Agder Batteri - Delingsarena

SØRLANDETS KOMPETANSEFOND

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UiA
University of Agder
Norway

LIBRES - Lithium ion Battery Recycling

Martin Choux,
Email: martin.choux@uia.no

22. Oct. 2020

LIBRES – NFR supported Lithium Ion Battery Recycling project

Project facts

- Hydro is project owner
- Main goal
  - Develop a design basis for a LIB recycling pilot plant in Norway
  - The pilot plant shall be large enough to handle commercial volumes in 2024
- Budget
  - 22 millNOK over 4 years (2018-2022)
- Partners
  - Commercial: Hydro ASA, Batteriretur AS, Glencore Nikkelverk AS, Keliber OY
  - R&D: IME RWTH Aachen, Elkem Technology, NTNU, UiA Grimstad

HYDRO

BATTERIRETUR® Vi gjenvinner batterier

Elkem A Bluestar Company

KELIBER

NIKKELVERK A GLENCORE COMPANY

RWTH AACHEN UNIVERSITY

NTNU

UiA University of Agder

EYDE CLUSTER | NCE EYDE Norwegian Center of Expertise Sustainable Process Industry

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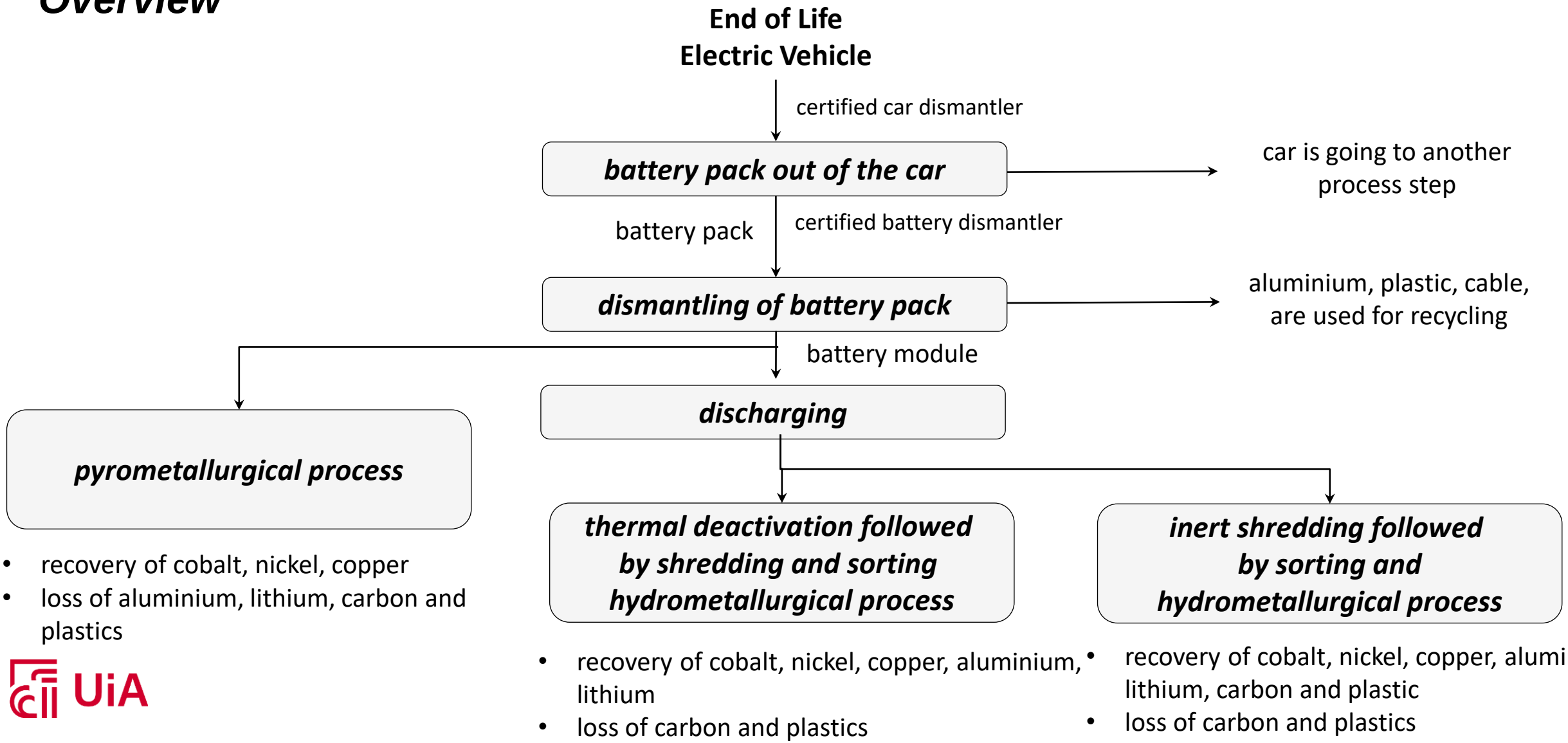
Principle of the LIB Recycling route

Overview



- recovery of cobalt, nickel, copper
- loss of aluminium, lithium, carbon and plastics

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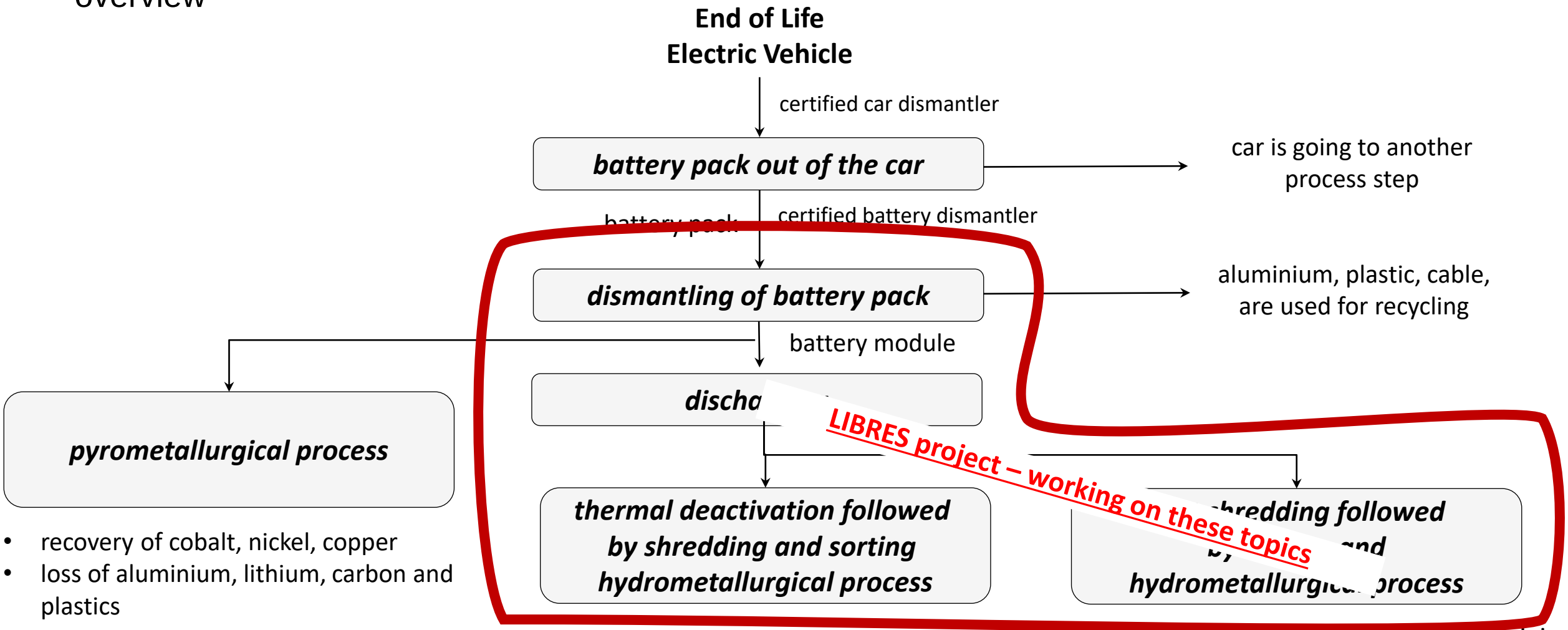

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Robotic Disassembly

of electric vehicle battery packs

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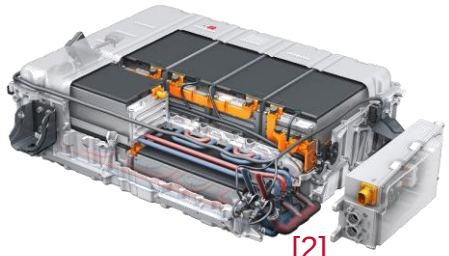
Goals

Developing a **robotic dismantling process** from a battery pack to cell level components

LIBRES WP1

[1]

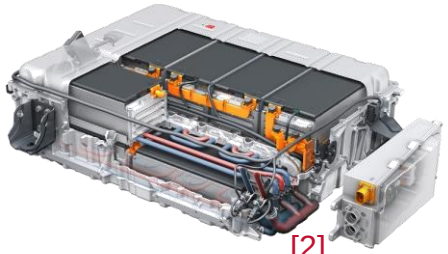


[2]

[2]

[3]

Robotic system that will deal with a **large variety of battery systems**



[2]

[4]

[5]

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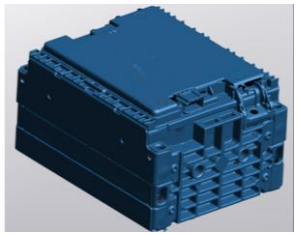
Challenges

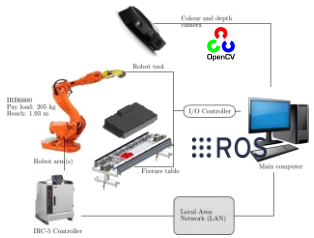
- Large variations in battery pack/module/cell designs
- Dirty battery packs – recognition challenges

- Recognition of different components (e.g. flexible cables)
- Dismantling process with a minimum number of tool changes
- Safety issues with regards to high voltages and chemicals

Approach

Battery Models → Disassembly plan / process → Connections → Robot Integration → Testing Cognitive Algorithms





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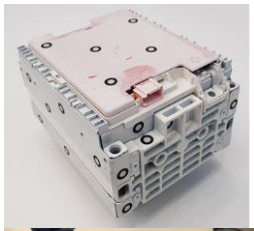
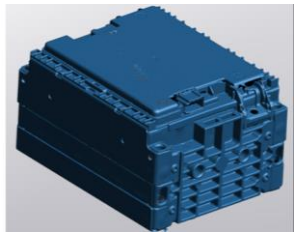
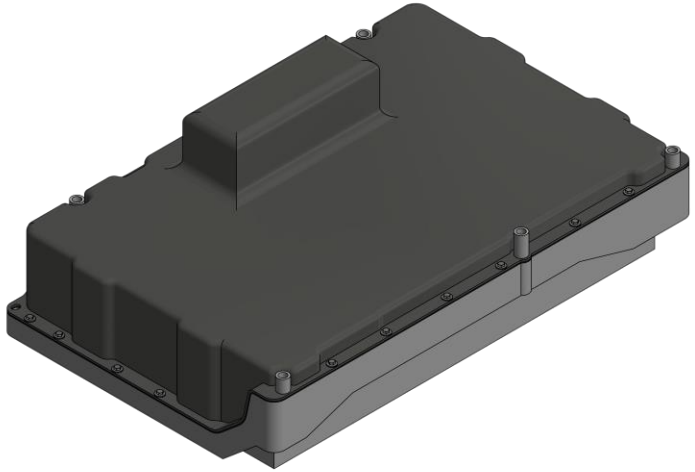
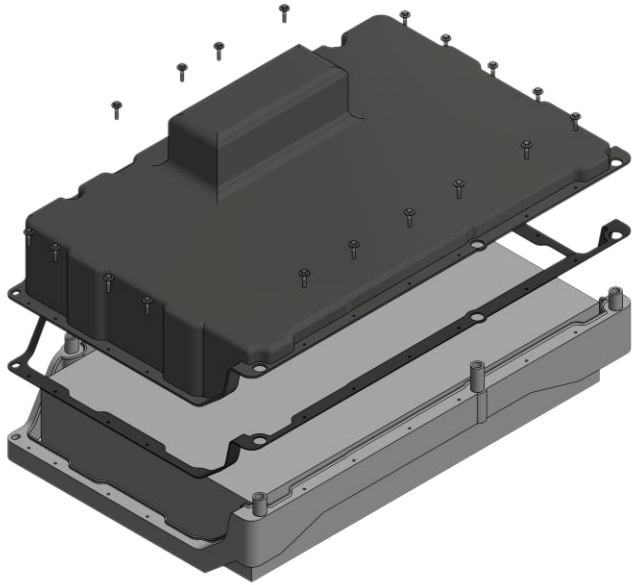
Battery Models

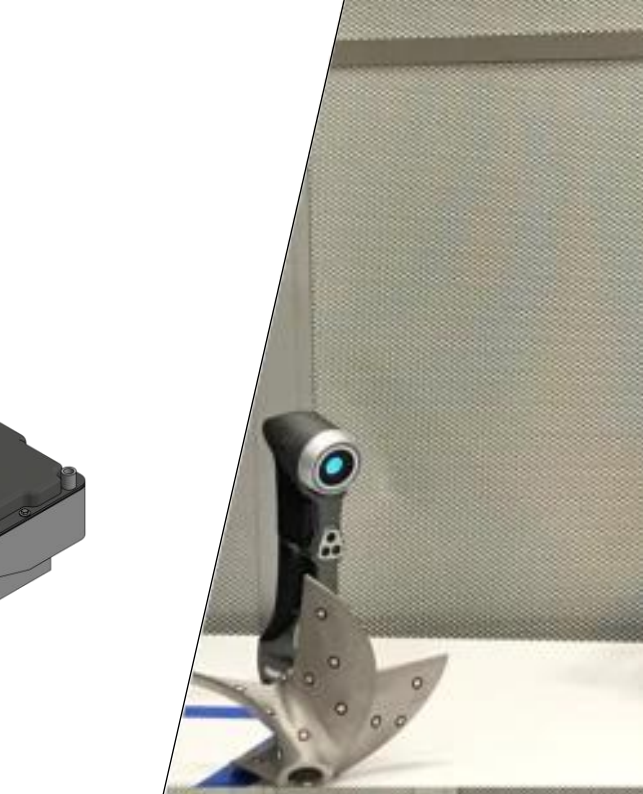
3D Scanning / Modelling











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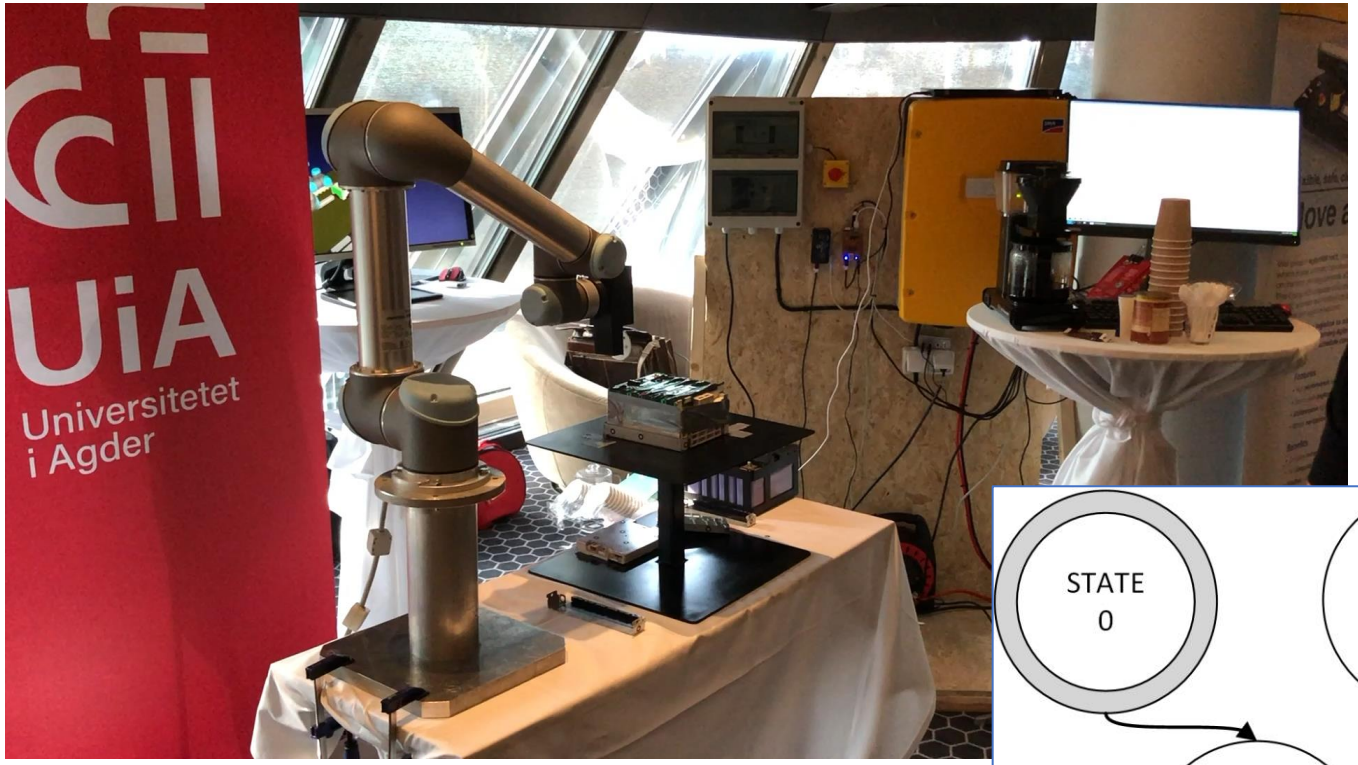
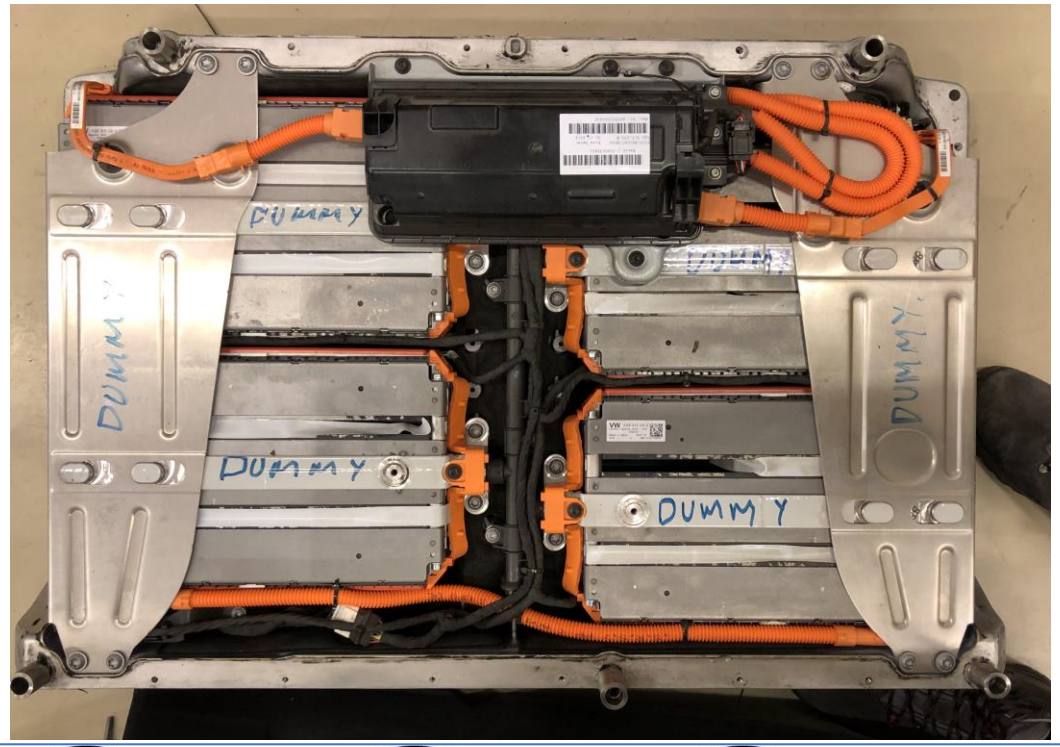
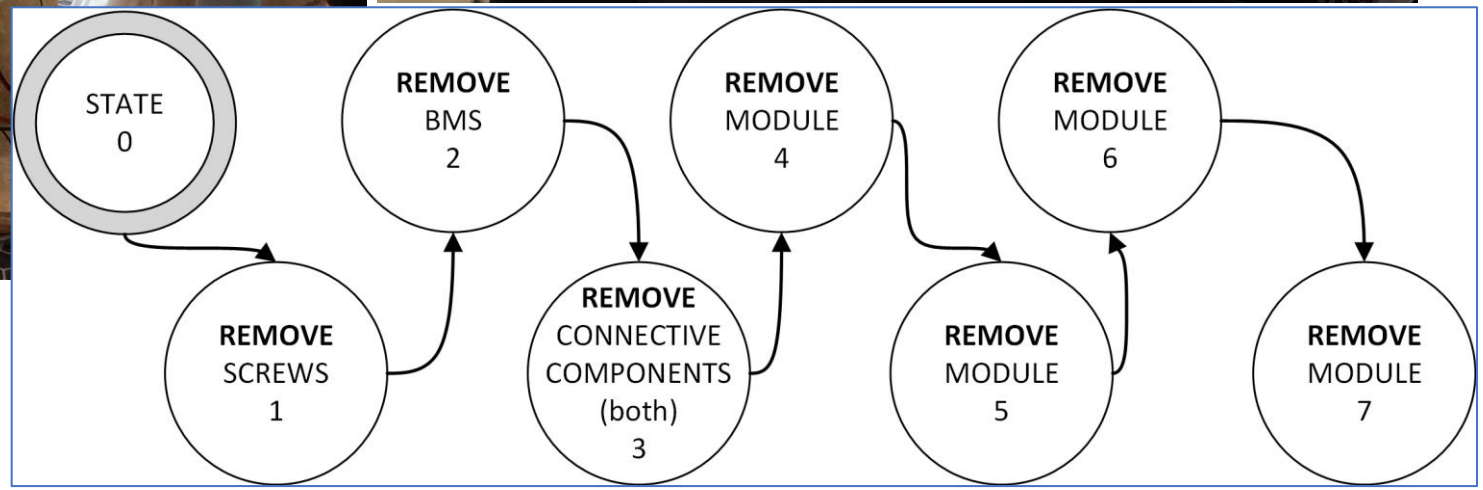
Battery Models

Disassembly plan / process

Disassembly Sequence Plan







Oslo Battery Days, August 2019

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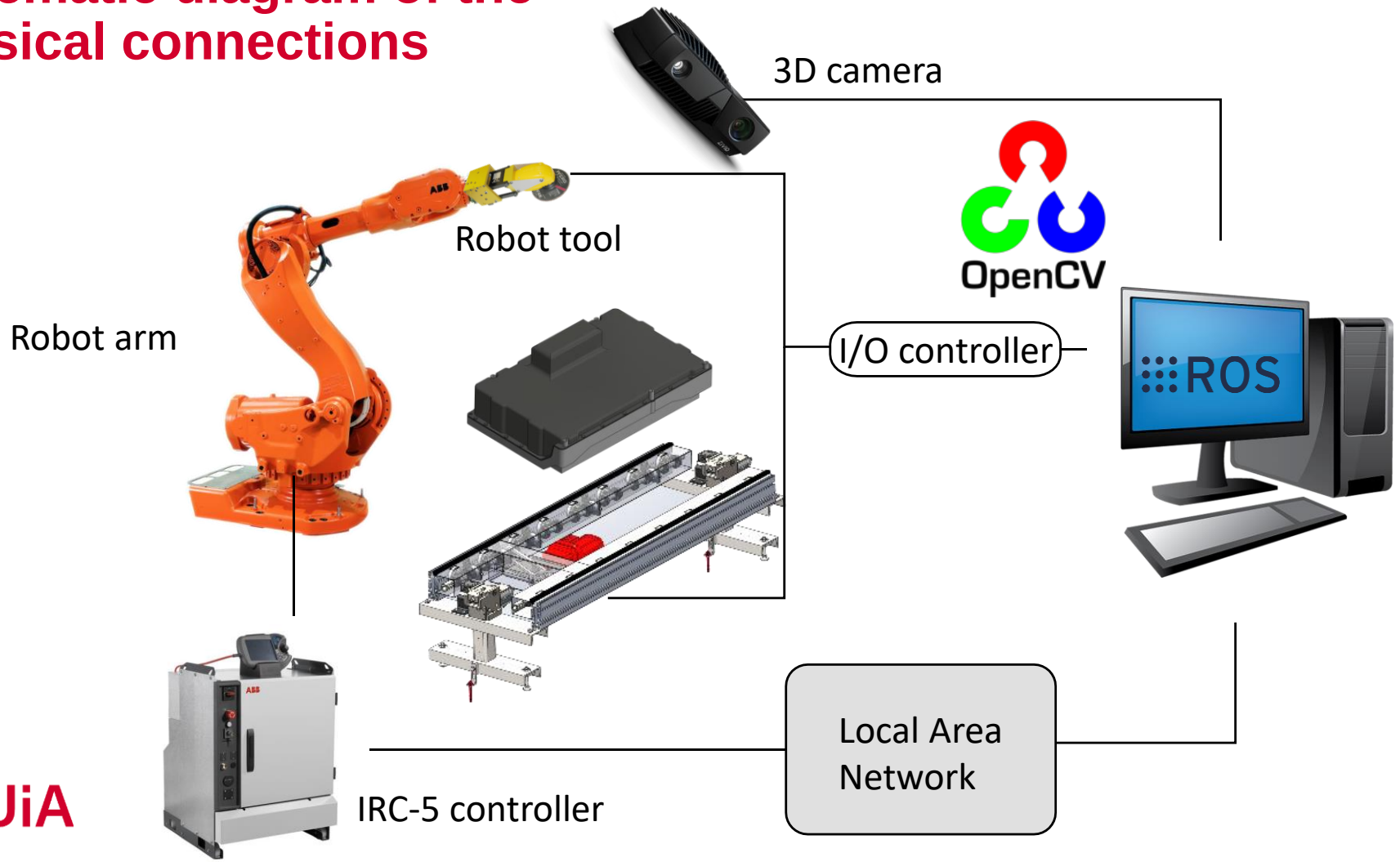
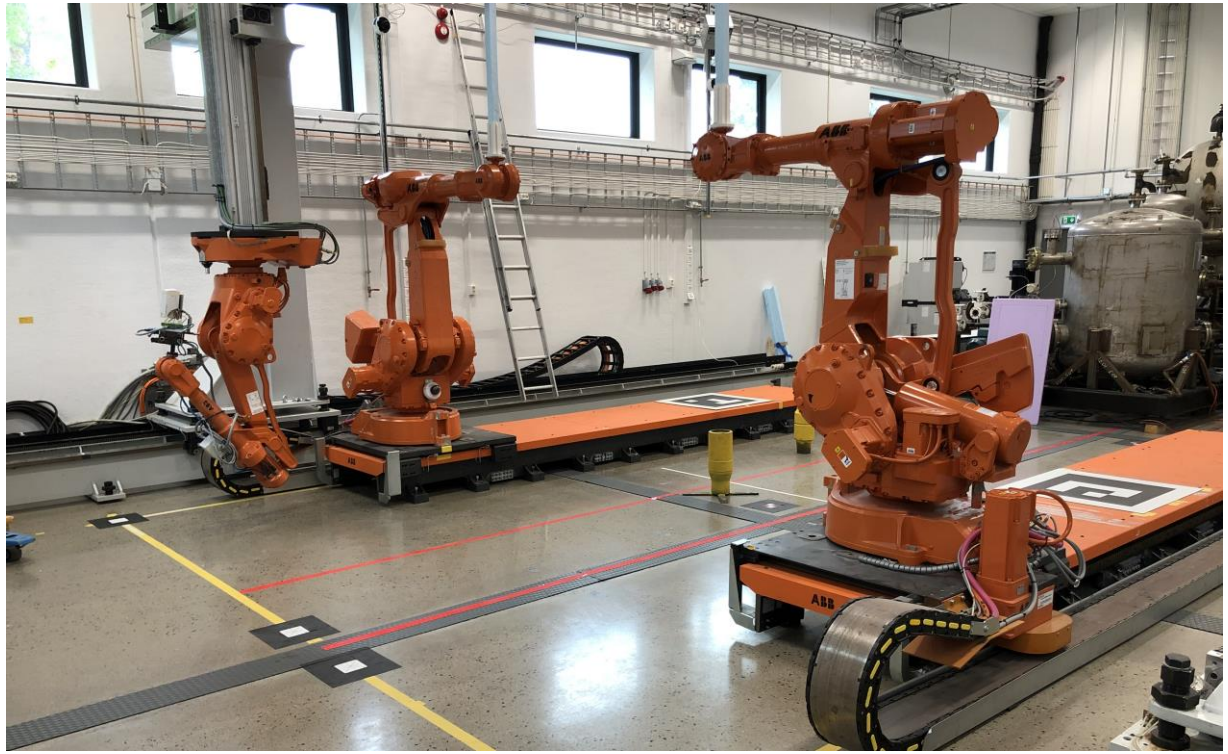
Schematic diagram of the physical connections



Battery Models → Disassembly plan / process → Connections → Robot Integration

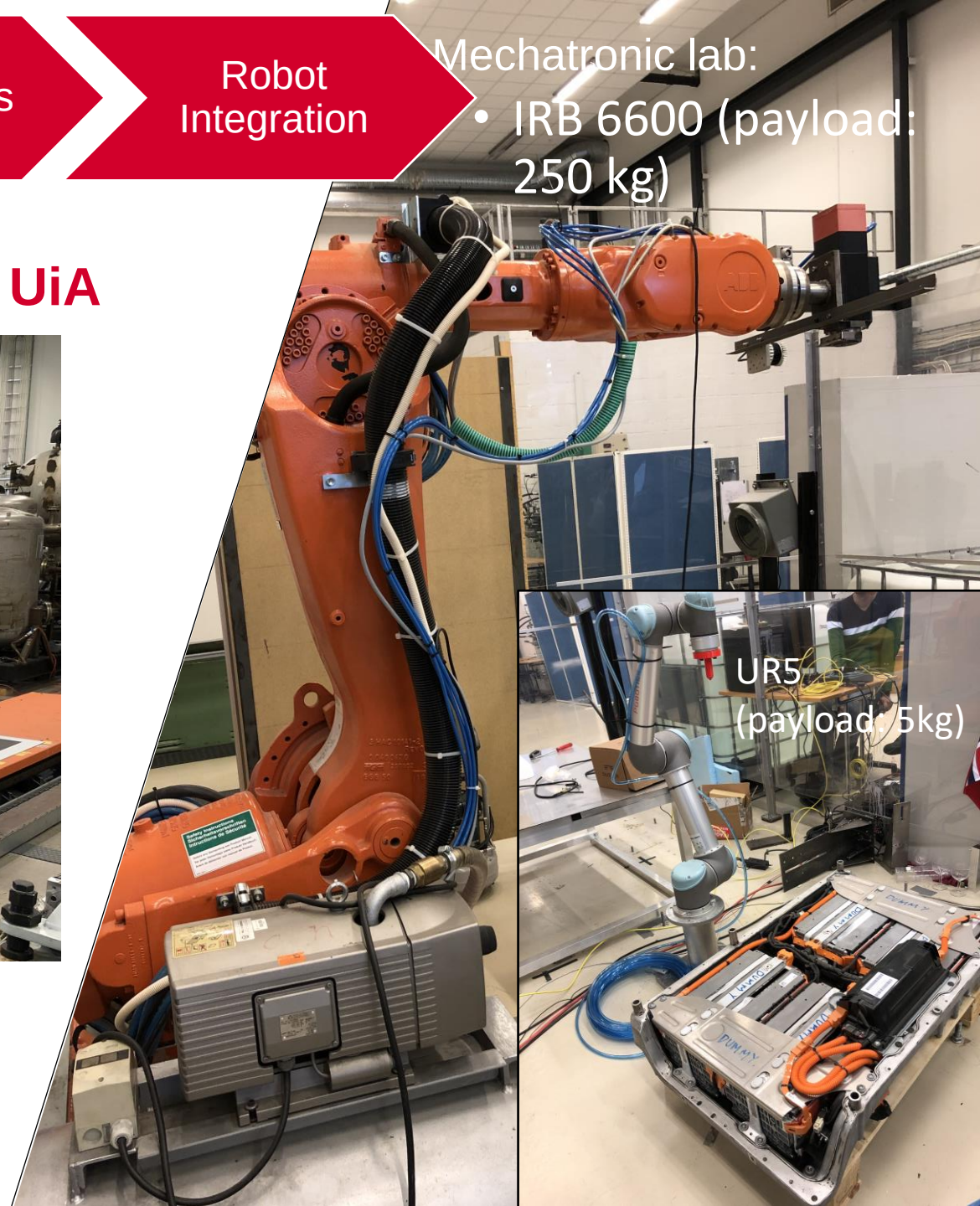
Lab space allocated for dismantling at UiA



- Robot Lab
  - 2* IRB 4400 (payload: 60 kg)
  - IRB 2400 (payload: 7-20 kg)

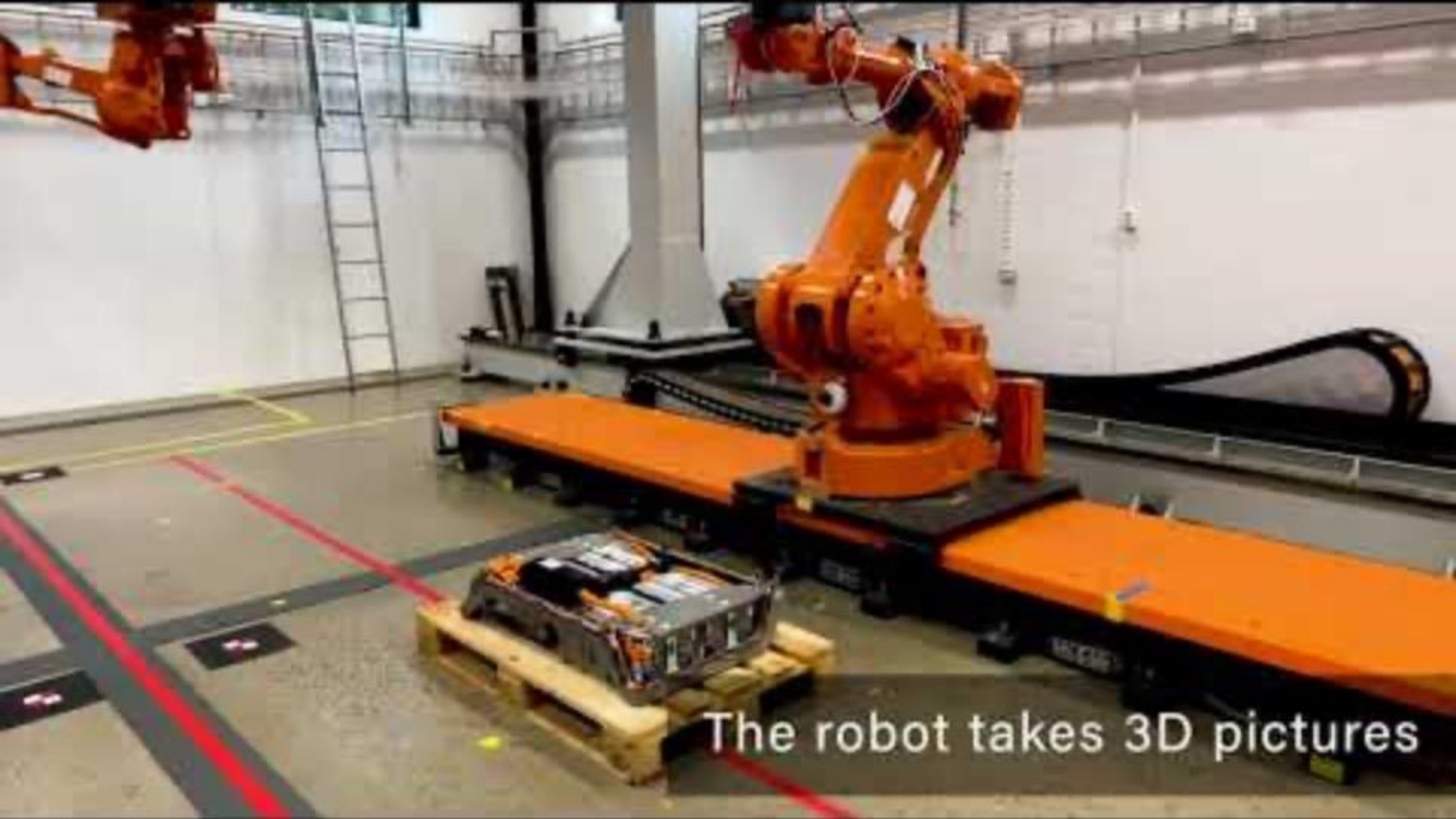
Mechatronic lab:

- IRB 6600 (payload: 250 kg)



Cognitive Robotic Agent

- Image Capturing
- Object detection (2D Image analysis).
- Pose estimation (3D Point cloud and depth image).
- Decision making.
- Robot communication and path planning (using ROS and MoveIt!).


The robot takes 3D pictures

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