Backend & Data Layer

Advanced Programming

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Lecturer
Universidad Distrital Francisco José de Caldas

2024-I

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Outline

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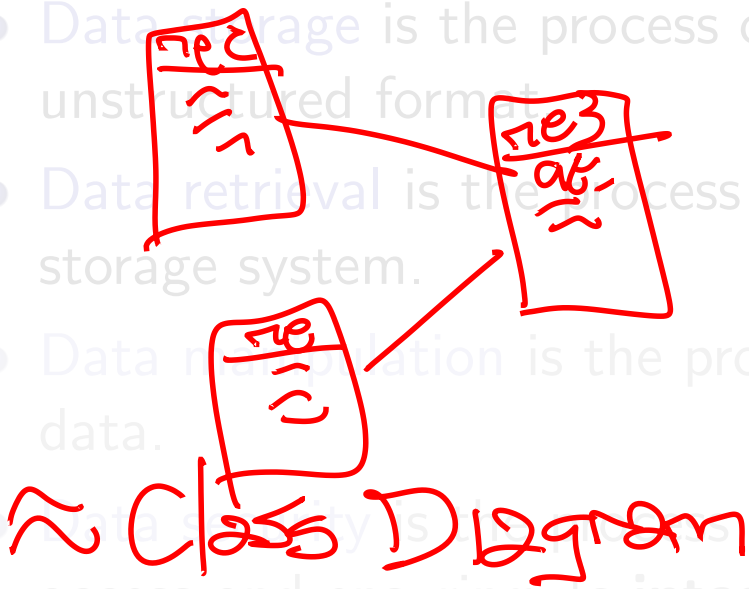
Data System Concepts

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 security is the process of protecting data from unauthorized access and ensuring its **integrity** and **confidentiality**.



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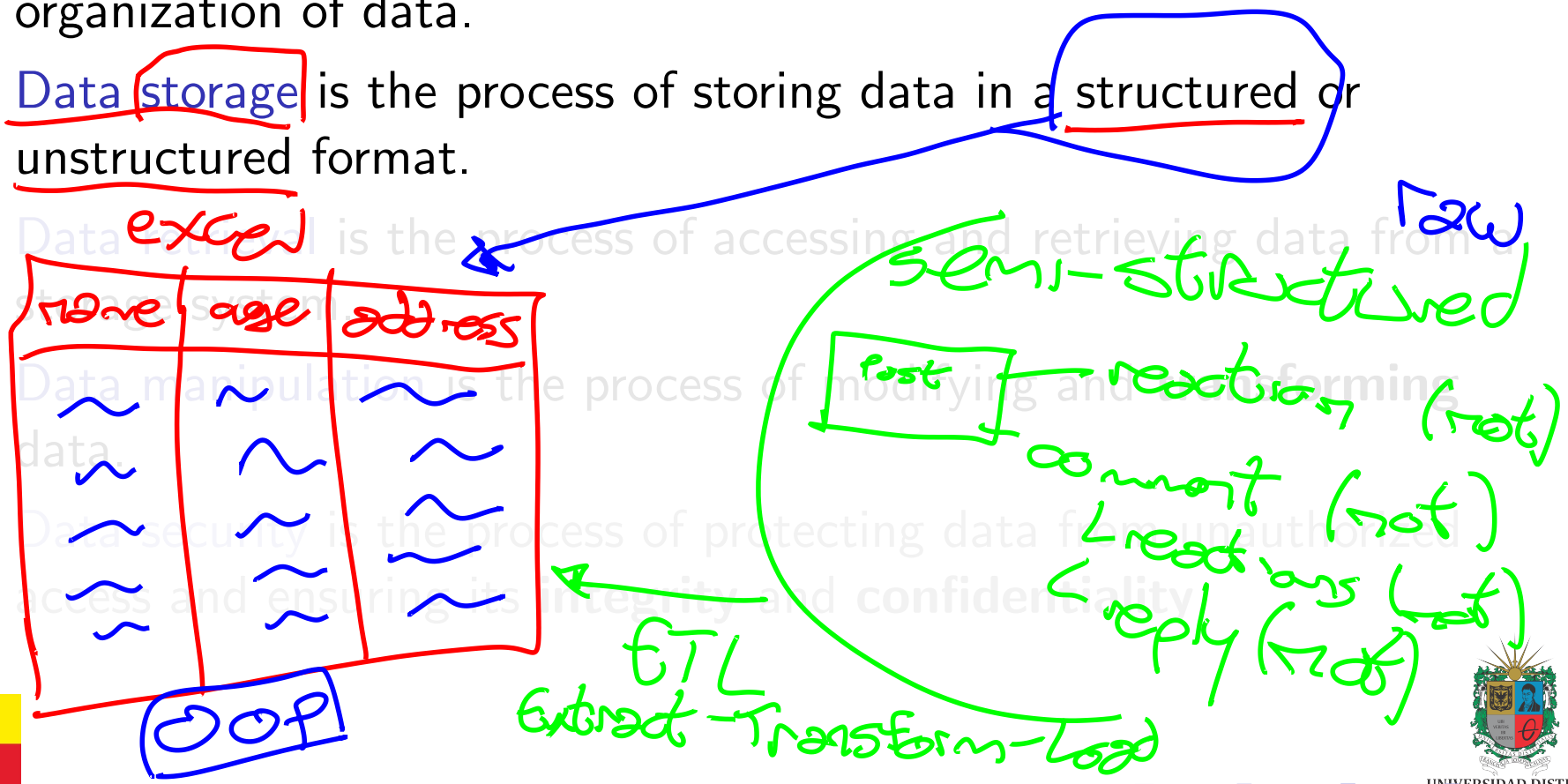

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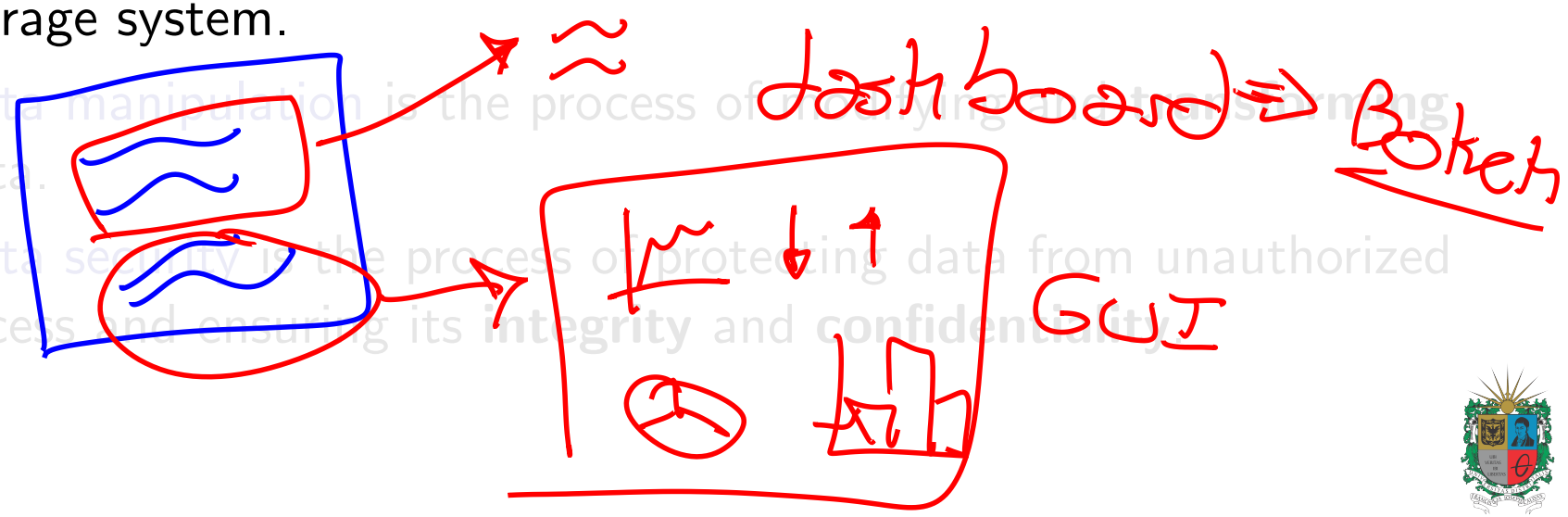

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Relational Databases

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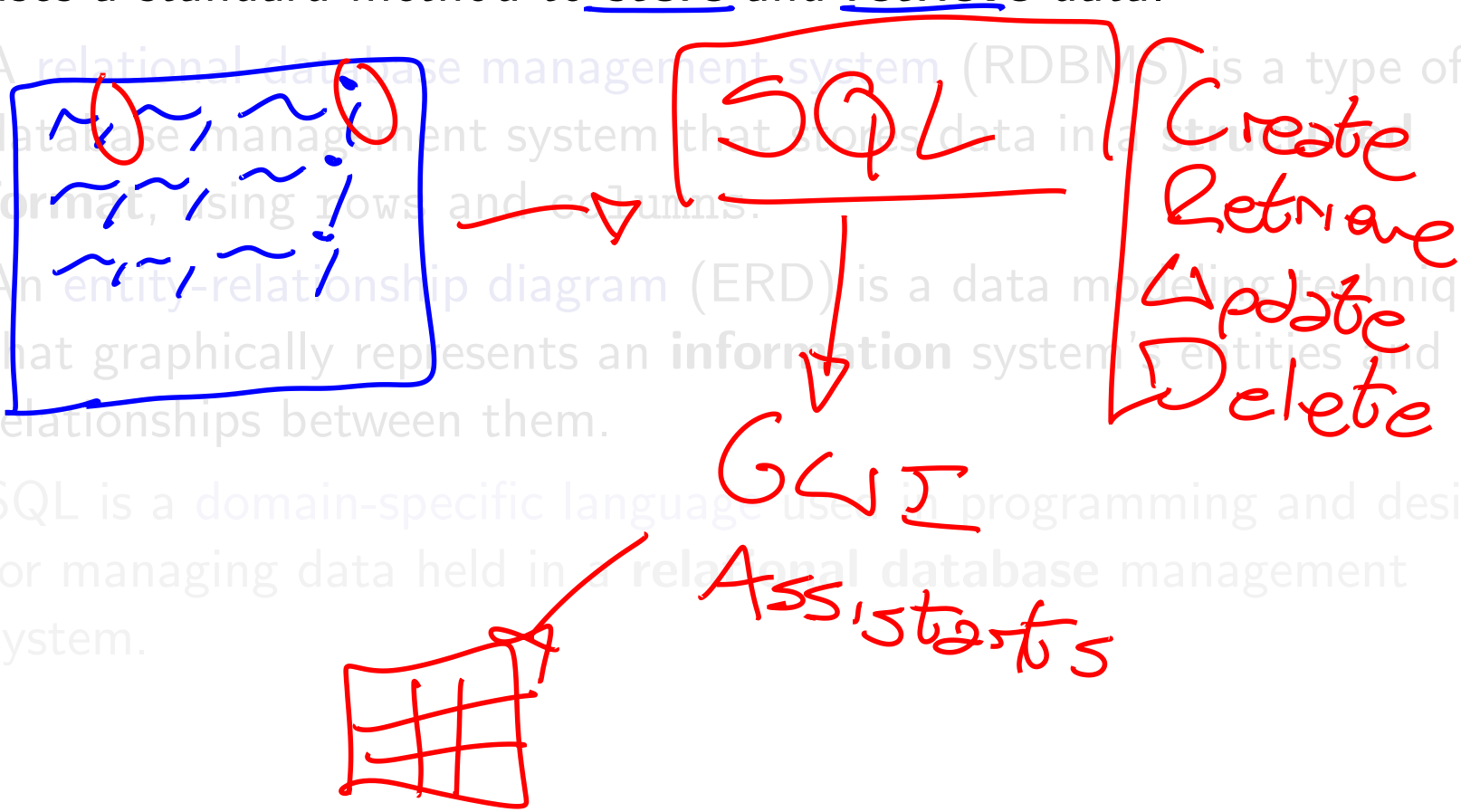

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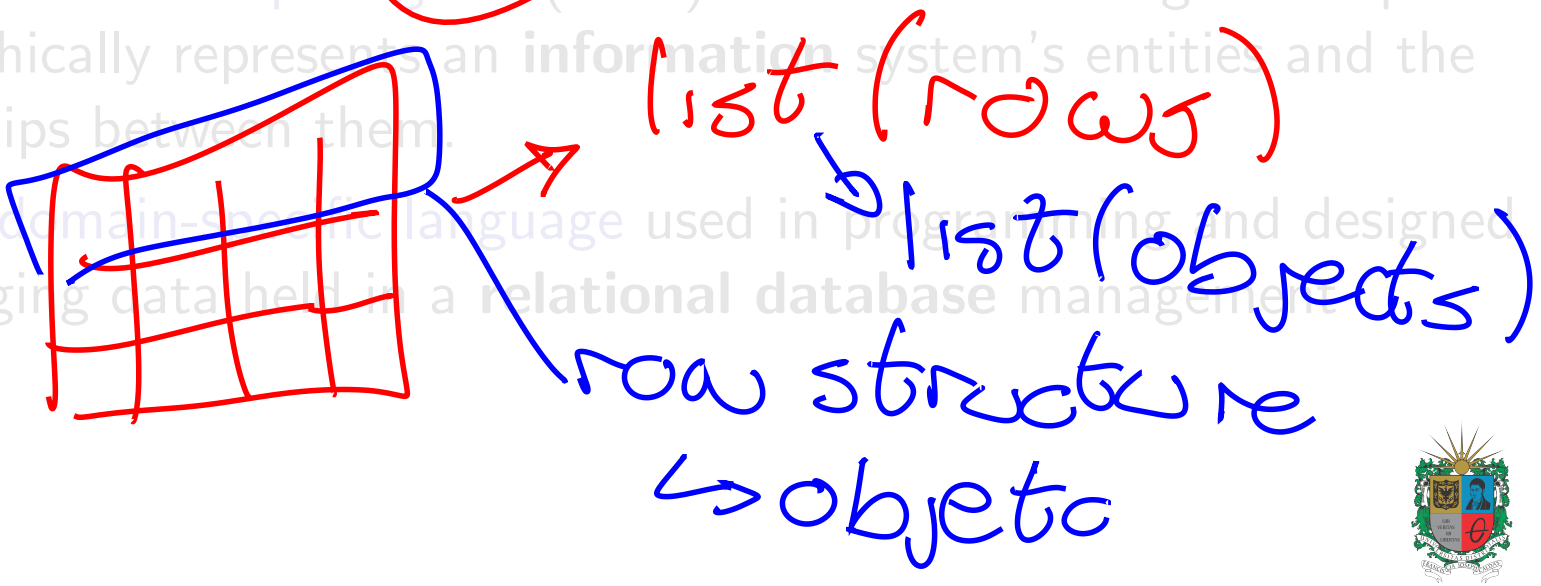
- A database management system (DBMS) is a software system that uses a standard method to **store** and **retrieve** data.
- A relational database management system (RDBMS) is a type of database management system that stores data in a **structured format**, using `rows` and `columns`.
- An entity-relationship 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 in programming and designed for managing data held in a **relational database** management system.



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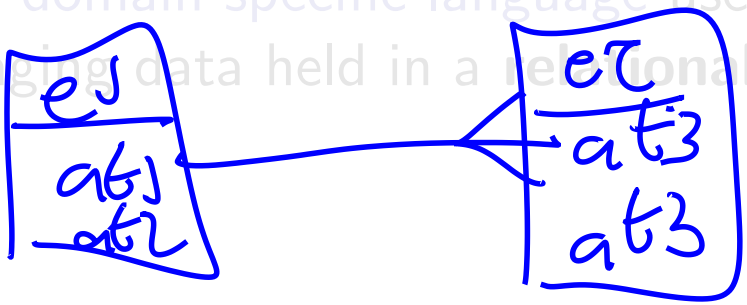

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declarative
→ no-logic => how
→ ask => what

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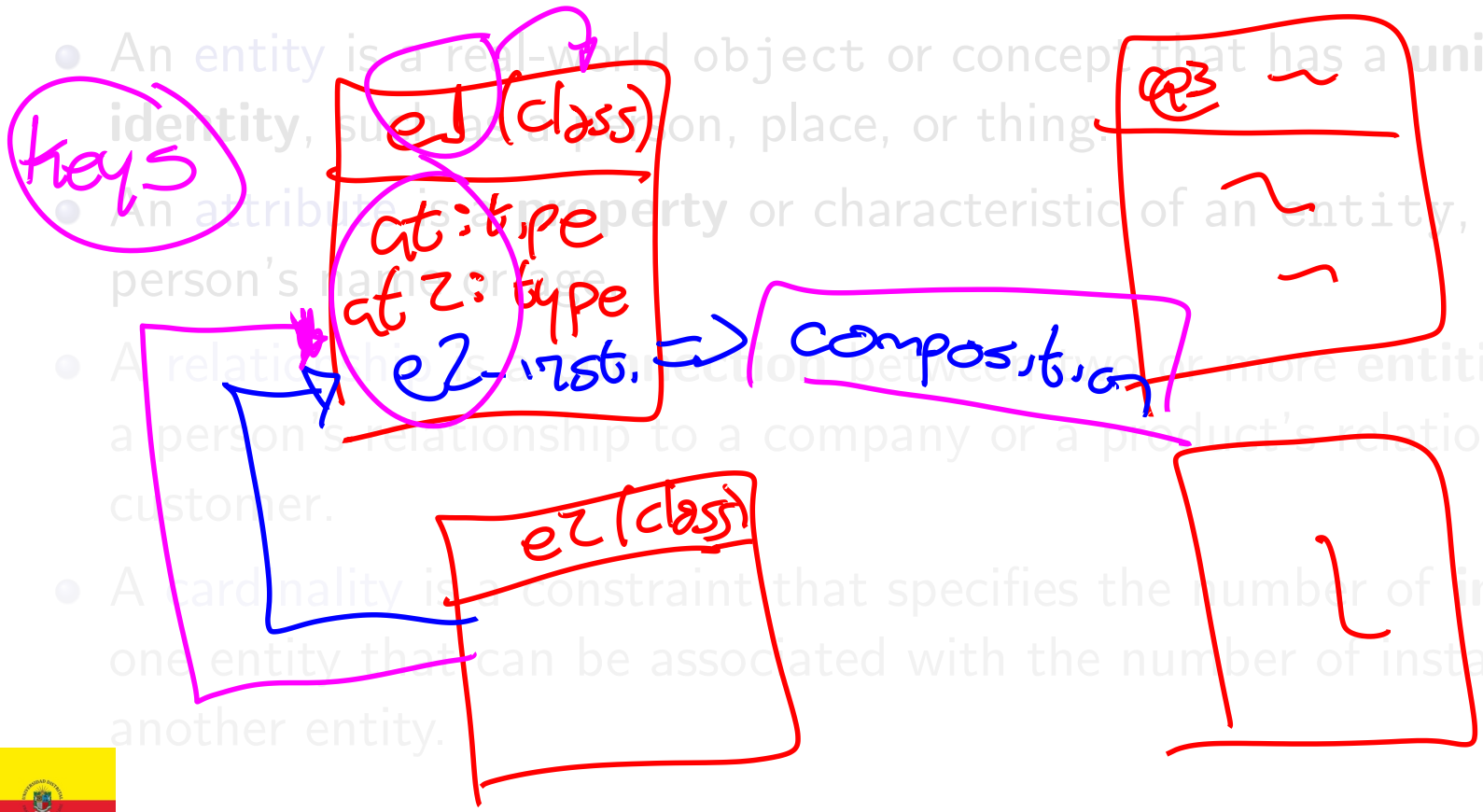

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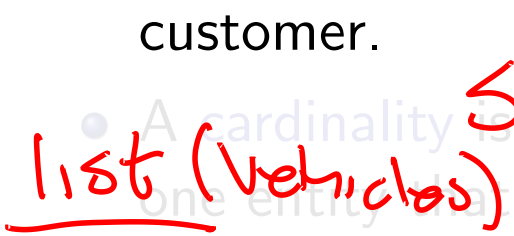

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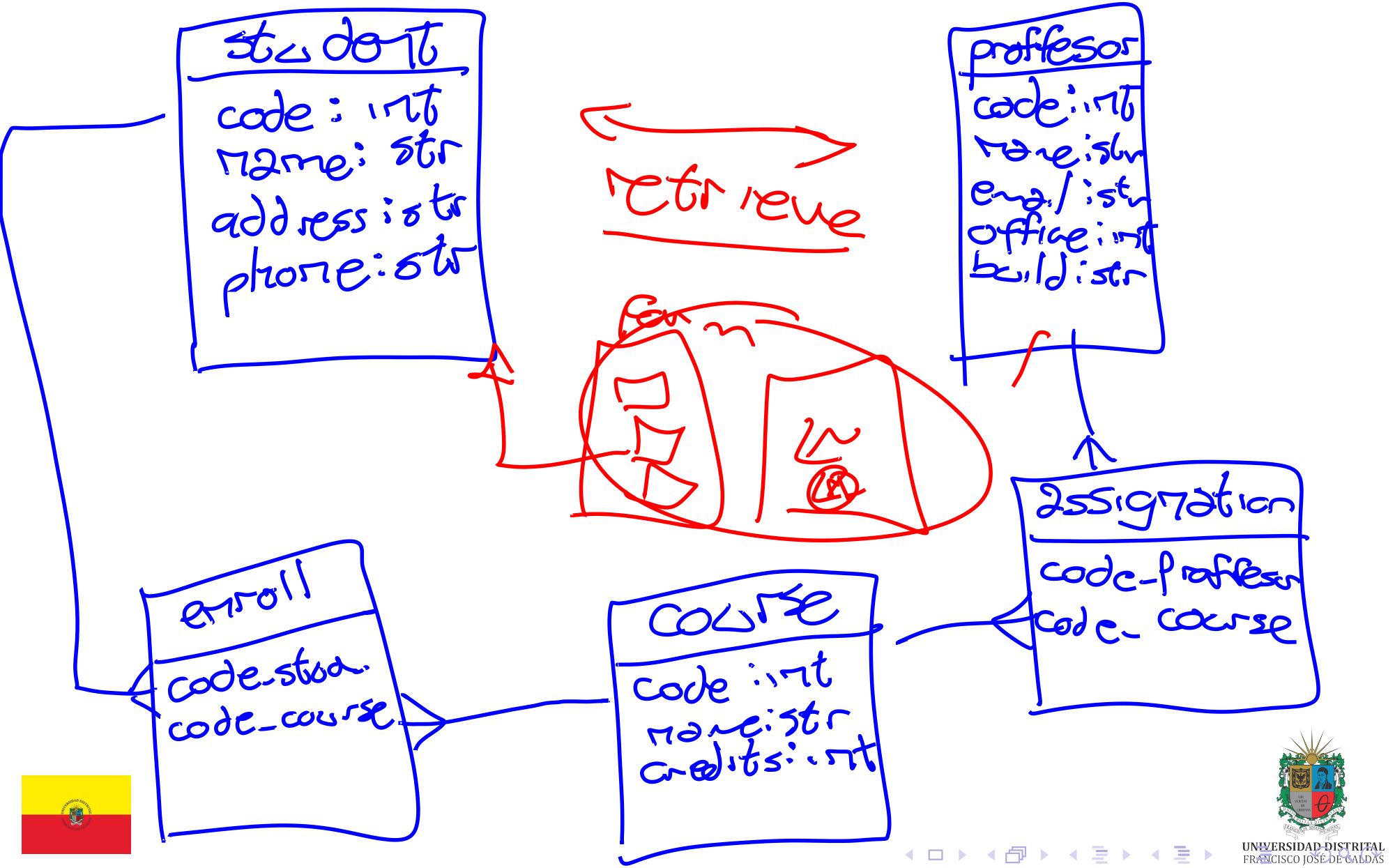
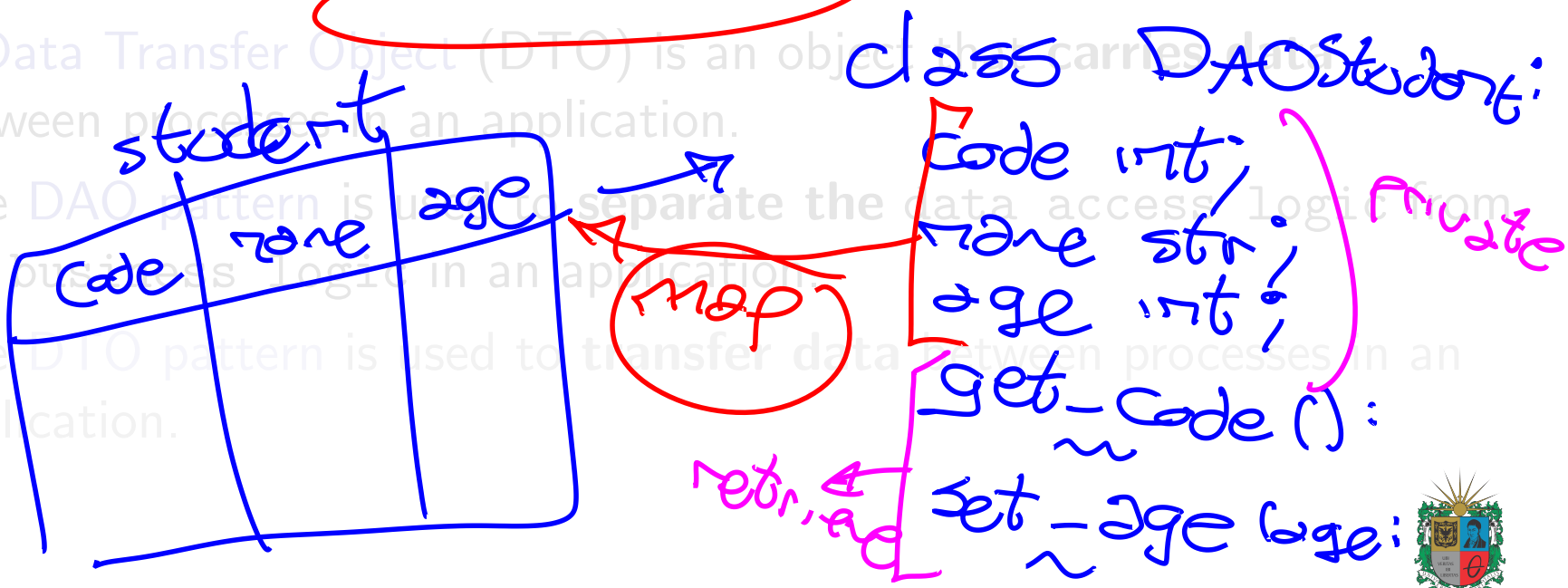
Study Case: ER Diagram for an Academic System



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 DTO pattern is used to **transfer data** between processes in an application.



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class enroll:
def course_enrolls(listKDTOstudent)

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Object-Relational Mapping

+ integrity

- 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.

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.

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- A backend system typically consists of a server, a database, and an application server.
- A server is a computer that provides services to other computers over a network.
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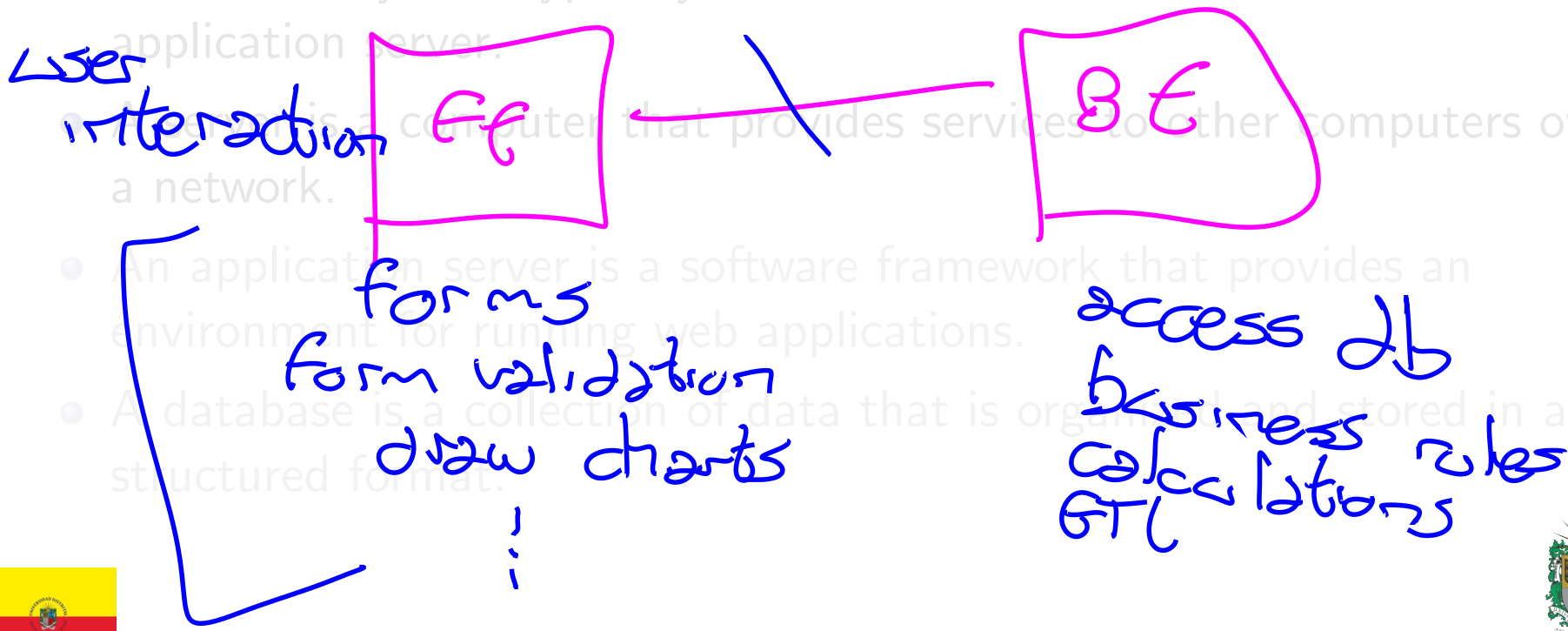

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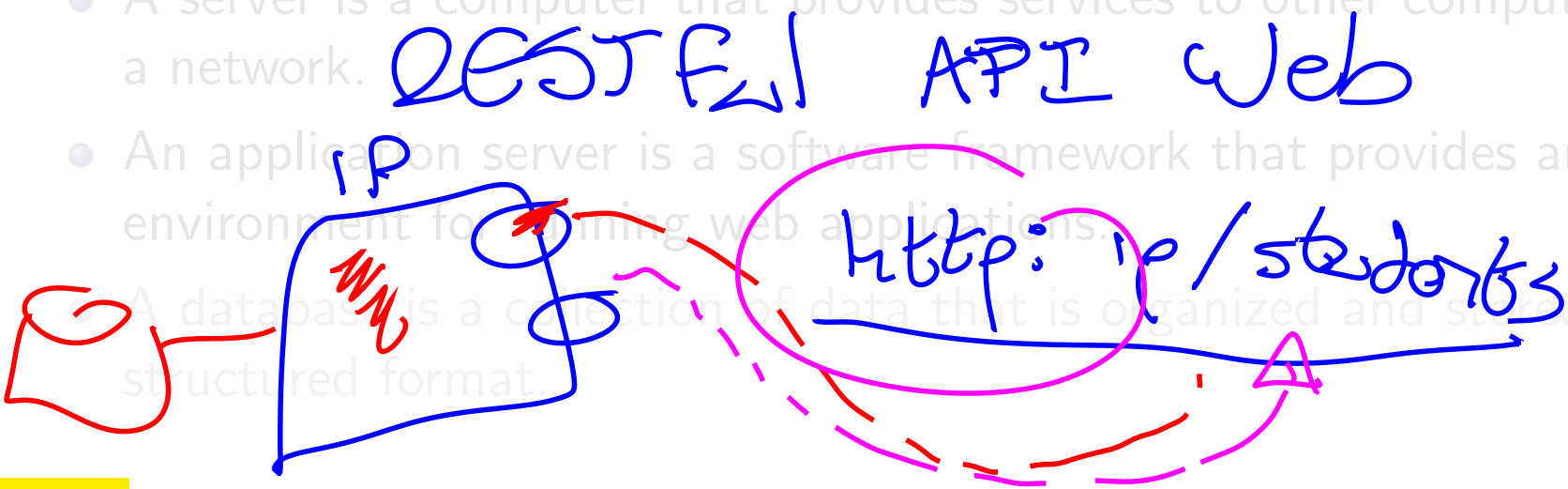

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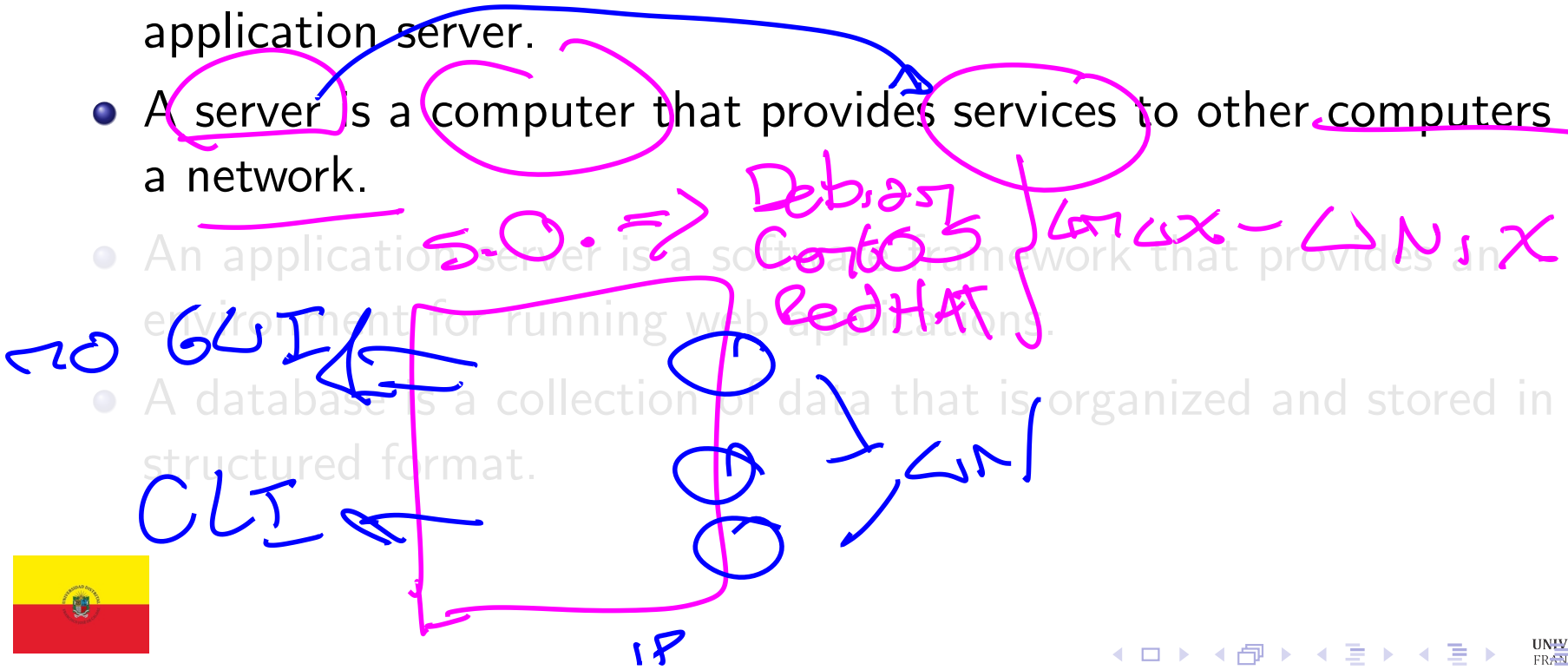

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No - structured → raw ⇒ data lake

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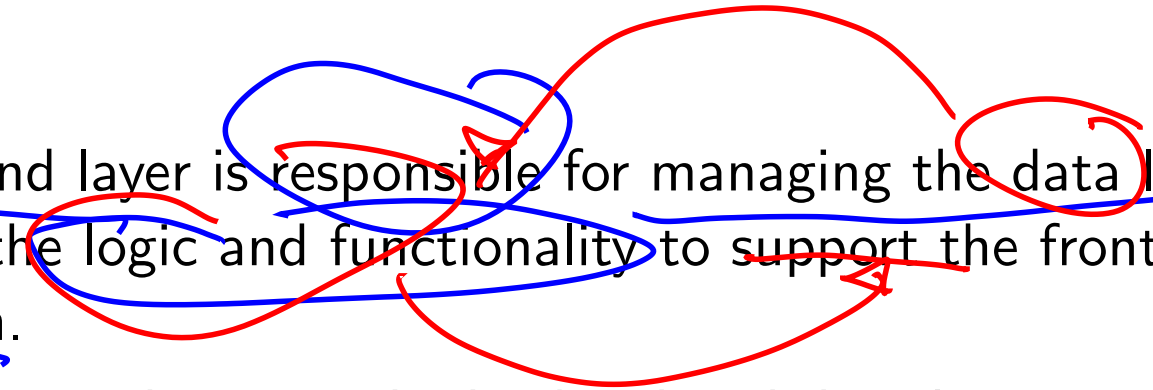
Connection with Data Layer



- 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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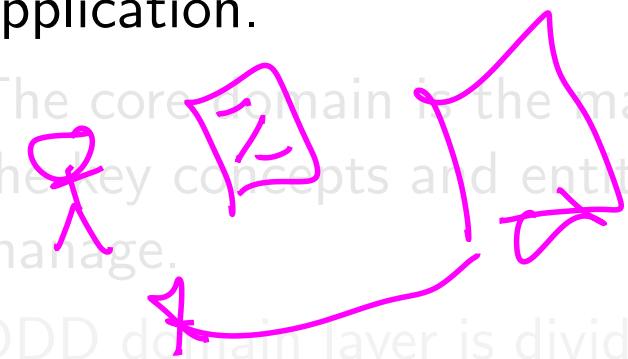

- The core domain is the main focus of the application and represents the key concepts and entities that the application is designed to manage.
- DDD domain layer is divided into domain objects, which represent the core concepts and entities of the application.
- DDD application layer is divided into services, which are responsible for coordinating the domain objects and implementing the application logic.
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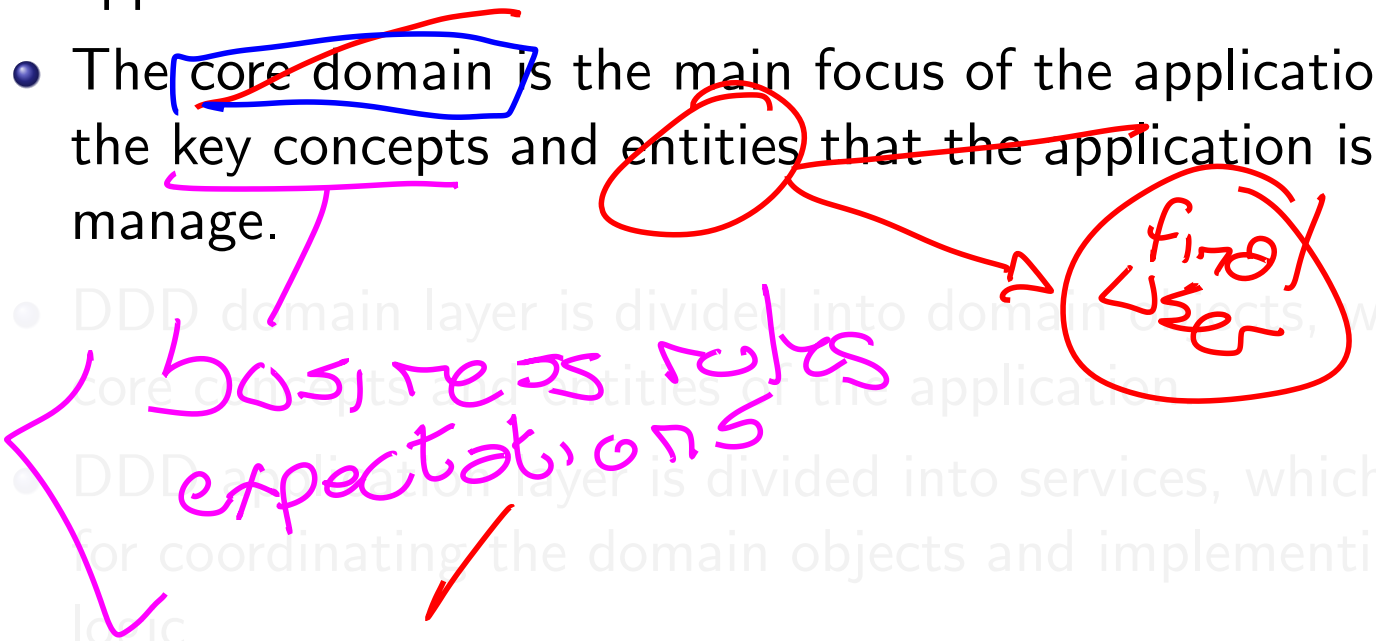

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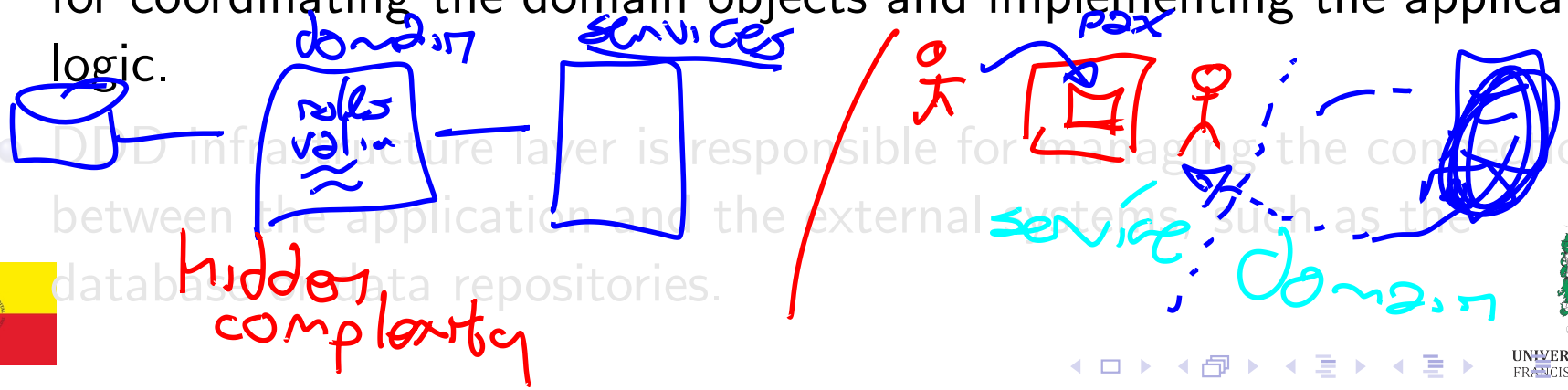

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RESTful API (sockets)

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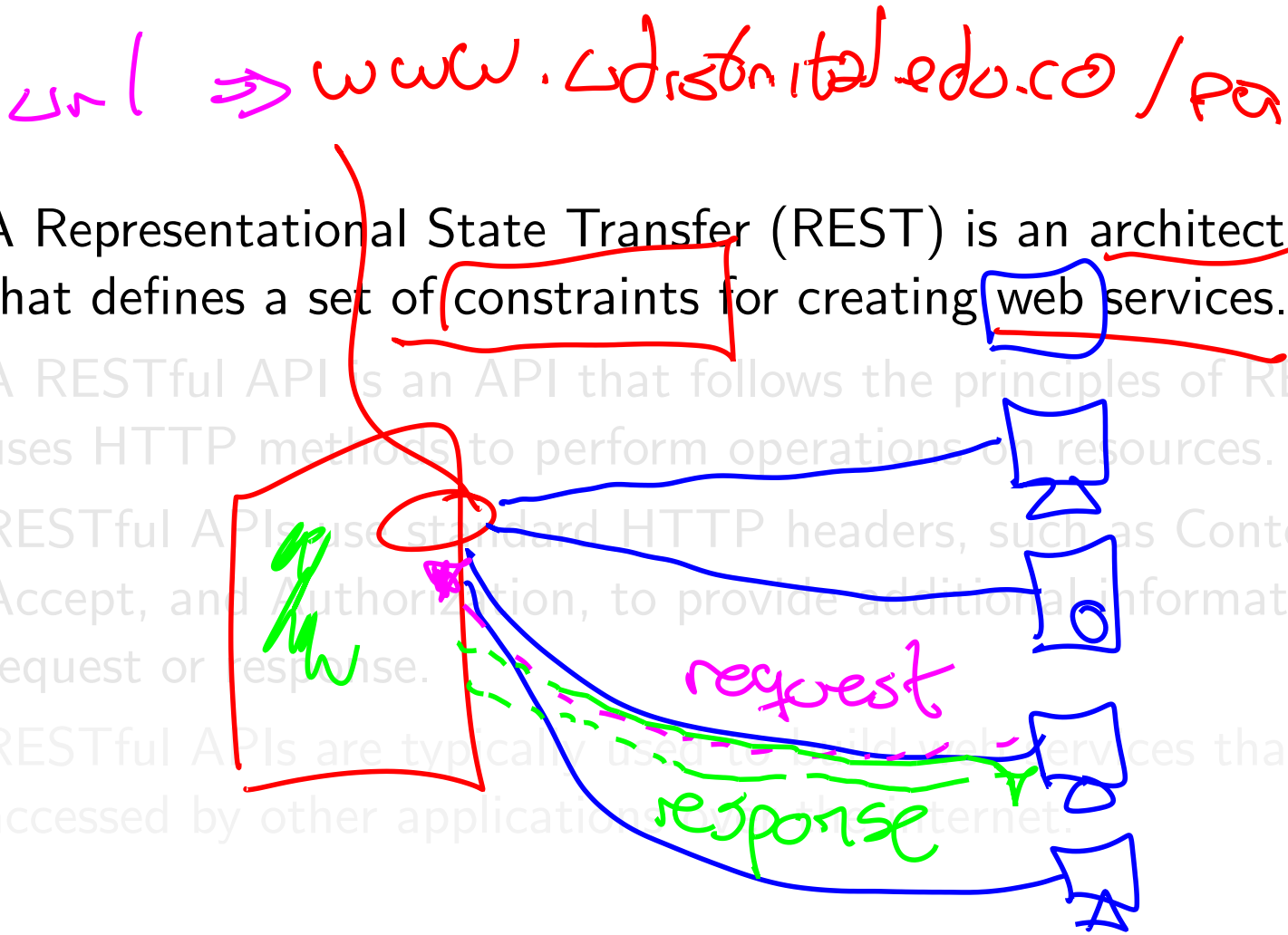

- A Representational State Transfer (REST) is an architectural style that defines a set of constraints for creating web services.
- A RESTful API is an API that follows the principles of REST and uses HTTP methods to perform operations on resources.
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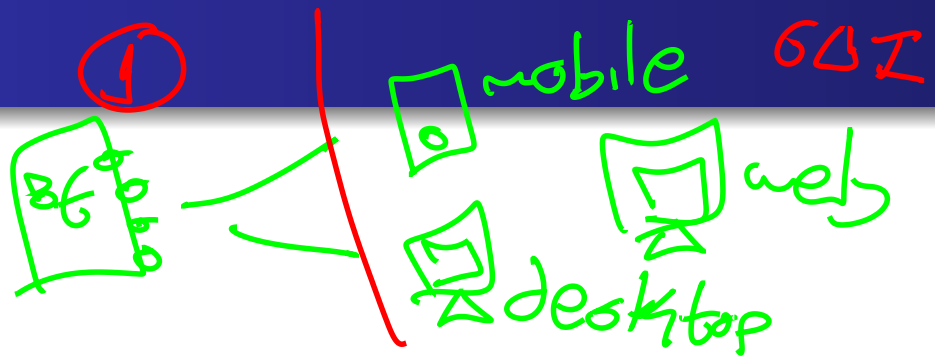
RESTful APIs



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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.
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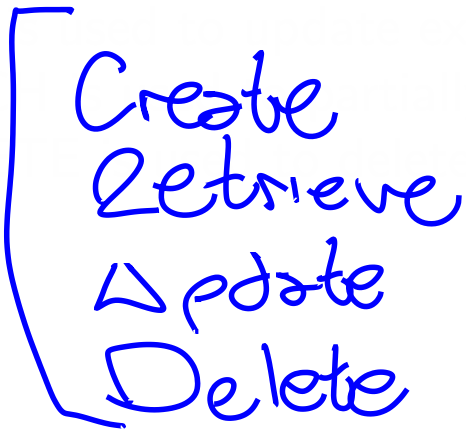

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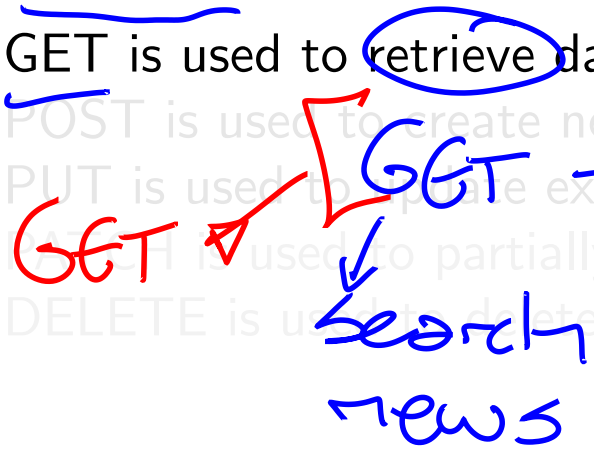

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POST => Body => Data

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HTTP Codes

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- 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 in order to complete the request.
  - 4xx: Client Error — the request contains bad syntax or cannot be fulfilled.
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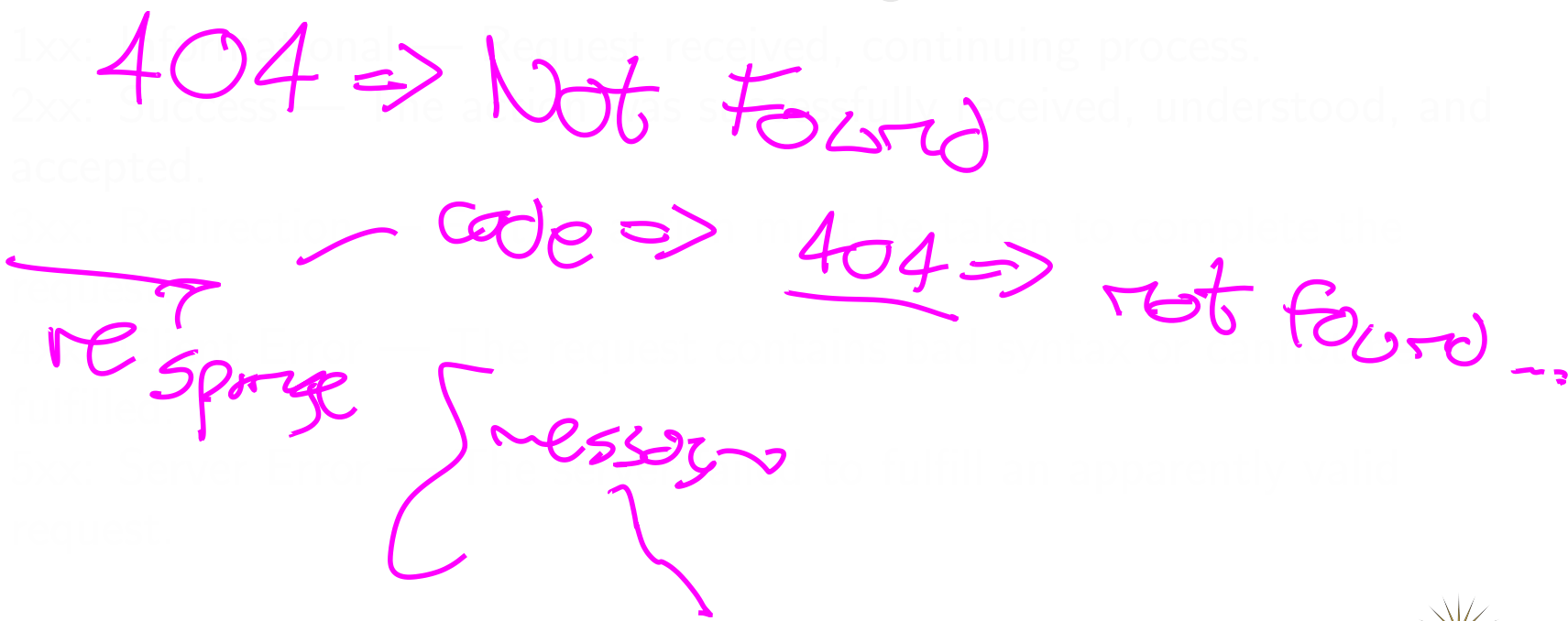

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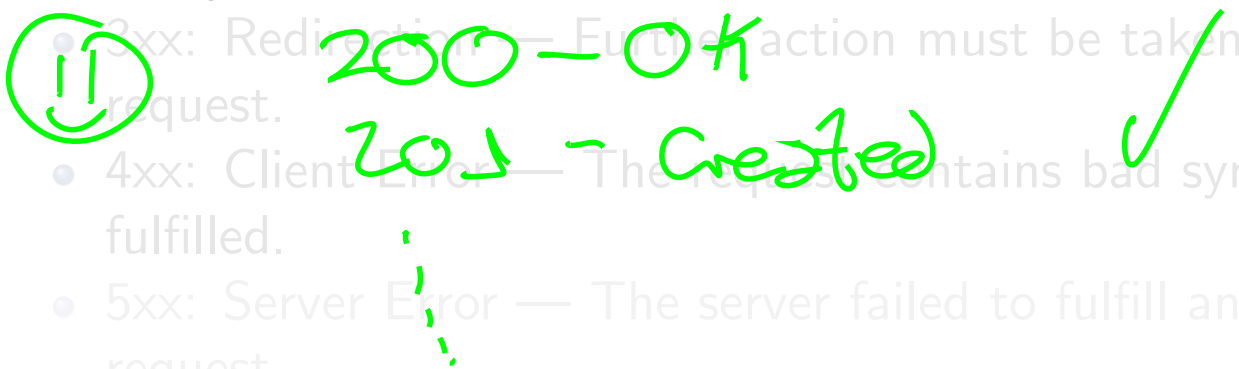

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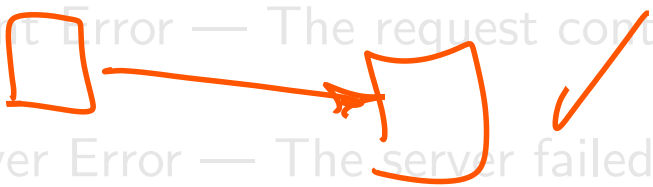

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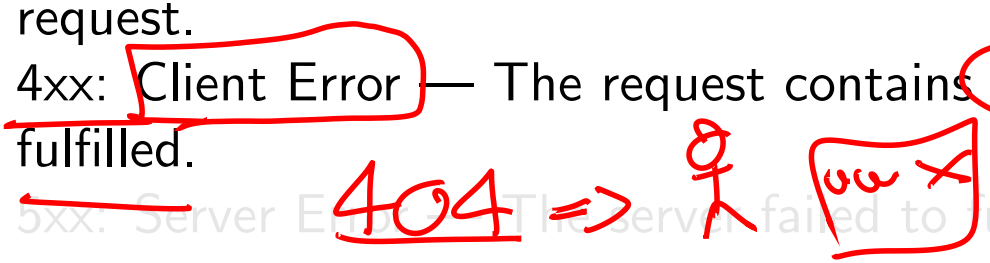

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Tiangolo → Sebastián Montaña

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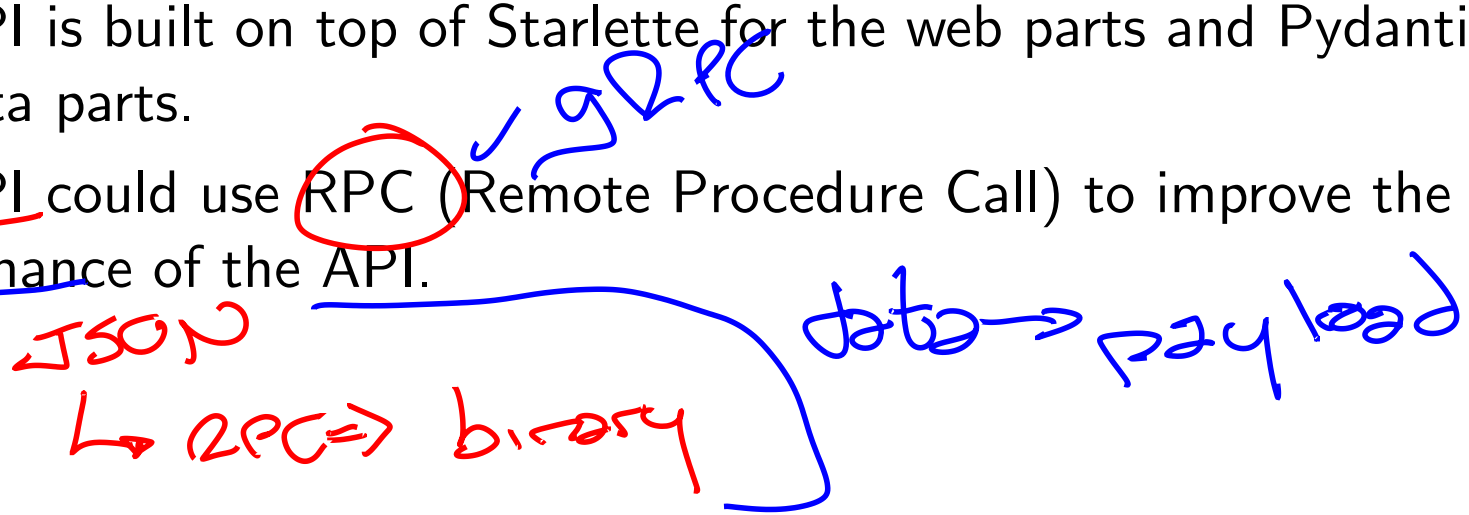

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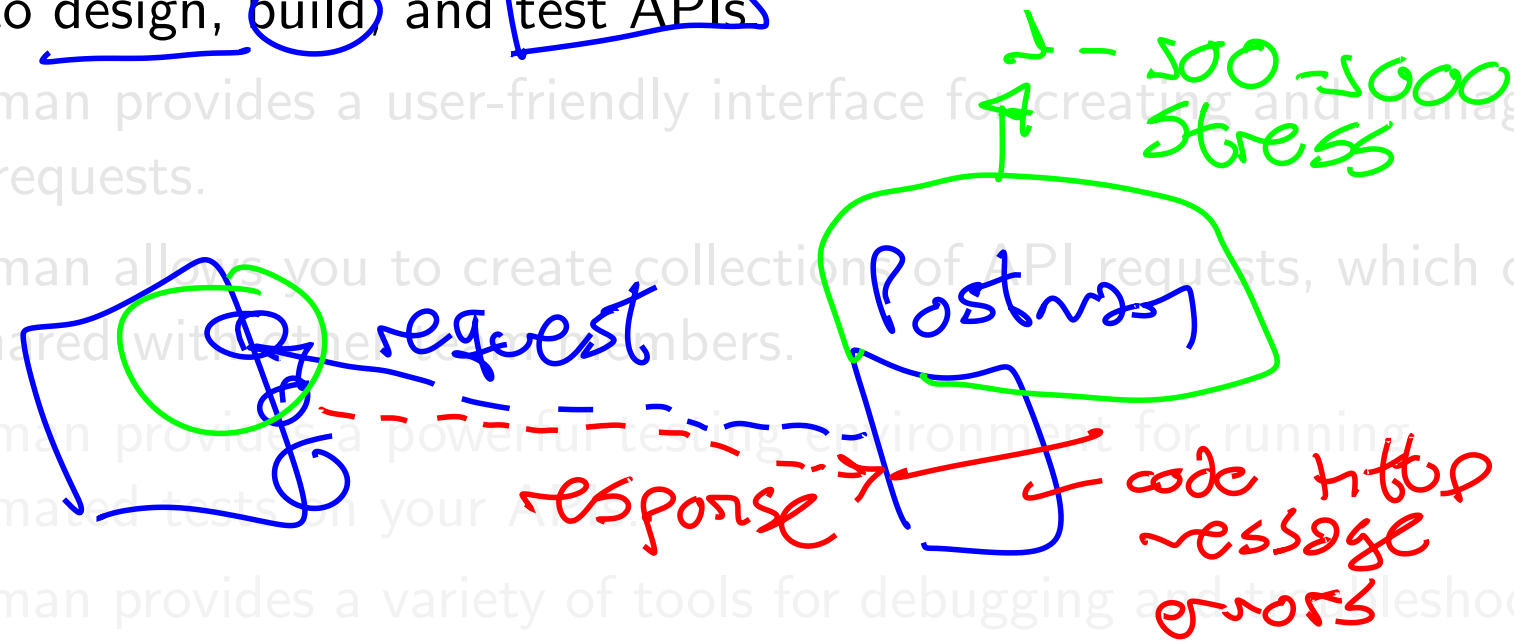

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Outline

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Thanks!

Questions?

Repo:
github.com/engandres/ud-public/tree/main/courses/advanced-programming

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