THE FUTURE OF ARTIFICIAL INTELLIGENCE: PHYSICAL AI AND HUMANOID ROBOTICS ARE THE NEXT INDUSTRIAL FRONTIER

WHEN NVIDIA CEO JENSEN HUANG SAYS HUMANOID robots may arrive "this year," it signals a shift that's impossible to ignore: the future of work is no longer on the horizon - it's at the door. Investors searching for the next industrial revolution may find their answer in humanoid robotics. The sector is set to grow from $2–3bn today to $40bn by 2035, with upside scenarios reaching as high as $200b. The question is no longer whether humanoids will matter, but who will capture the lion's share of the value chain. And Europe could emerge as a serious contender, with decades of car making expertise offering a competitive edge in the kind of hardware complexity humanoids demand.

Agility Robotics' humanoid robots have already been deployed at Amazon, GXO, Mercado Libre and Schaeffler. At BMW's Spartanburg plant in South Carolina, Figure's robots are now on the line, loading sheet metal parts and helping to roll out 30,000 vehicles. No longer confined to research labs, these machines have stepped — quite literally — into real industrial environments. Their presence forces fresh questions about the future of work: which tasks humans will retain, which they'll willingly hand off, and how productivity evolves when labour itself becomes scalable.

Three structural shifts will drive multi decade demand. First, populations are ageing: the share of those over 65 will rise from 10% to 16% by 2050, while working age populations stagnate, according to the United Nations. Second, urbanisation is accelerating, with nearly 70% of the world expected to live in cities by mid century, leaving rural sectors short staffed. Third, workers are increasingly reluctant to take on physically demanding or monotonous roles. Together, these forces widen labour gaps in manufacturing, logistics, agriculture and healthcare — sectors where human like dexterity has made automation difficult.

Humanoid robots, purpose built for environments designed by and for people, offer a potential structural solution. Their advantage lies in near continuous operation: even at half human efficiency, a humanoid can deliver 25% more daily output; at parity, that rises to 150%, according to our analysis. For investors, that's a compelling productivity thesis.

The market is already responding. Venture capital funding for robotics reached $8.8bn in Q2 2025, a 15 fold increase since 2017, according to PitchBook. Figure AI's valuation surged from $2.6bn to $39bn in just seven months. And twenty one new humanoid models have been unveiled in 2025 — compared with none in 2021. The acceleration isn't only technological; it's commercial. Collectively, these signals point toward a future where physical AI reshapes productivity, supply chains and labour markets more fundamentally than any software only leap before it.

While headlines often focus on algorithms and large language models, the real story in humanoid robotics is unfolding in the physical world. AI's first act belonged to the software titans — hyperscalers and chipmakers laying the digital foundations. Now, a new act is beginning: physical AI, where cognitive intelligence is fused with mechanical muscle.

Hardware, precision engineering and advanced

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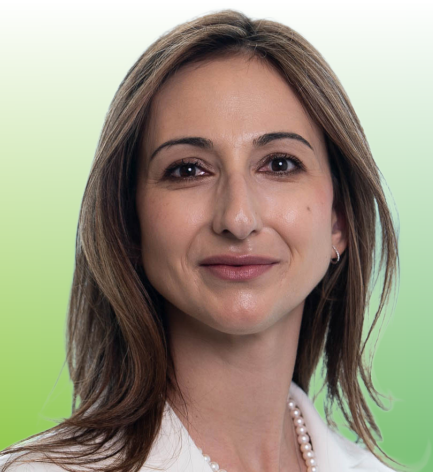

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manufacturing take centre stage. And in a digital century, it's striking that the old school components — actuators, bearings, gears — matter as much as they did in the mechanical one.

The "three Bs", brains, brawn and batteries, drive humanoid costs. Brains deliver compute; batteries keep the lights on; brawn is the hardware stack of actuators, motors, sensors and gears that move the limbs. Brawn alone accounts for roughly half the build. Teaching a robot to walk isn't just coding, it's converting neural signals into physical motion. Breakthroughs across the three Bs have helped drive a dramatic collapse in costs, from roughly $3 million per unit a decade ago to about $100,000 today. China currently leads in production and deployment, but that advantage is not guaranteed.

Scaling physical AI and humanoid production creates a powerful tailwind for industrials: actuator manufacturers, component suppliers, automation specialists, companies barely mentioned in AI's first software driven wave. But hardware introduces new pressures. Motors require magnets, and magnets depend on rare earths — critical minerals concentrated in a handful of regions. Building humanoids at scale is as much a materials and engineering challenge as it is an AI one.

For investors, this means the age of physical AI represents a supply chain opportunity as much as a technological one. Europe may have missed the hyperscale moment of AI's first act, but its industrial DNA positions it strongly for the sequel. Partnerships are gathering pace: humanoid developer Figure is working with BMW, while Neura is partnering with Schaeffler, early signs of a broader industrial realignment.

Ultimately, Silicon Valley may write the code, but physics moves the limbs. In this new era, torque matters as much as token. The real prize sits in engineering excellence, resilient supply chains and the companies positioned to build the next generation of growth engines.

Cars rewired the 20th century by putting mobility on wheels. Humanoids won't transform the world overnight — but in time, they could reshape the 21st by putting labour on legs. And when that curtain finally rises, don't be surprised if the future of work has a humanoid face.

ABOUT FII INSTITUTE

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