

COL 362 & COL 632

Relational

10 Jan 2023

Everything is a “Relation”

(Character, Name, movie)



- A relation is both a mathematical concept and just a table of values
- The relational model models “everything” as relations
- **Schema** of the relation:

→ • Actor-Movies (Name varchar(20), Movie varchar(50), Character varchar(20))

Actor-Movies

Table

Name	Movie	Character
Priyanka Chopra	Baywatch	Victoria Leeds
Tom Cruise	MI-I	Ethan Hunt
Anthony Hopkins	Thor: Ragnarok	Odin

- Relation is a **Set** not a bag or a sequence
- Attribute set is a **set** – order invariant.
 - Permuting the order of attributes does not matter

Priyanka Chopra,
Baywatch2,
Victoria Leeds

Announcement

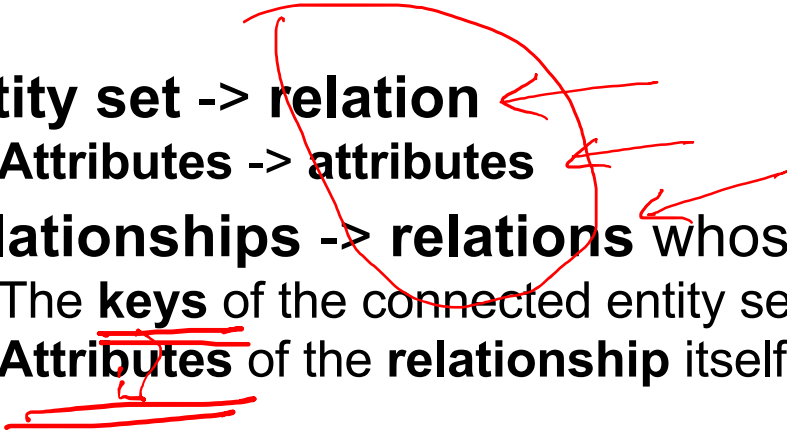
A homework will drop tonight. Deadline 23rd.

It is **not graded** – but **mandatory to submit**.

The goal is to resolve issues from:

- PostgreSQL build and install – platform specific subtleties
 - Data load to relational database and basic SQL practice
 - Submission process, and following the instructions precisely
-
- **These things come in handy when dealing with subsequent assignments**

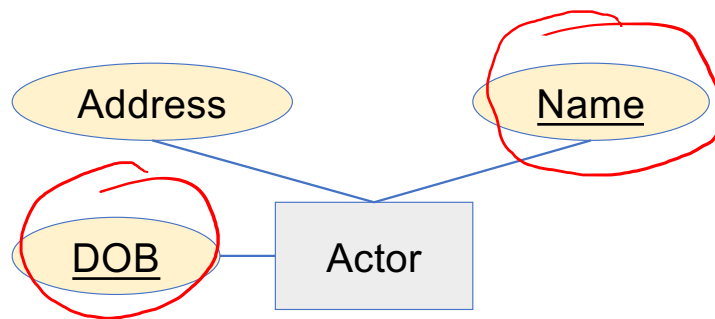
E-R to Relational

- ER diagrams are easy to understand for humans
 - Relational model is **powerful** because it is **simple** – only one kind of object
 - Any operation on the relation, results in yet another relation
 - So, let's convert our ER diagrams to relational!
 - **Entity set -> relation**
 - **Attributes -> attributes**
 - **Relationships -> relations** whose attributes are only:
 - The **keys** of the connected entity sets.
 - **Attributes** of the **relationship** itself.
- 

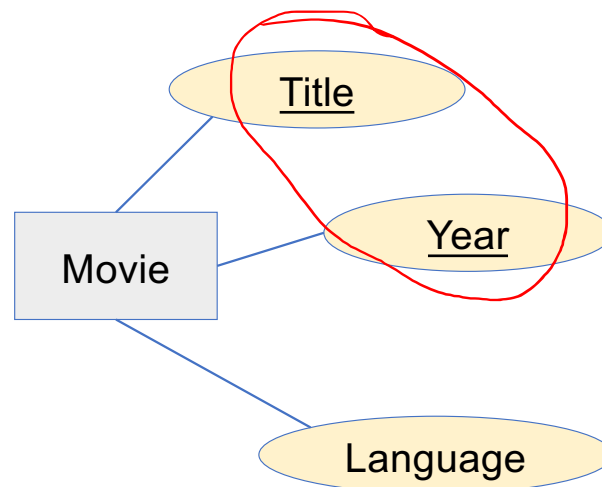
E-R to Relational

- Entity sets and relationship sets can be expressed uniformly as **relation schemas** that represent the contents of the database.
- A **database** which conforms to an E-R diagram can be represented by a **collection of schemas**.
- For each entity set and relationship set there is a unique schema that is assigned the name of the corresponding entity set or relationship set.
- Each schema has a **number of columns** (generally corresponding to attributes), which have **unique names**.

Entity-sets and Attributes

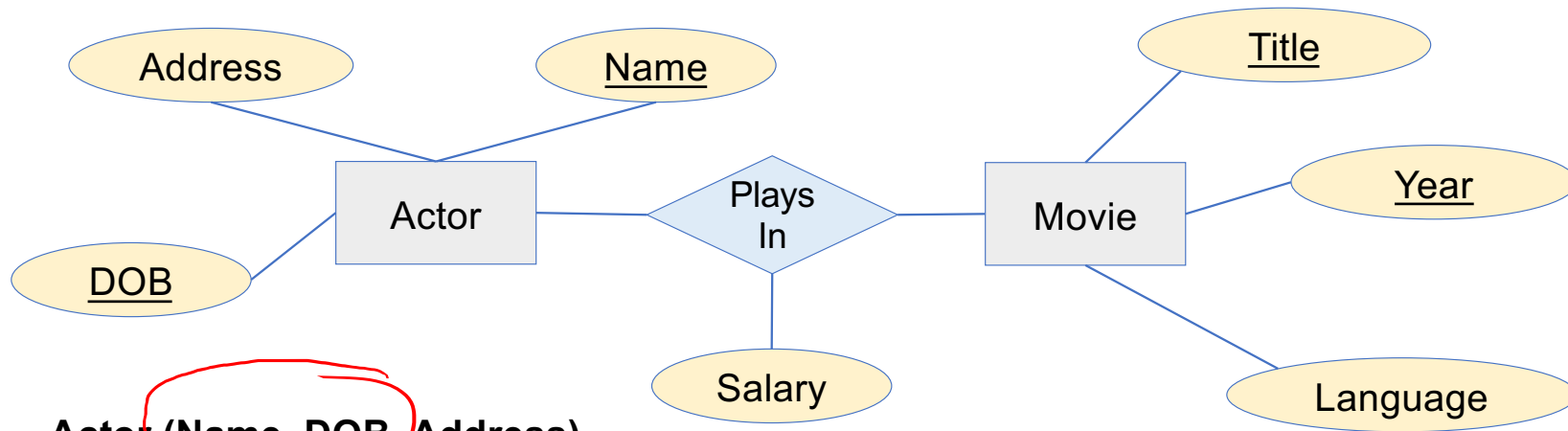


Actor (Name, DOB, Address)



Movie (Title, Year, Language)

Relationships to relations



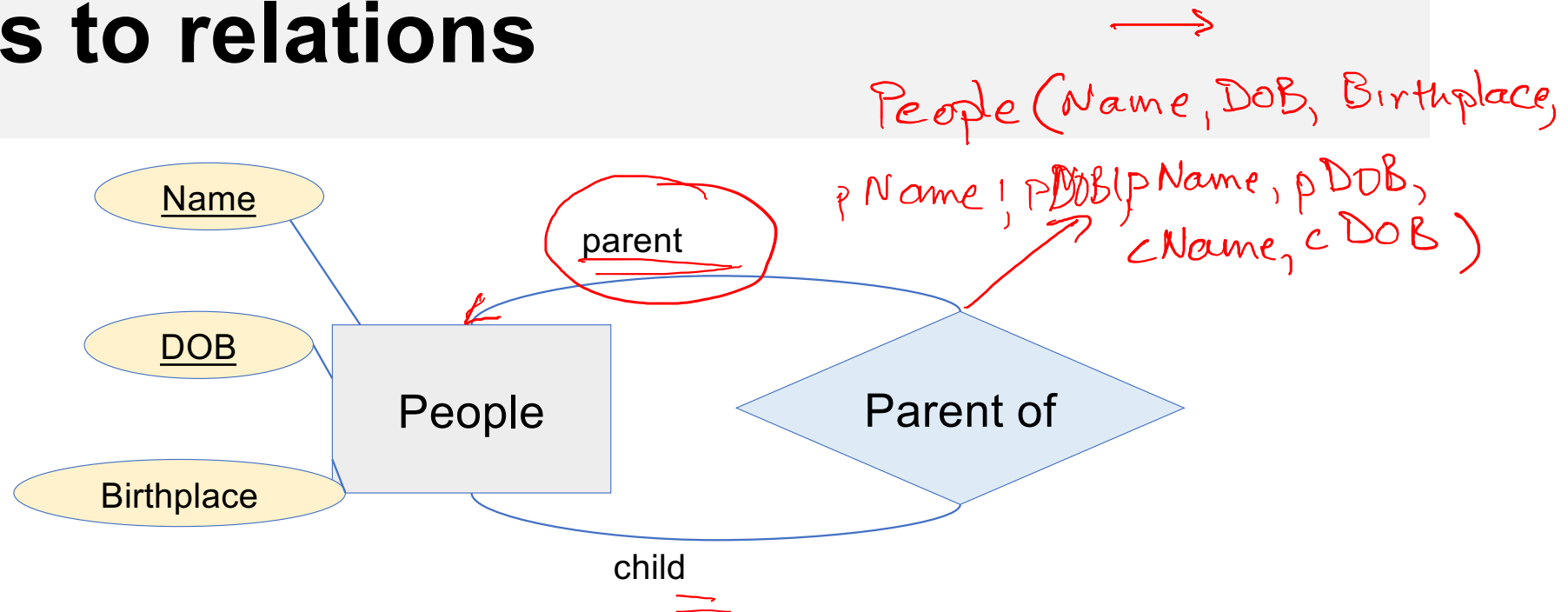
Actor (Name, DOB, Address)

Movie (Title, Year, Language)

PlaysIn (Name, DOB, Title, Year)

~~PlaysIn (Name, DOB, Title, Year, Salary)~~

Roles to relations

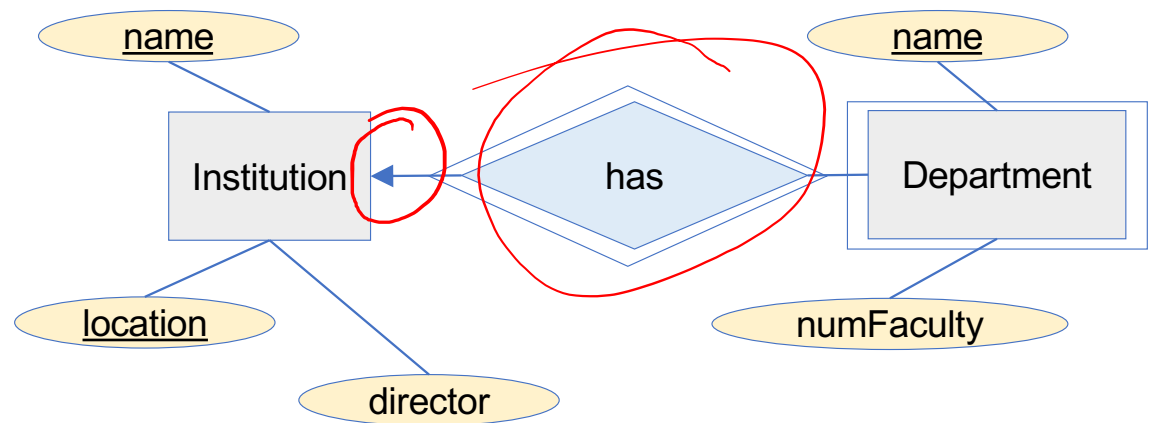


People (Name, DOB, Birthplace)
parentOf (parentName, parentDOB, childName, childDOB)

parentOf (pN, pD, cN, cD)

Weak entity sets to relations

- Relation for a **weak entity set** must include attributes for its **complete key** (including those belonging to other entity sets), as well as its own, nonkey attributes.
- A supporting relationship is redundant and yields no relation (unless *it* has attributes).

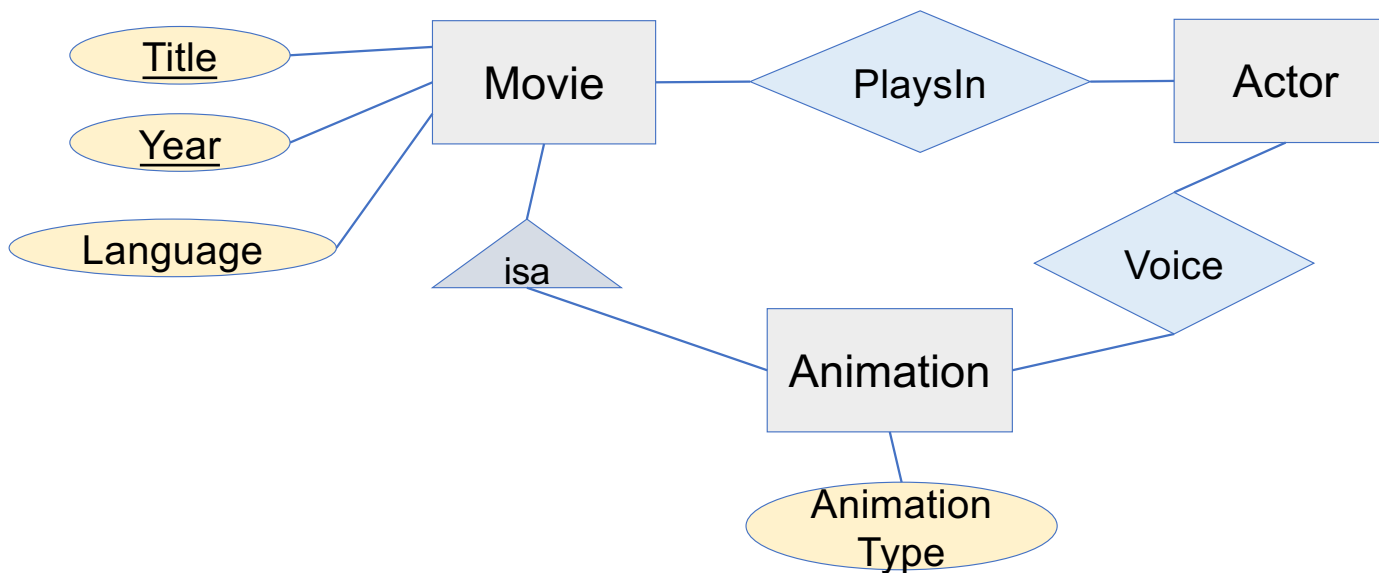


Institution (Name, Location, Director)

⇒ Department (Name, InstName, Instlocation, NumFaculty)

⇒ Has (DeptName, InstName, Instlocation)

Hierarchies to relations



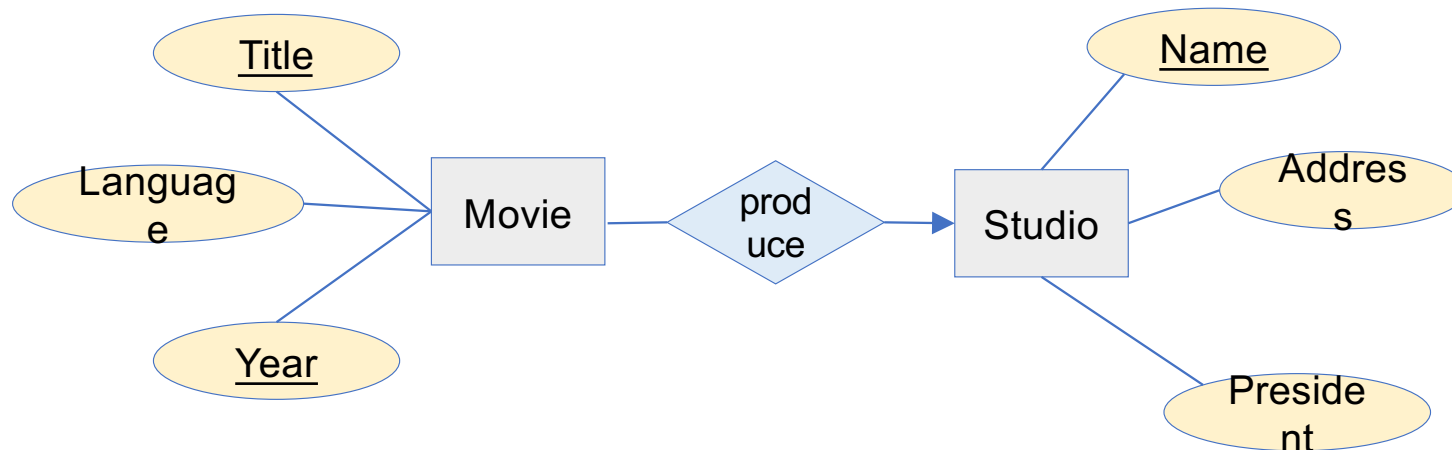
Movie (Title, Year, Language)

Animation (Title, Year, AnimationType)

Actor (Name, DOB, City)

AllMovies (Title, Year, Language, AnimationType)

Combining relations (1/2)



Movie (Title, Year, Language)

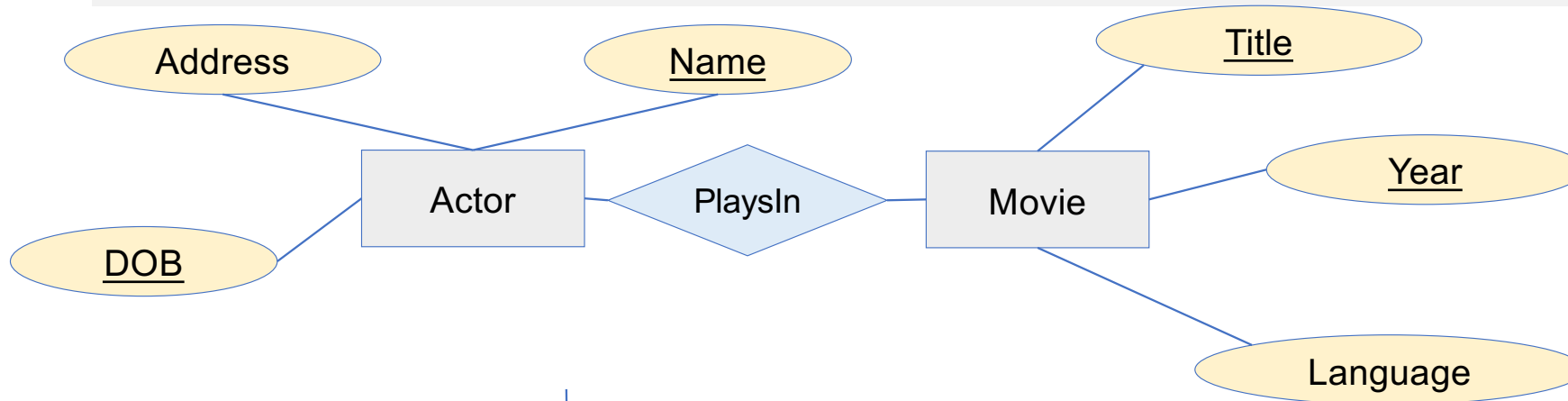
Studio (Name, Address, President)

Produce (Title, Year, StudioName)

Movie (Title, Year, Language, StudioName)

Studio (Name, Address, President)

Combining relations (2/2)



Actor (Name, DOB, Address)

Movie (Title, Year, Language)

PlaysIn (Name, DOB, Title, Year)

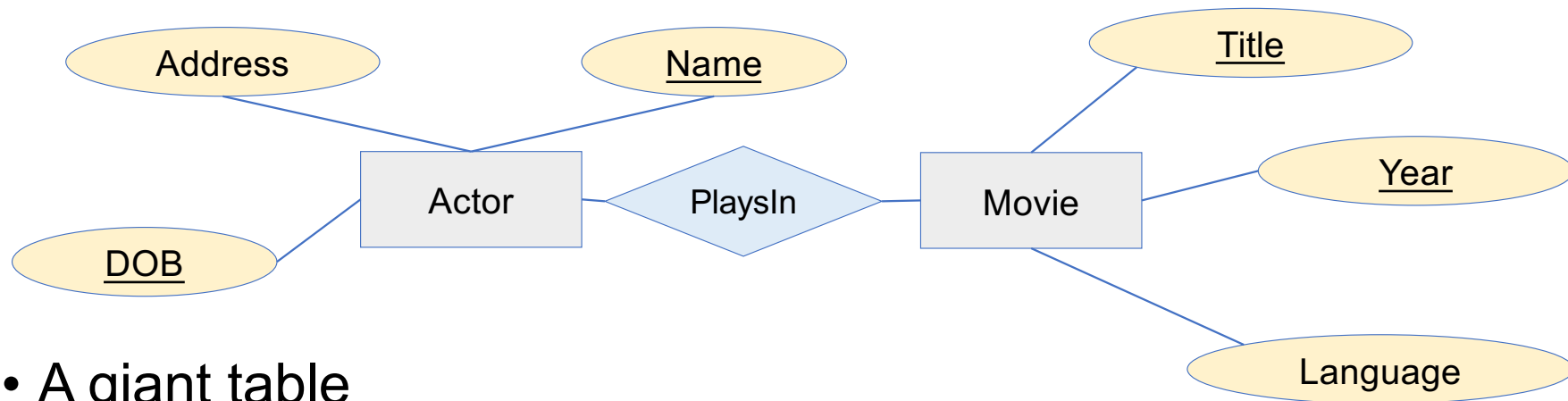
Actor (Name, DOB, Address, MovieTitle, Year)

Movie (Title, Year, Language)

Actor (Name, DOB, Address)

Movie (Title, Year, Language, ActorName, DOB)

Even More Extreme



- A giant table
Actor (Name, DOB, Address, MovieTitle, Year, Language)

What is a good database design?

Anomalies

Name	DOB	Address	MTitle	Year	Language
Ayushman Khurana	1984	Mumbai	DoctorG	2022	Hindi
Ayushman Khurana	1984	Mumbai	Andhadhun	2018	Hindi
Henry Cavill	1983	Beverley Hills	Man of Steel	2013	English
Tom Cruise	1962	LA	Top Gun: Maverick	2022	English
Peter Sellers	1925	London	Dr. Strangelove	1964	English

- Redundancy
- Update Anomalies
 - Ayushman Khurana changed his name to Ayushmaan Khurrana
- Deletion Anomalies
 - Delete the movie “Dr. Strangelove” from the DB

Normalization is the process of systematically eliminating these anomalies => Leads us to better database designs

Functional Dependencies

- There are usually a variety of constraints (rules) on the data in the real world.
- For example, some of the constraints that are expected to hold in a university database ...
- **Legal instance of a relation:** an instance that satisfies all real-world constraints
- A legal instance of a database = all relations are legal
- Require that the **value for a certain set of attributes** determines **uniquely the value for another set of attributes**.
 - A functional dependency is a generalization of the notion of a key.