Administrative

- Homework 1 is due Feb 11.
- The first midterm is scheduled on March 2\textsuperscript{nd}. We will have a review before the midterm. More details later.
Today’s Topic

- Logical database design: Translation ER to relation schema
Database Design

1. Functional Requirements
   - REQUIREMENTS COLLECTION AND ANALYSIS
   - Data Requirements
   - CONCEPTUAL DESIGN
     - Conceptual Schema (In a high-level data model)
     - LOGICAL DESIGN (DATA MODEL MAPPING)
     - Logical (Conceptual) Schema (In the data model of a specific DBMS)
   - APPLICATION PROGRAM DESIGN
     - DBMS-independent
     - DBMS-specific
   - TRANSACTION IMPLEMENTATION
     - Internal Schema
     - Application Programs
Database design steps: Review/Preview

- Understand the mini-world
- Specify it using a database design model (e.g., E/R)
- Translate specification to the data model of DBMS (e.g., relational)
- Create DBMS schema

Today’s focus: translating E/R design to relational schema
Translating entity sets

- An entity set translates directly to a table
  - Attributes → columns
  - Key attributes → Primary key
Translating entity sets (cont.)

Notes:

- No multi-valued attributes (called first Normal Form)
Mapping of Multivalued attributes.

- Mapping multivalued attribute using relation.
  - Use primary key attribute from the original entity as a foreign key in the new relation
Translating 1:1 Relationship

- Translate a 1:1 relationship between two entities.
  - Merging the two entity types and the relationship into a single table.
  - Works well for total participation

![Diagram of Student and Account entities connected by an association with attributes: SID, name, own, aid, date]
Translating 1:1 Relationship (II)

- Mapping 1:1 relationship using foreign key
  - Usually choose the entity type with total participation to include the foreign key (why?)

```
<table>
<thead>
<tr>
<th>SID</th>
<th>Students</th>
<th>own</th>
<th>Bschool account</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td></td>
<td></td>
<td>date</td>
</tr>
</tbody>
</table>
```

Baid
Translating 1:1 Relationship (III)

- Mapping 1:1 relationship using relation
  - Termed as relationship relation

![Diagram showing a 1:1 relationship between Students and Bschool account]

- SID
- name
- Students
- own
- Bschool account
- Baid
- date
Translating 1:N Relationship

- Mapping 1:N relationship using foreign key
- Or using relationship relation
Translating M:N Relationship

- Use relationship relation

```
EID
name

Employee ---workson--- Project

Pnum
Budget
```
Translating weak entity sets

- Use a “borrowed” key
- Watch out for attribute name conflicts
Mapping of N-ary relationship

- For each n-ary (n>2) relationship type, create a new relationship relation S.
  - Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types.
More examples

- SSN
- Persons
- Marry

husband
wife
Design principles

- **KISS**
  - Keep It Simple, Stupid simple

- **Avoid redundancy**
  - Redundancy wastes space, complicates updates and deletes, promotes inconsistency

- **Capture essential constraints, but don’t introduce unnecessary restrictions**

- **Use your common sense**
  - Warning: Mechanical translation procedures given in this lecture are no substitute for your own judgment