Humanoid robots and Tesla Optimus 2025

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At the end of 2024 we published our first analysis of the humanoid robot market dynamics: https://causalitylink.com/resources_/humanoid-robots/ .

Given that Elon Musk just published his Master Plan Part 4 and indicated on X that up to 80% of the value of Tesla would one day rest on his Optimus robot, https://www.cnbc.com/2025/09/02/musk-tesla-value-optimus-robot.html , it seems appropriate to update our 8-month old perspective.

Let us start with a reproduction of our forecast of December 16, 2024:

“There is no doubt that the humanoid robot market will reach tens of billions of dollars in ten years. And there is no doubt that Elon Musk has contributed to putting the topic at the top of many governments and companies’ agendas in the manufacturing and defense industries.

However, the development speed advantage that has benefited Tesla in its early years, and still benefits it against its Western competitors, does not apply in China, which incorporates innovations and improves on them faster than Tesla itself.

This has been demonstrated against Tesla by BYD in electric vehicles, against Tesla by CATL in energy storage, against Alcatel by Huawei in telecommunications, against Apple by Xiaomi in phones, against Amazon by Alibaba in e-commerce and many more.

It is therefore doubtful that Tesla will be able to achieve and maintain during the coming decades a significant market share in a domain where Chinese competitors are already entrenched, where they are applying larger amounts of collaborative engineering efforts and where they benefit from a much larger manufacturing market. It would take a successful national humanoid robot program in the US to counter the Chinese effort, and

to give Tesla a chance to compete and win in this promising market to justify its current lofty valuation."

Let us see now how this forecast has gone against the last 8 months of activity.

Market estimations

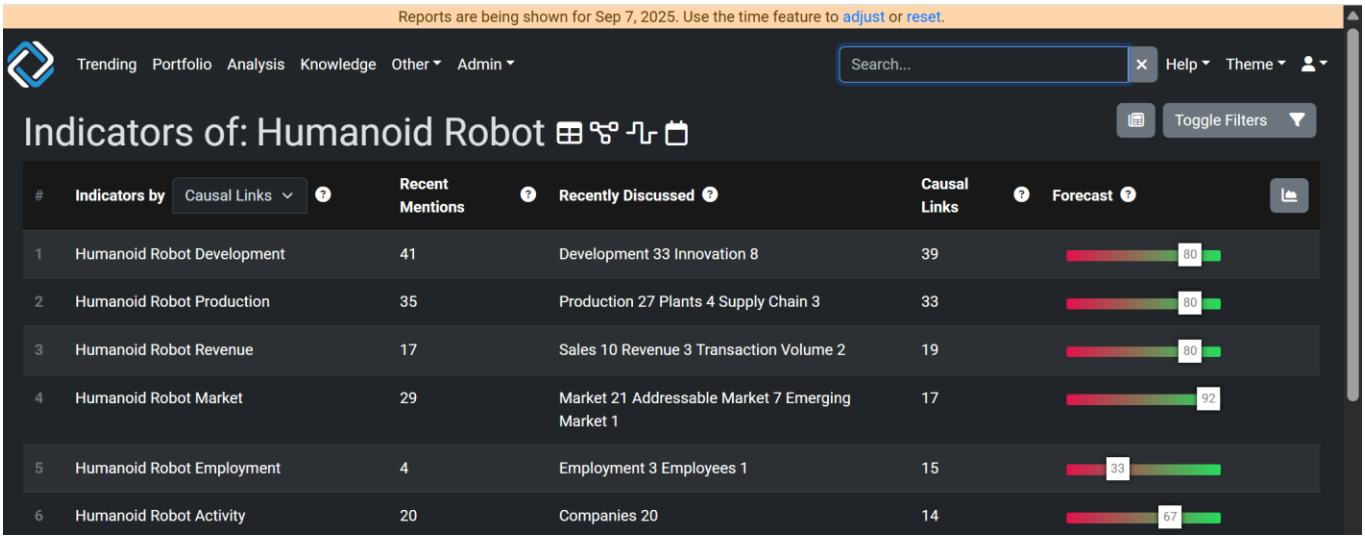
Estimations for the humanoid robot market have gone up in the past 6 months. While Goldman Sachs sticks to its $38B forecast for 2035, Research Nester pegs it at $81B, Future Market Insights at $181B, and Research and Markets at $243B. Morgan Stanley even estimates this market will reach $5T in 2050: https://www.morganstanley.com/insights/articles/humanoid-robot-market-5-trillion-by-2050

While all these estimations are using unproven assumptions, it is remarkable that so many publishers predict such an astounding CAGR until 2050 for that technology. The hype is not slowing down, and for those who believe in this opportunity, there is a growing list of recent (2025) ETFs which enable us to place an easy bet on it: HUMN, KOID, as well as more established ones which are broader in scope such as BOTZ or ROBO.

Despite this increased hype, the relative mindshare of Tesla Optimus is declining in 2025. While we observed 8 months ago that "In our corpus, the number of articles mentioning humanoid robots has doubled from 2023 to 2024, while Elon Musk has been able to capture most of the journalists' narrative on the topic by tripling (from 10% to 30%) the percentage of articles mentioning Optimus when they mentioned humanoid robots.", this trend has reversed. In the same corpus, the number of articles mentioning humanoid robots has doubled again on the first 8 months of 2025 vs 2024, but the number of articles mentioning Optimus when they mention humanoid robots has stayed constant, meaning its mindshare has been divided by two.

Causality Link analysis

A Causality Link report on the main indicators of that industry is displayed below.



The most explained Key Performance Indicators are “Development”, “Production”, “Revenue” and “Market”, which are all very positive (80% or more of belief in future growth). Unsurprisingly, there is a negative on “Employment” in the context of humanoid robots, while “Activity” is growing with the number of companies jumping in.

As in many nascent industries, the concept of “Profit” is much less mentioned, but the second position of “Production” and third position for “Revenue” indicate that this industry has passed the research phase and is becoming real.

General robot usage

The general usage of robots (humanoid or not) in manufacturing differs widely by country according to the International Federation for Robotics: https://ifr.org/ifr-press-releases/news/global-robot-density-in-factories-doubled-in-seven-years .

The graph showing the number of robots per 10,000 manufacturing jobs in 2023 has South Korea leading with over 1,000 robots, followed by Singapore at 770 and China, at 470. Germany and Japan are number 4 and number 5, while the US is tenth, at 295 and France 19th, at 186.

This shows that industries in some countries are more eager to automate than in other countries and this ranking could be a good proxy for the future rate of adoption of humanoid robots, giving South Korea and China a significant advantage over the western world.

Chinese competition update

The Chinese competitive situation stems from the 2023 government decision to make humanoid robots a national priority, and the strength of the local manufacturing sector.

In August 2025, Beijing hosted both the World Robot Conference and the World Humanoid Robot Games, with the dual goal of showcasing the rapid progress of the Chinese companies and boosting public interest for this technology. Both conferences have produced many videos to that purpose.

The most prominent Chinese company for humanoid robots, Unitree, is planning an IPO for the end of the year, selling both quadruped robots and humanoid robots. It just introduced Unitree R1, a research humanoid robot for the low price of $6,000: https://www.unitree.com/R1 , complementing the G1, priced at $21,600. In both cases, these commercial robots have today better agility than intelligence and are not yet fully integrated with an AI back end to make them fully useable out of the box in a manufacturing setting.

However, Unitree follows the standard Chinese EV protocol of introducing cheaper functioning hardware first and then adding intelligence later as in their EV ADAS systems. This guarantees higher levels of distribution and lower prices than Optimus which should become available in 2026, at least a full year behind Unitree robots. Moreover, Unitree is partnering with Chinese manufacturing companies such as Great Wall Motor and will benefit from an early real-life test of their robots in multiple vehicle manufacturing contexts.

They are not alone, as the management of UBTech Robotics declared in September 2025 that they had over 100 robots deployed in several manufacturing plants, “achieving 30 to 40% level of human efficiency”.

And another humanoid robot start-up, X Square Robot, just announced a $100M investment from Alibaba on September 8, 2025…

This Chinese performance in humanoid robots is better understood in the context of the complete academic and industrial ecosystem that is frantically developed in China on the topic: from individual components such as rare earth magnets powering the robots' motions to joint actuators and sensors, to open-source software managing these robots and University research on new AI architectures, Chinese entities are covering the whole supply chain required to build cheap efficient robots.

By contrast, Tesla had to slow down Optimus production when the tariff war between the US and China led to a suspension of the exports of rare earth magnets from China to the US: https://evxl.co/2025/04/23/china-magnet-ban-threatens-tesla-optimus-production.

Conclusion

We maintain our forecast of the end of 2024 unchanged. The evolution of the market and the competition in humanoid robots is unfolding according to our predictions, and the speed and performance of this competition makes it highly unlikely that Tesla will ever reach its lofty goals of Optimus sales, supposed to justify its future valuation.

However, it is highly likely in the coming years that the impact of this humanoid robot technology on reducing employment and increasing efficiency will be massive in manufacturing, in the services industry and even in agriculture. The Chinese government was right to declare it a national priority in 2023.