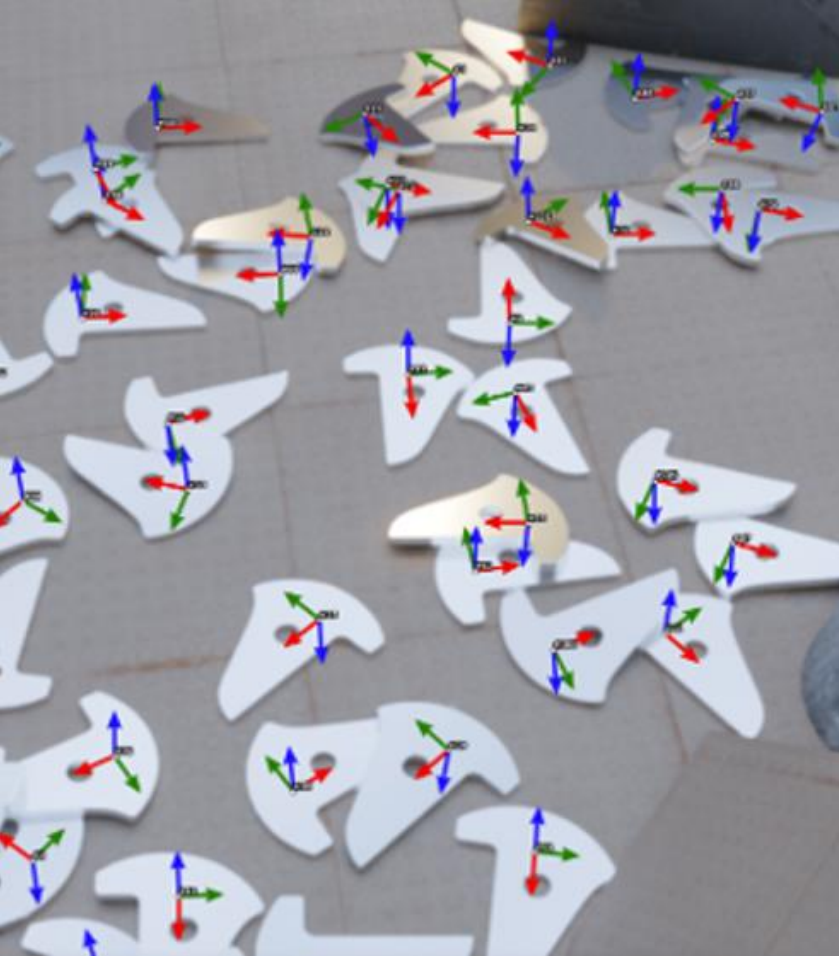




Francesco Crivelli
Head of Research & Business Development

Photonics4MedTech, 10.09.2026

FROM PIXELS TO MOTION VISION FOR AGILE ROBOTICS





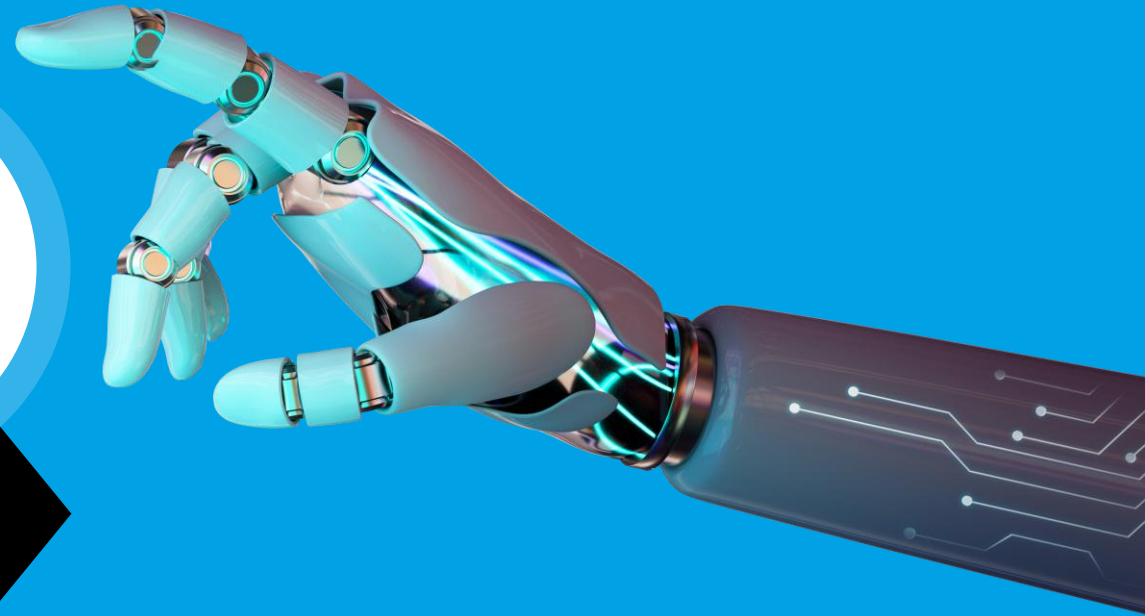
Source: NEURA Robotics

THE ENGINE BEHIND HUMANOIDS AGILITY

DIGITAL

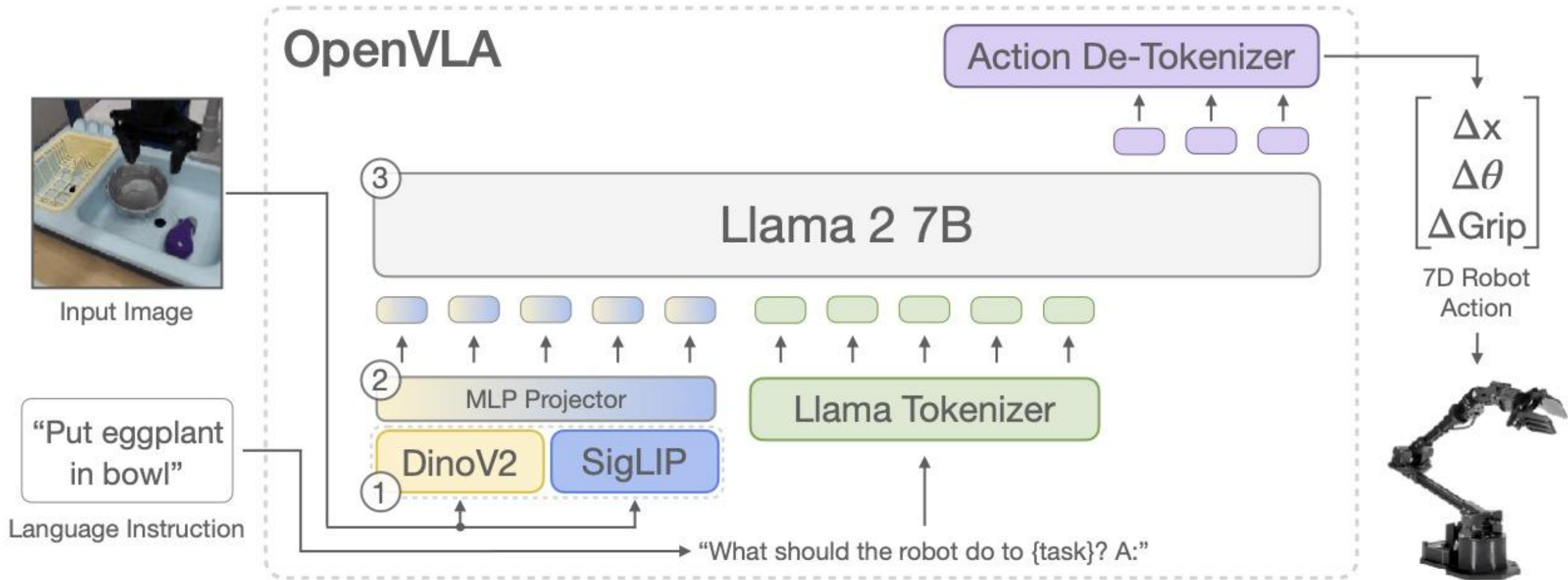
REAL

**PHYSICAL
AI**



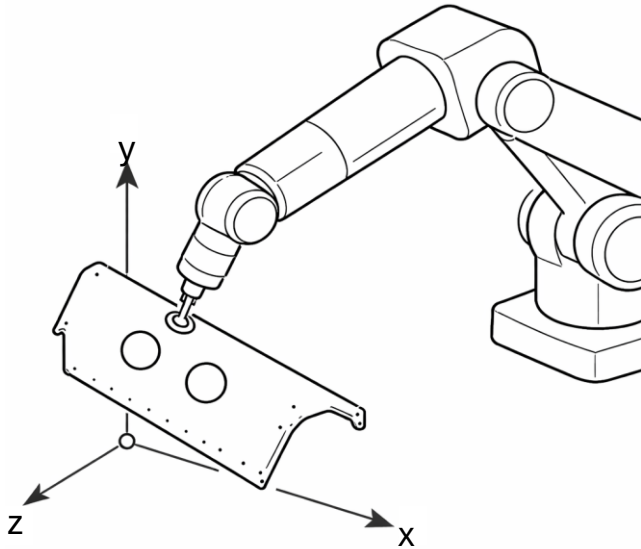
VISION-LANGUAGE-ACTION (VLA) MODELS

END-TO-END FROM PIXEL TO MOTION COMMAND

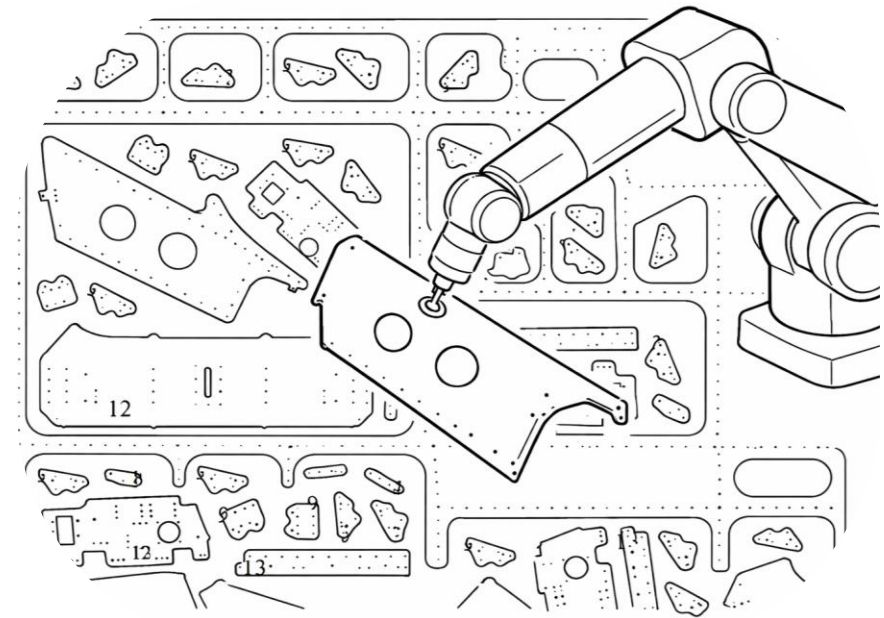


TOWARD GOAL ORIENTED ROBOTICS

“Move to position (10,35,22)”



“Sort all Parts according to ID number”



AGILE PERCEPTION AND CONTROL

Mission generation

Analyse available information, take decisions and define the tasks to be executed to achieve the desired goal

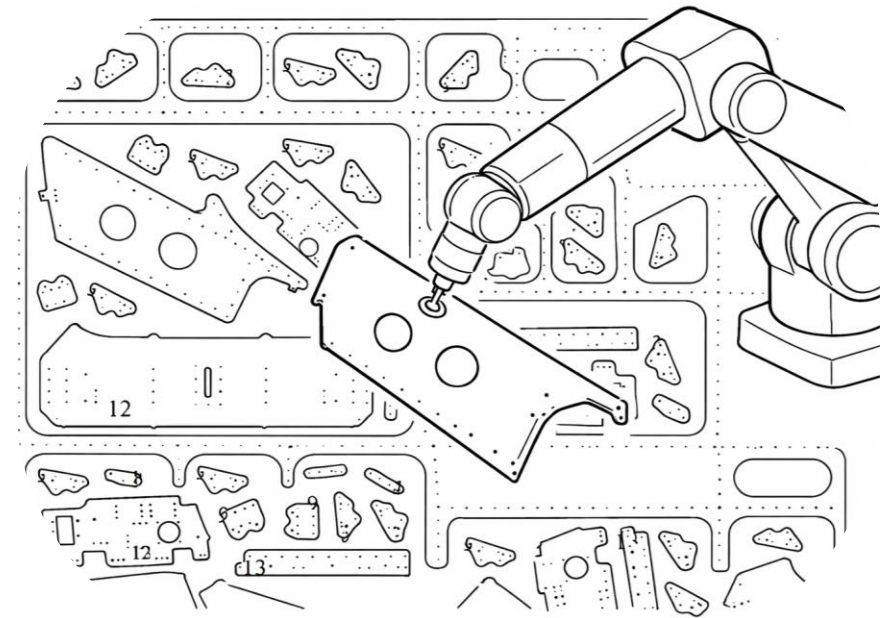
→ Very specific and today mostly preprogrammed

Mission execution

Perceive the environment and uses this information to navigate and move

→ Generic, mostly autonomous already

“Sort all Parts according to ID number”



AGILE PERCEPTION AND CONTROL



Agile part handling

- Bin-picking
- Machine tending
- Intra-logistic

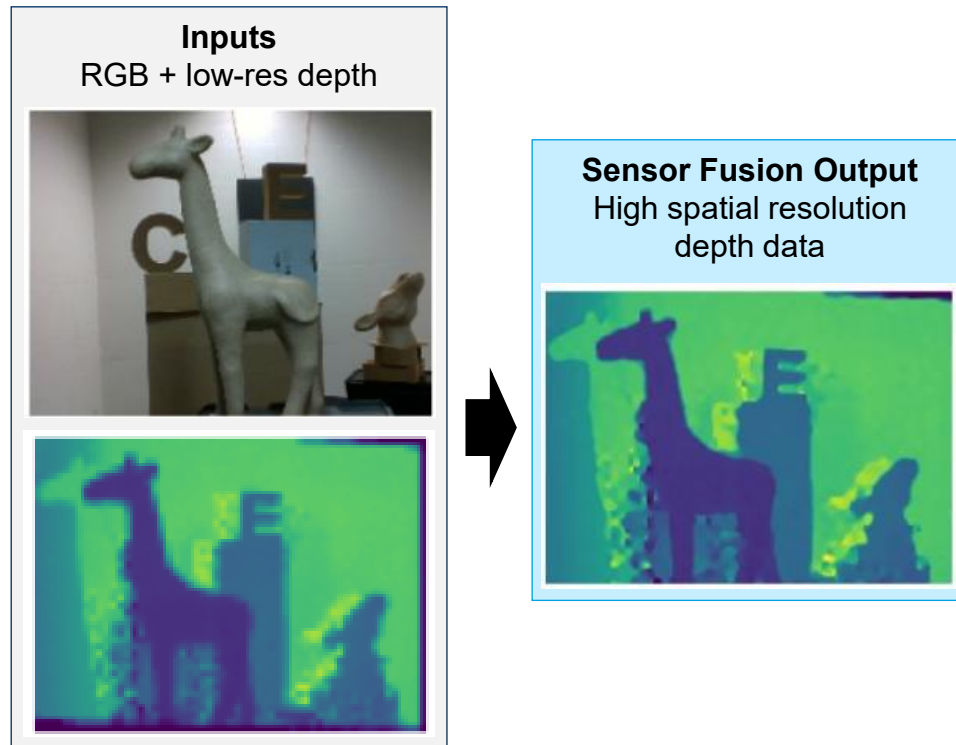


Monitoring and inspection

- Parts quality control
- Monitoring and routine maintenance in industrial plants or infrastructure
- Troubleshooting and root-cause analysis

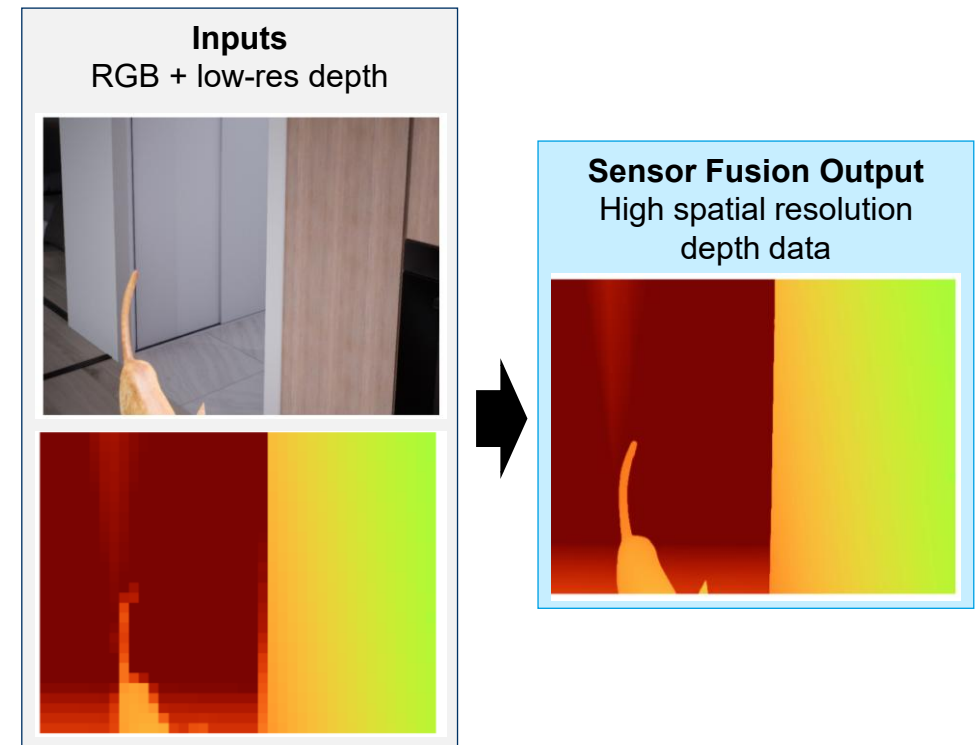
CAMERA-LIDAR ALGORITHMS FOR RESOLUTION-IMPROVED THREE-DIMENSIONAL IMAGERY

Pre-study results
with CSEM flash LiDAR



8x spatial depth upsampling

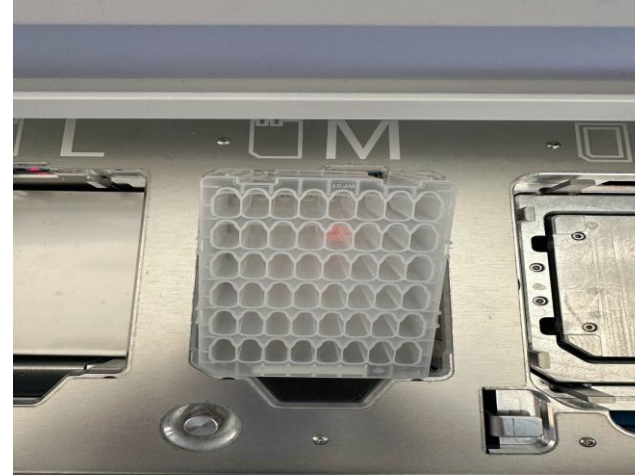
Pilot study results
with public datasets



16x spatial depth upsampling

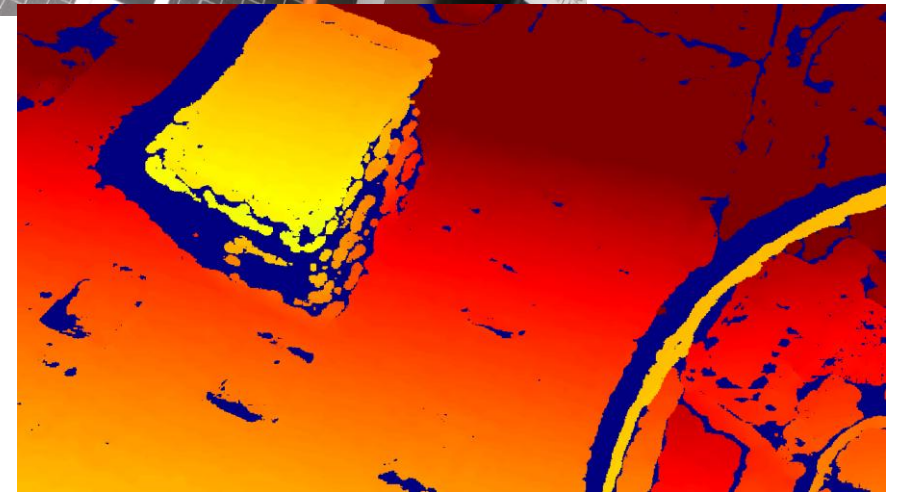
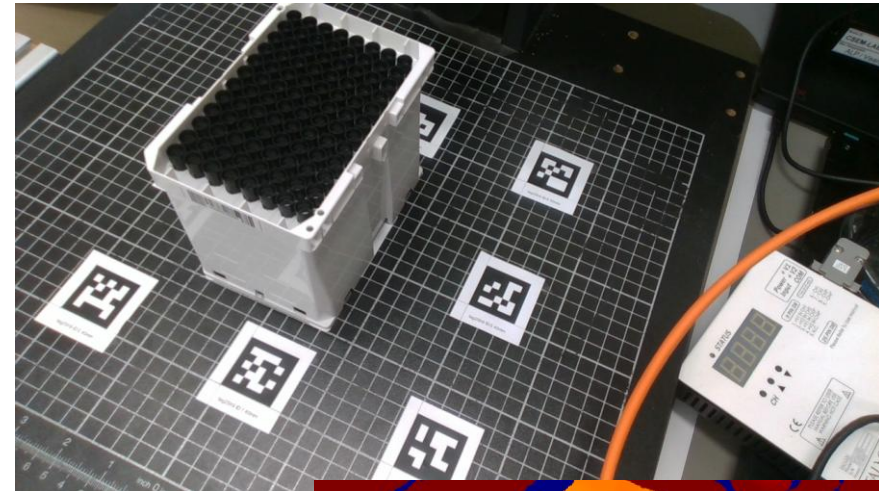
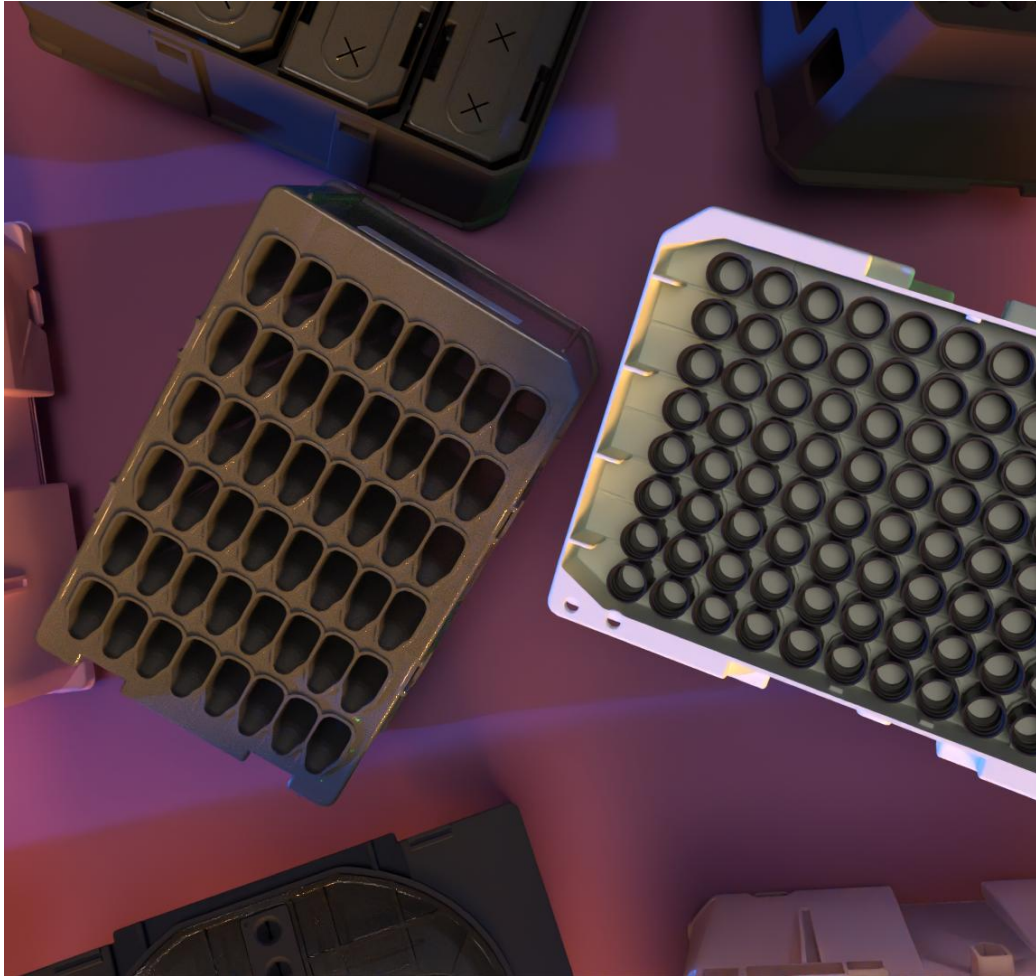
AUTONOMOUS LABWARE HANDLING

FLEXIBLE BUT ROBUST



AUTONOMOUS LABWARE HANDLING

FLEXIBLE BUT ROBUST



INFRASTRUCTURE MONITORING

FLEXIBLE MISSION PLANNING



HARDWARE-IN-THE-LOOP AGENTIC SYSTEM MANIPULATION AND INSPECTION





Inspection Robot

AUTONOMOUS

72%

- ☒ Navigate to valve
- ☒ Inspect and scan
- ☒ Analyze leak
- ☐ Generate report



Machine Tending Robot

IN PROGRESS

4/6 parts

- ☒ Pick part from tray
- ☒ Move to machine
- ☐ Load into machine
- ☐ Close door



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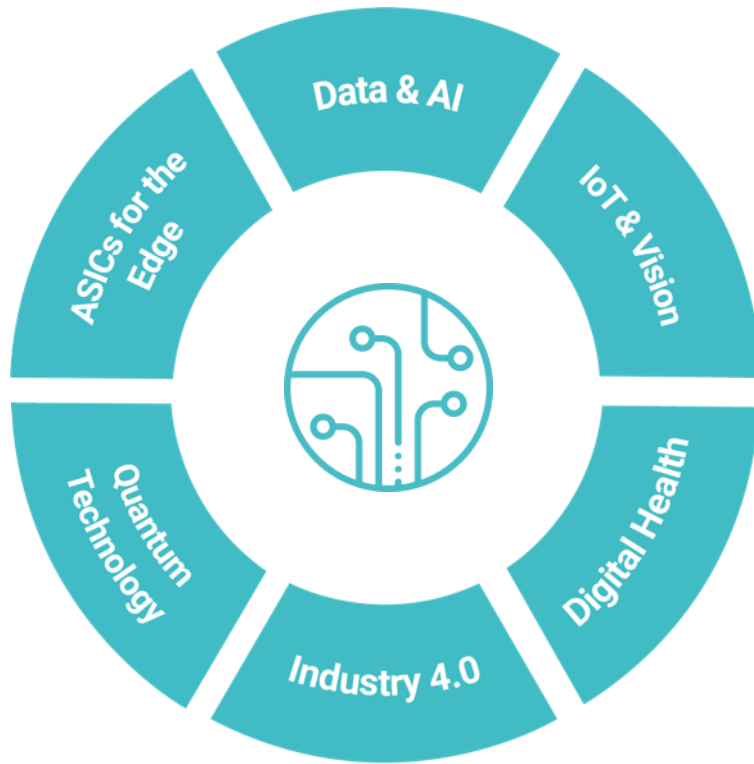


csem

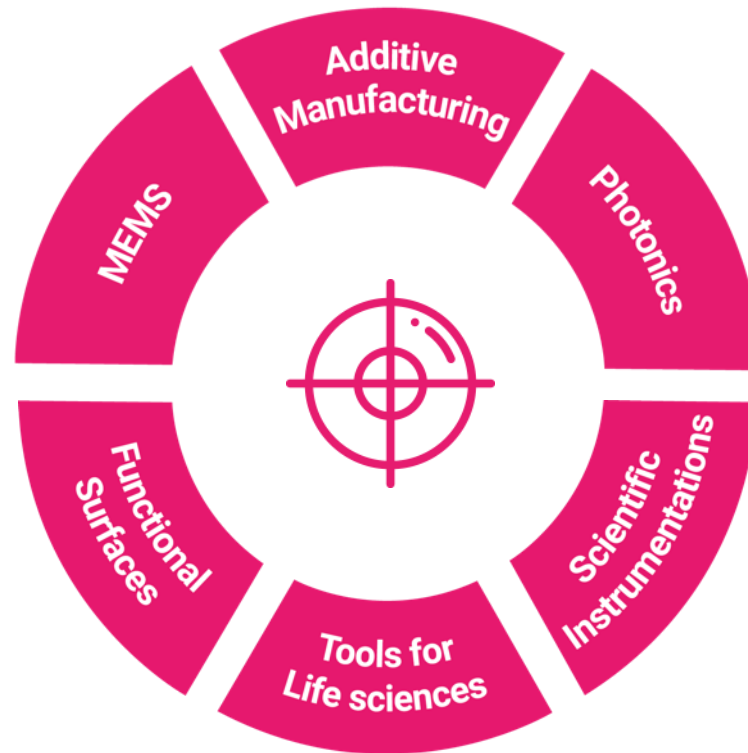
FACING THE CHALLENGES OF OUR TIME

RESEARCH PRIORITIES @CSEM

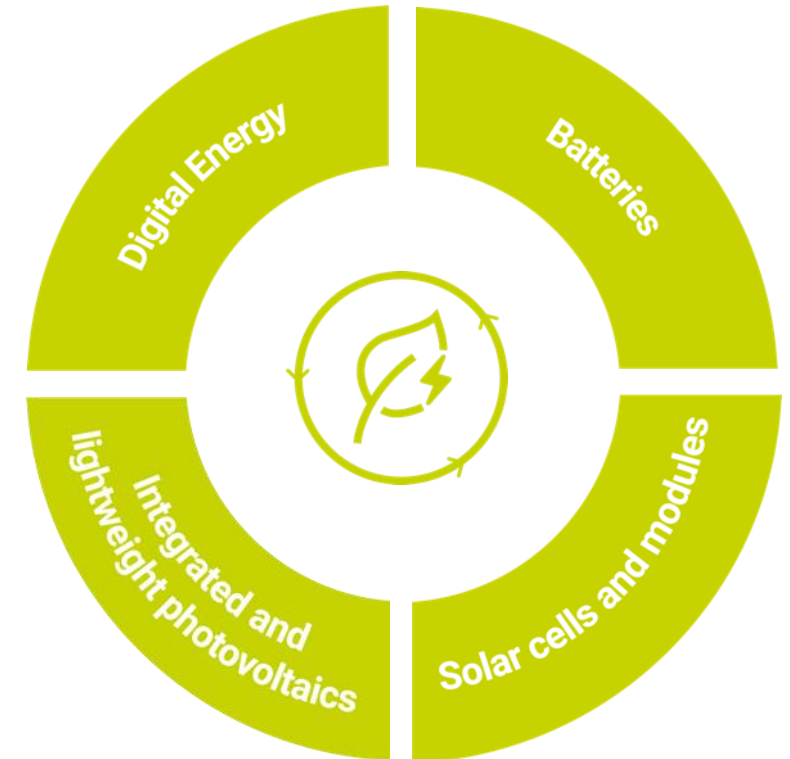
Digital Technologies



Precision Manufacturing



Sustainable Energy



WHY COMPANIES CHOOSE CSEM AS THEIR PARTNER



Deep expertise in vision and deep learning

(25+ years robotics, 18+ years Deep Learning)



Industry-ready prototyping – not just research



Unique integration of Hardware + Software



Fully embedded in the EU research landscape



Close collaboration with clients



End-to-end customization: from sensors to data analysis

n|w EPFL ETH zürich PAUL SCHERRER INSTITUT FFI

SUPSI SDSC idiap

FH Empa Materials Science and Technology OST Hes-SO

FH GR WYSS CENTER HSLU

swissuniversities zhaw

... and many more +



HOW WE WORK: YOUR CHALLENGE, OUR MISSION

From Problem



Understand **your**
process and pain

Co-Design



Select and tailor the
right technologies

Prototype



Co-create, prototype,
and test in **industrial**
environments

Integration



Transfer and **support**
for scaling

OUR TECHNOLOGY TOOLBOX FOR SMARTER INDUSTRY

