chosen by the database designer to uniquely identify the entity set.

ER Model Basic Concepts

- Relationship
  - The association among entities is called a relationship.
  - For example
    - an employee **works_at** a department, a student **enrolls** in a course.
    - Here, Works_at and Enrolls are called relationships.

ER Model Basic Concepts

- Relationship
  - Relationship Set
    - A set of relationships of similar type is called a relationship set.
    - Like entities, a relationship too can have attributes.
    - These attributes are called **descriptive attributes**.

ER Model Basic Concepts

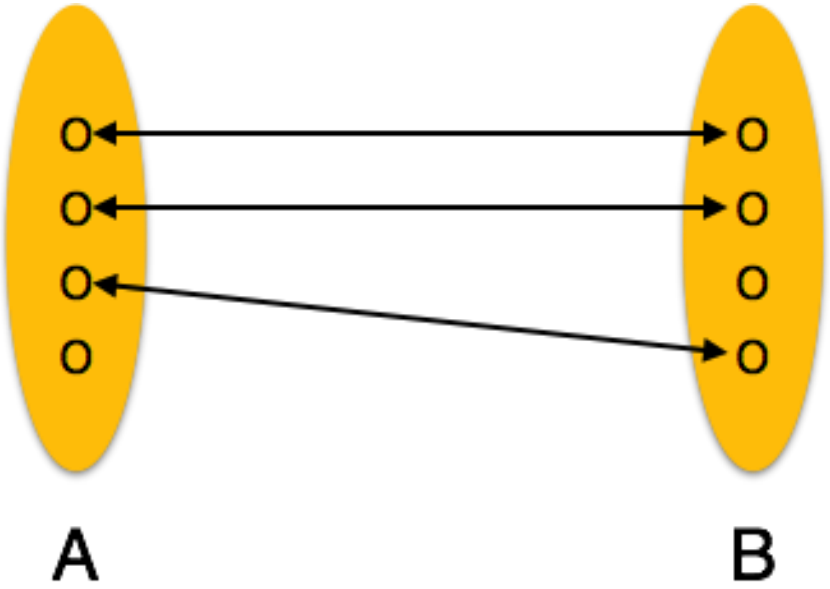
- Relationship
  - Degree of Relationship
    - The number of participating entities in a relationship defines the degree of the relationship.
      - Binary = degree 2
      - Ternary = degree 3
      - n-ary = degree

ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **Cardinality** defines the number of entities in one entity set, which can be associated with the number of entities of other set via relationship set.

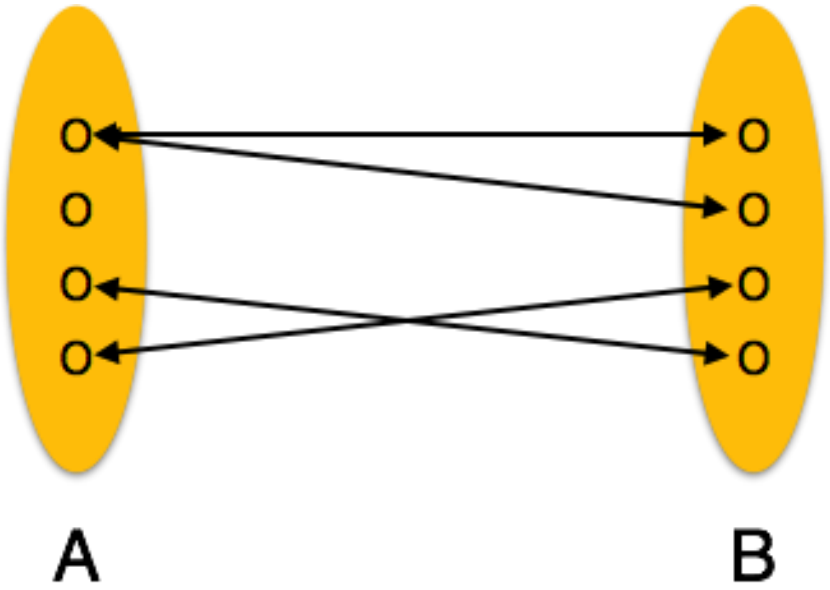
ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **One-to-one** – One entity from entity set A can be associated with at most one entity of entity set B and vice versa.



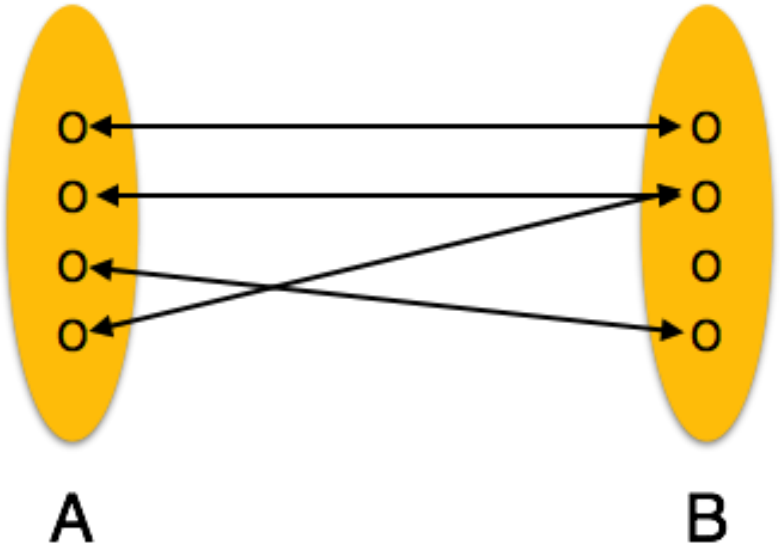
ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **One-to-many** – One entity from entity set A can be associated with more than one entities of entity set B however an entity from entity set B, can be associated with at most one entity.



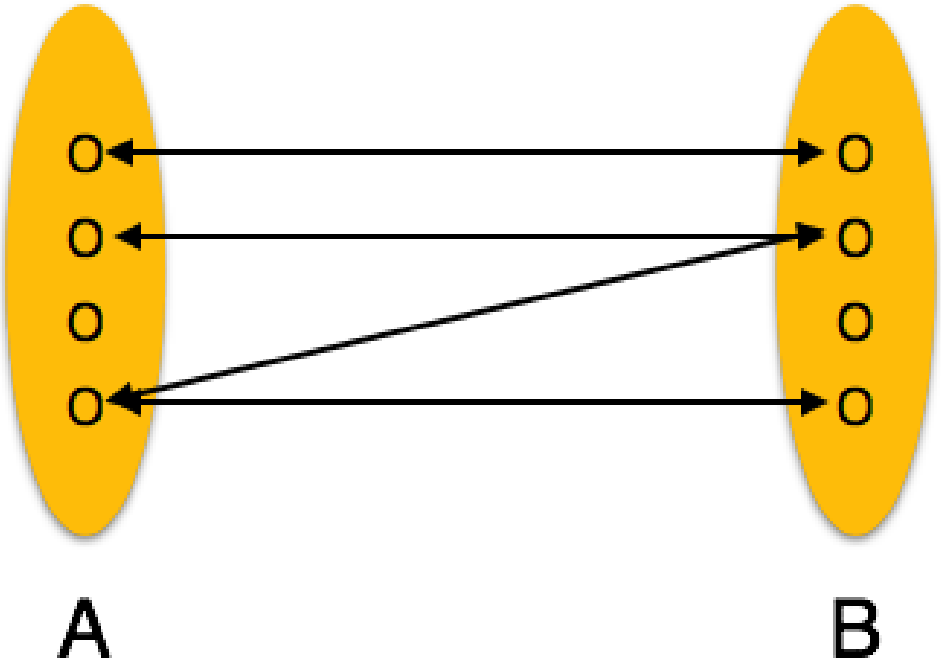
ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **Many-to-one** – More than one entities from entity set A can be associated with at most one entity of entity set B, however an entity from entity set B can be associated with more than one entity from entity set A.



ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **Many-to-many** – One entity from A can be associated with more than one entity from B and vice versa.



ER Model Basic Concepts

- Relationship
  - Mapping Cardinalities
    - **Many-to-many** – One entity from A can be associated with more than one entity from B and vice versa.