European Commission

HORIZON EUROPE
New Projects in AI, Data and Robotics
2024 Edition

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TABLE OF CONTENTS

INTRODUCTION
HORIZON EUROPE: FIRST WAVE OF AI AND ROBOTICS PROJECTS

In the name of my unit in charge of developing the European Ecosystem of Excellence in AI and Robotics, in cooperation with units in DG CNECT in charge of Data and Innovation Policies, Accessibility, Multilingualism and Safer Internet, Cloud and Software and Internet of Things, and the Unit in charge of Digital in HaDEA, I am very proud to announce a new wave of projects in AI, Data and Robotics, funded by the Horizon Europe, EU's key funding programme for research and innovation.

These projects will all work towards improving the society we live in, by tackling very important technological or application-driven challenges, as prioritised in the strategy developed by ADRA, the Public-Private Partnership for AI, Data and Robotics between the European Commission and the community, in the context of Horizon Europe (see ADRA Association and the Strategic Research Innovation and Deployment Agenda (SRIDA).

The brochure presents the objectives and expected impact of each project, grouping them by their respective Horizon Europe topics.

I invite you to discover all these projects in this brochure. Not only are they expected to have an impact within their respective application sectors, together, they will advance the field of AI, data and robotics throughout Europe, well beyond the completion of the individual projects.

We all look forward to following these new projects and accompanying them in realising the potential of AI, data and robotics for the improvement of European society and economy.

Cécile Huet

Cécile HUET, PhD
Head of Unit Robotics & Artificial Intelligence Innovation and Excellence – CNECT-A1

In cooperation with:

CNECT-G1: s Data Policy and Innovation
CNECT-G3: Accessibility, Multilingualism and Safer Internet
CNECT-E2: Cloud and Software
CNECT-E4: Internet of Thing
HaDEA- B2: DIGITAL

EUROPEAN NETWORK OF AI EXCELLENCE CENTRES:

EXPANDING THE EUROPEAN AI LIGHTHOUSE (RIA)

dAIEDGE

A network of excellence for distributed, trustworthy, efficient and scalable AI at the Edge

Call	*HORIZON-CL4-2022-HUMAN-02*
Duration	*1 September 2023 > 31 August 2026*
Project ID	*101120726*

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CETIC, *cetic.be*

CNRS, *cnrs.fr*

CSEM, *csem.ch*

DLR, *dlr.de*

ETHZ, *ethz.ch*

FBA, *fundingbox.com*

FRAUNHOFER, *fraunhofer.de*

FORTH, *forth.gr*

HES-SO, *hes-so.ch*

HIPERT, *hipert.it*

IMEC, *imec.be*

INRIA, *inria.fr*

INSAIT, *uni-sofia.bg*

IOT-DIH, *air-institute.org*

KUL, *kuleuven.be*

SED, *safran-group.com*

SINTEF, *sintef.no*

ST, *st.com*

SORBONNE UNIVERSITY, *sorbonne-universite.fr*

SYNOPSYS, *synopsys.com*

THALES, *thalesgroup.com*

UBOTICA, *ubotica.com*

UCLM, *uclm.es*

UNIVERSITÉ CÔTE D'AZUR, *univ-cotedazur.fr*

OBJECTIVES

The vision of the **dAIEDGE Network of Excellence** (NoE) is to **strengthen and support the development of the dynamic European edge AI ecosystem** under the umbrella of the European AI Lighthouse and to sustain the advanced research and innovation of distributed AI at the edge as essential digital, enabling, and emerging technology in an extensive range of industrial sectors. dAIEDGE aims to reinforce the research and innovation value chains to accelerate the digital and green transitions through advanced edge AI technologies, applications, and innovations, building on Europe's existing assets and industrial strengths. In parallel, it will fortify the edge AI research and industrial communities through technological developments beyond state of the art and become a dependable and strategic pillar for the European AI Lighthouse. This will be achieved by mobilising and connecting the European AI and edge AI constituency, the relevant stakeholders, European partnerships, and projects, to provide roadmaps, guidelines and trends supporting the next-generation edge AI technologies. The NoE activities address the following objectives: **Edge AI scientific excellence** on emerging approaches for hybrid and distributed AI solutions, a **united edge AI community** with multi-disciplinary networking and scientific exchange, establishment of a **strategic research agenda** to share a vision and roadmap on edge AI development and methodological aspects, **demonstration of edge AI leadership** with the development of innovative solutions and deployement of three use cases, **a virtual innovation in-**

frastructure, based on a virtual laboratory and federation of benchmarks, datasets and experiments, and **support to the industrial ecosystem** with the development of a edge AI marketplace, industrial project grants and a dedicated business incubator.

EXPECTED IMPACT

Reinforcing the European AI Lighthouse for the AI community: dAIEDGE constitutes a new pillar of the European AI Lighthouse, with a strong focus on distributed AI at the edge, a topic which is transversal to other thematic such as trustworthiness, security, sovereignty. It also contributes to establishing a common vision and cooperation mechanisms for the European Lighthouse to facilitate leveraging the synergies between existing and upcoming NoEs (collaboration arena, mobilization of the community, long-term strategy.

Scientific and technological excellence in edge AI: We have identified major challenges for the development and uptake of AI at the edge: efficient inference on device, efficient domain shift in dynamical situations, onsite continual learning, distributed learning, privacy, and security for AI at edge. We will push the state-of-the-art in the associated domains to tackle these challenges and demonstrate the efficiency of the solutions.

Leadership on AI based on trust: dAIEDGE will push forward Europe's sovereignty by fostering excellence in European research centres and industries while focusing on the independence in terms of research, development and production of edge AI software, middleware, and hardware to produce embedded and edge AI that is compliant with European values and rules by design. By facilitating the

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UNIMORE, *unimore.it*

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VARJO, *varjo.com*

VERSES, *verses.io*

VICOMTECH, *vicomtech.org*

creation of European AI applications at the edge for both citizens and workers, dAIEDGE will contribute to the empowerment of the users, bringing digital solutions in their workplace and daily life. Trust in edge AI and edge devices through European labels will foster adoption for sensitive applications, including social equity and inclusion.

Our **key expected results** encompass a virtual research laboratory for edge AI, strategic roadmaps, benchmarks and benchmarking tools, a marketplace for edge AI and a business incubator. In addition, we foster adoption in the community with financial programmes for scientific exchanges and technological projects.

VISIT US ON:

https://elias-ai.eu
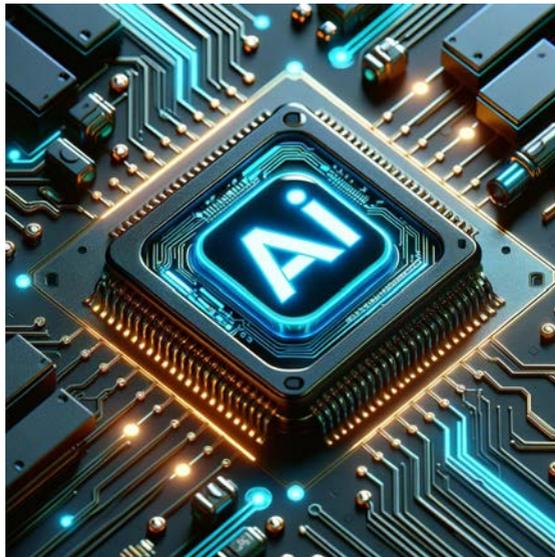
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CENTRE OF RESEARCH AND TECHNOLOGY HELLAS
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UNIVERSITY OF VALENCIA
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HASSO PLATTNER INSTITUTE
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UNIVERSITY OF MILAN
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UNIVERSITY OF COPENHAGEN
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EUROPEAN LIGHTHOUSE OF AI FOR SUSTAINABILITY (ELIAS)

ELIAS aims at establishing Europe as a leader in Artificial Intelligence (AI) research that drives sustainable innovation and economic development.

Call	*HORIZON-CL4-2022-HUMAN-02*
Duration	*01 September 2023 > 31 August 2027*
Project ID	*101120237*

OBJECTIVES

ELIAS aims to **create a Network of Excellence** connecting researchers in academia with practitioners in the industry to differentiate Europe as a region where **AI research builds towards a sustainable long-term future for our planet, contributes to a cohesive society, and respects individual preferences and rights**. In short, this project will identify domains where AI can have a transformative impact on economic growth. As such, ELIAS will establish a new pillar for the **European AI lighthouse** focusing on sustainability. The **specific** objectives are as follows:

1. ELIAS aims to unite the European AI community to address impactful economic and technological challenges, with sustainability as the guiding principle. It plans to expedite the development of AI-driven methods for computational design, data-driven simulations, and the development of neural networks for fast approximation of scientific computations.

2. ELIAS will provide high-impact research, software and benchmarks to the European AI community to address social challenges thanks to the collaboration with the main academic and industrial

specialists. Such a collaboration will be conducted according to European values and will be competitive with leading international players.

3. ELIAS will develop impactful research, software and benchmarks achieving human-centric, trustworthy and responsible AI. ELIAS will strive to develop high-impact research in the areas of 1) algorithmic fairness, inclusiveness and transparency; 2) cognition-aware hybrid decision-making systems; 3) privacy-preserving machine learning; and 4) personalisation and diversification for responsible AI.

4. ELIAS will develop a network of young AI researchers who will be the key actors of Sustainable AI. ELIAS will build upon the successful ELLIS PhD program, extending mobility programmes for PhD students to tackle fundamental challenges in Sustainable AI and strengthening the industrial PhD opportunities to maximise the economic and social impact.

5. ELIAS will create and manage a new research program on AI and sustainability. The aim is to grow an inclusive and interdisciplinary research community while ensuring full transparency of all the resulting processes, including verifying the excellence criteria.

6. ELIAS will implement measures to attract and enable talents at the interface of scientific innovation and business to generate economic impact and establish original AI solutions that move towards a sustainable long-term future for our planet, contribute to a cohesive society, and respect individual rights.

7. ELIAS will implement measures to attract and enable talents at the interface of scientific innovation and business to generate economic impact and establish original AI solutions that move towards a sustainable long-term future for our planet, contribute to a cohesive society, and respect individual rights.

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UMEA UNIVERSITY
https://www.umu.se/en/

ISTITUTO ITALIANO DI TECNOLOGIA
https://www.iit.it/it/

UNIVERSITY POLITEHNICA OF BUCHAREST
https://upb.ro/en/

IDEAS NCBR
https://ideas-ncbr.pl/en/

BITDEFENEDER
https://www.bitdefender.com/

NATIONAL INSTITUTE FOR RESEARCH IN DIGITAL SCIENCE AND TECHNOLOGY
https://www.inria.fr/fr

INTERNATIONAL BUSINESS MACHINES CORPORATION
https://www.ibm.com

ROBERT BOSCH GMBH
https://www.bosch.com/research/

ROBERT BOSCH KFT
https://www.bosch.com/research/

UNIVERSITY OF GENOA
https://malga.unige.it

IDIAP RESEARCH INSTITUTE
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EIDGENÖSSISCHE TECHNISCHE HOCHSHULE ZÜRICH
https://ai.ethz.ch

AALTO UNIVERSITY
https://fcai.fi

UNIVERSITY OF MANCHESTER
https://www.digitalfutures.manchester.ac.uk

EUROPEAN LIGHTHOUSE OF AI FOR SUSTAINABILITY (ELIAS) - continued

EXPECTED IMPACT

IMPACT 1: ELIAS will embrace a **human-centred approach** to the development of new AI tools. The sustainability and trustworthiness of AI lie at the core of ELIAS research and innovation activities but also of training, community building, and entrepreneurship initiatives. The ELIAS Research Agenda is structured upon three spheres rooted in foundational European values: (a) sustainable development, (b) democracy and prosperity for all, and (c) equality and respect for human rights. ELIAS will develop approaches that ensure widespread adoption and acceptance of AI tools by the public by guaranteeing transparency, accountability, interpretability and fairness of algorithmic decisions and enabling better human-AI interfaces. solutions for a sustainable planet, society and individuals in the context of 6 use case studies.

IMPACT 2: ELIAS will build on the European AI ecosystem combining academic research excellence in AI with a vibrant environment of innovative startups and industry and implement several initiatives to connect academia with industry while also improving the knowledge and skills of young researchers. ELIAS will promote new thematic programs on AI for a sustainable future. It will also establish the **European Innovation Alliance** to academia and business and support their access to regional entrepreneurial and industrial ecosystems while also promoting **Sciencepreneurship initiatives** to equip young researchers with an entrepreneurial mindset and a deeper understanding of business aspects and to increase the number of researchers.

UC5 — vegetation state forecasting

UC1 — building optimization

AI FOR A SUSTAINABLE PLANET

UC6 — material discovery

UC4 — migrant perception in EU

AI FOR A SUSTAINABLE SOCIETY

TRUSTWORTHY AI FOR INDIVIDUALS

UC2 — virtual infrastructure monitoring

UC3 — responsible user-centric advertising

COORDINATOR
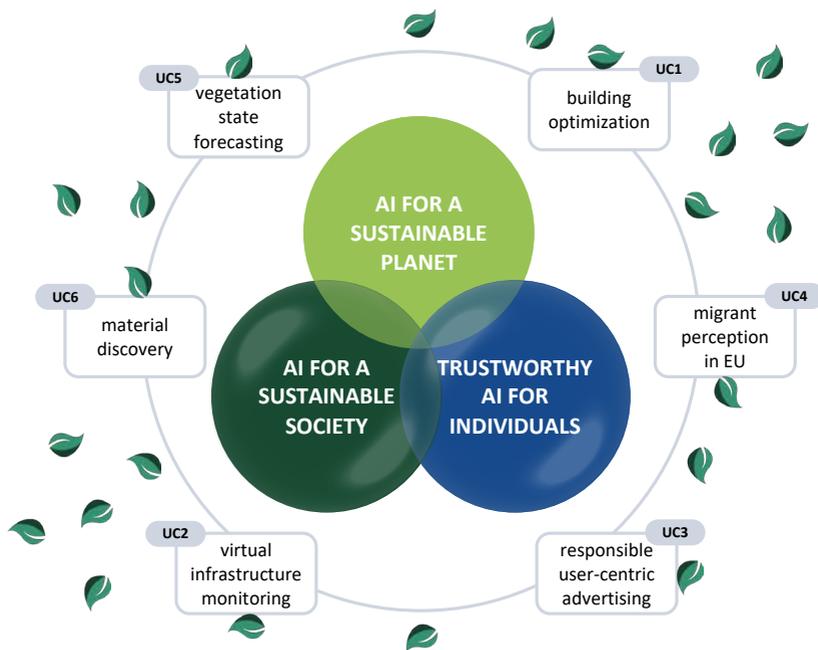
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GAZDASAGTUDOMANYI EGYETEM

KNOW-CENTER GMBH RESEARCH
CENTER FOR DATA-DRIVEN BUSINESS &
BIG DATA ANALYTICS

TEKNOLOGISK INSTITUT

NORSK REGNESENTRAL

TECHNISCHE UNIVERSITEIT EINDHOVEN

INSTITUTE OF COMMUNICATION AND
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PREDICT SAS

ENFIELD

European Lighthouse to Manifest
Trustworthy and Green AI

Call	*HORIZON-CL4-2022-HUMAN-02*
Duration	*01* Sep 2023 > 31 Aug 2026?
Project ID	101120657

OBJECTIVES

ENFIELD aims to create a unique European Centre of Excellence that excels in fundamental research in the pillars of **Adaptive, Green, Human-Centric, and Trustworthy AI** that are new, strategic and of paramount importance to successful AI development, deployment, and acceptance in Europe and will further advance the research within verticals of **healthcare, energy, manufacturing and space** by attracting the best talents, technologies and resources from world-class research and industry players in Europe and by carrying out top-level research activities in synchronisation with industry challenges to reinforce a competitive EU position in AI and create significant socio-economic impact for the benefit of European citizens and businesses. The main objectives are the following:

1. Bring European AI teams up to the highest level of research excellence in the scientific pillars of Adaptive AI, Green AI, Human-Centric AI, and Trustworthy AI.
2. Link, benchmark and further advance the state-of-the-art research within societal-driven challenges of energy, healthcare, manufacturing and space verticals to address industry-relevant limitations and bottlenecks and strengthen knowledge to fill in critical gaps for Europe
3. Define, verify, and evolve a shared EU-wide vision and roadmap for research and innovation at the cutting-edge of AI technologies and develop a Safety and Security Risk Assessment Framework by implementing common research agendas, pooling world-class resources – people, technologies, and infrastructures – and by lifting-up existing multidisciplinary and cross-sectorial collaborations

4. Attract top-level next-generation talent, contribute to their further education and training and enhance their career prospects by implementing a range of dedicated measures to support and sustain top-level education and knowledge sharing among AI specialists and non-specialists throughout Europe.

5. Network and cooperate with stakeholders through the quintuple-helix model, spread information about ENFIELD activities and outcomes and link with other EU strategic initiatives and projects to support national and European initiatives on AI, reflect on the European challenges and targets and increase Europe's leadership in science and innovation by applying a diverse range of collaboration, engagement and outreach instruments.

6. Foster innovation mechanisms to further exploit new ideas coming out of the ENFIELD network's activities by enabling research and industry collaborations, contributing to standards, certification and regulation, establishing solid partnerships with EDIHs and incubators and collaborating with the EU platforms and marketplaces to make results available

PARTNERS (CONTINUED)

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ERATOSTHENES CENTRE OF EXCELLENCE

BOEING AEROSPACE SPAIN

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and usable, and contribute to further development and continuous stimulation of innovation ecosystem to create socio-economic impacts for European citizens and businesses.

7. Develop, maintain, scale up and sustain a vibrant European network on AI composed of active multinational and cross-sectorial network players (including previously selected networks of excellence centres in AI) jointly addressing critical issues of research and innovation frontiers in this new topic of the European AI Lighthouse.

EXPECTED IMPACT

IMPACT 1: Scientific progress in AI, addressing major challenges hampering its deployment, including systems engineering.

IMPACT 2: Build up the European AI lighthouse, initiated by earlier Networks of excellence centres.

IMPACT 3: Unify and reinforce the world-class European AI community.

IMPACT 4: Creating a more resilient, inclusive and democratic European society.

IMPACT 5: Creating a more resilient, inclusive and democratic European society.

ENFIELD – continued

European Lighthouse to Manifest Trustworthy and Green AI

Call	*HORIZON–CL4–2022–HUMAN–02*
Duration	*01 Sep 2023 > 31 Aug 2026?*
Project ID	101120657

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GREEN AI (SINTEF)

ADAPTIVE AI (IMT)

HUMAN-CENTRIC AI (TUE)

TRUSTWORTHY AI (NTNU)

ENERGY (POLIMI) **HEALTHCARE** (ICCS) **MANUFACTURING** (POLIMI) **SPACE** (ECOE)

Available Resources

- Research labs
- Data
- Infrastructure
- DIHIWARE Platform

Strategic Initiatives

- Policy initiatives
- Networks and alliances
- National and international R&I projects

Innovation Paradigm

- DIHs and Incubators
- Industry collaborations in ENFIELD and beyond
- Open Cascading Calls: Innovation Scheme

Common Research Vision and Roadmap
Safety and Security Risks Assessment Framework Regulations
Standards and Certification
Collaboration, Networking and Exchange Programmes

OPEN INNOVATION:

ADDRESSING GRAND CHALLENGES IN AI (AI DATA AND ROBOTICS PARTNERSHIP) (CSA).

VISIT US ON:

aiboost-project.eu/

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UNIVERZITA PAVLA JOZEFA SAFARIKAV KOSICIACH
www.upjs.sk/en

EIT DIGITAL
www.eitdigital.eu

UNIVERSIDAD POMPEU FABRA
www.upf.edu

AI-BOOST

A prominent open challenge prize programme that will serve as a benchmark for the European AI community.

Call	*HORIZON-CL4-2023-HUMAN-01-CNECT*
Duration	*01 September 2023 > 28 February 2027*
Project ID	*101135737*

OBJECTIVES

AI-BOOST stands for "Artificial Intelligence for better opportunities and scientific progress towards a trustworthy and human-centric digital environment". The overall objective of the project is to create and run highly replicable AI open innovation competitions that attract outstanding talent all over the EU and Associated Countries, to drive scientific progress in the major AI Areas. The project will foster collaboration between the key stakeholders in the AI community to define attractive AI challenges with the potential to lead trustworthy and human-centric real-world solutions.

Among several objective the project aims to achieve, its main objectives are to:

1. Create a unique sound methodology capable of defining high social impact AI challenges.
2. Create a highly replicable and attractive AI open innovation competition capable of leading breakthrough technologies and solutions.
3. Provide access to infrastructure and expert knowledge and promote its adoption through effective training and trouble-shooting during the challenges' implementation.
4. Attract outstanding talent and the best research teams to tackle AI challenges.
5. Engage private and public sponsors capable of providing funding, attractive rewards and expertise.
6. Create an AI community to foster interaction among all relevant stakeholders.

Open Challenge Prize Program

Establish a prominent open challenge prize program that will serve as a **benchmark** for the EU AI community

AI COMPETITIONS

Create highly replicable and attractive AI open innovation competitions

BREAKTHROUGH SOLUTIONS

Leading to breakthrough technologies and solutions with substantial scientific progress. Leading trustworthy and human-centric real-world solutions.

ATTRACT TALENT

Attract outstanding talent and the best teams to tackle AI challenges. Teams from academia and industry. Encourage people from underrepresented communities to pursue careers in AI research

ENGAGE SPONSORS

Engage private and public sponsors capable of providing funding, attractive rewards, and expertise.

EXPECTED IMPACT

IMPACT 1: Demonstrate and reinforce Europe's research excellence in AI. The project will lead to 20 breakthrough technologies and solutions providing substantial and broad scientific progress in the major strategic AI areas: optimisation, explainability, robustness, natural language understanding and interaction, and collaborative intelligence.

IMPACT 2: Develop prestigious AI open innovation challenges. AI-BOOST will engage and mobilise more than 2.000 participants in the AI open innovation competition from all over EU and Associated countries and more than 100 participants in the AI challenge definition and validation.

IMPACT 3: Contribute to the effort of unlocking AI, robotics and data innovations uptake across several sectors and applications through collaboration and co-creation.

IMPACT 4: Substantially increase interest and investment from industry in AI (incl. SMEs and start-ups) providing attractive and sound approaches. Invite and engage them in all competition stages. Ensure robust scientific progress enabling a multitude of different applications across the previous sectors following the co-creation methodology and the funnel approach with a control environment to monitor the technical progress and ensure obtaining successful results. provide a portfolio of comprehensive sponsorship packages that clearly outlines the benefits and opportunities for sponsors at different levels of support, including non-monetary investments.

NATURAL LANGUAGE UNDERSTANDING AND INTERACTION IN ADVANCED LANGUAGE TECHNOLOGIES (AI DATA AND ROBOTICS PARTNERSHIP) (RIA)

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EUROPEAN UNIVERSITY INSTITUTE
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BRNO UNIVERSITY OF TECHNOLOGY
www.vut.cz

PRIVANOVA
www.privanova.com

INOSENS
www.inosens.rs

TRANSFORMATION LIGHTHOUSE
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GRANTXPERT CONSULTING
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OMILIA
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SYNELIXIS
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IDIAP RESEARCH INSTITUTE
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ELOQUENCE

Multilingual and Cross-cultural interactions for context-aware, and bias-controlled dialogue systems for safety-critical applications

Call	HORIZON-CL4-2023-HUMAN-01-03
Duration	01.01.2024 – 31.12.2026
Project ID	101135916

OBJECTIVES

ELOQUENCE is dedicated to advancing collaborative voice/chat bots through innovative technology research and development. We aim to understand and transform unstructured dialogues into explainable, safe, knowledge-grounded, trustworthy, and bias-controlled language models. Our technology goals include self-learning, adaptability across languages and use-cases, sustainability with new computational frameworks, and serving as a guide for European citizens, particularly in safety-critical applications.

Our project leverages prior successes in conversational agents, including non-EU-developed Large Language Models (LLMs). We collaborate with European enterprises and validate our technology in safety-critical scenarios like emergency services as well as smart home assistants for less risky autonomous systems.

ELOQUENCE focuses on context-aware conversational AI in diverse settings, with an interdisciplinary team including experts in various fields. Our project emphasizes sustainability, open science, and addressing ethical and societal concerns, including bias mitigation.

1. Advanced SLU technologies for safety-critical applications
2. Hybrid LLMs combining contextual knowledge toward explainable and decision making in complex semi-structured and unstructured dialogues
3. Enhanced conversational agents toward un-biased and trustworthy dialogues with end-users

4. Definition of a framework to assess the conversational AI methods in various scenarios
5. Definition and execution of pilots to validate ELOQUENCE technologies
6. Validation ELOQUENCE technologies against legal, ethical and societal requirements, demonstrate their compatibility with European values, awareness of achievements

EXPECTED IMPACT

IMPACT 1: ELOQUENCE is committed to achieving greater inclusiveness in technology development while aligning with European values and sustainability. This commitment is realized through an agile software development approach that facilitates continuous dialogue and assessment between technology developers and pilot study leaders. The project comprises five work packages, each addressing specific aspects of technology development, including multilingual conversational AI systems, scalable decision-making agents, resource-efficient models for low-resourced languages, and ethical and legal considerations.

ELOQUENCE's key objectives include significantly reducing bias in deployed models to align with European AI regulations. The project also plans to showcase its virtual agent's capabilities in call center safety-critical scenarios and smart home environments through pilot validations. These results will be shared with industrial partners and stakeholders to promote responsible AI development and deployment.

IMPACT 2: ELOQUENCE is committed to promoting sustainable and high-quality job creation by addressing skills gaps and empowering workers, including those at risk of social exclusion. The project recognizes the ethical considerations associated with technological progress and its impact on job markets. To achieve this, specific work packages (WP3 and WP5) focus on developing AI-based solutions for complex problem-solving in both high-risk and low-risk scenarios. These solutions are expected to lead to more sustainable and high-quality jobs, particularly in industries requiring complex decision-making.

Among the key results include drastically reducing the quantity of training data and energy consumption, which will make AI technologies more accessible and environmentally friendly. Additionally, ELOQUENCE aims to achieve a high degree of correlation between automatic responses generated by AI models and those from human agents, enhancing reliability and trust in AI-powered technologies. This will facilitate their acceptance by end-users and increase their adoption across various industries.
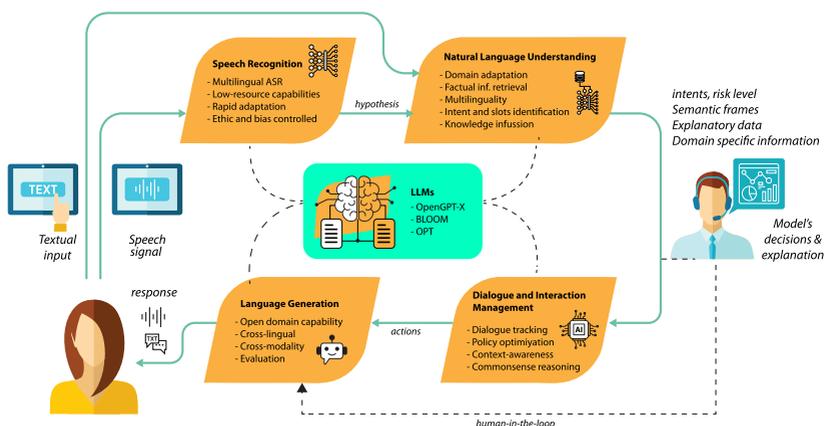
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https://www.itunovatto.com.tr/

TAUS BV
https://www.taus.net/

ZVC GERMANY GMBH (ZOOM)
https://www.zoom.us/

PI SCHOOL SRL
https://picampus-school.com/

**AKADEMIA GÓRNICZO-HUTNICZA IM.
STANISŁAWA STASZICA W KRAKOWIE
(CYFRONET)**
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MEETWEEN

My Personal AI Mediator for Virtual Meetings

Call	*HORIZON-CL4-2023-HUMAN-01-CNECT*
Duration	*1 January 2024 > 31 December 2027*

OBJECTIVES

Meetween aims to build the AI-based technology solutions needed to power the next generation of video conferencing platforms for Europe, to enable smooth, engaging and barrier-free collaboration across languages, geographies and time zones.

The project will build multilingual, foundational AI models and datasets that allow seamless integration of speech, text and video. These will be released openly yielding broad downstream commercial and scientific benefits. Further, 20 task-specific models will be released targeting use cases like speech translation, transcription and summarisation.

Meetween will leverage these core technologies to develop assistive, open-source videoconferencing solutions that support both individual and group participants in different physical settings. These solutions will be designed to adapt fluidly to a meeting participant's context as well as their language, culture and regional inflections.

Overall, the project seeks to foster and facilitate business collaboration by providing real-time machine-learning-powered speech-to-speech translation and face dubbing, summarisation and virtual assistant services for online meetings.

It seeks to do this whilst defending a European vision for AI with regard to safety, privacy, social and ethical approaches, anchored in Europe's regulations, data standards and shared initiatives, and operationalised in engineering solutions.

EXPECTED IMPACT

SpeechLMM (3 generations) - A multimodal and multilingual speech foundation model that handles input and output in 3 modalities: text, speech audio, and speech video.

Mumospee (MUltiMOdal SPEEch corpus) - A large-scale, multimodal and multilingual dataset focused on speech phenomena.

SPEECHM (Speech Performance Evaluation Criteria and Holistic Metrics) - A unified suite of speech-related task benchmarks with an accompanying evaluation server to provide automatic metrics.

Models for downstream tasks - Models for 20+ automatic recognition and generation tasks, built through specialisation of SpeechLMM.

Meetween Butler - A virtual butler providing advanced, multilingual videoconferencing features including realtime interpreting, minuting and summarisation, with a natural speaking voice, appearance, gestures and expressivity.

Meetween Agentar - An AI meeting participant that can stand in for a human participant and deliver presentations, participate in discussion and respond intelligently based on a user-supplied knowledge base.

TrustLLM

TRUSTLLM

Democratizing trustworthy and efficient large language model technology for europe

Call	*HORIZON-CL4-2023-HUMAN-01-CNECT*
Duration	*November 2023 > October 2026*
Project ID:	101135671

VISIT US ON:

https://trustllm.eu/
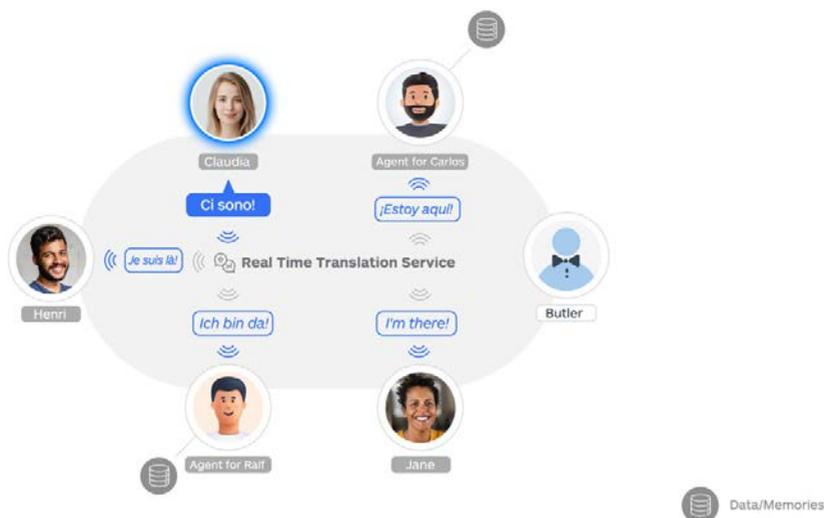
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FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG
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FORSCHUNGSZENTRUM JULICH
fzj.de

AI SWEDEN (LINDHOLMEN SCIENCE PARK)
lindholmen.se

MIÐEIND
mideind.is

UNIVERSITY OF ISLAND
english.hi.is

KOBENHAVNS UNIVERSITET
ku.dk

ALEXANDRA INSTITUTTET
alexandra.dk

NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITE
ntnu.no

NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK
tno.nl

AKADEMIE FÜR KÜNSTLICHE INTELLIGENZ
ki-verband.de/projekte

OBJECTIVES

The main objective of TrustLLM is the development of an open, trustworthy, and sustainable Large Language Model: LLM, initially targeting the Germanic languages. This will create the foundation for an advanced open ecosystem for next generation modular and extensible European trustworthy, sustainable, and democratized large language models.

The TrustLLM and the surrounding ecosystem will enable, support, and improve context-aware human-machine interaction in a wide range of applications, such as in smart assistants, conversational and dialogue systems, text processing, information extraction, and content generation services.

This ecosystem is based on existing Natural language processing: NLP and LLM initiatives, such as GPT-SW3, OpenGPT-X, SPEAKER, GPT-NL, DFM, NorGLM and will be leveraged by the European AI-on-Demand Platform.

The project will foster LLM technologies to the European AI research ecosystem, academic and industrial, and will maximise the scientific, social, and economical impact while integrating other projects, platforms, and solutions.

EXPECTED IMPACT

IMPACT 1: Development of natural language understanding and interaction in advanced language technologies based on context-aware language models able to further integrate long-term general knowledge and derive meaning in order to develop automated reasoning and enhanced interaction skills.

IMPACT 2: Effective multilingual and bias-controlled language models, capable of learning from smaller language corpora, efficient in computing and respectful of European values (i.e., privacy, non-discrimination, robustness in legal, ethical and technical terms, reliability and trustworthiness, interpretability and explainability, security and safety).

IMPACT 3: AI systems and solutions based on novel multilingual pre-trained language models that have assimilated cross-language and cross-cultural knowledge through textual and speech input.

IMPACT 4: Higher uptake of innovative language technology solutions by European companies, providing extensive language coverage of AI-enabled applications and services in Europe

EFFICIENT TRUSTWORTHY AI - MAKING THE BEST OF DATA (AI, DATA AND ROBOTICS PARTNERSHIP) (RIA)

AI-DAPT

AI-Ops Framework for Automated, Intelligent and Reliable Data/AI Pipelines Lifecycle with Humans-in-the-Loop and Coupling of Hybrid Science-Guided and AI Models

Call	*HORIZON-CL4-2023-HUMAN-01-CNECT*
Duration	*01 January 2024 > 30 June 2027*
Project ID	*101135826*

OBJECTIVES

The AI-DAPT's vision is to **deliver an AIOps framework to support and automate AI pipelines**, bringing a two-fold data-centric mentality in AI:

- **Data axis:** AI-driven automation for data pipelines based on Explainable AI (XAI) techniques as well as data synthetic generation and observability.
- **AI/Model axis:** Automation on AI model building and hybrid science-AI solutions, bringing together data-driven AI models and science-based (first-principles) models that build on high-quality data.

The key objectives of AI-DAPT are:

- Design and develop **automated pipelines for data lifecycle operations**: from data harvesting, exploration and curation to training dataset preparation, including data pre-processing and **synthetic generation**.
- Design and develop interoperable pipelines that **automate the end-to-end AI management processes**, coupling science-based models and data-driven ML models.
- Deliver automated, fair and trusted **hybrid science-AI models** to provide constantly accurate, data-driven and scientifically consistent insights.
- Develop the **AI-DAPT AIOps platform** to integrate all AI-DAPT services, enabling efficient, trustful, reliable & interoperable data/AI pipelines.

VISIT US ON:

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www.upc.edu

SUITE5
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MCS DATALABS
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WITSIDE
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UNIVERSITY OF CYPRUS
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CHARITE
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BIBA
www.biba.uni-bremen.de

OHS ENGINEERING GMBH
www.ohs-engineering.de

ZENITH
zenith.gr

- Set up demonstrator hubs that implement diverse hybrid (science-guided and data-driven) scenarios for real-world business problems: **health, manufacturing, energy, robotics/cognitive ergonomics**.
- Diffuse, replicate and scale up the AI-DAPT outcomes, fusing **business models and satisfying stakeholders' needs**.

PARTNERS (CONTINUED)

DOMX
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MADE SCARL
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CONSORZIO INTELLIMECH
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EXPECTED IMPACT

AI-DAPT aims to deliver an innovative and impactful research framework that will provide tangible benefits to a variety of stakeholders that struggle with making AI services, e.g, AI operators, industries, research community, regulators, gov, associations, public.
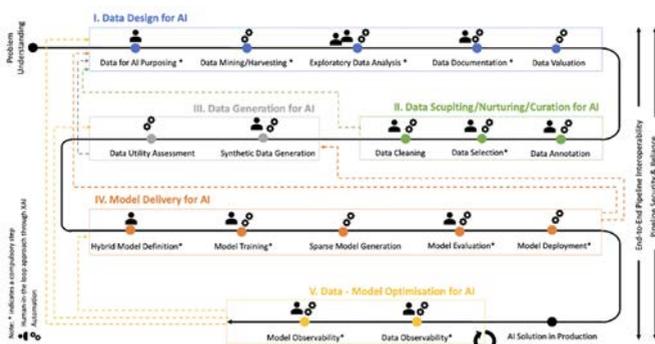
Expected impact on achieving expected call outcomes:

- **Performance Improvement in Data and AI Management Pipelines:** efficient AI solutions by optimizing model design and data usage to maximize accuracy and robustness.
- **Improved Data and Model Quality:** high-quality, representative, unbiased and compliant training data for AI development in all relevant sectors, i.e., health, manufacturing, energy, and robotics/cognitive ergonomics sectors that comprise a representative landscape of EU industries.
- **Improved Model Accuracy, Reliability and Trustworthiness:** automated support for data preparation and AI training processes.
- **Added Value Generation from Data and Models:** lowering access barriers for SMEs to data and AI pipeline operations.

- **Resource Savings:** more efficient data management & AI pipeline operations, concerning all data & AI tasks.

As for long-term and wider impacts, the AI-DAPT will contribute towards increased inclusiveness, by supporting a human-centred approach to technology development that is aligned with European social and ethical values:

- AI-DAPT will introduce a novel framework that **promotes accuracy and trustworthiness**, while respecting ethical, social, and legal principles. Synthetic data generation techniques to be employed in AI-DAPT, alongside with data minimization and data for AI purposing principles, will increase transparency during the AI model training. Data minimization will also contribute to **reduced energy consumption** by AI models execution.
- Moreover, AI-DAPT will also contribute to the creation and maintenance of high-quality jobs and empowerment of employees with tools for the design and development of the **next-generation AI pipelines**.

EXTRA-BRAIN

Explainable Trustworthy Brain-like AI for Data Intensive Applications

Call:	*HORIZON-CL4-2023-HUMAN-01-CNECT*
Duration	*January 2024 > March 2026*
Project ID	*101135809*

OBJECTIVES

The main mission of EXTRA-BRAIN is to develop, validate and deploy new optimised artificial intelligence (AI) solutions based on scalable brain-like neural networks. Although the mainstream deep learning approaches have demonstrated impressive performance in specific applications domain, tailored to concrete tasks in the spirit of so-called narrow AI, their training process incurs high resource consumption and often relies on repeated passes through large volumes of annotated data. They do not offer a robust and sustainable solution in applications or systems that require low-power consumption, dynamic scalability, deployment flexibility in the edge-cloud continuum, adaptation to changing conditions, efficient learning, continuous adaptation, and multi-tasking. EXTRA-BRAIN postulates the need for an operational alternative to specialised deep learning solutions in problem domains or application realms with the aforementioned characteristics and constraints. To this end, the project exploits a brain-like AI approach that builds upon the growing understanding how neural information is processed in the brain to support its rich functionality, e.g. in perception and cognition.

Our key objectives in the project are to advance such brain-like AI methods that provide fast, flexible, data efficient computing capabilities with scalable energy efficient neuromorphic implementations in the edge-cloud continuum, and demonstrate their applicability in diverse real-world use cases in the realm of robotics, telecommunication and financial analytics. In EXTRA-BRAIN we aim for human-centric design of the entire AI system that follows the principles of transparency, trustworthiness, and explainability.
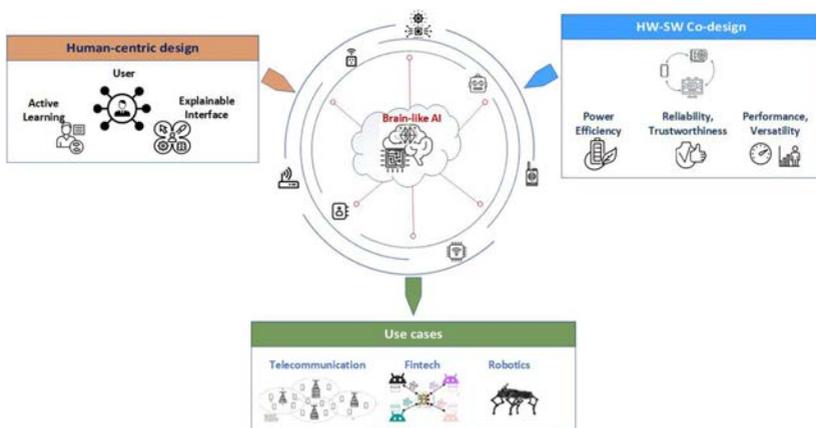
EXPECTED IMPACT

The project is expected to have scientific impact in the realm of AI technologies, particularly in a wider context of artificial general intelligence (AGI). A brain-like neural network approach with the prospect for scalable, energy efficient and versatile neuromorphic implementations open up for a new computational paradigm holding promise for human-like multi-functional (holistic) performance in the long-term perspective.

Through the proposed AI technology and eco-system design EXTRA-BRAIN is expected to have tangible socio-economical and industrial impact.

IMPACT 1: Enhancing inclusiveness in the design and deployment of AI technology through a human-centric co-design strategy. By engaging users right from the beginning of system design, providing human-centric interfaces that support transparency, explainability and thus actively involving users in the operational cycle of the AI technology it is expected to promote societal trust in such tools and their wider use in industrial as well as societal contexts.

IMPACT 2: Sustainable development of AI technology by relying on a brain-like approach and human-centric system design strategy. The proposed brain-like neural network methods facilitate re-use of the basic design concept and cost effective deployment in new application contexts with the flexibility of energy-efficient implementation in the edge-cloud continuum.

IMPACT 3: New technological opportunities and their effect on concrete industrial and application domains considered as pilot studies in the project. EXTRA-BRAIN is envisaged to offer novel solutions in selected aspects of autonomous robotics, fintech services and distributed telecommunication operations. In the longer run we expect a growing interest in industrial applications with compatible characteristics and functional demands.

MANOLO

Trustworthy Efficient AI for Cloud-Edge Computing

Call	HORIZON-CL4-2023-HUMAN-01-01
Duration	01 Jan 2024 > 31 Dec 2026
Project ID	101135782

OBJECTIVES

The overall objective of MANOLO is **to deliver a complete and trustworthy stack of algorithms** and tools to **help AI systems** reach better **efficiency** and **seamless optimization** in their operations, resources and data required to train, deploy and **run high-quality and lighter AI models** in both **centralised and cloud-edge** distributed environments.

MANOLO will **push the state of the art** in the development of a collection of complementary algorithms for training, understanding, compressing and optimising machine learning models by advancing research in the areas of:

1. model compression
2. meta-learning and domain adaptation
3. frugal neural network search and growth
4. neuromorphic models.

Complementary, **novel dynamic algorithms** for data/energy efficient and policy-compliance **allocation of AI tasks** to assets and resources in the **cloud-edge continuum** will be designed, without sacrificing on performance and allowing for trustworthy widespread deployment.

To support these activities, **a data management framework** for distributed tracking of assets and their provenance (data, models, algorithms) together with a **benchmark framework** to monitor, evaluate and compare new AI algorithms and deployments will be developed, along with **explainability, robustness and security mechanisms** to evaluate and augment the trustworthiness of the models and system.

VISIT US ON:

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https://atos.net/es/spain

EVIDEN TECHNOLOGIES SRL
https://eviden.com/

TECHNISCHE UNIVERSITAET BRAUNSCHWEIG
https://www.tu-braunschweig.de/en/

NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS"
https://www.iit.demokritos.gr/

FOUR DOT INFINITY INFORMATION AND TELECOMMUNICATIONS SOLUTIONS PC
https://fourdotinfinity.com/

FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV
https://www.iis.fraunhofer.de/en.html

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE
https://www.inria.fr/en

UNIVERSITE PARIS-SACLAY
https://www.universite-paris-saclay.fr/en

YRKESHOGSKOLAN ARCADA AB
https://www.arcada.fi/en

KATHOLIEKE UNIVERSITEIT LEUVEN
https://www.kuleuven.be/english/kuleuven

LAUREA-AMMATTIKORKEAKOULU OY
https://www.laurea.fi/en/

By design, the project and the system will adhere to the **Trustworthy AI principles** via the adaptation of the Z-Inspection methodology and provide guidelines to help AI systems address the new AI Act regulation.

The MANOLO framework will be deployed as a toolset and tested in lab environments via **Use Cases** with different distributed AI paradigms within cloud-edge continuum settings; it will be validated in verticals such as **healthcare, manufacturing, and telecommunications** aligned with *ADRA-identified market opportunities*, and with a granular set of embedded devices covering **robotics, smartphones, IoT** as well as using **Neuromorphic chips**.

Finally, for widespread adoption, collaboration, and innovation, MANOLO will (i) integrate with ongoing Horizon Europe projects including the **ICOS project**, where a good number of part-

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PAL ROBOTICS
https://pal-robotics.com/

BIT & BRAIN TECHNOLOGIES SL
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Q-PLAN INTERNATIONAL ADVISORS PC
https://qplan-intl.gr/

EIT DIGITAL
https://www.eitdigital.eu/

ners in MANOLO lead the development of the next cloud-edge meta operating system; (ii) support the **AI BOOST** project, providing innovation challenges leveraging its framework, (iii) actively engage with the **AI-on-demand** platform and other key European initiatives such as **ADRA** and its ecosystem (**ADRA-e**).

EXPECTED IMPACT

IMPACT 1: (Scientific) Breakthrough progress in HW-aware training optimisation for trustworthy efficient AI systems.

IMPACT 2: (Scientific) Open-source solutions, benchmarks, and open data for promoting excellence in European AI, Data, and Robotics communities.

IMPACT 3: (Economic/Technological) Facilitating accessibility and inclusiveness in cutting-edge AI-powered services by reducing device costs, increasing trustworthiness, and edge autonomy.

IMPACT 4: (Economic/Technological) Introducing new business models for manufacturing, healthcare, telecoms, cloud-edge continuum AI s/w and h/w systems.

IMPACT 5: (Societal) New guidelines for the implementation and operation of trustworthy efficient AI systems.

IMPACT 6: (Societal) Catalyst in Nurturing and Harnessing EU talent.

IMPACT 7: (Environmental) Significant reduction of AI systems environmental footprint.
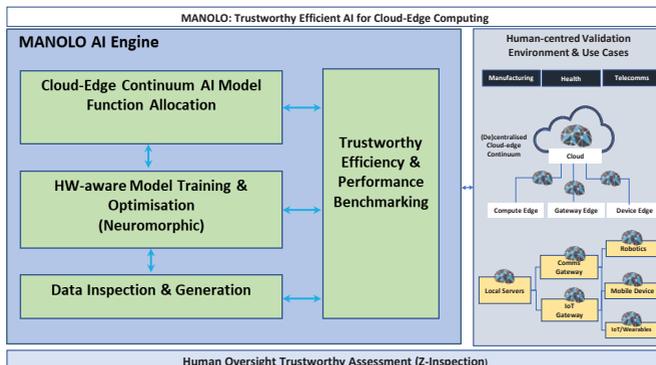
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THE AWARENESS MOVEMENT

KRECHNOLOGIES

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HELLENIC DYNAMICS PLC

QUEEN MARY UNIVERSITY OF LONDON

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SIDROCO HOLDINGS LIMITED

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UNIVERSITE DE FRANCHE

EIGHT BELLS LTD

MATHEMA SRL

ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS

UBITECH ENERGY

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ADRESTIA EREVNITIKI IDIOTIKI KEFALAIOUXIKI ETAIREIA

LOGOS RICERCA E INNOVAZIONE

JESSA ZIEKENHUIS

RAIDO

Reliable AI and Data Optimization

Call	*HORIZON-CL4-2023-HUMAN-01-01*
Duration	*1 January 2024 > 31 December 2026*
Project ID	*101135800*

OBJECTIVES

RAIDO aim to provide a comprehensive framework for Trustworthy and Green-AI by offering a holistic solution that covers all data and model-related aspects, within an integrated platform. It offers automated data curation and enrichment methods, such as Digital Twins and diffusion models, to ensure high-quality, representative, unbiased, and compliant training data for trustworthy AI model development. The platform also offers data-/compute-efficient models and tools for energy-efficient Green AI. Transparency, explainability (XAI), and soundness of optimized AI models, along with proper data handling processes are ensured through various XAI methods, decentralized blockchain and feedback-based reinforcement learning. The RAIDO platform further aims to provide novel KPIs and to support adaptive human-in-the-loop (HiTL) interactions through novel visualization techniques, also emphasizing the construction of dynamic interfaces to support appropriate AI paradigms. RAIDO organises the objectives into four main pillars:

PILLAR I: AUTOMATED ENRICHMENT OF DATA FOR AI

1. Automatically enhance data quality and perform data augmentation for energy efficient AI
2. Generate large volumes of synthetically generated data with corresponding annotations

PILLAR II: DATA & COMPUTE EFFICIENT MODELS AND AI ORCHESTRATOR

3. Optimise learning processes and models without quality degradation
4. Develop AI Orchestrator for creating an optimized dataset & training pipeline tailored to the application in hand

PILLAR III: ETHICAL & UNBIASED DATA FOR TRUSTWORTHY AI TRAINING, AND AI EXPLAINABILITY (XAI)

5. Enhance the explainability, fairness, and transparency of the AI models
6. Develop AI framework benchmarking, and progress monitoring and feedback to ensure continuous improvement

PILLAR IV: FLEXIBLE AND ENERGY EFFICIENT E2C DEPLOYMENT POWERED BY AN AI-ORCHESTRATOR

7. Optimise and automate the AI E2C pipeline and performance

EXPECTED IMPACT

IMPACT 1: POLITICAL
- Strives to addresses regulatory gaps in AI governance.
- Mitigates bias and discrimination in AI data.
- Aims to aid in resolving issues over intellectual property of AI.
- Addresses AI ethics through inclusive and aligned policies.

IMPACT 2: SOCIAL
- Counters societal reluctance towards technological changes and AI adoption.
- Enhances stakeholder awareness and understanding of AI's impact on everyday industrial/commercial applications.
- Bridges the knowledge gap in technology use and application.

IMPACT 3: TECHNICAL
- Tackles high costs and accelerates the slow growth rate of AI deployment infrastructure.
- Develops a framework, methodology and techniques to support Green AI, reducing environmental impact.
- Develops a framework for adaptive evaluation and validation of AI in a variety of applications.
- Increases the acceptance and wider usage of AI through reliable and efficient solutions.

PARTNERS (CONTINUED)

TWI ELLAS ASTIKI MI KERDOSKOPIKI ETAIREIA

MPAI STORE LIMITED

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

IMPACT 4: ECONOMICAL
- Strives to minimise funding needs for monetization through software-based innovations.
- Engages stakeholders and develops exploitation strategies to encourage private and public investments.

IMPACT 5: CULTURAL
- Promotes societal and cultural transformation towards acceptance of AI applications.
- Disseminates opportunities and impacts on social, environmental, and behavioural changes to enhance digital trust.

RAIDO

COORDINATOR

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RAIDO – continued

Reliable AI and Data Optimization

Call	HORIZON-CL4-2023-HUMAN-01-01
Duration	1 January 2024 > 31 December 2026
Project ID	101135800

RAIDO Platform Flow

RAIDO Concept
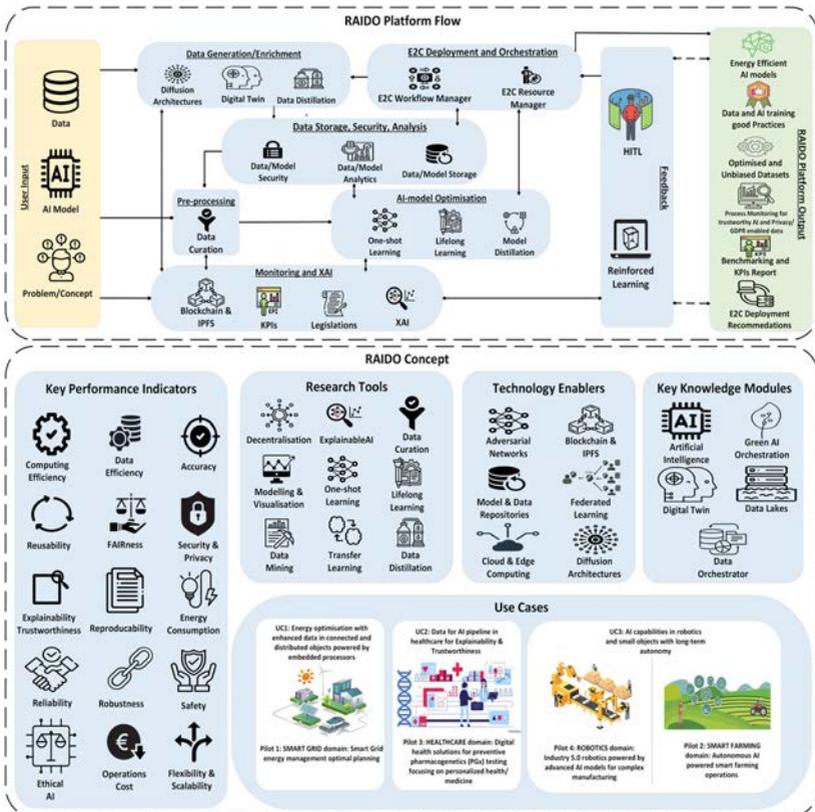
INTEGRATION OF DATA LIFE CYCLE, ARCHITECTURES AND STANDARDS FOR COMPLEX DATA CYCLES AND/OR HUMAN FACTORS, LANGUAGE (AI, DATA AND ROBOTICS PARTNERSHIP) (RIA)

CEDAR

Common European Data Spaces and Robust AI for Transparent Public Governance

Call	*HORIZON-CL4-2023-DATA-01-02*
Duration	*01 January 2024 > 31 December 2026*
Project ID	*101135577*

OBJECTIVES

Europe is facing unprecedented challenges, such as the health, migration, economic, climate, energy, and political crises, leading to a sharp increase in emergency public spending and relaxation of due diligence checks. This has resulted in a rise in corruption and fraudulent activities, which have significant negative impacts on the European economy, society, environment, and democracy.

Despite emerging technology's potential to become a powerful tool in the fight against corruption and fraud, the public sector has been slow to adopt digitalization, resulting in data NOT being shared, harmonized, or properly analysed, making evidence-based decision-making almost impossible. Governments are slowly adopting new approaches to ensure a more data-driven, transparent, and accountable public governance, but several fundamental data-related issues remain unresolved.

CEDAR aims for the following objectives:
Objective #1: Identify, collect, generate, harmonise, align, protect, and share new large-scale, high-quality, high-value datasets relevant for increasing transparency and accountability of public governance in Europe.

Objective #2: Build and improve methods and tools for effective data management and machine learning (ML) operations (DataOps, MLOps) that facilitate efficient, scalable, automated, and trustworthy management of open data spaces, especially in the context of ensuring and fostering transparent public governance.
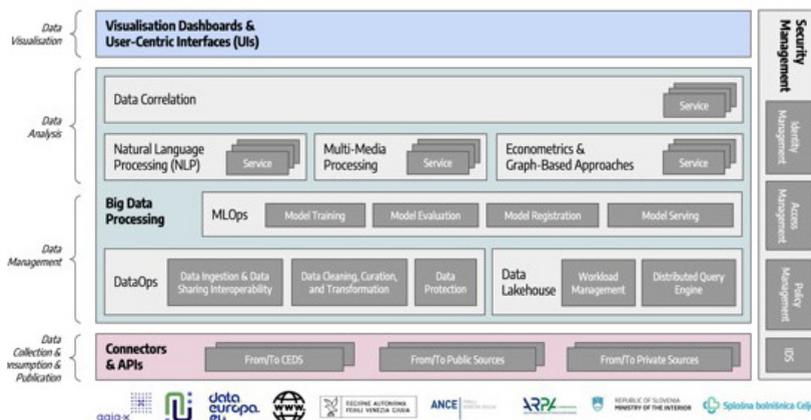
Objective #3: Develop new data analytics and machine learning methods for robust, data-efficient, humancentric, and well-informed decision making, following the Quintuple Helix Innovation Model.

Objective #4: Validate and promote CEDAR results with relevant public and private stakeholders and generate great positive, direct, tangible, and immediate impacts on the European economy, society, and environment.

EXPECTED IMPACT

IMPACT 1: Promoting an open strategic autonomy by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations

IMPACT 2: Contribution to the CEDS and improved European leadership in the global data economy.

IMPACT 3: Maximised social and economic benefits from the wider and more effective use of data.

IMPACT 4: Reinforced Europe's ability to manage urgent societal challenges (e.g., data for crisis management, digital for clean).

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REGIONE AUTONOMA FRIULI-VENEZIA GIULIA (FVG)
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ANCE FRIULI VENEZIA GIULIA (ANCE)
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MINISTRSTVO ZA NOTRANJE ZADEVE (MNZ)

MINISTRSTVO ZA ZDRAVJE (MZ)

MINISTRSTVO ZA DIGITALNO PREOBRAZBO (MDP)

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STATE AGENCY FOR RESTORATION AND DEVELOPMENT OF INFRASTRUCTURE OF UKRAINE (ARU)
TRANSPARENCY INTERNATIONAL DEUTSCHLAND EV (TI-D)
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KATHOLIEKE UNIVERSITEIT LEUVEN (KUL)
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ARTHUR'S LEGAL BV (ALBV)
https://www.arthurslegal.com/

DIADIKASIA BUSINESS CONSULTING SYMVOULOI EPICHEIRISEON AE (DBC)
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THE LISBON COUNCIL FOR ECONOMIC COMPETITIVENESS ASBL (LC)
https://lisboncouncil.net/

SK SECURITY LLC (SKS)
https://www.sksecurity.ua/en

FUND FOR RESEARCH OF WAR, CONFLICTS, SUPPORT OF SOCIETY AND SECURITY DEVELOPMENT SAFE UKRAINE 2030 (SU)

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CyclOps

Automated end-to-end data life cycle management for FAIR data integration, processing and re-use

Call	HORIZON-CL4-2023-DATA-01-02
Duration	1 January 2024 > 31 December 2026
Project ID	101135513

OBJECTIVES

Data-driven applications using AI techniques are reshaping various industries such as manufacturing, tourism, and mobility. The European Strategy for Data has led to the development of Common European data spaces, yet the governance of the data life cycle in organizations has not kept up with the rapid technology evolution and remains largely manual. A systematic mechanism is needed to ingest, integrate, and process data, thus boosting the ability to develop new data-centric business models. In this context, Cyclops' general objective is to provide interoperable, trustworthy, and secure automatic management, governance, and maintenance of the entire data life cycle for large-scale volumes of data generated in heterogeneous distributed sources to enable data sharing and exchange in data spaces. CyclOps specific objectives are:

1. Design and development of a trustworthy end-to-end automated platform to discover, integrate, and analyse heterogeneous data sources.
2. Adoption of federated and privacy-preserving AI techniques for transfer learning
3. Design and development of the protocols required to enable data sharing and interoperability, considering the enforcement of data-related rights.
4. Validating the solution in real-world heterogeneous use cases, deployed in public and private application domains.
5. Leveraging and engagement of CyclOps with common European data spaces and other European data sources and services.

EXPECTED IMPACT

IMPACT 1: SCIENTIFIC

- CyclOps proposed generic architecture facilitates further scientific research without domain-specific constraints and beyond specific data spaces.
- Improved data space technologies. The use of well-structured metadata in Knowledge graphs (KG) enables automation and enforces regulations, security, and privacy in data management, enhancing accessibility for non-expert organizations.
- Enhancing the data life cycle with human-centred data integration. CyclOps captures contextual aspects, increasing data accessibility for humans based on social and cultural factors. This has a scientific impact, advancing human-computer interaction.

IMPACT 2: ECONOMIC

- CyclOps facilitates greater company participation in the data economy, enabling SMEs to leverage data assets without a heavy investment and to gain a competitive advantage by making informed decisions using data from other ecosystem players.

- CyclOps can enhance European companies' global competitiveness by promoting the exposure and sharing of data. This improved data access facilitates collaboration among companies, including joint production and cooperation with various stakeholders. The re-use of data further enables the integration of value chains across sectors and within the EU market.

IMPACT 3: SOCIETAL

- The rise of a data-agile economy is set to boost workforce skills, creating demand for data professionals, new job opportunities, and higher wages. Through user training and education, this shift has the potential to bridge the skills gap and reduce inequalities in the labour market.
- CyclOps enhances compliance with GDPR and ethical standards, building trust in data management systems. This not only boosts citizen well-being but also promotes public trust, fostering greater engagement in the digital economy for innovation and growth.
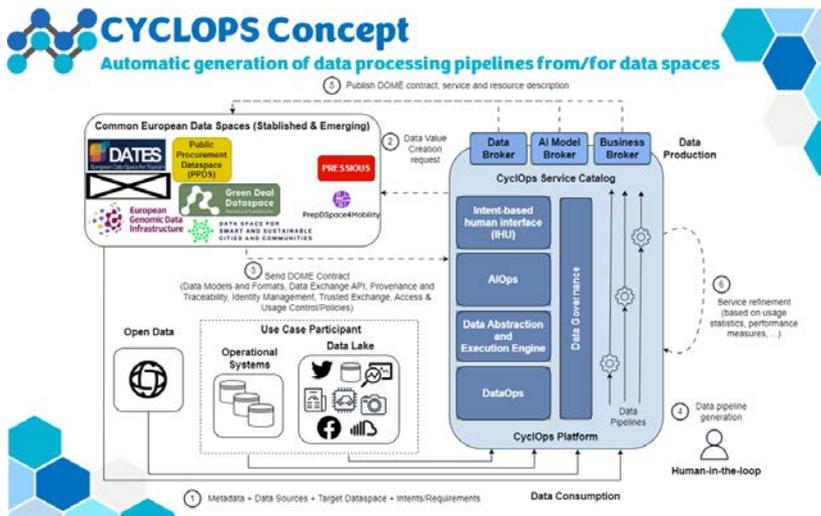
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DS2

A modular, secure, trust-sensitive, platform neutral environment for the networked sharing of data

Call	*HORIZON-CL4-2023-DATA-01*
Duration	*01 Jan 2024 > 31 Dec 2027*
Project ID	*101135967*

OBJECTIVES

DS2 brings together experts from various fields across Europe to ensure smooth and secure data sharing, aggregation and tracking, while respecting data owners' rights and adhering to European data regulations. Our modular software infrastructure connects different data sources, facilitating efficient **cross-sector data** sharing with ease.

Using the **Intersector Data Space Toolkit (IDT)**, DS2 enables seamless communication between data sources. The IDT Toolkit consists of a **Broker** for fail-safe network operation and various modules for executing **complex data lifecycles**, including filtering and labelling, with options for both automated and human-in-the-loop processes.

DS2 will be co-created and trialled via 3 use cases – City Scape, Green Deal, and Precision Agriculture – to demonstrate its effectiveness across sectors.

Key Features:
- Efficient cross-sector data sharing
- Modular software infrastructure
- Intersector Data Space Toolkit for seamless communication
- Pilot projects in diverse sectors

DS2 aims to accelerate the transition to a data-driven economy by addressing challenges and requirements related to complex data lifecycle.

Specific Objectives:
- Maximizing the impact of DS2 building blocks and ecosystem.
- Defining the Intersector Dataspace problem space and framework.

- Providing decision support for complex data lifecycle sovereignty.
- Developing framework building blocks.
- Implementing human-in-the-loop modules to address social and cultural differences.

- Establishing a federated, fully interconnected DS2 ecosystem
- Demonstrating and evaluating DS2 in 3 intersector use cases.

EXPECTED IMPACT

DS2's cutting-edge, open-source digital infrastructure is designed to establish and validate inter-sectoral data spaces, prioritizing trust, and human-centric principles. Unlike traditional cloud-centric approaches, DS2 decentralizes computational and AI processing, bringing it closer to the data's source. By doing so, it reduces reliance on non-EU cloud providers, thus enhancing EU sovereignty over data. With DS2, the EU can process vast amounts of data at the edge with AI based analytics, bolstering its position as a leader in the global data and digital infrastructure economy.

Maximizing Social & Economic Benefits through Enhanced Data Utilization: DS2 focuses on fostering increased and efficient data sharing by placing data owners at the forefront. By prioritizing trust and human-centricity over strict data control, DS2 enables the creation of wealth and adds value to innovative, complex data-driven services and products.

Strengthening Europe's Capacity to Address Societal Challenges: Aligned with the EU Green Deal and United Nations' Sustainable Development Goals, DS2 contributes to achieving climate neutrality and addressing societal challenges. By minimizing CO_2 footprints and promoting sustainability, DS2 reinforces Europe's commitment to environmental stewardship and sustainable development.

Creating a Secure and Dynamic Data-Agile Economy: DS2 aims to transform the EU market by promoting the uptake of next-generation computing and data technologies. By shifting from sector-specific data spaces to cross-sectoral, complex data-driven applications and services, DS2 fosters a globally attractive, secure, and dynamic data-agile economy. This transition empowers European SMEs by providing a robust computing continuum and facilitating the creation of trustworthy AI ecosystems, ultimately establishing a European single market for data.
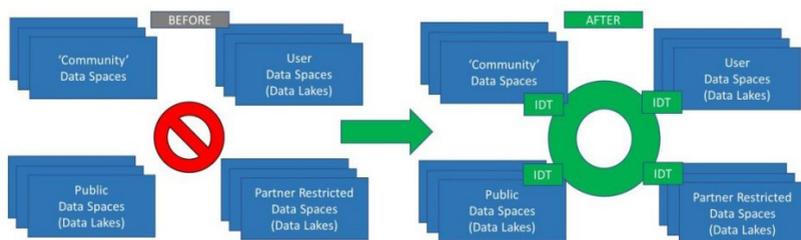

Figure 1: Before and After the Implementation of DS2

Follow our progress, subscribe for updates, or just reach out to the team and say hello at:
WWW.DATASPACE2.EU
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NOUS
Empowering Europe's Data Future

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ECLIPSE FOUNDATION
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F6S NETWORK IRELAND
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DIMOSIA EPICHEIRISI ILEKTRISMOU ANONYMI ETAIREIA
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A CATALYST FOR EUROPEAN CLOUD SERVICES IN THE ERA OF DATA SPACES, HIGH-PERFORMANCE AND EDGE COMPUTING.

NOUS will develop the architecture of a European Cloud Service that allows computational and data storage resources to be used from edge devices and supercomputers through the HPC network and Quantum Computers. NOUS will be an Infrastructure-as-a-Service/Platform-as-a-Service cloud provider, harnessing edge computing and decentralization paradigms to incorporate a wide array of devices and machines in its computational flow to provide leaps in Europe's capability to process vast amounts of data.

Call:	*HORIZON-CL4-2023-DATA-01*
Duration	*1 January 2024 > 31 December 2026*
Project ID	*101135927*

OBJECTIVES

We aim to develop a robust technological framework bridging Europe's High-Performance Computing network with NOUS. This involves enhancing NOUS's computational capabilities by integrating Quantum computers with the HPC network. We are crafting a data processing module for merging data from physical assets and digital models, effectively distributing computations across Edge-to-Cloud devices. Furthermore, we are evaluating Blockchain's implementation as a decentralized database linked to edge computing, comparing it with traditional models for NOUS applications. We will also design

a translation-to-standards concept using a data lake to standardize data formats within Mobility, Energy, and Green Deal Data Spaces. Moreover, we will develope an architecture for a European Cloud Service suite, integrating computational, edge computing, and data processing functionalities to enhance the EU's digital sovereignty. In facilitating collaboration, we are creating a dynamic platform inspired by Living Labs, enabling knowledge exchange and data sharing across domains. Lastly, we will collaborating with other initiatives to promote seamless data sharing within NOUS and align efforts for European Cloud Services.

EXPECTED IMPACT

IMPACT 1: SOCIETAL
Data's value extends beyond economics, benefiting healthcare, public safety, governance, and employment. NOUS will maximize data value by merging diverse datasets, particularly aiding crisis management and real-time decision-making.

IMPACT 2: ENVIRONMENTAL
Increasing awareness of environmental issues is supported by growing data availability and meteorological evidence. NOUS will leverage data to develop impactful applications, reducing CO_2 and NOX emissions, monitoring biosphere progress, and addressing specific R&D challenges.

IMPACT 3: SCIENTIFIC
NOUS will enhance research collaboration, knowledge sharing, and patent production by improving access to publications and research data.

NOUS will establish common APIs, values, and principles within the open-source community, ensuring maintainability, scalability, and de facto standards.

IMPACT 4: ECONOMIC
Enhanced data sharing and accessibility unlock economic potential, reducing information management costs, improving transparency, and creating new business opportunities. NOUS will foster competitiveness and generate benefits for institutions and economic stakeholders

IMPACT 5: POLICY AND LAW
NOUS aims to clarify legal questions surrounding data sharing, contributing to legal transparency and facilitating implementation within the framework of the EU Data Strategy and the EC Communication on Data Space

PLIADES

AI-Enabled Data Lifecycles Optimisation and Data Spaces Integration for Increased Efficiency and Interoperability

Call	*HORIZON-CL4-2023-DATA-01*
Duration	*01 January 2024 > 30 June 2027*
Project ID	*101135988*

OBJECTIVES

PLIADES aims to research novel AI-enabled tools for full data lifecycles integration and develop sustainable data creation methods, while ensuring data privacy and sovereignty. The goal is to revolutionise data sharing and enable interoperability between diverse data spaces, while following the dimensions of the IDS Reference Architecture Model.

The specific objectives of PLIADES are:

- To research and develop novel models, abstractions and methods for environment-friendly, context and human-factors aware creation of vast amounts of data for the mobility, green deal, energy, industrial, and healthcare dataspaces
- To advance data privacy, security, trustworthiness and sovereignty, and enable data owners to safely determine how their information is collected, stored, and used
- To promote advanced data decentralisation and to further advance AI-boosted brokers
- To generate advanced Data Spaces connectors to extend the scope of data spaces interoperability, while encompassing full data life cycles into existing data reference architectures
- To facilitate novel data processing and analytics services to ensure data privacy, trustworthiness, security, resilience, re-use, and disposal
- To deploy the proposed framework in diverse use cases, focusing on transportation, energy, manufacturing, healthcare, and green deal sectors
- To develop new business models that promote data sharing and re-use, and to establish synergies with other EU initiatives

EXPECTED IMPACT

Scientific: Expanding the state-of-the-art, a suite of novel tools and standards will be researched, aiming to solve critical and complex problems on data creation, storage, ownership, discovery, and disposal, across diverse data spaces.

Societal: The project aims to produce greener data by introducing advanced, yet eco-friendly data processing methods for vehicles and robots with respect to the current environmental conditions. Moreover, enhanced services and products will result through the proposed framework, such as personalised and advanced healthcare products, smart vehicles, etc., aiming to further improve everyday life. Finally, user acceptance and trust will be enhanced through proper training and support, throughout the project, while adhering to relevant legislations and state-of-the-art security practices in data sharing.

Economic/Technological: The deployment of the PLIADES framework can reduce the resources requirements for data acquisition, while the utilisation of vast amounts of high-quality data is expected to drive improved technological solutions, paving the way for advancements across multiple industries. Moreover, the synergy of multiple dataspaces within PLIADES could yield novel insights, leading to the development of innovative technological solutions, which align with sustainability goals, by utilising the energy-efficient data management processes of the framework.

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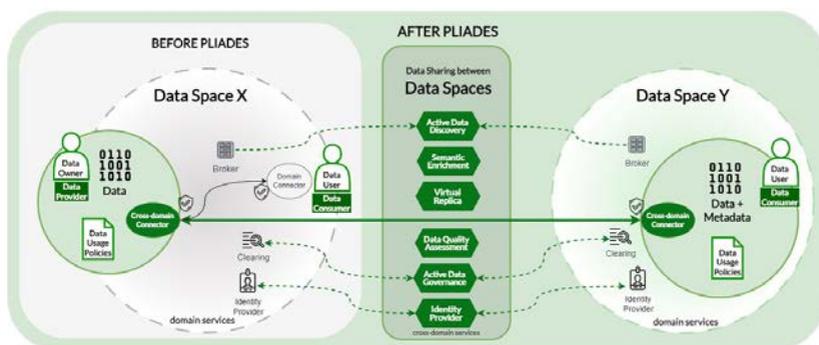www.cicbiogune.es

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PRAVO IINTERNET FOUNDATION
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DATAMITE

DATAMITE empowers European companies by delivering a modular, open-source and multi-domain Framework to improve data Monetization, Interoperability, Trading and Exchange, in the form of software modules, training, and business materials.

Call	HORIZON-CL4-2022-DATA-01
Duration	01 January 2023 > 31 December 2025
Project ID	101092989

OBJECTIVES

In a data-driven era, the mere accumulation of data is no guarantee of value. The DATA-MITE project understands the precise nature of existing barriers to data monetisation, and its **main objective** is to help users monetise, govern and improve trust in their data by developing a set of key modules: Data Governance, Quality, Security, Sharing and Support Tools.

DATAMITE unleashes the monetisation potential at two levels: internal and external. To achieve this vision, the **specific objectives** of DATAMITE are grouped into two main areas: **Research and Innovation Objectives (RIO)** and **User-Oriented Objectives (UO)**:

- RIO 1: Develop an open-source framework that enhances how companies manage and exchange data, boosting monetisation.
- RIO 2: Create a Data Sharing module with tools for seamless data sharing and trading, focusing on data compatibility and control.
- RIO 3: Supply a set of open-source modules for data governance, quality, and security that is easy to integrate into current systems.
- UO 1: Strengthen European companies with proven models, indicators, and training resources for better data monetisation.
- UO 2: Put DATAMITE into action by testing its performance in six pilots and data-sharing scenarios.

EXPECTED IMPACT

SHORT TO MEDIUM TERM IMPACT 1: Enhance digital technologies, solutions, and interoperable frameworks for data markets, ensuring discoverability, fair pricing and secure exchange/trade of data assets in a user-friendly, compliant and energy-efficient manner.

SHORT TO MEDIUM TERM IMPACT 2: Promote the development of an EU industrial data economy ecosystem capable of ensuring digital autonomy.

SHORT TO MEDIUM TERM IMPACT 3: Develop training material to equip workers in this occupational group with the appropriate skills to deploy new technologies.

WIDER IMPACT 1: Improved European leadership in the global data economy. DATAMITE will evolve into a business-friendly EU reference suite in five years, facilitating data monetisation and compliance with next-generation architectures, including European Data Spaces.

WIDER IMPACT 2: Maximised social and economic benefits from the wider and more effective use of data. Competitive application sectors cut costs through system reconfiguration, product variability, and data monetisation tools. The framework is validated with end-users for firsthand feedback.

WIDER IMPACT 3: Reinforced Europe's ability
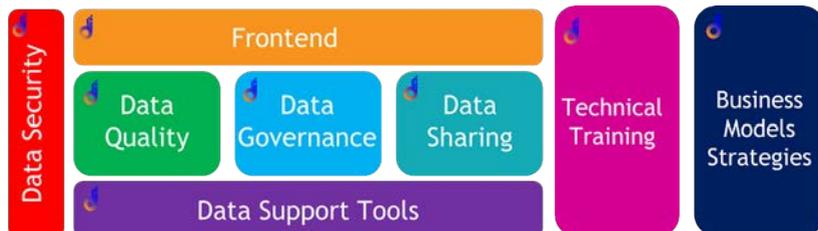
to manage urgent societal challenges. DATAMITE highlights the societal impact of EU common data spaces on the data economy. By improving data quality and minimising biases in AI models, it contributes to fairer and more reliable results. This strengthens societal trust, reduces the need for frequent re-training of models, and lowers the associated energy consumption.

FAME

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UNPARALLEL INNOVATION LDA
www.unparallel.pt/

FAME

Federated decentralized trusted dAta Marketplace for Embedded finance.

Call	*HORIZON-CL4-2022-DATA-01-04*
Duration	*01 Jannuary 2023 > 31 December 2025*
Project ID	*101092639*

OBJECTIVES

FAME's main goal is to develop, integrate, validate and offer as a publicly accessible service Europe's first federated, decentralized, trusted and energy efficient data assets marketplace for EmFi.

Unlocking the full potential of the data economy, the FAME Data space transcends the limitations of centralized cloud marketplaces. In this direction, the project will enhance a state of the art data marketplace infrastructure (i.e., H2020 i3-Market marketplace) with novel functionalities in three complementary directions namely:

- Secure, interoperable, and regulatory compliant data exchange across multiple federated cloud-based data providers in-line with emerging European initiatives like GAIA-X.
- Decentralized, programmable, data assets trading and pricing leveraging blockchain tokenization techniques (including support for accruing data assets value in NFTs).
- Integration of trusted and Energy Efficient (EE) analytics based on novel technologies such as Quantitative Explainable AI, Situation Aware Explainability (SAX), incremental EE analytics, and edge analytics.

FAME will become operational in a federated cloud environment with multiple providers of EmFi data assets, including datasets, AI/ML models, and more. It will become interconnected with more than 12 data marketplaces that are operated by the project partners, as well as with other data infrastructures that will support the implementation of 7 pilots.

Through this process, the catalog of the FAME

marketplace will be populated with a critical mass of 1000+ data assets. Furthermore, FAME will establish a Learning Center (LC) for tech and non-tech users, as this is a key prerequisite for unlocking the potential of the data economy.

FAME will build a vibrant community of EmFi stakeholders around the FAME platform, which will serve as a catalyst for the sustainability of the project's results.

EXPECTED IMPACT

IMPACT 1: FAME will provide the means for integrating, pricing and trading data assets from interconnected, federated data management infrastructures, including heterogeneous data spaces and data marketplaces.

The project will provide the means for aggregating and integrating data assets from different providers in a federated catalogue (FDAC).

IMPACT 2: FAME will offer access to a novel decentralized approach to keeping track of metadata and the lifecycle of data assets leveraging high-performance, energy-efficient permissioned blockchain technology.

The Project will implement a variety of trading and monetization schemes, integrated in smart contracts. FAME will implement value-based trading and pricing schemes for unique assets that will accrue value into NFTs.

IMPACT 3: FAME will offer a pool of powerful, trustworthy and energy efficient analytics tools.

PARTNERS (CONTINUED)

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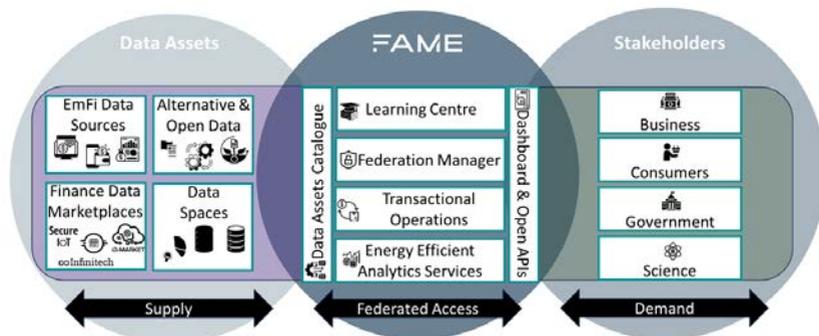
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PISTIS

*Promoting and Incentivising Federated,
Trusted, and Fair Sharing and Trading
of Interoperable Data ASsets*

Call	*HORIZON-CL4-2022-DATA-01*
Duration	*01 January 2023*
	> 30 June 2026
Project ID	*101093016*

OBJECTIVES

Data is crucial for the digital economy, driving tangible benefits and innovation for all stakeholders. However, managing and sharing data securely, seamlessly, and reliably remains challenging due to technical, cultural, economic, and legal factors.

In response to these challenges, PISTIS offers a **federated reference data sharing/exchange and monetization platform** for the secure, reliable, and controlled exchange and use of proprietary and derivative data assets. In its effort to unleash the potential of data, PISTIS advances currently available techniques and technologies, such as federated data discovery and sharing, distributed ledger technologies (DLT), non-fungible data tokens (NFT), AI-guided data quality assessment and monetization, to **build trust between data providers, data owners and consumers**.

PISTIS will establish the underlying methodological and technical foundations through four axes.

The Federated Data Management, Interoperability and Governance aims at collecting, curating, securing and fully controlling the data made available through each organisation's data space.

The Federated, Secure Data Sharing Axis concerns the effective management and on-chain storage of multi-party data contracts across their negotiation, settlement, remuneration, enforcement, and monitoring life, as well as the secure peer-to-peer data transfer and usage monitoring mechanisms.

The **Data Valuation and Monetisation Axis** systematically articulates and recommends an appropriate target value, indicatively taking into consideration the "cost" (total costs to generate, collect, store, and maintain such data), the "income" (the value added by the underlying data itself), and the "market" (what other stakeholders pay for comparable assets).

The PISTIS Data Sharing Skills Cultivation Axis raises a data sharing mentality within the organisation by fostering data sharing-related skills and technology competences and understanding the "shared" data value concept.

PISTIS will be tested in r**eal-life settings in three large-scale demonstrators' hubs** in Greece (mobility and urban planning), Spain (energy) and Austria & Germany (automotive).

EXPECTED IMPACT

SCIENTIFIC IMPACT : A paradigm shift towards federated data sharing under an interoperable, trusted, and fair distribution scheme, enabling the valuation and monetisation of data and its derivatives, advancing research conducted in the areas of semantics, security, sharing, DTLs, dinance and AI.

ECONOMIC IMPACT: Fair data value flows and data asset monetisation, combined with an efficient, intelligent, performant and highly trusted Data Space sharing, dropping CapEx and OpEx costs by utilising existing resources.

TECHNOLOGICAL IMPACT: Game changing open-source technologies for next-generation data interoperability, quality, and value improvement, enabling secure and responsibile data sharing operations, opening to data owners' new revenue streams for their data, without sacrificing data sovereignty and autonomy.

SOCIETAL IMPACT: Increased trust in renovated Data Spaces for security, privacy and intellectual property rights protection and decreased resource use and emissions.

PARTNERS (CONTINUED)

DAEM
https://www.daem.gr

OASA
https://www.oasa.gr

CUERVA
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OMIE
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Federated data management interoperability & governance

Federated secure data sharing

Data valuation and monetisation

Data sharing skills cultivation

UPCAST

Universal Platform Components for Safe Fair Interoperable Data Exchange, Monetisation and Trading

Call	HORIZON-CL4-2022-DATA-01
Duration	36M January 2023 > December 2025
Project ID	101093216

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ICT ABOVO

DAWEX

OBJECTIVES

The **high-level objective** of UPCAST is to design and deploy a set of universal plugins for Data **sharing, monetization and trading platforms** that enable actors in common European data spaces to collaboratively **negotiate, improve and enforce data sharing contracts automatically**, providing **dynamic fair pricing** mechanisms while implementing **energy-efficient data exchange**, ensuring **privacy**, c**onfidentiality and legislation compliance** and adhering to **ethical** and **responsibility guidelines**.

UPCAST provides a set of universal, trustworthy, transparent and user-friendly data market plugins for the automation of data sharing and processing agreements between businesses, public administrations and citizens.

Our plugins will enable actors in the common European data spaces to design and deploy data exchange and trading operations guaranteeing
1. automatic negotiation of agreement terms,
2. dynamic fair pricing, (ii) improved data-asset discovery,
3. privacy, commercial and administrative confidentiality requirements,
4. low environmental footprint, as well as ensuring compliance with
5. relevant legislation and
6. ethical and responsibility guidelines.

UPCAST will support the deployment of Common European Data Spaces by consolidating mature research in the areas of data management, privacy, monetisation, exchange and

automated negotiation, considering efficiency for the environment as well as compliance with EU and national initiatives, AI regulations and ethical procedures. Four real-world pilots across Europe will operationalise a set of working platform plugins for data sharing, monetisation and trading, deployable across a variety of different data marketplaces and platforms, ensuring digital autonomy of data providers, brokers, users and data subjects, and enabling interoperability within European data spaces. UPCAST aims at engaging SMEs, administrations and citizens by providing a transferability framework, best practices and training to endow users in order to deploy the new technologies and maximise impact of the project.

EXPECTED IMPACT

IMPACT 1: TECHNOLOGIES AND SOLUTIONS FOR DATA TRADING, MONETIZING, EXCHANGE AND INTEROPERABILITY

UPCAST will enable the EU to manage, trade and monetise data that is the fuel of the European data economy. It will put businesses, public administrations and other organisations in a position to be autonomous in the way they exploit their data assets and negotiate data processing agreements with local service providers, retaining data and processing in Europe without requiring intermediation from large foreign corporations.

IMPACT 2: MAKING EUROPE THE FIRST DIGITALLY LED CIRCULAR, CLIMATE-NEUTRAL AND SUSTAINABLE ECONOMY

UPCAST will facilitate sharing and manipulation of data with responsible, fair and environmentally friendly data operations. Today IT consume roughly 250 TWh annually or about 1% of global electricity use. This is expected to double before 2030 UPCAST cannot reverse this trend on its own but will set an example and make a contribution in task 3.3 by enabling members of the target groups to assess the environmental impact of their data processing workflows and find greener alternatives.

IMPACT 3: GLOBALLY ATTRACTIVE, SECURE AND DYNAMIC DATA-AGILE ECONOMY

One of the key impacts of UPCAST is the Diffusion of platforms for data sharing in Europe. Data is an essential resource for economic growth, competitiveness, innovation, job creation and societal progress. Today, the 10 leading commercial data market platforms are headquartered outside Europe. UPCAST will provide an open data ecosystem for agile creation, deployment, and management of data-driven services including AI and ML.

IMPACT 4: DATA SHARING IN THE COMMON EUROPEAN DATA SPACE

UPCAST will enable a data ecosystem for Europe in line with the movement of European data spaces. It will allow SMEs and innovators to establish value added services that increase usability, findability, and quality of data. Pricing allows sellers and buyers to better understand the business opportunities and costs associated with data UPCAST will also increase the agility of data sharing agreements that will reinforce Europe's ability to manage urgent societal challenges

COGNITIVE COMPUTING CONTINUUM:

INTELLIGENCE AND AUTOMATION FOR MORE EFFICIENT DATA PROCESSING. (AI, DATA AND ROBOTICS PARTNERSHIP) (RIA)

EMPYREAN

COORDINATOR

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RYAX TECHNOLOGIES
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NEC LABORATORIES EUROPE GMBH
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EMPYREAN

EMPYREAN will build collaborative collectives of computing and storage resources and deployed machines that we will call Associations.

Call	HORIZON-CL4-2023-DATA-01
Duration	01 February 2024 > 31 January 2027
Project ID	101136024

OBJECTIVES

An Association is a collection of IoT devices, multilayer edge resources and federated cloud platforms that dynamically and autonomously cooperate via a sophisticated coordination framework.

EMPYREAN's Associations operation will be empowered by a cognitive platform that involves distributed algorithms, decentralized AI-enabled decision-making and autonomous adaptations.

An EMPYREAN Association will constitute a secure and trusted execution environment (island) for IoT devices and edge resources that may belong to different organizations, and data belonging to ML-workloads and (hyper-distributed) applications. Associations will also be coupled with identity and access management mechanisms to assure controlled access and confidentiality of data. EMPYREAN will develop an S3- compatible distributed secure storage service operating autonomously inside an Association when needed, but also in the continuum.

What is more, EMPYREAN will provide a decentralized and distributed interconnection and data distribution service that supports decentralized data distribution, enabling services and data to interconnect seamlessly. Communication mechanisms will be developed for direct message and data transfer, using an FPGA-based RDMA device driver that drastically improves small-message transfer performance.

EMPYREAN also contributes to workflow-based, AI-augmented application development and seamless control and deployment on the edge-cloud continuum.

EMPYREAN focuses on three diverse, hyper-distributed, dynamic and high-performance demanding use cases (UCs) in (i) advanced manufacturing, (ii) smart agriculture, (iii) warehouse automation. These include robots, equipped with cameras and various sensors, while operating in diverse environments (industry, warehouse and fields).

EXPECTED IMPACT

IMPACT 1: EMPYREAN will play a crucial role in EU's strategic autonomy, in its effort for the edge/cloud dominance. EMPYREAN's Associations will enable any European organization, groups of organizations or groups of EU citizens, to make their own choices in line with their interests and values, regarding the processing and storage of data. This will also strengthen their independence from external (cloud) providers, since an EMPYREAN Association can operate independently when required.

IMPACT 2: EMPYREAN unique technological advancements, their application in diverse key sectors (manufacturing, agriculture and warehousing) through the UCs and the candidate services and products identified by industrial partners will substantially contribute toward the realization of Europe's Digital Decade targets by 2030, while benefiting EU industry roadmap.

IMPACT 3: EMPYREAN is committed to promote interoperability and portability at every stage of the innovation process, towards an EMPYREAN-based open ecosystem based on Associations that (i) renews and expands edge-based infrastructure foundations across Europe, (ii) supports the establishment of a mature, leading and competitive European supply chain on global market focusing on trustworthy data exchange and cybersecurity, and (iii) contributes to the shaping of worldwide standards and practices.

IMPACT 4: EMPYREAN partners will promote the strategic industrial cooperation in AI/ML-based data storage and processing that can benefit the EU industry roadmap. Also, EMPYREAN aims to assess various business models and roles so that EMPYREAN-based services will significantly contribute to the global IoT-edge-cloud services market in the coming years, not only within the EU but also in non-EU regions such as the Asian-Pacific (APAC).
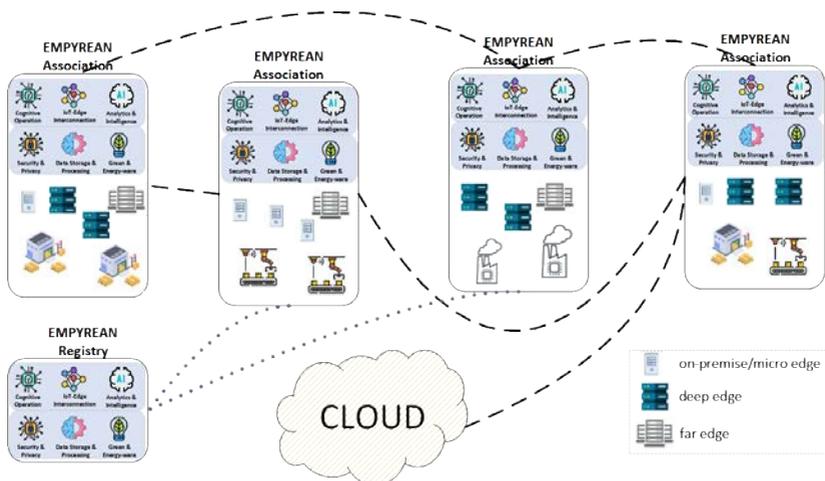
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INFORMATION CATALYST
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ECLIPSE FOUNDATION
https://www.eclipse.org/org/foundation/

MOG TECHNOLOGIES
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DIGITAL SYSTEMS 4.0
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INNOVALIA ASSOCIATION
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ARCTUR COMPUTER ENGINEERING
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FUJITSU TECHNOLOGY SOLUTIONS
https://www.fujitsu.com/pl/

SOCIEDAD DE PROYECTOS PARA LA TRANSFORMACIÓN DIGITAL
https://sptcv.net/

ENACT

Adaptive Scheduling and Deployments of Data Intensive Workloads on Energy Efficient Edge to Cloud Continuum

Call	*HORIZON-CL4-2023-DATA-01-04*
Duration	*January 2024 > December 2026*
Project ID	*101135423*

OBJECTIVES

ENACT aims to provide mechanisms to optimise the execution of distributed applications (across Edge to Cloud) and proactively balance and optimise the compute swarm according to needs and opportunities in the Cognitive Compute Continuum. In particular:

- To provide mechanisms for smartly deploy and execute distributed applications proactively based on their context, available resources, supporting the autonomous reconfiguration of resources, availability, and devices churn adjustment
- To support decentralized and proactive coordination of hyper-distributed applications strengthening transparency, openness, autonomy, and resource optimisation in novel business collaborative interactions
- To provide a toolbox to facilitate to developers the development and integration of new and existing hyper-distributed intelligent applications capable of learning from other nodes of the compute continuum
- To setup the core mechanisms to enable and boost future ENACT continuum's adoption by multi-domain and different size companies
- To validate its tools and mechanisms in real-world scenarios that require seamless management of distributed resource, as well as efficient processing of data in hyper distributed applications
- To establish proven knowledge exchange and community building scenarios for fostering a competitive European software industry

EXPECTED IMPACT

IMPACT 1: The development of common standards, frameworks, and infrastructures across Europe for Computing Continuum and Data Spaces technologies is a key element to create a more open and interoperable data ecosystem. ENACT will facilitate the development and deployment of Computing Continuum and Data Spaces technologies enabling the collaborations between different stakeholders, including industry, academia, and government in the European countries, supporting the creation of a more integrated data ecosystem.

IMPACT 2: ENACT will allow a wider and more effective use of data processed with in the continuum computing. It will enable real-time decision-making in applications such as manufacturing, media, telecommunication, and transportation and many other relevant sectors. By processing data at the edge, insights can be generated immediately, leading to improved operational efficiency.

IMPACT 3: ENACT fully embraces the EU Green Deal strategy towards climate net neutrality (especially CO2 footprint minimization), also aligning with several sustainable development goals of the United Nations. To this end, the target is to design energy aware data infrastructures that will avoid the explosion of ICT footprint and provide deeper understanding of the potential of decentralized intelligence to support green digital solutions by exploiting ML capabilities to process data from smart connected objects

IMPACT 4: ENACT outcomes aim at enabling a market shift from the widespread use of cloud-edge continuum market models that are currently dominated by non-EU entities, to a future strategy for European SMEs, providing a computing continuum with strong capabilities throughout the layers of it (infrastructure, data, and computation).
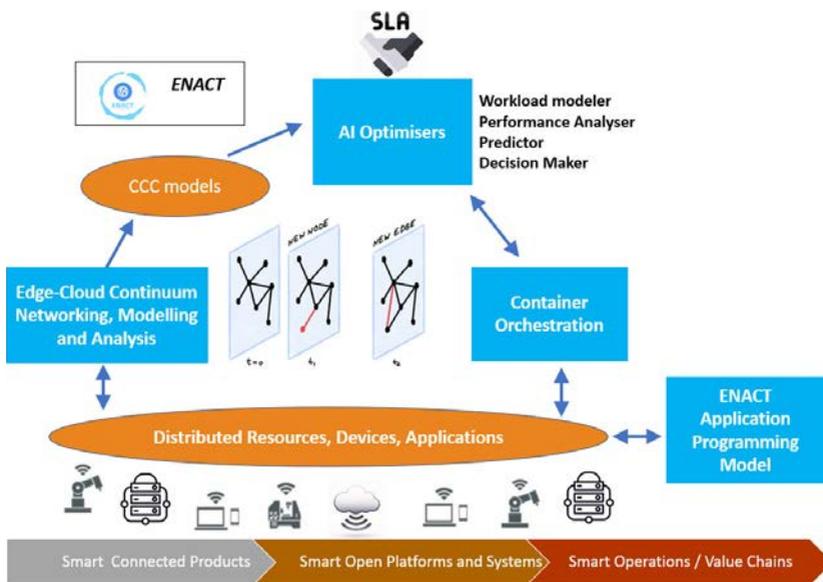
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SEOUL NATIONAL UNIVERSITY
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AIM FUTURE, INC.
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HANYANG UNIVERSITY
www.hanyang.ac.kr

INTEND

Intent-based data operation in the cognitive computing continuum

Call	*HORIZON-CL4-2023-DATA-01-04*
Duration	*1 January 2024 > 31 December 2026*
Project ID:	*101135576*

OBJECTIVES

INTEND will explore the latest AI break-throughs to bring the next-level human-like intelligence into the cognitive computing continuum, enabling the continuum to:

- Adapt" like human: Continually learn by itself how to use its heterogeneous and unconventional resources in an effective way, to data pipelines accordingly.
- "Think" like human: Make strategic decisions that coordinate adaptation actions at different places in the continuum for different purposes, just like as how the human brain takes decisions in a multi-objective and decentralized way.
- "Talk" like human: Chat with data stakeholders in natural language to understand how they intend their data pipelines to perform and explain what it did according to the intent.

INTEND's ambitious research in the three directions will lead to 11 novel software tools, to realize the novel concept of intent-based data operation in the continuum: Data stakeholders chat with the toolbox about how they intend their data pipelines to perform in the continuum. Understanding the intents, the toolbox will keep adapting the data pipelines in the continuum and explain to the stakeholders what it did or could not achieve, in order that the stakeholders can trust the AI and collaborate with AI for better data operation. The new intent-based operation will be validated in five use cases, in the domain of video streaming, machine data analysis, 5G data infrastructure, urban dataspace and robotic AI.

INTEND TOOLBOX
for intent-based cognitive data operation
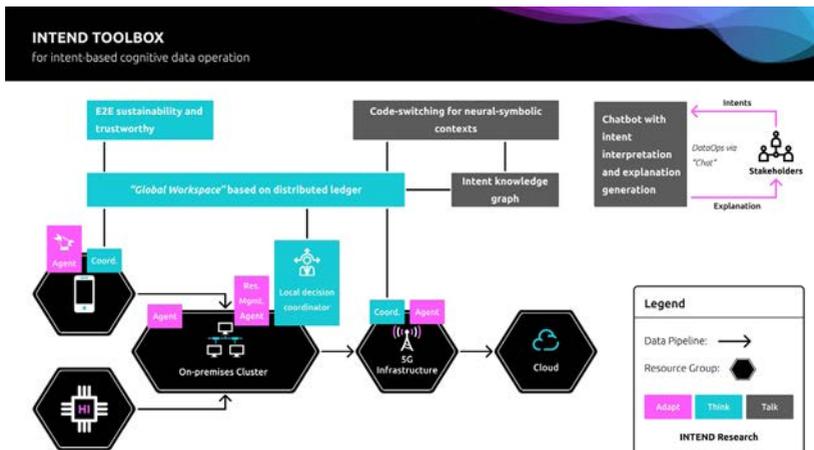
EXPECTED IMPACT

Scientific: The project will invistigate and prototype the novel concept of intent-based data operation, and push forward the state of the art in data engineering, decentralized AI, and human-AI interaction.

Business: The result will increase the efficiency of data processing in the continuum, utilize unconventional devices on the edge, and eventually boost the open edge ecosystem across the entire supply chain from chip producers, server builders, infrastructure providers to software and service developers.

Environment: Through intelligent data operation, the project aims at reducing the total enviornment footprint of the data processing in the continuum.

Society: Intent-based data operation will facilitate wide stakeholder involvement in data processing, helping to bring digital solutions closer to citizens.

Politics: By pushing data processing from the cloud to the edge, the project will contribute to EU's objective of open strategic autonomy in the data and AI economies.

MYRTUS

MYRTUS

Multi-layer 360° dYnamic orchestrion and interopeRable design environmenT for compute-continUum Systems

Call	HORIZON-CL4-2023-DATA-01-04
Duration	1 January 2024 > 31 December 2026
Project ID	101135183

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OBJECTIVES

The MYRTUS project aims at unlocking the **new living dimension of CPS**, embracing the principles of the TransContinuum Initiative, **integrating edge, fog and cloud computing platforms**. This integration requires the reinvention of programming languages and tools to **orchestrate collaborative distributed and decentralised components**. Additionally, components must be augmented with interface contracts covering both functional and non-functional properties. MYRTUS solutions play a crucial role in enabling sustainable computing and trustworthiness in CPS.

OBJ1 - MYRTUS defines a **reference infrastructure** where a **diversity of fog-level and edge-level devices converge with the cloud** to form a **computing continuum** capable of addressing the needs of complex and dynamic systems, including CPS with a living dimension.

OBJ2 - MYRTUS features a **360° dynamic runtime orchestration scheme**, embodied within the MIRTO **AI-powered cognitive engine**, to guarantee high performance and energy efficiency, preserving security and trust.

OBJ3 - MYRTUS provides a reference **design and programming environment** for continuum computing systems, featuring **interoperable support** for **cross-layer modelling, threat analysis, design space exploration, application modelling, components synthesis, and code generation**.

MYRTUS
Computing Continuum Infrastructure

MYRTUS
Design and Programming Environment

MIRTO
Cognitive Engine

Mobility Safety Use Case

Healthcare Use Case
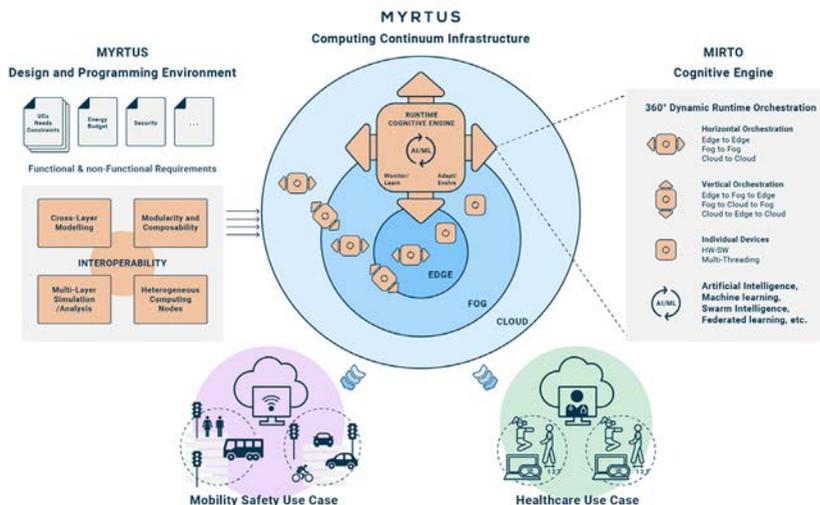
EXPECTED IMPACT

MYRTUS collaborates with relevant initiatives, including IPCEI, Gaia-X and the TransContinuum Initiative, to establish synergies and promote strategic industrial partnerships.

MYRTUS scientific impact:
- Create **new knowledge** in the computing continuum domain, with methodologies and tools for node execution and processing portability over edge-fog-cloud, including **dynamic and seamless orchestration**.
- Become a r**eference in the computing continuum**.
- Promoting the creation of **new collaborations, synergies and projects**.

MYRTUS economic/technology impact:
- Overcome vendor/platform lock-in.
- Promoting the **adoption** of the MYRTUS technologies **among startups and SMEs**, reducing development time and cost.
- MYRTUS industrial partners **enrich** their **business** offering and attract **key world's leading players**.
- **Strengthening** industrial **cooperations**, **consolidating Europe position** in the market and facilitate is **access to the foreign ones**.

MYRTUS societal impact:
- Induce **positive changes of habit** in the society through human-centred CPS.
- Guarantee **capillary rehabilitation** services and equitable access to care.
- **Decreases mortality** on the road by making **intersections safer**.
- Contribute to the **CO2 emission reduction**.

COORDINATOR

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KEEN SOFTWARE SL
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www.westminster.ac.uk

SEOUL NATIONAL UNIVERSITY
www.en.snu.ac.kr

EDINBURGH NAPIER UNIVERSITY
www.napier.ac.uk

SWARMCHESTRATE

Application-level Swarm-based Orchestration Across the Cloud to Edge Continuum

Call:	*HORIZON-CL4-2023-DATA-01-04*
Duration	*1 January 2024 > 31 December 2026*
Project ID	*101135012*

OBJECTIVES

All currently available orchestration tools, responsible for deploying and managing data processing applications in the Cloud-to-Edge computing continuum, are based on a certain level of centralisation. Such centralisation, while relatively easy to implement, carries several disadvantages. The central component can become a single point of failure, can be easily overloaded as the system scales, and also provides a good target for security attacks. Additionally, such a centralised approach does not fit well to the highly distributed and dynamically changing nature of the computing environment. A centralised management approach cannot react fast enough for some changes in local environments (e.g. volatility of resources) and cannot support fast adaptation of resources and application requirements (e.g. due to the movement of certain computing elements).

The **overall aim of the Swarmchestrate project** is to combine emerging technologies such as Swarm computing, distributed AI, distributed ledger systems and decentralised identity management, and create a completely decentralised autonomous and self-organised application management system that supports the processing of large amounts of data generated at the network edges with the help of hyper-distributed and complex applications in the Cloud-to-Edge continuum. The approach applied by Swarmchestrate is fundamentally new to application orchestration and suitable to manage hyper-distributed applications that span across large distances and the different layers of the dynamic compute continuum.

EXPECTED IMPACT

IMPACT 1: ENHANCED OPENNESS AND OPEN STRATEGIC AUTONOMY IN THE EVOLVING DATA AND AI-ECONOMIES ACROSS THE COMPUTING CONTINUUM.

Through its decentralised approach, the project will support the better and more natural integration of edge and fog computing nodes into the execution of hyper-distributed applications. With specific focus on energy optimisation, the project will contribute to decreasing the carbon footprint of distributed big data processing applications, supporting the green transition.

IMPACT 2: PAVING THE WAY TO STRATEGIC INDUSTRIAL COOPERATION IN DATA PROCESSING REQUIRED TO SUPPORT FUTURE HYPER-DISTRIBUTED APPLICATIONS.

The four Swarmchestrate demonstrators in high-impact areas, wastewater and parking space management, urban video scene analytics and the digital twin of nature, all require large amounts of sensors distributed in wide geographical areas to collect and process data.

IMPACT 3: ESTABLISHMENT OF ADAPTIVE HYBRID COMPUTING, COGNITIVE CLOUDS AND EDGE INTELLIGENCE BEYOND TODAY'S INVESTMENTS ON DATA INFRASTRUCTURE.

Swarmchestrate will develop a fundamentally new decentralised application deployment and run-time management concept, based on Swarm intelligence, that provides new opportunities for hybrid computing in the Cloud-to-Edge continuum.

IMPACT 4: BETTER INTERNATIONAL COLLABORATION WITH TRUSTED PARTNER REGIONS, GUARANTEEING A MINIMUM LEVEL OF INTEROPERABILITY AND PORTABILITY, THEREBY FOSTERING COMPETITION IN THE CLOUD/EDGE SERVICES MARKET.

Through the inclusion of a key Korean partner, Seoul National University and their extended industry connections, the project will provide links with the Korean market to explore and offer future exploitation of the results.
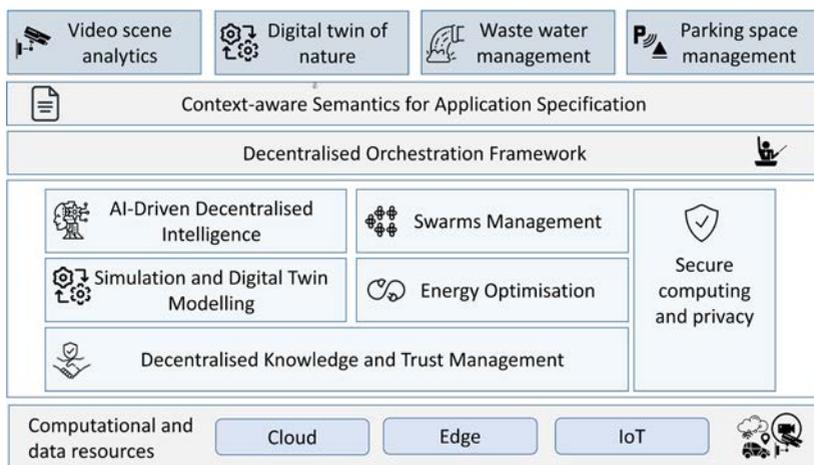
AI FOR HUMAN EMPOWERMENT (AI, DATA AND ROBOTICS PARTNERSHIP) (RIA)

AI4REALNET

AI for REAL-world NETwork operation

Call	*HORIZON-CL4-2022-HUMAN-02-01*
Duration	*1 October 2023 > 31 March 2027*
Project ID	*101119527*

OBJECTIVES

AI4REALNET covers the perspective of AI-based solutions addressing **critical systems (electricity, railway, and air traffic control)** modeled by **networks** that can be simulated and **traditionally operated by humans** and where AI complements and augments human abilities. These networks operated by humans, often combining human expertise with control and supervision software and different levels of automation, will face challenges in handling increasing uncertainty (e.g., from weather, assets aging, demand), combinatorial and sequential decisions to exploit network flexibility, and in human overseeing the increasing automation and intervene when required. In the **AI4REALNET vision, high levels of human control and AI-based automation coexist with "optimal" balance**. They are divided into a) full human control, b) co-learning between AI and humans, including adjustable autonomy, and c) trustworthy full AI-based control.

It aims to achieve the following two strategic overarching objectives:

1. To **develop the next generation of decision-making methods powered by supervised and reinforcement learning**, which aim at trustworthiness in AI-assisted human control with augmented cognition, hybrid human-AI co-learning, and autonomous AI, with the resilience, safety, and security of critical infrastructures as core requirements, and

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2. To **boost the development and validation of novel AI** algorithms by the consortium and AI community **via existing open-source AI-friendly digital environments** capable of emulating realistic scenarios of physical systems operation and human decision-making, enabling a direct assessment of AI-based decision quality.

EXPECTED IMPACT

SCIENTIFIC IMPACT 1: AI-based decision systems that enable the interaction between human operators and varying degrees of autonomous AI-powered capabilities in a common social-technical system.

SCIENTIFIC IMPACT 2: Novel reinforcement learning algorithms to optimise the operation of large-scale dynamic networks, considering scalability, embedding available knowledge, and covering a variety of problem characteristics.

SCIENTIFIC IMPACT 3: Increase AI trust by combining SSH and psychological assessment to derive the needs of explainability, develop explainable reinforcement learning techniques, and exploit ecological design interface concepts.

SOCIETAL IMPACT 3: Support energy transition at the European scale and help to meet the REPowerEU strategic goals.

SOCIETAL IMPACT 4: Increase resilience to nature and man-made hazards and assets aging.

SOCIETAL IMPACT 5: Achieve more flexibility and operational reliability to maximise the capacity of the current infrastructures and avoid costly new infrastructure developments.

SOCIETAL IMPACT 6: Facilitate continuing growth of air traffic demand and accommodate new entrants to the airspace while maintaining aviation's high level of safety.

TECHNOLOGICAL IMPACT 7: 3 open-source digital AI-friendly environments as a valuable resource for start-ups/SMEs to quickly implement prototypes and assess the value of their AI.
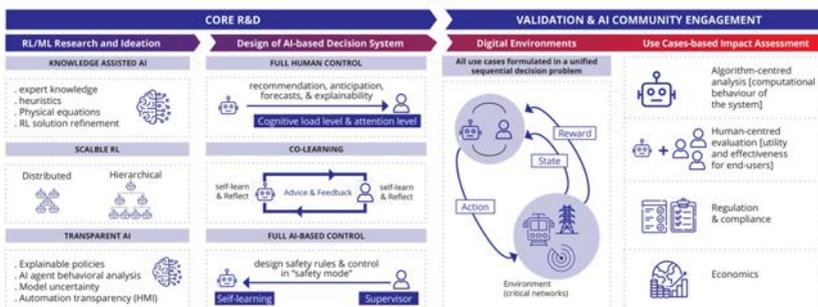
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HUMAINE

Hybrid human-AI decision support for enhanced human empowerment in dynamic situations

Call:	*HORIZON-CL4-2022-HUMAN-02*
Duration	*01 Oct 2023 > 30 Sep 2026*
Project ID	*101120218*

OBJECTIVES

HumAIne researches, develops, validates and promotes a novel operating system for Human-AI collaboration, which will enable the development of advanced decision-making applications in dynamic, unstructured environments in different industrial sectors.

The HumAIne OS will empower AI solution integrators to implement Human-AI collaboration systems that outperform AI systems and humans when working in isolation. HumAIne's developments will be integrated into a single OS platform, which will coordinate four interwind components offering Active Learning (AL), Neuro-Symbolic Learning (NSL), Swarm Learning (SL) as well eXplainable AI (XAI) capabilities.

Active Learning enables the development of effective Human-in-the-Loop systems that involve humans when AI faces increased uncertainty.

Swarm Learning paradigm supports collaborative interactions between different cohorts of humans and robots, preserving data protection and privacy.

Neuro-Symbolic Learning combines DL with semantics and rules to complete highly complex tasks with high accuracy while requiring considerably less training data than current AI models.

Advanced XAI models will be made available, providing explanations of models' predictions while considering the global context instead of just analysing the feature importance of a single AI model. HumAIne's XAI will provide guidance to humans to enable the timely optimisation of AL and SL models where human participants provide feedback dynamically as well as fine-tuning of Neuro-Symbolic models.

EXPECTED IMPACT

IMPACT 1: Boost human-AI collaboration in various sectors for enhanced decision-making. The platform goes clearly beyond the state of the art as it enables the design of patterns for human-AI co-learning enabling human-machine interactions and two-way knowledge sharing.

IMPACT 2: HumAIne will provide a credible impact on AI transparency and fairness by providing human-centered XAI models that will facilitate both the developers and the users of the system. The platform will guarantee technical accuracy and robustness as the available AI models will be evaluated on respective benchmark datasets. In cases of high uncertainty, Active Learning will be leveraged, while swarm learning will allow collaborative decision-making aggregating inputs from federated humans and machines.

Moreover, through Neuro-Symbolic AI, HumAIne will outperform current approaches in human AI.

IMPACT 3: HumAIne will have a significant scientific impact on the European research ecosystem, through research in areas with significant potential for scientific breakthrough (e.g., human-centered XAI, Neuro-Symbolic and swarm learning).

IMPACT 4: HumAIne will positively impact the European economy through enabling the development of trusted human-centric applications that exhibit excellent technical and industrial performance without compromising social performance. The HumAIneOS will improve human performance at work, while ensuring that the era of hyper-automation can be human-centric.

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PEER

The hyper expert collaborative AI assistant

pEER project will address the barriers to accepting AI in sequential decision-making problems by systematically putting the user at the center of the entire AI design, development, deployment, and evaluation pipeline. To do this, PEER will take an interdiciplinary approach that considers both social sciences and artificial intelligence to faciliate a two-way communication flow to enhance user trust. In addition to this, PEER will develop an AI acceptance index for the evaluation of AI systems from a human-centric perspective and will conduct integration and evaluation of these novel approaches in several real-world use cases.

Call:	HORIZON-CL4-2022-HUMAN-02-01
Duration	01 OCT 2023 > 30 SEP 2027
Project ID:	101120406

OBJECTIVES

The main objectives include:

1. to make AI an accessible design material and to make the capabilities and limitations of AI known to stakeholders and users before development process is carried out;
2. To improve feedback loops and enable a two-way communication flow between AI and human users to ensure better engagement in collaborative human-AI teamwork;
3. To measure progress towards truly mixed and trustworthy AI by defining qualitative and quantitative, transparent, reliable measurement scales and metrics for interactivity, acceptance, explainability and trustworthiness as well as perceived trust and fairness; 4) To integrate a human-centric perspective, relying on the proposed indexes next to more traditional AI performance indicators.

EXPECTED IMPACT

IMPACT 1: SCIENTIFIC

PEER's approach facilitates a more sustainable production process, contributing to a reduction in production cycles, and making manufacturing more responsive. The democratized AI-based quality control introduced by PEER significantly helps in minimizing production delays, especially crucial during events like pandemic. The project's human-centered approach, combined with AI trustworthy concept, advances the understand of AI's impact on sociaty. Moreover, PEER enables sustainable options in product selection by suggesting environmentally friendly alternatives based on user preferences, therby contributing to scientific knowledge on integrating AI with sustainability considerations.

IMPACT 2: SOCIETAL

The project aims to redifne the interaction between users and AI systems, enhancing the bidirectional interactions and knowledge transfer. Through personalized AI systems, it will expand user agency, enabling better-informed decisions with transparent overviews of potential solutions. This will result in a more effiecient user journey, optimized manufacturing services, and increased user satisfaction. Additionally, the project contributes to decreased environmental impact by considering sustainability concerns, leading to less waste.

IMPACT 3: TECHNOLOGICAL / ECONOMICAL

Co-creation methods in AI are evolving globally, and this project addresses the challenges in defining user requirements for AI as a design material. Techcards, data sheets, and low-fidelity simulations empower end-users to consider AI attributes before system development. The technology use in this project aims to empower workers and customers, transforming the interaction between AI and users into a two-sided collaboration. The deployment of the AI Acceptance Index enhances the human-centered approach in designing and implementing AI systems by providing clear, transparent, and reliable metrics. This approach contributes to the establishment of a composite index for a more human-centered and trustworthy AI system.
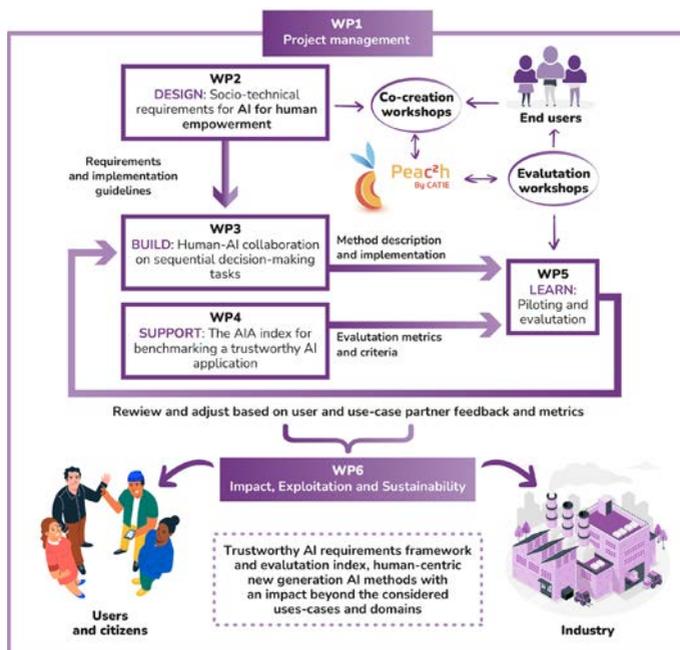
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TANGO

It takes two to tango: a synergistic approach to human-machine decision making.

Call:	*HORIZON-CL4-2022-HUMAN-02*
Duration	*01 October 2023 > 30 September 2027*
Project ID	*101120763*

OBJECTIVES

TANGO is a €7M EU-funded project that aims to develop the theoretical foundations and the computational framework for synergistic human-machine decision making. The 4-year project will pave the way for the next generation of human-centric AI systems.

The goal is to fully develop the enormous potential that AI holds in terms of positive impact on individuals, society and economy by establishing a symbiosis between humans and machines: people should feel they can trust the systems they interact with, in terms of reliability of their predictions and decisions, capacity of the systems to understand their needs, and guarantees that they are genuinely aiming at supporting them rather than some undisclosed third party.

The strategy that TANGO will pursue to achieve this objective is based on a cognitive theory of mutual understanding and hybrid decision making (HDSS), cognition-aware eXplainable AI (XAI) paradigms in support of synergistic human-machine interaction and collaboration, and a "Human-in-the-loop" co-evolution of human decision making and machine learning models.

The potential impact on individuals and society of the TANGO framework will be evaluated on a pool of real-world use cases of extremely high social impact, to ensure alignment between TANGO scientific activities, tech-oriented ones, and experimental activities. The pilot studies, namely, consist of supporting women during pregnancy and postpartum, supporting

surgical teams in intraoperative decision making, supporting loan officers and applicants in credit lending decision processes, helping public policy makers in designing incentives and allocating funds.

EXPECTED IMPACT

IMPACT 1: Increased inclusiveness, obtained by supporting a human-centred approach to technology development aligned with European social and ethical values, and sustainability. More specifically: increased fairness of decisions taken by the hybrid decision support system; increased engagement of pregnant women in AI-assisted health and wellbeing improvement; increased engagement of bank customers in taking actions to improve their risk profile; increased engagement of citizens in the design and validation phases of the policy making process; references to papers, project results, and contributions from consortium authors.

IMPACT 2: Sustainable, high-quality jobs, obtained by targeting: skills mismatches, the need to empower workers, and ethical considerations relating to technological progress. More specifically, it will lead to: increased effectiveness of workers' DM processes (healthcare professionals, bank officers, and policy makers); increased effectiveness of surgical teams training; reduction of perceived stress level for high-impact decision makers (e.g., surgeons); trained workers improving their ability to collaborate effectively with AI agents, as measured through end-of-course tests.

Given the diversity of the sectoral case studies, TANGO offers a high replicability of its solutions, contributing therefore to the sustainability of the project assets. The maximisation of the project impact is also leveraged through the extensive network of TANGO partners that includes AI, Data and Robotics Partnership and relevant initiatives. The experience gained in the project will be used to create a set of best practices for reskilling and upskilling workers, with guidelines publicly released.

THEMIS 5.0

THEMIS engages users through AI-driven interactive dialogues and helps them assess how trustworthy they think a particular AI decision is.

Call	*HORIZON-CL4-2022-HUMAN-02-01*
Duration	*01 October 2023 > 30 September 2026*
Project ID	*101121042*

OBJECTIVES

THEMIS 5.0 is seeking to reshape the landscape of artificial intelligence (AI). At the heart of the project is a **Human-Centred AI Trustworthiness Evaluation Framework and Ecosystem**.

The main goal of the ecosystem and its tools is to **improve trust in AI systems for all users**. The project consortium draws researchers and practitioners from diverse disciplines to ensure that AI-hybrid decision support is trustworthy and takes place in accordance with human needs and moral values, as well as adhering to key socio-technical standards and guidelines.

Co-creation ensures the integration of all facets involved in hybrid-AI decision making, such as fairness, technical accuracy and robustness, are considered to to ensure that AI used for decision making is accessible, dynamic, explainable and sustainable.

This is achieved by empowering people from a range of different backgrounds to evaluate the trustworthiness of AI solutions using a risk-based approach, so they can better understand how the AI works, and provide feedback on how to improve the systems (fig 1).

This feedback loop ensures AI system developers, AI-based service providers and AI system users, including educators, professionals, and policy makers, can all work together to attain high levels of trustworthiness in AI systems/decisions.

THEMIS 5.0

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The specific objectives of THEMIS 5.0 are to:

- Implement a human-centric and ethical approach to developing THEMIS 5.0 AI
- Define human-centred trustworthiness evaluation and optimisation AI framework
- Create benchmark datasets for the training of the THEMIS 5.0 AL/ML algorithms
- Implement the THEMIS human-centred trustworthiness optimisation ecosystem
- Evaluate the relevance of THEMIS to real-world applications
- Create impact and sustainable value for the THEMIS 5.0 results

THEMIS 5.0 will be co-designed developed and tested via 3 use-cases across Europe – **personalised healthcare** (Plovdiv), **port logistics** (Valencia) and **disinformation in journalism** (Athens).

EXPECTED IMPACT

THEMIS 5.0's project vision is to leverage the opportunity provided by AI to:

- Co-create solutions to help users assess the trustworthiness of AI through globally relevant use cases
- Empower human users to make decisions that give them control over AI technology
- Foster an open technical and policy driven environment to create sustainable change

This approach will deliver the following impacts:

IMPACT 1: Advance responsible use of AI for critical decision support in public and private sectors through effective tools, capacity building and support to better help humans manage and govern its impact.

IMPACT 2: Introduce a new AI environment for organisations which can be used to stim-ulate a new wave of workplace innovation, from helping to make better business decisions, to new, ethical, personalised services

IMPACT 3: Support people at work in understanding why decisions are made using outputs of AI and help them more easily have a collective say in enhancing the decisioning tools. Also, support policy makers to develop practical, applicable AI policies

IMPACT 4: THEMIS 5.0 is designed to support the wider aims of the Horizon Europe strategy to 'accelerate green & digital transformation' with a strong focus on pillar D 'creating a more resilient, inclusive and democratic society'. The project will contribute by: bridging policy policies with practice; inclusive growth & new job opportunities; enabling a secure, open & democratic EU society; building a resilient EU prepared for emerging threats.

AI, DATA AND ROBOTICS FOR INDUSTRY OPTIMISATION (INCLUDING PRODUCTION AND SERVICES) (AI, DATA AND ROBOTICS PARTNERSHIP) (IA)

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COROB

Cooperative Robotics Powered by AI and Data for Flexible Production Cells

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02-05*
Duration	*1 October 2023 > 1 September 2026*
Project ID	*101120640*

OBJECTIVES

Manufacturing industry is facing a new market trend oriented towards higher productivity, a large variety of products in small quantities and with high customization. The high-mix low-volume production implies the need to build highly flexible and intelligent manufacturing environments, that allow a fast adaption of processes and systems to changing conditions, maintaining high product quality with lower production costs and energy consumption.

COROB aims to develop a **flexible, cooperative and intelligent multi-robotic solution** for arc welding-based manufacturing processes (joining and additive manufacturing).

Conceived as a global solution and powered by Inspection, Monitoring, Control and AI techniques COROB will optimise the welding process, and the adjacent manufacturing stages (pre-process and post-process) for time, cost, energy, and resource reduction. The data generated will be processed in a data acquisition platform to feed the AI technologies, addressing optimisation, search, planning, and analysis, ensuring AI robustness and trustworthiness.

The solution will be validated in two semi-industrial use cases focused on arc-welding joining and wire-arc additive manufacturing for repairing, ready to be extrapolated to other processes such as aassembling, painting or finishing. Thus, manufacturing processes will benefit of the latest technological innovations in cooperative and intelligent robotic solutions, but with human in the loop approach, towards a more sustainable and competitive manufacturing industry.
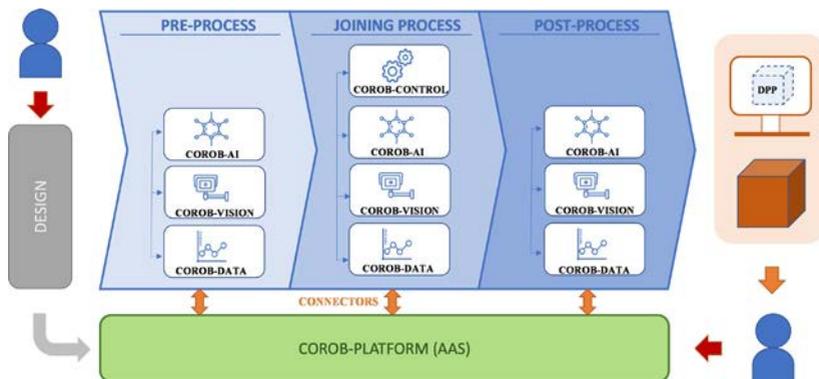
EXPECTED IMPACT

SCIENTIFIC IMPACT: COROB will develop and integrate novel technologies combining robotics, AI and data to boost manufacturing for strategic sectors and industries. It will demonstrate a feasible solution for flexible, agile and reconfigurable manufacturing using cooperative robots enhanced by AI and humans, which is supposed to be the next-generation robotics.

ENVIRONMENTAL IMPACT: Green and Digital transitions require digital solutions to optimize resources through flexible manufacturing. The intelligent manufacturing environment of COROB proposes easy adaptation of the processes to changing conditions with a fast response. More specifically, the two pi-

lots developed will ensure (i) the significant reduction of fixtures and scrap ratio and (ii) repairing for circular economy. In both cases the use of materials and energy consumption will be reduced.

INDUSTRIAL IMPACT: According to the report on Europe's Digital Decade, the digital targets for 2030 are set at 75% of EU companies using cloud/AI/big data. Nowadays, only 10% of AI adopters capture full potential use. The development and adoption of COROB novel digital solutions and the training material developed to facilitate adoption of the solution will contribute to regain European industry's digital leadership across the supply chain.

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dAIry 4.0

Advanced, trustworthy AI and data solutions for individualized automated milking & feeding of dairy cows.

Call:	*HORIZON-CL4-2022-DIGITAL-EMERGING-02-05*
Duration	*01 October 2023 > 31 March 2027*
Project ID	*101119714*

OBJECTIVES

The agricultural sector has a big challenge: producing more with fewer raw materials and less adverse effects on society, production animals, climate, and biodiversity. Climate-friendly sustainable agriculture, with care for natural resources, is essential for our food production and quality of life, today and for future generations.

dAIry 4.0 addresses these challenges by combining AI, Data, and Robotics solutions to further progress Automated Voluntary Milking Systems (AVMS) capabilities leading to overall improved outcomes with measurable results to be demonstrated through real-world use cases. The project is focused on:

· Automated health assessment of cows' while exploiting data from both the AVMS and activity sensors on the animals,
· Development and integration of a novel milk analyser based on mid-IR spectroscopy for in-line milk quality assessment.
· Upgraded individualization of milking settings at singe teat level,
· Upgraded individualization of the forage-to-concentrate ratio and quantity of concentrate in AVMS, for more efficient automated monitoring of nutrient balance per animal,
· Development of a novel Decision Support System (DSS) based on new simulation models, and digital twin of farm providing individualized decision support for stakeholders.

The advanced data to be collected from the newly developed and upgraded tools will be combined with all other data already measured via the AVMS and other sensors in the farm and on the animals for enriched visual analytics supporting the overall farm monitoring.

EXPECTED IMPACT

IMPACT 1: Automated milk quality detection in with a novel milk analyzer and automatic milk partitioning leading to new dairy products based on different milk compositions.

IMPACT 2: Individualized milking settings at the single teat level lead to healthier cows, which also affects milk yield.

IMPACT 3: Individualized feeding of cows for reduced overall feeding costs, enhanced farm financial sustainability and improved animal health with individual handling of metabolic disorders and reduced susceptibility to disease.

IMPACT 4: Automated health assessment for early detection and treatment of cow health conditions.

IMPACT 5: Healthier animals, with improved nutritional status expected to deliver enhanced milk quality, reaching the animal's genetic potential, improving farm's profitability.

Overall, the optimization of both milking and feeding is expected to positively impact the environmental footprint of the farms. The new integrated system proposed by dAIry 4.0 also aims for significant reduction in CO_2 emissions.

EMERALD

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EMERALD

AI and process automation for sustainable entertainment and media

Call:	*H2020-HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 October 2023 > 31 March 2026*
Project ID:	*101119800*

OBJECTIVES

The current surge in video and extended reality content is causing an excessive demand for skilled human resources, data processing, and energy. The main objectives of EMERALD are to automate and speed processing for sustainable media creation; optimizing data use for Artificial Intelligence/Machine Learning (AI/ML) while increasing the quality of content in entertainment and media applications; reducing the power demands for large-scale media data processing; and creating acceptance and demand for AI and sustainable production technologies in the entertainment and media industries.

To these aims, in EMERALD we are

a) developing new ML/DL and process automation tools based on more efficient data use that increase the speed and quality of digital content creation, enable user-guided control and reduce the energy/resource demands of large-scale media data processing;
b) developing open-source energy consumption metrics at granular level for quantifying energy consumption and impact of these algorithms and hardware pipelines at granular level,
c) developing more efficient data use in entertainment and media applications
d) reducing the power demands for large-scale digital content processing while fostering acceptance and demand for AI and sustainable entertainment and media production, specifically exploring how these techniques could make media industry more sustainable.

Figure: Project Evolution — EMERALD work packages flow (Algorithms and Data sets → Prototypes and Demonstrators → Testing and Evaluation → EMERALD Outputs)

- **Algorithms and Data sets**
  - **WP2** AI-supported automation of tools and methods for sustainable digital content creation
  - **WP4** Efficient data use in entertainment and media applications
  - **WP5** Reduced power demands for large-scale digital content processing
  - **WP3** Energy measurement framework for content processing
  - **WP6** Acceptance and demand for sustainable entertainment and media
- **Prototypes and Demonstrators**
  - New Toolsets ML Training Datasets
  - Energy Profiling Tool Validation
- **Testing and Evaluation**
  - Demonstrations and Evaluation
- **EMERALD Outputs**
  - Video analysis, matting, colour matching, modification
  - Reduced datasets, Cloud-based streaming, enriched video
  - Compression, hardware acceleration, low-power processing
  - Energy measurement tools, APIs, energy profiles
  - Publications, demonstrations, evaluation, business plans

EXPECTED IMPACT

IMPACT 1: SOCIETAL
- Improved VP/XR tools enhance entertainment quality.
- Rich data creation for inclusive content with automated audio descriptions.
- XR experiences increase access to events, promoting sustainability and inclusion.
- Automated sign language generation supports societal inclusion.

IMPACT 2: SCIENTIFIC
- AI/ML tools speed up media production and reduce resource requirements.
- Precise energy consumption measurement in video pipelines advances scientific understanding.

IMPACT 3: TECHNOLOGICAL
- Intelligent tools (software and hardware) drive AI and sustainability adoption.
- Real-time tools in VP/XR trend enhance creativity and production efficiency.
- Empowers creatives and assesses energy consumption for sustainable practices.
- Alignment with AV1 for efficiency benefits in content creation and streaming.

IMPACT 4: ECONOMIC
- Task automation fosters economic innovation and sustainability.
- Efficiency gains maintain or increase competitiveness in the globalized economy.
- Increased creativity and efficiency boost creative and cultural industries, potentially increasing employment.

VISIT US ON:

PERKS

Eliciting and exploiting procedural knowledge in industry 5.0

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02-05*
Duration	*1 October 2023 > 30 September 2026*
Project ID	*101120323*

OBJECTIVES

The aim of PERKS is to support the **holistic management of industrial procedural knowledge in its entire life cycle**, by leveraging AI and data technologies. PERKS contributes to **advancing AI and data in terms of maturity, flexibility and user acceptance** with the goal to optimise industrial processes in a wide range of scenarios where **procedural knowledge** (at different levels of complexity) plays a key role.

By supporting the elicitation, building and exploitation of explicit Procedural Knowledge through advanced technologies, data value exploitation and digital supporting tools, PERKS improves employees' working conditions, enables more flexible and adaptable workflows, and contributes to industry sustainability.

PERKS draws **industrial requirements from a set of diverse yet representative scenarios** of different complexity, ensuring a broad validation of the proposed technologies and tools and the **transferability of the results across contexts and sectors**.

The main objectives of the PERKS project are:

- OBJECTIVE 1: Provision of **AI-powered and data-enabled digital tools for industry workers** to support their daily operations in relation to Procedural Knowledge
- OBJECTIVE 2: Formal definition of procedures in an ontology to **standardise the way to capture and exchange Procedural Knowledge** in Industrial Data Spaces

- OBJECTIVE 3: **Improvement of AI and data technologies with a human-in-the-loop approach** by involving representatives of industry professionals
- OBJECTIVE 4: **Measurable impact** on the use cases
- OBJECTIVE 5: **Increase of the TRL/IRL/MRL/HRL of the PERKS technological solutions**

EXPECTED IMPACT

The positive impact of PERKS is manifold:

IMPACT 1: Improved sharing, understanding and application of procedural knowledge by industry employees
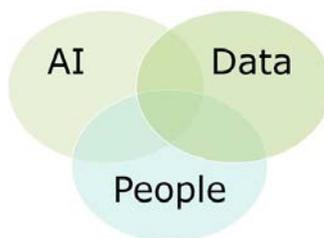
IMPACT 2: Even more increased operational standardisation with reduced costs, human errors and disruptions, which in turn lead to more dependable outcomes

Safety procedures   CNC configuration   Energy optimization

IMPACT 3: Shorter and more effective knowledge transfer between people, thus facilitating the adoption as well as the organic evolution of procedures

IMPACT 4: Significant indirect economic impacts, like changes in the productivity of organisations (such as through greater adoption of information technology) or enhanced skills and knowledge in a professional community

All of this is aligned with the main goals of the Industry 5.0 approach 7 towards a human-centric, resilient and sustainable European industry:

- **Human-centricity:** by putting the human interests at the center, PERKS aims to use AI and data technologies to adapt the industrial technologies to adapt the industrial and operational processes to the needs of the worker, by providing digital supporting tools to guide them in the formalisation and application of procedures

- **Resilience:** by supporting the management of the industrial operational procedures, PERKS helps in balancing the robustness and ease-of use of the technological solution with the flexibility to changing requirements and evolving procedures and processes

- **Sustainability:** by optimising resource efficiency and promoting safe and environmental friendly procedures, PERKS supports industrial workers in following best practices for a more responsible use of resources, a reduced energy consumption and waste, contributing to industry sustainability

Moreover, with its focus on AI and data, PERKS contributes to the efforts around the Industrial Data Space promoted and supported by the European Commission.

Se Con Rob

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SeConRob

Self-Configuring Multi-Step Robotic Workflows

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02-05*
Duration	*1st Oct. 2023 >30th Sept. 2026*
Project ID	*101118511*

OBJECTIVES

The SeConRob project aims at developing methods for the self-configuration of robotic processes, where each manufacturing step depends on the results of the previous step. In this case a lot of productivity, energy and resources are lost, because the processes currently cannot be automated for technical and economic reasons. Such situations typically occur during inspection and re-work, where the (downstream) re-work process depends on the results of the (upstream) inspection process of each individual part. SeConRob will develop technologies that enable the automation of such processes, by creating robotic processes that can be automatically configured for each individual part. This will build upon AI-based data analysis that extracts information from the inspection data, that are used in turn to automatically generate a robot program and process parameters for the downstream re-work process. Physical process models will be the basis for the initial planning and a long-term feedback loop based on reinforcement learning will be established to optimize the process and account for properties that are not included in the initial model.

Two use cases with multi-stage manufacturing processes including inspection, gouging, welding, grinding and polishing will provide test cases for the developments. Demonstrations are planned on a real-world production line to raise interest in sectors such as automotive and aerospace, where safety-critical parts are manufactured. The estimated market potential for such multi-stage self-configuring robotic process is about 2000 robotic workcells, corresponding to a market of 600 M€.

EXPECTED IMPACT
IMPACT 1: IMPROVE WORKING CONDITIONS

Almost all the production processes investigated in the SeConRob project are done in adverse working conditions. MPI usually requires a quite dark room to see the faint glow of the fluorescent particles, welding, grinding and polishing create noise, dust and require substantial protection of the workers. They are often done in separate cabins and workers usually need to be switched around after a few hours of e.g. doing a grinding operation. Furthermore, during MPI operators are exposed to high magnetic fields and in the future this kind of control will possibly be no longer allowed for health reasons.

SeConRob enables an automation of the process, so that it can be done in an isolated environment. Permanent human presence in this environment is not required and the control of the process, including the high-level analysis of process statistics and process feedback can be provided from a remote location.

IMPACT 2: SELF-CONFIGURING SYSTEMS

In SeConRob AI based data analysis will be used to provide input for the self-configuration of downstream robotic processes. The data acquired in the upstream process (e.g. inspection results, defect locations and characteristics) provide the main basis for the planning of the downstream process, e.g. where and with which intensity or depth re-work processes need to be executed. The resulting process plan will be converted into a robotic program (based on a model of the workcell and part), which is then executed automatically.

IMPACT 3: SELF-LEARNING

As a specific feature of the SeConRob technologies a long-term feedback loop is integrated into the system. A high level feedback signal representing the 'success' of the process (e.g. the quality of the part) will be input to a reinforcement learning method. This training input will adapt the concerned process steps to enhance their future execution

IMPACT 4: ADAPTING PRODUCTION

SeConRob addresses a very common situation in production, consisting of an inspection process, followed by re-work process(es) that depend on the results of the inspection. Such sequence of processes occurs in almost any manufacturing processes that is producing parts of moderate to high value. The capabilities offered by SeConRob technologies will adapt the production process automatically and will thus make re-work economically more efficient.

SoliDAIR

Solid, rapid and efficient adoption of Data, AI & Robotics applications in production

Call:	CL4-2022-DIGITAL-EMERGING-02
Duration	01 October 2023 > 30 September 2026
Project ID	101120276

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OBJECTIVES

Overarching goal: SoliDAIR brings together 10 manufacturing, technological and research experts to accelerate the uptake of AI and Robotics in European manufacturing, while using Data as an enabler, by co-developing and demonstrating tailored solutions to digitalise and automate visual inspection and physical testing, enable predictive quality control and process optimization.

Four industry-led use cases will be addressed:
· AI-enabled optical quality inspection system for non-AI-experts (BROSE)
· Robotics & AI enabled automated visual inspection and manufacturing efficiency optimisation (CIE)
· Robust AI quality prediction in matured, high rate and high volume production (BOSCH)
· Predictive quality control of a multi-step assembly process integrating human operators (AUTFORCE)

In line with the above overarching goal, SoliDAIR has the following objectives:
· Production processes are improved through digitalised & automated quality control for high volume, high rate, and flexible manufacturing
· Adaptable and replicable modules are developed with cutting edge, trustworthy and usable technologies in three functional themes: Visual AI, Data & AI, and Robotics & AI

- Competitiveness and sustainability of EU manufacturing companies is increased
- Widespread adoption of AI, Data & Robotics technologies across EU manufacturing industries is facilitated and boosted to maximise the impact

EXPECTED IMPACT

IMPACT 1: AI, data and robotics, and automation will be advanced for the optimisation of production optimisation of processes, to increase competitiveness, improve working conditions, environmental sustainability, and supporting the European Economy using AI, data and robotics technologies.

IMPACT 2: Processes to increase competitiveness and supporting the European Economy will be optimized. The AI and Robotics solutions demonstrated in the industry UCs will enable the partner companies to increase competitiveness and ensure their continued leadership by achieving gains in terms of manufacturing performance, quality and efficiency, as well as in terms of flexibility and agility of production.

IMPACT 3: Processes to improve environmental sustainability will be optimized. Improvement of environmental sustainability in production are achieved by reducing the reject rate of the process and the overall OEE, which saves wasted material, energy and CO_2.

IMPACT 4: Working conditions will by improved. Tedious jobs are substituted by more pleasant and knowledge-based tasks, such as the supervision, maintenance and improvement of the systems.

IMPACT 5: Europe's open strategic autonomy by sustaining first-mover advantages in strategic areas will be strengthen, by the project focus on automation in the manufacturing sector, which is one of the major competitive advantages for Europe today and in the future.

PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE (RIA)
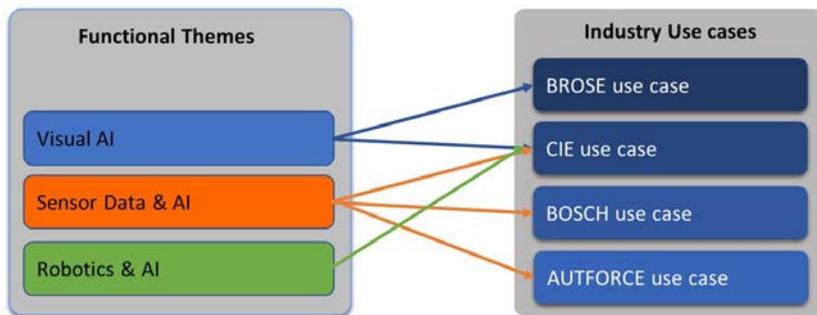
MANiBOT

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MANiBOT

Advancing the physical intelligence and performance of roBOTs towards human-like bi-manual objects MANipulation

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 November 2023 > 30 April 2027*
Project ID	*101120823*

OBJECTIVES

MANiBOT aims to empower bi-manual, mobile, service robots with enhanced manipulation capabilities enabling them to handle a wide variety of diverse objects, in a human-like manner and in diverse challenging environments. Project outcomes will be tested across four use cases in retail and transportation sectors, addressing tasks like shelves restocking in supermarkets and baggage handling in airports.

The specific objectives are to develop:

- Novel object/pose recognition and environment understanding methods based on an adaptive, context-aware fusion of vision, proximity and tactile sensing towards fast and effective manipulation of diverse, even unknown objects, in human-populated environments.
- A novel suite of manipulation primitives including non-prehensile manipulations for the transfer of diverse objects with various sizes, weights, shapes and materials from a mobile robot even within significant spatial constraints.
- Innovative cognitive mechatronics fusing advanced tactile and proximity sensors with the bi-manual mobile manipulator aiming at optimized energy efficiency and autonomy.
- A new multi-level adaptive robot cycles approach for robot cognitive functions enabling the robot to learn, compose and swiftly adapt behavior in order to achieve complex manipulations

EXPECTED IMPACT

Scientific: Expanding the state of the art, novel perception, control and cognition methods will be researched and, along advanced mechatronics, will lead to new bimanual cobots that operate under a novel concept of multi-level adaptive cycles inspired from human behaviour theory. The project is anticipated to lead into significant research outputs, posing a strong impact towards further promoting excellence in science and technology.

Societal: The project aims at improved working conditions alleviating workers from manual labor tasks with negative impact on their health based on user-centric designed technologies with emphasis on user's safety and acceptance that take into account the ethical aspects and influence on human rights of the workers and costumers.

Economic/ technological: The MANiBOT advanced bi-manual manipulation capabilities pave the way towards a new market of cobots that can manipulate objects in a human like manner revolutionizing the manipulation procedures and the future robots adoption in a wide range of application (e.g. logistics, transport, agri-food, manufacture) while giving added value to the Digital Supply Chain.

Summary of the MAniBOT functional architecture:
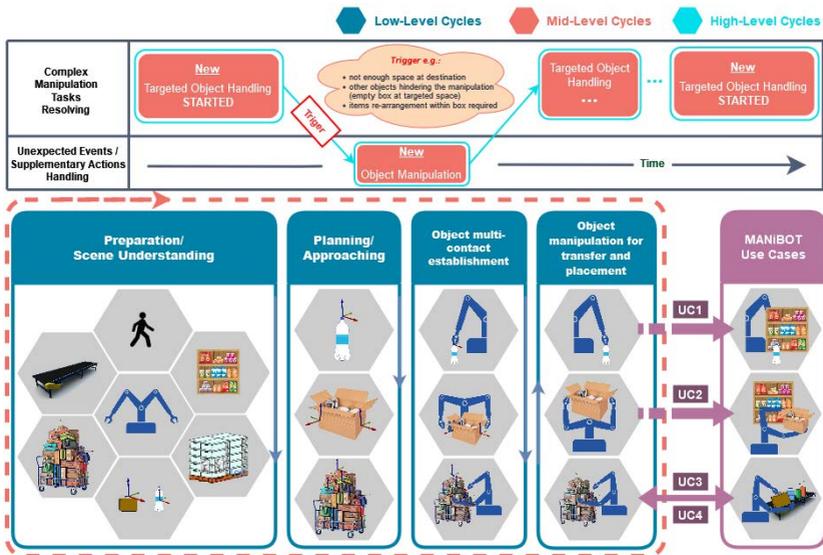
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PRIMI

Advancing Robots' Autonomy and Physical Performance for Interaction and Rehabilitation

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 November 2023 > 31 December 2027*
Project ID	*101120727*

OBJECTIVES

The next-generation personal robots will possess cognitive and motor intelligence that can enhance human interaction. However, the current AI and robotics paradigms require additional resources to achieve performance and reasoning abilities similar to those of humans.

PRIMI's ambition is to induce a paradigm shift in AI and robotics to create truly autonomous socially interactive robots, which will offer new technological perspectives for transforming personal robotic services. PRIMI will establish the engineering design principles for personal social robots with a human-like level of cognition and motor performance.

To this end, PRIMI cross-disciplinary research will synergistically combine emerging methodologies and technologies to produce biologically plausible innovations that support efficient integration between a robot's mind and body.

These innovations will improve robots' awareness of self (motor imagery), the environment (mental representation), and humans (Theory of Mind – ToM). With these skills, robots will be able to autonomously improve their physical performance, effectively interact with humans, and adapt actions to a broad range of open, dynamic situations. PRIMI's research will lay the foundation for the future personal robotics services provided by socially aware, high-performance, neuromorphic humanoid robots, which will be able to act transparently, cooperate with other robots and humans, and to adapt their abilities to changing internal, environmental, and user conditions.

As a proof-of-principle of the technological advancement in a relevant scenario, prototypes of neuromorphic humanoid robots will be validated in clinical pilot studies of robot-led physical rehabilitation of stroke survivors.

EXPECTED IMPACT

IMPACT 1: Robots with advanced physical functionalities, capabilities and efficiency (faster, safer, more agile and precise, etc.), to achieve wider variety of tasks efficiently.

PRIMI embodied higher order cognition capabilities will support a wider variety of physical and social functionalities, which will enable advanced collaborative human-robot interaction scenarios that are not currently possible. These results will contribute to the progress toward "tomorrow's deployable robots: efficient, robust, safe, adaptive and trusted".

IMPACT 2: Robots with greatly improved intrinsically safe and efficient human-centric human-robot and robot-environment/objects physical interaction capabilities, at natural human speed or more.
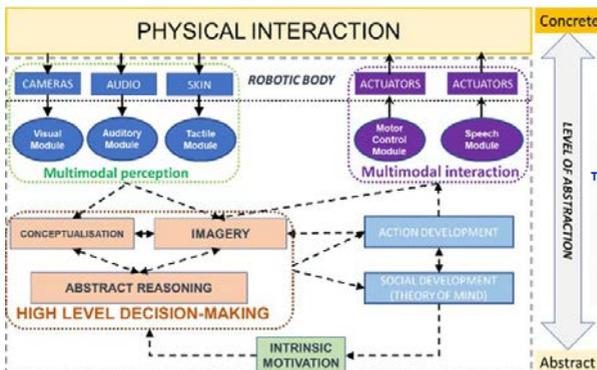
PRIMI's neuromorphic cognitive architecture will enable efficient human-robot interaction at natural speed. The high order cognition models of mental imagery and theory of mind will greatly improve robot's self, environmental and social awareness, therefore its ability to safely operate in complex and unknown situations with humans by predicting in real time the consequences its actions. These advanced interaction capabilities will enable a robot-led rehabilitation of post-stroke patients, which will be demonstrated in the clinical pilot studies that will involve at least 40 patients.

IMPACT 3: Robots with improved abilities and robustness, allowing them to adapt to changes in the environment, and making them more energy efficient in order to run autonomously for longer periods of time while maintaining trustworthiness and dependability.

PRIMI will deliver new computing and perception hardware and software that will result in a 5x reduction in energy consumption with respect to the best edge AI solution available on the market. This will result in longer autonomy and improved dependability also thanks to the reduction in heat produced by the computing and sensing. PRIMI will also target an increase in people trust (+30%) thanks to transparent learning and interaction with mental imagery and ToM.

These novel technologies developed in PRIMI will have a significant scientific impact in the many different disciplines covered by the project. The project will give the foundation of next generation of humanoid robotic platforms with life-like features and motion. The envisioned personalisation and transparency of the learning process and interaction will have a positive on impact people's trust, acceptance, and adoption of robots in their lives.

SPEAR

The SPEAR project blends evolutionary computing and deep learning to create advanced aerial robots with unique morphologies and superior navigation tailored to their mission & environment.

Call:	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 November 2023 > 31 October 2027*
Project ID	*101119774*

OBJECTIVES

SPEAR's vision stems from clear observations regarding inconsistencies between the engineered design of flying robots and the natural paradigm of flying organisms. The bodies and brains of flying animals vary greatly depending on their ecological niche. A striking example is the difference between species such as mosquitoes and eagles. Among the two, both bodies and brains are vastly different. However, for flying robots until now, it almost seems to be a "one-size-fits-all". A look at the history in this domain is particularly telling. By 1922, the de Bothezat helicopter with its four six-bladed rotors had performed its maiden flight, while it was in the 2000s that small, unmanned quadrotors emerged and dominated the drone sector due to their simplicity and agility. Despite the vastly different mission profiles, manned and unmanned rotorcrafts share a striking set of similarities. A change of paradigm is necessary.

SPEAR aims to revolutionize the field and deliver the vision of mission- and environment-tailored aerial robotics through a collective view of the design of the robots' "body" and "brain," To that end, our research will exploit the synergy of a) evolutionary algorithms, b) a combination of rigid and soft materials, c) robot perception incorporating diverse sensors, d) efficient propulsion systems and e) progress in deep neural networks for navigation strategy learning. The objective

is to have AI create novel aerial robots that are more efficient, resilient, and safe through their optimized fit to the mission and the type of environment. Upon its success, SPEAR has the potential to drastically shift aerial robot design from human-conceived creations to automated, task-specific designs.

EXPECTED IMPACT

IMPACT 1: SPEAR shall deliver automated computational tools that allow for environment- and mission-specific collective optimization of aerial robot airframes and navigation autonomy policies. This shall lead to a new class of aerial robots that greatly outperform today's conventional designs for the tasks they were designed for.

IMPACT 2: SPEAR shall strengthen European capacities in key parts of digital and future supply chains by establishing European technologists as pioneers in a game-changing methodology that delivers new, previously unseen, navigation-superior flying robots.

IMPACT 3: SPEAR focuses on two application areas, navigation in forests and information sampling in industrial settings and delivers two robot classes with superior abilities and robustness for these domains. SPEAR's methodologies shall generalize to other tasks and mission profiles.

IMPACT 4: Focusing on open-source practices in combination with technology exploitation and commercialization, the project shall create high-quality knowledge and foster Open Science. SPEAR shall lead to a leap in growth for the robotics sector, with European leadership, based on a new class of robots breaking ground for new market opportunities.

SWAG

Soft Wearable Assistive Garments for human empowerment

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 November 2023 > 31 October 2027*
Project ID	*101120408*
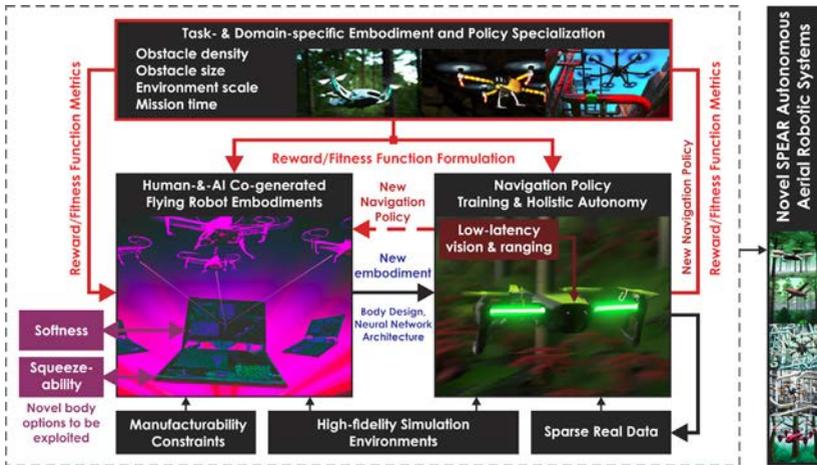
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OBJECTIVES

The SWAG project is a multidisciplinary initiative in the field of soft robotics, focusing on the development of lower limb exosuits: soft **wearable exoskeletal robots to empower the lower body and core**.

The project aims to replace traditional rigid materials found in exoskeletons, with high-strength, inflatable fabrics, interrogated by flexible proprioceptive sensing films and actuated by portable pneumatic sources, to create **smart, motion-assistive, soft and lightweight garments**.

SWAG will be the first exosuit to realise **complete assistance** for multi degree-of-freedom joints, such as the ankle or hip, by adapting flexibly and conforming to motions through continuum robot designs.

Textile-based soft actuators lie in the core of the SWAG project, differentiating our approach from other, "rigid" solutions for motion support. The fabrics used are selected for their high strength to weight ratios, as well as for their comfort and durability. The suit can remain undetected when worn under the wearer's clothes. SWAG's material selection prioritizes user safety, without sacrificing comfort and aesthetics.

SWAG will provide **individualized assistance**, tailored to each user's specific needs, by employing high fidelity data sampling, detailed musculoskeletal models for real-time control, and AI-based user intent tracking for diverse applications.

SWAG is developed with the users in mind: a **user-centric adaptive design** approach is used to ensure end-user satisfaction and maximization of SWAG's applications and impact. The SWAG exosuit will constitute an intuitive and discreet solution to motion support, offering a seamless user experience.

EXPECTED IMPACT

Motion assistance: SWAG will be used as a motion assistance exosuit for persons with mobility impairments. The aim is to provide these vulnerable groups with an aid that will increase their mobility, thus leading to improved quality of life and independence during their activities of daily living.

Occupational enhancement: In an occupational enhancement context, SWAG will be demonstrated as a tool that increases manual labourers' capabilities to manipulate and move heavy objects with reduced physical strain and increased safety through the support of their lower limbs and back.

Wellness and health: As wellness training equipment, SWAG will provide resistive training capabilities to athletes or to people undergoing physical therapy.

Immersive virtual reality: As a haptic feedback solution, SWAG will be integrated with a virtual reality application to demonstrate its capability to provide an immersive VR experience of unprecedented realism.

Smart textiles: Our research project will advance the science of functional textiles, guiding the development of novel soft fabric actuators and sensors that can be embedded into lightweight smart garments.

Distributed and continuous data sampling: Through our distributed sensing approach, with active sensing elements embedded into the SWAG exosuit, we will be able to track both signals in the user's body indicating intent, as well as joint motion data. The data can be continuously sampled when the exosuit is worn, and can constitute a unique dataset of human biomechanics, to help enhance our understanding of our bodily functions during our daily activities.

Adaptive motion control: To utilize the suit's rich sampled data, we aim to employ powerful AI models and assist the user in a predictive and immersive manner, adopting an adaptive combination of hardware and software intelligence.

Human empowerment: SWAG exosuits will empower humans in their daily activities, as the first exosuit to provide full lower body active support.

INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS (AI, DATA AND ROBOTICS PARTNERSHIP) (IA)

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AUTOASSESS

The goal of the AUTOASSESS project is to employ state-of-the-art AI and robotics to remove human surveyors out of harm's way, while at the same time obtaining an accurate, repeatable, and quick vessel inspection.

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 October 2024 > 30 September 2027*
Project ID	*101120732*

OBJECTIVES

The overall objective of the AUTOASSESS project is to remove human surveyors and workers from dangerous and dirty confined areas of offshore structures by employing an autonomous robotic system that exceeds human capabilities and is able to perform maritime vessel classifications.

The **specific objectives** are the following:
1. Autonomous Exploration and Overall Assessment of Confined Ballast Water Tanks.
2. Comprehensive Inspection of Ballast Tanks & Cargo Holds, including NDT Measurements.
3. Autonomous aerial NDT with ultrasonic-testing hardware less than half the mass of currently available solutions, cm-level position accuracy and NDT measurement accuracy.
4. ML system capable of detecting >95% of defects across different vessels in a range of 20+ years of age.
5. Transforming Robotic Scans of Ballast Tanks and Cargo Holds into Actionable Data.
6. Decision Support System capable of planning and initiation missions, and post-processing past missions.
7. Quantify repeatability and accuracy of autonomous inspections via 3 demonstration events.

Current Status

AUTOASSESS Vision
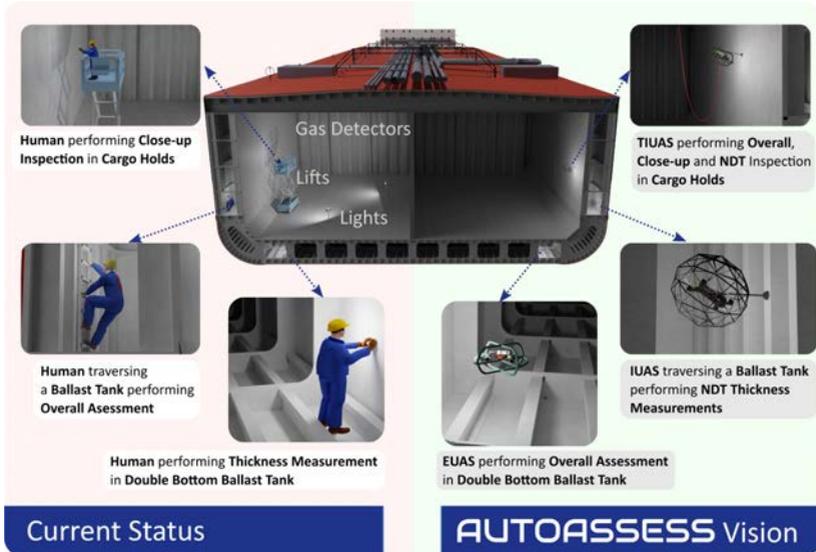
EXPECTED IMPACT

IMPACT 1: Human death and injury avoided: In the past 5 years, there have been 50 deaths on average every year in enclosed spaces on marine vessels with a total of at least 739 deaths between 2000-2021. Through AUTOASSESS an average of one death per week in confined marine spaces is avoided.

IMPACT 2: Super-human performance: Automating the classification procedure, providing 3D maps, defect detection, ultrasonic thickness measurements and trend analysis provides a better, faster, more traceable and repeatable inspection solution than is possible using human inspectors. Our target is 95% fault detection accuracy and better than 100 μm thickness measurement accuracy.

IMPACT 3: Boost EU competitiveness: The low-cost advantage of Far Eastern dry docks will be eliminated. A typical inspection of a vessel including comprehensive thickness measurement requires 15 days (8 days inspection and 7 days travel). Looking at DANAOS technical data, preferred shipyards for dry-dock service are mostly located far East (China, Korea). Lost revenue, operational costs and off-hire opportunity cost can reach 100K€ per day. With AUTOASSESS, the time reduction in inspections at the yard and the associated cost, savings could offset this paradox of choosing a distant shipyard and bring business back to Europe.

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ZABALA BRUSSELS
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PIPPLE B.V.
https://pipple.nl/en/

HARMS & WENDE GMBH & CO KG
https://harms-wende.de/

MAGICIAN

The MAGICIAN project addresses the products aesthetics and quality issues by facilitating tasks related to defects detection and rework through the use of robotics and artificial intelligence and using human-robot cooperation and collaboration.

Call	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*1 October 2023 > 30 September 2027*
Project ID	*101120731*

OBJECTIVES

The main objective of the project is to introduce a robotic solution for autonomously classifying and reworking defects in semi-finished products before their final aesthetic processing. This addresses the physically and cognitively demanding tasks traditionally performed by skilled operators in unsafe environments. The current manual process involves operators visually assessing defects upon the semi-finished piece's approach, followed by tactile inspection for finer classification. Subsequently, another team plans and executes rework operations, prioritizing visible areas and severe defects. Human workers swiftly localize and classify defects, while the experience led them to the high dexterity needed for the reworking operations. The robotic approach aims efficiently relieve operators from these unsafe tasks, promoting both physical and psychological well-being.

Hence, the MAGICIAN project will bring AI to industrial maturity while aiming to bring a profound innovation in the manufacturing world addressing the "improving human working condition and satisfaction" use-case. We will develop sensing technologies and methodological approaches to learn the human expertise in defect classification and reworking. The strong social and psychological implications will be considered throughout the

whole development process and the valida-
tion phase. An equal consideration will receive
the needs of potential adopters and system
integrators that will be involved during the

project course through an FSTP scheme, thus
proving the scalability and the replicability of
the solution to different scenarios.

EXPECTED IMPACT

MAIN IMPACT: The technologies tested and
piloted in MAGICIAN will prevent workers from
engaging in strenuous and hazardous tasks,
thus improving their safety and well-being.
This will translate into a reduction of work-
ers engaging in health hazardous activities.
The developed robots will physically embed
AI operating with levels of accuracy and pro-
ductivity comparable to humans. This result
will be obtained by learning the policies and
criteria used by humans to detect and remove
defects using multi-modal approaches, thus
demonstrate the value of integrating AI, data
analysis, and robotics with human-centred ap-
proaches into the development of innovative
industrial solutions.

SCIENTIFIC: The project contributes to the
creation of robotics components executing
machining operations; designs immediate and
easy to use human-robot interfaces; reinforc-
es the knowledge on multi-modal perception
and learning systems through relevant indus-
trial applications.

TECHNOLOGICAL: new paradigms to endure
a safe coexistence of human workers and ro-
bots in production areas, by integrating tactile
and visual information in quality evaluation.

ECONOMIC: increases productivity and
quality in the production area; extends the
market size for cobots and robotic compo-
nents; reduces the turnover for physically
intensive working activities; enables imme-

diate knowledge transfer between different
sites, preventing the loss of the skills gained
by the human operators when they are as-
signed to a different position, i.e. digital-skills
preservation.

SOCIETAL: The project cotributes by hanging
the paradigm in the manufacturing industry
towards a class of skilled and motivated work-
force; by improving ergonomics in the work-
site; by removing humans from unhealthy/
hazardous activities; by revitalising industrial
districts and improving labour relations
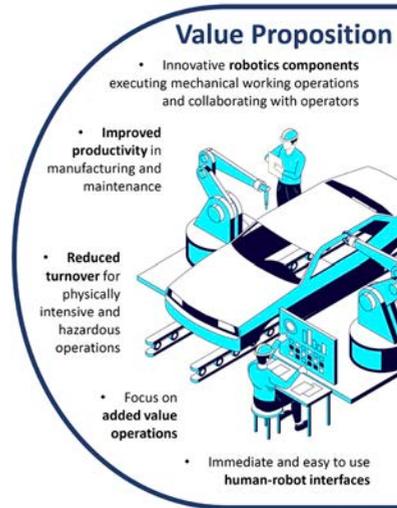
SOPRANO

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www.e-terry.de

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HAROKOPIO UNIVERSITY OF ATHENS
www.hua.gr

IFADO
www.ifado.de

JADE UNIVERSITY
www.jade-hs.de

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NTUA
www.ntua.gr

PROFACTOR
www.profactor.at

TECHNOLOGY TRANSFER SYSTEMS
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SOPRANO

Socially-Acceptable and Trustworthy Human-Robot-Teaming for Agile Industries

Call:	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 October 2023 > 31 January 2027*
Project ID	*101120990*

OBJECTIVES

Manufacturing, construction, and agriculture are major driving forces for the European economy and prosperity. Maintaining its competitiveness in these sectors demands highly efficient and flexible processes. Novel intelligent robotic capabilities that can be deployed side-by-side with humans and can operate and adapt to dynamic environments can accelerate this process. However, existing robotic systems cannot fit well into such settings as they are not versatile and flexible enough to automate certain tasks, cannot collaborate safely with humans in open and dynamic environments, nor are they easily and economically adaptable to process changes.

Vision: The SOPRANO project coalesces multidisciplinary research and innovation in human-robot collaboration and intelligent multi-agent systems, aspiring to design the next generation of manufacturing floors, construction sites, and agri-food production, where humans and intelligent machines will seamlessly work together. It proposes to scale collaboration from the single human-agent dyad to a peer-based synergy between multiple interconnected robotic systems featuring different physical and cognitive properties, supporting various tasks in collaboration with human workers, robotics and other agents.

Use Cases: SOPRANO will validate the technological offering in three novel and open-access use cases addressing both large-scale industries and small to medium enterprises.

Open Call: The open call from the project will enable the building of demonstrators using SOPRANO technologies that will open

new market opportunities for their products and services.

Project Objectives

- Develop advanced human-centric robotic capabilities.
- Ensure trustworthy and dependable operation in MH-MR synergistic tasks.
- Provide modular and reconfigurable tools to aid deployability and adaptability.Demonstrate the effectiveness of the SOPRANO technological offering in three novel use cases, advancing and shaping the reali-

zation of the next generation of MH-MR teams in the key application sectors.

PARTNERS (CONTINUED)

THE OPEN GROUP
www.opengroup.org

UNIVERSITY OF BREMEN
www.uni-bremen.de

UNIVERSITY OF YORK
www.york.ac.uk

EXPECTED IMPACT

SCIENTIFIC INNOVATION:

Design the next generation of MH-MR systems to support more flexible, resilient, and reconfigurable agile processes by exploring and developing advanced collaborative human-centric robotic capabilities, Trustworthy and Dependable AI-based MH-MR teaming, to ensure safe and robust operation in industrial environments and exploiting modular, reconfigurable and flexible engineering tools and techniques to support adaptability, ease of use in various operating environments.

ECONOMIC/TECHNOLOGICAL:

Advance human-robot collaboration and MRS in industrial practices, within the manufacturing, construction, and agriculture domains, exploiting the most suitable technologies at hand.

SOCIETAL:

Adding value to EU industries and instrumenting community building in the EU industrial ecosystem and further support external technology providers, such as SMEs and start-ups, via the open call.
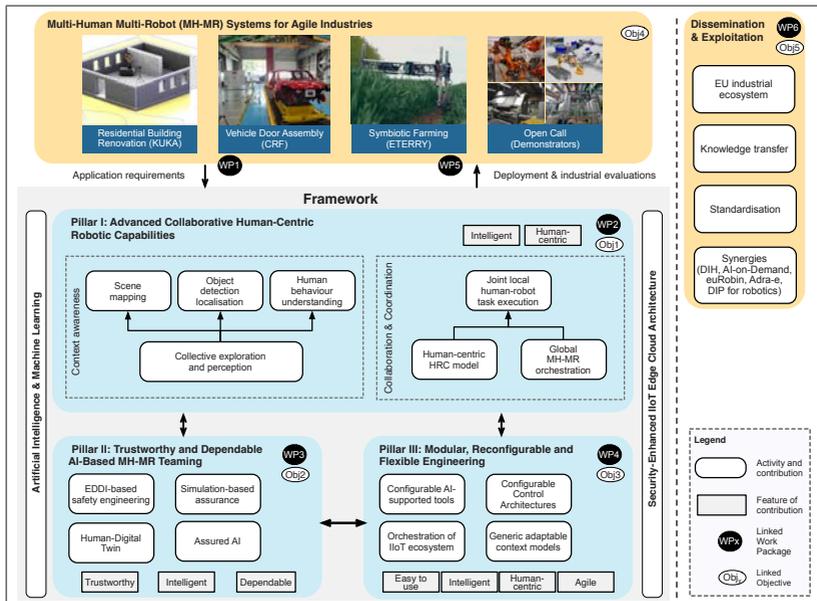
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DTA
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FUNDINGBOX
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ICONS
www.icons.it/

ISOTROL
www.isotrol.com/en/

ALYSIS DIGITAL
alisys.net/en/

INGETEAM O&M SERVICES
www.ingeteam.com/

STICHTING WAGENINGEN RESEARCH
www.wur.nl/en/research-results/research-institutes.htm

CERTH – IBO
ibo.certh.gr/

EDENCORE TECHNOLOGIES
edenlibrary.ai/

AGRICULTURAL UNIVERSITY OF ATHENS
www2.aua.gr/en

TALOS

Robotics and AI to improve O&M tasks in different PV scenarios

Call:	*HORIZON-CL4-2022-DIGITAL-EMERGING-02*
Duration	*01 October 2023 > 30 September 2026*
Project ID	*101119744*

OBJECTIVES

TALOS will develop and demonstrate world-class robotics solutions for different photovoltaic (PV) energy operating scenarios – Land-based, Floating, and AgriPV, promoting innovation in both the energy and agriculture sectors.

TALOS will demonstrate the added value of robotics and their potential in reducing greenhouse gas (GHG) emissions, minimizing wasted resources, lowering operation and maintenance (O&M) costs, and optimizing human-robot and robot-robot collaboration to reduce humans' exposure to risky environments.

Dangerous, dull, or dirty tasks will be performed autonomously by the TALOS solutions – such as monitoring, inspection, cleaning, and vegetation management, where robust robotics solutions will be developed for all the three PV scenarios and then demonstrated to show increasing PV plant performance ratio, reducing the risk exposure of O&M workers or the human burden of monitoring crops in the PV demonstration scenarios, allowing feasible inspection periods to be 24/7.

Address robotics challenges for the energy-food nexus in the growing APV subsector by integrating energy and crop models into decision support tools, and demonstrate crop health and inspection alongside PV panel checks.

A multi-robot platform and recommendation system will demonstrate the robot-robot interactions, autonomous inspections and human-in-the-loop features. Requirements will be co-created with relevant stakeholders and refined for the TALOS technology partners, as well as for the 9-13 robotics startups/SMEs that will be granted the cascade funding and demonstrated in the test bed scenarios set up by the TALOS project.

EXPECTED IMPACT

IMPACT 1: TALOS solutions are expected to increase the reliability and yearly availability of PV plants, reducing downtime and underperformance associated with O&M issues. Comparing to traditional O&M practices, TALOS expects to reduce O&M costs, promoting more frequent O&M and consequently resulting in an increased performance ratio for PV plants. The autonomous crop monitoring capabilities offered will additionally promote higher yields, reduction in labour, and lower agricultural input costs.

IMPACT 2: TALOS will generate and disseminate new knowledge on human-robot and robot-robot interactions by analyzing the interactions between the robotic solutions and the human operators, who oversees the operation of the robots and perceives the status of the PV plants and crops without being physically on-site.

IMPACT 3: TALOS will generate know-how in robotics and AI by creating innovative solutions that combine methods such as data analytics, ML tools and algorithms for the detection and prediction of failures/problems, with more complex (RL) systems implied in the autonomous robots and recommendation systems. TALOS will contribute to current data visualization methods by offering a novel method for mission execution and decision-making based on a user interface capable of overseeing real environments.

NOVEL PARADIGMS AND APPROACHES, TOWARDS AI-DRIVEN AUTONOMOUS ROBOTS (AI, DATA AND ROBOTICS PARTNERSHIP). (RIA)

ARISE

Advanced AI and robotics for autonomous task performance

Call	*HORIZON-CL4-2023-DIGITAL-EMERGING-01*
Duration	*1 January 2024 > 31 December 2027*
Project ID	*101135959*

OBJECTIVES

ARISE aims to realise a robotic platform that focuses on two crucial industrial sectors that can drive the European Green Deal progress, namely Energy and Agriculture. ARISE will be driven by the needs of Solar Panel installation and maintenance and the harvesting of hydroponic lettuce. AIRISE's objectives can be summarised as following:

- Develop a novel, pneumatic-based reconfigurable manipulator with advanced soft end-effectors capable of operating in environments with high risk of dust or water ingression while carrying out tasks involving both high forces/torques and delicate, complex manipulation
- Develop a Hierarchical Imitation Learning module, grounded on acquired knowledge alongside task planning algorithms with reactive planning capabilities including human-robot interaction
- Develop an Ontological framework for Knowledge Representation to enable robust and fault-tolerant collaboration and autonomous task completion through reasoning based on domain-specific fact understanding
- Develop a cognitive algorithm module encompassing Active Perception, Semantic Mapping and Localisation capabilities to fuse and orchestrate perception modalities in a dynamic context-aware that will enable identification changes in the environment and autonomous operation for longer periods while maintaining trustworthiness and dependability

VISIT US ON:

in *www.linkedin.com/showcase/arise-robotics/about/*
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https://www.cea.fr/english

P6-ALSYMEX
https://www.alsymex-alcen.com/

P7-PLAIXUS
https://plaixus.com/

P8-BENDABL
https://bendabl.com/

P9-CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS
https://www.certh.gr/root.en.aspx

P10-SPANISH NATIONAL RESEARCH COUNCIL
https://www.csic.es/en

P11-UBITECH
https://ubitech.eu/

P12-PROBOTICA
https://www.probotica.hr/

P13-TELEKINESIS
https://telekinesis.ai/

- Establish an edge-native, resource-optimised and automated computing infrastructure able to support dynamic computing at the Cloud-Edge continuum realising an ecosystem where ML-models for new tasks and/or applications are efficiently updated deployed on-board the robot or in a distributed manner.

EXPECTED IMPACT

IMPACT 1: Achieve substantial "next step autonomy" in robots, undertaking non-repetitive tasks in realistic settings, including Human-Robot interactions, as well as robots acting in isolation, demonstrated in key high impact sectors where robotics has the potential to deliver significant economic and/or societal benefits.

IMPACT 2: Accelerate enabling conditions essential for the diffusion of robots in various industries, sectors and services.

IMPACT 3: Enable a step-change with respect to science towards the automation of manual tasks, paving the way for further applications across a vast range of industries.

IMPACT 4: Deliver a step change in autonomy essential for the diffusion of robots in various industries, sectors and services which can; (i) interact safely and smoothly to support humans in their daily activities, based on strong multidisciplinary approach, including the relevant Social Science and Humanities (SSH) dimension, (ii) handle tasks autonomously, and safely, for a long periods of time significantly beyond the current state of the art in each sector and service addressed, (iii) address human and work interaction in high impact sectors under realistic conditions.

IMPACT 5: Improve performance by reducing errors and increasing speed and productivity.

IMPACT 4: INVERSE will also foster the wider adoption of other paradigms and techniques, such as predictive maintenance and manufacturing, closing the gap to zero-defect-manufacturing and facilitating and increasing recycling and re-use of key strategic components and materials.

Solar installation and maintenance

| 41 GW New solar power installations in the EU in 2022[4] | >47% Growth compared to 2021[4] |
| 82% Cost of energy reduction over the last decade[5] | 600 GW Capacity goal set by EU for 2030[5] |

>5mn workers Predicted gap by 2030 just for Germany[6]

Sources: SolarPowerEurope Annual Report, European Commission report on solar energy, "Solar skills shortage threatens EU targets" Article by Reuters

Hydroponic lettuce farming

| >4x Lettuce produced per hectare[7] | >90% Less water needed per hectare[7] |
| 100% Organic produce, no pesticides required[7] | 365 days Plant growth throughout the year[7] |

>28% Less agricultural workforce in Europe by 2030[9]

Sources: SolarPowerEurope Annual Report, European Commission report on solar energy, "Solar skills shortage threatens EU targets" Article by Reuters

INVERSE

Interactive robots that intuitively learn to invert tasks by reasoning about their execution.

Call	*HORIZON-CL4-2023-DIGITAL-EMERGING-01*
Duration	*01 January 2024 > 31 December 2027*
Project ID	*101136067*

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KONECRANES GLOBAL
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MTU CIVITTA FOUNDATION

OBJECTIVES

The scientific vision of INVERSE is to endow robots with the cognitive capabilities needed to synthesise, monitor, and execute inverse plans from direct tasks defined in terms of human-understandable instructions and procedures.

INVERSE's approach to synthesise reusable and robust plans implies an enhanced ability of the robot

- to understand its surroundings, including human intentions and needs, in order to determine what action the robot has to perform and how the environment is expected to change as a result;
- to represent robot knowledge in a flexible structure, specifically designed to facilitate execution monitoring, recovery from failures and task inversion;
- to adapt robot knowledge to different domains in order to synthesise effective solutions for direct and inverse tasks and to robustly react to the intrinsic variability of non-repetitive tasks.

The framework envisioned in INVERSE will result in substantial advances in long-term robot autonomy, enhancing the robot's ability to solve complex manipulation tasks across different domains. Most learning algorithms fail to revert a learned task because they are not designed to adapt when training data are scarce or missing.

The INVERSE MoCLE loop combines multi-modal learning updates and execution, commonly treated as separate steps, in the same loop.

EXPECTED IMPACT

IMPACT 1: Achieve substantial "next step autonomy" in robots, undertaking non-repetitive tasks in realistic settings, including Human-Robot interactions, as well as robots acting in isolation. INVERSE will significantly improve workers' well-being, safety, productivity, and quality in manufacturing and logistics operations by taking over hazardous and complex aspects of tasks. Moreover, they will improve efficiency and competitiveness in manufacturing through the optimization of industrial tasks as well as environmental sustainability by facilitating the re-use of materials and establishing more efficient and environmentally friendly production processes.

IMPACT 2: INVERSE will deliver a step change in autonomy for the diffusion of robots in various industries and sectors. INVERSE's collaborative framework will enable the design and programming of robots to work seamlessly with humans, enhancing their capabilities and improving their work experience.

IMPACT 3: Accelerate enabling conditions for the diffusion of robots in various industries, sectors and services. the adoption of the innovations and paradigms proposed by the project as well as the diffusion of robots in several fields, will be consolidated through the training of the next generation of engineers/workers at the academic institutions partnering with the project and the implementation of Open Science practices.

IMPACT 4: INVERSE will also foster the wider adoption of other paradigms and techniques, such as predictive maintenance and manufacturing, closing the gap to zero-defect-manufacturing and facilitating and increasing recycling and re-use of key strategic components and materials.

INVERSE TASK

DIRECT TASK

MULTI-MODAL CONTINUAL LEARNING AND EXECUTION

QUALITY CONTROL
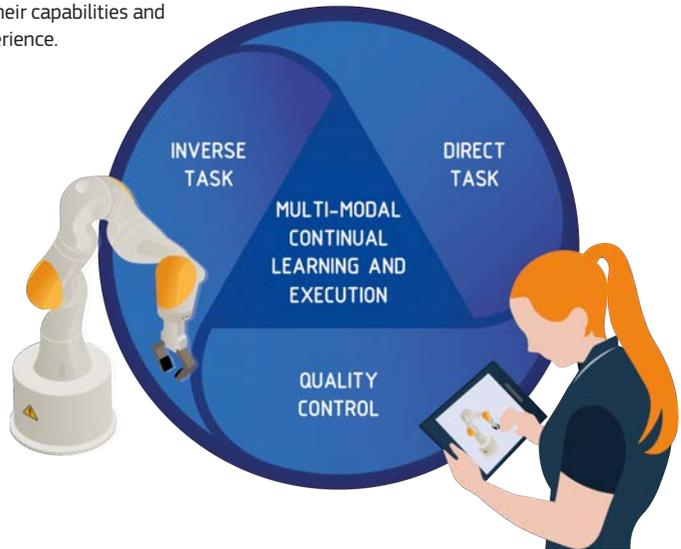
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UNIVERSITEIT TWENTE
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www.regionh.dk/CAMES-english/Pages/default.aspx

INSIMO
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AMBU A/S
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EBERHARD KARLS UNIVERSITAET TUEBINGEN
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IRE

Intelligent Robotic Endoscopes for Improved Healthcare Services

Call	*HORIZON-CL4-2023-DIGITAL-EMERGING-01*
Duration	*01 March 2024 > 29 February 2028*
Project ID	*101135082*

OBJECTIVES

The IRE project aims to empower endoscopy technology by inventing next-step autonomy robotic functionalities that create a step change in undertaking non-repetitive colonoscopy cancer screening procedures in realistic laboratory settings. This includes critical safe human-robot interactions when operating in the complex and dynamic working environments inside of the human body.

The results will be demonstrated on three real-world scenarios within colonoscopy: endoscope design (both through novel digital methodologies and novel technical robotic functionalities), endoscope operator training (using both virtual-reality-based and phantom-based training), and endoscope operator assistance (through intelligent navigation, human-robot interaction, and augmented sensory feedback). The proposed results will be possible by advancing the state of the art on many areas of cognitive robotics and digital supply chain technology.

The IRE project will work on five specific objectives, which can be summarised as:

1. Soft robotic endoscopes
2. Robotic test and train phantoms
3. AI-enabled digital endoscope twins
4. AI-powered navigation
5. OPEN/FAIR models and data.
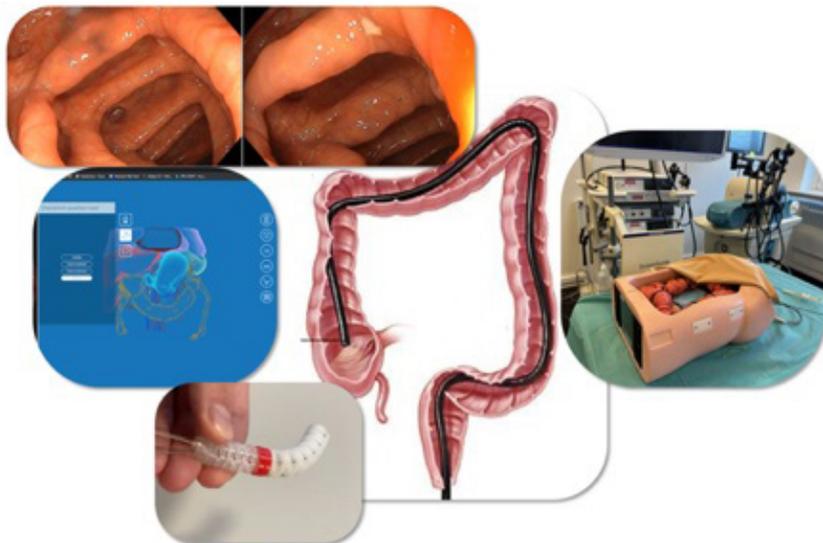
EXPECTED IMPACT

IMPACT 1: SOCIETAL

Improved training measures for students, specialised staff, and technicians in area of colonoscopy. At least a 10% improvement on missed cancer detection in colonoscopy screening programs as well as at least a 10% faster screening process.

IMPACT 2: SCIENTIFIC

New scientific breakthrough on design and learning control of autonomous soft robotics. New state-of-the-art approach for using synthetic population modelling for control of robot motion inside humans.
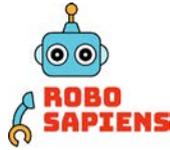
IMPACT 3: ECONOMIC/TECHNOLOGICAL

A new market for soft robotics phantoms.

IMPACT 4: ECONOMIC/TECHNOLOGICAL

Speed up design and development of new endoscopes and foster European technology leadership.

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ISDI ACCELERATOR, ISDI
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SIMULA RESEARCH LAB, SRL
https://www.simula.no/

RoboSAPIENS

In the development of tomorrow's robots, there is an anticipation for rapid and unforeseen adaptability in system structure or environment, ensuring trustworthy collaboration with humans by changing behavior while maintaining or enhancing performance and safety.

Call	*HORIZON-CL4-2023-DIGITAL-EMERGING-01*
Duration	*1 January 2024 > 31 December 2027*
Project ID	*101133807*

OBJECTIVES

The main objective of the RoboSAPIENS project is to advance the field of robotic self-adaptation and empower robots with open-ended autonomous software adaptations, allowing them to dynamically respond to unforeseen changes in system structure or environment while maintaining trustworthy collaboration with humans.

Specific Objectives:

Enable Open-Ended Adaptation
Develop control software for robotic open-ended self-adaptation, specifically addressing unprecedented changes in system structure and environmental conditions,including human interactions.

Enhance Safety Assurance
Advance safety engineering techniques to ensure not only pre-adaptation but also during and postadaptation safety, incorporating trustworthiness checkers and self-evaluation schemes.

Reduce Task Uncertainty with Deep Learning
Utilize Deep Learning techniques to actively reduce task uncertainty in robotic self-adaptation, ensuring more reliable and reproducible adaptations, with a focus on addressing uncertainties inherent in DL models.

Assure Trustworthiness
Develop and apply formal methods to assure the trustworthiness of systems using both Deep Learning and computational architectures for robotic selfadaptation, incorporating verification tools and techniques.

EXPECTED IMPACT

IMPACT 1:
RoboSAPIENS will develop the underlying technologies which enable robots to fully autonomously adapt their controllers and configuration settings to accommodate for unknown changes, such as, physical changes in the robots themselves, changes in the robot's mission or changes in their collaborating environment, while ensuring safety.

IMPACT 2:
RoboSAPIENS will apply forefront virtual design and analysis techniques such as DTs and co-simulation to extensively and automatically explore and validate adaptations to the robot environments.

IMPACT 3:
RoboSAPIENS will apply DT concepts to the MAPE-K framework in order to establish trustworthiness.

IMPACT 4:
RoboSAPIENS will elaborate the MAPE-K-loop for adaptive controllers in robotic applications, and reconcile it with stringent safety requirements. The generation of the adapted controller settings will largely rely on DL and DT techniques.

IMPACT 5:
The deployment of results created in Impact 4 onto robotic platforms will require balanced cloud and edge computation.

IMPACT 6:
As central part in the autonomous adaptation procedure, the RoboSAPIENS project will largely rely on DL techniques to be able to generate new settings from older experiences.

IMPACT 7:
Automated design methods and techniques will take a central place in the RoboSAPIENS project and aims to improve the overall reception of autonomous adaptation in robotic systems among certification authorities as well as insurance companies.

IMPACT 8:
Augmented self-awareness and environment awareness is a mandatory precondition to apply successful selfadaptation. RoboSAPIENS will deeply rely on available sensor data as input to the robotic DT. Automated (virtual and real) tests will be deployed to evaluate a safe operation of the robot after adaptation.

On a societal level, RoboSAPIENS strives to positively impact education by disseminating knowledge essential for engineering and maintaining Digital Twins (DTs) with self-adaptive loops. Societal benefits extend to the redefinition of production line roles, improved scalability and adaptability of robots, reduced accidents in supply chain operations, creation of high-quality jobs, and lower costs in safety engineering and certification

INDUSTRIAL LEADERSHIP IN AI, DATA AND ROBOTICS – ADVANCED HUMAN ROBOT INTERACTION (AI DATA AND ROBOTICS PARTNERSHIP). (IA)

ARISE

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ARISE

*Agile, human-centric & real-time
enabled open-source technologies
advancing industrial HRI in Europe*

Call	*HORIZON-CL4-2023-DIGITAL-EMERGING-01-CNECT*
Duration	*01 January 2024 > 30 June 2027*
Project ID	*101135784*

OBJECTIVES AND AMBITION

ARISE aims to create an all-in-one middleware for AI-powered and human-centric industrial robots which is open-source, real-time enabled, and seamlessly integrates industrial robotics and automation units with shop floor systems (SCADA, DCS, MES) and business systems (ERP, PLM, CRM) alike. Regarding non-technical aspects, ARISE will develop a comprehensive SSH Framework for Industrial Human-Robot Collaboration (HRC), bringing the right innovation tools to self-assess and maximize the human-centricity of technical solutions and approaches. The third and final dimension of ARISE objectives is the development of human-centric AI modules along with the creation of a sustainable ecosystem which ensures the continuity of ARISE beyond the planned project execution timeframe.

The objective is to empower Europe with convenient technical and non-technical means to design, create and maintain cost-effective deployments where humans and robots maximize their synergies. To reach that goal, an ambitious roadmap will deliver a first major release of ARISE outcomes along with 4 active TEFs on industrial HRC by month 12. During the second year, at least 10 innovation projects will leverage the first release and contribute to grow and stabilize project outcomes in a second major release. The third year of the project shall gather a critical mass of early adopters by adding 10+ innovation projects to the previous ones. By the end of the project, ARISE aims to become the reference European business ecosystem for open innovation in industrial HRC.
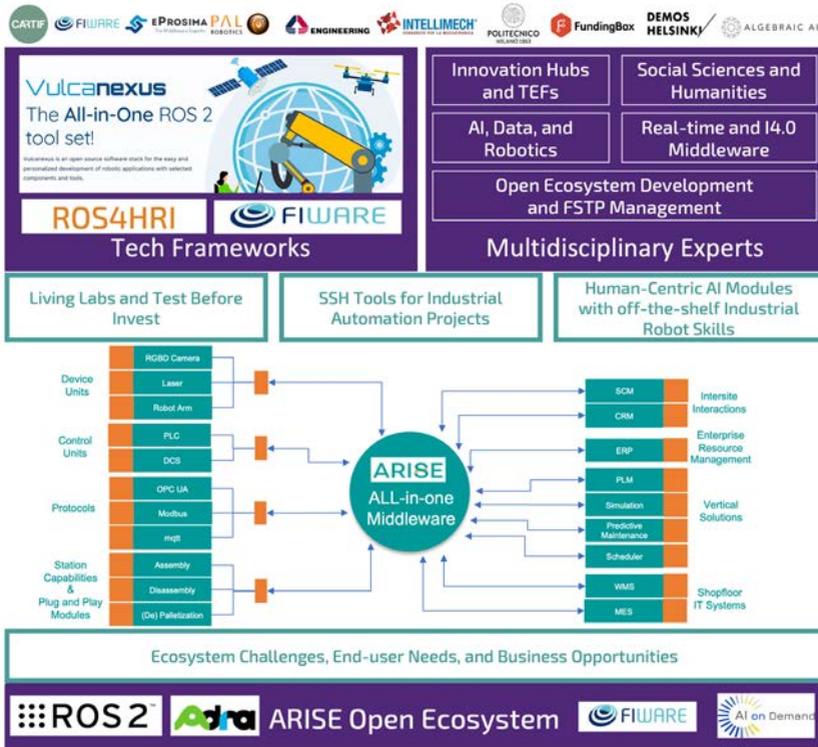
EXPECTED IMPACT

IMPACT 1: 20-25 FSTP-funded projects contribute to implementing ADR solutions to strengthen the innovation ecosystem stakeholders. Business support for FSTP applicants will pave the way for new business opportunities and job growth. Training materials will address upskilling needs for adopting ADR solutions. ARISE will prioritize strategic collaborations with the extensive ROS 2 and FIWARE ecosystems, along with referencing European innovation actions such as the European networks of DIH focused on AI, data, and Robotics.

IMPACT 2: ARISE's innovative middleware for integrating human-robot interaction has the potential for long-term impact in various European industry sectors such as healthcare, manufacturing, and services, as well as across the robotic applications supply chain.

By improving the capabilities and efficiency of human-robot interaction, this middleware can enhance productivity and reduce operational costs for these sectors. As a result, it will strengthen the competitiveness of European industries in the global market, particularly in the field of robotics and automation, while enhancing the capabilities and safety of robots, in healthcare and service sectors.

IMPACT 3: ARISE offers an open-source solution to develop agile human-robot interaction, it will drive industry innovation and standardization. It further promotes the adoption of HRI technologies facilitating the creation of data-driven applications, interoperability, productivity, reduced costs, and improved worker safety.

FORTIS

Multi-Modal and Multi-Aspect Holistic Human-Robot Interaction

Call	HORIZON-CL4-2023-DIGITAL-EMERGING-01-02
Duration	01 January 2024 > 31 December 2024
Project ID	101135707

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ARCELIK
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OBJECTIVES

FORTIS is an EU-funded project that aims to provide a **solution for enabling robots to interact with humans in a human-like way for long periods**. Therefore, the main objectives are:

1. Develop, integrate, and provide a human-centric solution for modelling and analysing humans.
2. Develop and provide a flexible and agile multi-robotic-centric solution interacting with humans.
3. Integrate and provide the FORTIS solution where a safe and trustworthy Human-Robot interaction is guaranteed and provides optimized operations for both humans and robots.
4. Demonstrate the solution for industrial pilots in construction, maintenance, and logistics.

The three **main paths** to achieve **FORTIS solution** are:

- Building the FORTIS digital world by **FORTIS HRI Digital Twin**.
- Monitoring **human safety** while preserving **privacy**.
- Optimising the operations of the human and robot during the interaction.

The **Tangible Expected Outcomes (TEOs)** related to the objectives of the FORTIS project will be:

- TEO 1: FORTIS **Human-Centric Toolkits** (Obj. 1). Toolkits for modelling the human's status.

- TEO 2: FORTIS **Robot-Centric Toolkits** (Obj. 2). Toolkits for building a multi-robotics solution that can interact with humans.
- TEO 3: FORTIS **Human-Robot Trustworthy Interaction** (Obj. 3). The Holistic solution of the FORTIS project.

EXPECTED IMPACT

IMPACT 1: HUMAN-CENTRIC
- Enrich the knowledge in a wide range of fields by understanding and modelling human behaviour.
- Bring new collaborative robot generations, more human-status aware and adaptable, able to provide more intuitive and user-friendly interfaces tailored to the cognitive capabilities of their users.
- Develop HRC and HRI systems that are more effective, user-friendly, and context-aware, leading to improved collaboration between humans and robots.
- •Develop AI systems that are more effective, context-aware, and user-friendly, user satisfaction, and business outcomes.

IMPACT 2: ROBOT-CENTRIC
- Providing a platform for testing and experimenting with new human-robot collaboration and interaction scenarios.
- Reduce development time and costs; increase market demand; improve product differentiation; enhance productivity; and create opportunities for innovation.
- Expansion of product portfolio, improvement of user experience, and meeting the increasing market demand for AI-embodied systems.

IMPACT 3: HUMAN-ROBOT TRUSTWORTHY INTERACTION
- Better understanding of the factors that influence human trust in robots.
- Improve the efficiency of manufacturing and production, allowing multiple robots to work together in a coordinated manner.
- Reduce the need for expensive physical prototypes and testing and reduce the risk of accidents and injuries in the workplace.
- Can enhance business processes, integrating AI and ML in cobots.
- Enhanced HRI architecture to endure both internal and external workplaces.
- Improve the quality of the work and the safety of workers.
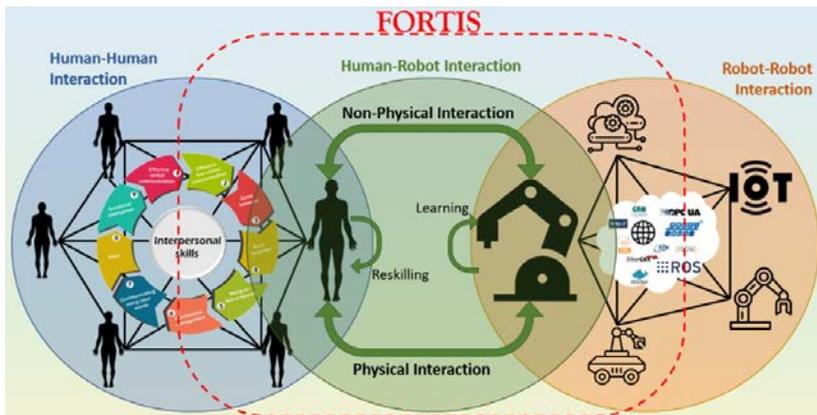
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JARVIS

*Intersubjective AI-driven multimodal
interaction for advanced user-centric
human robot collaborative applications*

Call	*H2020-CL2023-DIGITAL EMERGING-01-02*
Duration	*01 January 2024 > 31 December 2027*
Project ID	*101135708*

OBJECTIVES

JARVIS aims to develop a reusable set of tools that enable AI driven multimodal means of interaction:

1. involving interfaces **for physical and remote** information exchange, robot **control** and **programming**,
2. providing social skills to a plethora of robotic platforms to achieve **seamless user-centric interaction** that extends human ability for complex tasks and
3. demonstrating **scalability of application** and ability to achieve **economies at scale**.

Being an industry oriented Innovation Action, JARVIS is driven by industrial requirements which can be mapped to the following **objectives**:

· Development of **AI enhanced** means of **interaction** for seamless human-robot communication, control and programming
· Development of **socially interactive robots**
· Security, privacy and safety towards **trustworthy AI**
· Development of **cognitive and intelligent** mechatronics for advanced HRI, dynamic scene modeling and understanding
· Application of HRI in **large scale pilots**
· **Boosting** companies, in particular SMEs and start-ups, to adopt industrial HRI solutions

The project aspires to address the implementation of advanced HRI through a holistic approach. Finally, JARVIS aspires to expand the adoptoin of Human Robot Interaciton approaches in a pan-European fashion offering European innovators the opportunity to be invovled by means of FSTP financing with the help of a number of open calls.

EXPECTED IMPACT

IMPACT 1: SCIENTIFIC
The multidisciplinary research and innovation work contributes to the state-of-the-art in robotics, AI, human-machine interaction, communication and sensing technologies. Project's technological solutions contribute to applied research and builds basis for future innovations at a global level. Decrease of cycle time by 40% in average, reduction of reconfiguration and programming time by 30%.

IMPACT 2: ECONOMIC
JARVIS and the SMEs recruited via FSTP open calls develop technological and commercial solutions that will boost the European Industry in robotics, data, and AI. In the long term, the utilization of robotics will change the whole society and economy since human resources can be allocated differently. Allow SMEs to retain competitiveness through a 5% decrease of companies with low level of digital intensity.

IMPACT 3: SOCIETAL
Reduction by 50% of human exposure to harmful

environments through teleoperation, operator acceptance level of >60%, improvement of ergonomic conditions for HRC by 15%.
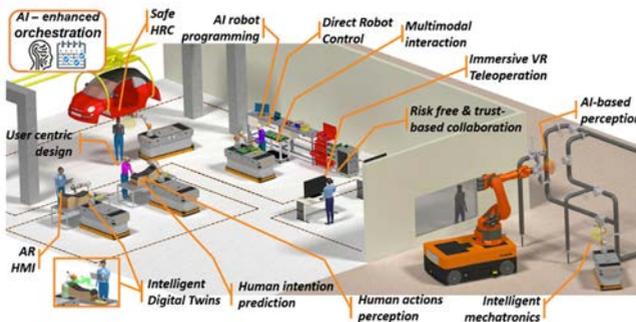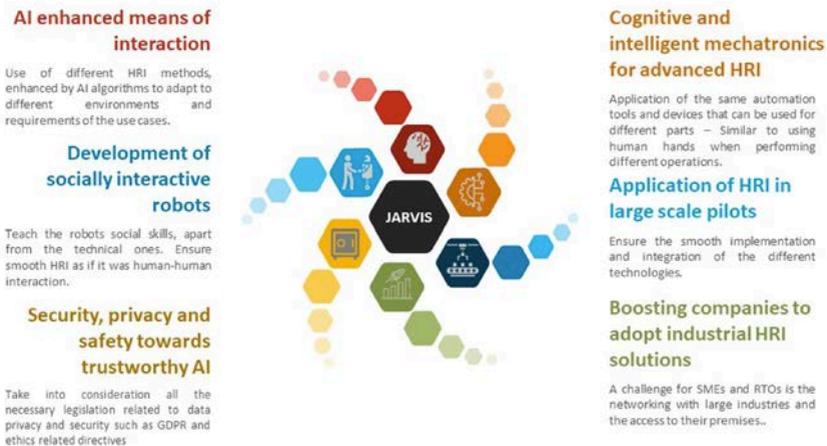
LARGE SCALE PILOTS ON TRUSTWORTHY AI DATA AND ROBOTICS ADDRESSING KEY SOCIETAL CHALLENGES (AI DATA AND ROBOTICS PARTNERSHIP) (IA)

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www.hygeia.gr*

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AI4Work

*A workplace of enhanced efficiency by
optimal work sharing between humans
and AI/robots*

Call	*HORIZON-CL4-2023-HUMAN-01-02*
Duration	*01 January 2024 > 31 December 2026*
Project ID	*101135990*

OBJECTIVES

AI4Work will investigate practical methods and tools for optimal work sharing between humans and AI/robots.

AI and robotics are likely to be the most powerful means for radical improvement of working conditions in diverse domains, as they can support human operators in diverse tasks, starting from difficult and tedious manual work up to complex decision-making tasks. The vision of the AI4Work project is to improve communication and collaboration between humans, AI, and robots, thus allowing for improved working conditions within different processes in organisations from several domains in terms of increased efficiency of work, reduction in stress upon employees, increased confidence in decision-making processes, etc.

Due to the high level of uncertainty in modern organisations, an appropriate balance between human and machine activities must be found. To cope with the required flexibility and dynamics, AI4Work will investigate the application of "sliding work sharing" – where this balance varies during the operation depending on the situational context, machine-based confidence levels, and human-machine interactions – as this is likely to be the most appropriate approach for modern organisations.

The key challenge of AI4Work is to develop a set of common methods and tools (methodological framework, digital twin service platform, software building blocks for sliding work sharing) that can be applied in diverse sectors and with different AI/robotics services, allowing for an effective experience exchange.

The project will make use of living digital twins of working systems to increase the efficiency and trustworthiness of AI/robotics solutions. By this, AI4Work will contribute to the acceptance of AI/robots supporting work in diverse domains, aiming to improve the quality of jobs and create more decent working conditions for human operators.

The project will be driven by six pilots in different sectors: logistics, manufacturing industry, construction, healthcare, education, and agriculture.

EXPECTED IMPACT

SCIENTIFIC INNOVATION

AI4Work is one of the first user-driven attempts to address how sliding work sharing between humans and AI can be effectively applied in a structured way, based on clearly defined and assessed criteria (such as confidence level of AI, context of human operators, etc.).

The project will investigate an innovative combination of diverse technologies that is likely to be applicable for a wide scope of services.

ECONOMIC/TECHNOLOGICAL

AI4Work will provide the basis for several potential new products: methodological framework, AI/robotics services, software building blocks for sliding work sharing, and digital twin service platform. Business models for bringing such products to the market will be elaborated. The pilots will demonstrate potentials for the commercial use of the new approach for sliding work sharing, supporting the collaboration between humans and AI/robotics services.

SOCIETAL

AI4Work aims to achieve improved acceptance of AI/robotics in diverse domains, but also in society in general. Especially in the six pilots, it is expected that the acceptance and trust regarding AI/robotics supporting the work will increase considerably.
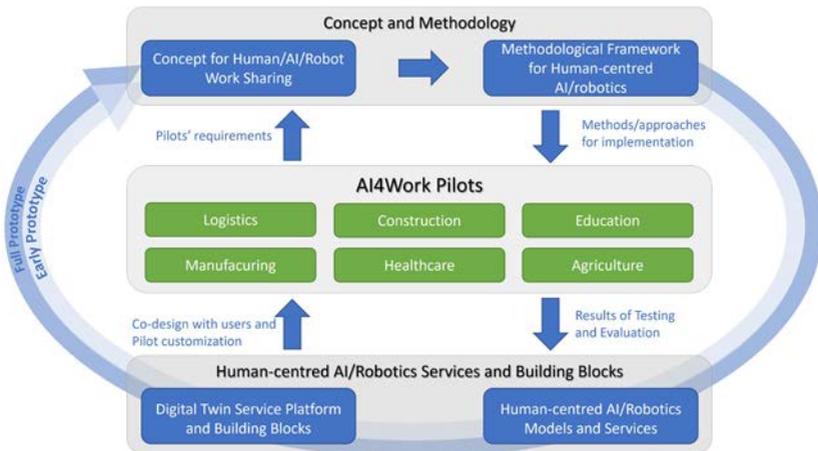
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PORTO DI RAVENNA
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fAith

Fostering Artificial Intelligence Trust
for Humans towards the optimization
of trustworthiness through large-scale
pilots in critical domains

Call	*HORIZON–CL4-2023–* *HUMAN-01-CNECT*
Duration	*1 January 2024* *> 31 December 2027*
Project ID	*101135932*

OBJECTIVES

Artificial intelligence (AI) plays a key role in the ongoing digital transformation and has triggered a global competition for tech leadership. The widespread application across many domains has led to a rising societal awareness around the consequences of misuse and a demand for systems that are ethical and trustworthy. Moreover, while many organizations consider AI to be the next frontier in digital transformation, they just cannot shift into the next gear and further their investment in AI-powered processes.

FAITH adopts a human-centric, trustworthiness assessment framework (FAITH AI_TAF) which enables the testing/measuring/optimization of risks associated with AI trustworthiness in critical domains. FAITH AI_TAF builds upon NIST Artificial Intelligence Risk Management Framework (AI RMF), upon the requirements imposed by the EU legislative instruments, upon ENISA guidelines on how to achieve trustworthiness by design and upon stakeholder's intelligence and users' engagement. Seven (7) Large Scale Pilot activities in seven (7) critical and diverse domains (robotics, education, media, transportation, healthcare, active ageing, and industry) will validate the FAITH holistic estimation of trustworthiness of selected sectoral AI systems. To this end, the proposed framework will be validated across two large scale piloting iterations/phases across focusing on assessing: (i) generic threats of trustworthiness, and (ii) domain--specific threats and risks of trustworthiness. In addition, FAITH AI_TAF will be used to identify potential associations

(in the context of cross-fertilisation) among the domains towards the development of a domain-independent, human-centric, risk management driven framework for AI trust-worthiness evaluation.

EXPECTED IMPACT

FAITH contributes to scientific, economic, societal, policy and technological impacts as follows:

Scientific: Advances responsible use of AI across multiple industries through effective analysis tools, capacity building and support to better help humans manage and govern its impact.

Economic: Introduces a new AI trust assurance solution which can be used to stimulate a new wave of innovation across industry, from helping to make better decisions, to new ethical, personalised services.

Social/Policy: Supports people using AI in understanding how the tech works and help them have a collective say in enhancing AI service/tools Supports policy makers to develop practical AI policies.

Technological: Drives responsible tech advances through greater ability to hold AI and Robotic systems to account, identify risks and co-create/innovate solutions to mitigate them.

FAITH is also designed to support wider aims of the Horizon Europe strategy to 'accelerate green & digital transition' with a focus on pillar D 'creating a more resilient, inclusive and democratic society.' Namely:

1. A resilient EU prepared for emerging threats by building the capacity of everyone to better understand AI trust elements and use data to ethically co-create/understand how solutions use data to make decisions;
2. A secure, open & democratic EU society by enabling an open collaboration ecosystem where humans and AI work together ethically to leverage large amounts of data and tackle urgent societal challenges in an ethical manner;
3. Inclusive growth & new job opportunities that are unlocked through co-creation activities, new network connections and enhanced capacity AI assurance;
4. Bridge policies with practice by accelerating the implementation of AI governance and assurance policy and legal requirements to technical specifications.

SHEREC

Safe, Healthy & Environmental   Ship Recycling

Call	*H2020-CL4-2023-HUMAN-01-02*
Duration	*1 January 2024 > 31 December 2027*
Project ID	*101136056*

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UPB
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UPM
upm.es

AVSAR
avsarshiprecycling.com

LEVIATHAN GMBH
leviathan.eu

HEMPEL A/S
hempel.com

OBJECTIVES

Ship recycling involves dismantling a ship in recycling facilities, along with the storage and processing of materials for reuse. This industry promotes the repurposing of raw materials for industrial use, aligning with the objectives of the European Circular Economy Action Plan and the Green Deal. However, the current state of shipbreaking yards presents significant dangers, with elevated rates of fatalities and injuries, making ship recycling one of the most hazardous occupations globally, in addition to the risks of work-related diseases caused by toxic substances (ILO 2015). Moreover, due to insufficient waste management, toxic waste from shipbreaking contaminates coastal areas, posing risks to workers. Despite international regulations (IMO 2009; UNEP 2011; Regulation EU No 1257/2013), the sector struggles to overcome challenges in enhancing worker safety and health, as well as preventing detrimental environmental impacts.

The primary goal of SHEREC is to integrate innovative robotics, data, and AI systems into the ship recycling industry, aiming to significantly enhance occupational health and safety conditions while preventing the contamination of hazardous materials both within the industry and the environment. Specifically, SHEREC will (1) semi-automate the ship recycling preparation process using an AI-powered drone to identify hazardous materials, (2) develop an automated ship recycling plan through a digital twin of the ship and AI-based planning methods, and (3) automate cutting and paint removal in the ship recycling process with two mobile robotic systems capable of autonomous or tele-operated operation.
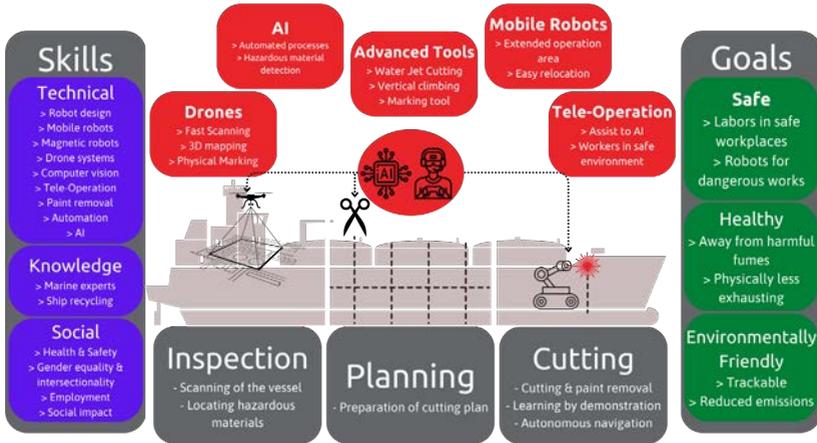
Figure. The general concept of the SHEREC project.

EXPECTED IMPACT

IMPACT 1: Reducing greenhouse gas emissions and managing hazardous waste in ship recycling will have a positive influence on tackling climate change.

IMPACT 2: Healthier and happier society due to reduction of occupational hazards

IMPACT 3: Raising awareness, changing negative opinion of society towards ship recycling, and potential policy change in EU regulations.

IMPACT 4: Fostering economy and the growth based on innovation

IMPACT5: Improvement in employment, better and more qualified job opportunities

IMPACT 6: Contribution to the investments in R&I and leveraging investments in R&I

IMPACT 7: Generation of AI, and robotics related data to database   and enhancing human capital in R&I through multidisciplinary research and investments in AI, data and robotics innovations.

IMPACT 8: The algorithm and the solutions having a strong connection with the progression of scientific knowledge will be provided at the end of the development of the whole system. The algorithm for marking the hazardous materials and creating the inventory of materials with the help of AI will be also shared as open source and open data. Data collection.