DATA MODELS

Data models (1/2)

- A model is an abstract representation
  - We care about data, so we have data models
- Do you know your data?
  - Is there something missing?
  - Are there redundancies?
  - How do various components of your data fit together?

Data models (2/2)

- To design a database, we first need a schema
  - Remember logical/physical independence ?
- Use a data model to design the schema
  - We will study two data models: ER and relational

ER MODEL

Entity-Relationship model (1/2)

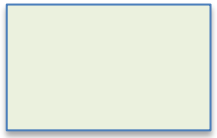
- Sets of entities and the relationships between them
- ER-diagrams
- Conversion to relational model

Entity-Relationship model (2/2)

- Entity sets
  - Actors, movies, studios
- Attributes
  - *Atomic values*
  - Name, age, height
- Relationships
  - Between two entity sets
  - Actors *actsIn* Movies

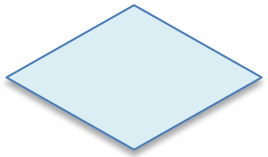
Go back and revise from the text book. Almost all material is from there.

ER diagram



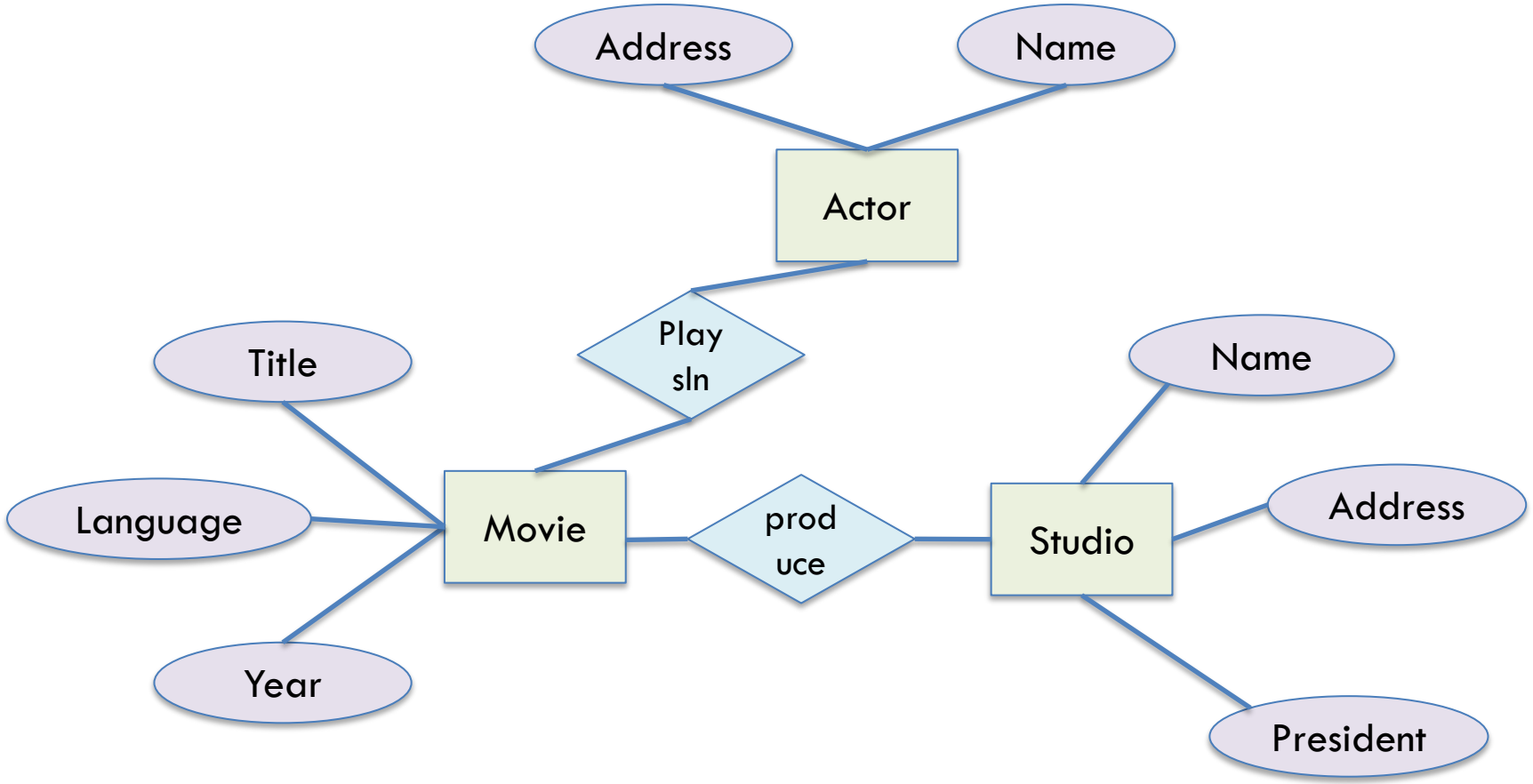
Entity set

Attribute



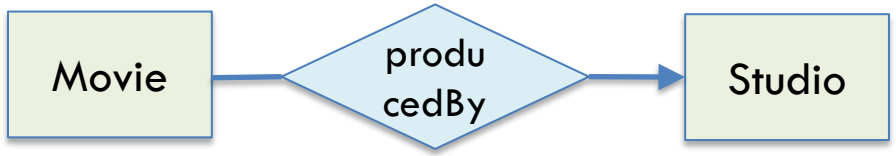
Relationship

Example – Movie DB



Types of relationships (1/2)

Movie produced by *at most* one studio, but a studio produces many movies



An actor plays at most one role, a role is played by at most one actor

A movie has many actors, an actor plays in many movies

Types of relationships (2/2)

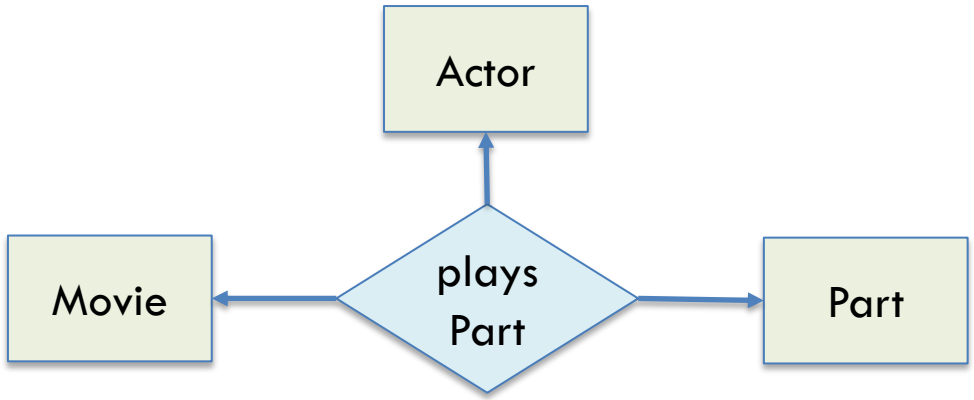
- one-one
  - an entity of one entity set is related to *at most* one entity of another entity set *and vice-versa*
- many-one
  - many entities of one entity set are related to *at most* one entity of another entity set
- many-many

Remember the maths

$$
\begin{aligned}
A &= \{a_1, a_2, a_3\} \\
B &= \{b_1, b_2\} \\
A \times B &
\end{aligned}
$$

Multi-way relationships

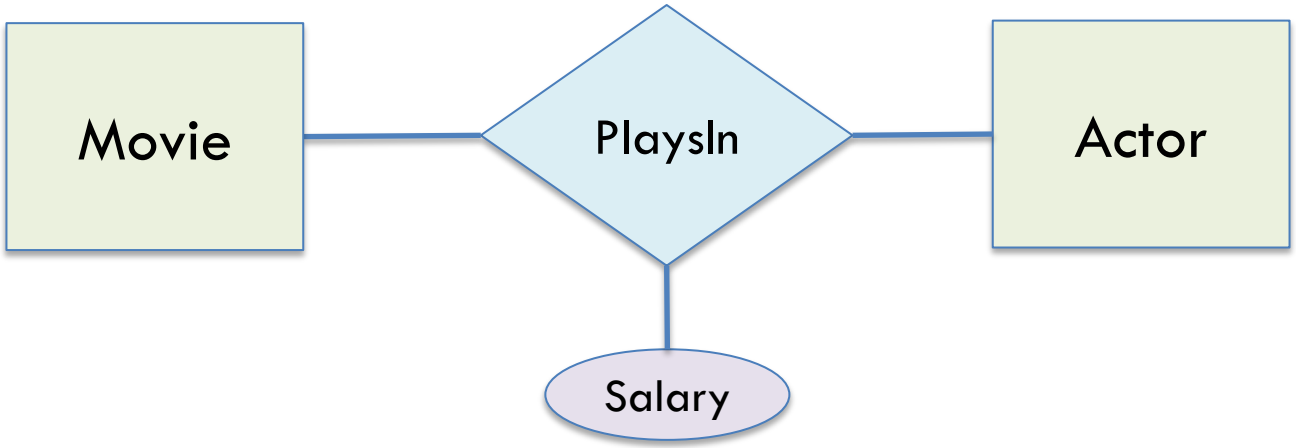
- Non-binary relationships



Priyanka Chopra	Baywatch	Victoria Leeds
Anthony Hopkins	Thor: Ragnarok	Odin

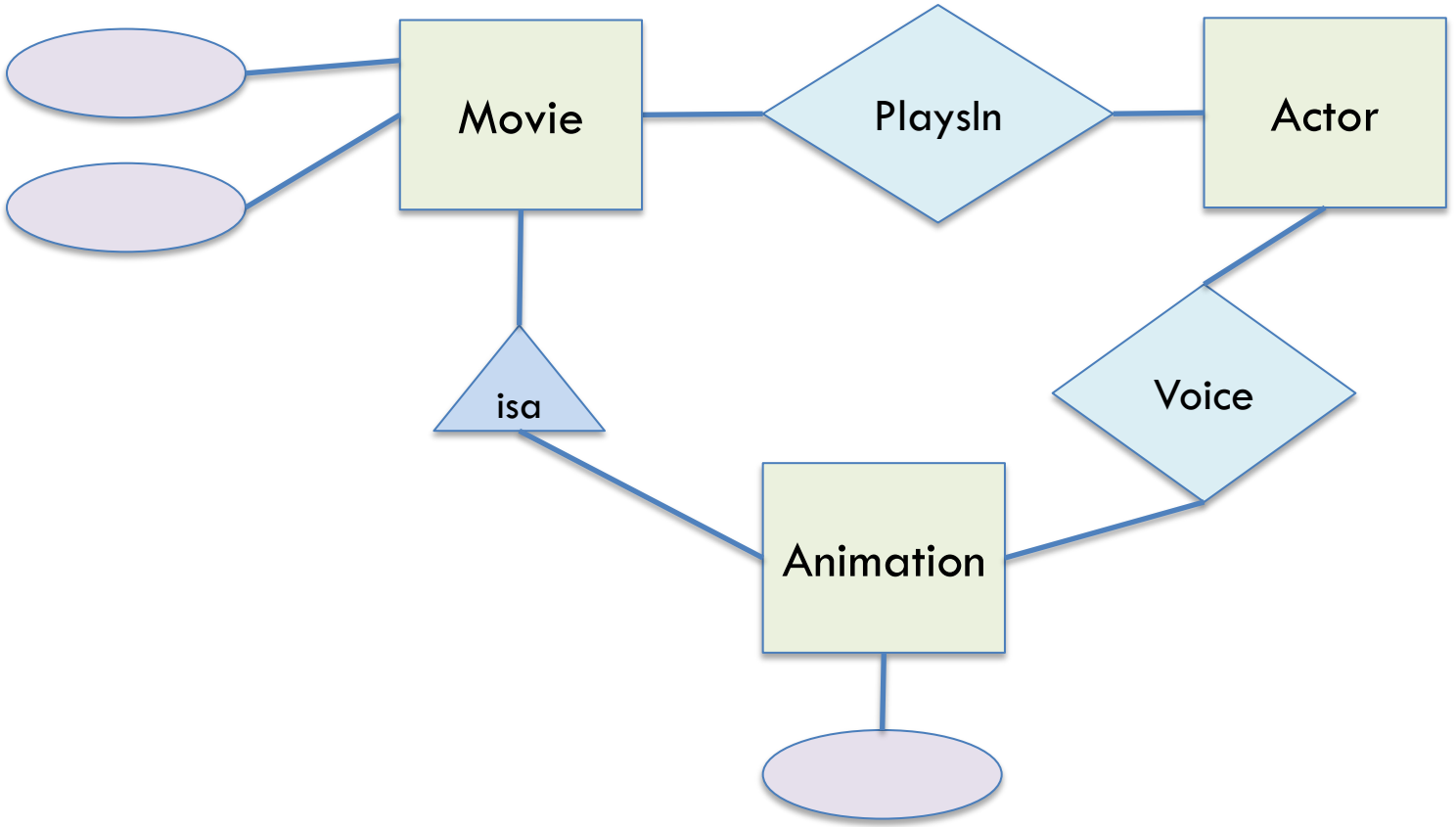
Attributes on relationships

- An attribute depends on a combination of entities, not a single entity
  - Relationships are how entities are combined!

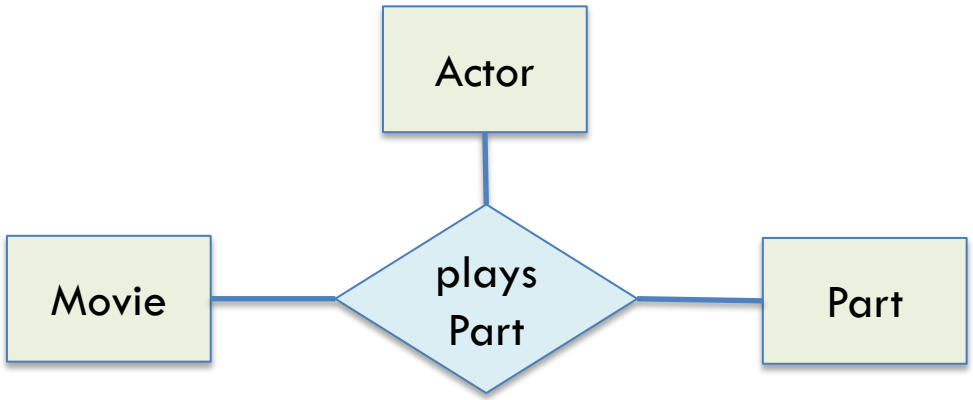


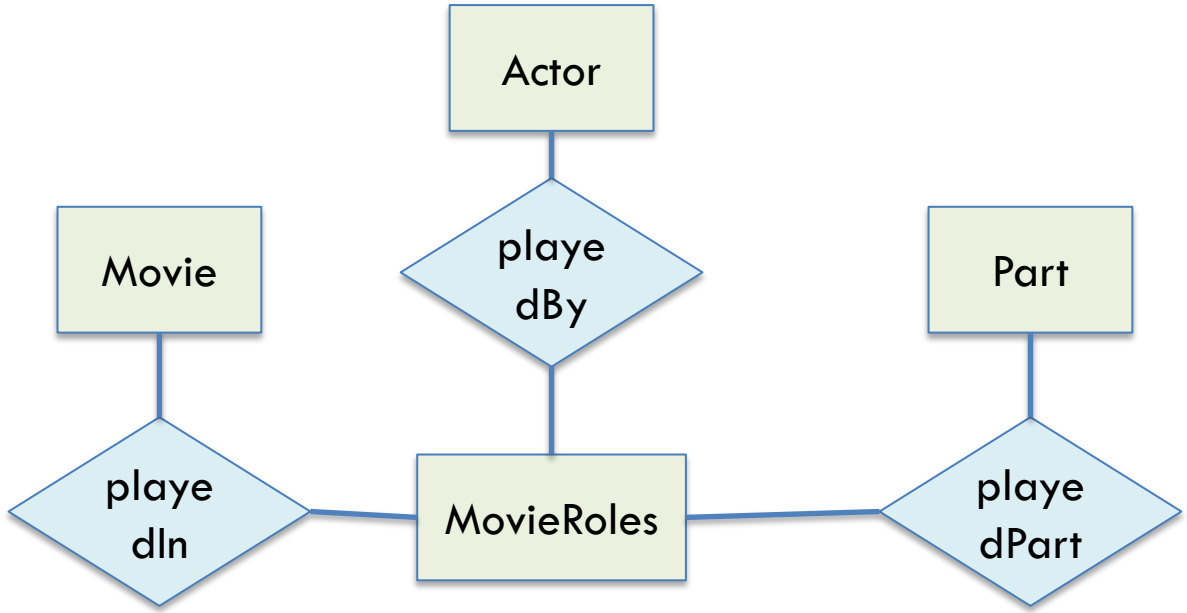
Modeling subsets

- ER model allows for hierarchies
  - Sound familiar?



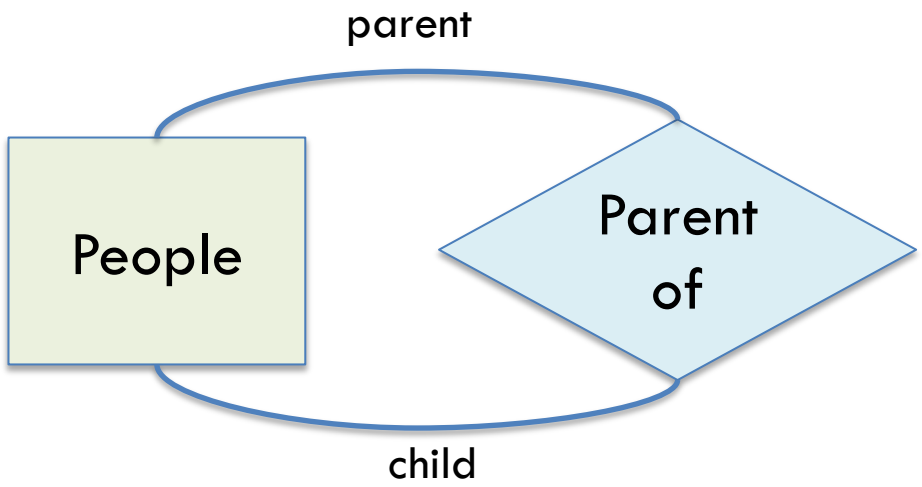
N-ary to binary





“Parallel” relationships

- A relationship from an entity set to itself
  - Each edge indicates a *role*



CONSTRAINTS

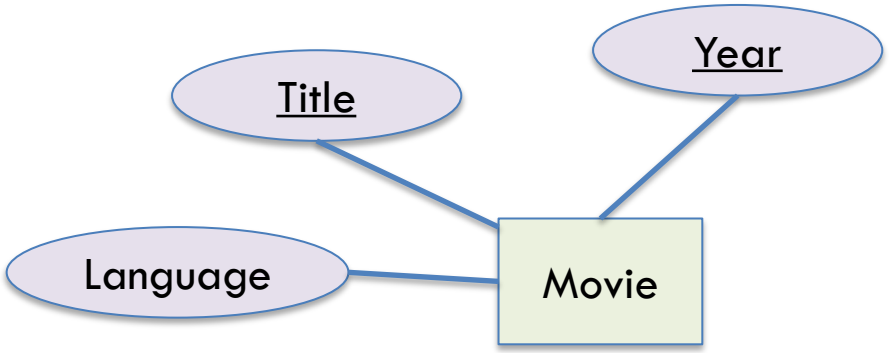
Modeling constraints

- Constraints model restrictions on the data
  - Data may be erroneous
  - Mistakes may be made during the data entry process
- Modeling the correct constraints are part of the design process

Common constraints (1/2)

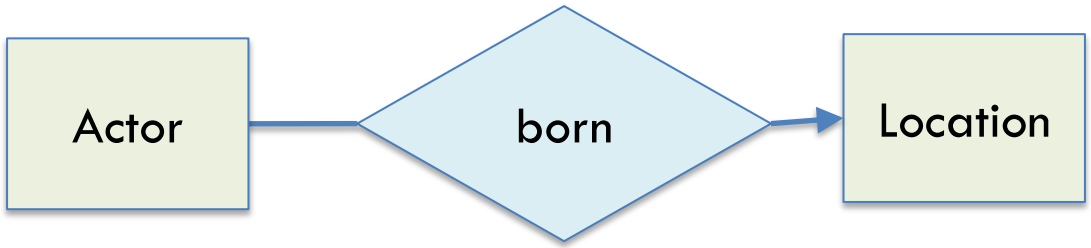
- Keys
  - How is an entity uniquely identified?
  - (Name, Year of birth) identifies an actor uniquely
- Single-value constraints
  - Unique values in a given context (keys are single-value constraints)
  - Place of birth has to be unique (right?)
  - Null values

Key constraints and single value constraints



- *Every entity set* should have a key
- There could be more than one key

Keys



Common constraints (2/2)

- Referential integrity
  - Remove the null, insist on the value
  - If an actor acts in a movie, then that movie *has to* exist in the database
- Domain constraints
  - Restricting the value set of attributes
  - Age in range from 0 to 100 (or is it 0 to 25?)
- General constraints

Representing constraints (2/2)

Referential Integrity

Other

Weak entity sets

- An entity set whose attributes are not sufficient to form a key