

GenAI for industrial robotics

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- Participation in more than **180 R&D Projects**
- Organization of more than **10 International conferences**
- Publication of more than **800 Scientific articles**



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Contents

Two use cases in AI for robotics

1. An LLM-based approach for enabling seamless Human-Robot collaboration in assembly

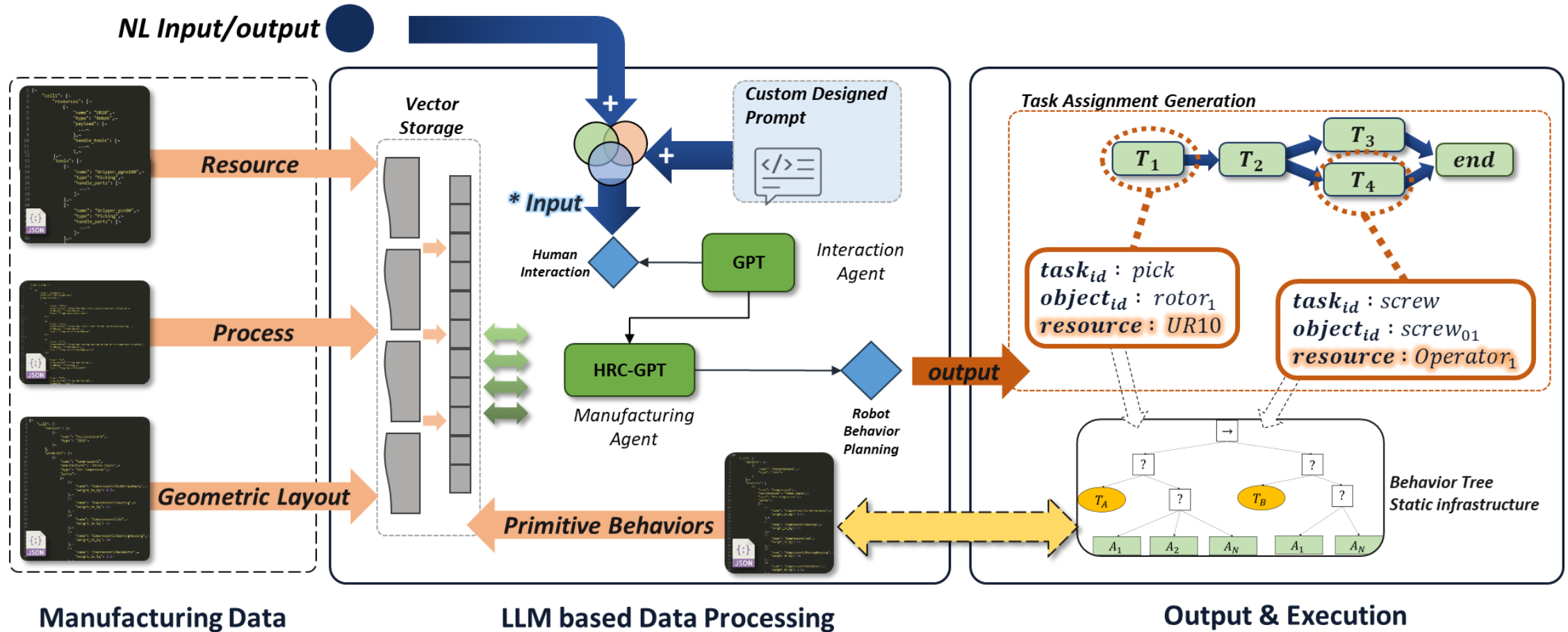


2. GenAI for supporting inspection activities in aerospace industry



Implementation

The architecture of the LLM-based execution system for HRC





[Click on the image to watch the video](#)

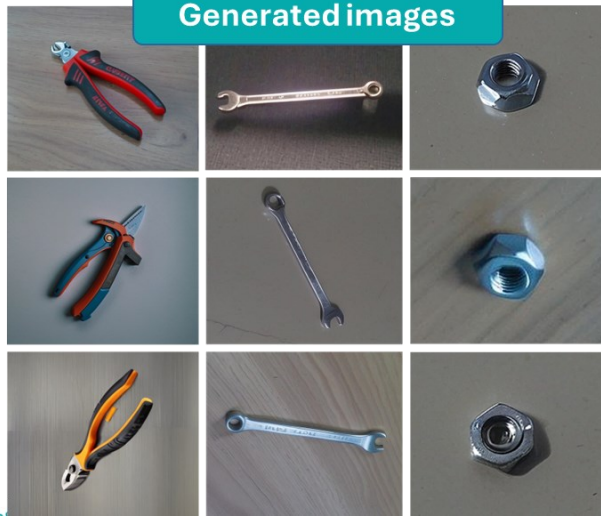
Image conditional Gen AI



Leonardo.Ai

- New images are generated using captured images as initial knowledge to the model
- Used Leonardo.Ai cGAN

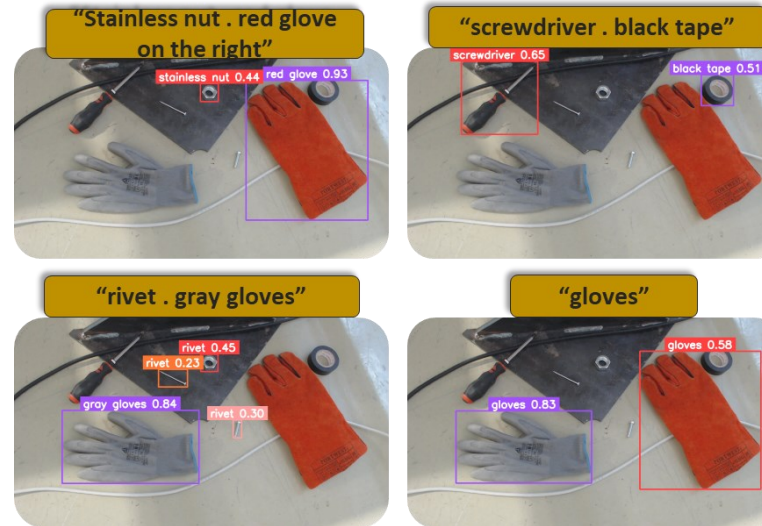
Generated images



Automatic annotation



- Automatic image annotation with text and image prompts
- GroundingDino tool



Augmentation of images



- New images with pixel and spatial transformations (Rotation, horizontal flip, zoom in, hue change, saturation, mix)
- Used the open source library Albumentations



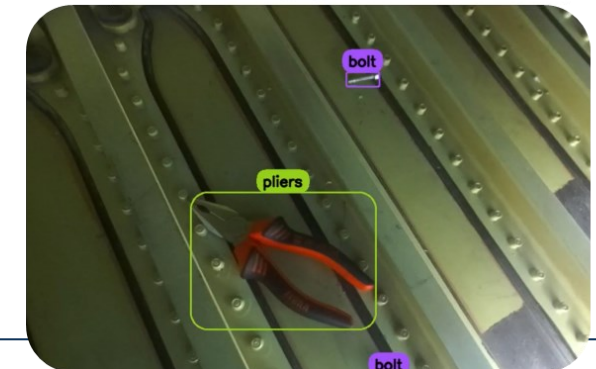
Technology:

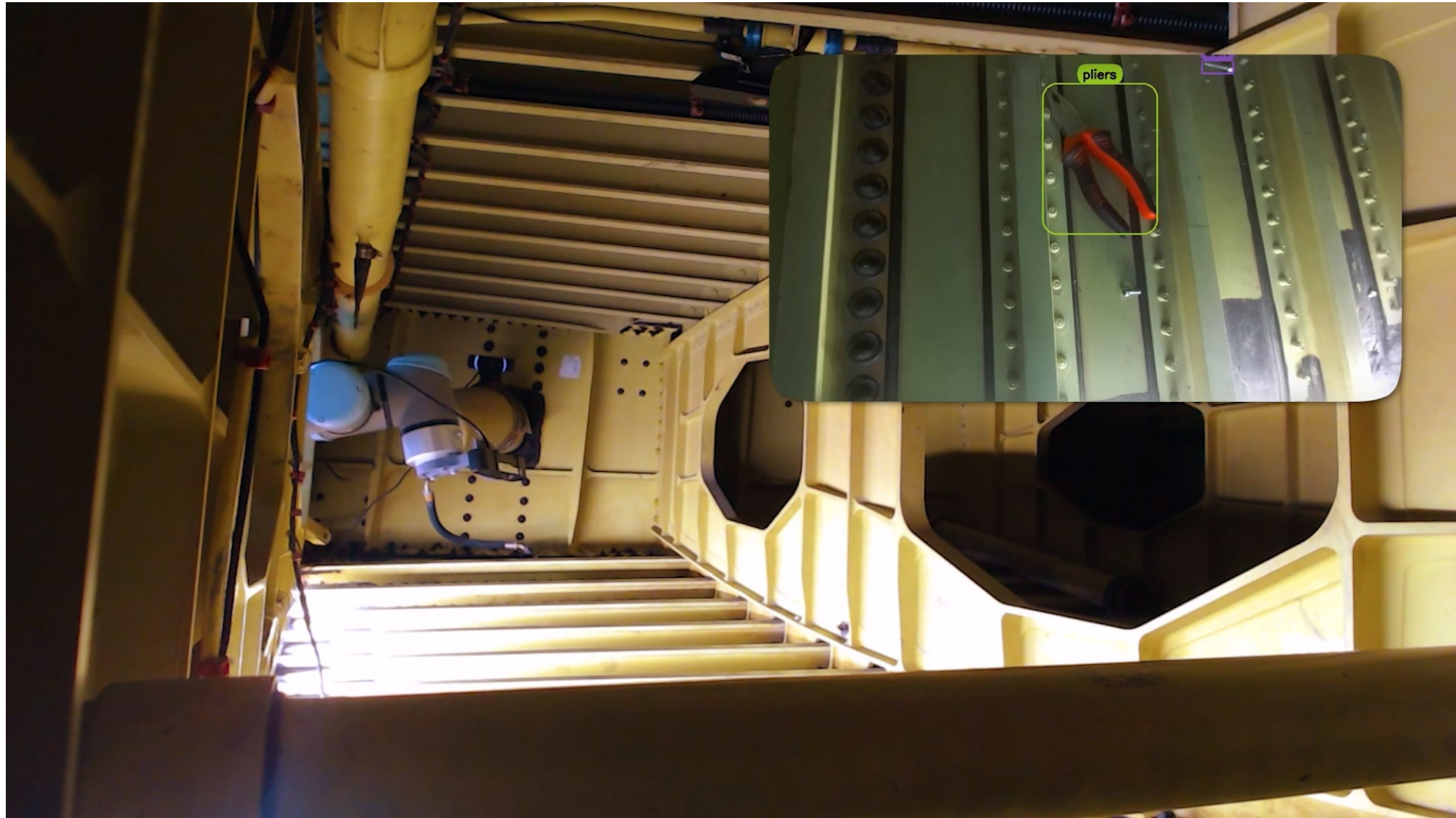
- i) Image generative AI for synthetic dataset creation
- ii) Large Multimodal Models (LMMs) for dataset labelling and validation
- iii) CNNs for object detection

Object detection model



- Real-time object detection model utilized throughout the inspection process
- Used YOLOv8 CNN.





Limitations, Challenges and Outlook

Limitations & Challenges

- Lack awareness of the environment and its physical constraints.
- Not suitable for real-time decision making.
- LLMs require continuous fine-tuning and updating to keep up with changing manufacturing processes and new product variants.

Outlook

- Refine training methodologies and prompt engineering strategies to improve performance in complex reasoning involving multiple parameters.
- Multimodality to include additional sources of information.
- Learn from experience. Setup continuous learning pipelines.

Generative AI for robotics and flexible industrial automation



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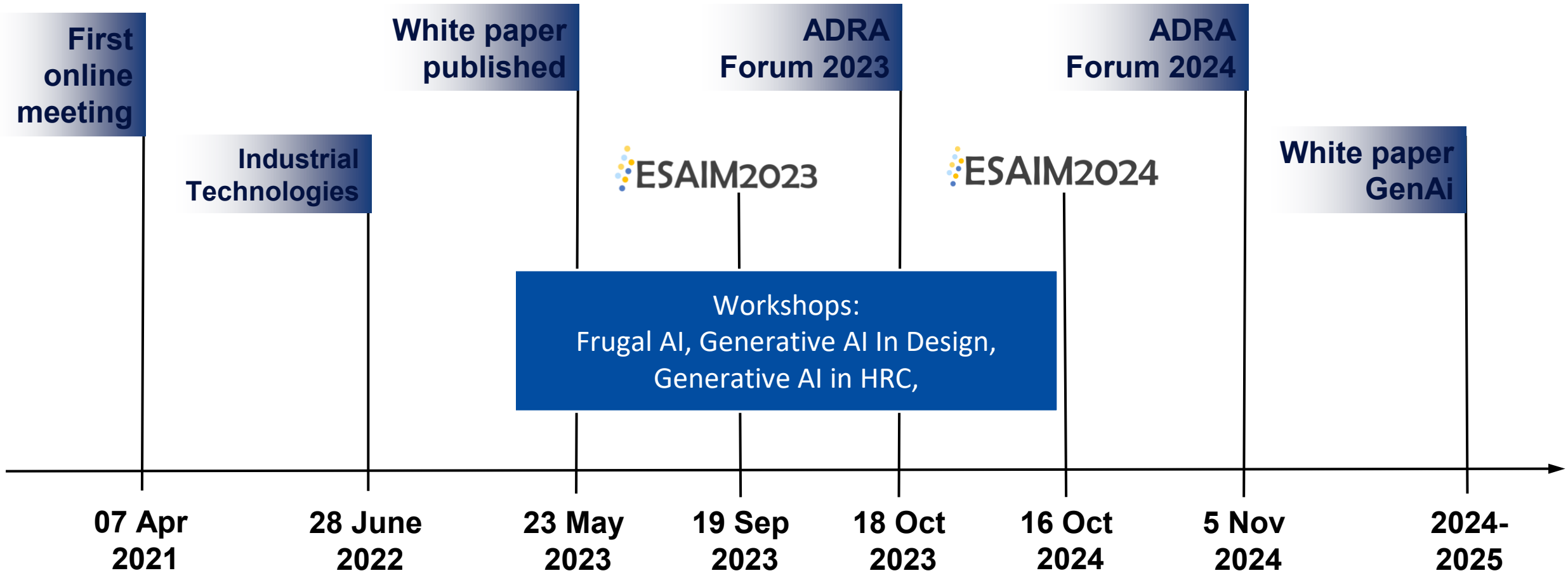
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Generative AI for Manufacturing

Home » Topic Group



This working group aims to explore the prospects of applying modern Data driven Generative AI methods in Manufacturing. Generative AI, refers to a class of AI systems and models designed to generate data that is similar to, or inspired by, existing data.

Even though this sort of AI approach showcases a great potential, its application to Manufacturing is still lagging for different reasons. A community effort will help to investigate the potential and to further eliminate the risks and further improve the understanding of Generative AI expected contributions for manufacturers.

Topic group chair

Mostafizur Rahman



Sotiris Makris



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Thank you for your attention!

Questions?

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