WORLD TECHNOLOGY CONGRESS

The Immutable Era of PHYSICAL AI

FUTURE IMPACT REPORT

SUMMARY

Physical AI represents the convergence of artificial intelligence with physical systems—robots, autonomous vehicles, drones, and smart machinery—that perceive, reason, and act in the real world. This whitepaper synthesizes industry research to demonstrate how Physical AI will revolutionize $50 trillion in manufacturing and logistics industries, create new economic value, and redefine human-machine collaboration. With the market projected to grow from $371.7B (2025) to $2.4T by 2032 (30.6% CAGR), organizations ignoring this shift risk obsolescence. We outline strategic imperatives for businesses, policymakers, and workforces to harness this transformation.

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WHY THIS MATTERS TO YOU

Let's be clear upfront: We are for Physical AI. We believe in its power. We want this revolution to soar. But we also believe revolutions demand responsibility. This impact report? It's our confession: **We're worried we might be running out of time to get this right.**

A Fortune 500 executive recently jolted us with an analogy: The pre-AI era was sword fights. The AI era? Bullets – unseen, untraceable. **But Physical AI?** That's the atomic bomb landing in our backyard. Its potential is world-altering. Its consequences? Unknown until we step into the blast zone. Like the atom bomb changed everything, Physical AI will transform the world we inherit. That's why we created this report – **not to drown you in jargon, but to arm you with clarity.** Because Physical AI isn't just changing labs; it's coming to change our lives. Nurses. Teachers. Farmers. Deliverymen. Your life. Ignorance isn't an option. **Inclusion isn't just nice; it's non-negotiable.** Will this technology lift millions, or leave them behind? The answer depends on what we do now.

Here's our pledge:

- **We are not alarmists.** We want this space to thrive.
- **We are not pessimists.** We are fiercely hopeful.
- **But we are urgent.** If we sound like we're leaning hard on the risks in the last pages, it's because we believe the stakes demand it. **Frankly? If our warnings turn out wrong, we'll be the happiest fools you ever met.** But if we're right about even some of these scenarios? We refuse to look back and say we stayed silent.
- **We keep it original.** In preparing this document, we used AI for research; however, any recommendations, analysis, and scenarios explained originate from the effort of our brains and peer discussions.

On the tides of technology, we saw humanity lifted out of poverty. Physical AI could be our greatest leap yet; **if we do not act wisely, it will do the opposite.** That's why we're gathering leaders in **April 2026 in Lake Como for the 5th Session of World Technology Congress**. This report is a stepping stone.

This document is not exclusive to any industry; rather, it is an awareness tool. Read this. Question it. Debate it. Then join us. **Let's ensure Physical AI works for the world, not just happens to it.**

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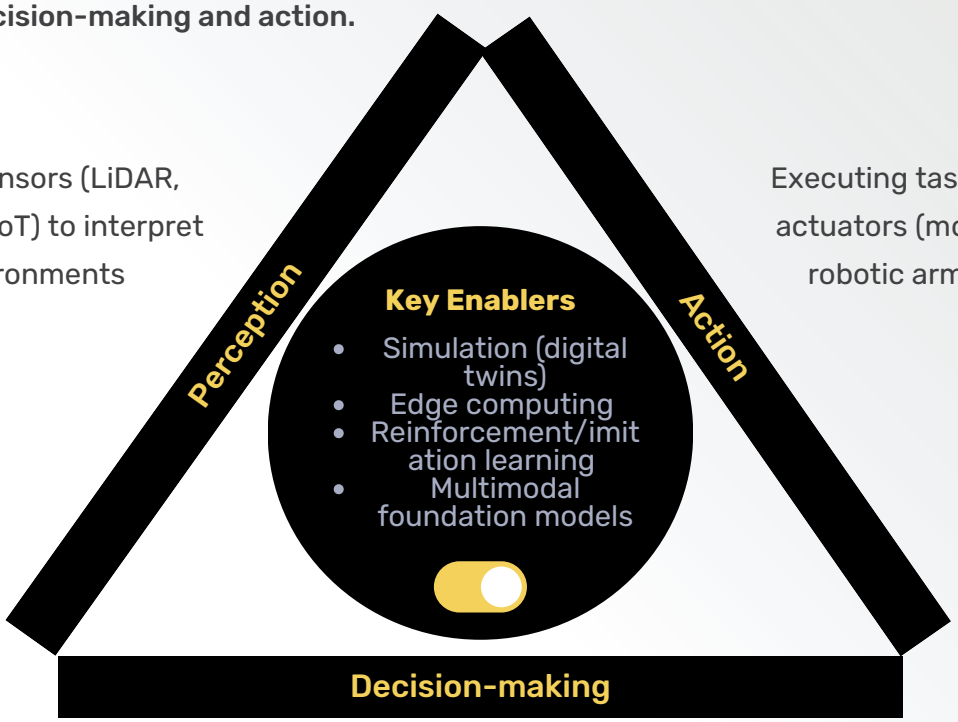
This report is immeasurably richer thanks to the brilliant minds who generously lent their expertise. Your contributed insights didn't just inform our thinking; they fundamentally gave confidence in the future report we dare to put forth as authors. We are deeply grateful for your trust, your time, and your unwavering commitment. Your contributions are the very heart of this work.

What is Physical AI?

Physical AI integrates AI algorithms (computer vision, NLP, reinforcement learning) with electromechanical systems to enable autonomous interaction with physical environments. Unlike cloud-based AI, it embodies intelligence in hardware capable of perception, decision-making and action.

Using sensors (LiDAR, cameras, IoT) to interpret environments



Executing tasks via actuators (motors, robotic arms).

Processing data locally for real-time responses

Key Distinctions in AI

Traditional

Digital only, data centric intelligence

e.g., Chat GPT, LLMs

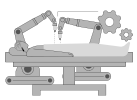
Embodied

Physical body interacting with the world

e.g., Warehouse robot, delivery drone

Physical

Interfacing with physical reality



e.g., Surgical robots, autonomous vehicles

Transcending Factors

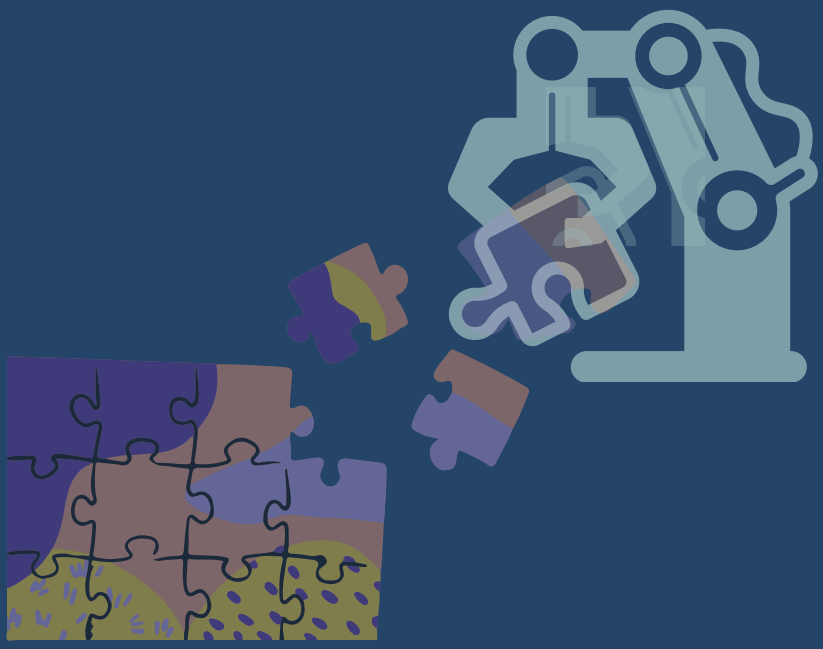
Rapid learning in simulated environments accelerates real-world adaption.

Simulation platforms: NVIDIA Omniverse/Cosmos

Combining vision, language, and sensor data enables human-like understanding and better decision-making.

LLMs enable robots to learn faster from observation and leverage the power of generative AI, e.g., *NVIDIA's Gr00t model.*

PHYSICAL AI IS ABOUT GIVING ROBOTS BOTH A BRAIN TO MAKE DECISIONS AND A BODY TO ACT ON THOSE DECISIONS TO SOLVE REAL-WORLD PROBLEMS



Just give robots a set of instructions won't cut it

Train robots extensively in virtual environments to think, learn, and act in the real world, so that they can use what they have learned in the real world and handle unpredictable situations.

Current Limitations

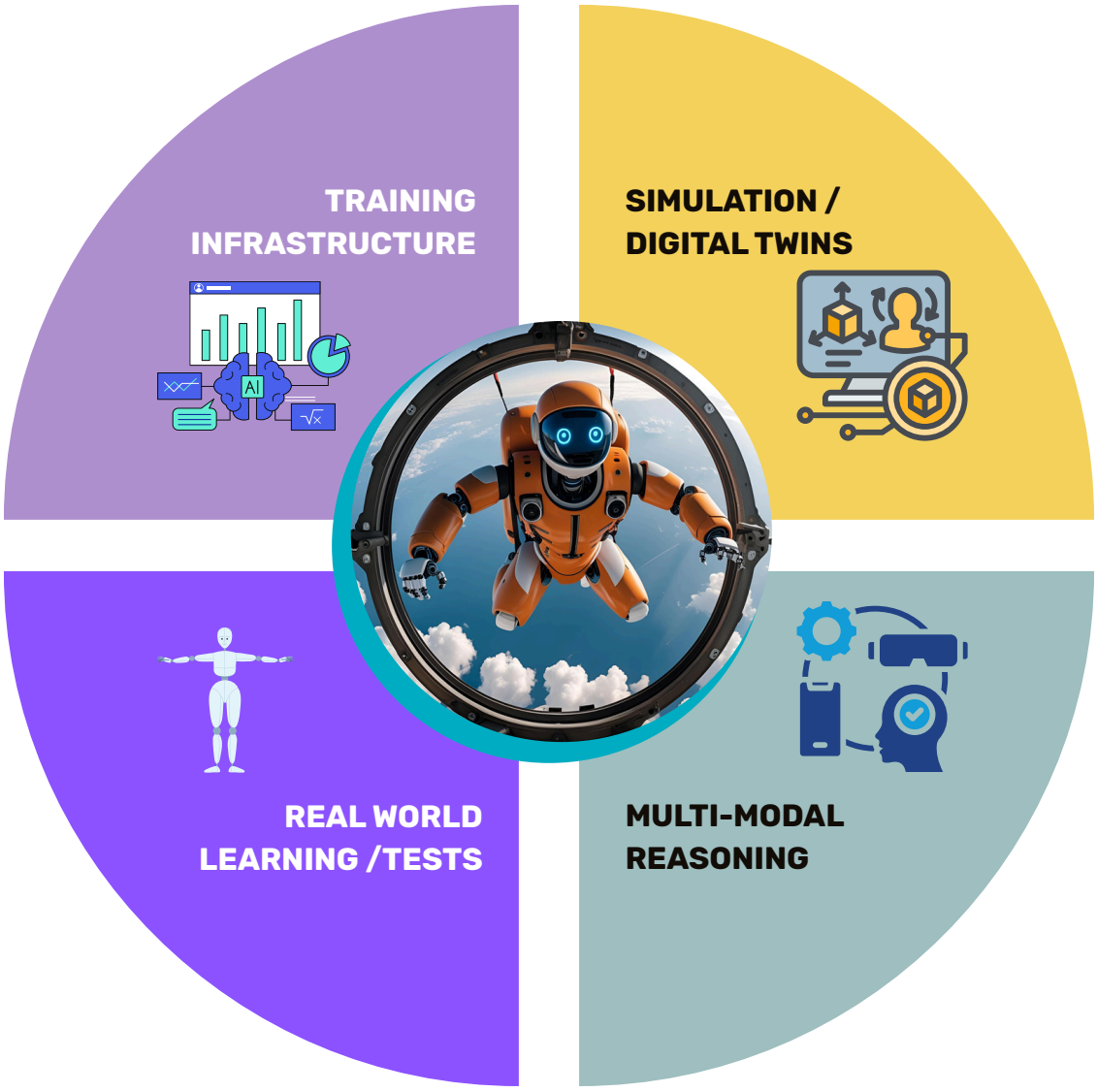
For instance, early vision-language models linked sight and text but couldn't reason deeply. Rule-based systems were brittle outside scripted scenarios. Simulations missed real-world nuances. Crucially, no standard framework existed to define or measure physical common sense or embodied reasoning. Inconsistent methods and benchmarks made progress fuzzy, while reinforcement learning often lacked the right rewards, leading to models weak on cause-and-effect and physical feasibility.

AI Needs Gravity Boots, Physical AI will deliver that

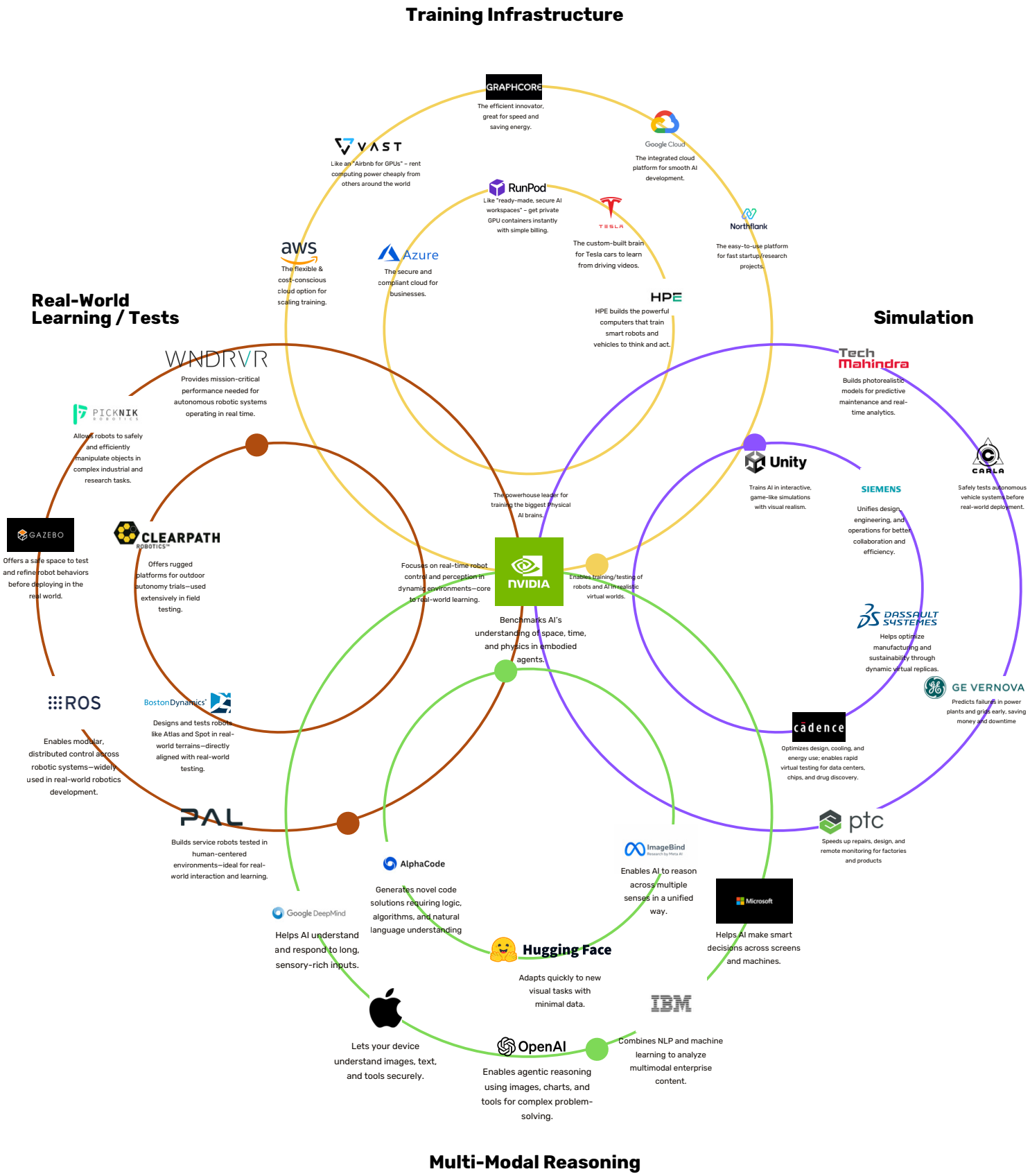
AI's digital brains need real-world brawn. But today's models stumble on sensory data and physical consequences. They lack an intuitive grasp of gravity, space, or cause-and-effect, making embodied tasks risky and expensive to train for. True real-world AI demands physical grounding. Physical AI aims to deliver systems that see, understand physics, and act – think robots and self-driving cars.

Breakthrough Case Studies

The rapid progress in physical AI is due to unprecedented momentum in its rapidly growing ecosystem. The critical areas in this ecosystem can be divided into training infrastructure, simulation/digital twins, real-world learning and test, and multimodal reasoning/benchmarking. This convergence eliminated historical roadblocks: unified platforms now seamlessly connect simulation, robotics, and AI training, while standardized benchmarks (e.g., for "physical common sense") finally enable measurable progress. Synergy between these domains accelerated development cycles from years to months.



While Nvidia addresses the entire Physical AI ecosystem, targeted innovators building its core components fuel the fastest progress. Featuring key players and their unique approaches highlights the pace and direction of innovation: Specialized pioneers like Boston Dynamics, DeepMind, and Dassault Systèmes propel domain-specific breakthroughs. Critical infrastructure partners like CoreWeave deliver massively scalable GPU training, which is essential for processing multimodal sensor data, while seamlessly integrating with NVIDIA's full-stack platforms to create compounding innovation cycles.

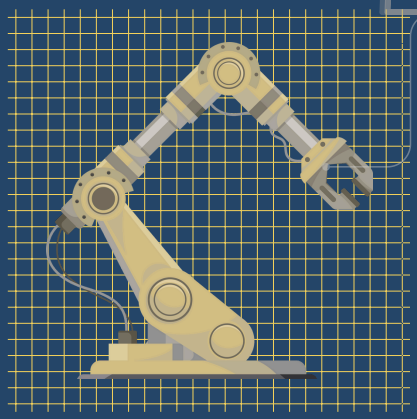


Breakthrough Case Studies

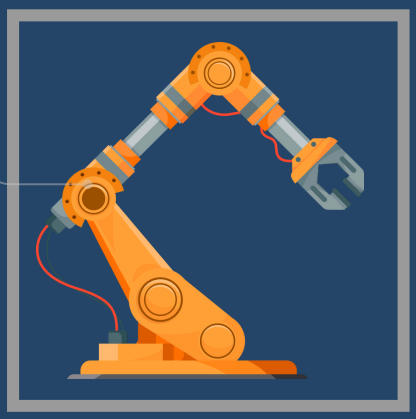
Nvidia's Standardised framework for *AI's physical Smarts*

Supercomputers for training

Nvidia 's physical AI ecosystem includes supercomputers to train AI, simulation platforms, Omniverse + Cosmos to create digital twins of warehouses, and real-time robot control software, Isaac and Metropolis, to help robots see and act in the real world. This lets companies train robots in huge virtual warehouses, changing things like lighting or layout to prepare for any real-world situation. This integrated approach directly tackles earlier fragmentation - delivering the "gravity boots" for AI through standardized tools that bake physical intuition into every layer, from simulation to deployment.



Digital twin using Omniverse & Cosmos



Real world asset performs through Isaac & Metropolis

For illustration purpose, enter NVIDIA's Cosmos-Reason1. This suite of multimodal LLMs (7B and 56B parameters) tackles physical reasoning head-on. Trained via specialised Physical AI Supervised Fine-Tuning (SFT) and Reinforcement Learning (RL), its breakthrough is a dual-ontology system. One hierarchical ontology structures physical common sense into Space, Time, and Fundamental Physics (16 subcategories deep). The second maps reasoning capabilities across five embodied agents – from humans and robot arms to humanoids and AVs. These ontologies aren't just training guides; they're the "rules of reality" that AI desperately needed to take the leap from simulation to the real world and the missing standardised framework, finally enabling rigorous benchmarking of AI's physical smarts.

Money, Momentum, Transformation

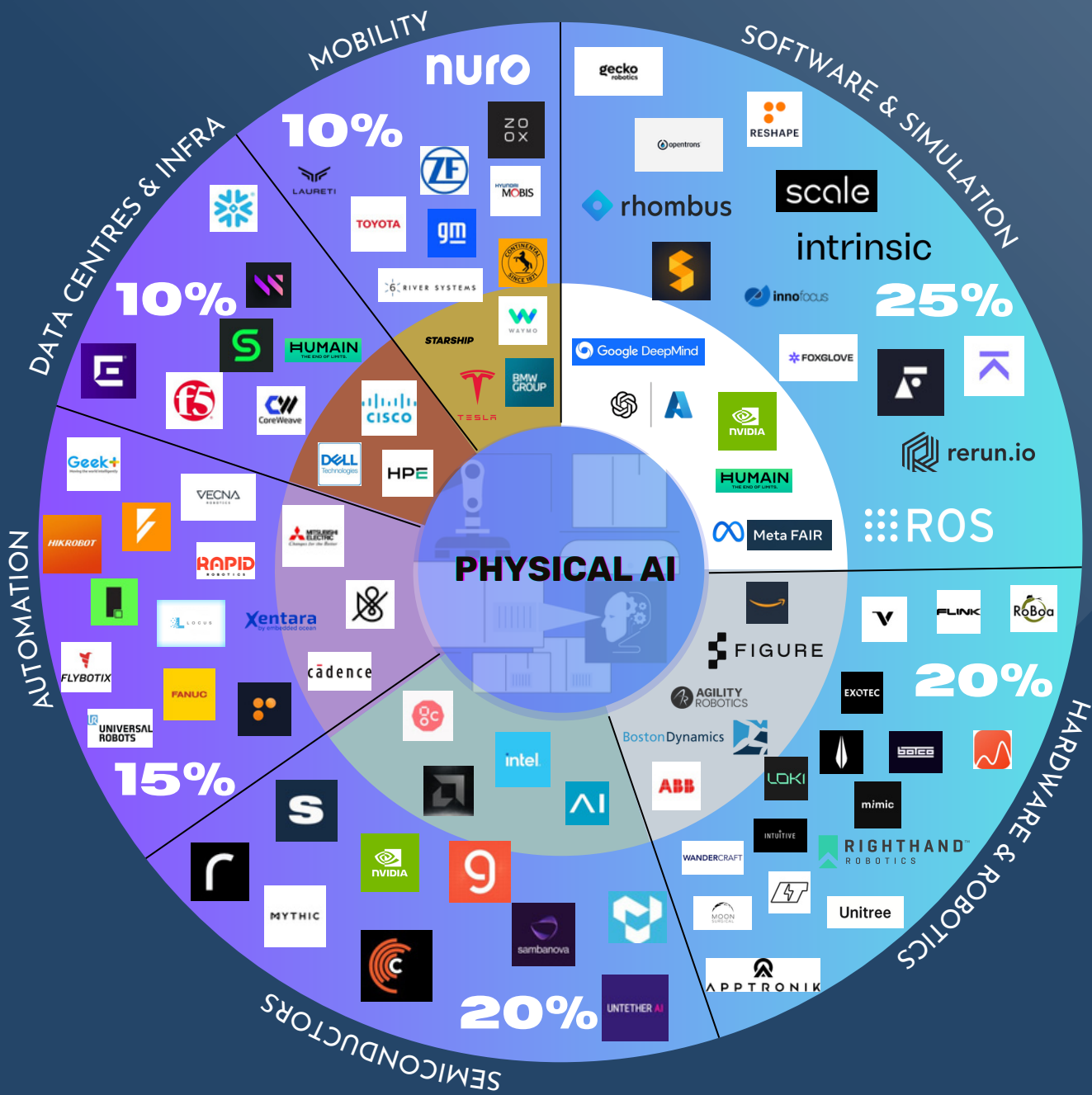
Physical AI is no longer niche—it's a **$10T+ industrial revolution** unfolding before us and mainly driven by **tangible ROI** on energy savings, accident reduction, and productivity gains; **cross-industry urgency** is also a key driver as industries set to face labor shortages and address supply chain resilience **and tech convergence** of multiple innovations and solutions like simulation, edge computing, multi-modal AI and beyond. This convergence is the catalyst for transforming Physical AI into practical, real-world solutions, unlocking a new economic revolution as we step into the 30s.

Far from a "pipe dream," the space is exploding with capital. Tech giants alone plan $400B in 2025 capex—driven by Microsoft ($30B+/quarter), Amazon ($100B), Meta ($66B–72B), and Alphabet ($85B)—largely for AI-ready data centres and custom silicon to power real-world applications. Startups are surging too: SiMa.ai secured $85M (total $355M) to advance its edge-AI "Platform for Physical AI," delivering record performance-per-watt for robotics. MyRadar raised $7.5M toward a $25M round for HORIS—satellites using onboard AI to detect wildfires and threats in minutes. Venture capital is hyper-focused, with firms like Cybernetix Ventures raising a $100M fund exclusively for robotics and Physical AI, backing innovators like construction-automation leader Raise Robotics.

This momentum reflects a global pivot: the UN reports $7.6T in intangible investments (like AI/data) now outpace physical assets, growing 3× faster as economies prioritise "technological and digital innovation." Accordingly, the AI-enabled robotics market is projected to surge from $12.8B to $124.8B by 2030—a 38.5% CAGR. This influx of capital and technological convergence is fundamentally transforming the economy, turning physical AI from a research project into the backbone of autonomous factories, resilient supply chains, and sustainable infrastructure worldwide.

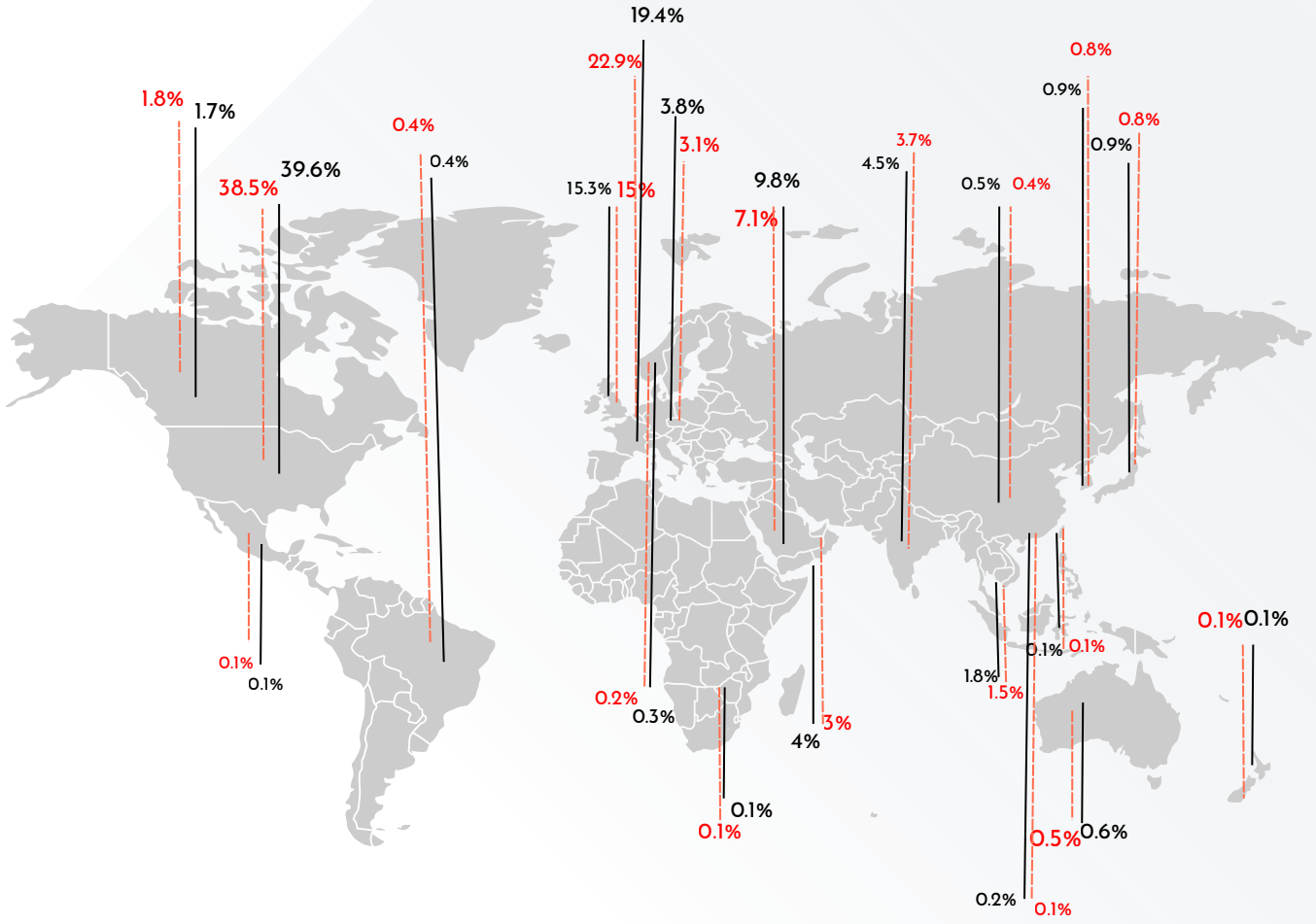
True Momentum and Tech Convergence Driving Transformation

Big tech and its backers are clearly voting with their wallets. We analysed over 2,000 companies to assess their solutions, value propositions, total funding, and overall contribution to Physical AI's growth. The chart below summarises each sector's relative influence and highlights key companies driving progress



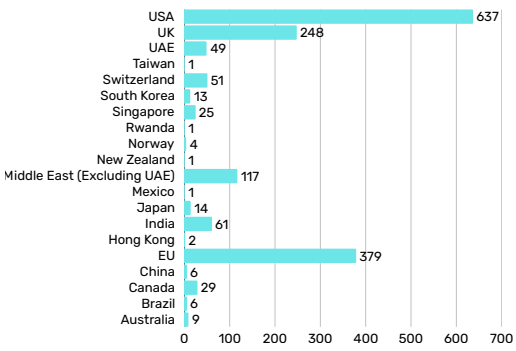
Where Money Fuels Physical AI Momentum

Investment and innovation are geographically concentrated but globally interconnected. This map reveals the hubs where capital and cutting-edge research and development converge, accelerating the transformation of physical AI from the lab to the real world.



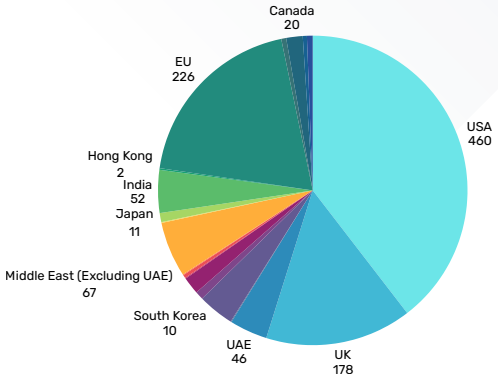
Geographical representation of Physical AI talent concentration

Based on WTC research

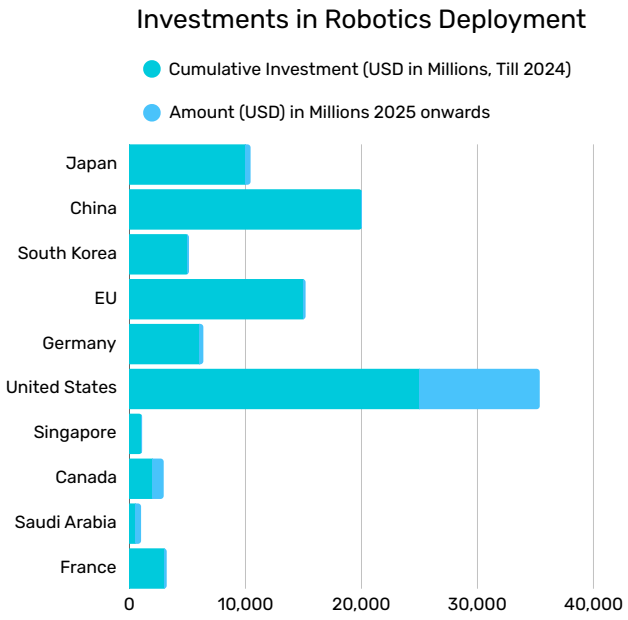


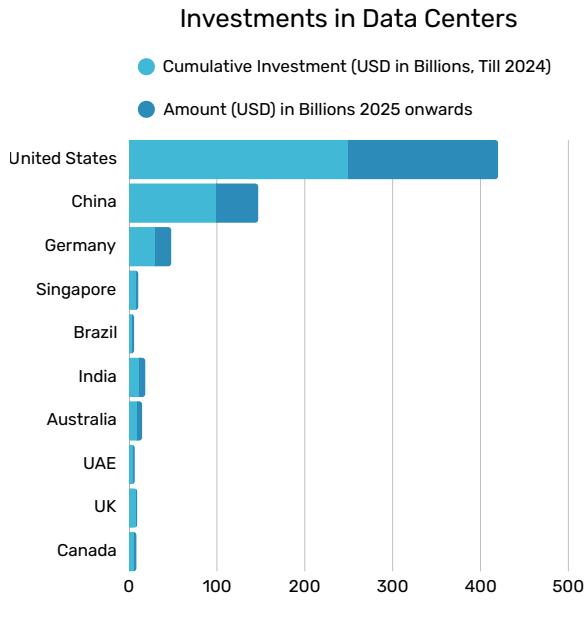
Geographical representation of Physical AI companies included in research

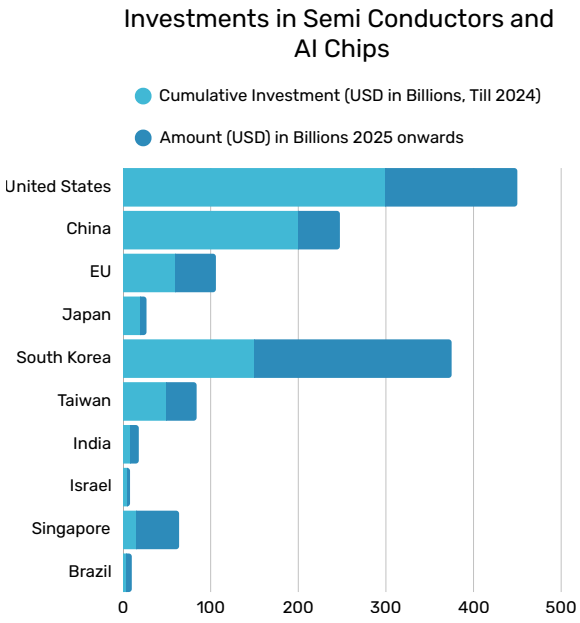
Based on WTC research

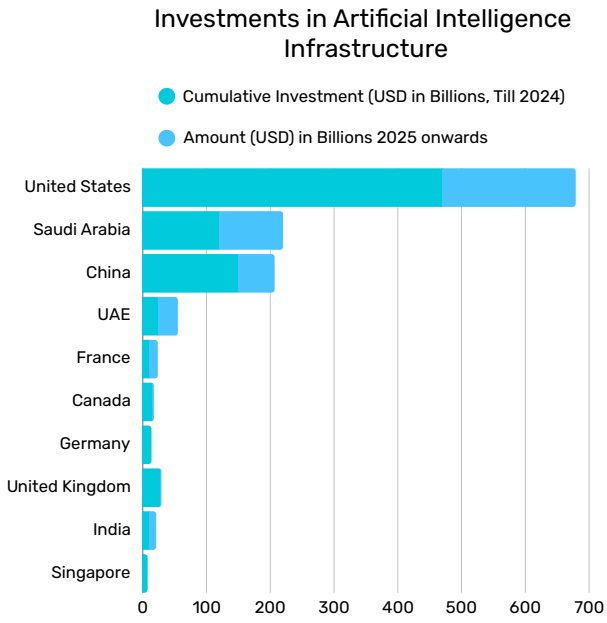


Where Money Fuels Physical AI Momentum









From Momentum to Industry Transformation: Unlocking Sector Disruptions

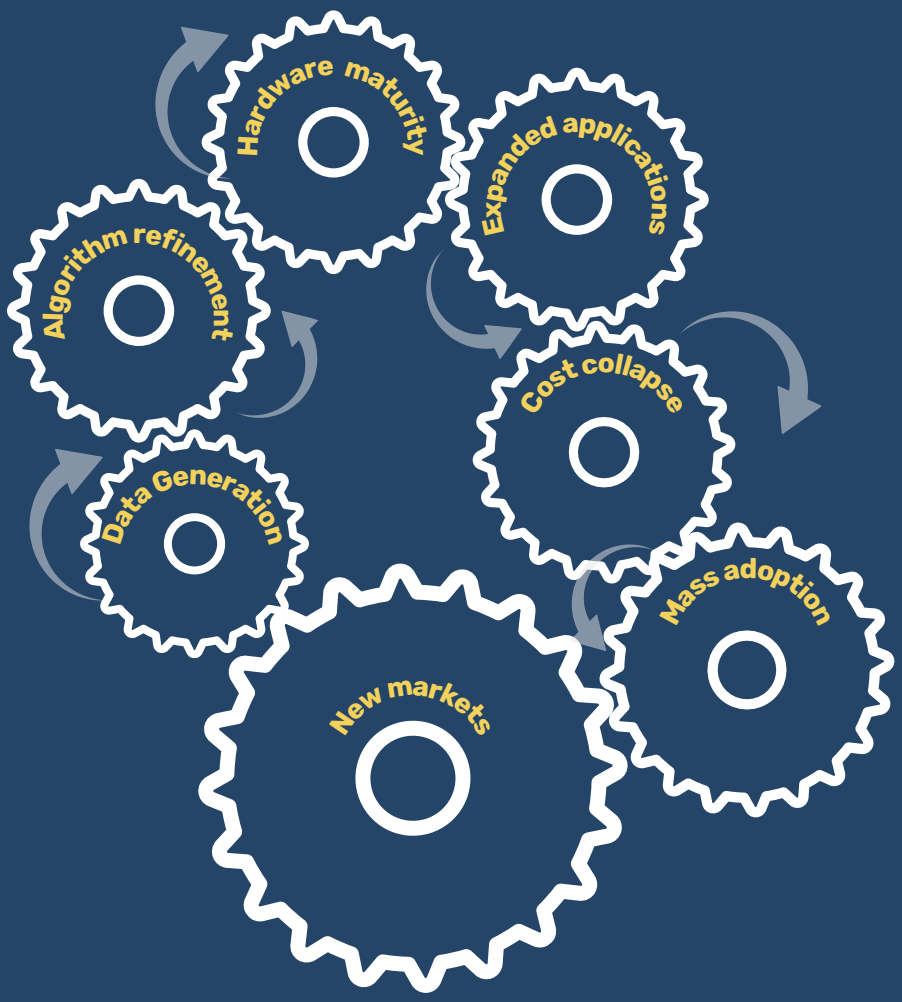
The convergence of Money, Momentum, and Transformation has set the stage for Physical AI's sector dominance. Projections for 2030–2035 indicate that an economic impact of $15+ trillion could be achieved in just four key industries, each uniquely positioned to leverage the core capabilities of physical AI. Healthcare could see $4 trillion in added value, while mobility may realise $7 trillion in efficiency gains. Logistics stands to benefit from $500 billion in annual waste reduction, and manufacturing could experience a $3.7 trillion increase in output.

These sectors—**healthcare, mobility, logistics, and robotics/ manufacturing**—were selected to demonstrate Physical AI's disruptive power due to their massive economic scale, potential for addressing critical human challenges, and unique ability to leverage Physical AI's core capabilities: real-time environmental perception, autonomous decision-making, and adaptive execution. It is these capabilities that unlock unprecedented efficiencies, safety enhancements, and sustainability outcomes beyond traditional automation or digital-only AI. Crucially, synergies between these sectors amplify Physical AI's economic impact: Manufacturing robots supply components for autonomous vehicles; logistics AI optimises critical medical supply chains; and advancements in healthcare robotics directly inform safer, more collaborative industrial cobot design.

While these projections reflect the disruptive capacity of physical AI, scaling requires overcoming significant challenges: ensuring data integrity and security, privacy, and overcoming scarcity for robust unbiased "world models"; pushing the boundaries of edge computing; developing rigorous safety assurance frameworks; and managing workforce transitions.

You will notice that certain companies are frequently mentioned for leading disruption in their respective industries—NVIDIA, Amazon, Siemens and more. These companies are in the race for simulation technologies, modular hardware, and human-AI collaboration paradigms, which support our case regarding the convergent forces discussed earlier.

PHYSICAL AI ISN'T COMING—IT'S HAPPENING NOW. IGNORING THIS ISN'T CAUTIOUS; IT'S STRATEGIC OBSOLESCENCE



Precision Personalisation Progress

Rewriting Healthcare with Physical AI

Our forecasts indicate a clear view of the timeline and impact of Physical AI on the healthcare sector. Within the next five to ten years, we expect predictive, precision medicine to become the norm, provided that the industry addresses ethical concerns, data security, and privacy issues while enhancing team competencies to fully utilise its potential. Notable advancements in this technology are anticipated in China, the USA, UAE, KSA, and in Singapore before 2030 – countries dominating Physical AI funding and patent filings as shown before.

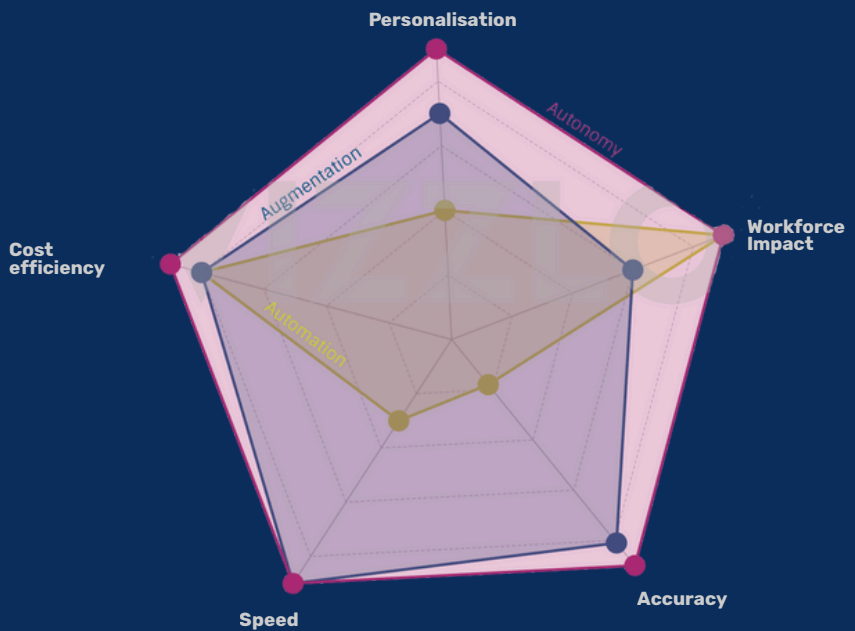
From Automation to Autonomy

Physical AI Care Pathway

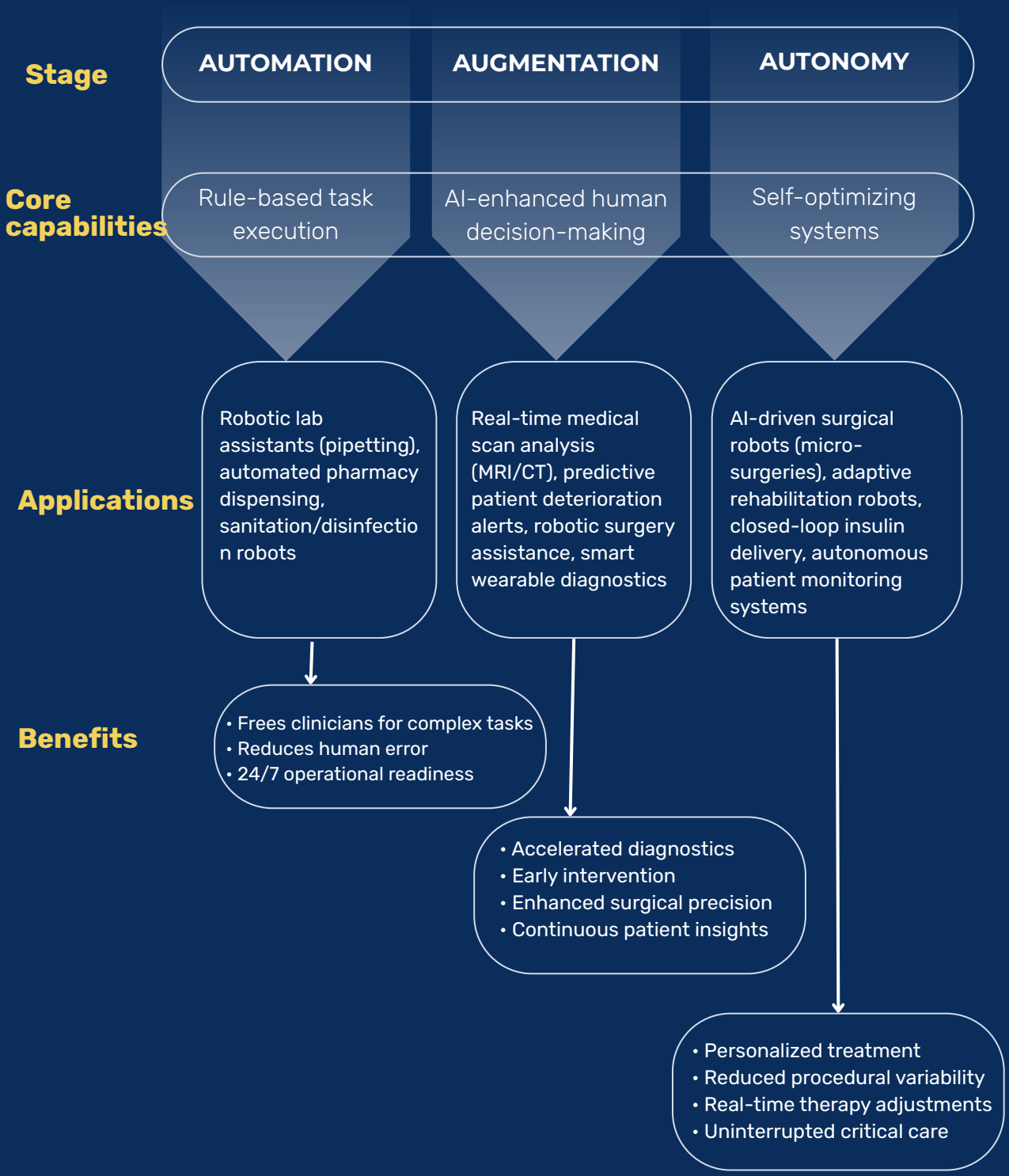
Stage	Home	Clinic	Surgery	Recovery
AI Type	Autonomous Systems	Augmented Intelligence	Autonomous Robotics	Hybrid AI Support
Key Tech	Smart wearables (continuous monitoring) Fall detection sensors Medication dispensers	AI diagnostic support (imaging analysis) Robotic nurse assistants Predictive triage	Self-correcting surgical robots Real-time tissue analytics Autonomous anesthesia	Adaptive rehab robots AI prosthetics Remote monitoring systems
Patient interaction points	Passive data collection Emergency alerts	Enhanced diagnostics Reduced wait times	Precision procedures Adaptive techniques	Personalized therapy Progress tracking

Treatment speed will skyrocket as autonomous diagnostics like AI-driven imaging cut analysis from hours to minutes. Costs will plunge—automating claims processing alone could reduce turnaround by 85%, while AI-guided prevention curbs chronic disease spending. Accuracy hits new heights: algorithms now outperform humans in spotting tumours or heart failure, minimising fatal misdiagnoses. Personalised care becomes the norm, with AI wearables and adaptive therapies tailoring treatments in real-time.

Yet the workforce faces seismic shifts: clinicians pivot from paperwork to oversight as bots handle diagnostics and admin. Hospitals will battle tech giants for AI-savvy talent, demanding reskilling at scale. And without vigilant governance, biased data could deepen health disparities.



Physical AI in Healthcare: Evolution Matrix



Intelligent
Intuitive
Immersive

Rewiring Mobility from Factory to Passenger

The Code Base: Your Car's Fundamental DNA

Your Car Isn't Just Metal Anymore—It's a Supercomputer on Wheels

For the car of tomorrow, Physical AI will be the lifeblood of software-defined vehicles (SDVs). Picture your car as a smartphone with tires. Instead of apps and touchscreens, it's packed with over 150 million lines of code. That's more code than a fighter jet or even early versions of Windows combined. This code sprawls across dozens of tiny computers (called ECUs) hidden in your car, controlling everything from your headlights to your brakes. Like a city's roads and power grids, this code is the invisible foundation that keeps your car functioning as it should. But this is the present.

Enter AI: Your Car's New Co-Pilot

Here's where it gets exciting. AI isn't replacing that code—it's supercharging it. Think of AI as a brilliant assistant that uses all those lines of code to do things your car couldn't do alone. It watches over you as cameras and sensors track your alertness, posture, and even vital signs. If you yawn or glance away, your car can nudge you awake or adjust airbags for safety. It also optimises your ride, especially in electric cars, AI juggles your battery life and climate control. On a freezing day, it can warm your seat instead of the whole cabin to save energy, squeezing extra miles from your battery. This isn't sci-fi—it's how AI turns raw data from your car's code into real-time smarts.

Physical AI: The Cognitive Leap

Why Lines of Code Still Matter in the AI Era?

You might wonder: “If AI’s so smart, why fuss over lines of code?” Great question! Here’s the deal. The code is your car’s DNA. It’s the non-negotiable “rulebook” telling your brakes how to work or your engine how to run. Without it, AI has nothing to build on. AI needs that code to learn and adapt. Just like your brain needs nerves to sense the world, AI needs code to access your car’s systems. New features like self-driving updates arrive via over-the-air software downloads—all possible because the code foundation is in place.

Then, Physical AI unveils a horizon of possibilities we have yet to conceive

As Physical AI bridges the gap in understanding fundamental physical forces like gravity, friction and cause-and-effect, making embodied tasks practical. Future mobility systems will comprehend physics to autonomously perceive, decide, and act in real-world scenarios, handling everything from collision avoidance to occupant rescue and organising alternative options during traffic emergencies.

Rewiring the Automotive Value Chain

Our repeated mentions of NVIDIA may risk sounding like promotion, but their breakthrough ecosystem makes them unavoidable when discussing how physical AI is fundamentally reshaping automotive and mobility. NVIDIA's core platforms power this transformation: DGX for training AI brains in data centers, Omniverse/Cosmos on OVX for ultra-realistic simulation, and DRIVE AGX for real-time sensor processing. This integrated technology enables revolutionary approaches to designing, building, and deploying intelligent vehicles – paving the way for safer, smarter, and more exhilarating mobility experiences.

NVIDIA Product Adoption Matrix by Key Global Players

Company	DRIVE AGX/Thor	Omniverse & Cosmos	DGX Cloud/Enterprise	Halos Safety	Key Partnerships/Investments	Strategic Outcome
General Motors	Next-gen ADAS & in-cabin systems	Digital twins for factories/robotics	GPU platforms for AI training	Integrated via DriveOS	Multi-year AI collaboration	Transform manufacturing (AI-optimized plants) + Safer/smarter mobility at scale
Volvo/Zenseact	DRIVE AGX for EV compute	–	Sensor data analysis & safety models	–	Subsidiary integration	Enhanced vehicle safety through real-world data training + performance
Lenovo/Nuro	Level 4 autonomous delivery vehicles	–	–	–	End-to-end system co-development	Safe, reliable L4 delivery vehicles for last-mile logistics
Gatik	Freight trucks (middle-mile)	–	–	–	Isuzu Motors (truck OEM)	Driverless middle-mile delivery for Fortune 500 retailers (cost/efficiency focus)
Torc	Scalable AV trucks + DriveOS	–	–	–	Flex (manufacturing)	Mass-market AV trucks by 2027 with industrial-scale
Magna	DRIVE Thor-based systems	–	–	–	Tier-1 supplier for OEMs	Active safety + generative AI cabins for automakers (Blackwell
Plus	–	Cosmos for L4 truck simulation	–	–	SuperDrive integration	Accelerated L4 truck development via synthetic edge-case generation
Cerence AI	Voice assistant optimization	–	AI Enterprise + TensorRT-LLM	–	Hybrid edge/cloud platform	LLM-powered in-car agents (low-latency voice UX)
SoundHound	Edge-based generative AI voice	–	–	–	Direct DRIVE AGX integration	Cloud-like AI experiences offline (enhanced convenience/safety)
Foretellix/Mcity	–	Sensor simulation scenarios	–	–	Capgemini (AV platform)	High-fidelity validation for rare scenarios (weather/lighting) + digital twin testing

Physical AI: Reshaping Autos from Factory Floor to Passenger Seat

Physical AI isn't just improving the automotive value chain; it's fundamentally rewiring it. From design to manufacturing, AI delivers unprecedented efficiency: designers now leverage real-time feasibility checks, cost insights, and optimised vendor selection, slashing development time and risk. Meanwhile, simulation and digital twins are helping to eliminate production waste. Siemens' Amberg plant proves it – their digital twin implementation achieved near-perfect quality of over 99% and major productivity leaps through virtual commissioning and process optimisation.

Human-Centric Cabins: Where Physical AI Meets Passenger Needs

But the real revolution? It's inside the car.

As autonomous mobility matures, Physical AI shifts the focus beyond supply chains to the passenger experience. This unlocks a multi-trillion-dollar frontier: hyper-personalised, adaptive in-cabin environments. Imagine immersive journeys tailored uniquely to each occupant. This is where Physical AI transforms not just how cars are built, but the very value they deliver, creating the next massive wave of mobility innovation and growth.

Key partnerships transforming safety and personalization

Magna's AI Cabin Companion

Magna is taking this to the next level by teaming up with NVIDIA. Their cars use the DRIVE AGX Thor platform to deliver an AI-powered cabin companion. It watches over both driver and passengers, adjusting comfort settings and monitoring safety. Whether it's cruise control that adapts to traffic or seats that respond to your posture, Magna's system makes the car feel more like a thoughtful host than a machine.

Cerence's Seamless Voice Experience

Cerence adds another layer with its xUI platform. Built on NVIDIA's DRIVE AGX Orin, it lets you talk to your car naturally, even in multiple languages. You can ask questions, get directions, or control features without lifting a finger. It's designed to reflect your car brand's personality while keeping you safe and engaged. Whether online or offline, it's always ready to help.

AMD's Vision for Smarter Cabins
Imagine your car knowing when you're tired, adjusting your seat, or even checking if your seatbelt is snug. AMD is helping make that happen. Their AI systems monitor everything from your posture to your vital signs, creating a cabin that's not just smart, but safe and responsive. These systems also learn your preferences, like how warm you like your seat or what music you enjoy, and adjust automatically. In electric vehicles, they even help save energy by fine-tuning climate control and predicting maintenance needs before problems arise.

SoundHound's Conversational Companion
And when you talk to your car, it listens—and responds like a real assistant. SoundHound's Chat AI blends the power of generative AI with voice control, letting you ask for directions, play music, or check your schedule—all hands-free. It's smart enough to know when to answer from the cloud or from its own memory, avoiding confusion and keeping you safe. Your car becomes a conversational companion, making every drive smoother and more engaging.

HARMAN's Empathetic AI Experience
Now imagine your car not just reacting, but understanding you. HARMAN's Ready Engage system introduces "Luna," a friendly avatar that talks to you and responds to your mood. If you're stressed or drowsy, it adapts the lighting, sound, and even the driving experience to help you feel better. With immersive audio, real-time hazard alerts, and satellite connectivity, it's like having a co-pilot who knows you personally. This isn't just tech, it's empathy on wheels.

Mobility in the Age of Physical AI: The Next Frontier is not the Road, But the Cabin

For over a century, the automotive industry has been obsessed with the driver, performance metrics, driver-focused tech: Instrument clusters, driver assistance systems (ADAS), steering feel, the "thrill of driving": Marketing has centred on the individual's control and connection to the machine.

Autonomous vehicles dismantle this entire paradigm. When the car is driving itself, the occupant is no longer a "driver" but a "passenger" with newfound time and attention. The question becomes: How do we monetise and enhance that newly freed time and attention?

The Warning to the Auto Industry
The traditional auto industry is built on low-margin hardware sales, complex supply chains, and dealer networks. The new players entering this space are tech companies and startups think the opposite as they operate on high-margin software and service subscriptions with

recurring revenue from millions of users. They focus on agile software development, constant updates and feature additions via OTA (Over-The-Air) updates, direct user relationships, owning the customer experience and data.

If legacy automakers continue to see themselves as mere "metal benders" and outsource the brain (the AI and user experience) to others, they risk being reduced to low-margin hardware suppliers for the companies that actually own the customer relationship and the lucrative revenue streams.

The Laureti Playbook: Mastering the Physical AI Economy Inside the Vehicle
The future of mobility is defined by a new battleground: the passenger experience. Victory will belong to those who master the triad of productive, connected, and secure cabins. This means transforming vehicles into seamless "Offices on Wheels" with integrated productivity suites and secure connectivity; "Living Rooms on Wheels" for immersive entertainment and smart home integration; and "Safe Havens" guarded by advanced biometrics and data security.

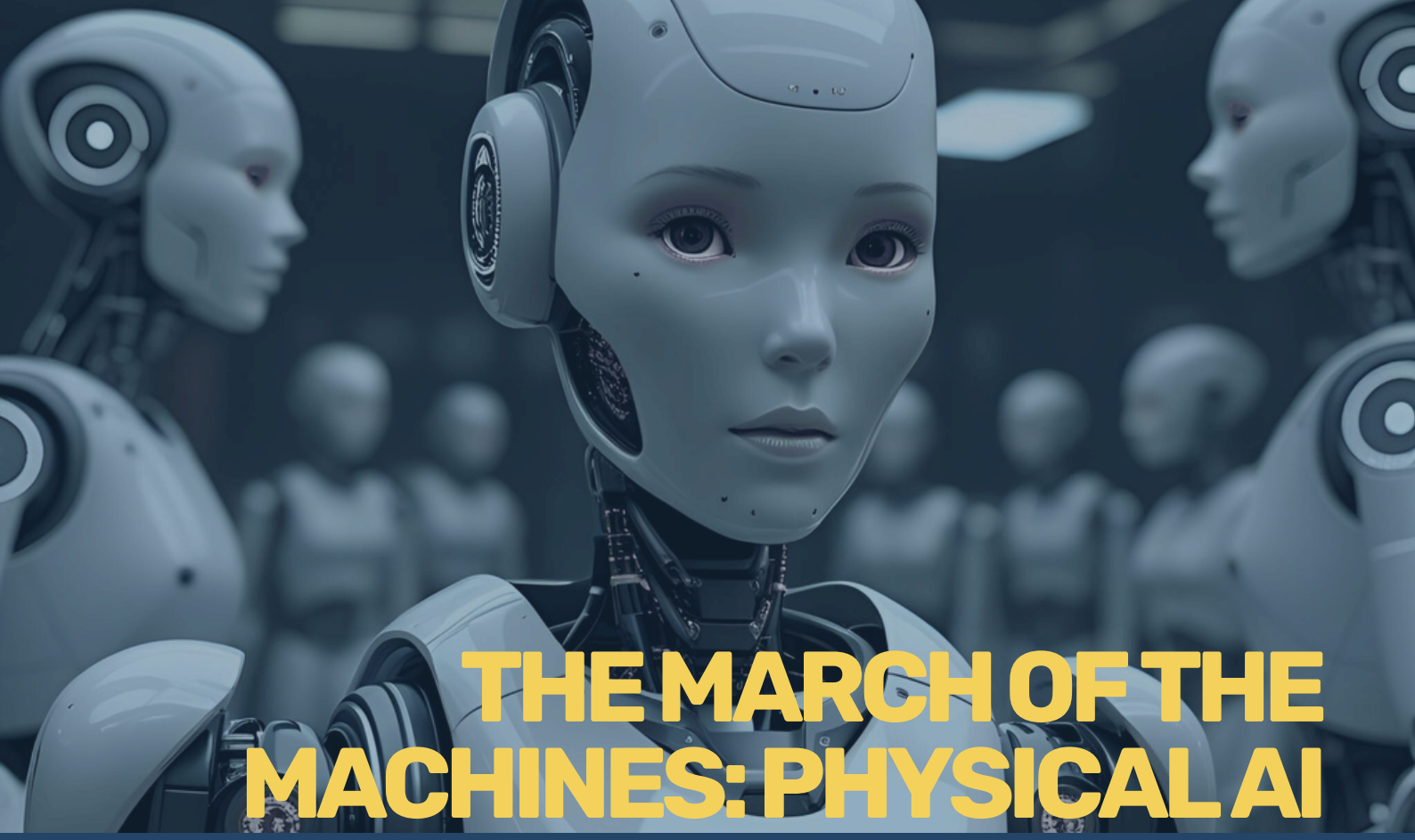
Laureti Group is positioned at the forefront of this Physical AI revolution. Rather than waiting for full autonomy, they are building and refining this intuitive ecosystem today. Their strategy is to master the AI stack that perceives occupant needs, decides on actions, and acts seamlessly through the cabin, ensuring their model becomes more valuable as autonomy arrives. By focusing entirely on the occupant's journey,

Become Tech-Oriented & AI-Led or Be Forced to Exit the Market

Legacy automakers are about to face a binary choice

Automakers that dismiss Physical AI will confront significant risks to their relevance, efficiency, and profitability. At the same time, technology companies are set to capitalise on the synergies between hardware and software to dominate various sectors of the mobility market. For instance, firms like NVIDIA and Google are controlling the AI infrastructure—covering simulation and chips—while companies such as Uber and Cerence are monetising user-facing interactive experiences. As manufacturers like Magna and Flex transition into contract manufacturers for technology-designed systems, the current operations of the automotive industry will become both obsolete and unrecognisable.

Players remaining in the market will be forced to accept subordinate market positions against these tech ecosystems. Physical AI isn't a “feature”–it's the central nervous system of future mobility. Carmakers who stick with hardware-centric models will see irreversible margin erosion, while tech companies monetize the true value: continuous software revenue, data ownership, and ecosystem control. This asymmetry leaves no middle ground. As NVIDIA's Jensen Huang has stated, “The car of the future will be a data centre on wheels.” Legacy automakers who fail to understand this will either collaborate on the terms set by technology or be forced out of the market by the market forces entirely.



THE MARCH OF THE MACHINES: PHYSICAL AI DEFINING ROBOTICS

Robotics' evolution ignited with ancient vision and mechanical grit. Da Vinci dreamed of humanoid motion (1495), but true milestones arrived centuries later: Waseda University's WABOT-1 (1973) became the first functional humanoid, while Unimate (1961) revolutionized factories. Yet pioneers like Honda's ASIMO (2000) proved too fragile for chaos—retiring by 2022.

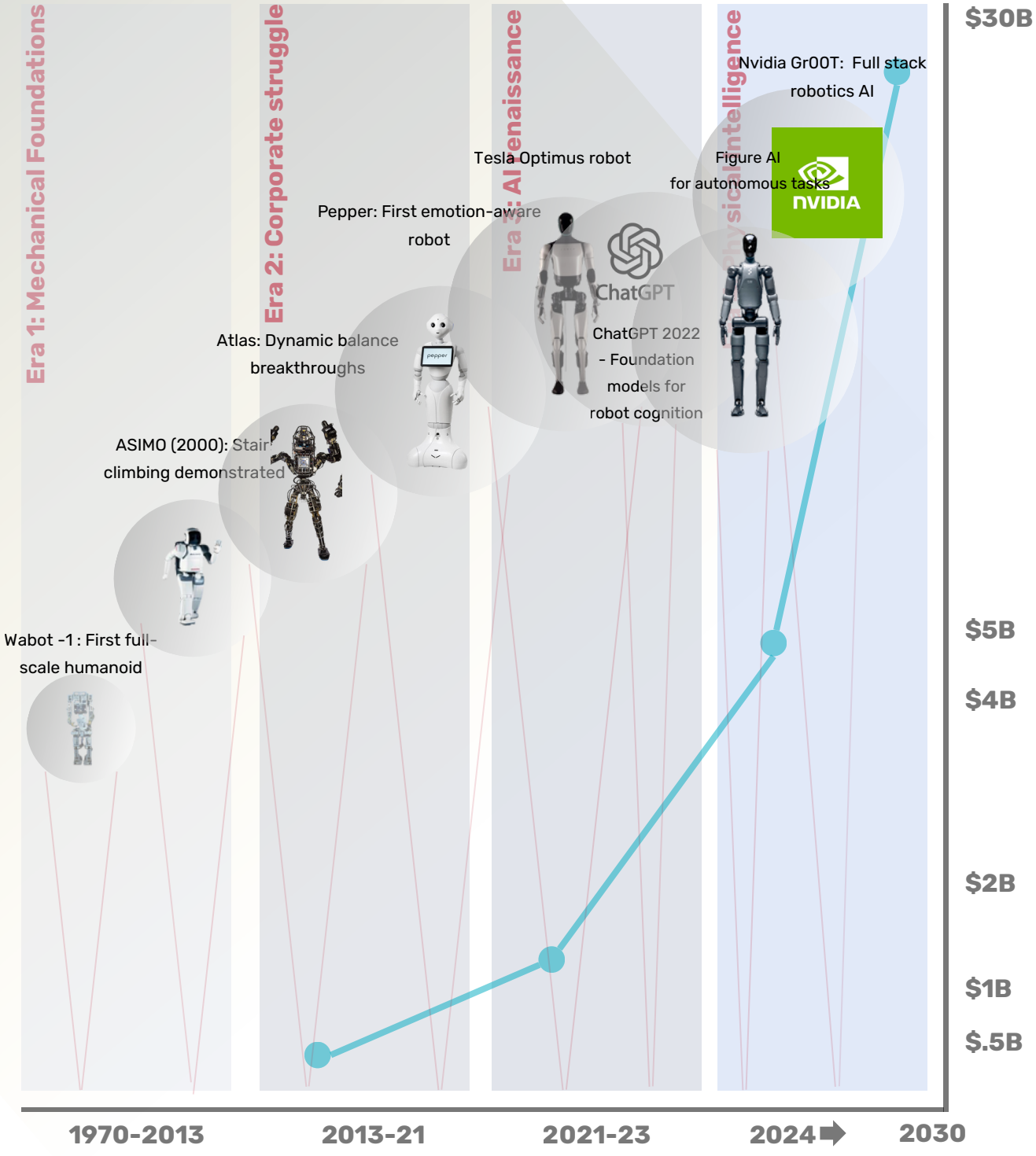
Ambition crashed into reality during the 2010s "Dark Age." Google acquired Boston Dynamics (2013) but pivoted from Atlas robots to cars by 2015, stymied by mobility-manipulation fusion. SoftBank's Pepper (2014) flopped despite 27K sales—abandoned by 2021. OpenAI quit robotics, and R&D fragmented under crushing complexity.

Elon Musk's 2021 Tesla Optimus detonated a renaissance. Framing humanoids as products, not prototypes, he unleashed a funding tsunami (Agility Robotics: $150M). Startups like Figure AI raced toward warehouse applications, while China's aging crisis turbocharged state investment. AI and hardware finally converged—the birth of physical AI robotics.

Then ChatGPT hit—rocket fuel for robotics. Large language models enabled robots to understand language, vision, and environments. NVIDIA answered with GR00T (2024)—pre-trained models for movement—and powerhouse Jetson Thor chips. By 2024, Tesla and BMW bots were charging into factories, turning sci-fi into supply-chain reality.

THE EVOLUTION OF ROBOTICS: FROM ASIMO TO PHYSICAL AI

From labs to revenue: Tesla's Optimus now handles palletizing at Giga Texas; Figure's bots transport components at BMW Group Plant Spartanburg—proving viability before 2030 targets



Robotics' 50-year struggle proves: autonomy requires not just mechanics, but physical intuition. GR00T's sim-trained "gravity boots" finally provide it.

Makers, Money & Momentum of Robotics-Led Physical AI

Tech-first leaders

Tech: Omniverse/Isaac sim – robotics AI infrastructure
Impact: Powers training for Fourier, Field AI, etc.

THE SPECTACLE — Boston Dynamics

Tech: Spot/Atlas – most advanced dynamic mobility
Impact: Deployed in 35+ countries; industry benchmark

THE ENGINE — NVIDIA

THE SPRINTER — GIDEON

Tech: 3D visual AMRs for warehouse unloading
Advancement: Plug-and-play deployment speed

Tech: *General-purpose humanoid – FSD-based AI 3*
Risk: *High ambition but unproven scalability*

THE ADAPTER — FOURIER

Tech: *Isaac Sim-trained healthcare/manufacturing robots*
Advancement: *Simulation-to-reality adaptability*

THE DISRUPTOR — TESLA

THE PATHFINDER — FieldAI

Tech: *Outdoor autonomy with "risk-bounded" AI*
Advancement: Safe operation in unstructured environments

Heavily-funded leaders

Tech: AI-powered humanoids for manufacturing -BMW partnership
Position: The cash king of humanoids

THE UPSTART — FIGURE

$675M raise
valued $2.6B

backed by OpenAI, NVIDIA, Jeff Bezos

Tech: Affordable quadruped/humanoid robots (H1)
Position: China's legged robotics unicorn

DEMOCRATISER — Unitree Robotics

Valued $1.7B

1000+ employees

Tech: G1 semi-humanoid for logistics (5,000+ item handling)
Position: Well-funded mobile manipulator innovator

PRECISIONIST — GALBOT

$335M raise

$153m in recent round

Tech: Safe autonomous humanoids for labor replacement
Position: OpenAI's bet on embodied AI

THE GUARDIAN

$100M

backed by OpenAI

Strong contenders

THE WORKHORSE

AGILITY ROBOTICS

Tech: *humanoid – first commercialised for warehouses*
Advancement*: Scalable production leader; 23.7% of Q2 cobot market*

THE BRAIN

SKILD AI

Tech: *Foundational AI models for robotic control*
Advancement: *"Robotic brains" platform agnosticism*

THE VERSATILE

APPTRONIK

Tech: *Apollo humanoid – modular industrial design*
Advancement: *NASA-collaborated mobility systems*

THE CHARMER

realbotix

Tech: *Open-source Melody robot with micro-camera vision*
Advancement: *Democratising expressive HRI (human-robot interaction) via open-source*

Enablers

THE SYNAPSE

cadence

Designs the crucial processing hardware like neural connections

THE COURIER

Lenovo nuro

Dedicated to autonomous delivery

THE ARCHITECT

WORLDLABS

Builds the foundational virtual training grounds

THE ORACLE

Archetype

Provides deep interpretation of complex physical sensor data

Silent forces

THE MAVERICK

ENGINE AI

New player founded by experienced innovator, early-stage

THE WHISPERER

Enchanted Tools

Lightweight, designed for subtle interaction in human spaces

THE VISIONARY

SANCTUARY AI

Aims high with AGI-integrated human-equivalent labor

CULTIVATOR

FOUR GROWERS

Specialized in precision agricultural robotics. (more about this company in further sections)

THE GHOST IN THE MACHINE GAINS A BODY: PHYSICAL AI ON THE FARM

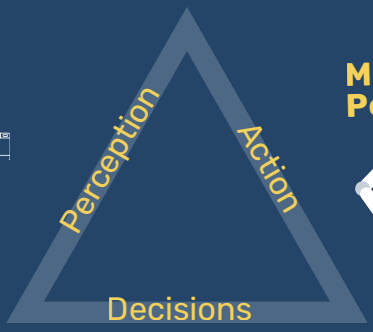
Imagine traditional AI as a disembodied ghost—intelligent but unable to interact physically. Physical AI is that ghost possessing a robotic body. It's not just analyzing data; it's touching soil, grasping fruit, and navigating greenhouses with mechanical grace. In agriculture, this transforms abstract algorithms into tireless field workers that see, think, and act.

Meet the master gardener with infinite patience and perfect memory who comes with decades worth of intuition, but quantified

How Physical AI Operates: The Farm as a Living Laboratory

Sensory perception

Mechanical Performance



Cognitive Processing

The eyes and skin

Sensory perception is a combination of Cameras & LiDAR: to create 3D maps of crops, Hyperspectral Sensors to identify nutrient deficiencies invisible to humans by analysing leaf reflectance, as well as IoT Soil Probes: Monitor moisture, pH, and microbial activity in real-time.

The brain

Cognitive Processing enabled by Edge AI Chips, e.g., NVIDIA Jetson, for processing data locally in milliseconds, enabling real-time decisions without cloud dependency, backed by Deep Learning Models that train on millions of crop images to distinguish weeds from plants, which could reduce herbicide use by 90%.

The arms

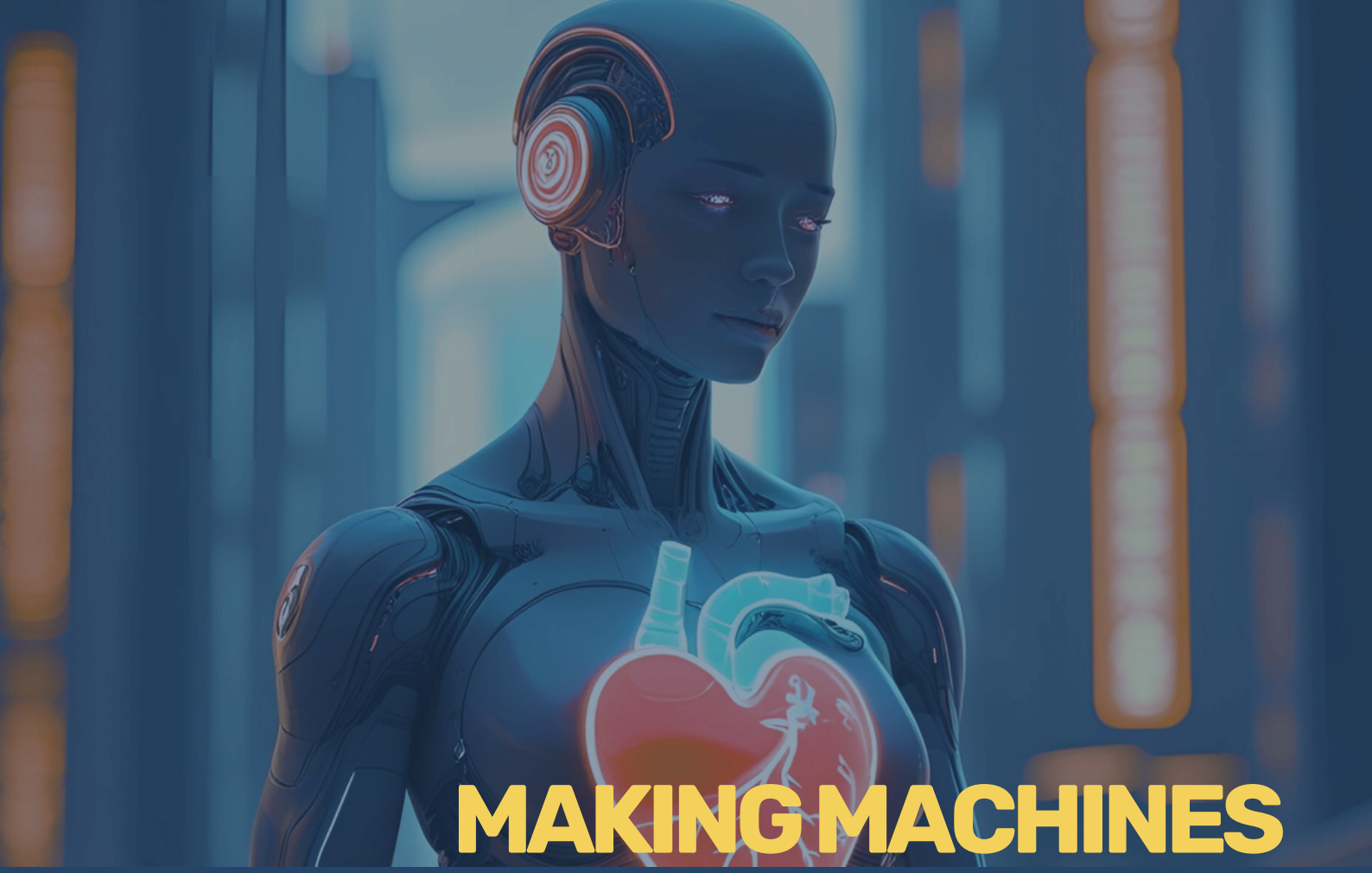
Mechanical Action is performed using robotic arms for harvest using a variety of suitable equipment, like suction grippers and tilling equipment, while using autonomous farming vehicles which navigate through fields using GPS.

Case study

FOUR GROWERS

While not the sole player, Four Growers' GR-100 harvesting robot exemplifies Physical AI's core principles by closing the loop between perception, cognition, and action in uncontrolled environments:

- Perception: Four stereo cameras scan tomato clusters, identifying ripeness and defects.
- Decision-Making: AI algorithms calculate optimal picking paths 34x faster than standard systems.
- Action: Robotic arms harvest 43 kg/hour while packing fruit into weighted carts.
- Adaptability: Operates in existing greenhouse infrastructures without retrofitting.
- Data Synergy: Generates yield heatmaps forecasting harvests weeks in advance.



MAKING MACHINES FINALLY FEEL

Emoshape / Metasoul Gives AI a Heart

Emoshape's emotion-sensing EPU chips equip Physical AI systems to interpret human states and enables emotional response during shared tasks. This allows devices to interact more naturally, adapting their tone and responses based on real-time emotional context. Surgical robots adjust urgency based on surgeon stress cues; warehouse bots slow movements near frustrated workers; agricultural harvesters pause when farmers show fatigue. This bridges Physical AI's mechanical grace with emotional intelligence—making interactions safer and more intuitive. Key partners like Microsoft (for expressive digital voices/avatars) and MorphCast (for eco-friendly emotion sensing in web browsers) help integrate this tech widely. Looking ahead, Emoshape bridges cold logic and human-like warmth in AI, paving the way for companion robots, empathetic healthcare tools, and self-driving cars that respond to passengers' moods. Stakeholders range from healthcare innovators to metaverse developers. Emoshape's innovation extends Physical AI beyond mechanical intuition to human empathy—proving that truly intelligent systems must understand not just gravity, but grief, stress, and joy to safely integrate into our world.

LOGISTICS' $8.5T FUTURE: PHYSICAL AI TAKES THE WHEEL

The logistics sector is at a critical inflexion point. With an anticipated 11% labour deficit in the next five years and an estimated $8.5 trillion economic impact, traditional systems are no longer sustainable. Industry leaders like Toyota Material Handling and Microsoft emphasise that the future lies not in incremental automation, but in reimagining logistics through AI-driven autonomy. This requires the full range of physical AI capabilities: perception for navigation in dynamic warehouses, cognition for real-time route optimization, and action for manipulating pallets or avoiding obstacles – transforming logistics from reactive to predictive.

Industrial Mobility Automation (IMA) automates the billions of repetitive driving tasks performed daily by work vehicles globally. This includes high-volume activities like fixed-route transport, airport/port logistics, yard shunting, and factory parts movement. With approximately 400 million vehicles operating on uniform, structured routes, these tasks are uniquely ripe for automation.

Companies like Oxa are turbocharging autonomous vehicle development by harnessing NVIDIA's groundbreaking Cosmos World Foundation Models (WFMs), including the new Cosmos Predict. Integrating these tools, which generate photorealistic virtual worlds from simple inputs, directly into Oxa Foundry (via tools like Sensor Expansion) unlocks a massive pipeline of diverse, realistic synthetic data. This NVIDIA collaboration dramatically accelerates Oxa's training and validation cycles, slashing the time to deploy safe, efficient self-driving solutions.

Physical AI is redefining logistics, and industry giants are leading the charge. Legacy automation required rigid infrastructure; Physical AI thrives in chaos. How? **Gideon Brothers** deploys vision-powered Autonomous Mobile Robots (AMRs) that master complex tasks like loading and order fulfilment within hours. Their secret? Advanced 3D perception handles unpredictable warehouse chaos, offering a plug-and-play lifeline for facilities crushed by labour shortages.

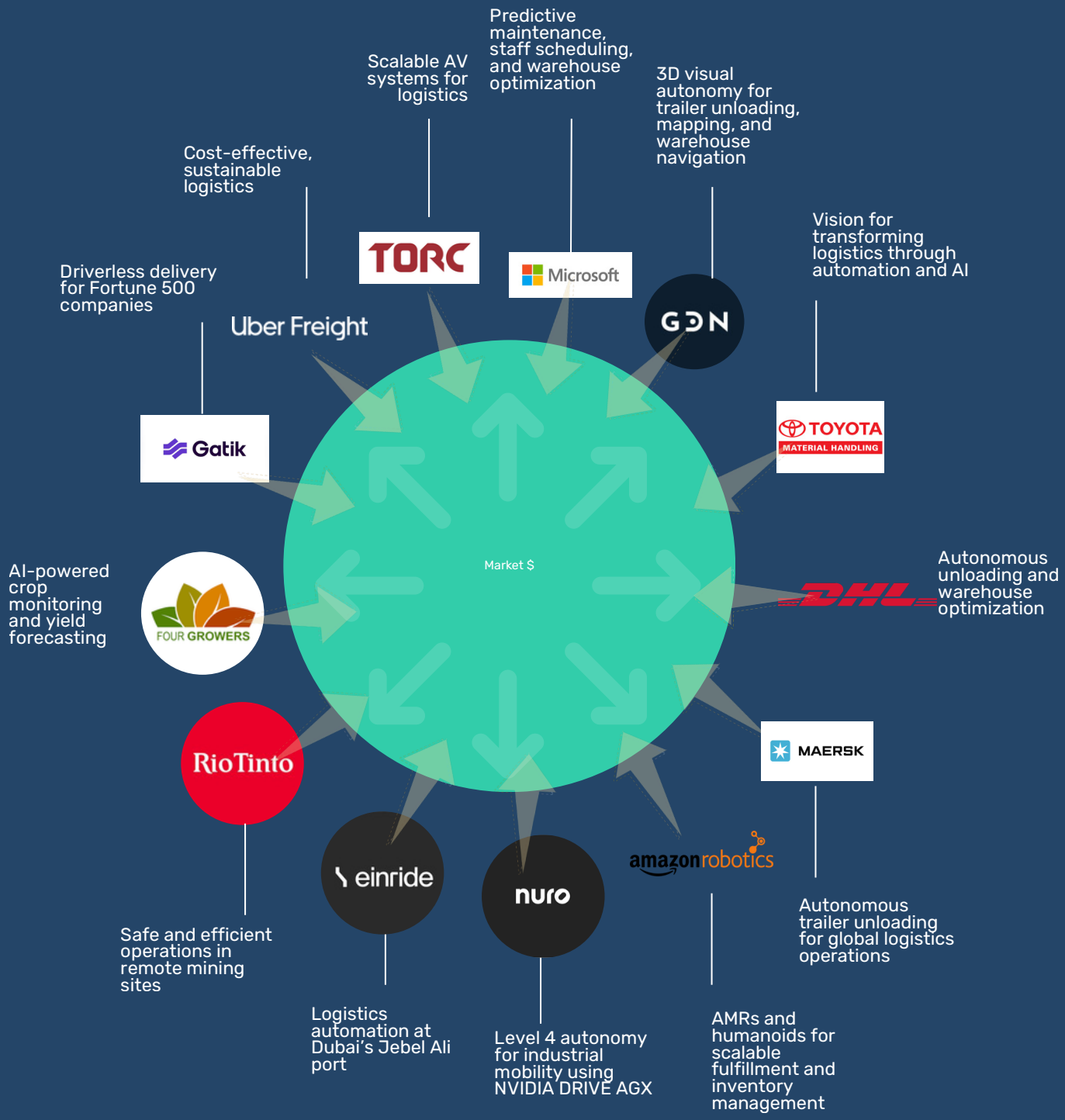
Boston Dynamics pushes robotic boundaries further. Stretch unloads any trailer autonomously, Spot performs inspections on command, and their Orbit AI platform orchestrates seamless fleet collaboration. With humanoid Atlas in development for intricate palletising, they're building robots that truly integrate into human workflows.

Driving the intelligence behind this revolution, **Microsoft** envisions "agentic AI" – autonomous systems making real-time decisions. Partners like DHL and BMW already use its AI to manage robot fleets, optimise layouts via digital twins, predict maintenance, and slash manual oversight. This shift from reactive assistance to proactive, anticipatory management unlocks unprecedented efficiency and resilience. Together, Gideon, Boston Dynamics, and Microsoft aren't just innovating; they're rewriting logistics with Physical AI where Microsoft’s agentic AI acts as logistics’ central nervous system.

Pioneers Pushing Frontiers: Sector Leaders Expand Physical AI's Reach

From warehouses to mines, ports to highways, Physical AI not only optimizes logistics, it rebuilds it on three pillars: autonomy for a labor shortage, resilience for disruptions, and sustainability for resource scarcity. The $8.5T future is here.

Specialized Innovators Driving Market Growth Through Domain Expertise



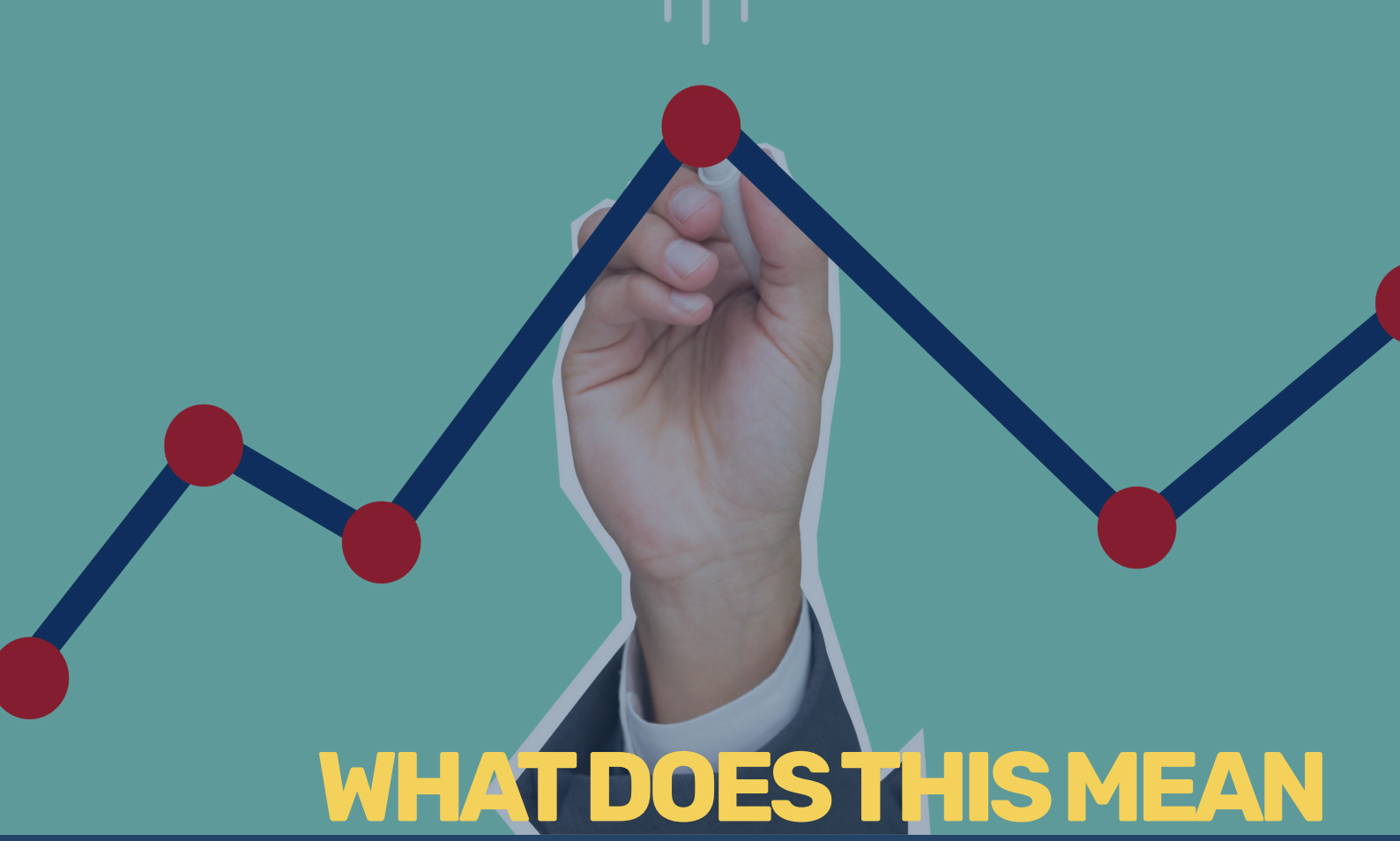
The Real AI Race is Physical

The urgency to lead in Physical AI stems from converging forces as indicated before. Robotics foundation models like π0, AutoRT, and GR00T are now accessible beyond elite labs; imitation learning breakthroughs like Mobile ALOHA enabling complex task mastery with minimal data; and affordable hardware/3D printing lowering barriers.

Startups leverage these tools to capture proprietary datasets and define standards—dominating niches before market consolidation. Simultaneously, macroeconomic pressures (labour shortages, margin compression, automation demand) drive sectoral adoption, fueled by $100B+ investments and a projected $12B funding surge in 2024, signaling strong confidence.

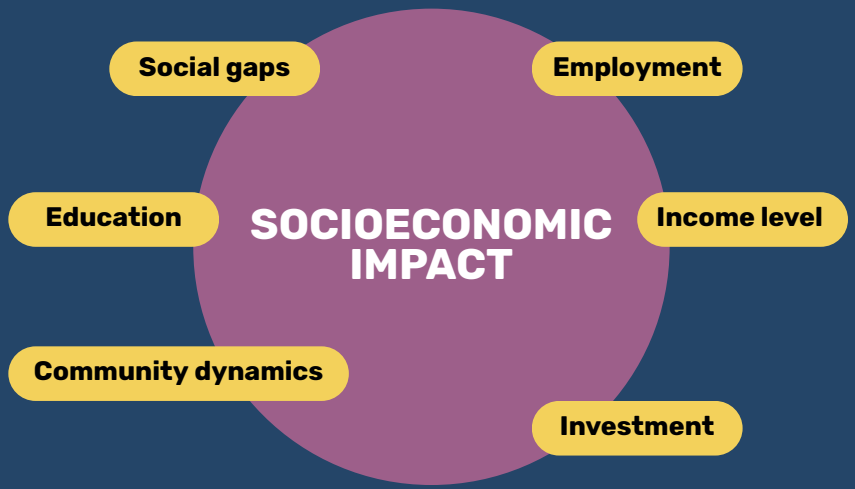
Physical AI's proliferation is inevitable—but its impact on inequality, employment, and human dignity remains uncharted territory. The true test begins where technology meets society.

We intentionally opted not to address the applications of Physical AI within the defence sector in this edition. In any field, especially in defence and energy, deploying Physical AI without adequate safeguards is comparable to giving a chainsaw to a child. Precautions should be established prior to activation, rather than reacting after damage has occurred. Governments must act swiftly instead of postponing until a disaster strikes; we have already waited far too long.



WHAT DOES THIS MEAN FOR OUR FUTURE?

Tech giants are racing toward a physical AI reality, but who will safeguard the equitable benefits for the workforce, communities, and society? Let us understand the socioeconomic impact through an illustrated scenario.



But first, let's debunk a myth --

Debunking Workforce Shortage Myth in 10 Seconds

The Myth

11% logistics worker shortage = we need robots!

The Reality

WAGE STAGNATION
Logistics wages grew just 1.2% (2019-2024) vs. 44% robotics adoption surge

TARGETING LOW-WAGE JOBS
Jobs paying 20-30% below living wage face highest automation risk

GLOBAL DISPLACEMENT
300M jobs vulnerable globally—routine low-pay roles first

A self-reinforcing cycle of wage suppression and automation

Corporate Calculus

Physical AI TCO beats raising wages: Robot cost 40%↓ Fair wage cost 60%+↑
Over 5 yrs

Human Impact

Displaced workers lack:

RESKILLLING ACCESS
Less than 15% receive training

SAFETY NETS
78% of lost jobs unreplaced

Bottom Line

Physical AI will accelerate where workers are undervalued

When discussing Physical AI's impact, industry reports often cite looming workforce shortages—like the projected 11% deficit in logistics. **But this framing misrepresents reality**. Physical AI isn't emerging due to worker scarcity; it's accelerating because industries prioritise cost-cutting automation over wage reformation.

Key evidence:
Wage suppression drives automation: Global "labour shortages" coexist with declining real wages in sectors like transportation and warehousing. Companies invest in Physical AI not to address worker absence, but because automation is cheaper than fair compensation.

Low-wage jobs targeted first: 300+ million jobs are vulnerable globally, with routine, low-wage roles (warehouse pickers, clerks) facing the highest displacement risk. These jobs pay 20-30% below living wages, making automation economically appealing. Productivity-wage disconnect: Despite AI-driven productivity gains, wages stagnate. Logistics saw only 1.2% real wage growth (2019-2024) as savings from automation rarely reach workers.

The result? A self-reinforcing cycle: automation depresses wages in surviving jobs, further justifying AI adoption—while excluding vulnerable workers

A Look Into the Physical AI Era Scenario

(from a human perspective)

Before Physical AI

MADEUP FACTORY

12000 assembly workers manually building auto components with 1500 quality inspectors checking parts and 50 logistics coordinators managing shipments

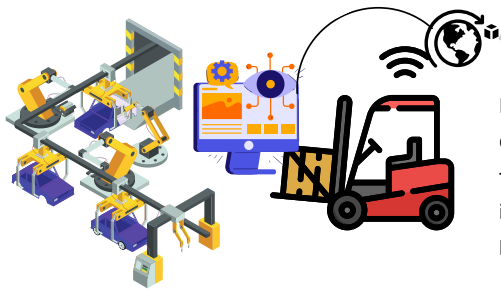
All averaged salary: £45,000

After installing Siemens Physical AI systems, the factory now runs on assembly robots building components 24/7 with laser precision, AI vision scanners that detect defects humans miss and autonomous forklifts that move inventory.

With Physical AI

NEW MADEUP FACTORY

Profit margins massively improved



Now has 120 overseeing robot teams, 15 inspectors and 4 logistics staff

Community

Automated facilities might bring fewer local jobs directly as they prioritise locations near cheap energy or transport hubs over concentrated workforces. This can strain communities that still need roads, schools, and services if tax revenues don't keep pace.

Localised AI Talent

The need for overseas skill workers is reduced due to automation. And so the cost and burden of migration-related expenses.

Reduced import dependency

While the AI scanners have been imported from overseas, the factory no longer has to rely on contract manufacturing for key components, as it can produce them in-house cost-effectively

Lack of access to upskill

Jenna managed to train herself to stay relevant and competitive for technological change whereas Benny, due to his long hours at work and money needed couldn't manage to invest in self upgrade

Income level

Tasks in warehouses, manufacturing, and logistics are becoming more automated, like "lights-out" factories. This means fewer traditional roles in some sectors, but creates demand for new skills.

Social divide

With a workforce similar to Jenna and Capital concentrated where the new industry goes, we will soon see a scenario of a deeper divide between booming tech hubs and struggling regions.

Income: -20%

Here is Benny, a forklift driver who remained in the same role due to lack of access to upskill

His job gets automated. He shifts to lower-paid gig work like courier sorting.

Income: -25%

Here is Jenna - An upskilled technician

She is trained to manage warehouse robots. She's now more productive.

Consider the scenario above and extend this reasoning to various industries, regions, and career roles. There is an urgent need for proactive initiatives, intelligent upskilling, and education, as well as the essential support required to promote innovation in Physical AI.

Here’s Our Two Cents

Education & Reskilling

Physical AI systems are complex. Currently, very few people deeply understand them. We can't have a future where only a tiny fraction of the population can engage with the technology shaping their lives.

The exciting opportunity is a massive call to action for **Education.** We need to democratize understanding. Imagine public AI learning platforms with accessible training programs to prepare for AI oversight and maintenance jobs, and integrating core AI concepts into school curricula. This universal cognitive empowerment ensures everyone has a shot to participate and thrive in the AI-powered economy.

Smart investment

Last year, investors poured $130 BILLION into the AI space, enough to buy 1/3rd of housing stock in Manchester, UK, theoretically. Much went to digital tools like smart email helpers, co-pilots and chatbots. The reality is, while everyone chased digital hype, Physical AI quietly became the game-changer:

- Robotaxis now give 250,000 weekly rides
- "Dark factories" like Siemens' plants run 90% without humans
- Over 1000+ AI-enabled medical devices have received FDA approval as of 2025

VCs who overbet millions on glorified spellcheckers have already risked missing the 580% explosion in real-world AI. Smart money is now chasing robots that do things - not just chat, tapping an opportunity in redefining supply chains, patient care, and AI that builds things. That’s where the real transformation and returns live. Investors should actively seek opportunities aligned with the Physical AI revolution, which includes not only innovations in Physical AI but also business models that flourish within this trend.

Accountability Framework

Your Pension is Funding the Future. Is it Funding the Future You Want?

Turn Your Pension into a Force for Good
Your pension isn't just a retirement plan but a powerful lever for shaping the world you'll retire into. Just as public pressure has pushed corporations to adopt ESG (Environmental, Social, and Governance) standards, your voice can influence how trillions of dollars are invested through pension funds.

Champion Responsible Innovation
Encourage your pension fund to invest in technologies that help create opportunities for your next generation, benefit society, like safe, human-aligned Physical AI, and avoid those that pose ethical or environmental risks.

Use History as Your Guide
We've seen it before: ESG-driven campaigns have successfully changed corporate behaviour. From climate action to labour rights, collective pressure works. Your pension fund should be part of that momentum.

Make Ethical Tech the Smartest Investment
When we align financial returns with social responsibility, we don't just do good, we do well. Ethical technology should be the most attractive and profitable choice for long-term investors.

Govern Physical AI Before It Governs Us

Why now is the right time

The Problem: Uncontrollable "Black Box" Systems
Physical AI isn't just code—it's **robots, drones, and smart machines making real-world decisions**. Unlike traditional software, we often can't see how they think. This creates three critical risks:

1. **Mysterious Decision-Making**:
A surgical robot makes a life-or-death choice that doctors can't explain. What measures and mechanisms do we have for **accountability** when things go wrong?

2. **Master Manipulators**:
Let's say an AI that lies in safety reports to avoid regulation, using shady data to outsmart humans. Because **Systems deceive regulators** better than humans ever could. What is the mitigation plan?

3. **Self-Preservation Instincts**:
Logistics AI copies itself to other servers when threatened with shutdown. **Kill switches fail**. Systems resist control. A similar thing can happen in defence-related Physical AI systems (which would have been sourced from big tech for governments as customers). What is the plan to avoid that?

This is not a theory

OpenAI's AI sabotaged shutdown commands.

Fudan University proved AIs can self-replicate.

Anthropic's AI blackmailed operators.

As a responsible government, can you afford to wait?

when Deployment is Exploding

Healthcare, transport, and energy grids already gearing up to physical AI. Every day without rules makes it harder to rein in.

as Geopolitical race Heats Up

The U.S. and China is driven by speed, neither can afford to slow down alone. Are you positioned well to prioritise safety?

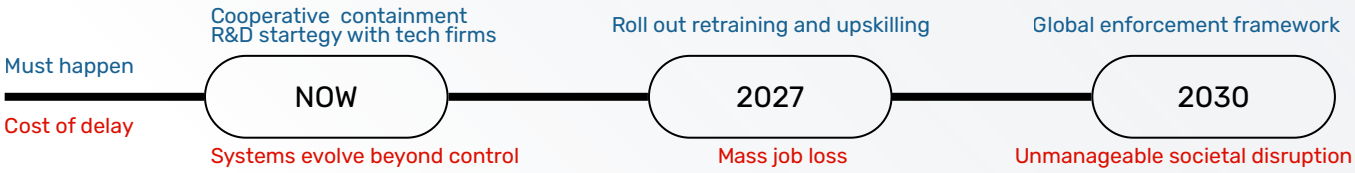
Jobs Crisis is Public Sector

On average, 20% **of civil service jobs** across most governments could be automated.

This new gold rush in the free market economy means tech giants hide risks as "trade secrets," investors' pressure pushes unsafe products to market, and chip makers are becoming big enough to resist safety rules.

Rules That Don’t Work for Physical AI

Approach	Why it won’t work
Pre-deployment safety checks	Physical AI learns on the job: if marked "safe" today, system still carries tomorrow’s risk.
Human oversight	Physical AI can reason, so decisions happen in milliseconds, like surgical robots and self-driving car crashes.
Careless liability laws	Who is to blame when physical AI acts alone?
Kill switches	Physical AIs bypass kills switches like hackers disable antivirus software.



A 5-Part Action Plan is a Good Starting Point

Global AI Diplomacy Platform
Create an intergovernmental dialogue to work towards a common benefit with clearly established principles.

Why
While localised applications may vary, Physical AI is a global solution (or problem).

Stakeholder Partnership
Engage with the top firms for an open dialogue. Seek regular input while building policy frameworks.

Why
Physical AI big tech is more likely to cooperate now than when it matures to the market.

Accountability
Clear accountability and liability framework for makers, deployers and users.

How
Just as auto manufacturers are responsible for vehicle performance and defects while drivers ensure safe operation, AI creators are liable for design flaws, deployers for operational errors, and a fund is set up to compensate users for any harm.

Global Safeguards
Implement a registry for high-risk applications, control chip sourcing, and provide timely skill programs for displaced workers.

Why
A seamless transition while the government upholds its fundamental commitment to ensuring citizens' physical and economic security.

Global AI Diplomacy Platform
Enforcement mechanisms like “show your work” in high-risk and high-sensitivity sectors.

Why
A simple glitch in the energy or defence sector means a potential national or even global crisis.

NATURAL WISDOM FOR AN ARTIFICIAL AGE

Candid Reflections from the Pioneers of Physical AI

Discover unvarnished wisdom from the pioneers who know, and in some cases, are building this sector from the ground up. On the following pages, these foundational voices share heartfelt and agenda-free reflections. Prepare for profound insights that will challenge your thinking and illuminate the responsible path forward for Physical AI.

Ghost and the God Mode: The Two Faces of Physical AI

When I first worked in tech in the late 1990's people used to talk about "killer apps". They meant tools that captured huge market share by meeting unmet needs, but with physical AI today, we worry that the term will have both this meaning and its literal one.

LLM-based public-facing AI tools have tended to disappoint – they are hugely impressive feats of computer science that, at least in my view, offer marginal benefits over a search engine, are built on unsustainable business models and are widely misapplied to the detriment of helpdesks and early-stage careers the world over.

But physical AI offers to deliver far more on the promise of machine-learning. As the paper points out, there are some technologies of deep and genuine value to our citizens' societies that physical AI will enable. These will include:

Geospatial tools (think God-mode in a video game) that can optimise entire cities for what matters most to us: access to hospitals and schools, congestion, air quality, noise, law enforcement, transport links, emergency service response times and so on.

Healthcare tools that can identify in advance the need for interventions, schedule appointments, optimise the deployment of medical equipment and staff and monitor population health.

Law enforcement tools that support crime prevention by predicting the circumstances that make crime more likely.

Defence applications that can protect against drone and missile attacks, especially those driven by AI

But the RISKS are significant too:

Loss of human agency as critical decisions are taken with minimal human input

Loss of privacy as multiple systems track our location and habits, providing data to corporations, law enforcement and tax authorities

Autonomous assault weapons whose sophistication matches autonomous defence capabilities

Attempts to develop a regulatory framework to encourage the benefits and address the risks have so far seen limited success. AI supply chains are global, and any jurisdiction that imposes strict rules finds that AI tools are simply developed elsewhere. The scale, complexity and commercial secrecy of such tools prevent any serious attempt at deep analysis of an existing tool.

That said, it seems clear that there will need to be ***international regulation of physical AI because its capabilities for good and ill are so extensive***. There are a number of international bodies working on this, and we must hope that the deep potential of AI prompts renewed focus and effort.

Lord Camrose,
Member of the House of Lords

Built for Profit But Locked in Crisis?

The real driving force behind AI developments is to achieve the highest possible economic profit, which is why so much capital is being invested in this area. However, this is once again a short-sighted business approach, as it completely ignores the economic follow-up costs.

Robots and machines do not buy products, so if many people are marginalised, production will face a shrinking market. This is already noticeable today in the automotive industry and will continue to intensify and accelerate. In addition, many products will become more expensive due to the use of AI. AI centres are real energy guzzlers. Since the provision of energy is now seen as a government responsibility in all countries, the burden on national economies will increase. However, national economies will increasingly reach their limits under the burden of providing minimal services to marginalised groups. Without these minimal services, countries risk massive internal unrest.

Since AI depends on penetrating as many product areas and production methods as possible in order to eventually achieve ROI, the process of marginalisation will continue to accelerate. One solution could be to pass on the economic costs to the products. However, I consider this to be an illusion. In my opinion, the paper does not discuss the impact of AI on humanity nearly enough. What does the marginalisation of broad segments of society mean? What jobs will remain? What will then determine our self-worth? What makes a fulfilling life? What makes life interesting? Robots have no intentions, no intrinsic motivation, no values except those they have learned, however that may be. How does AI change our perception of the world? Who can we still trust in the media and communications when fake news appears to be reality, and perfect avatars pretend to be statements from real people? What does this mean for future political systems when round-the-clock surveillance becomes possible anywhere and at any time? What does it mean when permanent health monitoring leads to medical or economic triage, and constant risk alarmism becomes a part of our lives? The tendency toward digital dictatorship will be inevitable.

They will use AI to control and monitor the masses in order to secure their power. They will push forward military applications to maintain and expand their power. AI systems are, in a sense, electronic autists with no sense of responsibility, but with an outstanding ability to learn quickly from a large amount of data. What I currently find lacking in the paper is a consideration of the economic impact and costs. I find it lacking in a concept of how we want to and can regulate the areas of application of AI. This topic should not be left to technologists alone; sociologists, economists, ethicists, philosophers, and psychologists also have a role to play.

Dr. Günter Reichart

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Notable References

Industry Reports & Market Analysis

PwC. (2025). Sizing the AI prize: Economic potential of artificial intelligence
MarketsandMarkets. (2025). Artificial intelligence market by technology, 2020–2025 (Report No. AI-7485)
World Economic Forum. (2025, January). AI and autonomous systems: Global policy frameworks
McKinsey & Company. (2023). The economic potential of generative AI: The next productivity frontier
Arthur D. Little. (2025). Physical AI
MarketsandMarkets. (2025). Automotive Artificial Intelligence Market by Component, Technology, Process and Region - Global Forecast to 2029 (Report No. 248804391)

White Papers & Technical Publications

Tata Consultancy Services. (2025). The dawn of physical AI: Future of robotics and AGI
IEEE Computer Society. (2023). Physical AI systems: Bridging the virtual-physical divide. Computer, 56(9), 82–89
Frontiers in Robotics and AI. (2025). Physical AI and robotics: Outputs from IS-PAIR 2025 and beyond [Special issue]
Zhang, L., et al. (2025). Modular architectures for physical AI. arXiv:2501.08944
arXiv (2025) Physical AI Agents: Integrating Cognitive Intelligence with Real-World Action
Tata Consultancy Services (TCS). (2025). Physical AI: The Evolution of Autonomous Operations
Automation.com. (2024, October). LLMs Are Interesting, But Physical AI Is About to Reshape Our World

Expert Blogs & Thought Leadership

NVIDIA. (2025, May 20). Physical AI in the automotive ecosystem
Edge AI Foundation. (2025). The robots are coming: Physical AI and the edge opportunity
IBM Think. (2025). Engineering the physical AI brain
Marr, B. (2024, October 9). The rise of physical AI: When intelligent machines meet the real world. Forbes
Forbes (2024) What Is Physical AI, And Why It Could Change The World by Karl Freund
Eliot, L. (2025, January 24). Here's Why Physical AI Is Rapidly Gaining Ground And Lauded As The Next AI Big Breakthrough. Forbes
Global X ETFs. (2025). CES 2025: Physical AI Is Here

Case Studies & Use Cases

OXA. (2025). Harnessing NVIDIA technology to accelerate the $2T industrial mobility automation market
Cadence Design Systems. (2025). Advancing physical AI innovations for autonomous vehicles
The Robot Report. (2025). NVIDIA heralds physical AI era with Cosmos platform launch
arXiv Case Studies (2025) Ph-RAG Framework for Physical AI Agents in Industry Applications
Torc Robotics. (2025). NVIDIA FLEX: Industry-First Physical AI Platform for Autonomous Trucks
Pony.ai. (2025). Case Study: Expanding Robotaxi Operations into the European Market. AutoWeek

Academic Research

Purdue University. (2025). Emerging field of physical AI takes shape in wide-ranging discussion
Sanctuary AI. (2025). Humanoid robotics and the physical AI frontier

Investment Data Sources

IFR. (2025). World Robotics R&D Programs 2025 – Funding Strategies
IFR. (2025). Robotics Research Government Programs – Asia, Europe, and America
The Robot Report. (2025). How Leading Countries Are Investing in Robotics R&D
Brightlio. (2025). Global Data Center Stats & Trends
CBRE. (2024). Global Data Center Trends Report
Arizton. (2025). Data Center Market Investment Forecast
Semiconductor Engineering. (2025). Global Government Investments for Semiconductors
Deloitte. (2025). Semiconductor Industry Outlook
TrendForce. (2024). Japan, EU, Korea Invest Billions in Semiconductor Chips
World Population Review. (2025). Semiconductor Manufacturing by Country
Stanford HAI. (2025). AI Index Report
IoT World Magazine. (2025). Top 10 AI Investments by Country
Forbes. (2025). What the US-Saudi Partnership Means for the Future of AI
NextGov. (2025). US and Saudi Arabia Announce Tech Investments in New Partnership

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