

26<sup>th</sup> September 2024



Discover the applied research of five groups of the **Xarxa RDI-IA!**



Institut de Robòtica i Informàtica Industrial

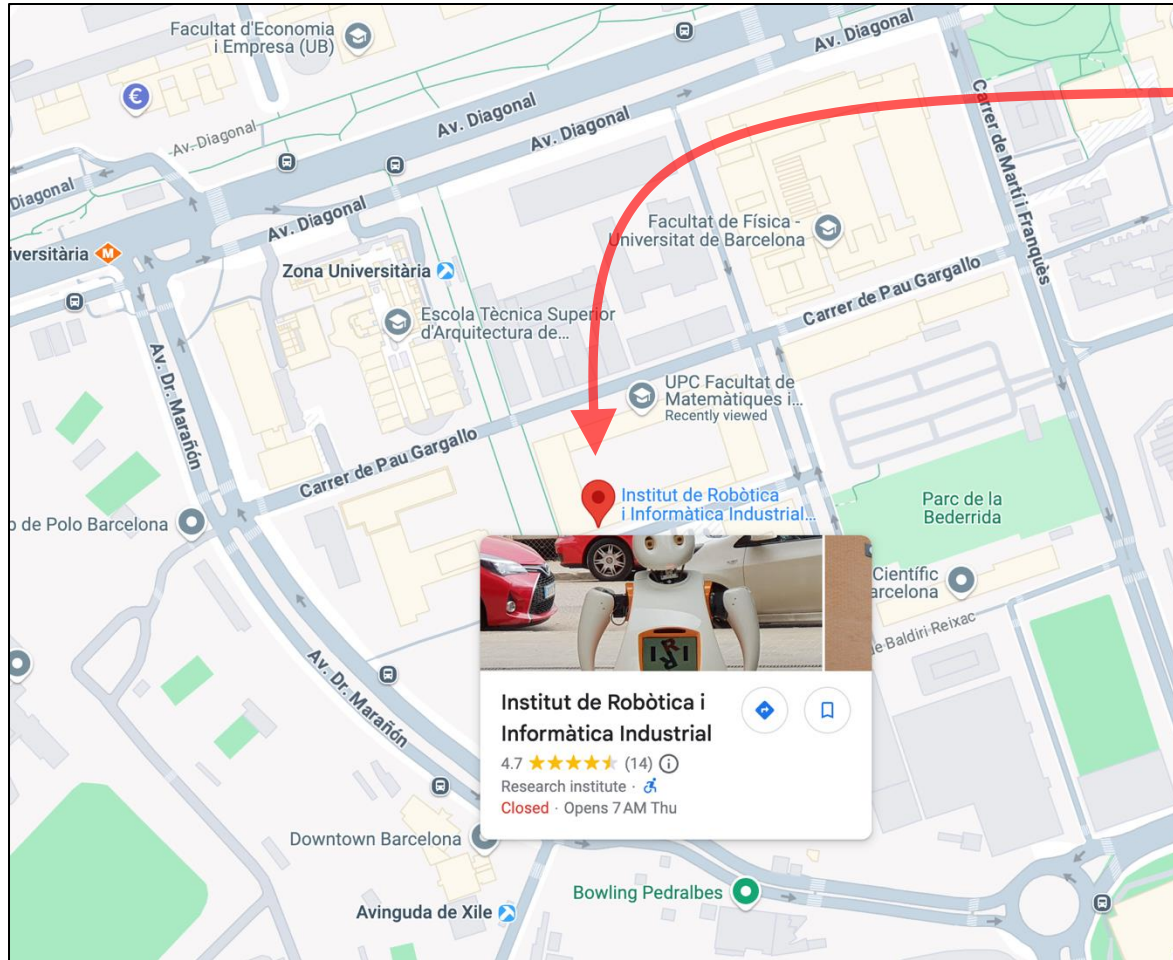


**CSIC**





# Institut de Robòtica i Informàtica Industrial, CSIC-UPC



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i Informàtica Industrial






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# RobIRI group



-  Doctors  
19
-  PhD Students  
28
-  MSc Students  
12
-  Technicians  
4
-  Robots  
12





# Perception and Manipulation Lab.



- **Perception & Representation** of deformable objects
- **Planning** for collaborative manipulation
- **Learning** from demonstration and reinforcement

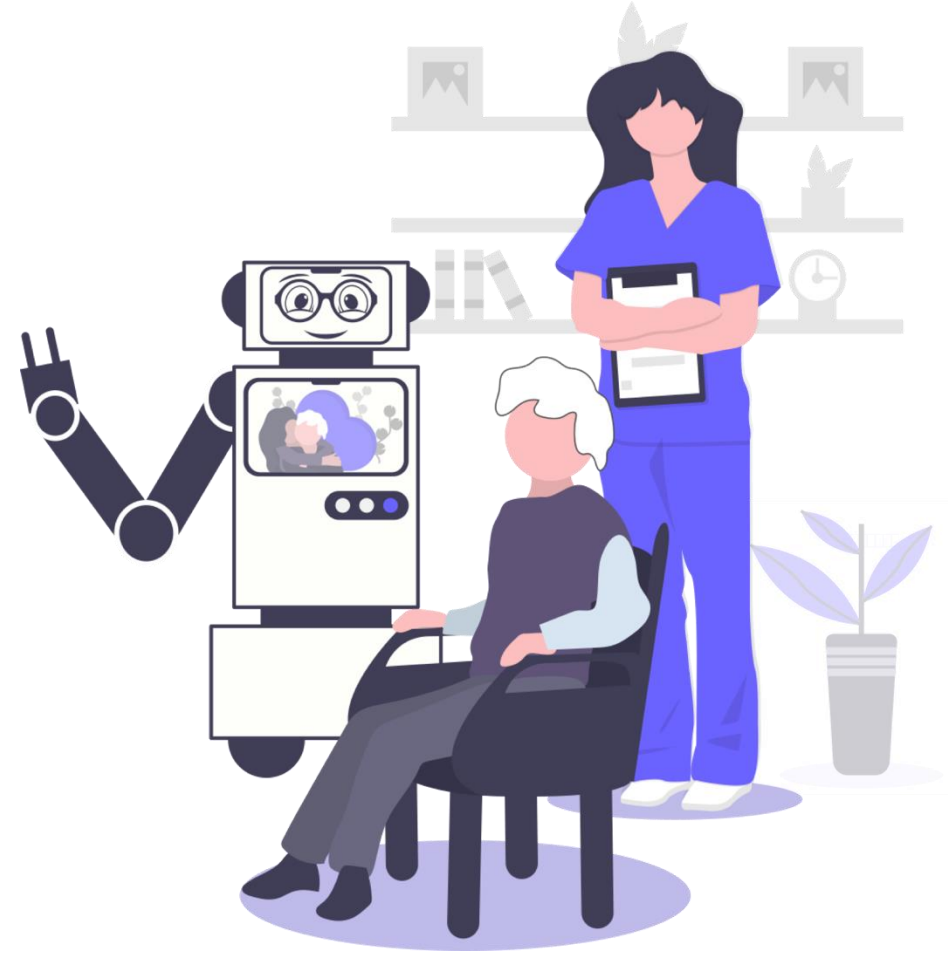


Assisted Living Facility



# Research on Assistive Robotics

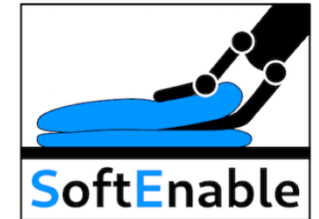
- Robot for: caregivers and patients
- Personalization
- Adaptability
- Explainability
- Easy to use
- Co-design with end users





# Overview of the talk

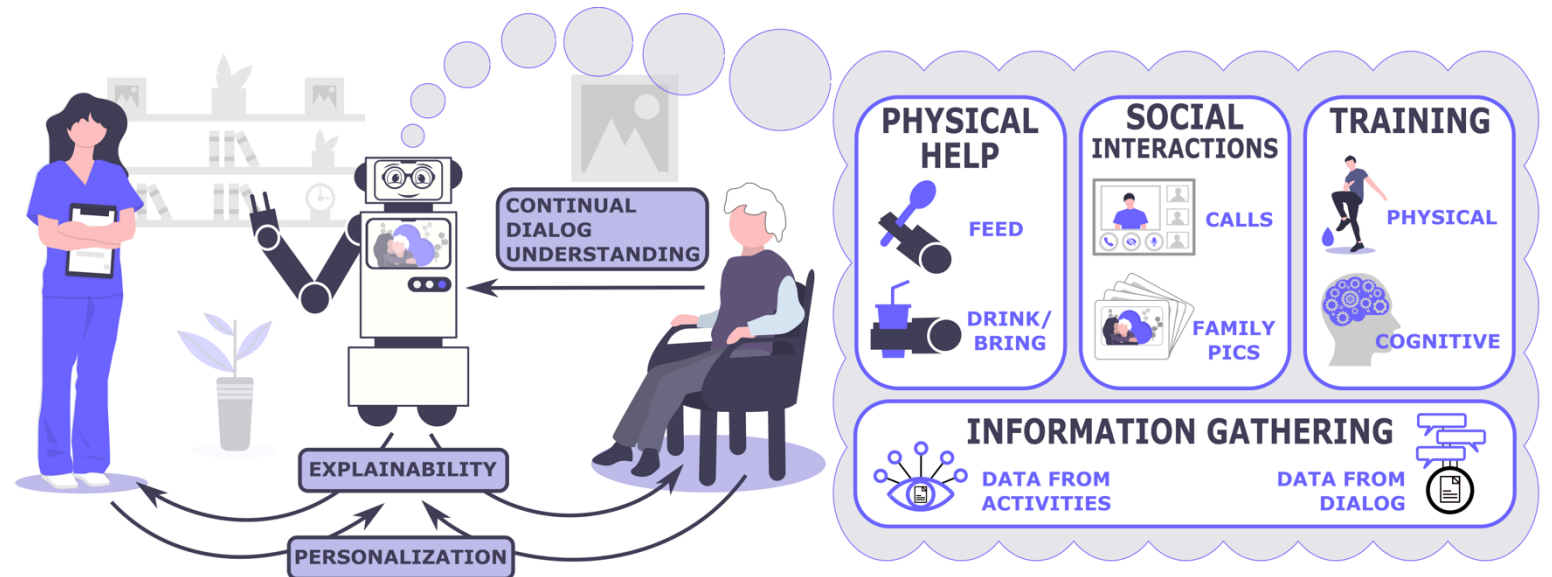
- ROB-IN: Personalized assistance in elderly homes
  - Robot companion
- SoftEnable: Manipulation of deformable objects through caging primitives
  - Patent: Gripper for layer separation
- Presentation of the LABORA initiative
  - Feeding robot
  - Robot for measuring fragility





# ROB-IN: Robot for continual personalized assistance

- O1: Personalization for long-lasting interactions
  - Robot decides when to take action
- O2: Continual dialogue understanding
  - Conversations scheduled or unexpected
- O3: Explainability
  - Build trust & acceptance
  - Ethics & privacy







# Robot for continual personalized assistance



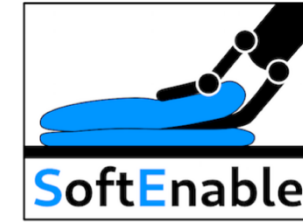
## ROB-IN

- Picking up objects, helping exercise, reminding things
- Gathering data
- Generation of explanations





# SoftEnable

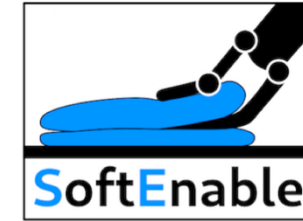


- Robot manipulation of soft materials to ease the task of workers





# SoftEnable



- Robot manipulation of soft materials to ease the task of workers



- Consortium:
  - KTH, Sweden (Coordinator)
  - DLR, Germany
  - **IRI-CSIC, Spain**
  - Technion, Israel
  - Ocado, UK
  - **Hopital Clínic de Barcelona, Spain**

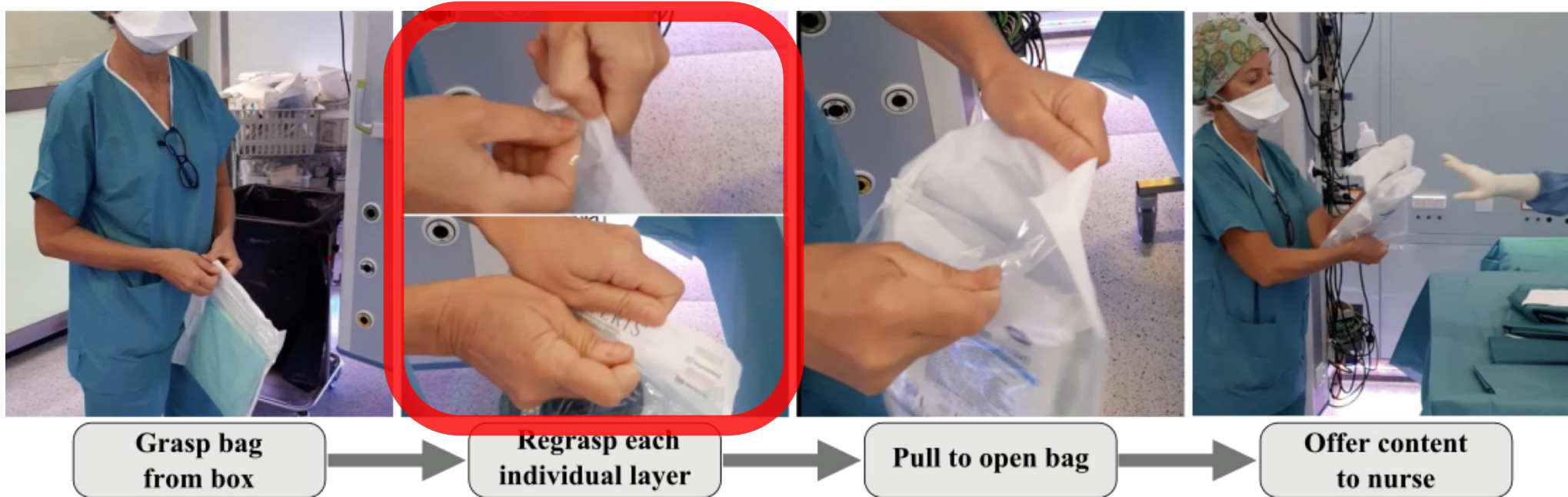




# SoftEnable: Opening of heat-sealed bags



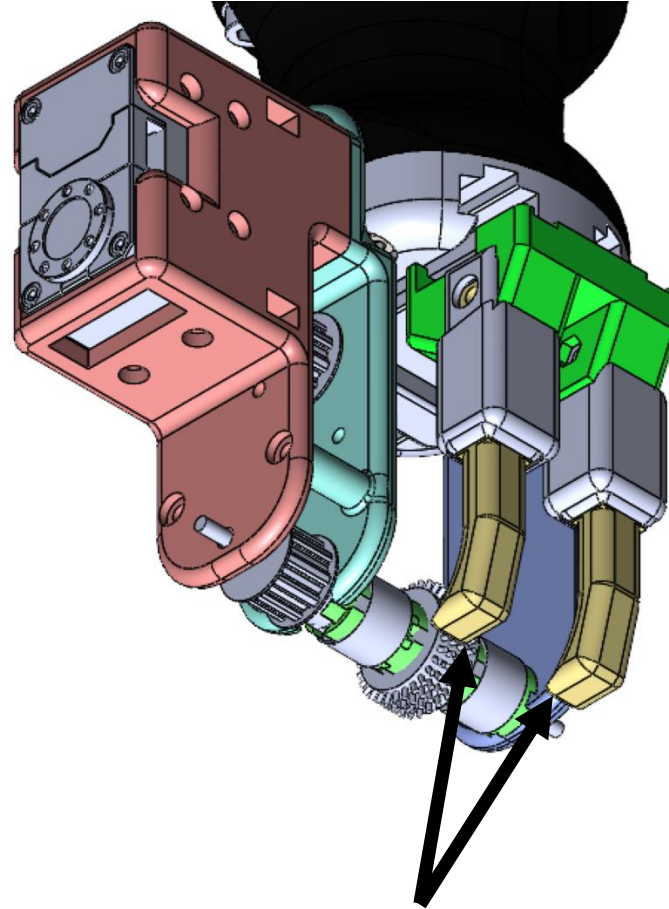
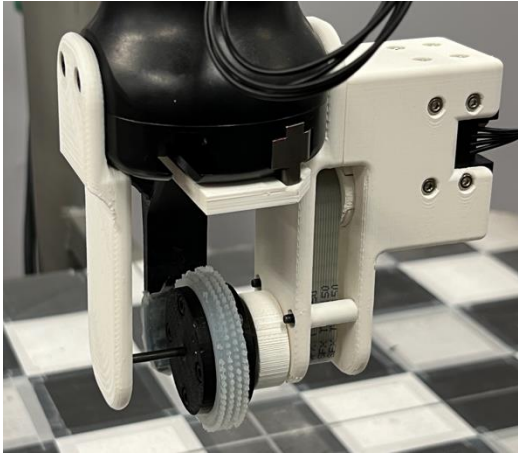
- We studied the problem of layer separation



- Friction is important
- Lots of different materials involved



# SoftEnable: Gripper design (Filed patent EP24382974)



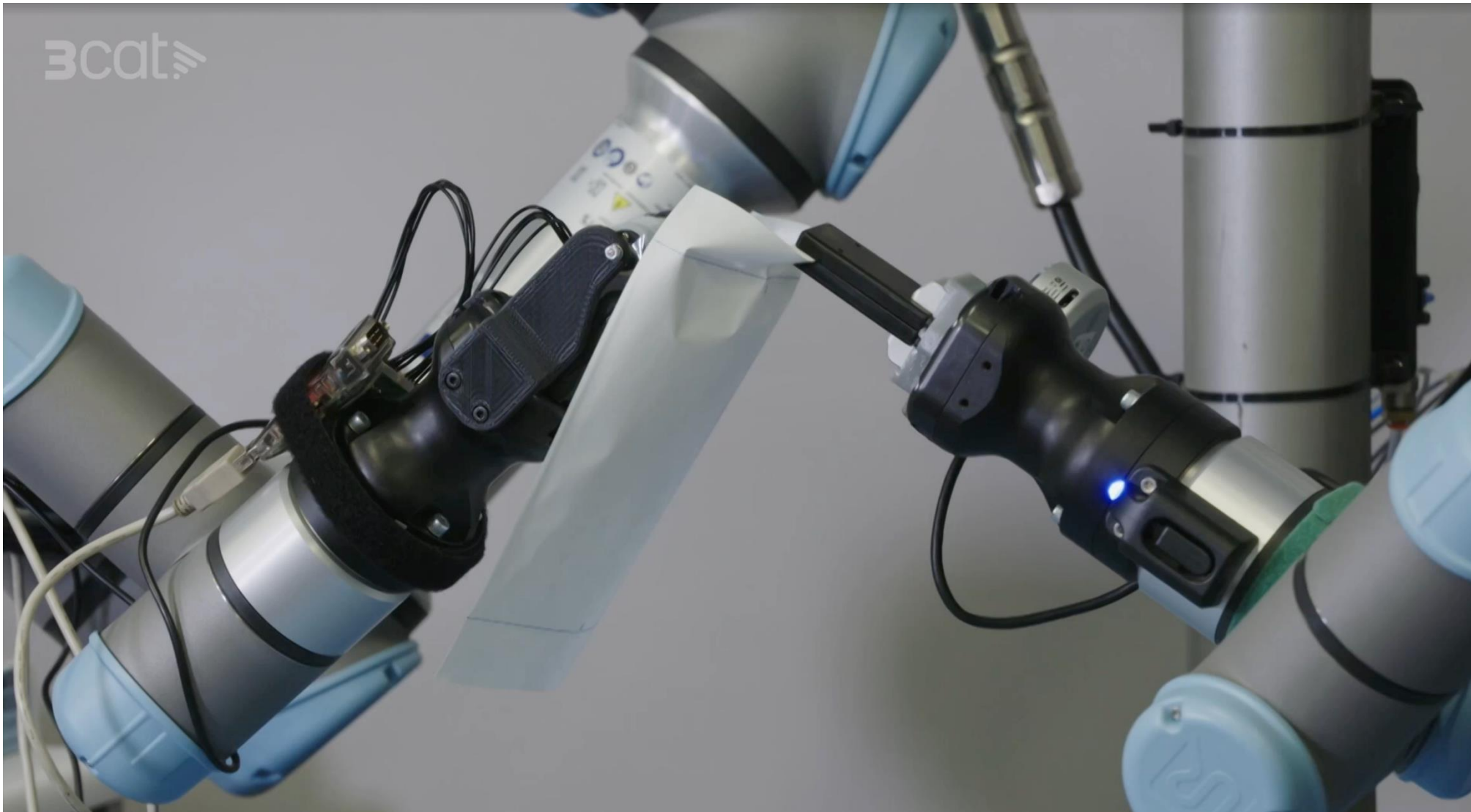
Extra fingers to hold the object







# SoftEnable: Gripper design (Filed patent EP24382974)





**LabORA**



# LabORA

LABORATORI OBERT DE ROBÒTICA ASSISTENCIAL





## WHY

- ▶ Get real impact and **change people's life**
- ▶ Create a **new economy**
- ▶ **Empower** users (caregivers and elders)

## HOW

- ▶ Create **collaborative** and open initiatives
- ▶ Identify close-to-market problems
- ▶ Identify missing enabling technologies

## WHO

- ▶ **Scientific** (robotics, psychology, marketing, human factors, ethics..)
- ▶ **Industry** (robotics, data, health...)
- ▶ **End-users** (caregivers, elder...)
- ▶ **Government** (new laws, service consumer...)

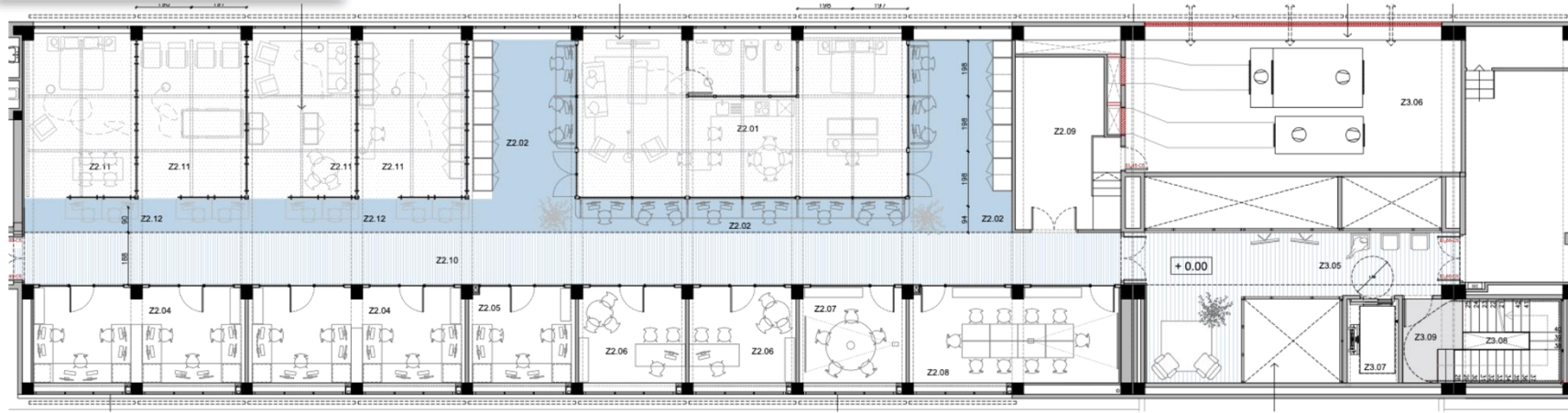
## WHERE

- ▶ **Research** - (IRI)
- ▶ **Evaluation and training**  
(hospitals, day care facilities, retirement homes...)



# LabORA

## Infraestructure



## Current partners







# NYAM: Feeding robot

- An estimated **142 million people** worldwide suffer from physical disabilities or mobility impairments and **may require assistance with eating** due to these conditions.



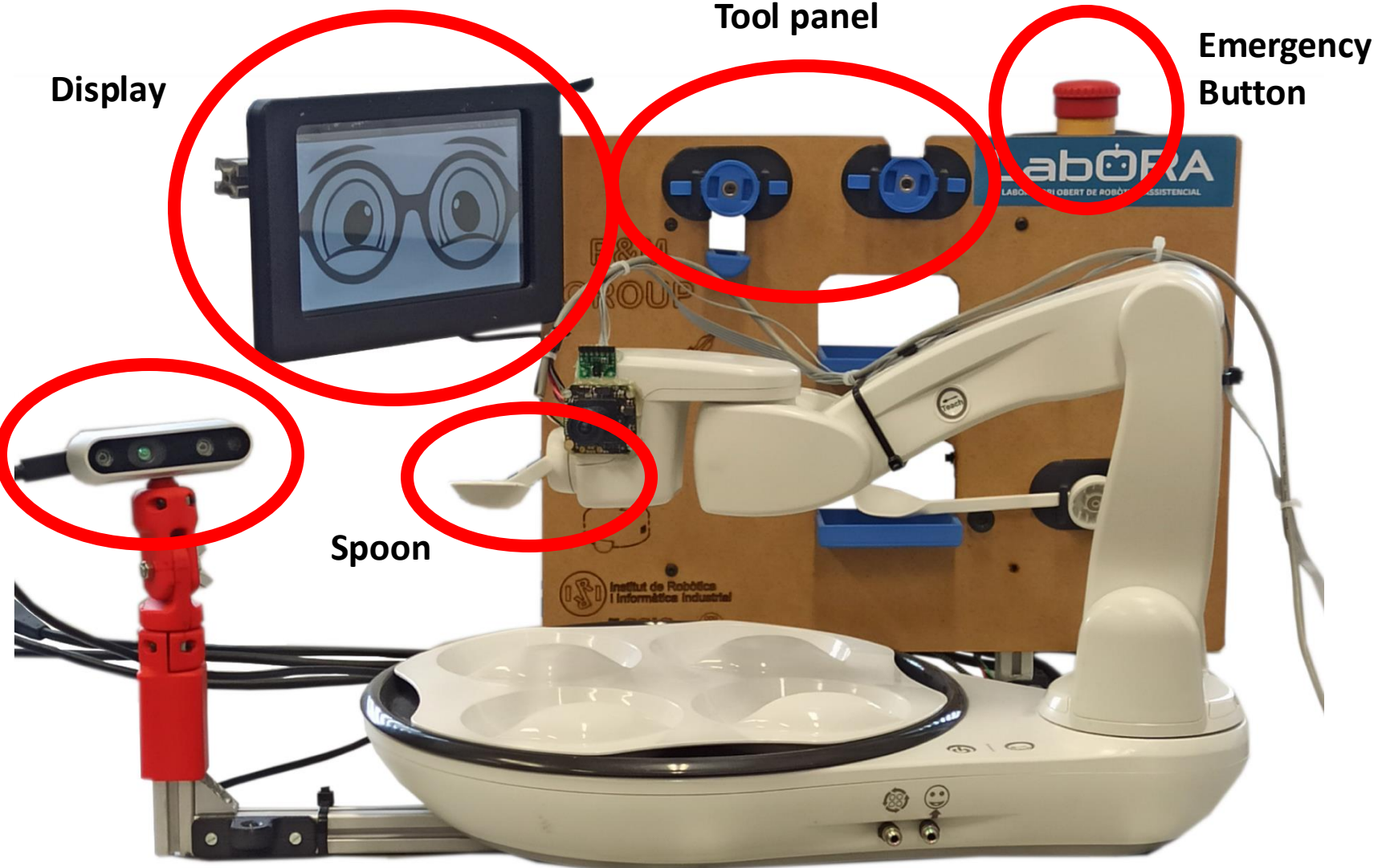
Parc Sanitari  
Pere Virgili



# NYAM: Feeding robot



obi



Display

Tool panel

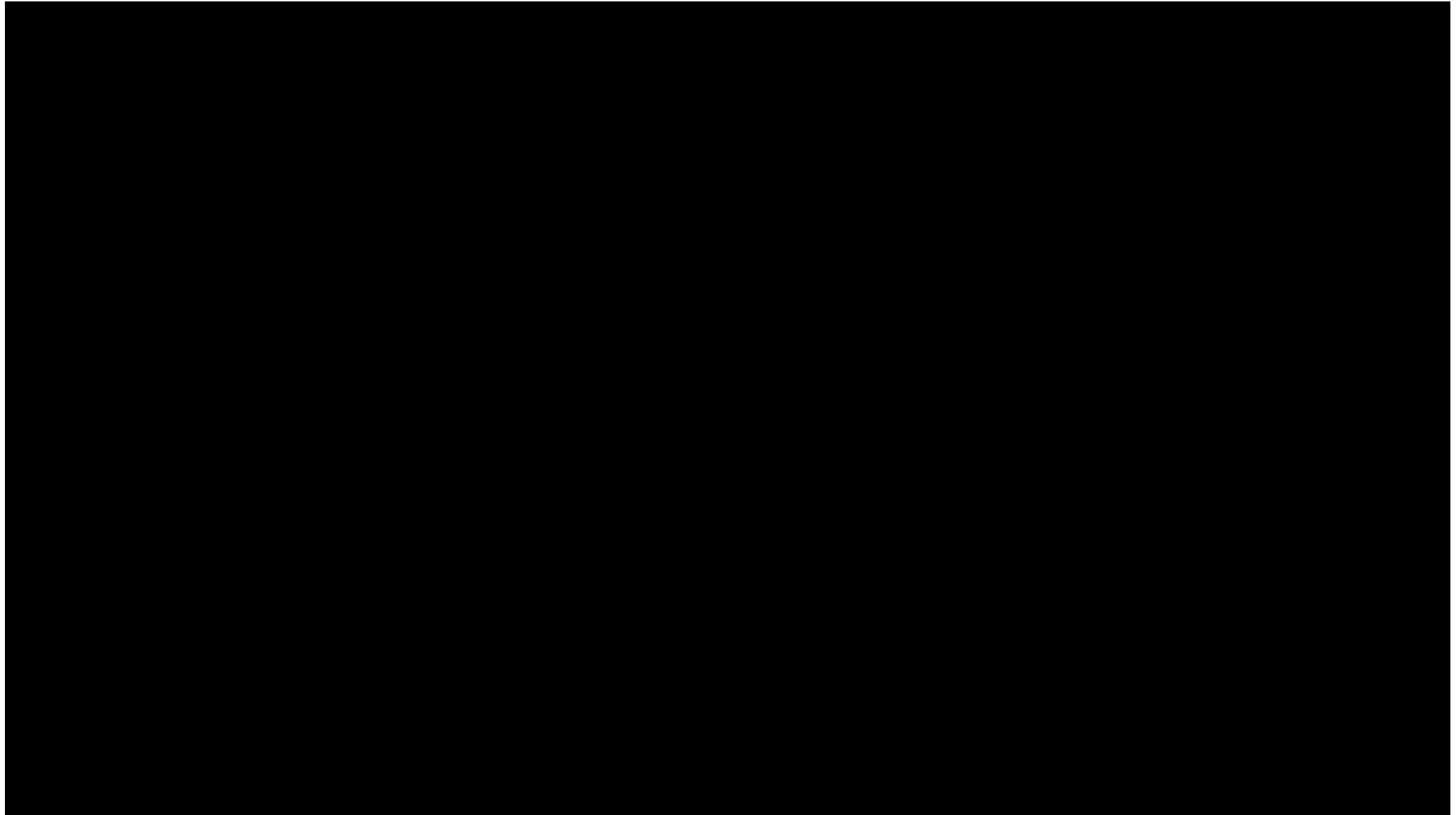
Emergency Button

RGB-D Camera

Spoon



# NYAM: Feeding robot







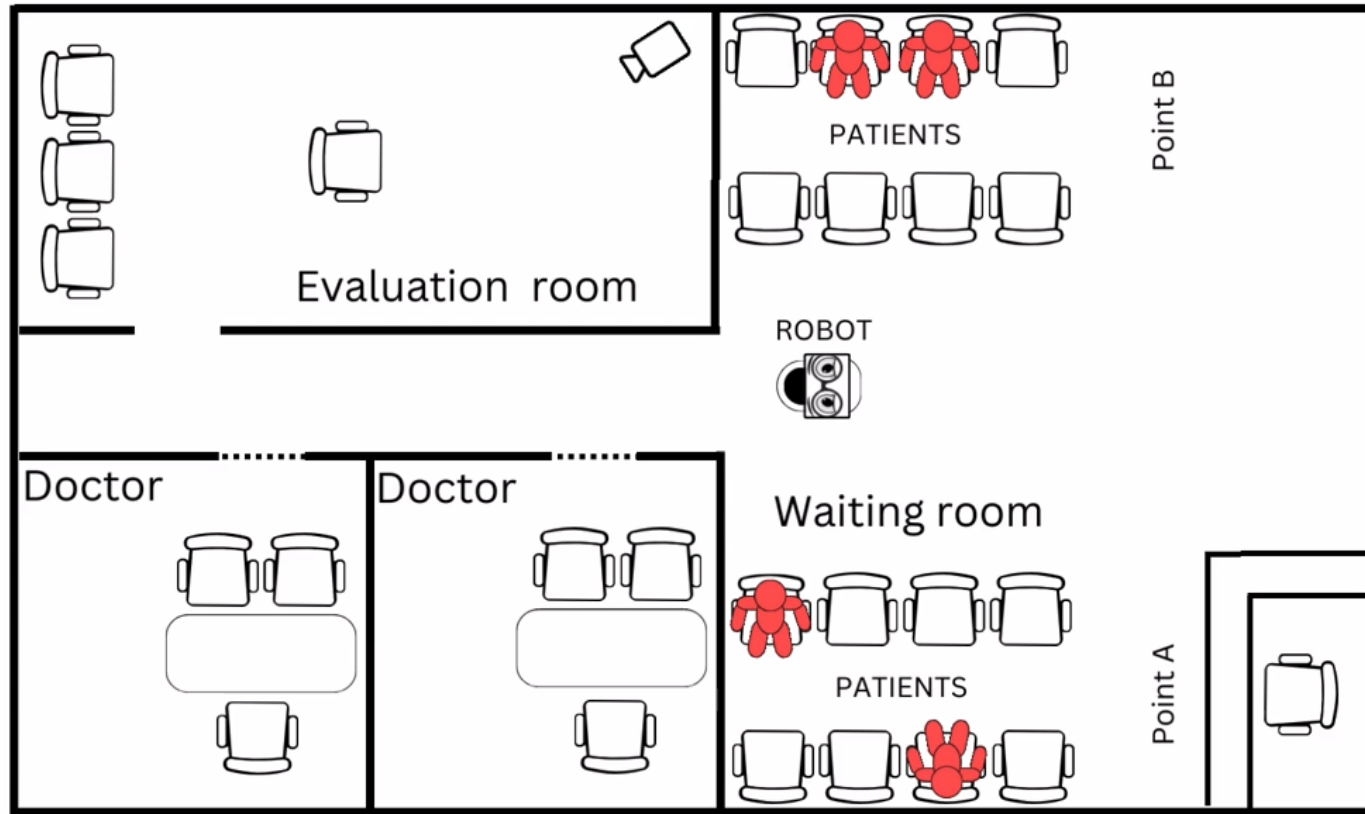
# FRAILWATCH: A robot to measure intrinsic capacities

- **Objectives:**
  - **Evaluate** fragility in elder adults
  - **Serve** to Health personnel
  - **Monitor:**
    - Physical condition
    - Quality of life





# FRAILWATCH



A. Civit, A. Andriella, C. Barrue, M. Antonio, C. Boqué and G. Alenyà. Introducing social robots to assess frailty in older adults, 2024 ACM/IEEE International Conference on Human-Robot Interaction, 2024, Boulder, CO, USA, pp. 342–346.

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