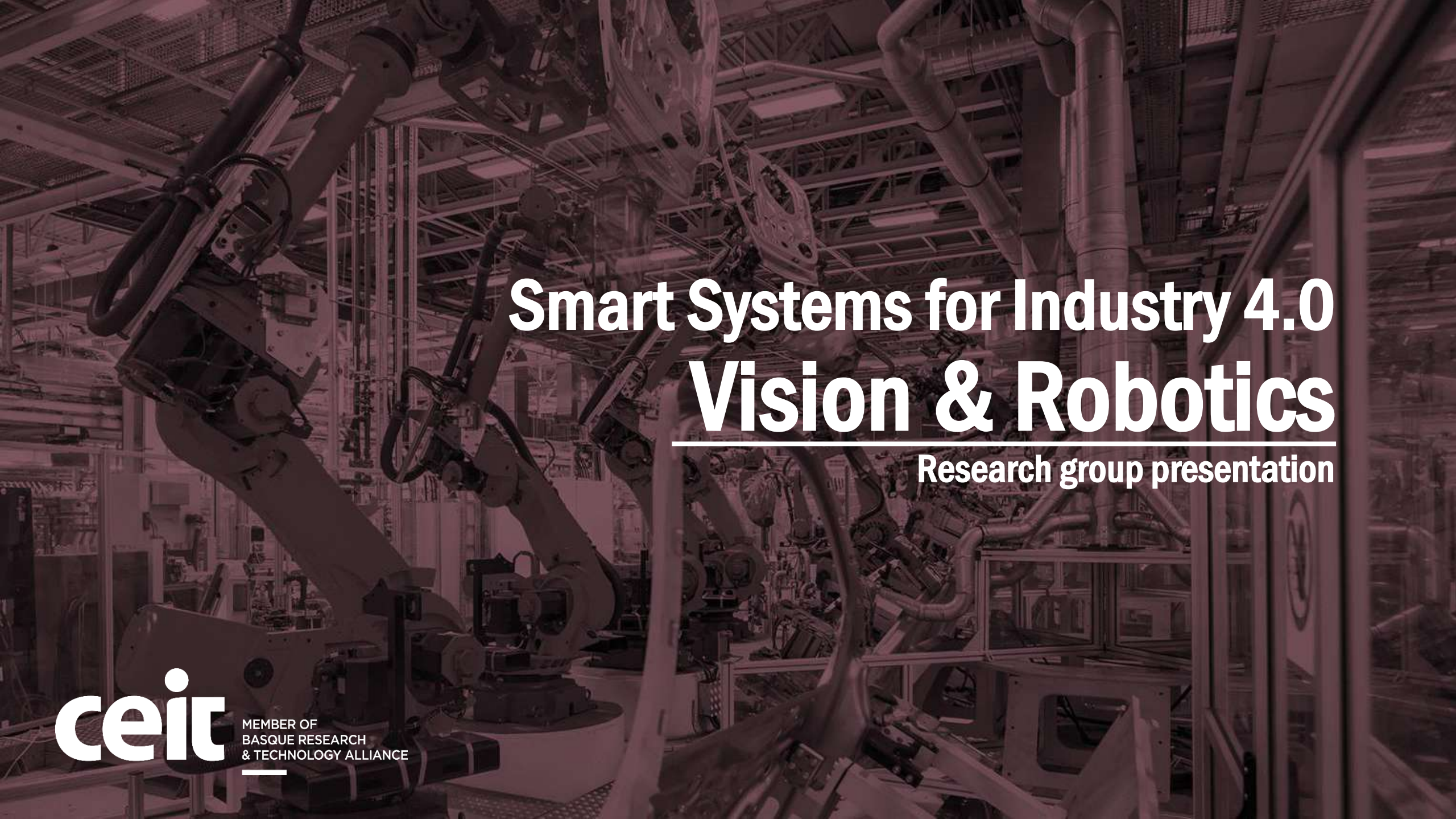


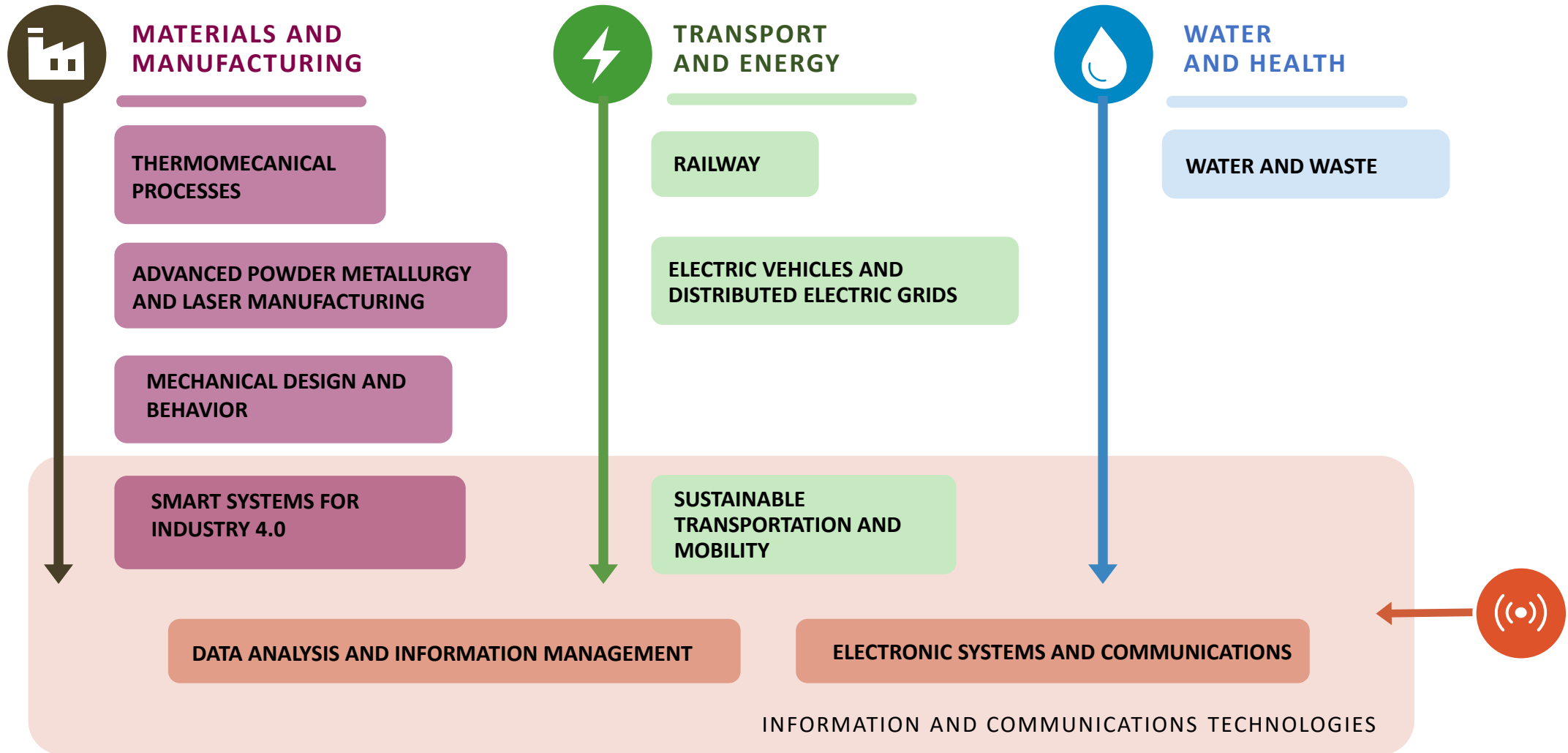
The background of the slide is a photograph of an industrial factory floor. Several large, white robotic arms are visible, some in the foreground and others in the background, all engaged in manufacturing tasks. The scene is filled with industrial equipment, pipes, and structural elements of the factory. The entire image has a dark, reddish-brown overlay.

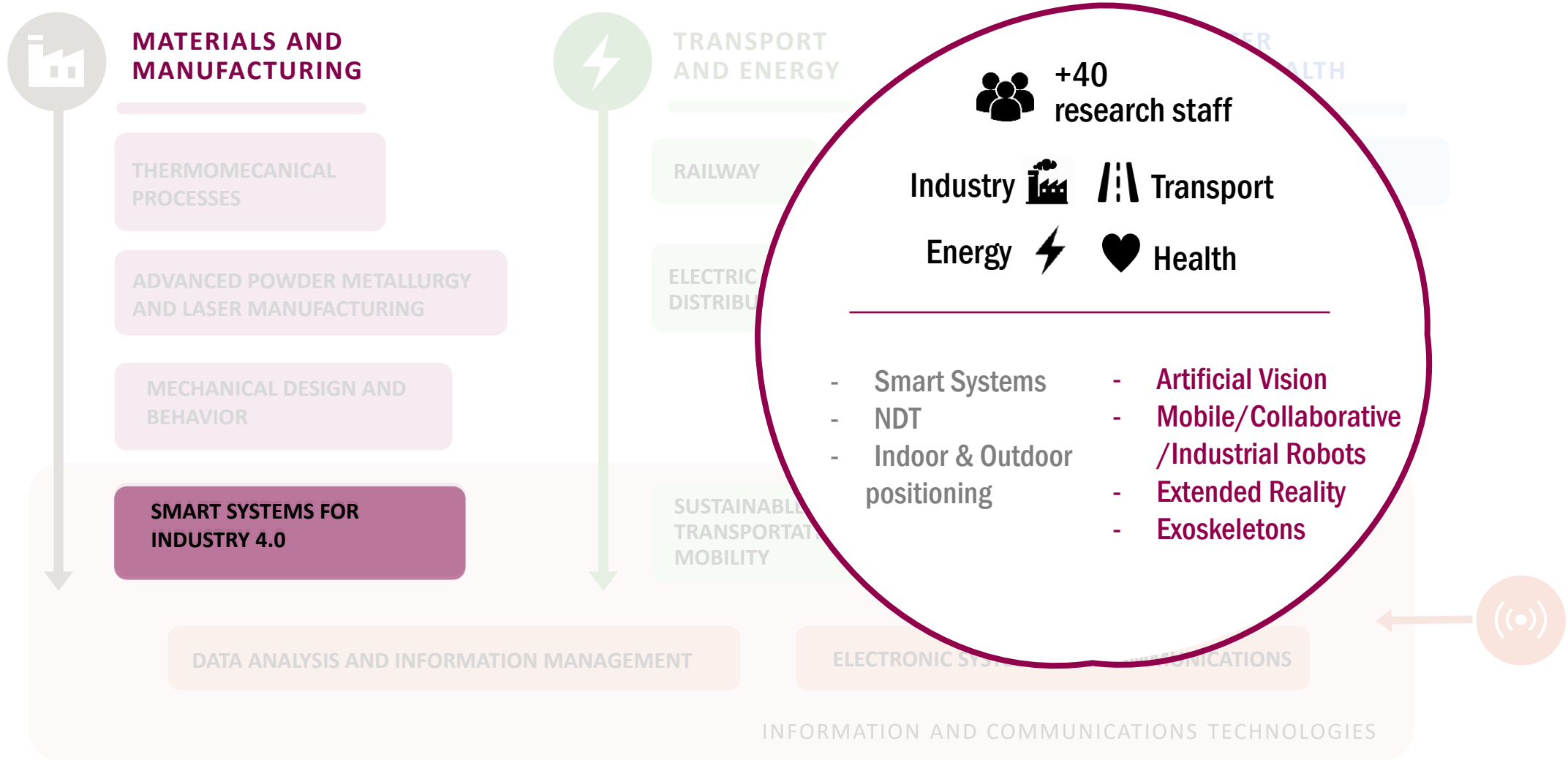
Smart Systems for Industry 4.0 Vision & Robotics

Research group presentation

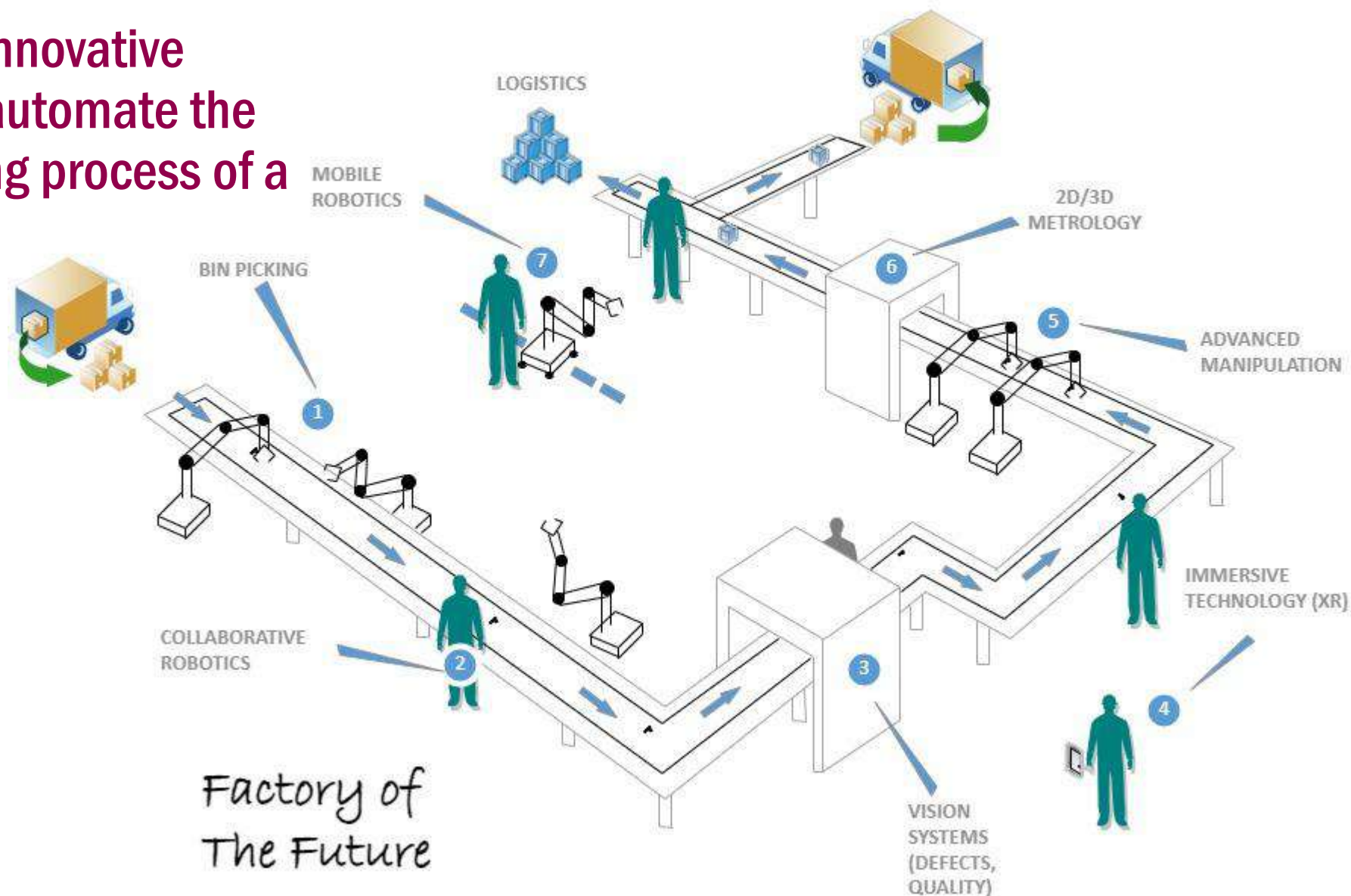
ceit

MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE





We develop innovative solutions to automate the manufacturing process of a company



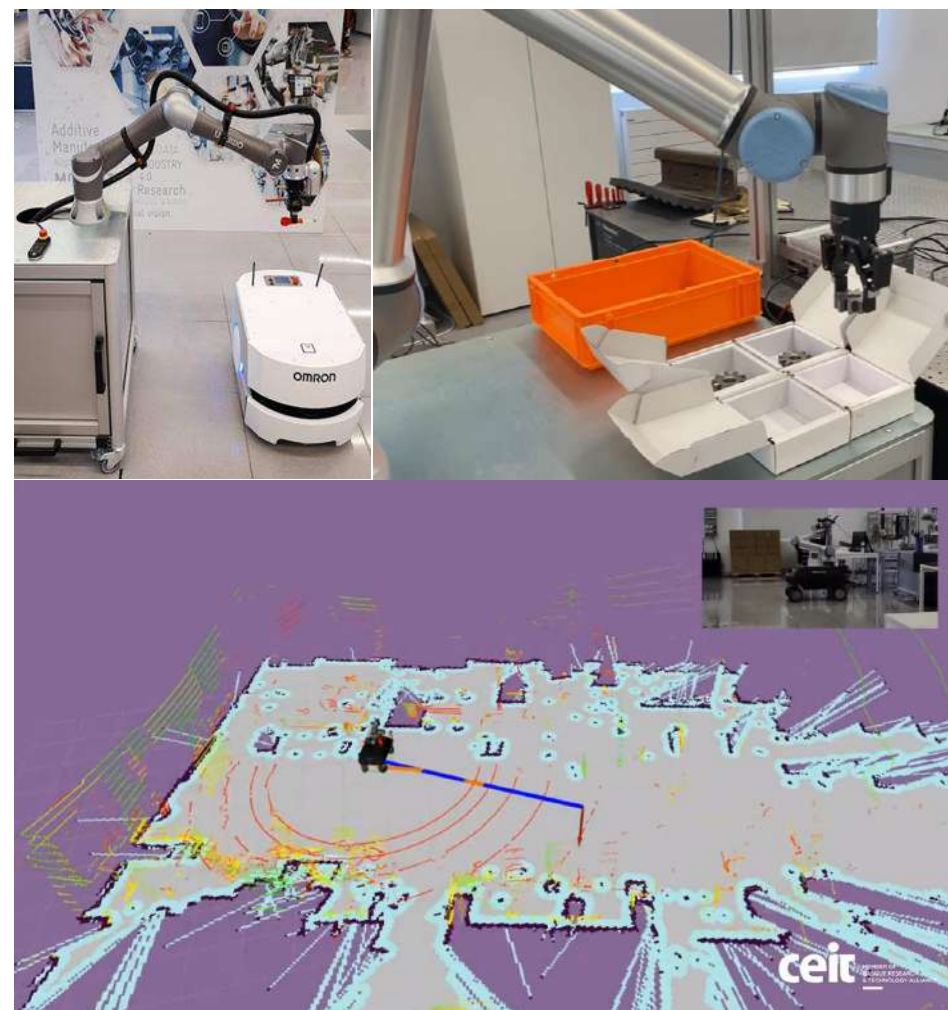
Industrial Robotics & Automation

(Customised robot cells, control algorithms, advanced manipulation, inspection, additive manufacturing, etc.)



Mobile Cobots

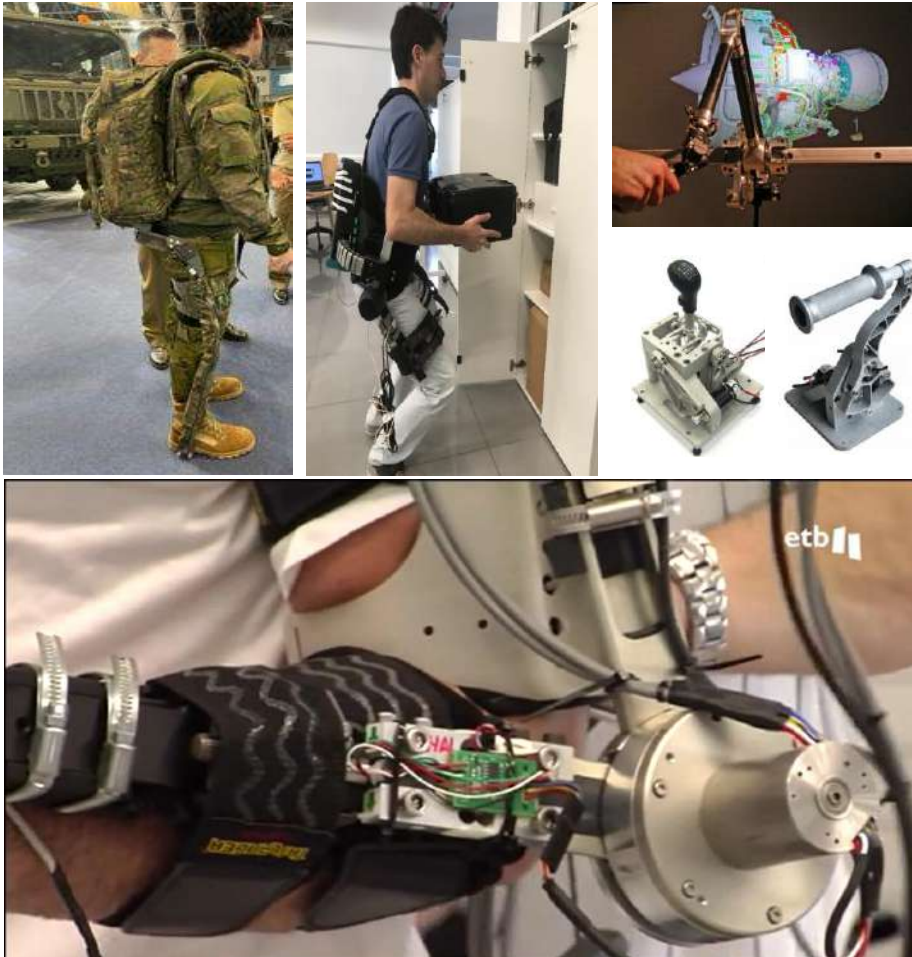
(Mobile manipulators, logistics, palletising tasks, trajectory planning, etc.)



Vision & Robotics

Exoskeletons and Haptics

(Multiple applications, innovative mechatronics design, AI based ad-hoc solutions, etc.)



Extended Reality

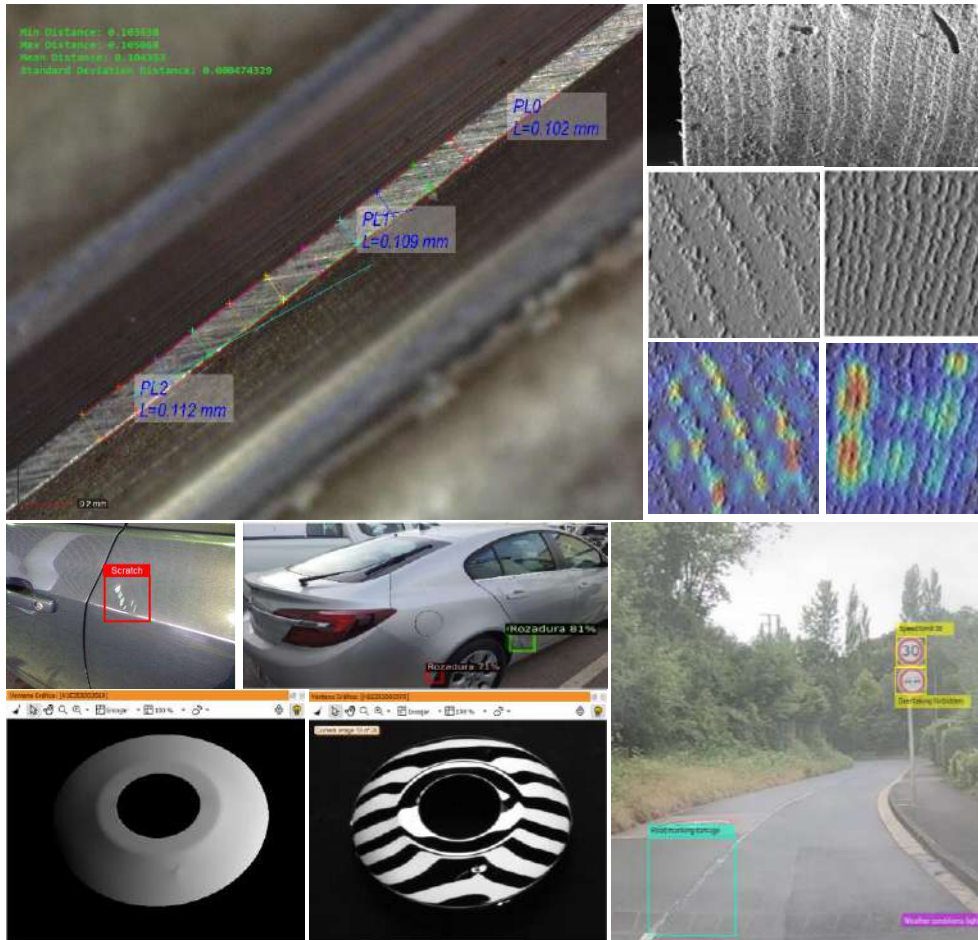
(Virtual Reality environments, Augmented Reality, immersive technology, simulation, virtual assistance, etc.)



Vision & Robotics

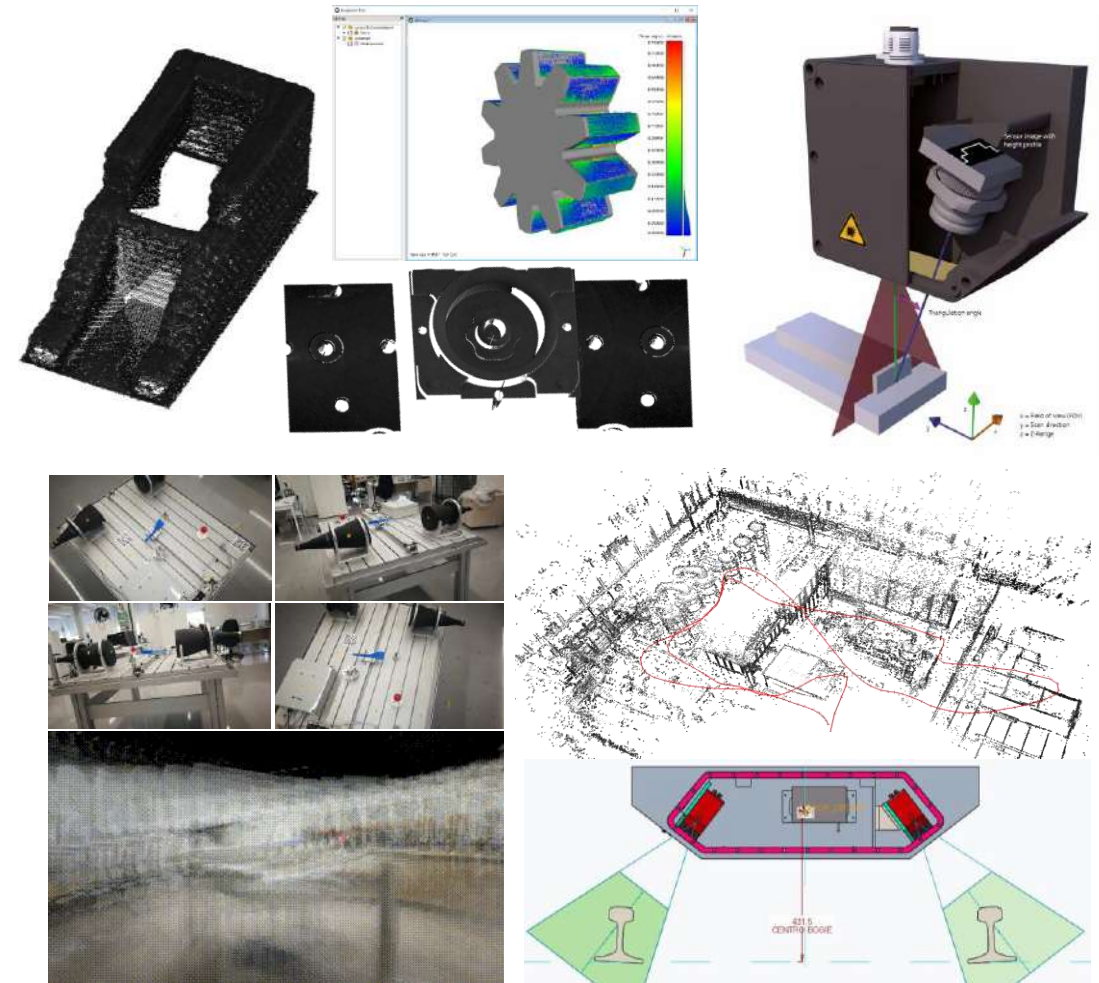
2D Vision

(High precision metrology, road monitoring systems, defects inspection, deflectometry, etc.)



3D Vision

(Additive manufacturing robot inspection, railway inspection, hot part inspection, perception technologies, 3D reconstruction, 3D metrology, etc.)



Key AI Technologies and Applications

8

Main Technologies

Machine Learning

Low level real-time machine control (Exoskeleton / Haptics / Robotics / Automation)

Generative AI

Synthetic data generation / expert integrators

Deep Learning (CNNs, etc.)

2D/3D Image classification / Segmentation / Detection / 6D pose / Reconstruction (expert lectures)

NeRF

3D image reconstruction (aeronautics, eolics), digital twin

Reinforcement Learning

Automated teaching of machines, high level control, digital twin

Explainable AI

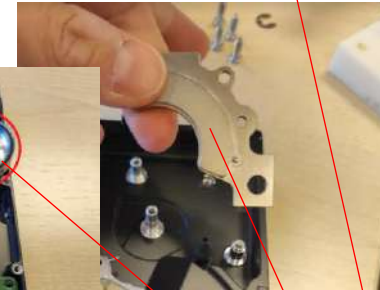
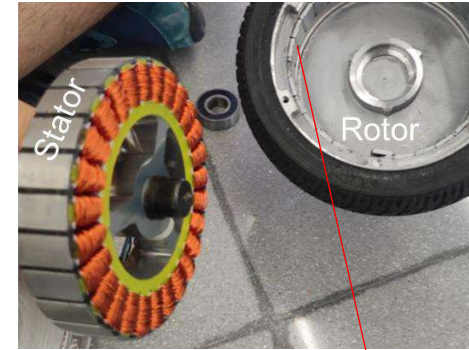
Transparency / trust of AI, bias detection

Classic AI

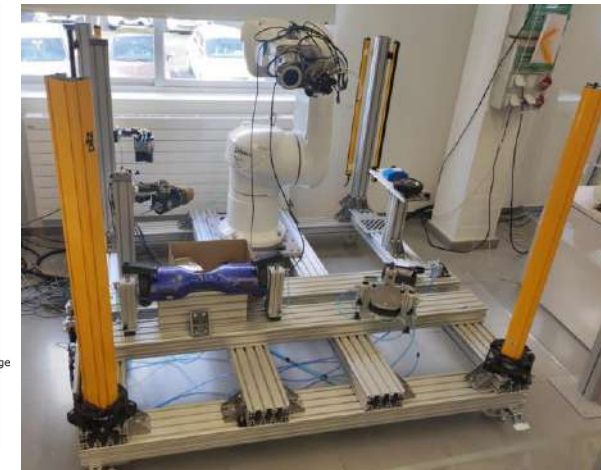
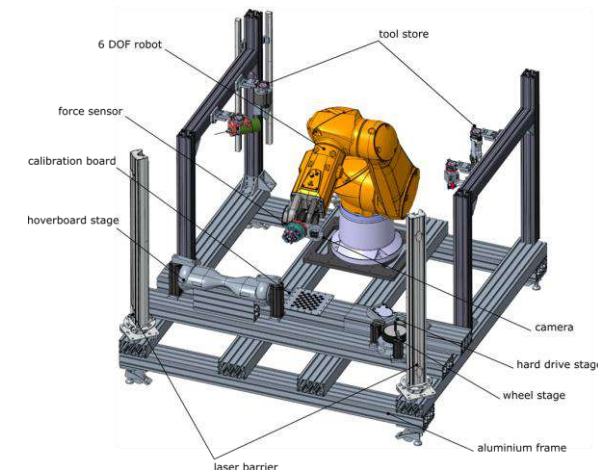
Genetic Algorithms, Motion Planning

RAEELAB: Recycling of electronic waste

- Robotisation of the disassembly of electronic waste to recover neodymium magnets and batteries.
- Use of different tools:
 - Automatic tool changer
 - Gripper
 - Drill
 - Vacuum
 - Unscrewdriver
- Requiring AI techniques to dare with
 - High and different number of tasks, elements,...
 - Waste condition
 - Device variability



Nd magnets



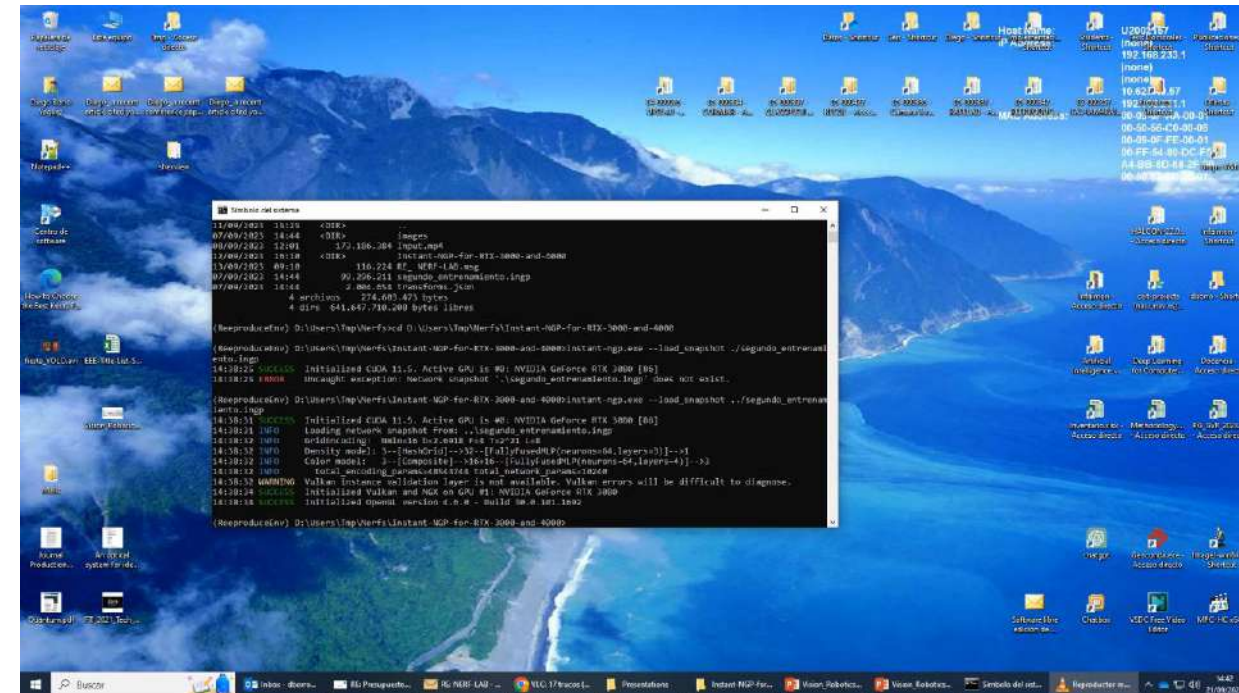
<https://youtu.be/22lt6iDdYSs>

Reconstruction of Work Spaces/Assets

Objetivo: Evaluation of AI models like Gaussian Splatting (image) or NeRF to capture the geometry of the workspace.



Video from a GoPro camera (fast motion video for presentation purposes)
After filtering, 3000 images for the training



3D volumetric reconstruction