# Software & Processes

## Systems Analysis

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# Outline



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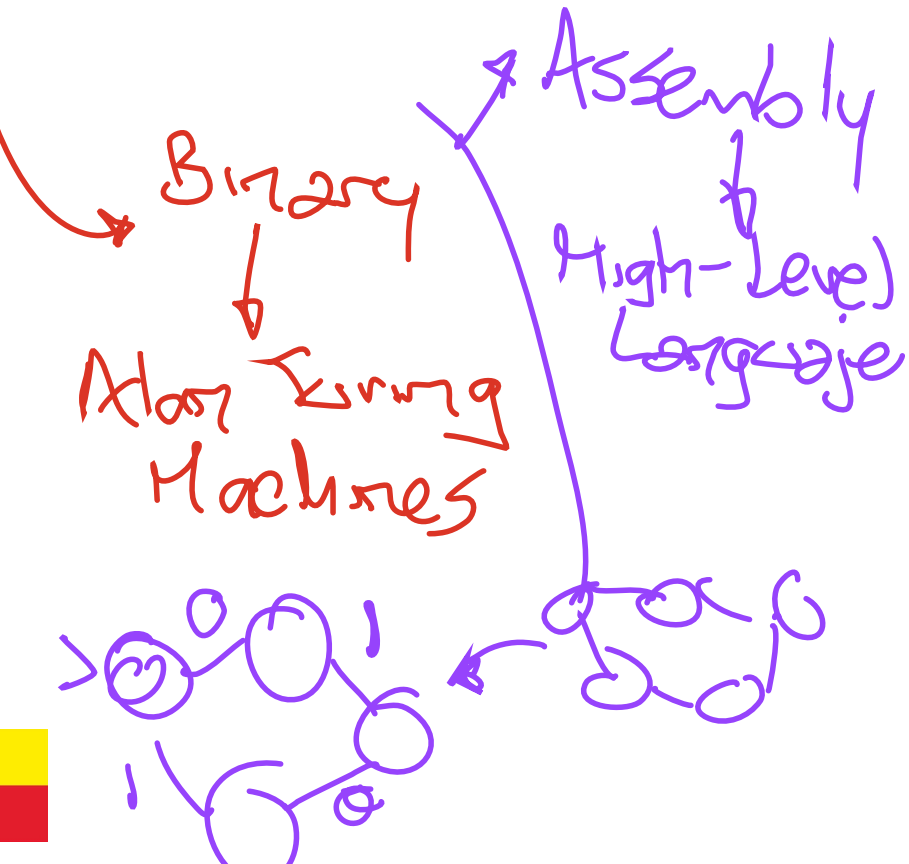
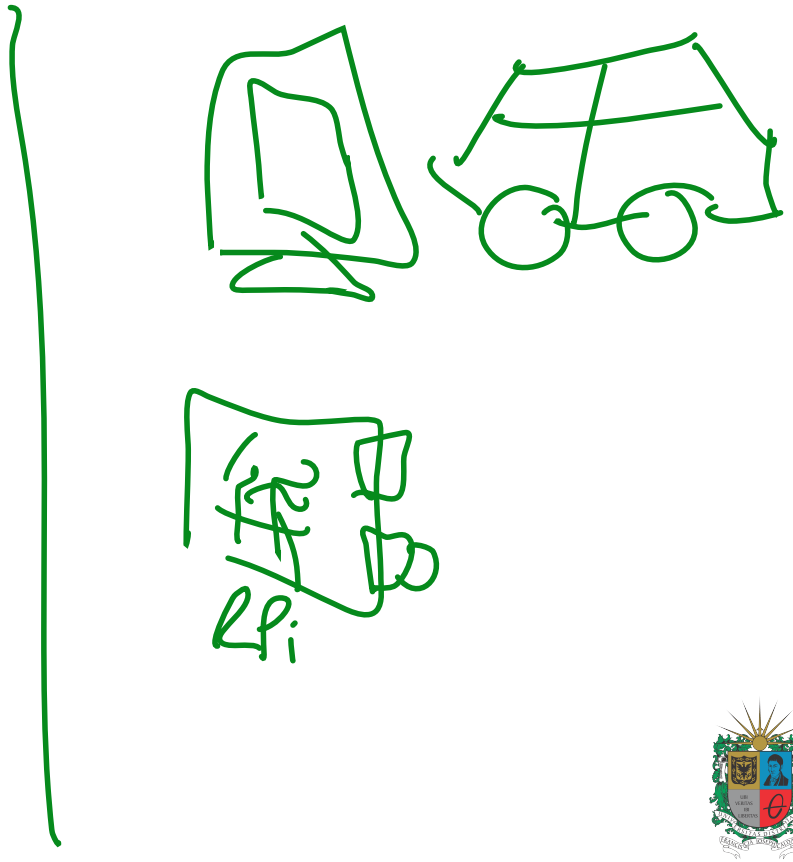
# What is Software?

- **Software** is a collection of data or computer instructions that tell the computer how to work.
- This is in contrast to hardware, from which the system is built and actually performs the work.



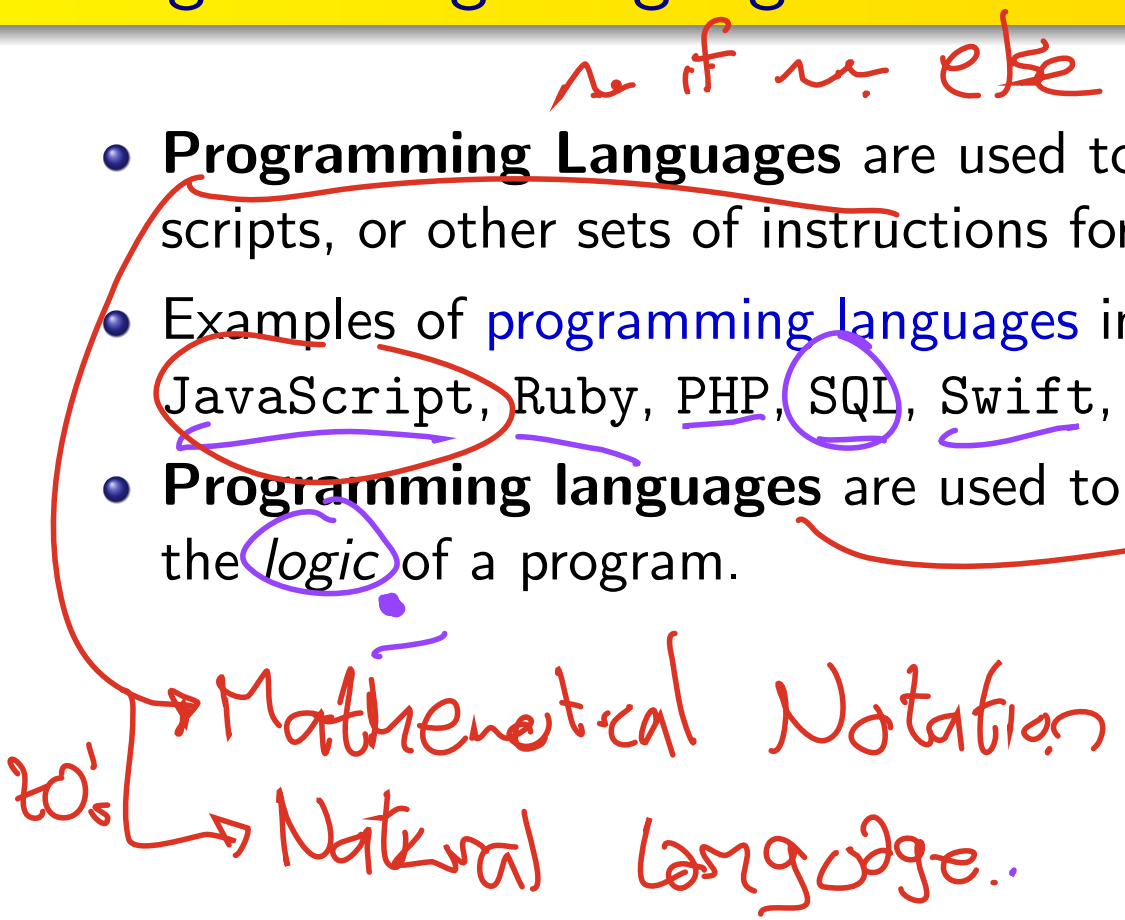



# Software Applications

- **Software Applications** are programs that perform specific tasks for users or for other programs.
- Examples of software applications include `word processors`, `database programs`, `web browsers`, `development tools`, `image editors` and `communication platforms`.
- **Applications** use the computer's operating system (OS) and other supporting programs, typically system software, to function.
- An application requests services from and communicates with other technologies via an `application programming interface (API)`.

# Programming Languages

- **Programming Languages** are used to create software programs, scripts, or other sets of instructions for computers to execute.
- Examples of programming languages include `Java`, `C++`, `Python`, `JavaScript`, `Ruby`, `PHP`, `SQL`, `Swift`, `R`, `Go`, `Rust`, among others.
- **Programming languages** are used to create algorithms that define the *logic* of a program.



# Universal Turing Machine

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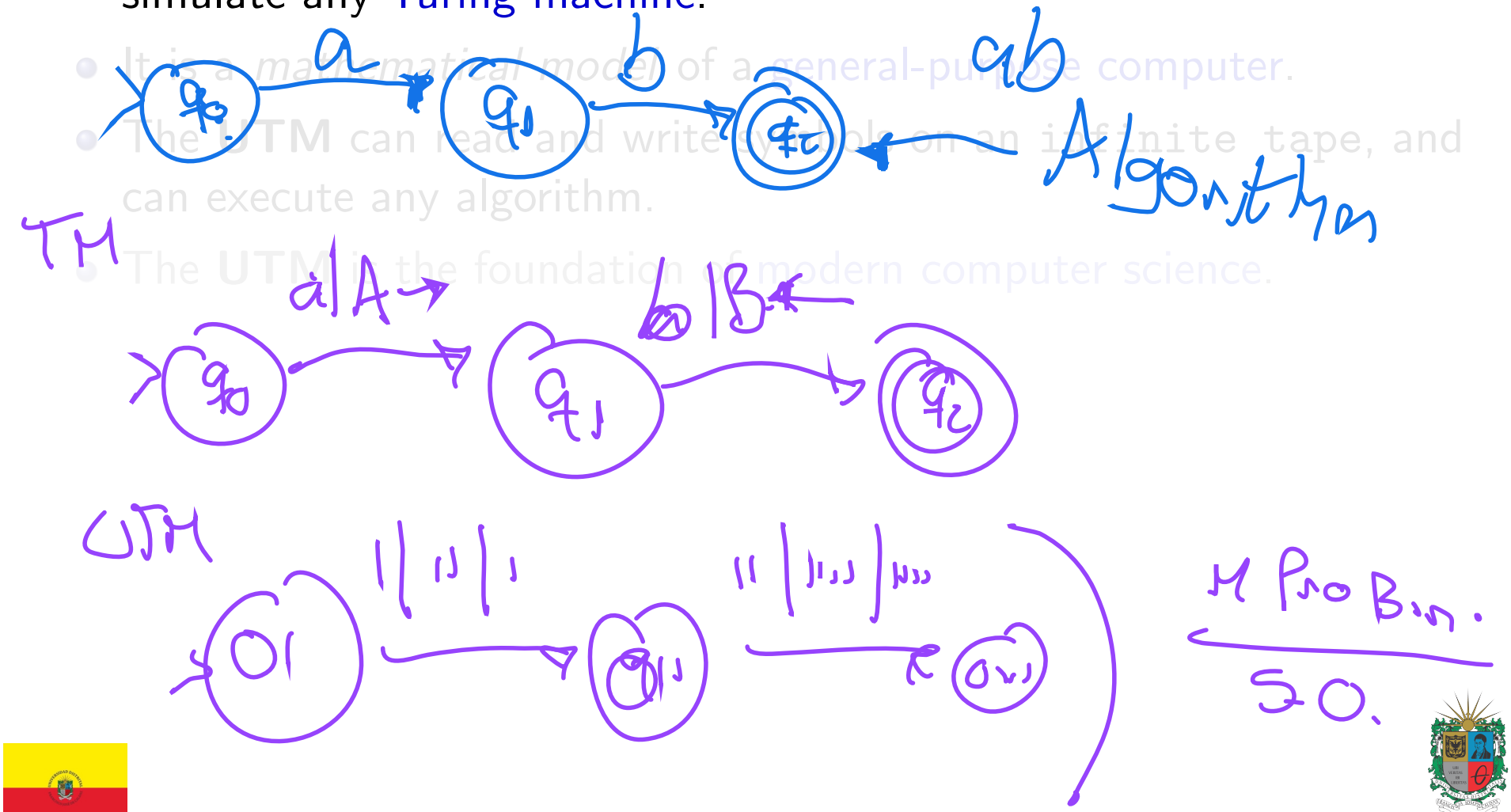

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- It is a *mathematical model* of a general-purpose computer.
- The **UTM** can read and write symbols on an infinite tape, and can execute any algorithm.
- The **UTM** is the foundation of modern computer science.

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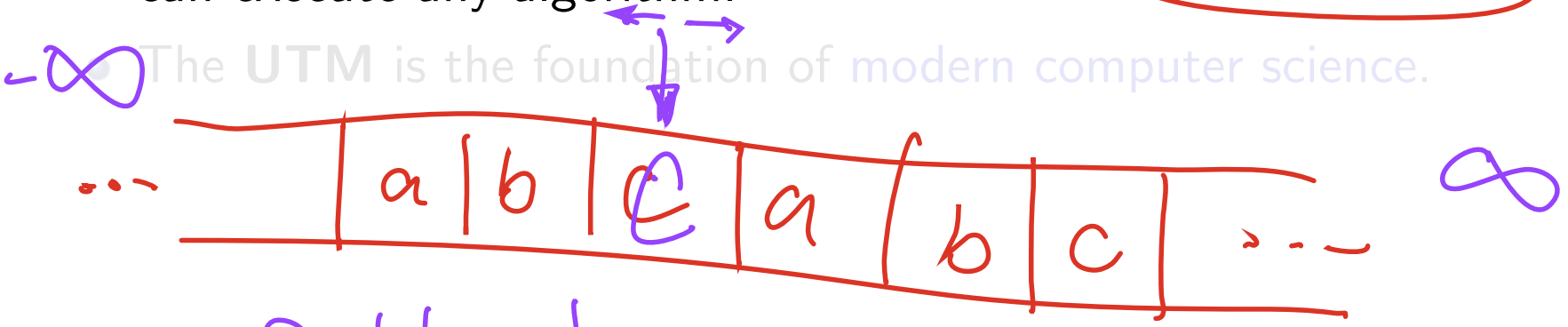

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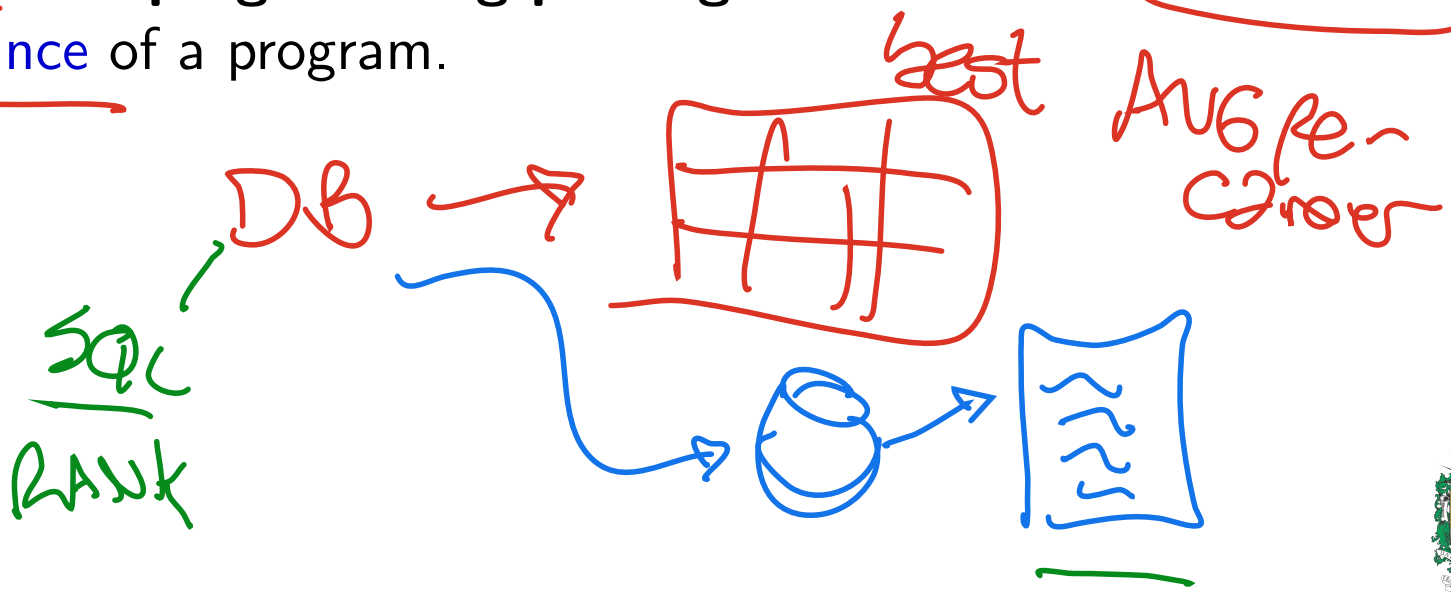
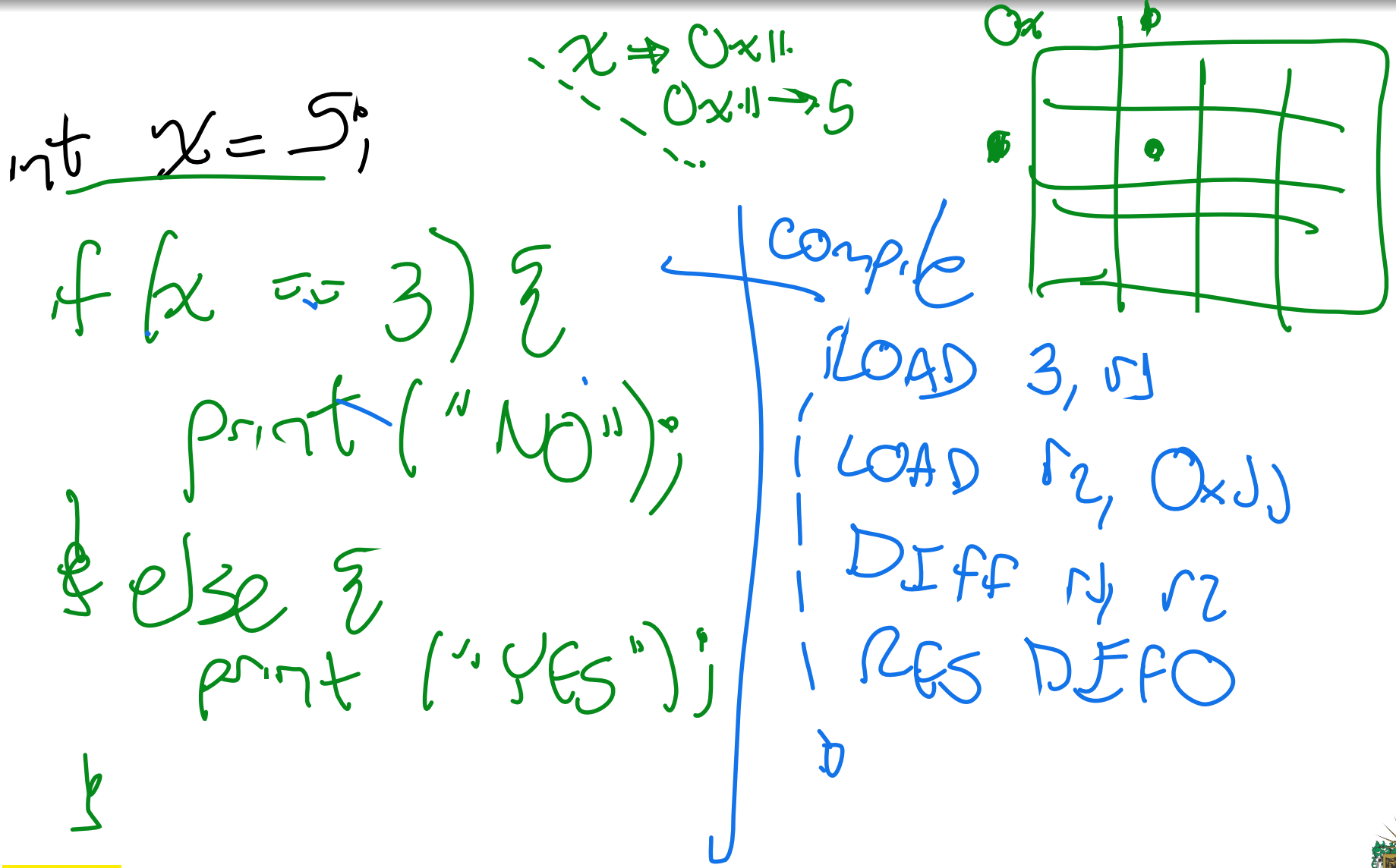
# Programming Paradigms

- Programming Paradigms are a way to classify programming languages based on their features.
- Examples of programming paradigms include `imperative`, `declarative`, `functional`, `object-oriented`, `procedural`, `logic`, `symbolic`, `concurrent`, among others.
- **Programming paradigms** are used to define the style of a program.
- The choice of **programming paradigm** can affect the structure and performance of a program.



# Programming Paradigms: **Imperative**



# Programming Paradigms: **Declarative**

SQL.-

- DROP TABLE tj;
- DROP DATABASE db;

CREATE TABLE tj(col1 typ1, ...);

INSERT INTO tj ... ;

UPDATE TJ SET ... ;

DELETE * FROM tj;

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# Programming Paradigms: **Object-Oriented**

# Software Architectures

- **Software Architectures** are the structures of software systems.
- Examples of software architectures include `monolithic`, `client-server`, `microservices`, `event-driven`, `service-oriented`, `layered`, `peer-to-peer`, `pipe-filter`, among others.
- **Software architectures** are used to define the components and interactions of a system.
- The choice of **software architecture** can affect the scalability and reliability of a system.

# Case of Study: **Netflix Technical Infrastructure**

# Outline



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# Process Definition

- A **Process** is a series of steps or actions taken to achieve a particular end.
- Processes are used to **organize** and **manage** work.

# Workflows

- A **Workflow** is a series of tasks that are performed in a specific order to achieve a goal.
- **Workflows** are used to automate and optimize business processes.
- **Workflows** can be sequential, parallel, conditional, or repetitive.

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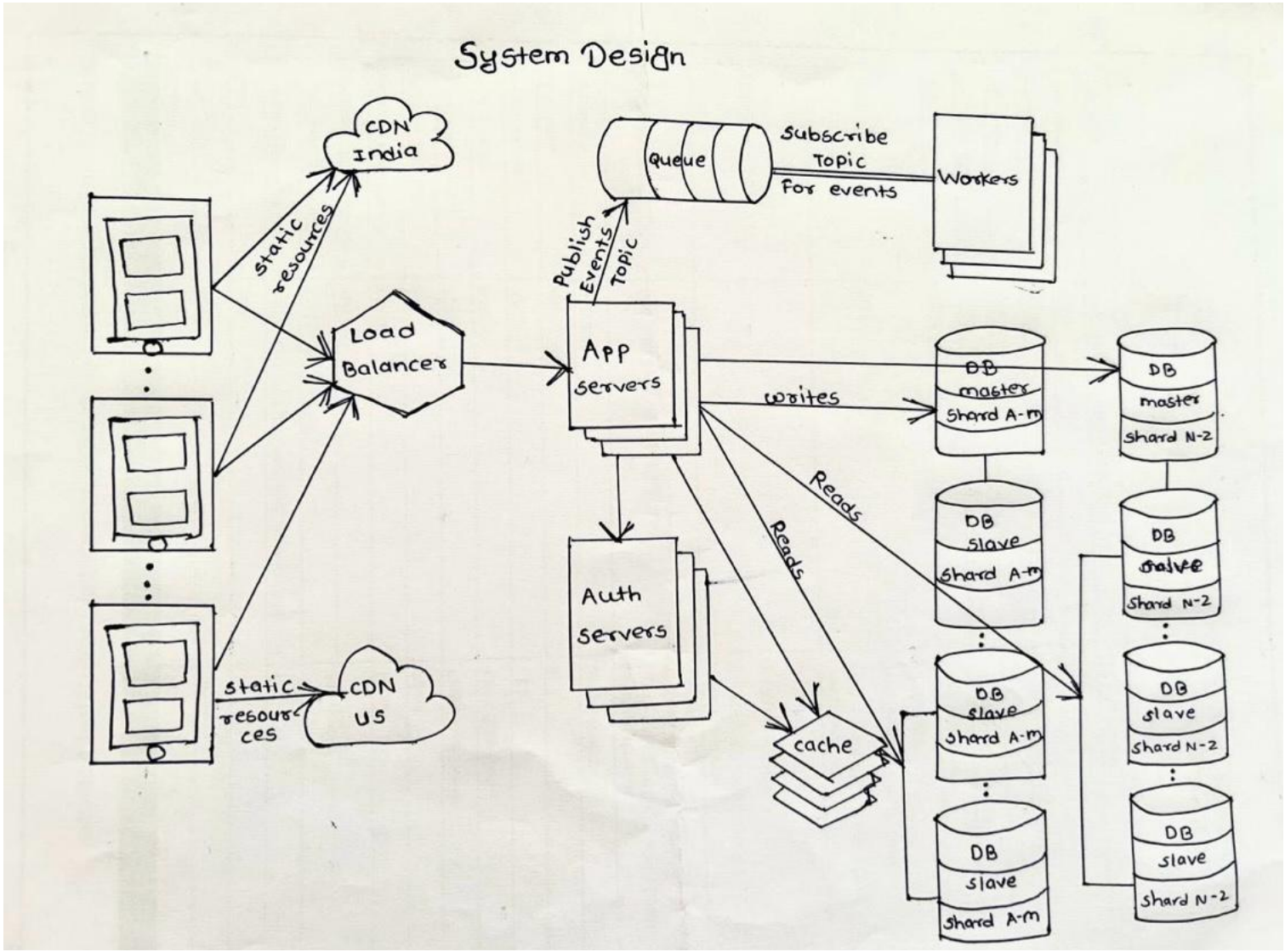
# Process Models

- A **Process Model** is a representation of a process that shows the sequence of steps and the relationships between them.
- **Process models** are used to analyze, design, and improve processes.
- Examples of process models include `flowcharts`, `data flow diagrams`, `activity diagrams`, `business process model and notation (BPMN)`, `petri nets`, `state diagrams`, among others.

# Business Process Model and Notation (BPMN)

# Systems Design applied to Software Architectures



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# Information Systems

- An **Information System** is a system that *collects*, *processes*, stores, and disseminates **information**.
- **Information systems** are used to **support** and **manage** business operations.
- Examples of information systems include `transaction processing systems`, `management information systems`, `decision support systems`, `executive information systems`, `expert systems`, `data systems`, among others.
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# Data Systems

- A **Data System** is a system that *collects*, *processes*, *stores*, and *retrieve* **data**.
- Examples of data systems include `databases`, `data warehouses`, `data lakes`, `data marts`, `data cubes`, `data streams`, `data lakes`, among others.
- **Data systems** are used to store and analyze data.

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# Expert Systems

- An **Expert System** is a system that uses knowledge and reasoning to solve problems.
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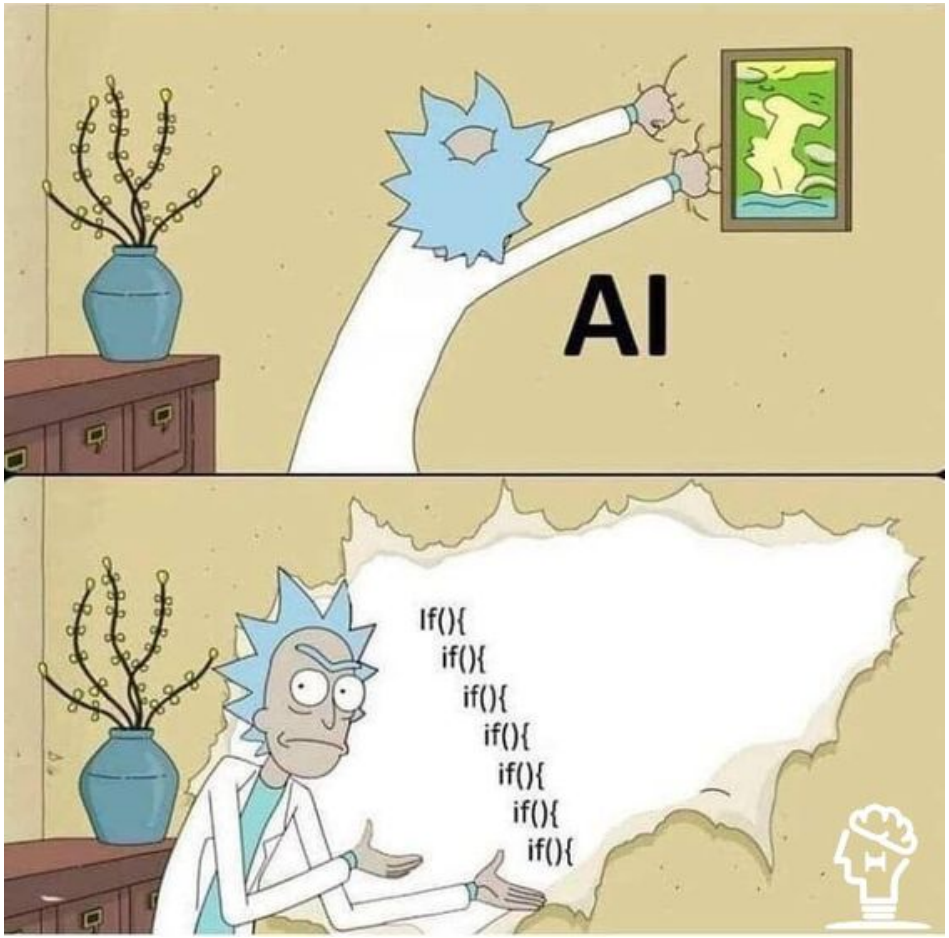
# Expert Systems as Classical Artificial Intelligence

**Here** there is a great example of a diagnostic system.



# Risks and Failures in Information

- **Information systems** are subject to risks and failures that can impact **business operations**.
- Examples of risks and failures include security breaches, data loss, system downtime, performance issues, compliance violations, among others.
- **Risks and failures** can be mitigated through security measures, backup systems, disaster recovery plans, monitoring tools, among others.

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# Thanks!

# Questions?

Repo: *https://github.com/EngAndres/ud-public/tree/main/courses/systems-analysis*

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