AGENDA

- **Physical AI**
- **Market**
- **Global scenario**
- **Industrial Robots & Humanoids**
- **ADRA's Strategy for European Physical AI**
- **Challenges & Opportunities**

Physical AI is *not* just robotics + AI
It's a paradigm shift: from automation to autonomous, adaptable, intelligent machines
Europe's opportunity to lead!
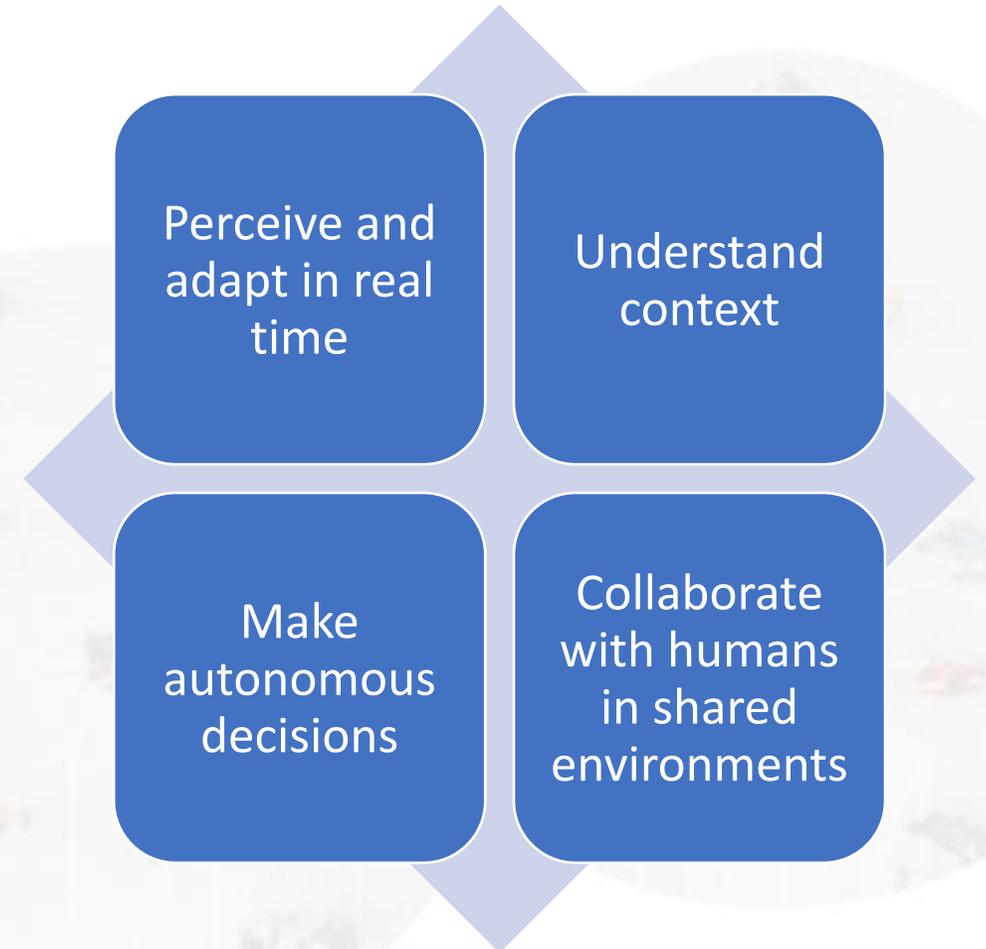
What is Physical AI?

Unlike traditional robots, physical AI systems:

Integration of AI with robotic platforms for interaction in the physical world

Physical AI, also known as **embedded AI** or **embodied AI**, is artificial intelligence that lives in the physical world: inside robots, autonomous cars, drones, intelligent sensors.
It is not just software: it is AI that perceives, reasons and acts in the real world, thanks to sensors and actuators.

Perceive and adapt in real time

Understand context

Make autonomous decisions

Collaborate with humans in shared environments

AI Transforming Robotics

Enhanced perception:
- Vision systems with semantic understanding
- Multisensory (visual, tactile, audio) integration
- Real-time scene recognition

Adaptive learning:
- Learning from demonstrations
- Reinforcement learning for complex motor skills
- Transfer learning across environments

Autonomy & decision-making:
- Planning under uncertainty
- Contextual behavior adaptation
- Self-learning and model refinement

Robotics Driving AI Innovation

Grounding intelligence:
- Physical interaction links AI to real-world constraints
- Enhances embodied reasoning

Multimodal integration:
- Vision, touch, proprioception and force data fusion
- Real-time decision constraints

Deployment challenges:
- Energy efficiency
- Environmental unpredictability
- Safety and human interaction

The market

AI and robotics

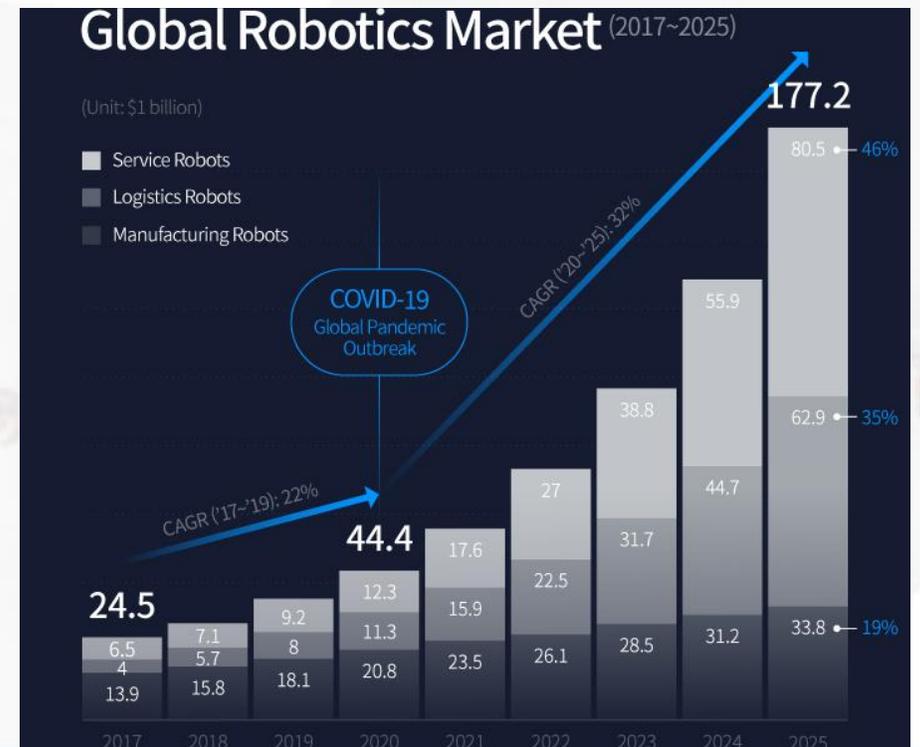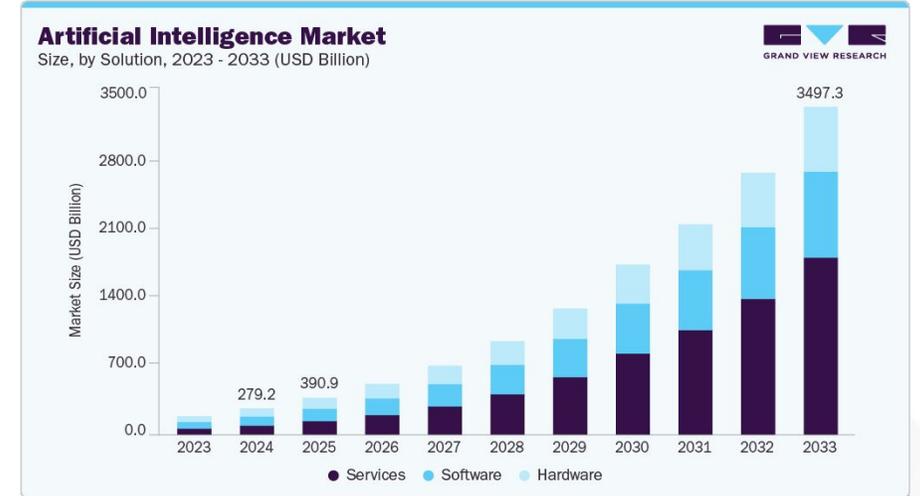The two most transformative technologies of our era

Convergence paradigm

From separate systems to fully integrated, intelligent machines

Market overview

Global robotics market: $55B in 2024
Projected to reach $165B by 2030

Global AI market: $748 B 2025
Projected to reach $2.74 trillion by 2032

Artificial Intelligence Market
Size, by Solution, 2023 - 2033 (USD Billion)
GRAND VIEW RESEARCH

Global Robotics Market (2017~2025)
(Unit: $1 billion)
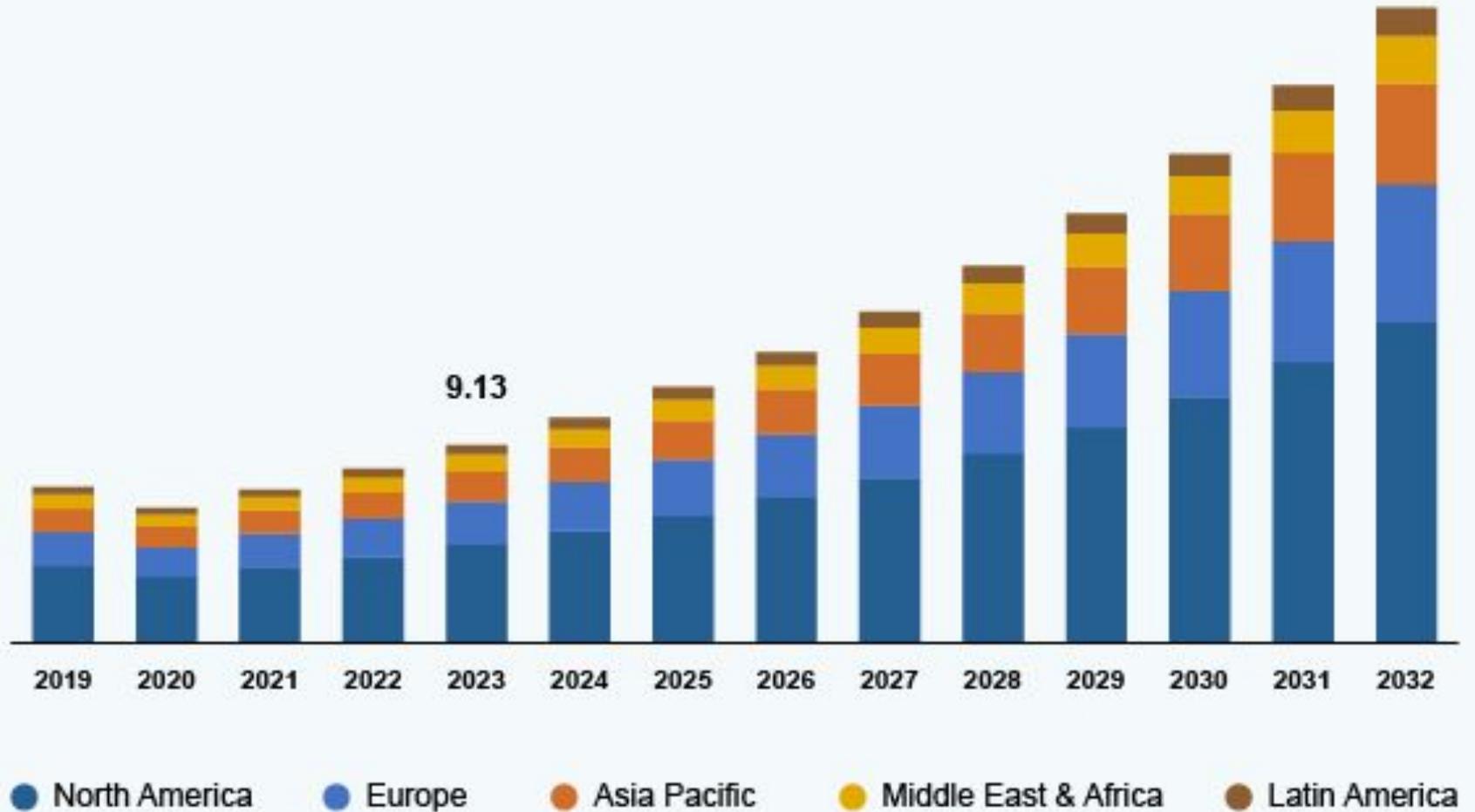
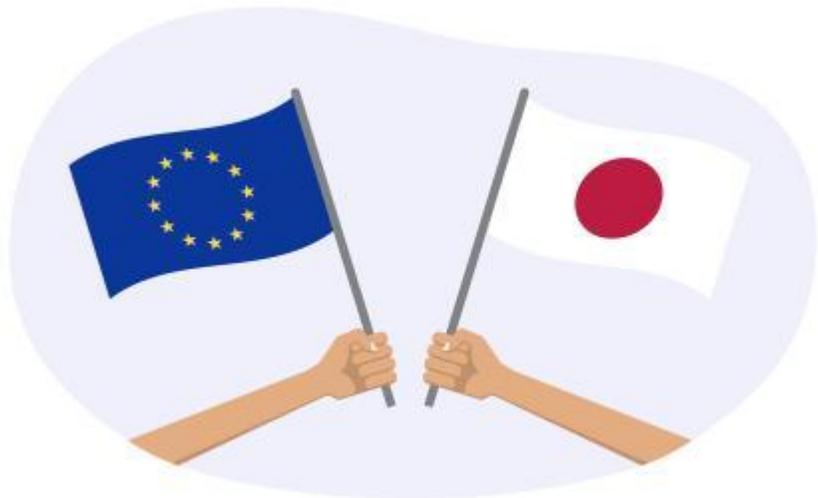# POLARIS
MARKET RESEARCH

Embedded AI Market

Size, By Region, 2019 - 2032 (USD billion)

The global embedded ai market is estimated to reach 29.26 billion by 2032

13.8%

Global Market CAGR 2024-2032

9.13

2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032

● North America ● Europe ● Asia Pacific ● Middle East & Africa ● Latin America

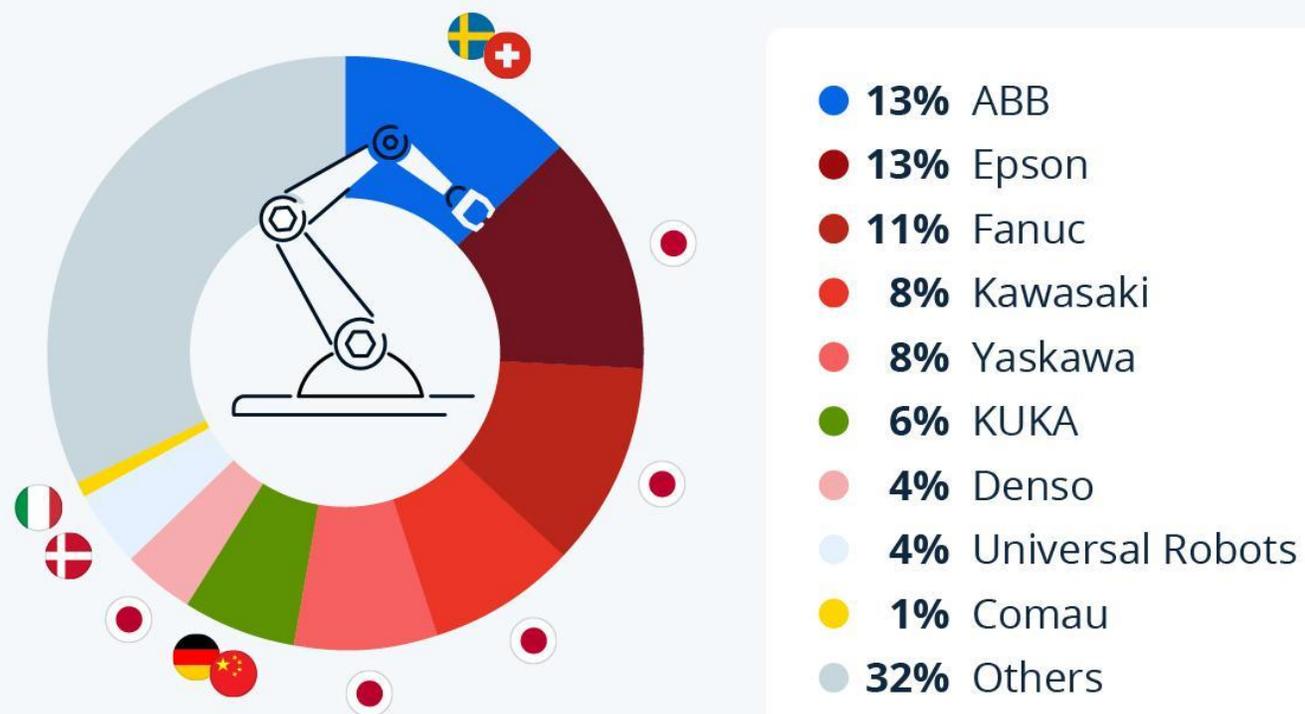Note: The images shown are for illustration purposes only and may not be an exact representation of the data.

Who is leading?

The Giants of Industrial Robotics

Estimated global market share of industrial robotics companies in 2023, by value

- **13%** ABB
- **13%** Epson
- **11%** Fanuc
- **8%** Kawasaki
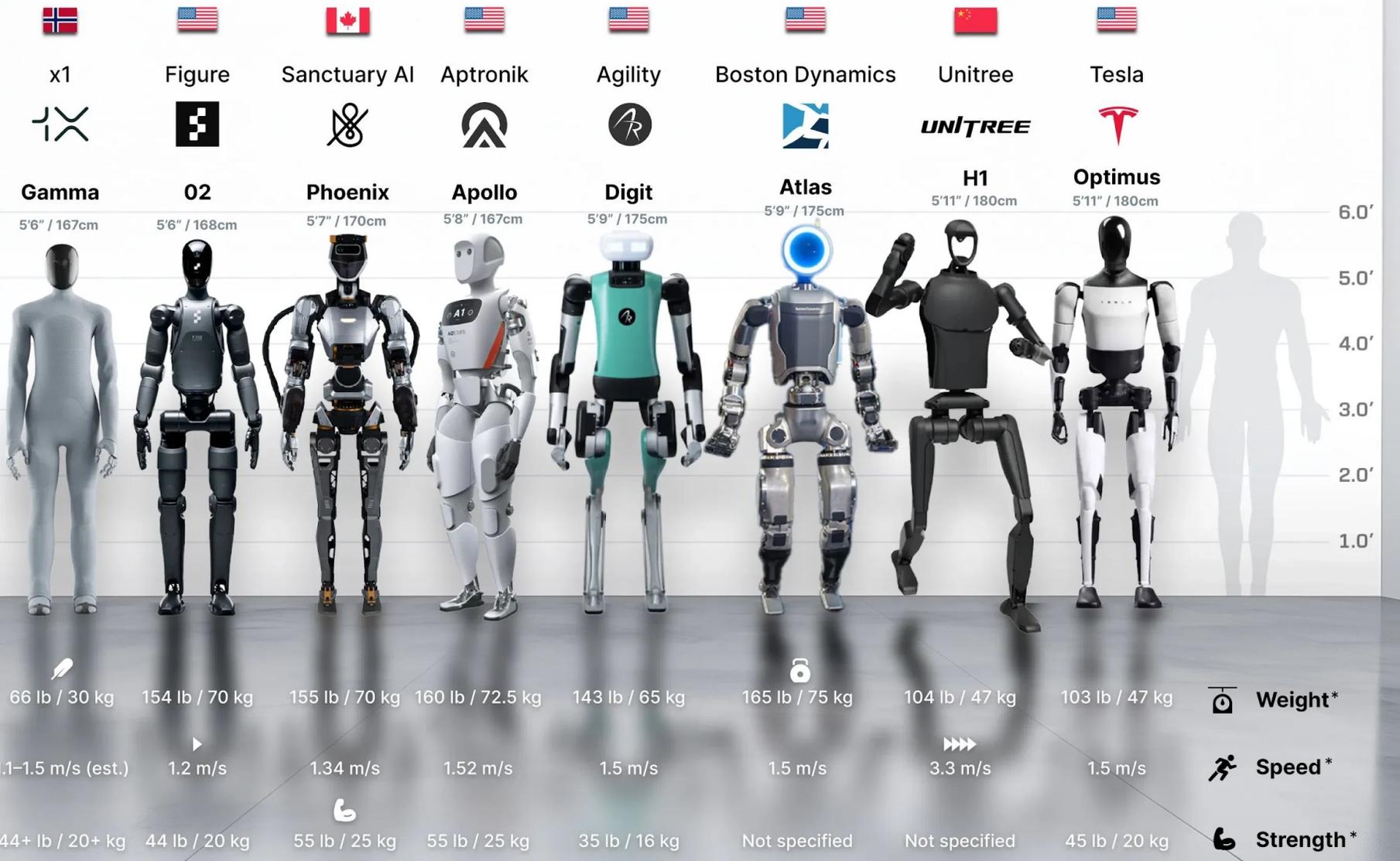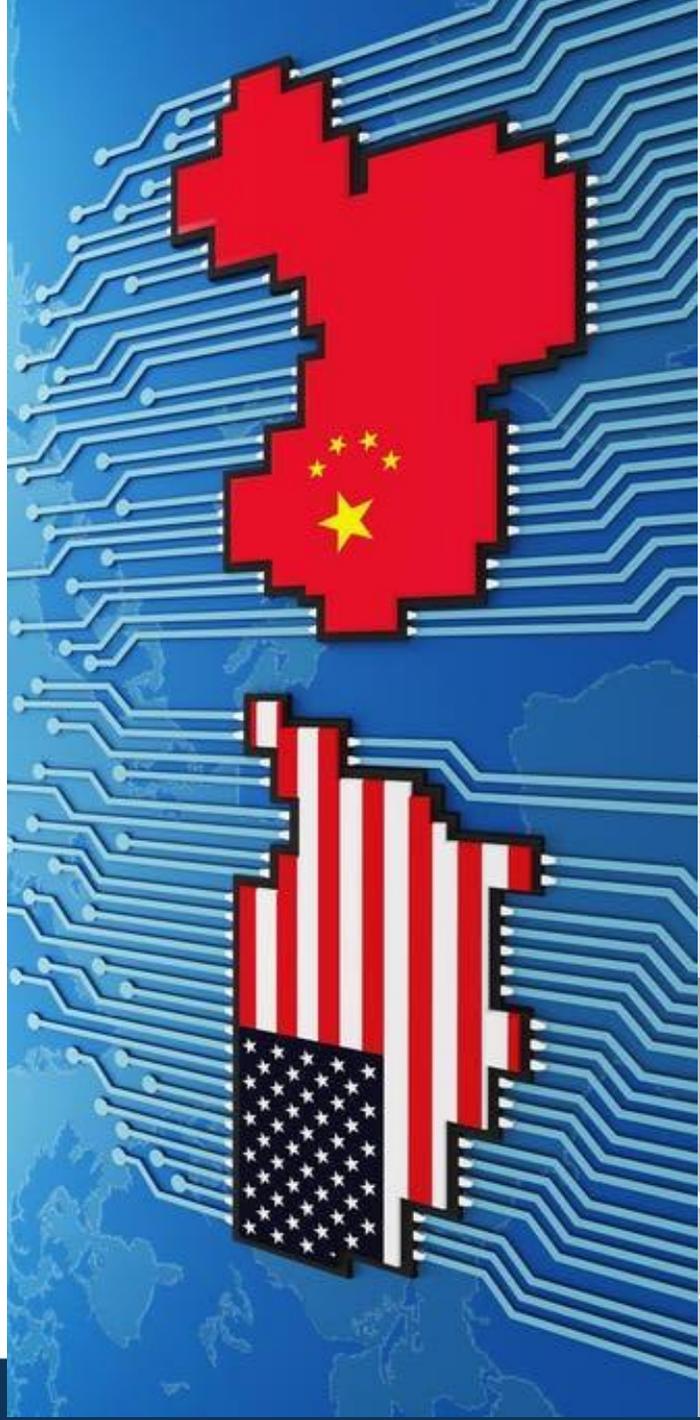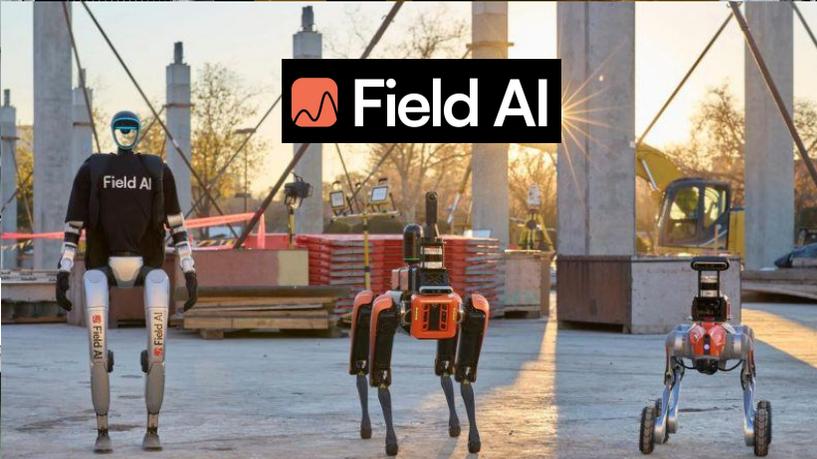- **8%** Yaskawa
- **6%** KUKA
- **4%** Denso
- **4%** Universal Robots
- **1%** Comau
- **32%** Others

As of Dec. 2024
Source: Statista Market Insights

statista

Humanoid Robots 2025

Made Visual Daily
MADEVISUAL.CO

	x1	Figure	Sanctuary AI	Aptronik	Agility	Boston Dynamics	Unitree	Tesla
	🇳🇴	🇺🇸	🇨🇦	🇺🇸	🇺🇸	🇺🇸	🇨🇳	🇺🇸
Model	**Gamma**	**02**	**Phoenix**	**Apollo**	**Digit**	**Atlas**	**H1**	**Optimus**
Height	5'6" / 167cm	5'6" / 168cm	5'7" / 170cm	5'8" / 167cm	5'9" / 175cm	5'9" / 175cm	5'11" / 180cm	5'11" / 180cm
Weight*	66 lb / 30 kg	154 lb / 70 kg	155 lb / 70 kg	160 lb / 72.5 kg	143 lb / 65 kg	165 lb / 75 kg	104 lb / 47 kg	103 lb / 47 kg
Speed*	1.1–1.5 m/s (est.)	1.2 m/s	1.34 m/s	1.52 m/s	1.5 m/s	1.5 m/s	3.3 m/s	1.5 m/s
Strength*	44+ lb / 20+ kg	44 lb / 20 kg	55 lb / 25 kg	55 lb / 25 kg	35 lb / 16 kg	Not specified	Not specified	45 lb / 20 kg

*Reported

FIGURE

Field AI

DOORDASH

UNITREE

PAL ROBOTICS

DLR

istituto italiano di tecnologia

Enchanted Tools

AI POWERED ROBOTICS: THE EUROPEAN WAY

Policy paper and Technology Roadmap GenAI and Robotics 4EU
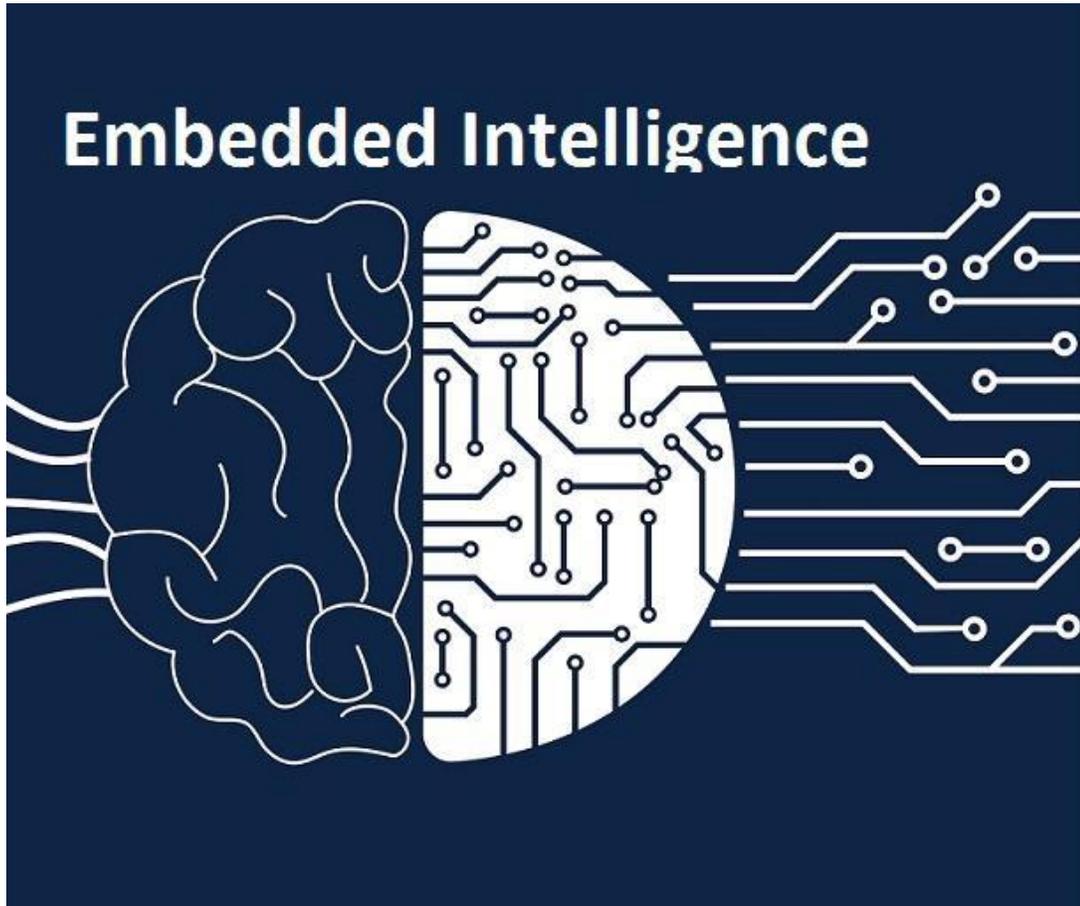
December 2024

AI-powered robotics

strategy for Europe
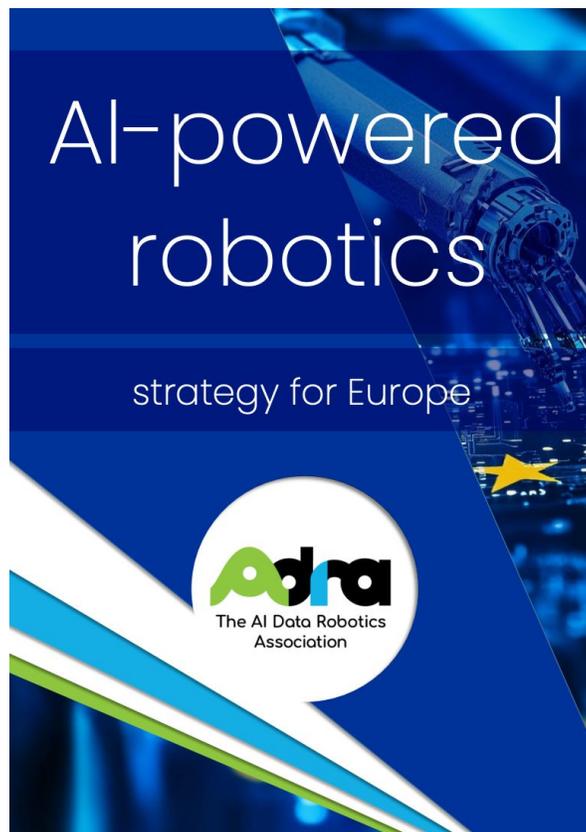
Workshops with EU leading players to share challenges, best practices & needs, and explore areas of collaborations.
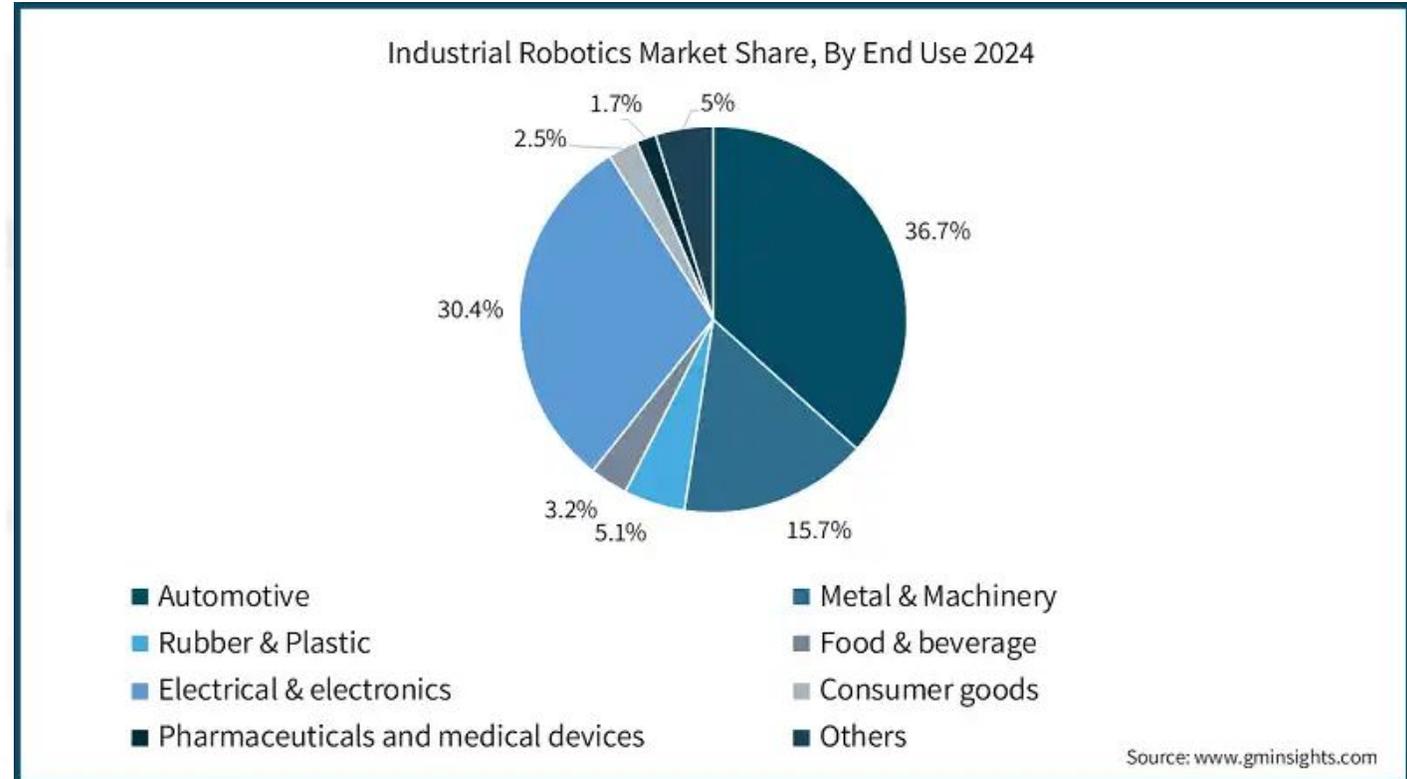
AREAS OF APPLICATION

Embedded Intelligence

- **Humanoid robotics**: general-purpose robots with mobility, perception, adaptation

- **Edge AI in production systems**: collaborative robots that adapt in real time to assembly or logistics processes.

- **Autonomous vehicles**: cars, trucks and drones navigating complex environments.

- **Intelligent spaces**: factories, warehouses, hospitals combining computer vision, route planning and human-machine interaction.

SECTOR ADOPTION

- **Automotive**: Utilizing robots for assembly, welding, and painting processes.

- **Electrical and Electronics**: Employing robots for assembling electronic components.

- **Pharmaceuticals**: Using robots for handling and packaging medicines.

- **Food and Beverage**: Implementing robots for packaging and processing tasks.

- **Metal and Machinery**: Applying robots for material handling and fabrication.

Industrial Robotics Market Share, By End Use 2024

- 36.7%
- 30.4%
- 15.7%
- 5.1%
- 3.2%
- 2.5%
- 1.7%
- 5%

Legend:
- Automotive
- Rubber & Plastic
- Electrical & electronics
- Pharmaceuticals and medical devices
- Metal & Machinery
- Food & beverage
- Consumer goods
- Others

Source: www.gminsights.com

FUNCTIONS

- **Handling**: Robots designed for material handling and transfer operations.

- **Welding**: Robots specialized in various welding applications.

- **Assembly**: Robots used for assembling components and products.

- **Dispensing**: Robots for painting, sealing, and adhesive applications.

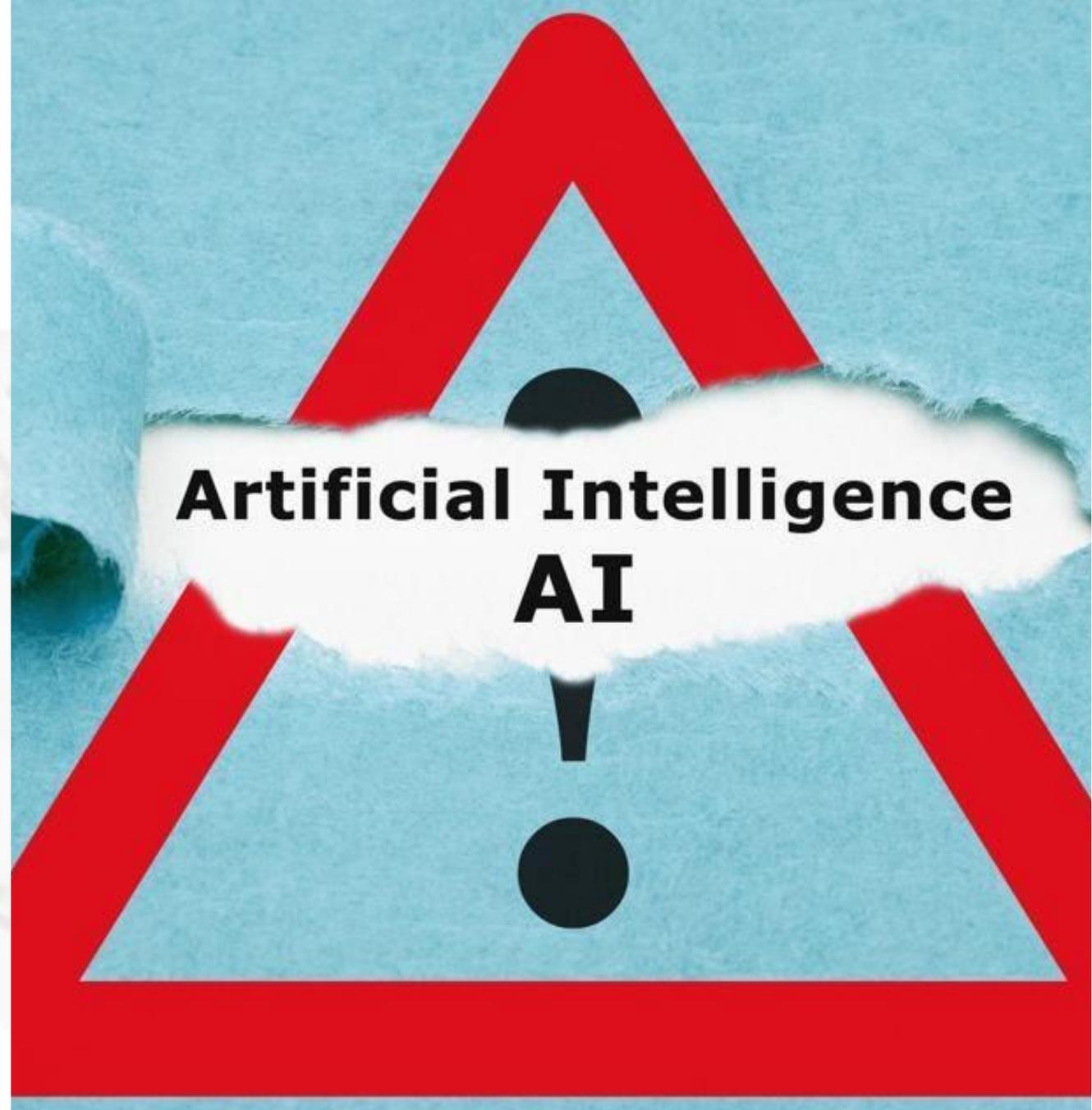- **Processing**: Robots involved in tasks like cutting, grinding, and polishing.
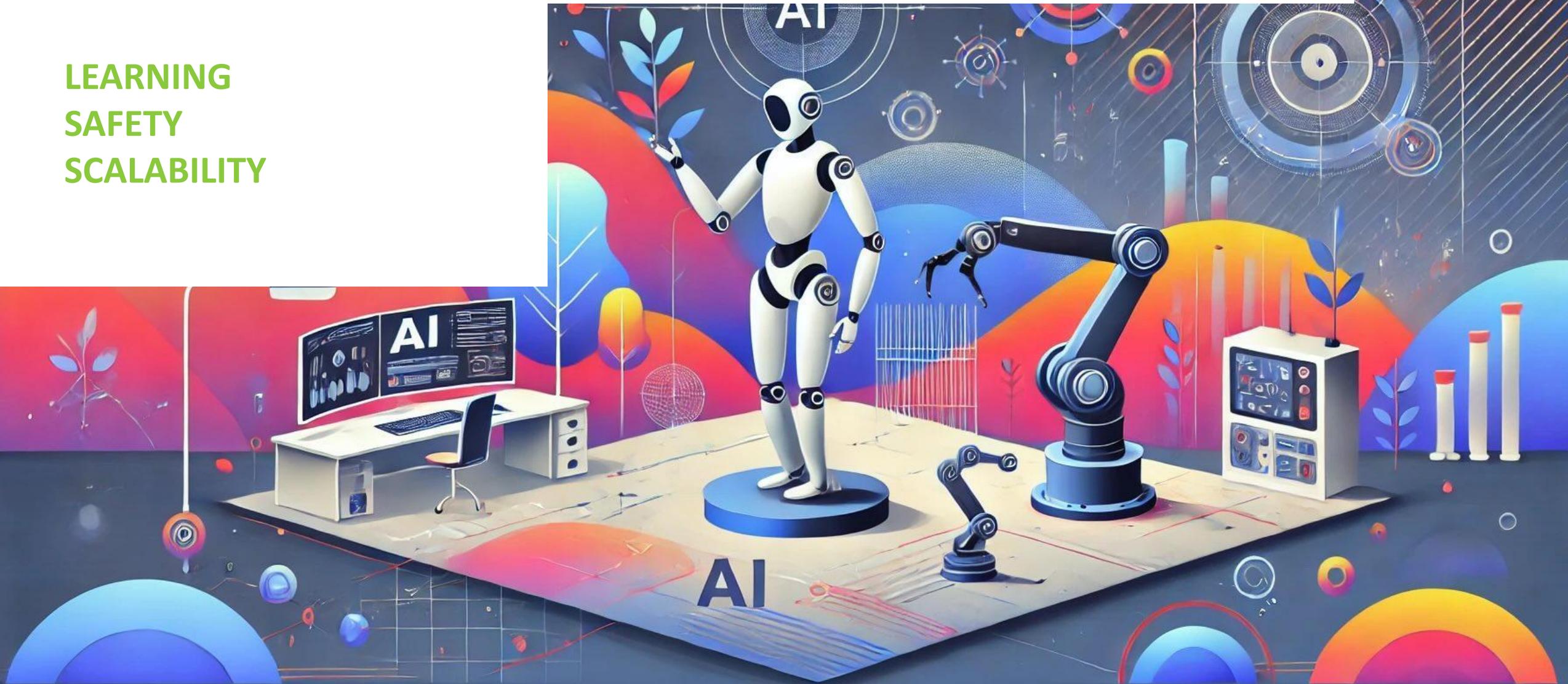
CHALLENGES OF PHYSICAL AI

- **Technical Challenges**

- **Organizational Challenges**

- **Governance Considerations**

- **Regulatory, Social and Ethical Considerations**

THE BIGGEST CHALLENGES ARE

LEARNING

SAFETY

SCALABILITY

Challenges for Robots in the Real World

Traditional training requires explicit programming or millions of real-world demonstrations.

- Physical AI systems must understand not just tasks, but *context, physics, and variability.*

- Real-world data collection (e.g., from hospitals or factories) is *expensive, time-consuming, and often incomplete.*

- *High failure costs* in early training: mistakes in physical environments = broken machines or safety hazards.

KEY BARRIERS TO ADOPTIONS

- Lack of reliability, explainability, and safety guarantees

- Inability to perform basic human tasks such as inspection, dexterity, unstructured, task understanding, etc

- High variability in production (high mix, low volume)

- Data governance challenges: quality, quantity, standards, ownership, privacy

- No global integrators to bridge tech and industry needs

- Startups struggle with funding and continuity risks

- Supply chains are not resilient due to vendor lock-in and single point of failure

- Solutions lack interoperability, no modular 'robotic skills' to plug into workflows

- Regulatory issues related to liability, compliance, etc

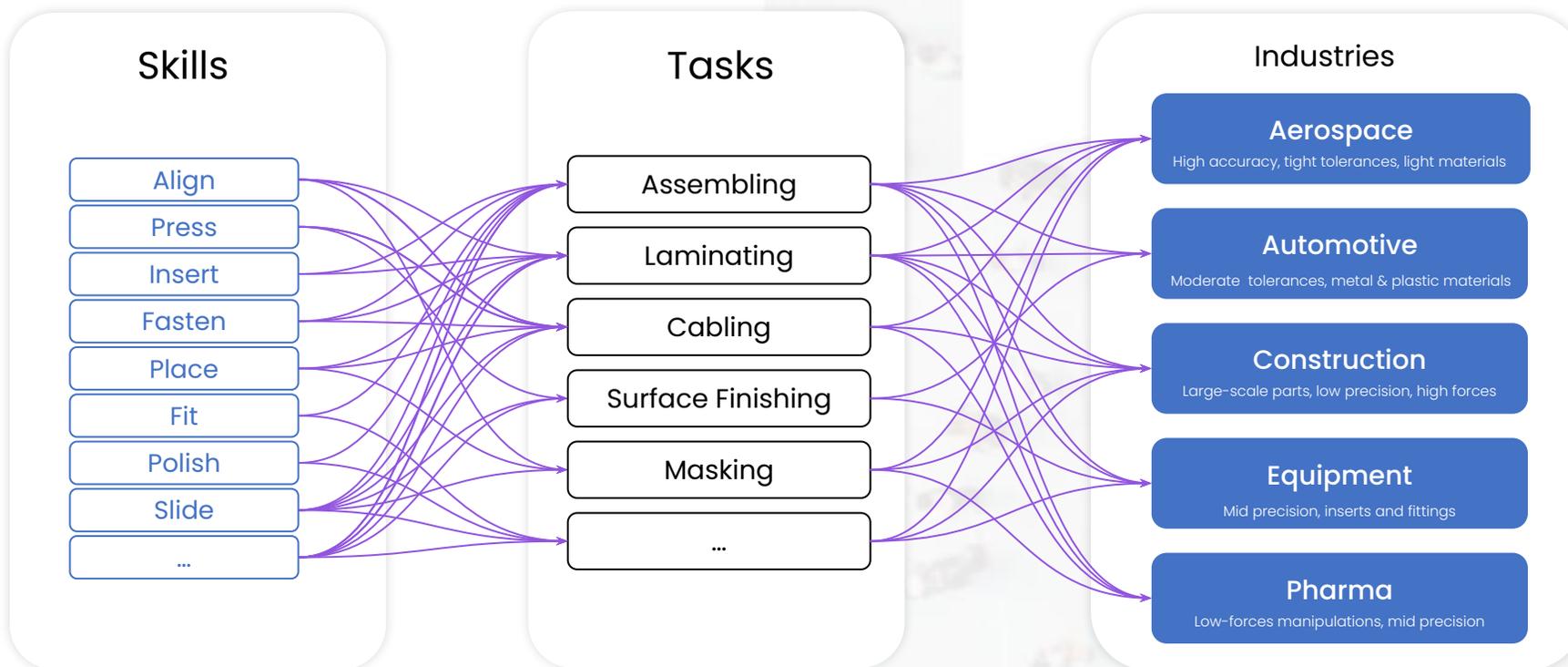- SMEs generally do not have capacity or competence to participate nor to integrate

A CROSS-SECTORS, SKILLS-BASED APPROACH

Fundamental skills transcend specific industries: **assemble, insert, polish, fasten, weld, inspect.**

While these tasks vary in **precision requirements, materials, and scale**, their underlying principles remain consistent

Unlocking Modular, Interoperable & Scalable Task Automation for Any Industry

Qualification Centers: independent facilites to Test, Qualify, and Certify **Robot Skills**