

# AI IN EVERYDAY LIFE

## *SCICOMM*

Unit 2 - Exploring AI applications



UNIVERSITÀ DEGLI STUDI  
DI TRENTO  
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**DataScientia**  
Unitas per Varietatem



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## 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

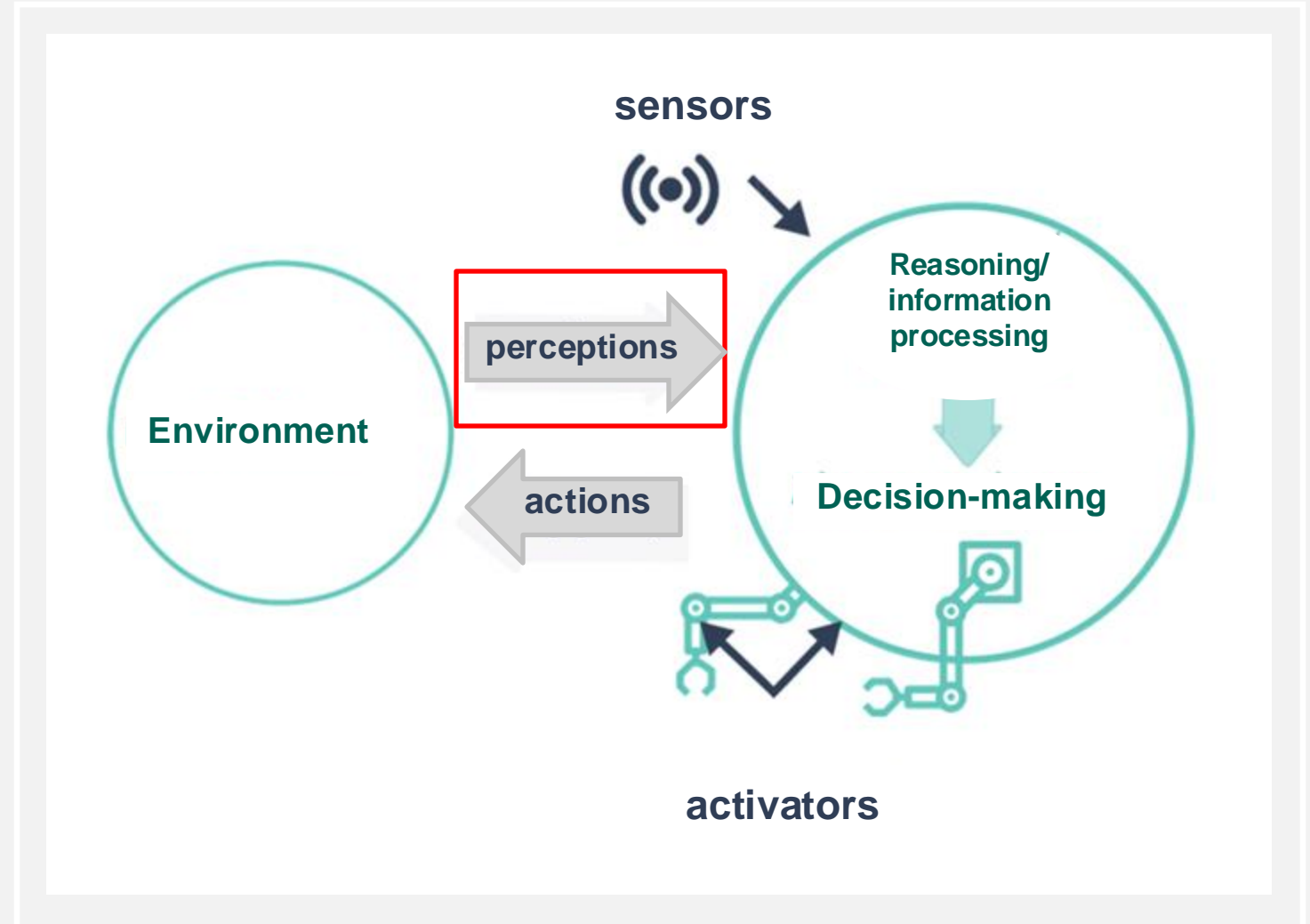


# BASIC FUNCTIONS

## I. Perception of the environment

The system must first perceive the state of its environment.

It collects data, which may be structured or unstructured.

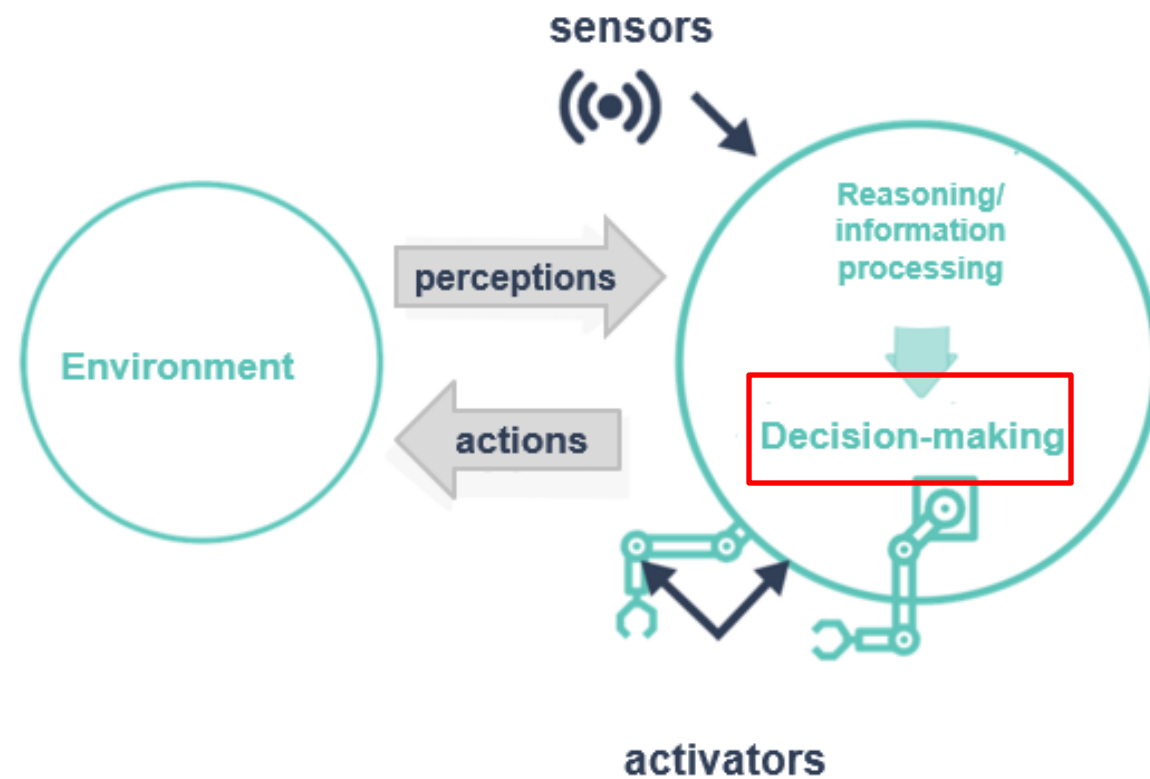


# BASIC FUNCTIONS

## 2. Reasoning/information processing and decision making

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

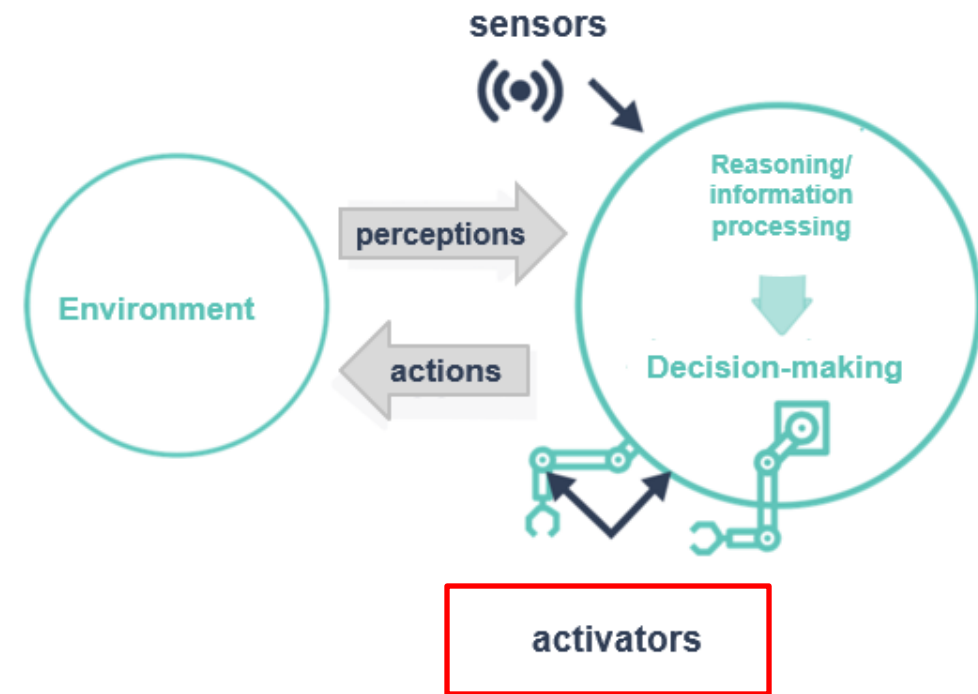
Here, the data is analyzed to determine what needs to be done, based on the system's goals.



# BASIC FUNCTIONS

## 3. Activation

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





# EVERYDAY EXAMPLES



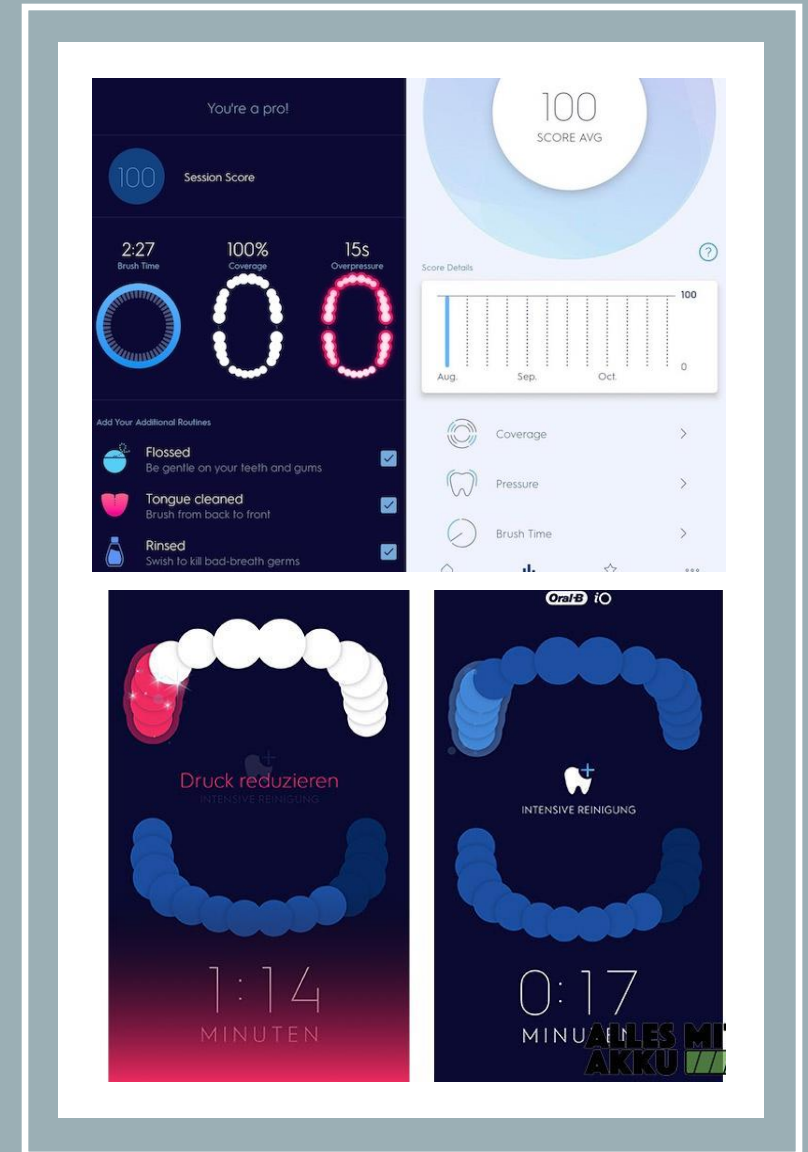
# ROBOTIC VACUUM CLEANER

- **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.



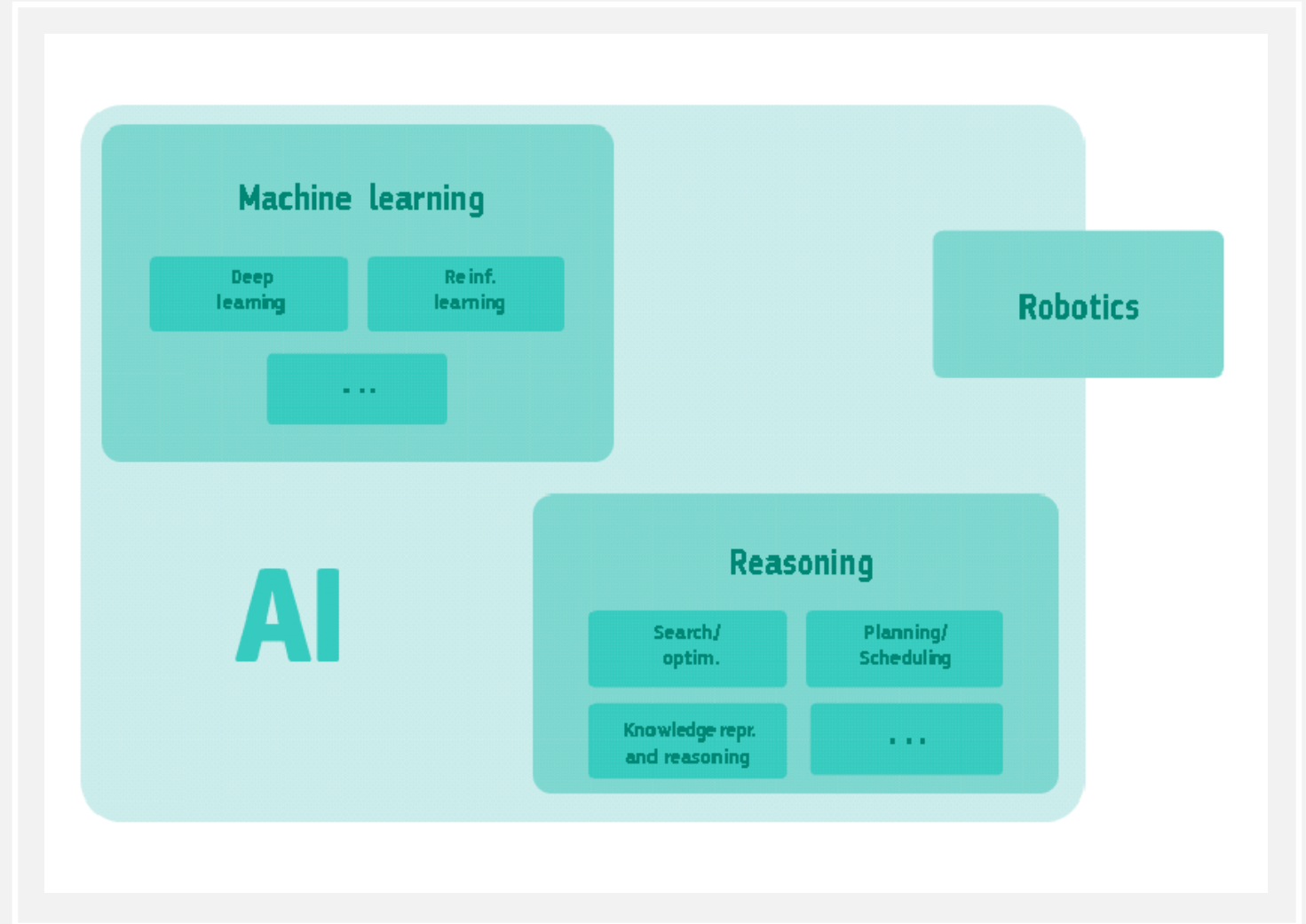




# AI AS A FIELD OF STUDY



## 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.

Data



Machine Learning Algorithms



Knowledge  
Production



# ROBOTICS

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



## 1. DEXTEROUS MANIPULATION IN ROBOTICS

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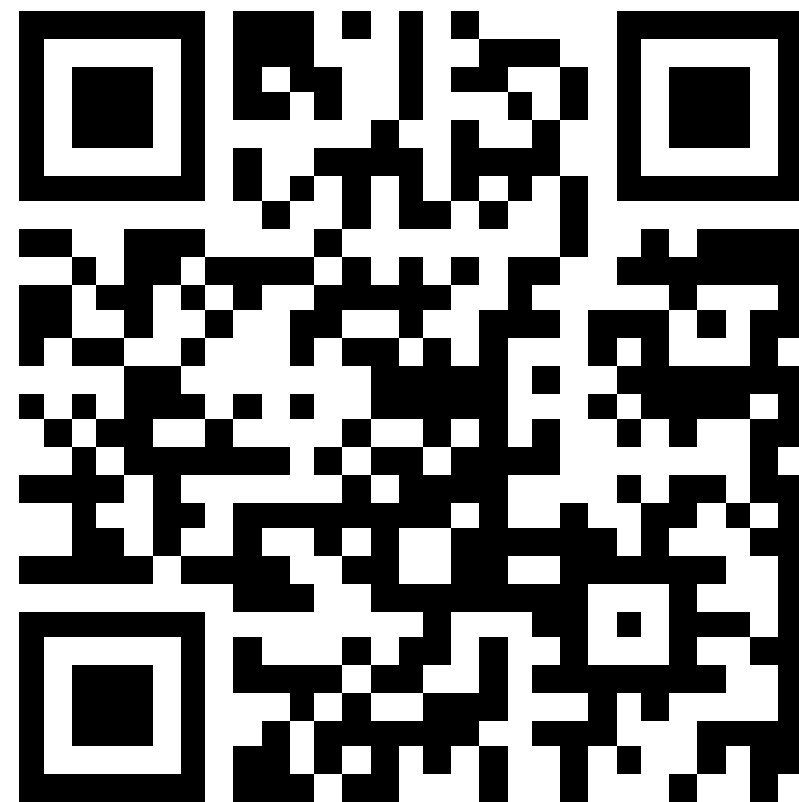
(a) Baxter. (b) Franka Emika. (c) Yumi. (d) PR2.

Figure 3: Examples of robots equipped with parallel grippers.

Source 1: <https://erc.europa.eu/projects-figures/stories/how-equip-robots-senses>

Source 2: Cruciani, S. (2019). Vision-Based In-Hand Manipulation with Limited Dexterity (Doctoral dissertation, KTH Royal Institute of Technology).

LET'S DISCUSS IT ON  
SLIDO!





## LINKS AND CONTACTS



<https://datascientiafoundation.github.io/datascientia-education-eai-2024-scicomm/>



<http://knowdive.disi.unitn.it/>



[@knowdive](#)



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# THANK YOU!

