Lab 2: ER Model

CS460 Fall 2021
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Database Design

Requirements Analysis
user needs; what must database do?

Conceptual Design
high level description (often done w/ ER model)

Logical Design
translate ER into DBMS data model

Schema Refinement
consistency, normalization

Physical Design
indexes, disk layout

Security Design
who accesses what
**ERD Basics**

**Entity (Rectangle):** An Entity is an object in real world that is distinguishable from surrounding environment. They have a primary key, distinguishing each occurrence of the entity.

**Relationships (Diamond):** Relationships are associations between or among entities.

**Attributes (Oval):** Attributes are characteristics of an entity or a relationship. Underlined attributes indicate primary keys. Dashed oval indicates derived attributes.
Participation Constraints

does every employee work in a department?
If so, this is a **participation constraint**
the participation is said to be **total (vs. partial)**

**Basically means “at least one”**

- **every employee works in (at least) one department**
- **“at most one” plus “at least one” “exactly one”**
- **every department has (at least) one employee**
Weak Entities

A weak entity can be identified uniquely by the primary key of another (owner) entity (+ some of its attributes)

- Owner entity set and weak entity set must participate in a one-to-many relationship set (one owner, many weak entities)
- Weak entity set must have total participation in this identifying relationship set

Weak entities have only a “partial key” (dashed underline)
Exercise

go to https://www.draw.io
Transform ERD to Table

• Convert all the Entities in the diagram to tables.
• All single valued attributes of an entity is converted to a column of the table
• Key attribute in the ER diagram becomes the Primary key of the table.
• Declare the foreign key column, if applicable.
• Any multi-valued attributes are converted into new table.
• One can ignore derived attribute, since it can be calculated at any time.
• Weak entity is also represented as table. Add a foreign key column, which would be the primary key of its strong entity. This foreign key column along with its key attribute column forms the primary key of the table.
• All many-to-many relations will be a table
SQL Example

```
CREATE TABLE Persons (  
    PersonID int,  
    LastName varchar(255),  
    FirstName varchar(255),  
    Address varchar(255),  
    City varchar(255)  
);

INSERT INTO Persons  
VALUES (1, 'Hopkins', 'Anthony', '111 Cummington Mall', 'Boston');

INSERT INTO Persons  
VALUES (2, 'Bale', 'Christian', '730 Comm Ave', 'Boston');

SELECT * FROM Persons;
SELECT * FROM Persons WHERE LastName LIKE 'Bale';
```