EIC COMMUNITIES

AI

INTELLIGENCE BRIEF

AI IN ROBOTICS

ENABLING SAFE, TRUSTED, AND AUTONOMOUS AI IN ROBOTICS IN EUROPE

Artificial Intelligence (AI) and robotics are rapidly transforming Europe's industrial sector, driving innovation and productivity. Yet this transformation also exposes complex challenges: fragmented standards, safety certification gaps, and the lack of coordinated policy frameworks.

To ensure Europe's competitiveness and leadership, the EIC Communities initiative convened experts from industry, academia, and start-ups through a series of co-creation workshops on AI in Robotics. The sessions identified priority areas for Research and Innovation (R&I) policy, focusing on Safety & Resilience dimension of AI in Robotics applied to the Industry sector.

This policy brief summarises the outcomes of those discussions and provides actionable recommendations to strengthen the European AI and robotics ecosystem.

EVIDENCE AND METHODOLOGY

The findings presented here are drawn from the EIC Communities Industry Community of Practice, which held three interactive online working sessions between April and June 2025.

The sessions gathered 14 unique participants from 11 organisations across 8 European countries, including universities, research centres, corporates, start-ups, and business support organisations. In total, five EIC-funded projects (four Pathfinder and one Transition) were represented.

The co-creation process combined desk research, interactive Miro board exercises, and foresight tools such as Backcasting. This participatory approach enabled participants to co-design visions for AI in Robotics by 2050 and formulate concrete policy recommendations based on shared priorities and interdependencies.

KEYPOINTS

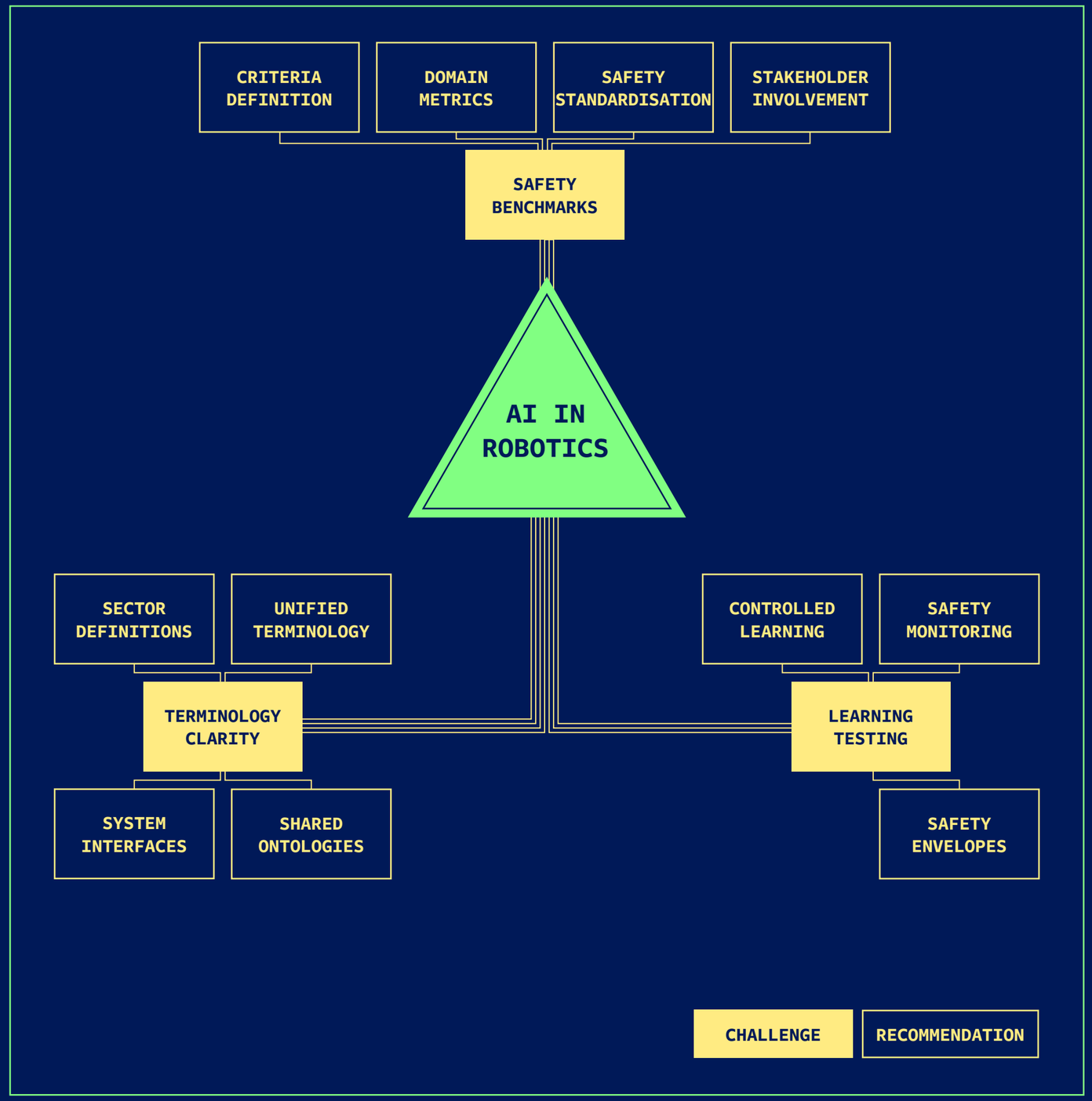
Resilience as a design feature: should be embedded in the design of robotic systems and subsystems, not achieved only after training or deployment.

Certification as a prerequisite: AI algorithms used in safety-critical systems or critical infrastructures must be certified to guarantee safety and enable practical deployment. Certification is crucial for industries developing high-risk systems and products

Human safety and operational resilience: systems must demonstrate resilience during operation while ensuring safety in close interaction with humans.

THE CHALLENGES

Europe’s progress in safe and resilient AI for robotics is slowed by gaps in standards, regulation, testing methods, ethics, and investment. Addressing these barriers is essential to create trustworthy systems, support innovation, and ensure strong industrial competitiveness across sectors.



WHAT TO SOLVE

LACK OF UNIFIED SAFETY BENCHMARKS

CHALLENGE	RECOMMENDATIONS
Very difficult to assess the degree of safety of systems and sub-systems and to compare the safety of different designs	Develop specific benchmarks and safety metrics through: • Creation clear definition of dimensions to evaluate scenarios and capabilities • Development of domain specific safety metrics • Standartisation of Safety metrics • Involvement of different actors in the development of benchmarks

LIMITED TESTING OF CONTINUOUS LEARNING SYSTEMS

CHALLENGE	RECOMMENDATIONS
In critical contexts AI systems are not allowed to learn online or while being implemented, and no consolidated methods currently exist to test or certify how such systems will behave in the future. This prevents systems from following a learn-by-doing process, which in turn makes it difficult for developers to forecast the learning trajectory of data-driven systems.	Formalise testable guarantees for continuous learning through: • Controlled learning periods with defined procedures. • Supervised monitoring to ensure safety compliance. • Embedded safety envelopes that keep system actions within predefined safe boundaries.

AMBIGUOUS TERMINOLOGY AND INCONSISTENT DEFINITIONS

CHALLENGE	RECOMMENDATIONS
Misinterpretation of commands by systems due to inconsistent terminology in specific areas was regarded as a critical gap. Such ambiguities hinder interpretability and the ability of systems to make correct decisions, particularly when different systems interpret the same command or sentence differently.	Align sector-specific definitions and terminology by: • Developing clear specifications. • Standardising terms to prevent divergent interpretations. • Defining interfaces between system layers to reduce miscommunication. • Creating unified ontologies for relevant sectors.

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