Relationships

- An association between two (or more) entities
  - More specifically, how the members of two (or more) entities are connected. Normally, we name a relationship with a verb.
- Examples:
  - Employees and Companies:
    - How many companies a employee can work?
    - How many employees a company can have?
  - Companies and products:
    - How many companies a product can belong to?
    - How many products a company can produce?

Relationships - Degree

- A relationship can include one or more entities

- The degree of a relationship is the number of Entities that participate in the relationship

- Relationships of degree 1 are called Unary relationships (also called Recursive).

- Relationships of degree 2 are called Binary relationships. Most relationships in databases are Binary.

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Relationships - Cardinality

- Cardinality refers to the number of instances of the entity involved in the relationship.
  - Also called max cardinality / multiplicity of a relationship
- There are three types:
  - 1:N (also called One to Many)
  - N:1 (also called Many to One)
  - N:M (also called Many to Many)

Relationships - Participation

- Participation of instances in a relationship may be mandatory or optional.
  - Also called optionality, minimal cardinality of a relationship
- There are two types:
  - Mandatory
  - Optional

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Practice

- Your client is an online-education company. You need to help your client to record the data needed.
  - The company has more than 100 instructors, more than 400 courses, more than 50 online programs, and around 1 million students.
  - Instructors have info: Name, EmpID, SSN, DoB, Email, Salary
  - Courses have info: Title, Course#, Time, Location, Description.
  - Programs have info: Title, Chair, Office#, Contact, Description.
  - Students have info: Name, StuID, DoB, Email

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Practice

- You should first find Entities, what are they?

  - Instructors, Courses, Programs, Students.

- Then, what are the attributes of these Entities?

  - Instructors have info: Name, *EmpID, SSN, DoB, Email, Salary

  - Courses have info: Title, *Course#, Time, Location, Description.

  - Programs have info: *Title, Chair, Office#, Contact, Description.

  - Students have info: Name, *StuID, DoB, Email

- Then, what are the identifiers of these Entities?

Practice

- At last, what are the relationships among these Entities?

  - An instructor may teach multiple courses; and a course might be taught by multiple instructors.

  - Each course must belong to one and only one online-program, and each program must have one or more courses.

  - A student may take multiple courses; and a course must have one or more students.

  - A student must belong to exactly one program; and a program may have one or more students.

  - A student may be friend of other students

  - A student must have exactly one instructor as advisor; and one instructor may advise one or more students

Practice

- Let's do more practice in Lab1.