AI IN EVERYDAY LIFE
SCICOMM

Unit 2 - Exploring AI applications

UNIVERSITÀ DEGLI STUDI DI TRENTO
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DataScientia
Unitas per Varietatem

OPEN UNIVERSITY OF CYPRUS

CY. center for algorithmic transparency

UNIT 2 – EXPLORING AI APPLICATIONS

1. Definition of AI
2. Which characteristics do “smart” devices / applications have in common?
3. What are their basic functionalities?
4. Analyzing a “smart” everyday application
5. AI as a field of study

Samsung Smart Refrigerator

CONCEPTS AND A DEFINITION

USEFUL RESOURCE

- High Level Expert Group for AI
  - Independent group established by the EC in June 2018
- «Definition of AI – Main capabilities and scientific fields»
  - The definition proposed in the EU Communication (April 2018 - "AI for Europe")
  - Based on the "classic" book of Russell and Norvig "Artificial Intelligence: A Modern Approach»

WHAT IS INTELLIGENCE?

- This is a vague concept!
- The concept of **rationality** can help:

  The ability to choose the best action to achieve a specific goal based on …
  - *Specific criteria to optimize*
  - *The available resources*
- Of course, rationality is not the only characteristic of intelligence, but it is a start!

CLARIFICATION – "AI SYSTEM"

- Each individual component (software and hardware) that is based on AI
- That is, most "AI Systems" are not stand-alone systems, but are integrated into larger, more complex systems
- Each AI system is first and foremost rational.

A SYSTEM OF SYSTEMS

CHARACTERISTICS OF AI SYSTEMS

- They all
  - Display a small range of intelligent behaviors
  - Consist of software (and hardware, networking, etc.)
  - Are designed by humans
  - Are goal-oriented

GOAL ORIENTED

- Solve a problem and/or make a decision in the physical or digital environment.
- To this end they:
  - **Perceive** their environment
  - **Interpret** data
  - **Consider/process** information gained
  - Determine the best **action/decision** in service of their goal

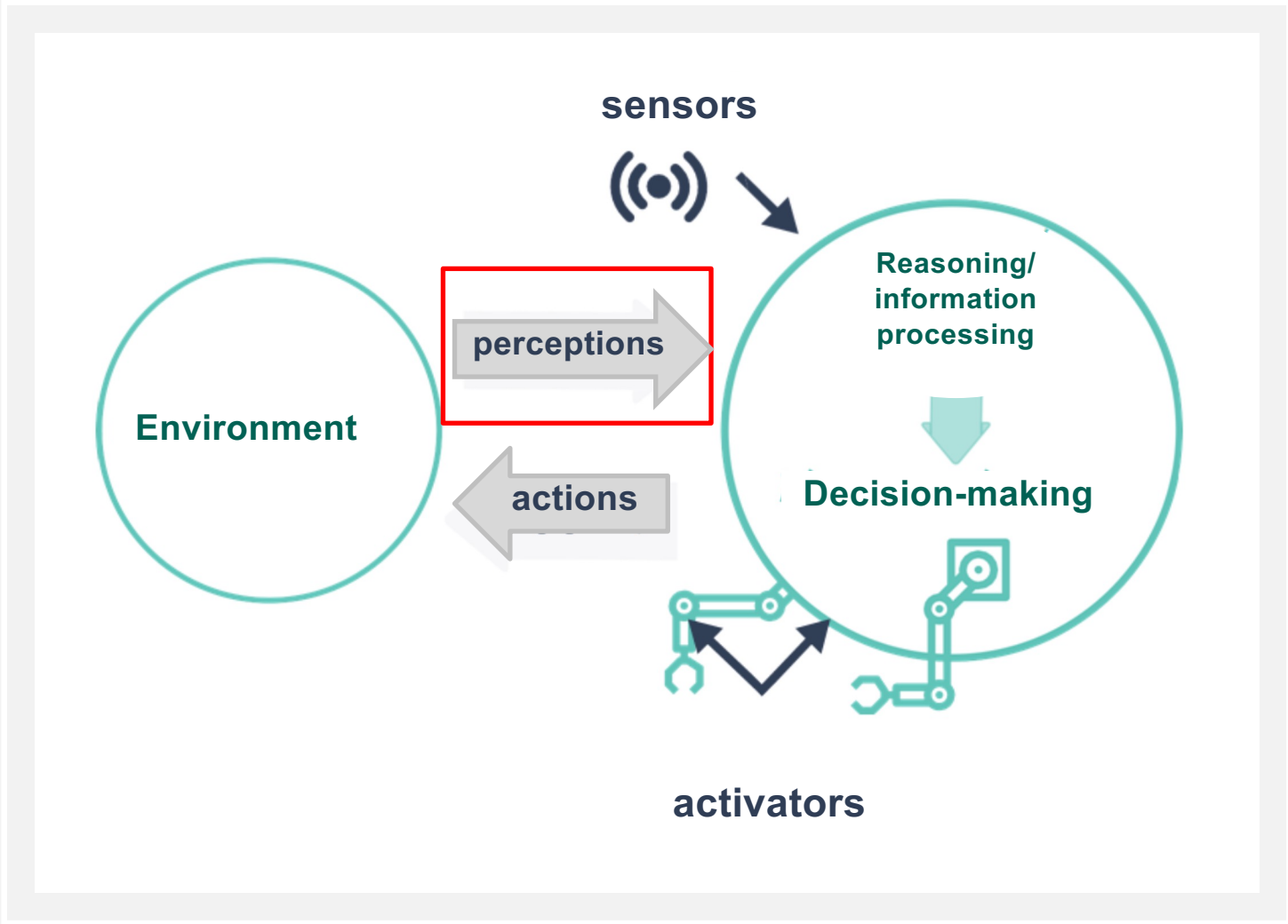
BASIC FUNCTIONS

BASIC FUNCTIONS

1. Perception of the environment

The system must first perceive the state of its environment.

It collects data, which may be structured or unstructured.

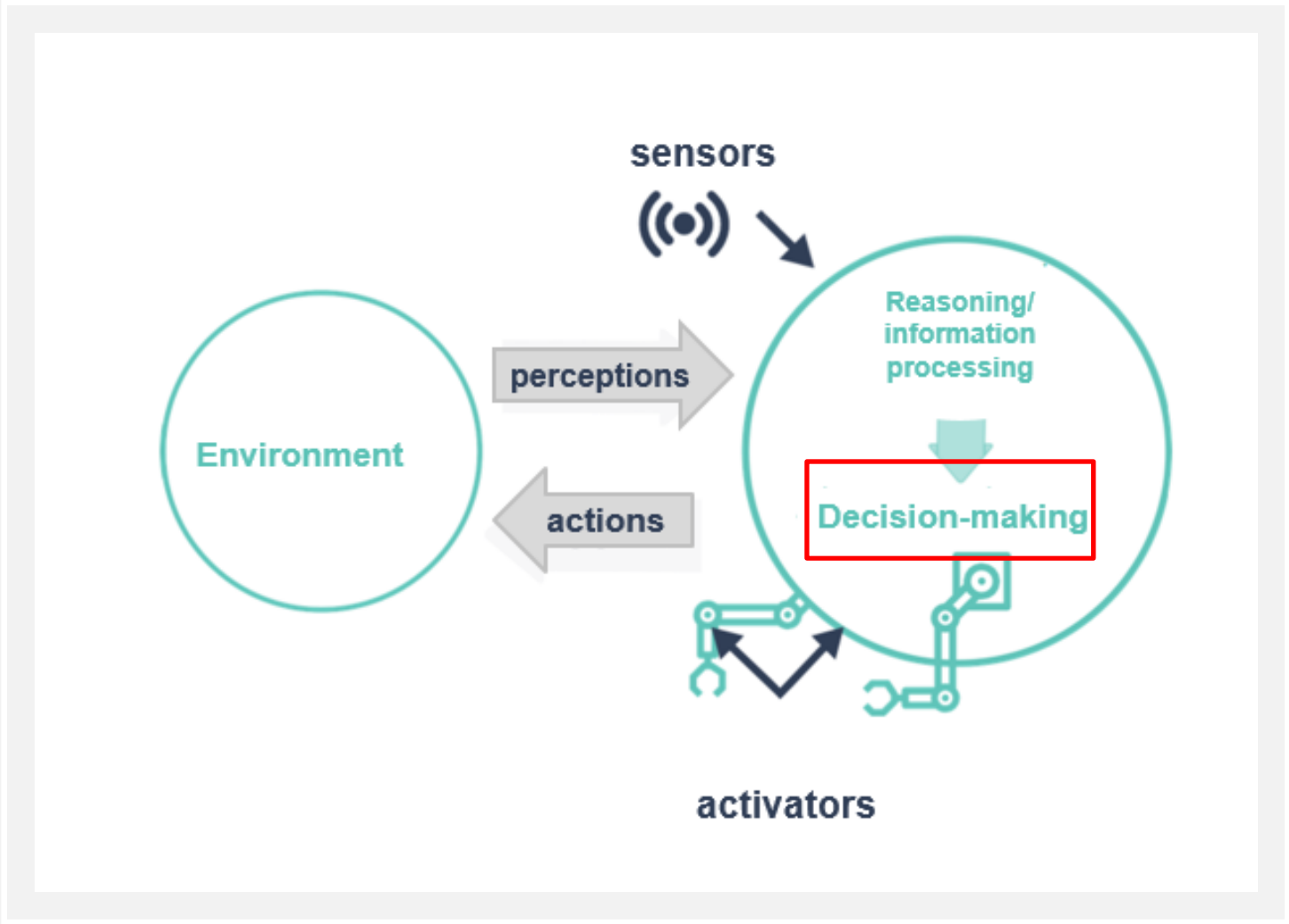


BASIC FUNCTIONS

2. Reasoning/information processing and decision making

The core of the system is its functional unit which processes the data collected from the environment.

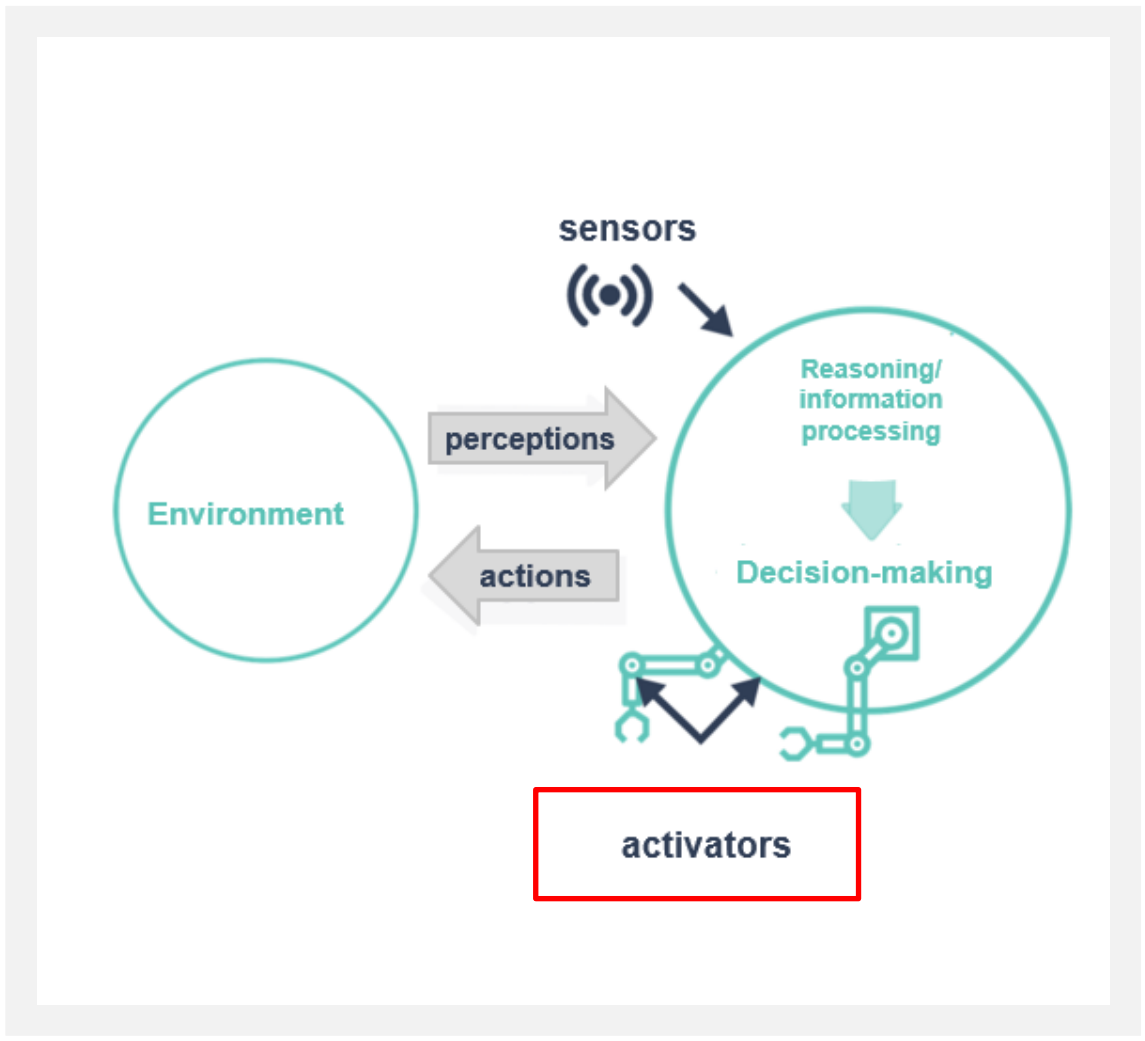
Here, the data is analyzed to determine what needs to be done, based on the system's goals.

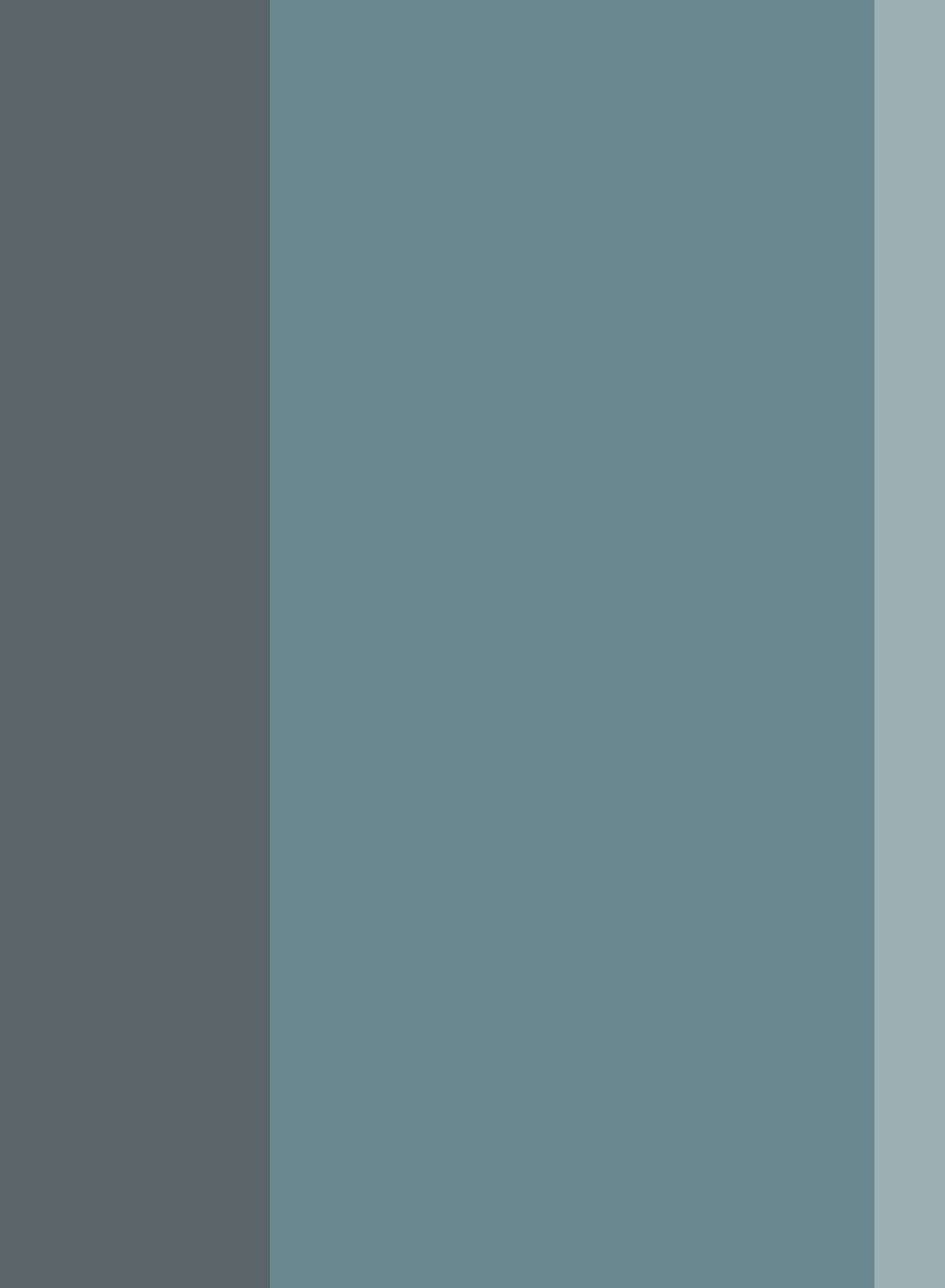


BASIC FUNCTIONS

3. Activation

Once the decision is made, the system is ready to perform the actions at its disposal.





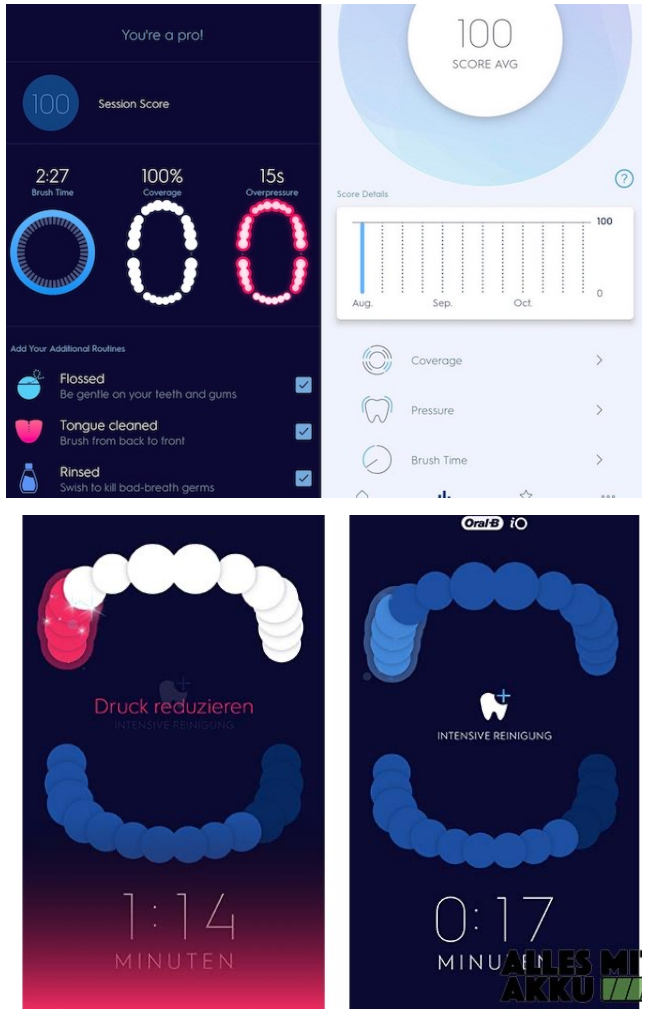
EVERYDAY EXAMPLES

ROBOTIC VACUUM CLEANER

- **Perception** of the environment
  - Through its sensor, it measures the level of dust.
- **Reasoning** / decision making
  - If the dust level exceeds a given limit, sweeping is required.
- **Activation**
  - Sweeps the floor.

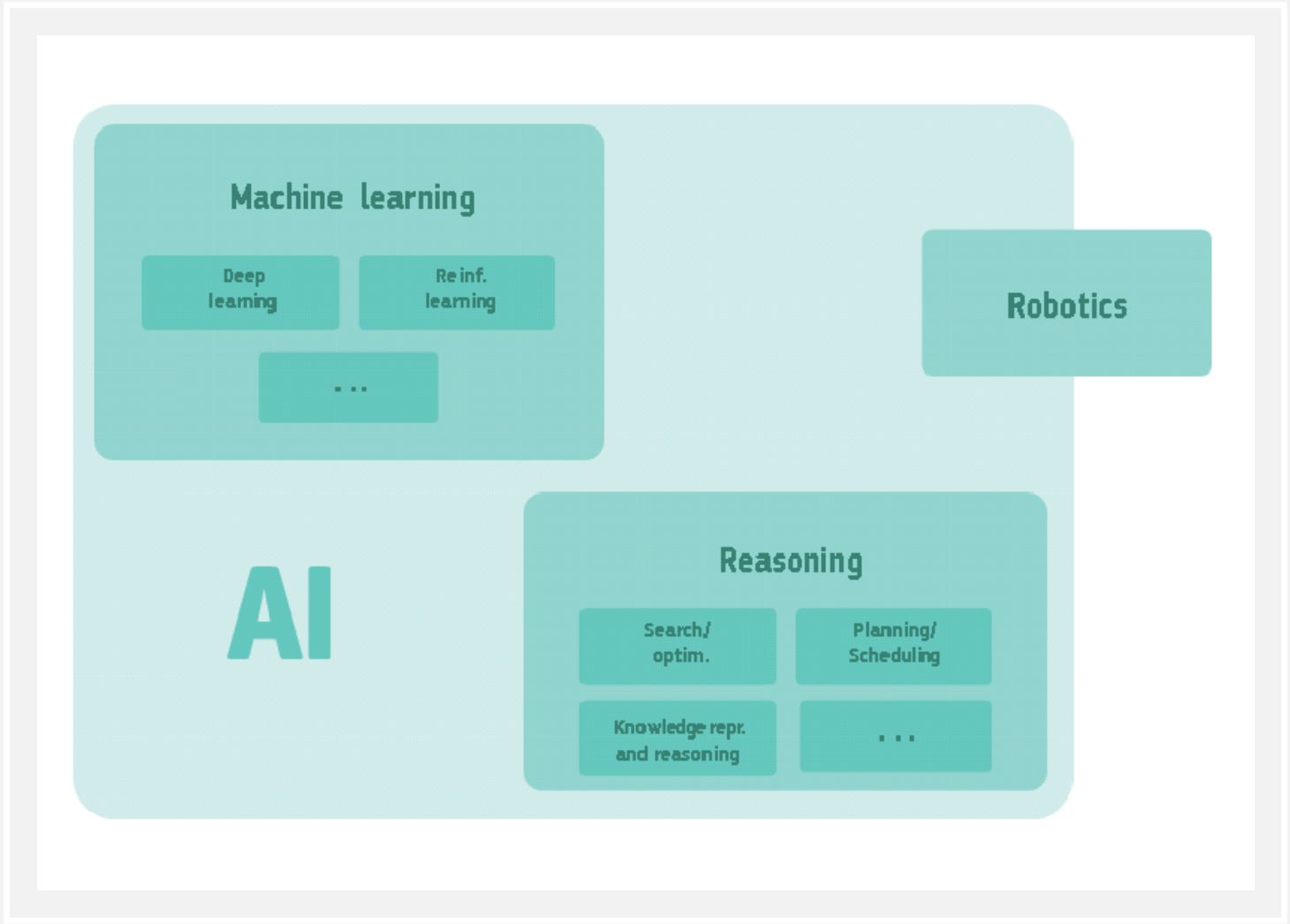
SMART TOOTHBRUSH

- **Perception** of the environment
  - Through its sensor, it understands where you have brushed, and the pressure used.
- **Reasoning** / decision making
  - If the pressure exceeds a given limit, give a warning. If the coverage is 100% give a smiling face.
- **Activation**
  - User notifications.



AI AS A FIELD OF STUDY

RECENT ISSUES IN MODERN AI



REASONING AND DECISION MAKING

- Key question
  What are techniques that help systems reason and/or make decisions?
- The problems that can be addressed must be very well-defined.
  e.g., How can the robotic vacuum cleaner decide whether it should clean?

REASONING AND DECISION MAKING

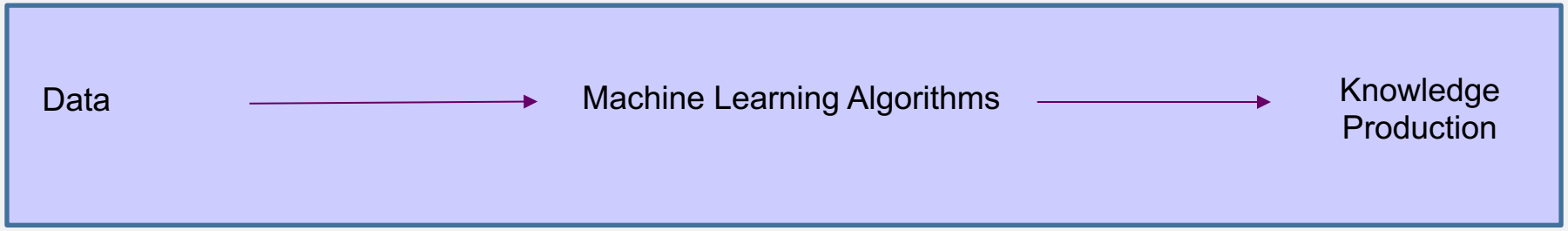
- Important questions include:
  - How can we represent, in a model, what people know about their environment?
  - What rules govern the logical processes that are useful for understanding the environment?
  - What procedures can be used to choose the optimal decision?

MACHINE LEARNING

- Key question
  What techniques can help the system learn from data about its environment?
- The problems that can be addressed are not so well defined.
  e.g., How to recommend the best webpages for a user's search? How to predict a user's personal characteristics based on her behavior?

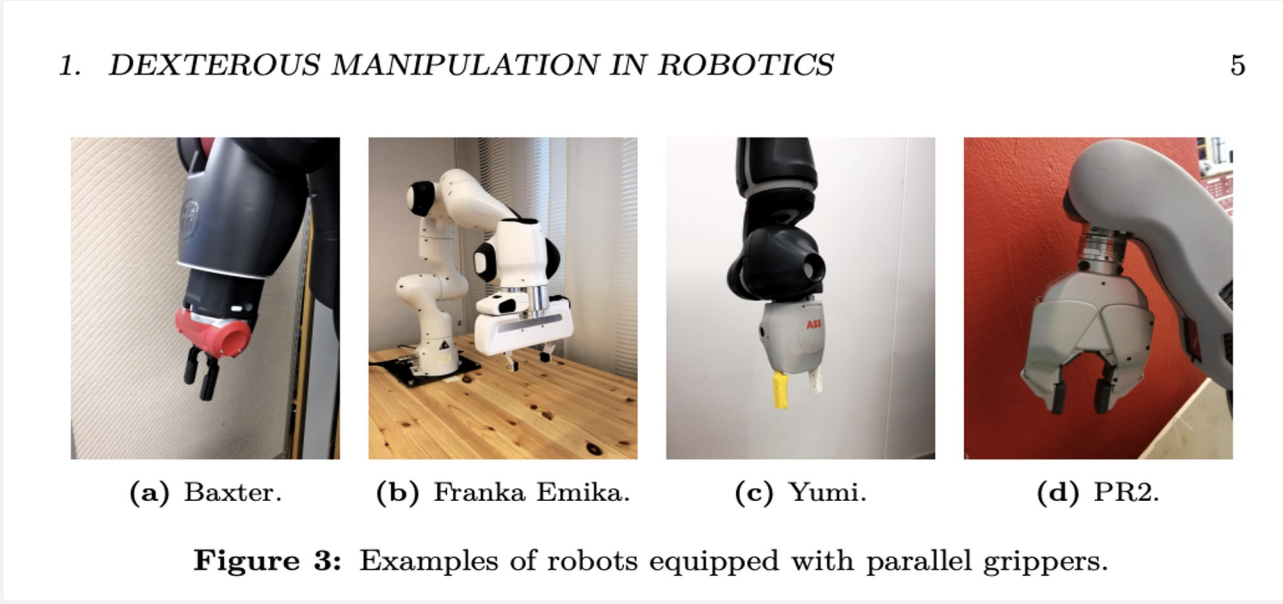
MACHINE LEARNING

- Important questions include:
  - Given previous observations, how can we learn a model, with which we can make predictions about the future?
    - E.g., Given a set of users who have shared their personal characteristics, as well as their history of their clicks on a website, create a model to predict the personal characteristics of new users at the website.



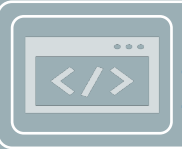
ROBOTICS

- Key question
  What are techniques that help systems solve problems in the physical environment?

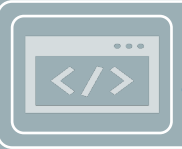


Source1: https://erc.europa.eu/projects-figures/stories/how-equip-robots-senses
Source2: Cruciani, S. (2019). Vision-Based In-Hand Manipulation with Limited Dexterity (Doctoral dissertation, KTH Royal Institute of Technology).

LINKS AND CONTACTS



https://datascientiafoundation.github.io/datascientia-education-eai-2023-24-unitn



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THANK YOU!