

# SOFTWARE & PROCESSES

## Systems Analysis

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# Outline

- 1 Software
- 2 Processes
- 3 Information Systems



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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

- The **Universal Turing Machine** is a theoretical machine that can simulate any Turing machine.
- 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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# 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.



# 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.



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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**.



# 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.





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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.
- Information systems are used to **automate** and **optimize** business processes.



# 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.



# Expert Systems

- An **Expert System** is a system that uses **knowledge** and **reasoning** to solve problems.
- Examples of expert systems include diagnostic systems, predictive systems, prescriptive systems, decision support systems, among others.
- Expert systems are used to **automate** and **optimize** decision-making processes.



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# 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>

