The Enhanced E-R Model: Specifying Constraints in Supertype/Subtype Relationships

Database Management Systems

Introduction to the Enhanced E-R (EER) Model

What is EER?

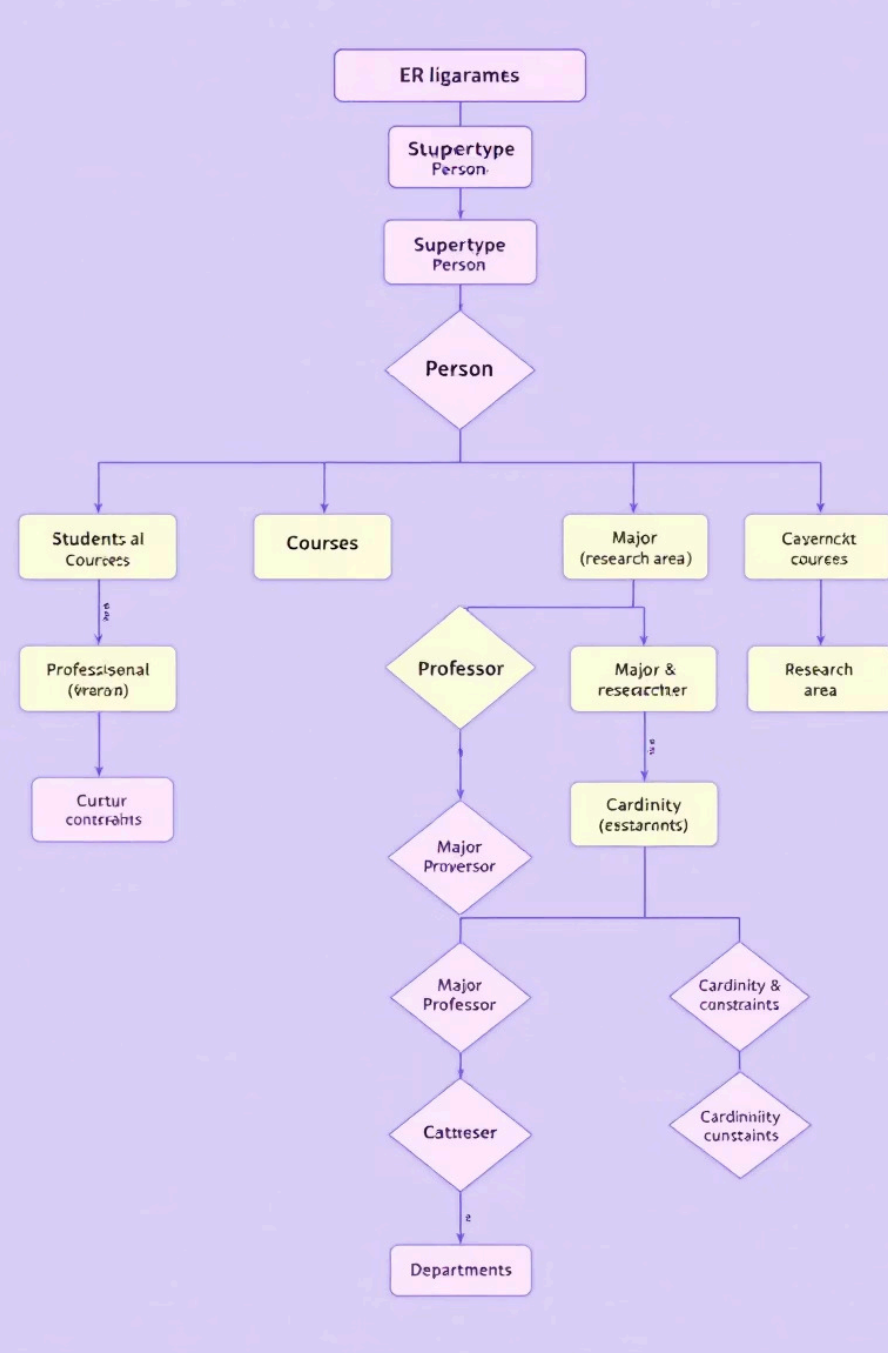An extension of the basic ER model with richer semantics.

Need for Enhancements

Captures complex real-world scenarios better than basic ER.

Key Feature

Supports supertype and subtype entity relationships for detailed modeling.

Understanding Supertypes and Subtypes

Supertype

A generic entity representing shared attributes.

Example: Employee

Subtype

Specialized entities with distinct attributes.

Examples: Engineer, Manager

Users		Products		Orders
Users		Name. Price		Name. Price
Name; Price		Order Date		Order Date

Importance of Constraints in Subtype Relationships

Maintain Data Integrity

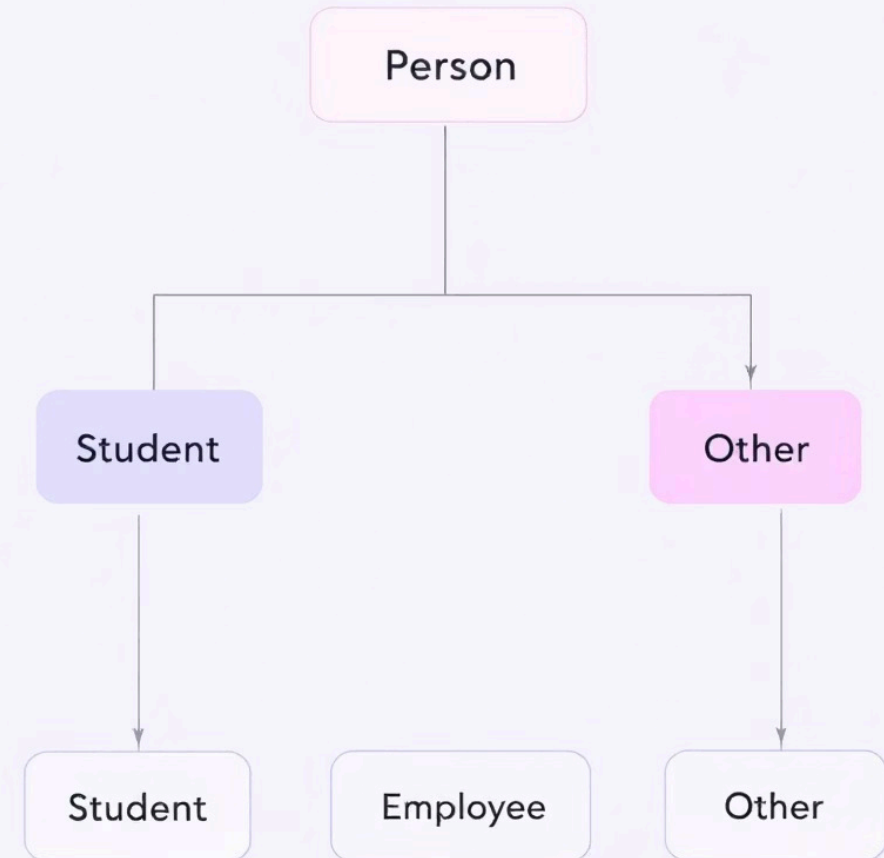Constraints ensure data accuracy and consistency.

Define Valid Membership

Control which subtype entities an instance can belong to.

Clear Semantics

Help define precise business rules in the model.

Enhanced Entity-Relationship (EER) showiing disjoyent constraint

Disjoint Constraint

Definition

Entities can belong to only one subtype.

Types

- Disjoint: Exclusive membership
- Overlapping: Multiple memberships possible

Example

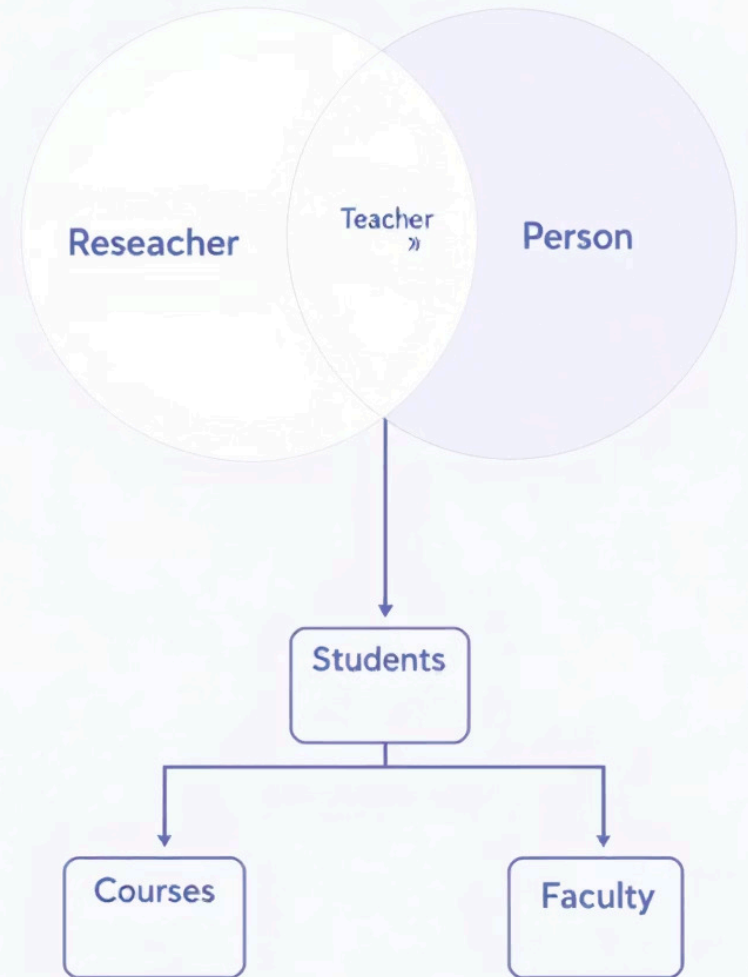A person is either a student or an employee, not both.

Overlapping Constraint

Definition

Entities may belong to multiple subtypes simultaneously.

Real-Life Example

A person can be both a teacher and a researcher.

Completeness Constraint
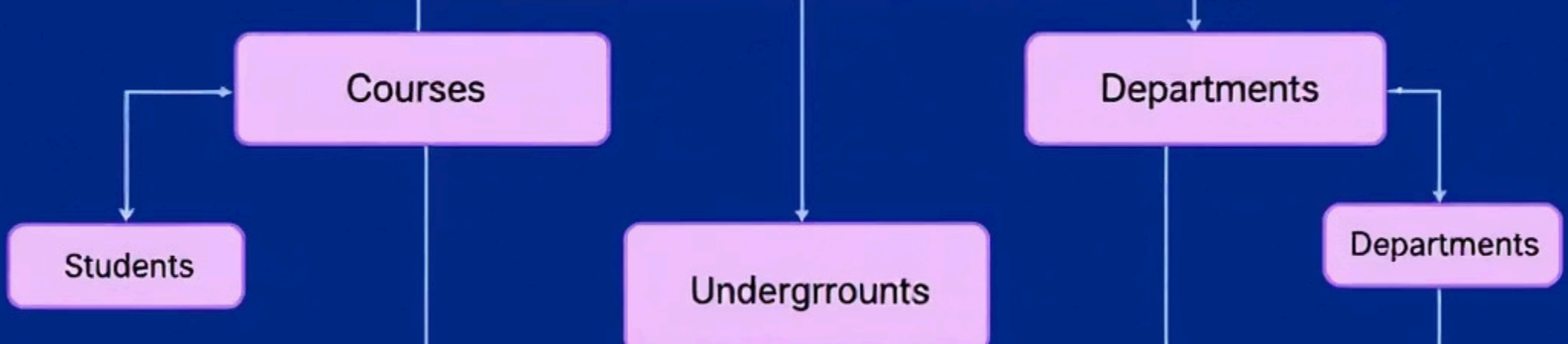
Total Participation

Every supertype entity belongs to at least one subtype.

Example: All employees are hourly or salaried.

Partial Participation

Some supertype entities may not belong to any subtype.

Example: Not every vehicle is a car or a truck.

Specifying Constraints in EER Diagrams

Notation

- Circle with "d" or "o" for disjoint/overlapping
- Double line for total, single line for partial participation

Best Practices

Use clear labels and consistent symbols for readability.

Examples & Case Studies

University Model

Student supertype with overlapping subtypes: undergrad, grad.
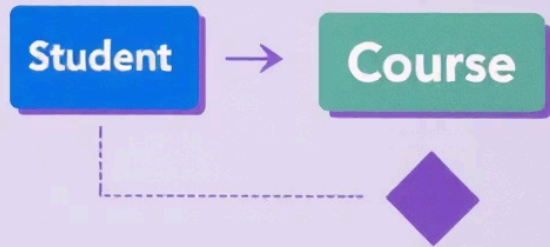
Constraints Applied

Total participation: every student is undergrad or grad.

Overlapping: can be both in special cases.

Practice of E-R Model

Enhanced E-R Model in Action

Recap: What is the E-R Model?

Entities

Objects or things in the real world with distinct existence

Attributes

Properties or details of entities

Relationships

Associations between entities

Importance

Foundation for designing clear, efficient databases

Steps in Designing an E-R Model

Identify Entities and Relationships

Spot objects and how they connect

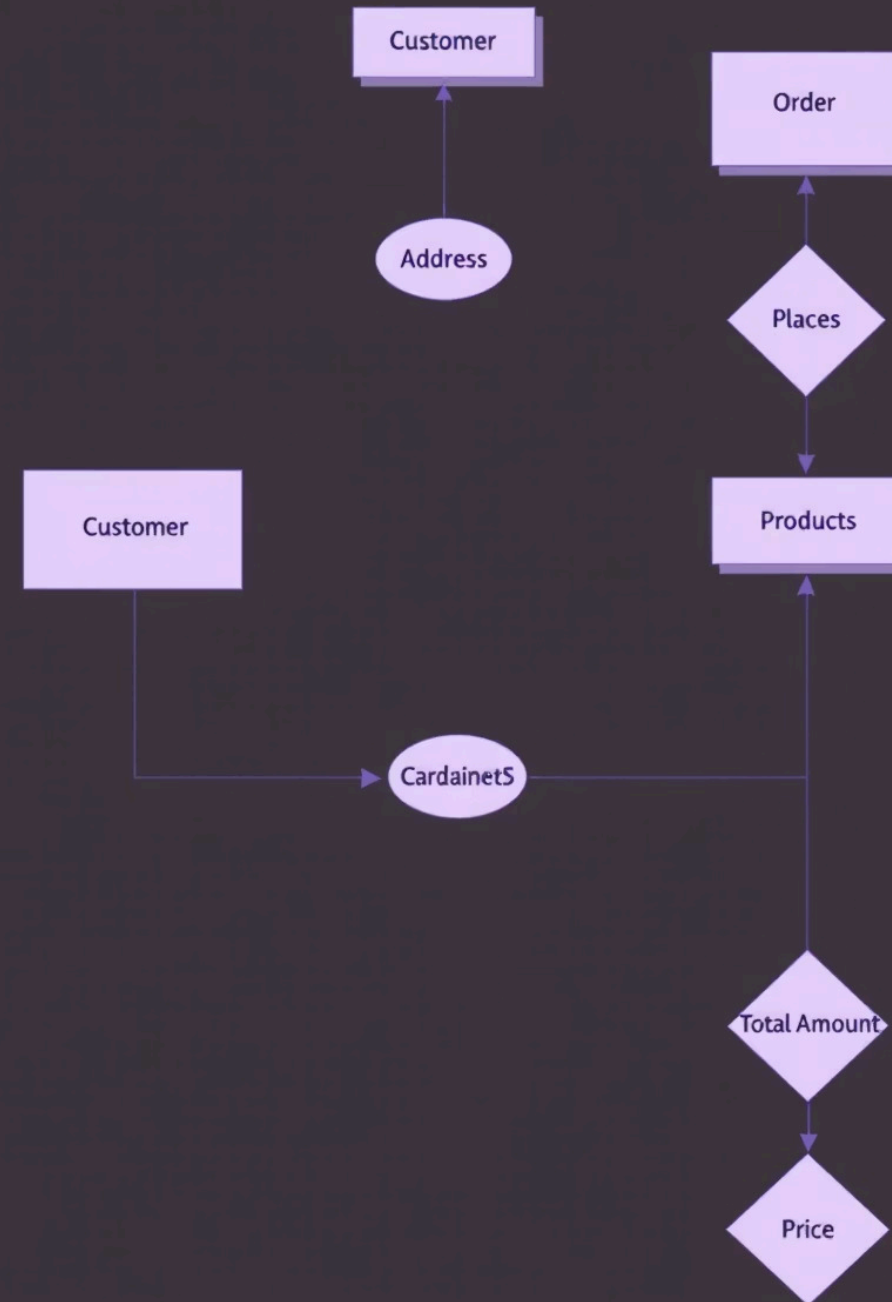**Determine Key Attributes**

Select unique identifiers for entities

Map Relationships and Cardinality

Define how entities relate and their frequency

Apply Constraints

Introduce rules to refine the model, including enhanced features
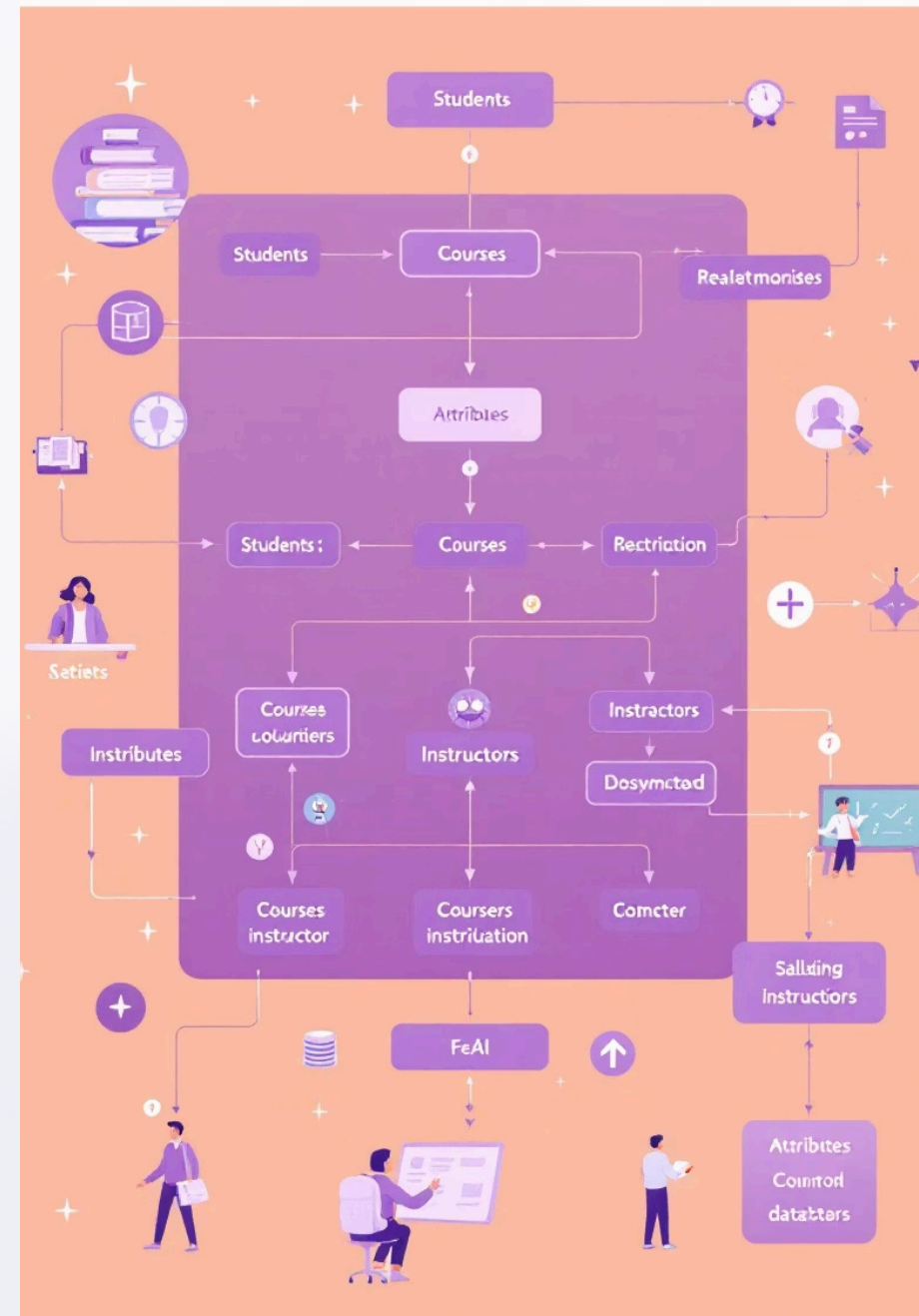
Example Scenario 1 – University Database

Entities

Student, Course, Instructor

Attributes

ID, Name, Credits, Department

Relationships

Enrollment, Teaching

Example Scenario 2 – Library Management System

Entities

- Book
- Member
- Author

Special Attributes

- Composite (e.g., Full Name)
- Multivalued (e.g., Book Genres)

Relationships

- Borrow
- Writes

Common Modeling Mistakes to Avoid

Too Many or Too Few Entities

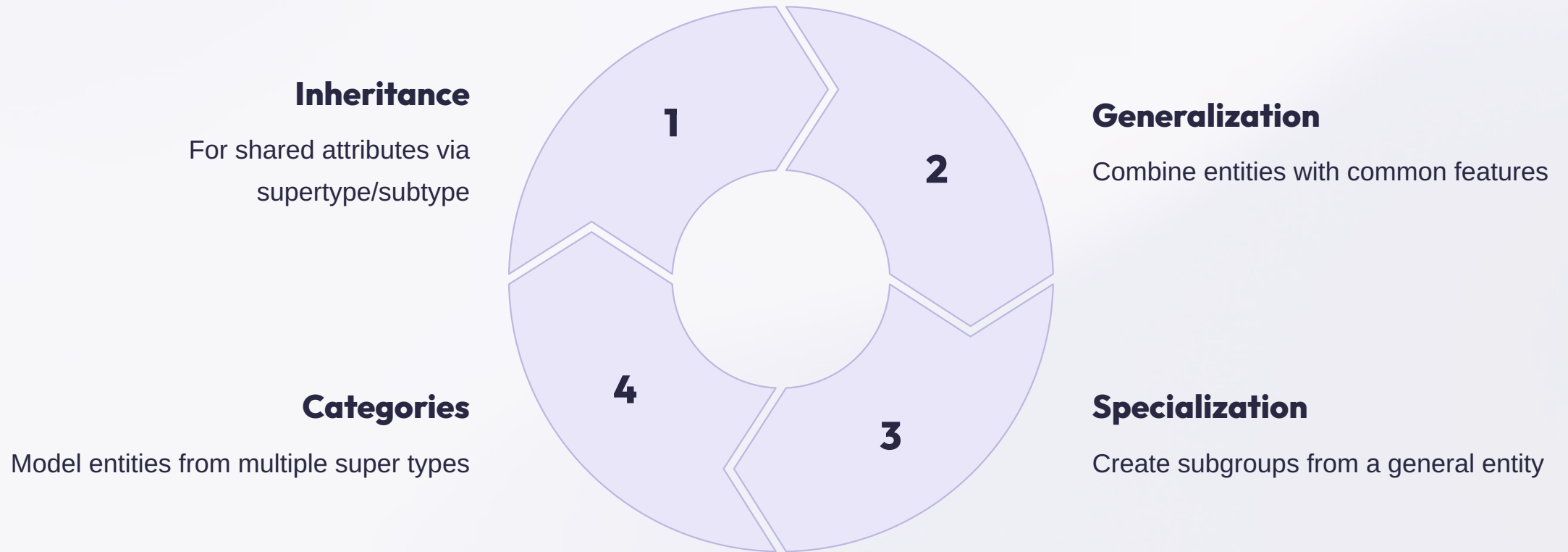Avoid overcomplicating or oversimplifying

Missing Relationship Attributes
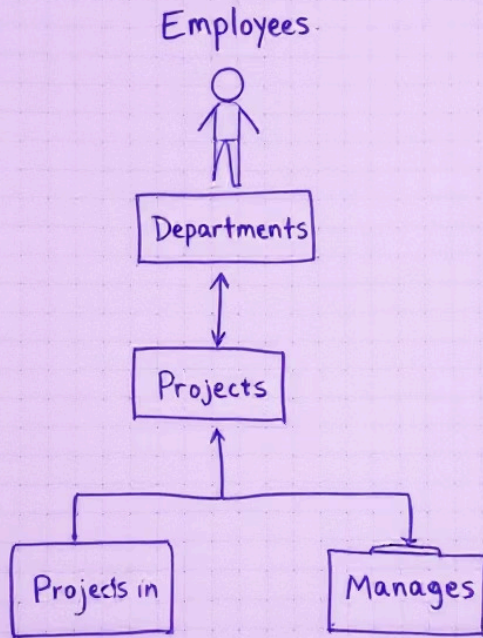
Include attributes that describe relationships

Incorrect Cardinality

Use accurate multiplicities to model real scenarios

From ER to EER – When to Use Enhanced Features

Inheritance

For shared attributes via supertype/subtype

1

Generalization

Combine entities with common features

2

Specialization

Create subgroups from a general entity

3

Categories

Model entities from multiple super types

4

Practice Activity – Model a Small Business

Scenario

A company with employees, departments, and projects

Task

Identify entities, attributes, and relationships

Challenge

Sketch your own ER diagram or discuss possibilities

Review & Key Concepts

Recap ER Modeling Steps

Identify, attribute selection, relationships, constraints

Practice is Essential

Hands-on modeling improves understanding and skills

Tips for Clean Diagrams

Use consistent symbols, labels, and color coding