Tutorial 1

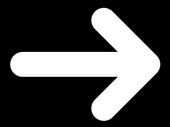
CS4.301: Data and Applications

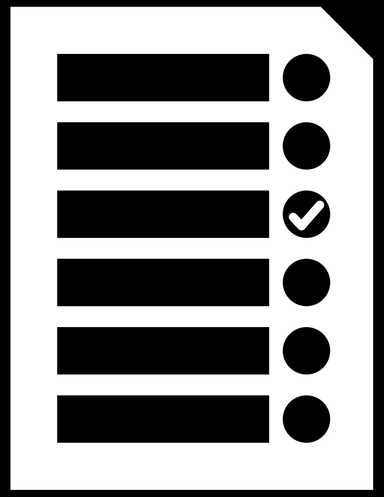
September 27, 2023 — Monsoon 2023 — Ayush, Rohan, Siddharth, Ankith

Agenda

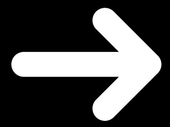
- ER Data Model
- Assignments
- Project
- Administrative stuff

Miniworld /
UoD





Data
Requirements



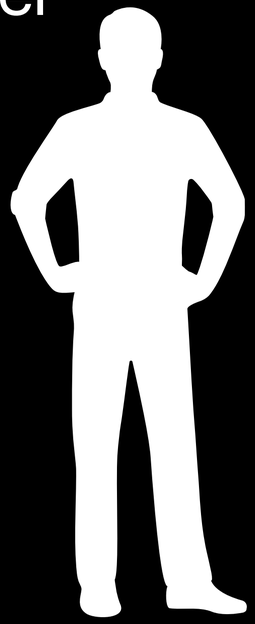
Conceptual
Design

Entity-relationship (ER) Model

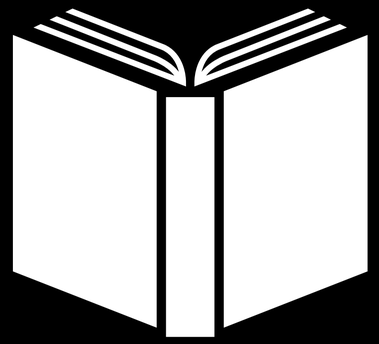
ER Model

- Wikipedia: *“Describes interrelated things of interest in a specific domain of knowledge”*
- Designed by Peter Chen and published in a paper in 1976
  - https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.523.6679&rep=rep1&type=pdf
- Different sources might have slight variations, try to follow the course’s book (Elmasri) for this course

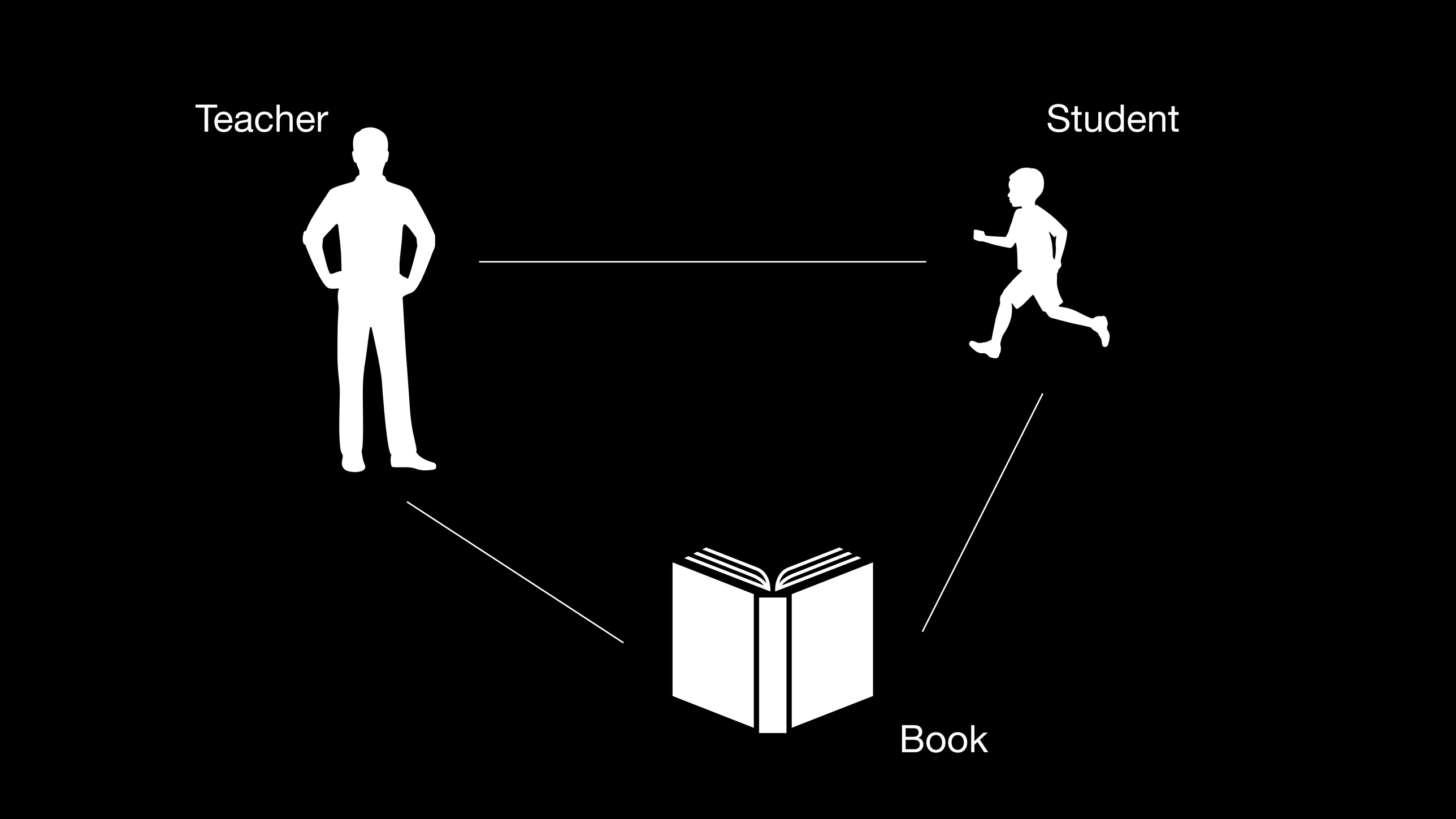
Teacher



Student



Book


Teacher
Student
Book

Components of an ER Model

- Entity sets (all entities of the same entity type)
- Relationship sets (all relationships of the same relationship type)
- Attributes

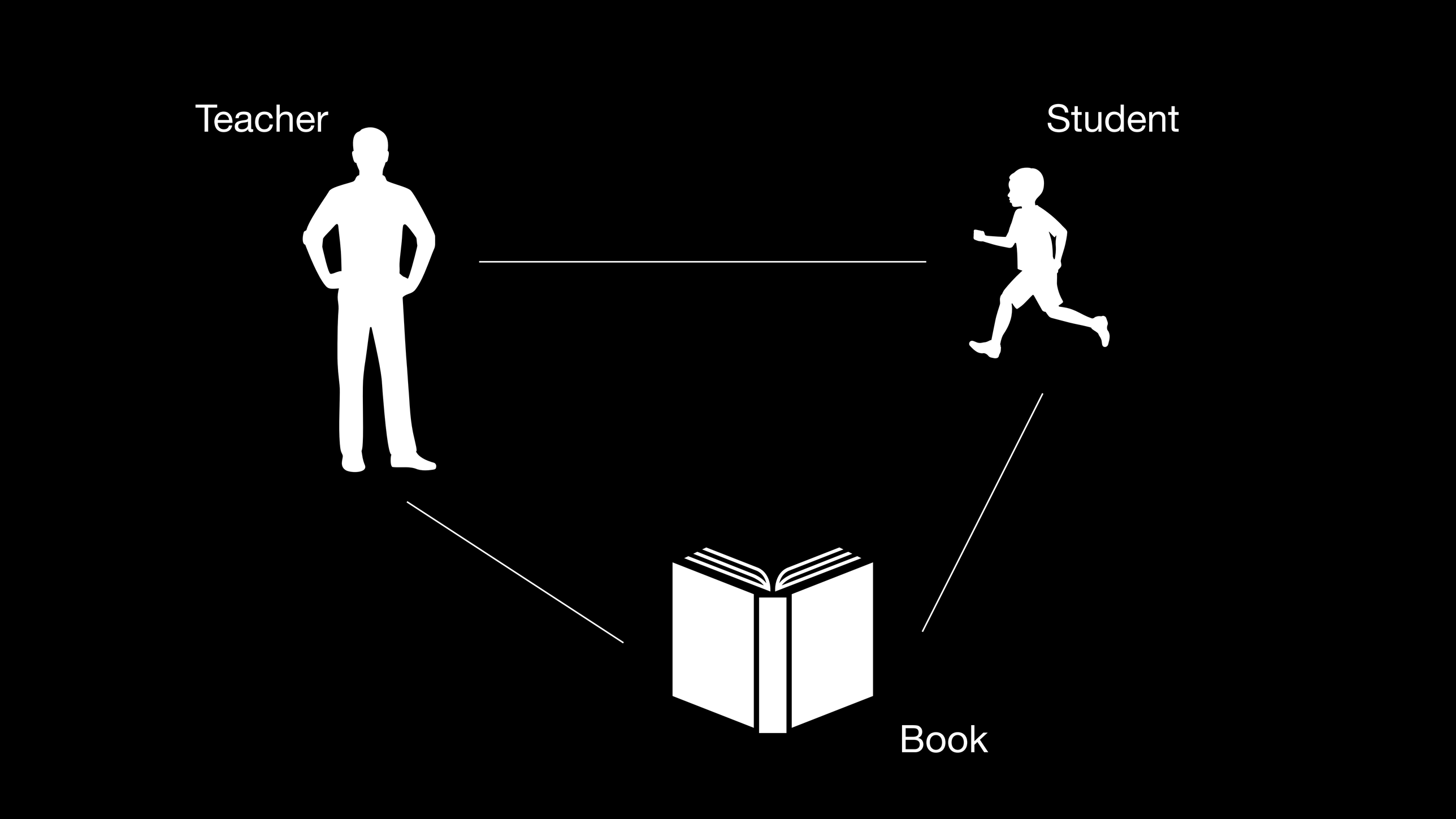
Entity & Entity type

Entity vs Entity Type

- Wikipedia: *“thing capable of an independent existence that can be uniquely identified”*
- *C*an be physical or logical
  - house/ car
  - house sale/ car service

Entity vs Entity Type

- Although the term is *entity* is most commonly used, we must distinguish between an **entity** and an **entity-type**
- **Entity-type** is a category
- **Entity** is an instance of a given entity-type
  - many such instances generally exist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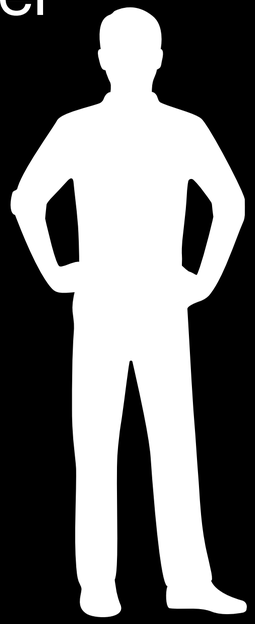
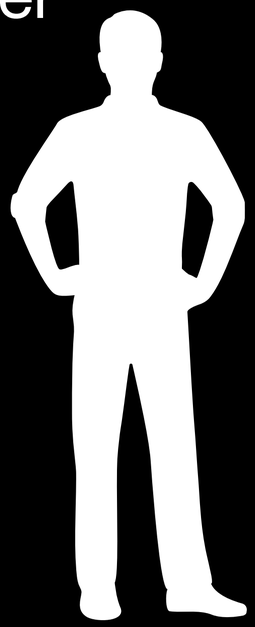


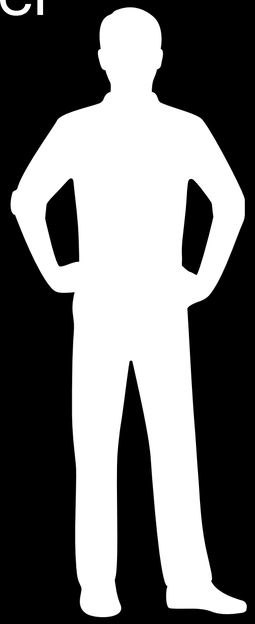
- Name
- Date of Birth
- Age
- Phone number
- Salary

Teacher

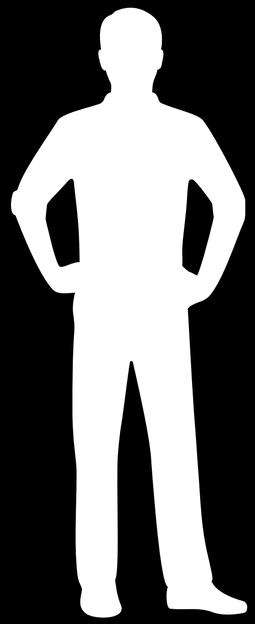


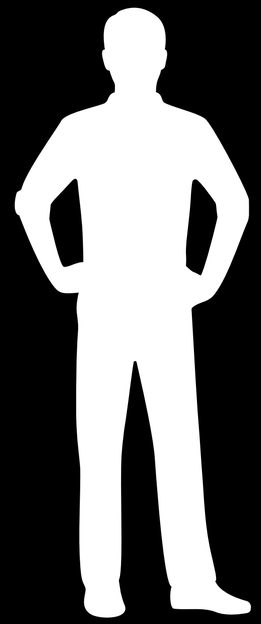
- Name
  - First Name
  - Last Name
- Date of Birth
- Age (can be derived from DoB)
- Phone number (can have multiple)
- Salary

Teacher



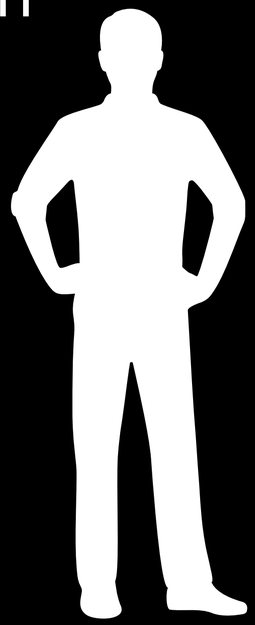
- Name [Composite Attribute]
  - First Name
  - Last Name
- Date of Birth
- Age (can be derived from DoB) [Derived Attribute]
- Phone number (can have multiple) [Multivalued Attribute]
- Salary



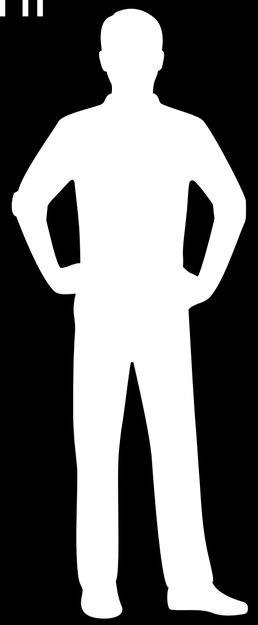


- How do we identify who is who?
- We need something to differentiate (uniquely identify) an entity

Ankith



Mavani

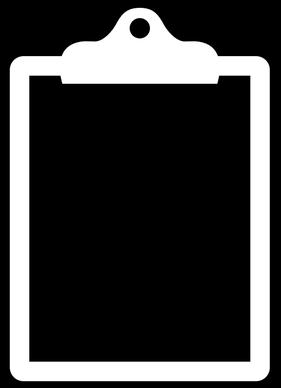


- How do we identify who is who?
- We need something to differentiate (uniquely identify) an entity

[Key Attribute] Can use phone number/ email ID/ employee ID, et cetera

Weak Entity type

- Cannot be uniquely identified
- Needs another entity type to identify it



Course
(eg: CS4.301: D&A)

Problem is that this same course is taught every year

Weak Entity type

- Cannot be uniquely identified
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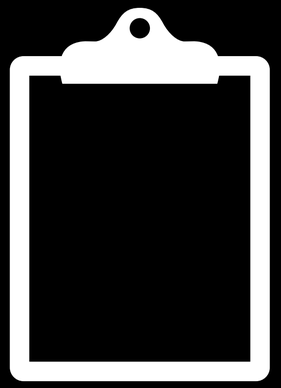
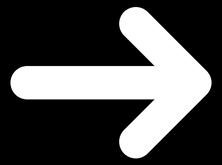


Course
(eg: CS4.301: D&A)

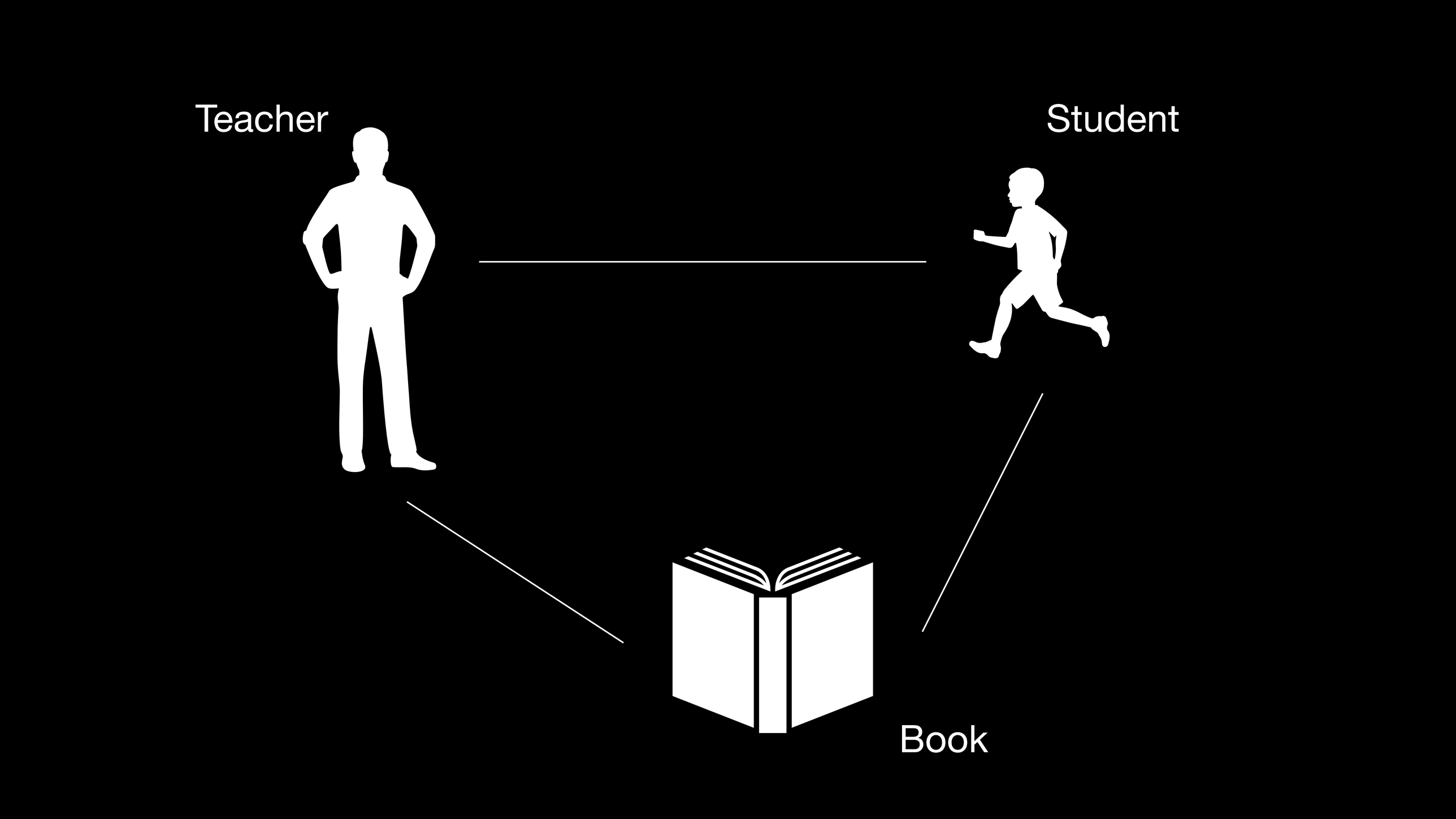


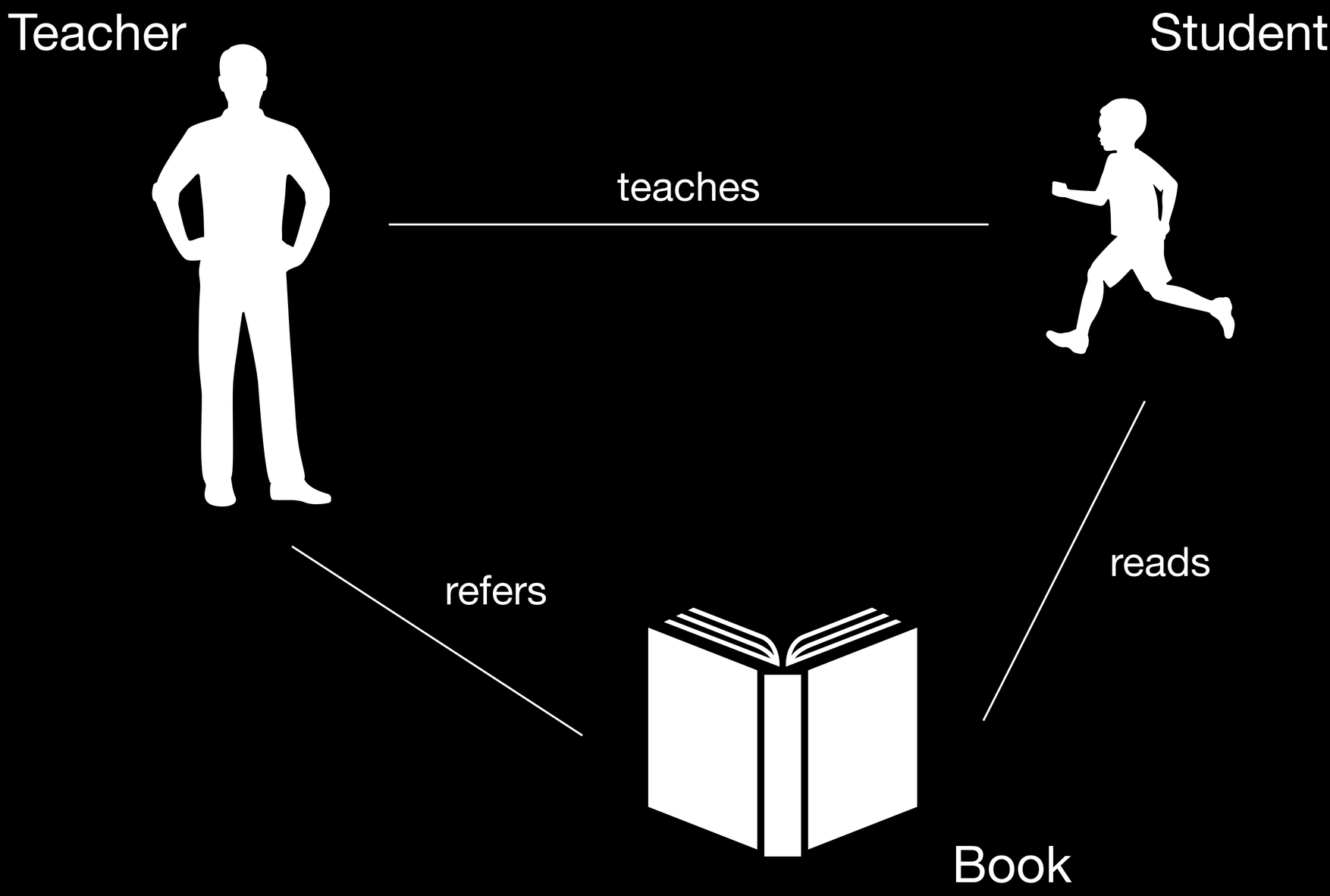
Semester
(eg: Monsoon 2022)

Relationship & Relationship type

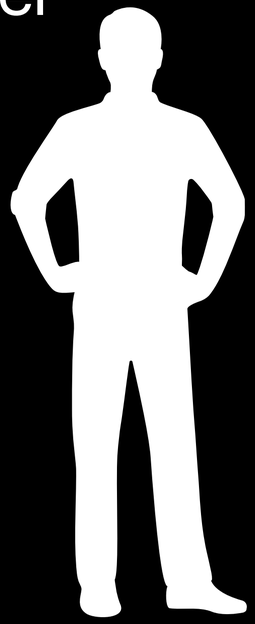
yes please & toxic

- Similar to entity vs entity-type: relationship-type is a category and relationship is an instance of a relationship-type
- A relationship-type gives a relationship between two (or more) entity-types
  - The entity-types are called as **roles** in this relationship-type


Teacher
Student
Book

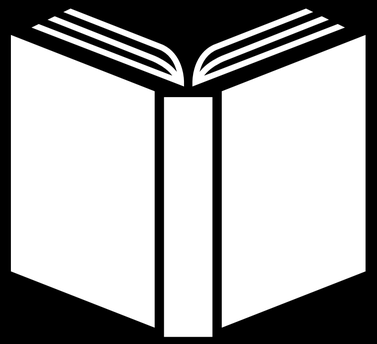

Teacher
Student
teaches
refers
reads
Book

Teacher



Student

teach



Book

Notations

Entity

Weak Entity

Relationship

Indentifying Relationship

Attribute

Key Attribute

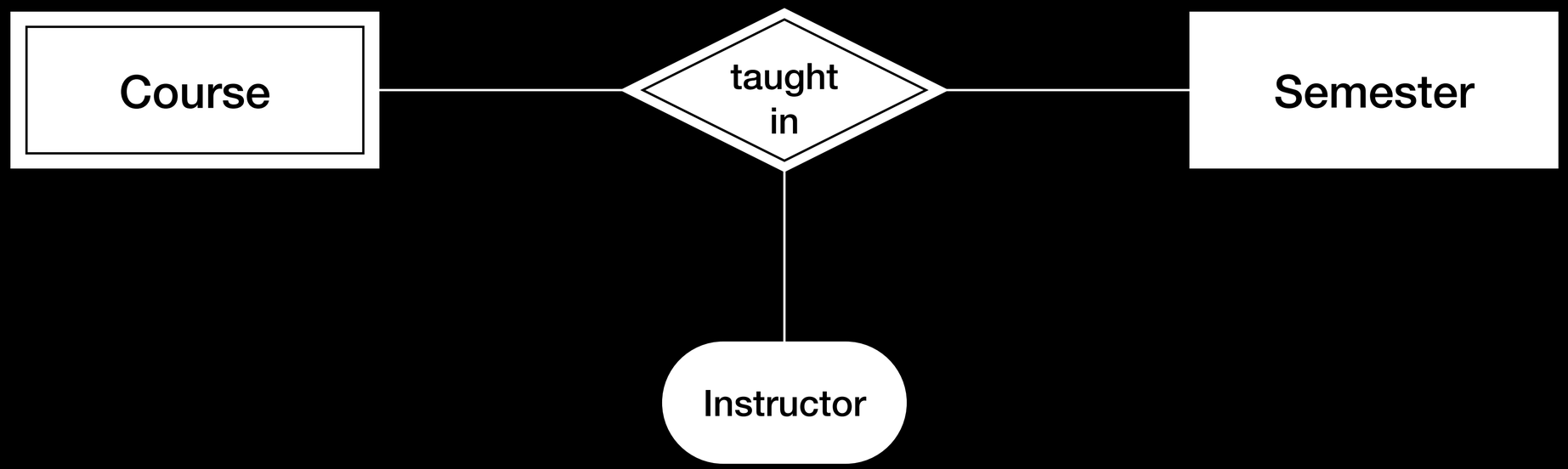
Multivalued Attribute

Composite Attribute

Derived Attribute

Identifying Relationship

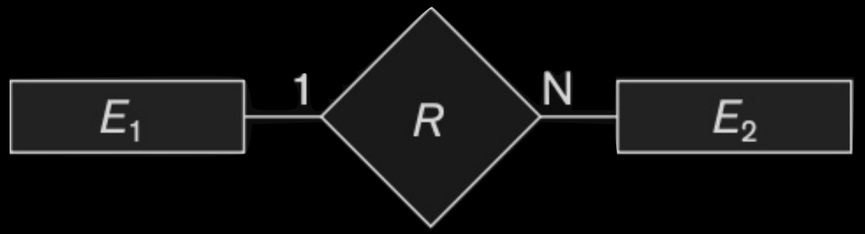
Relationship-types can have attributes!



Constraints on Relationship types

Cardinality Ratio

- Specifies the *maximum* number of relationship instances that an entity can participate in
  - 1:1
  - 1:N
  - N:1
  - M:N



Cardinality Ratio 1: N for $E_1 : E_2$ in R

Homework 1

Requirements Documents

Objectives

- Define a mini-world
- Define the entity types of the mini-world
- Understand how they interact with each other
- Translate these interactions into relationships
- Define boundaries
- Define basic system behavior

Requirements Documents

Sections

- Introduction
  - define your mini-world, set boundaries
- Purpose of the DB
  - why does the DB exist? what does it offer that non-DB solutions don’t?
- Users of the DB
  - who uses it? what do they do with it?
- Applications of the DB
  - what all applications exist for your DB in the given mini-world?

Project

1
Requirements
Document

2
ER Diagram

3
Normalisation

4
Coding

Tips and Suggestions

- Brevity is king
  - Be precise, concise and well-rounded
  - More does not imply better
- Separate requirements from rationale
  - Requirement is a statement of one thing a product must do or a quality it must have
  - Justify your assertions later
- Manage your expectations
  - DO NOT choose a project that you will regret coding
  - DO NOT choose a project with minimal complexity
- Keep revisiting the requirements document during phases. DO NOT deviate from your requirements

Administrative stuff

- Teams
  - 3-4 people in a team (might change)
  - will remain same throughout this course
  - Same teams for both project and assignment
- Approaching TAs
  - TA office hours will be shared on Moodle
  - mailing list will be shared on Moodle — do not spam it!
  - be formal — WhatsApp messages will be ignored


I Heard you like requirements
SO I gave you requirements for your requirements
meme-generator.com

Vacation.