

BACKEND & DATA LAYER

Advanced Programming

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2024-I



Outline

1 Data Layer

2 Backend Layer



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1 Data Layer

2 Backend Layer



Data System Concepts

Key Points of Data Systems:

- **Data modeling** is the process of designing the **structure** and organization of data.
 - Data storage is the process of storing data in a structured or unstructured format.
 - Data retrieval is the process of accessing and retrieving data from a storage system.
 - Data manipulation is the process of modifying and **transforming** data.
 - Data protection is the process of protecting data from unauthorized access and ensuring its **integrity** and **confidentiality**.
- Object → BD*
- OLM*
- Class Diagram*



Data System Concepts

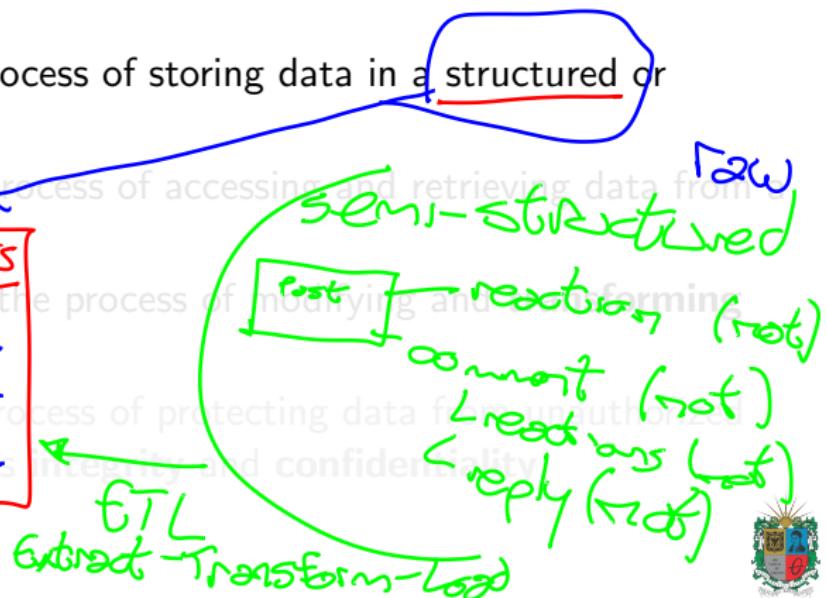
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excel

name	age	address
~	~	~
~	~	~
~	~	~
~	~	~

OOD



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16 - 04 - 2024 16:01:01.001 (Z)

Zulu ← UTC (Z)

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format => dates

UNIX Timestamp



correct UTC

*UTC
11:00*

*UTC + 1
12:00*



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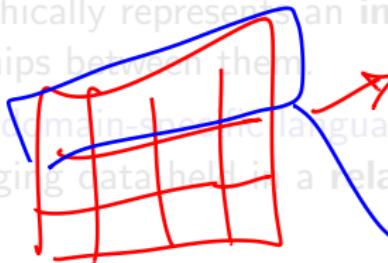
Relational Databases

- A **database management system** (DBMS) is a software system that uses a standard method to store and retrieve data.
 - A relational database management system (RDBMS) is a type of database management system that stores data in a structured format, using rows and columns.
 - An entity-relationship diagram (ERD) is a data modeling technique that graphically represents an information system's entities and the relationships between them.
 - SQL is a domain-specific language used for managing data held in relational database management systems.
-
- The diagram illustrates the components of a relational database system. On the left, a blue-bordered box contains a grid of wavy lines representing a database table. An arrow points from this box to a red-bordered box containing the letters "SQL". From the "SQL" box, two arrows point downwards to a red-bordered box containing the words "Create", "Retrieve", "Update", and "Delete". Another arrow points from the "SQL" box to a red-bordered box containing the letters "GUI". Below the "GUI" box, the words "Assistants" are written in red. To the right of the "GUI" box, there is a faint watermark-like text: "A relational database management system (RDBMS) is a type of database management system that stores data in a structured format, using rows and columns." The entire diagram is overlaid with red handwritten-style annotations.



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list (rows)
list (objects)
row structure
↳ objeto



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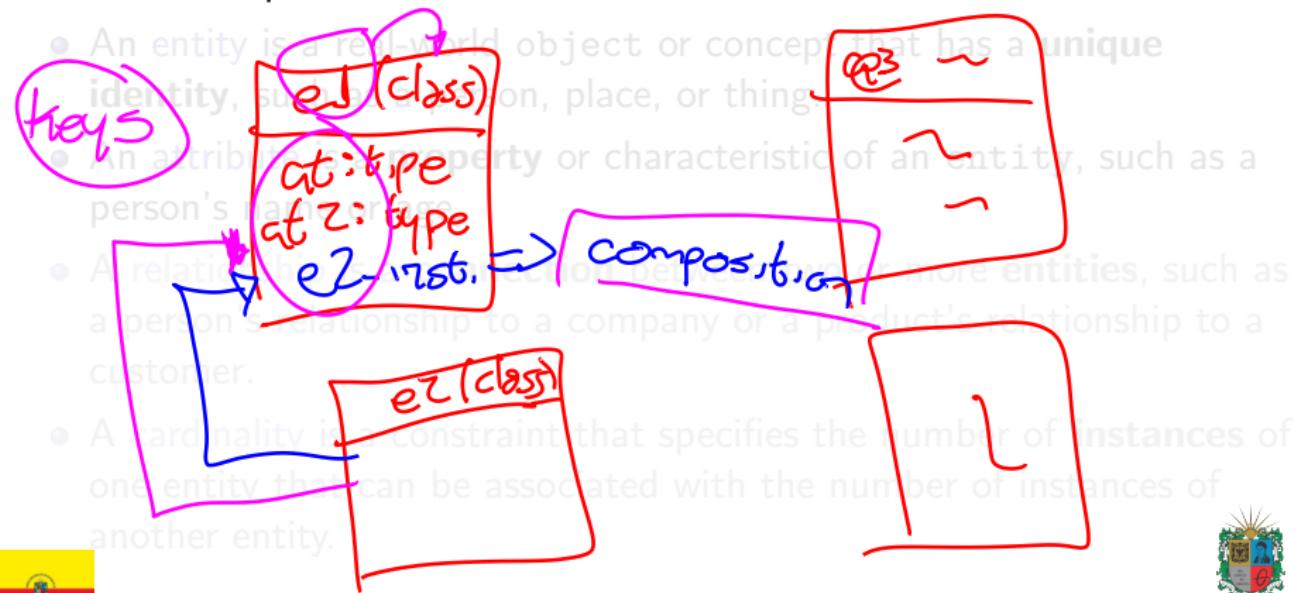
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declarative) } no-logic \Rightarrow how
} task \Rightarrow what



ER Diagrams

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 - An attribute is a property or characteristic of an entity, such as a person's name or age.
 - A relationship is a connection between two or more entities, such as a person's relationship to a company or a product relationship to a customer.
 - A cardinality is a constraint that specifies the number of instances of one entity that can be associated with the number of instances of another entity.
- communication
- entity → class object
- DB BG



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list (Vehicles) 

another entity. 

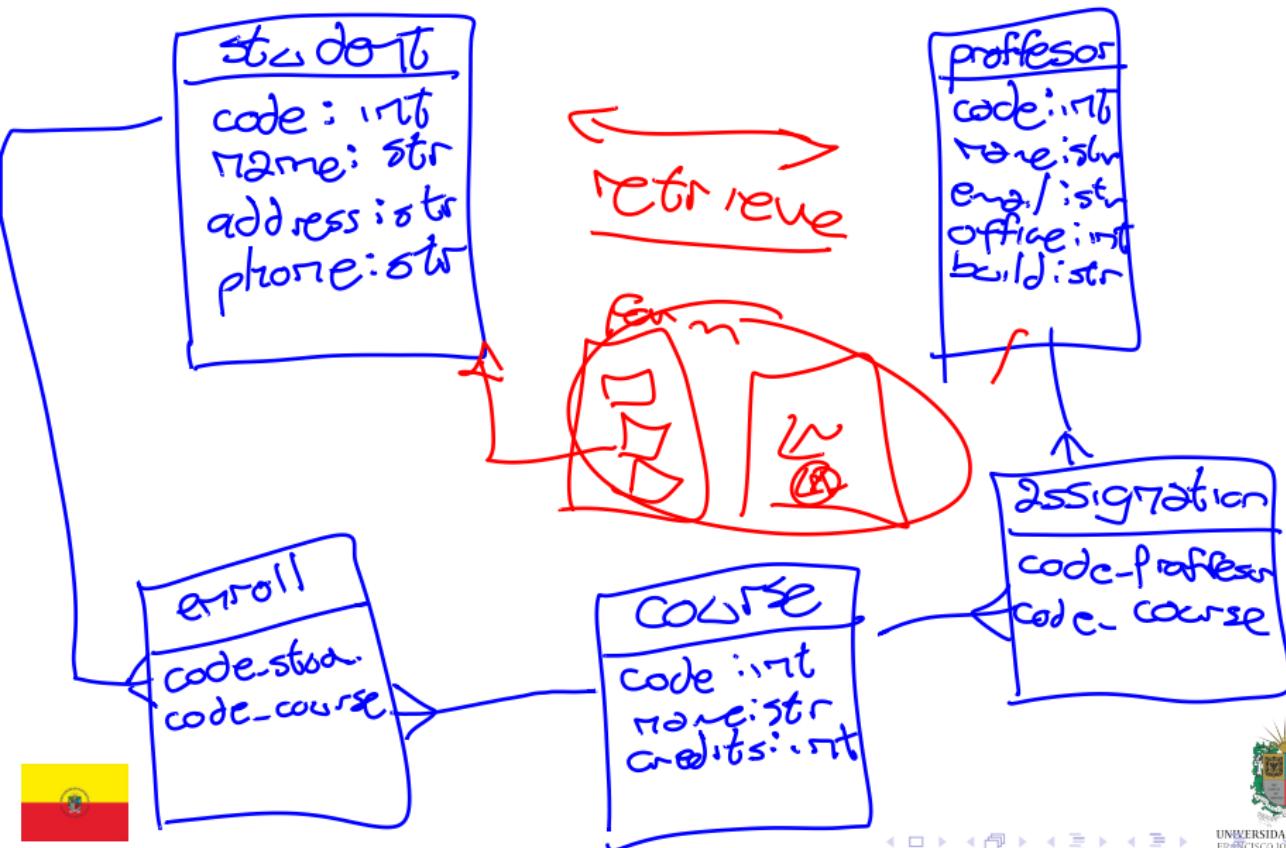


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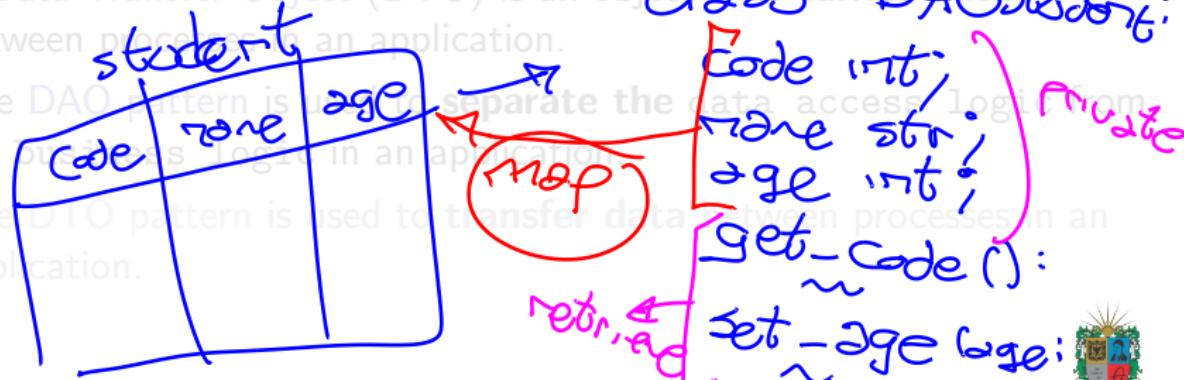
Study Case: ER Diagram for an Academic System



Data Access Objects and Data Transfer Objects

Data Access Objects (DAOs) and Data Transfer Objects (DTOs) are design patterns used to separate the data access logic from the business logic in an application.

- A Data Access Object (DAO) is an object that provides an abstract interface to some type of database or other persistence mechanism.
- A Data Transfer Object (DTO) is an object that carries data between processes in an application.
- The DAO pattern is used to separate the data access logic from the business logic in an application.
- The DAO pattern is used to transfer data between processes in an application.



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class enroll:
- The DTO pattern is used to **transfer data between processes in an application.**
def course_enrolls (list<DTOs>)



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Object-Relational Mapping

- Object-Relational Mapping (ORM) is a programming technique that converts data between incompatible type systems using object oriented programming languages.
- An ORM framework is a tool that automates the process of mapping objects to relational databases.
- ORM frameworks include features such as data validation, data retrieval, and data manipulation.
- ORM frameworks lets you work with data in an object-oriented way, rather than in a relational way.

+ Integrity



PostgreSQL and SQLAlchemy

- PostgreSQL is a powerful, open-source object-relational database system.
- SQLAlchemy is an open-source SQL toolkit and Object-Relational Mapping (ORM) library for Python.
- SQLAlchemy provides a full suite of well-known enterprise-level persistence patterns, designed for efficient and high-performing database access.



Outline

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2 Backend Layer



Backend Concepts

Key Points of Backend Systems:

- A backend system is a software system that provides the logic and functionality to support the front-end of an application.
 - A backend system typically consists of a server, a database, and an

LÜSER

Interaction

6

87

- An application server is a software framework that provides an environment for running web applications.
 - forms
 - form validation
 - draw charts
 - A database is a collection of data that is organized and stored in a structured format.
 - access db
 - business rules
 - calculations



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No-structured \Rightarrow non \Rightarrow data / logic

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Connection with Data Layer

- The backend layer is responsible for managing the data layer and providing the logic and functionality to support the front-end of an application.
- The connection between the backend and data layers is typically managed through an application programming interface (API).
- An API is a set of rules and protocols that allows different software applications to communicate with each other.
- The API provides a way for the front-end of an application to interact with the backend and access the data stored in the database.
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- The core domain is the main focus of the application and represents the key concepts and entities that the application is designed to manage.
- DDD domain layer is divided into domain objects, which represent the core concepts and entities of the application.
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RESTful APIs

- A Representational State Transfer (REST) is an architectural style that defines a set of constraints for creating web services.
- A RESTful API is an API that follows the principles of REST and uses HTTP methods to perform operations on resources.
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HTTP Methods

- The Hypertext Transfer Protocol (HTTP) is a protocol that defines how data is transmitted over the internet.
- HTTP methods are used to perform operations on resources, such as retrieving, creating, updating, or deleting data.
- The most common HTTP methods are GET, POST, PUT, PATCH, and DELETE.
 - GET is used to retrieve data from a server.
 - POST is used to create new data on a server.
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HTTP Codes

- HTTP status codes are standard response codes given by web servers on the internet.
- The status codes are divided into five categories:

◦ 1xx Informational — Request received, continuing process.

◦ 2xx Success — The action was successfully received, understood, and accepted.

◦ 3xx Redirection — Further action must be taken by the user to complete the request.

◦ 4xx Client Error — The request contains bad syntax or cannot be fulfilled.

◦ 5xx Server Error — The server failed to fulfill an apparently valid request.

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- FastAPI is based on standard Python type hints, which makes it easy to use and understand.
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Outline

1 Data Layer

2 Backend Layer



Thanks!

Questions?



Repo:

[github.com/engandres/ud-public/tree/main/courses/
advanced-programming](https://github.com/engandres/ud-public/tree/main/courses/advanced-programming)

