

# Robotics for Critical Raw Materials



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**We live in a science-fiction age.  
Yesterday's fantasy is already today's fact.**

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**Chester Whitehorn, "Science Fiction Digest", 1954**



# Robotics: Where we stand







# Intelligent Robots



*Perceive  
Actively*



*Learn*



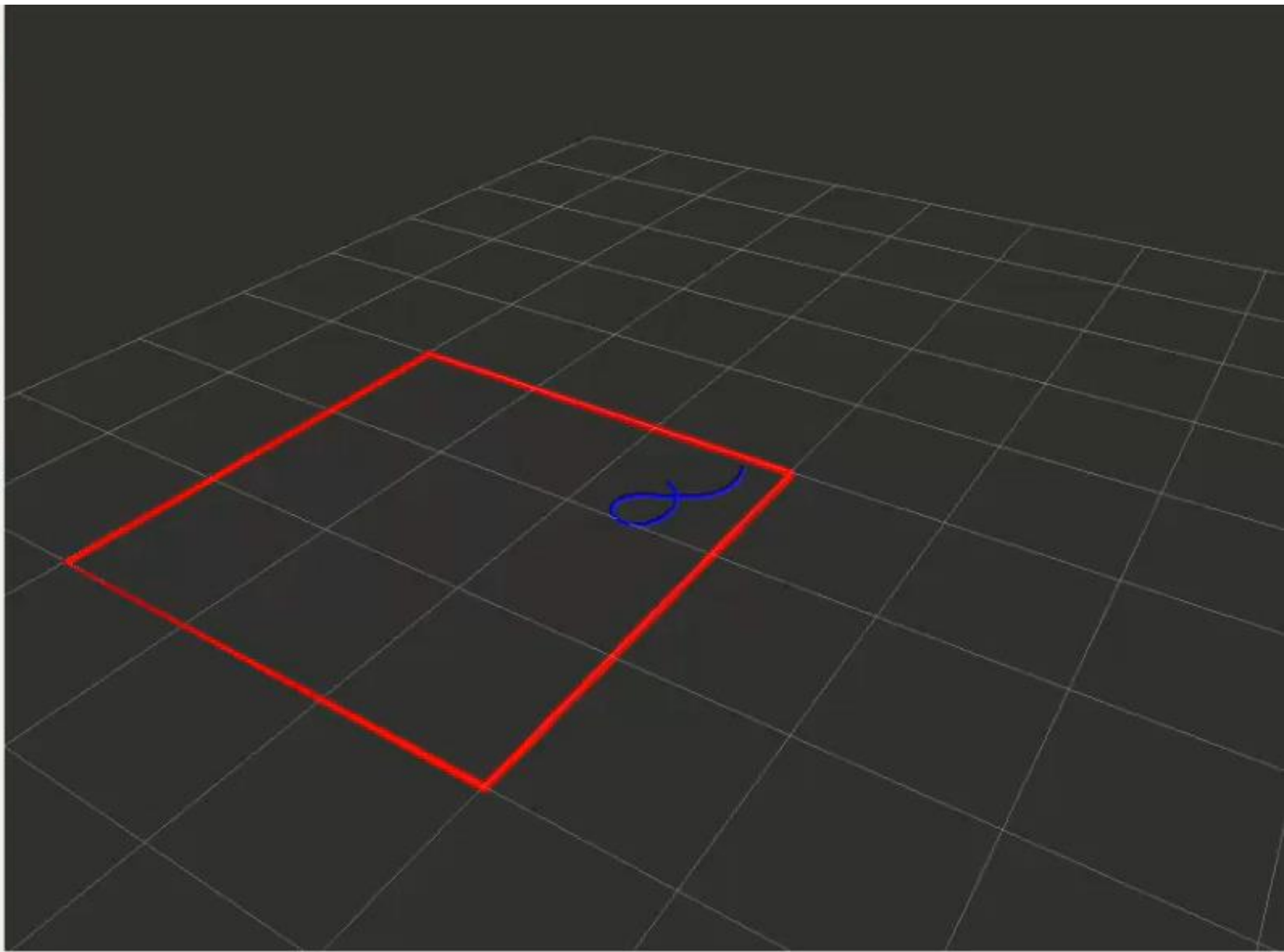
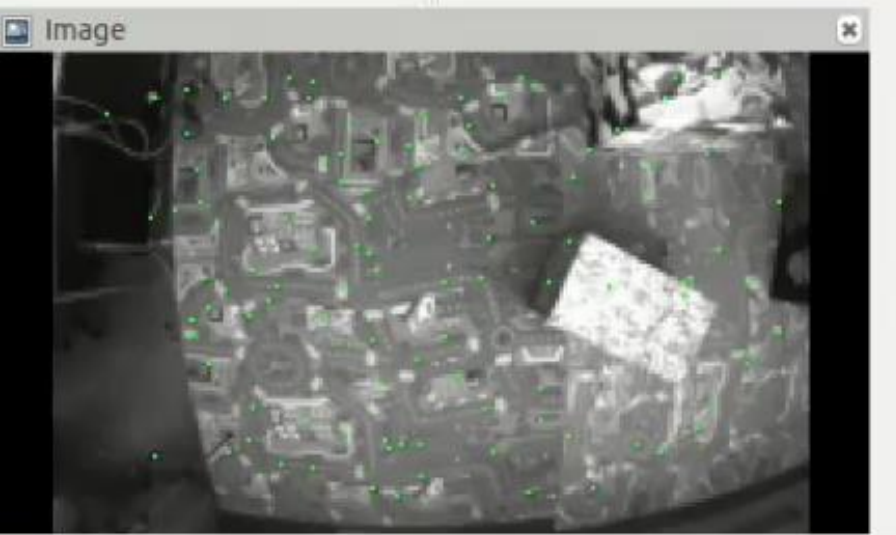
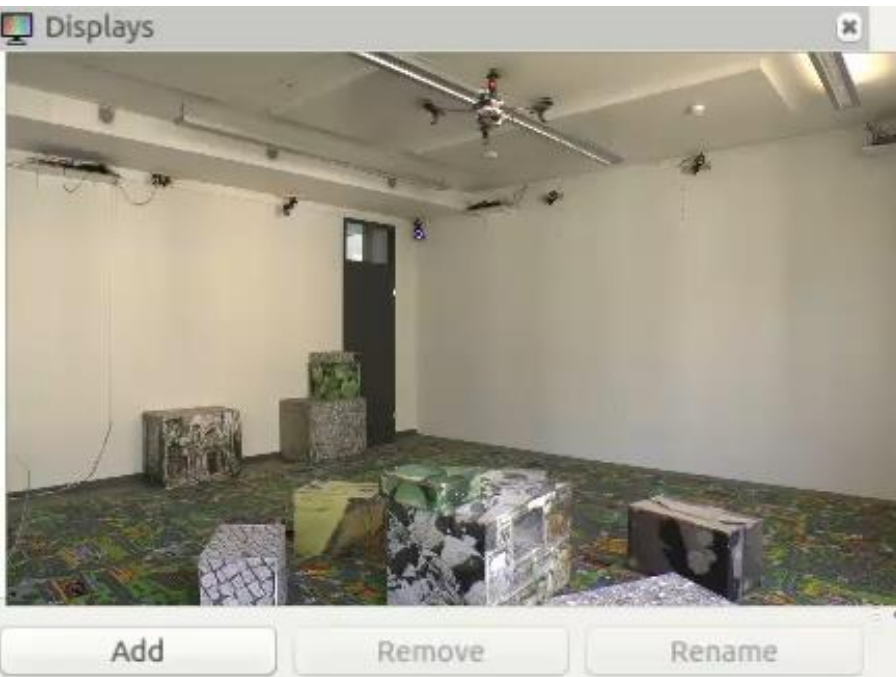
*Reason*



*Make  
Decision*

# Active dense 3D reconstruction for mobile eye-in-hand robot

Experimental run with cost weight 0.25







# Why Robots for CRM?



# EU Act on Critical Raw Materials

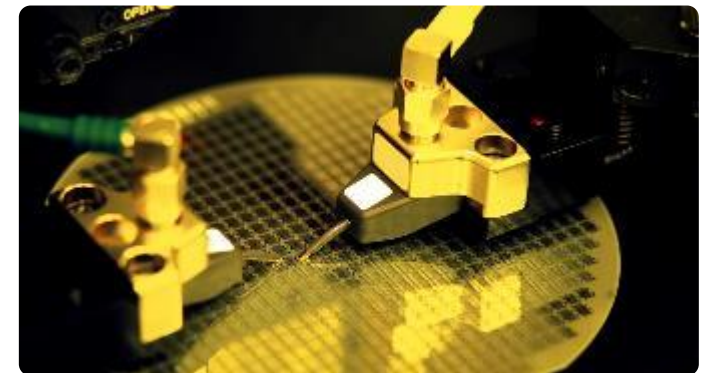
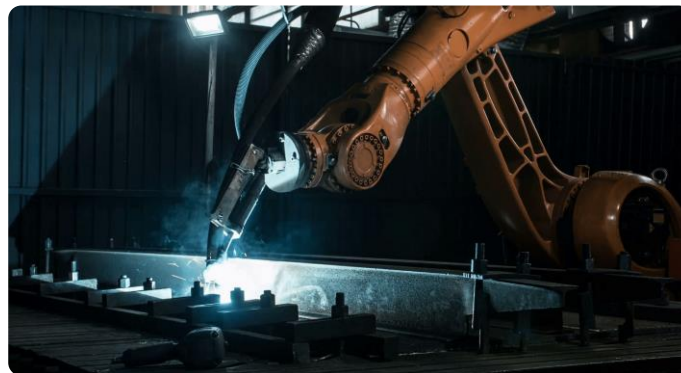


- Recycle CRMs
- Optimize use of CRMs
- Find new resources
  - In EU lands
  - Strategic partnership
  - Deep sea
  - Space

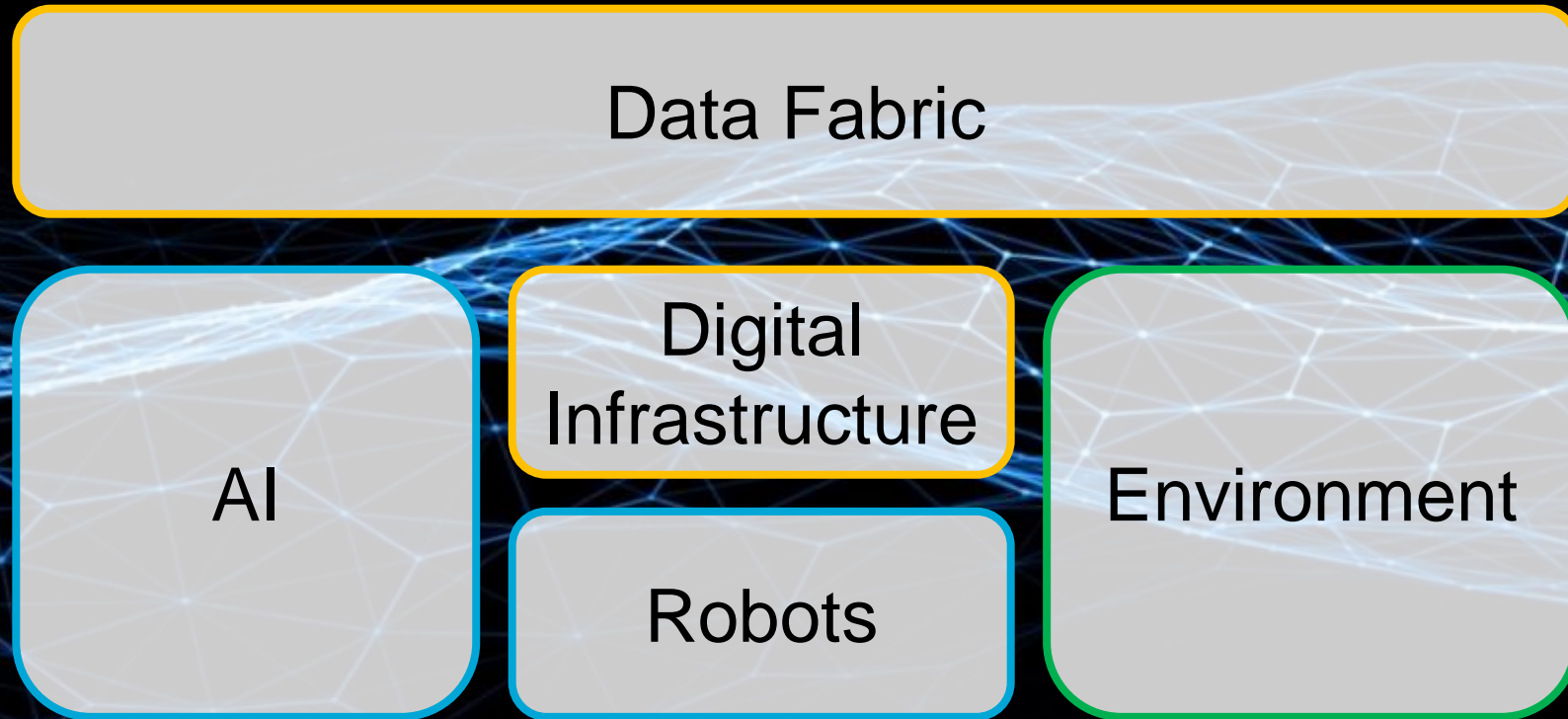
# Where do robots come to play?

- *Highly precise tasks*
- *Manipulating extra large objects*
- *Working in hazardous environments*

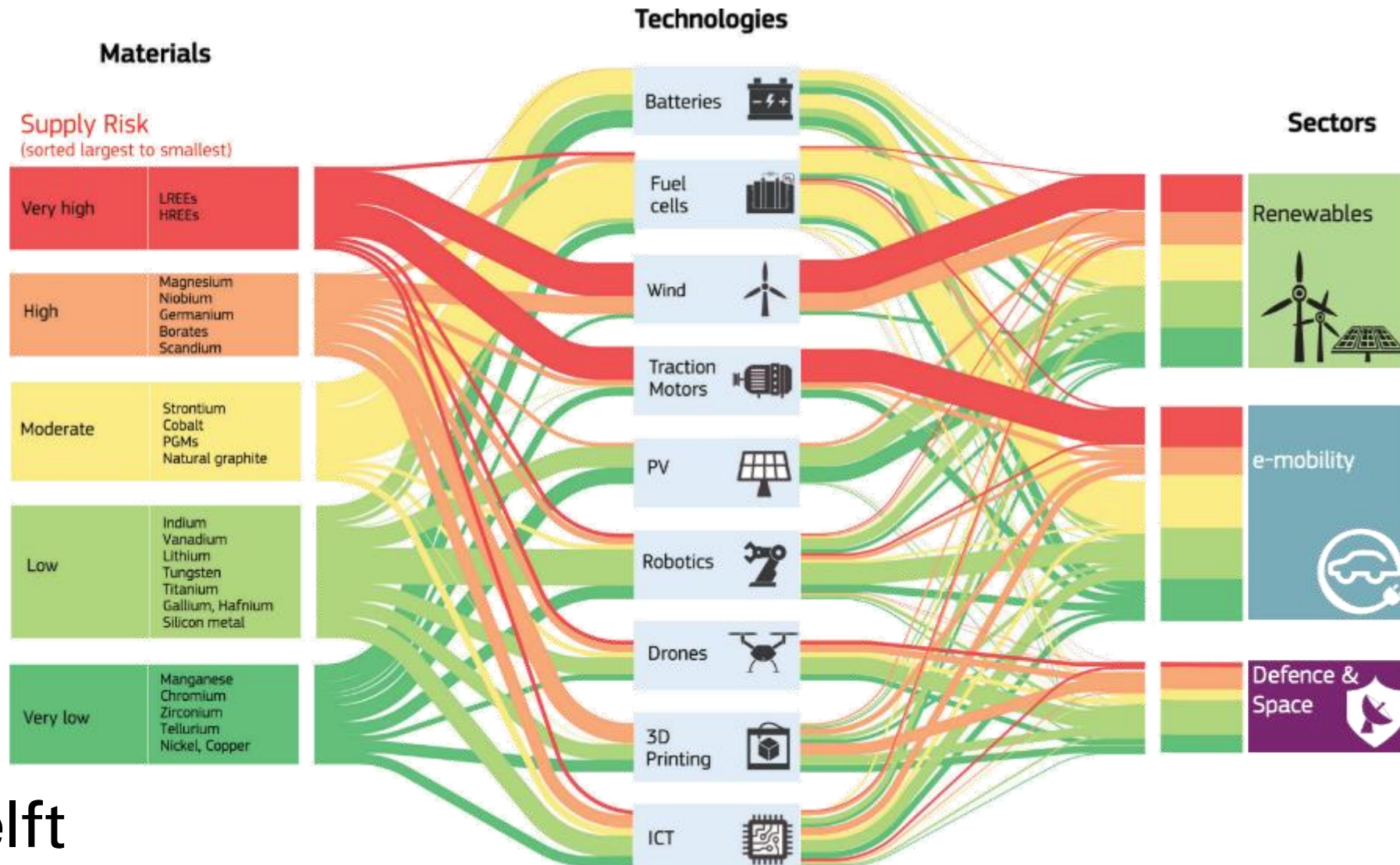
... are simply beyond human capabilities.



# Why are CRMs important for Robotics?



# EU Act on Critical Raw Materials - Strategic Technologies and Sectors



# Food for thought!

- Who holds accountability for the actions of intelligent robots?
- Should intelligent robots possess the capacity for feelings and emotions, what rights would they be entitled to?

