Backend & Data Layer

Software Design

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Outline

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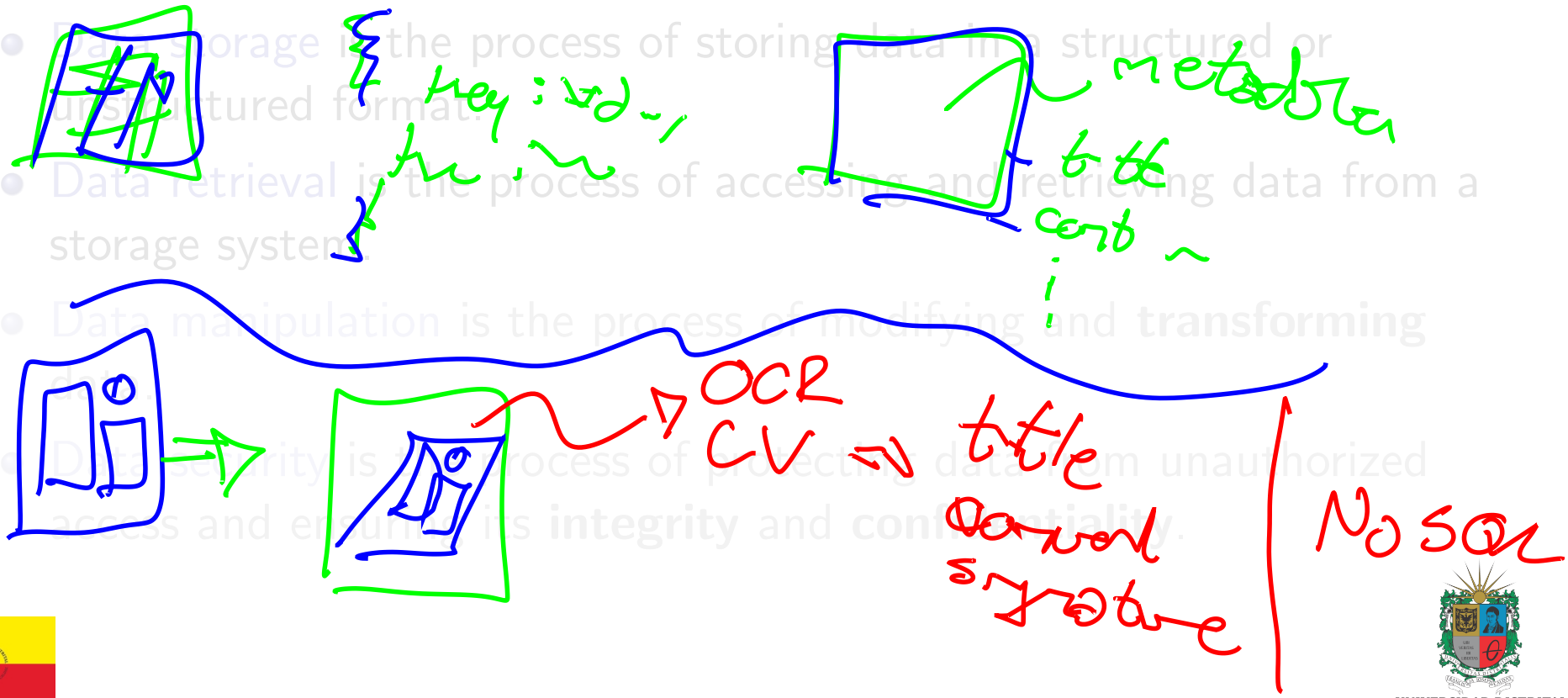
Data System Concepts

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 structured or unstructured formats.
- 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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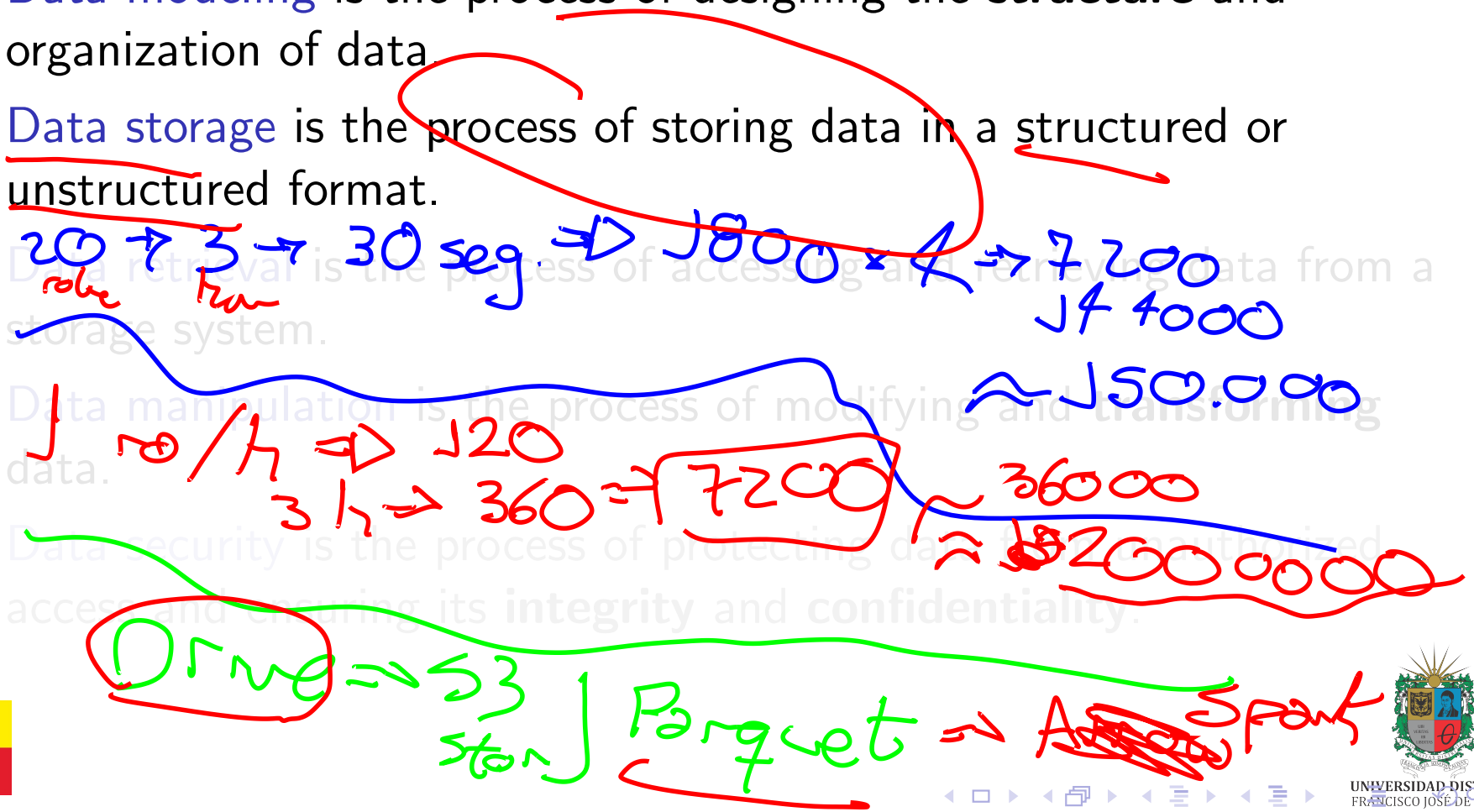

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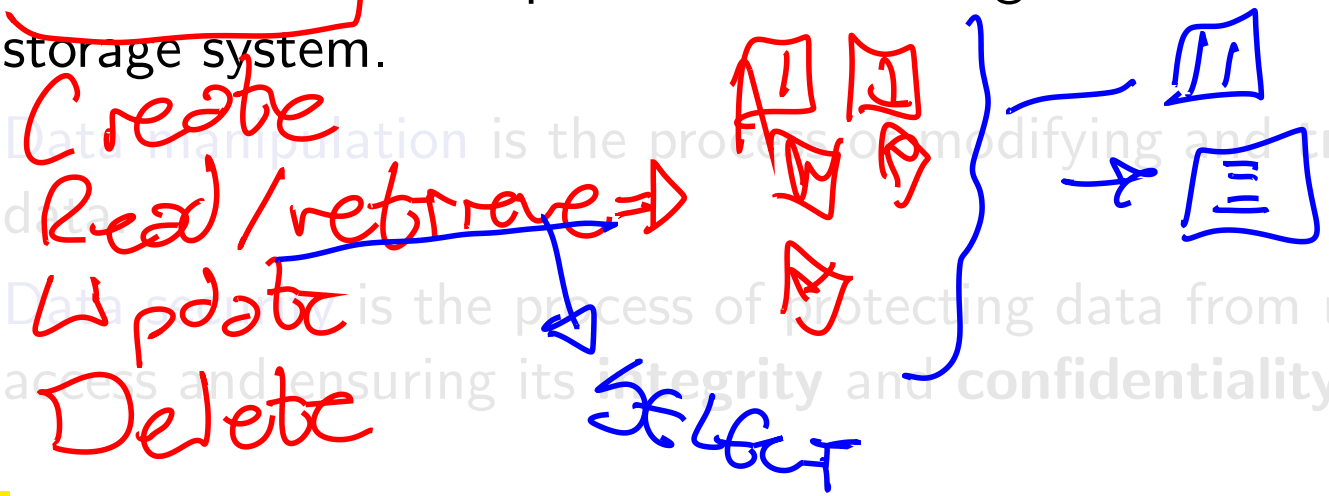

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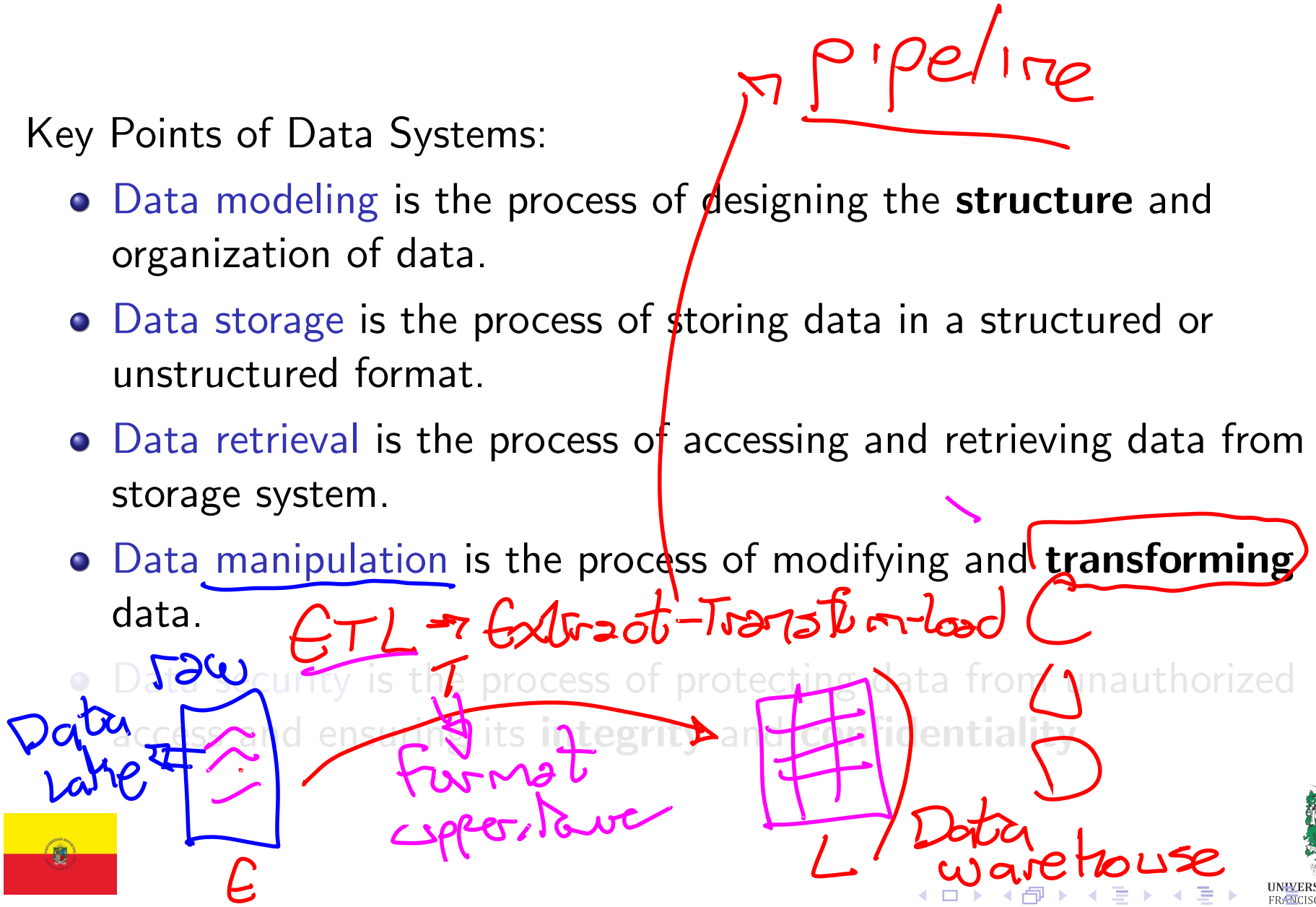

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Relational Databases

- 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 in programming and designed for managing data held in a **relational database** management system.

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declarative — what (how?)

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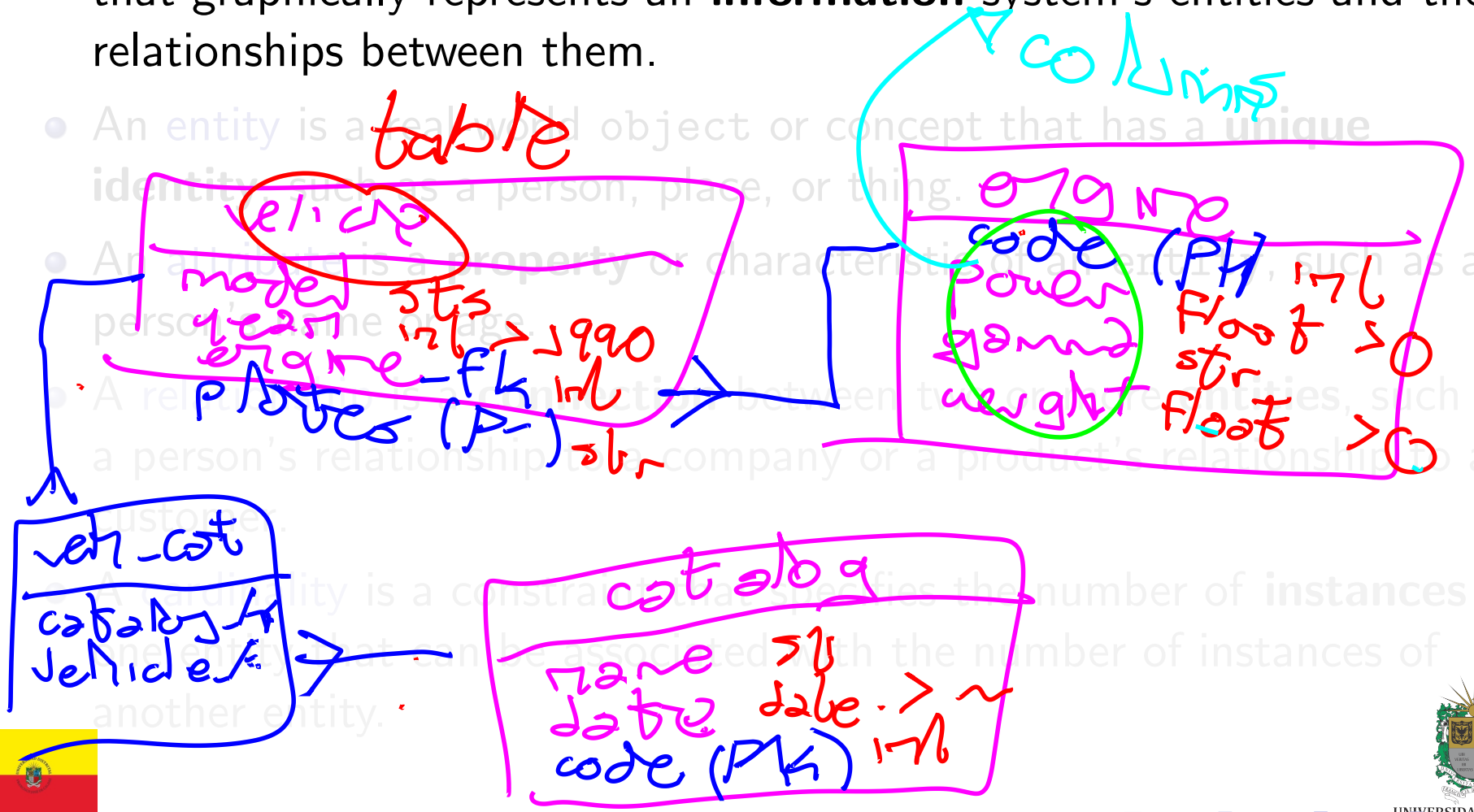

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- An attribute is a **property** or characteristic of an `entity`, such as a person's name or age.
- A relationship is a **connection** between two or more **entities**, such as a person's relationship to a company or a product's relationship to a 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.

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property → column

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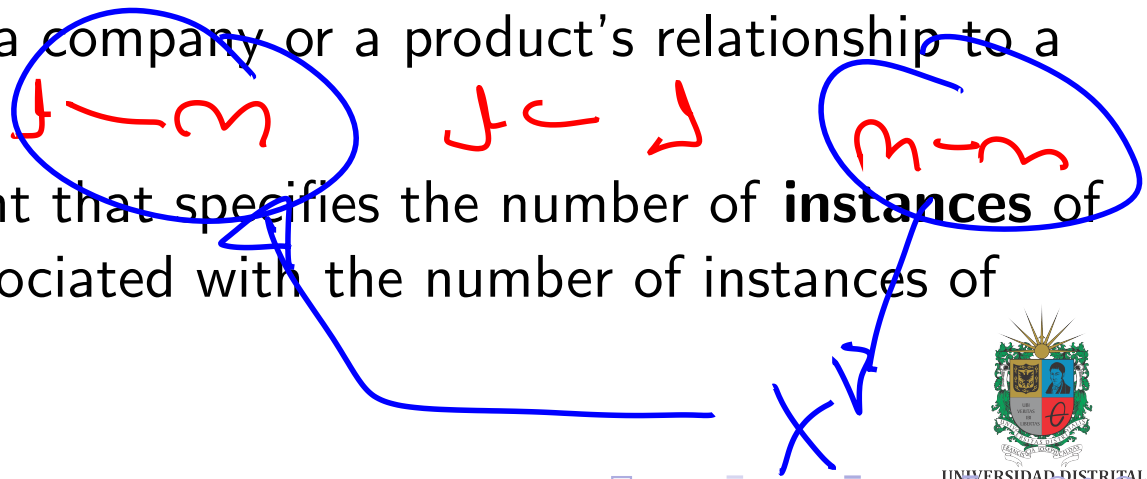
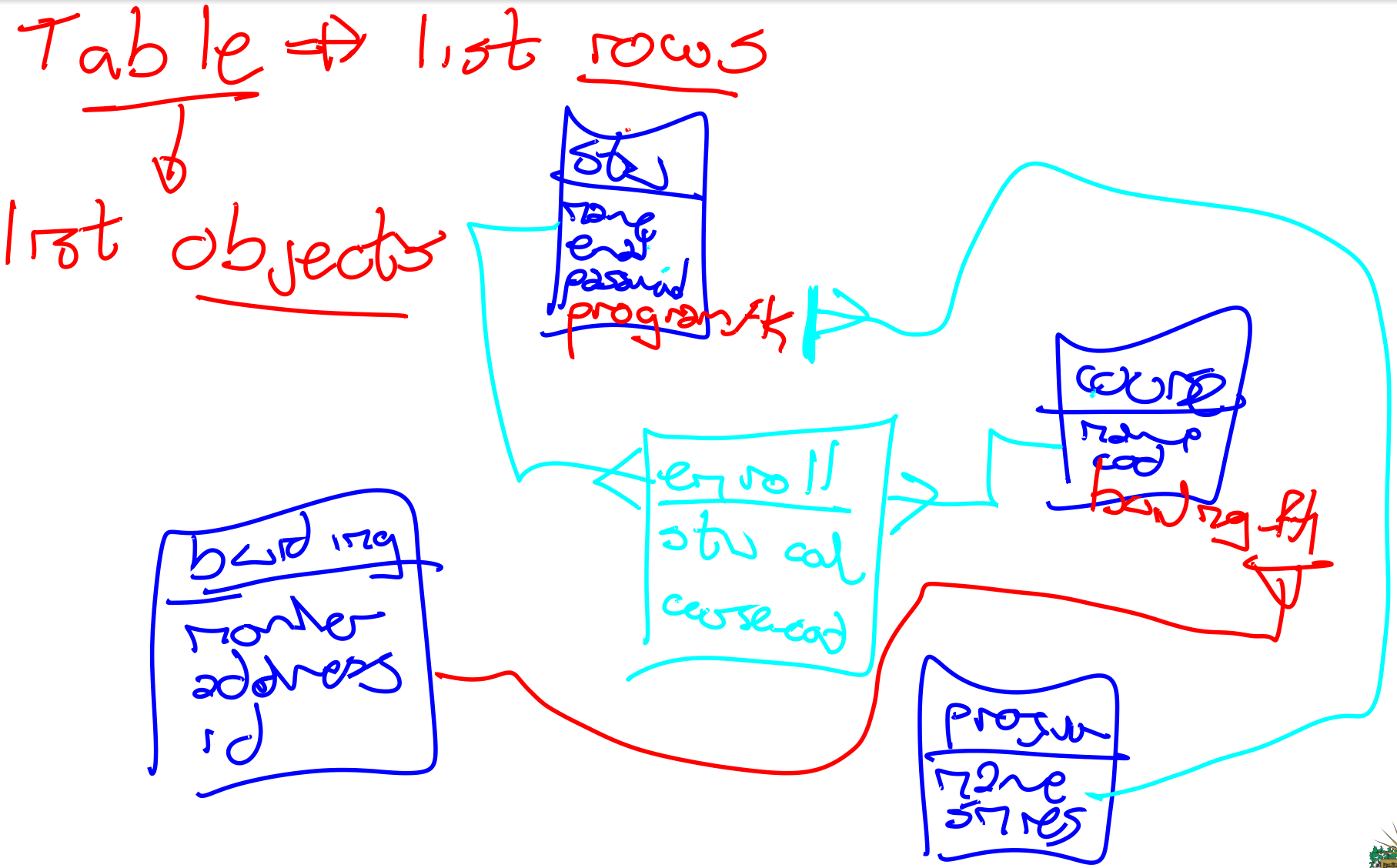


Study Case: ER Diagram for an Academic System



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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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.

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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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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 `application server`.
- A server is a computer that provides **services** to other computers over a network.
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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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- DDD domain layer is divided into **domain objects**, which represent the core concepts and entities of the application.
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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 **(CRUD)**.
- 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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- 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:
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  - 2xx: Success — The action was successfully received, understood, and accepted.
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FastAPI

- FastAPI is a modern, fast (high-performance), **web framework** for building APIs with Python 3.6+.
- FastAPI is based on standard Python **type hints**, which makes it easy to use and understand.
- FastAPI is designed to be easy to use and understand, with a focus on **performance and scalability**.
- FastAPI is built on top of `Starlette` for the web parts and `Pydantic` for the data parts.
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Postman

- Postman is a collaboration **platform** for API development that allows you to design, build, and test APIs.
- Postman provides a user-friendly interface for creating and managing API **requests**.
- Postman allows you to create **collections** of API requests, which can be shared with other team members.
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Outline

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Containers & Docker

- A Container is a standard unit of software that **packages up code** and all its dependencies so the application runs quickly and reliably from one computing environment to another.
- A Docker is a platform for developing, shipping, and running **applications in containers**.
- A Dockerfile is a text document that contains all the commands a user could call on the command line to **assemble a docker image**.
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- With Docker Compose, you use a `YAML` file to configure your application's services.
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Thanks!

Questions?

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

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