

[HERO IMAGE 2] Spotlit humanoid reaching for boxes; tired engineer with laptop & mop in shadow at right. Full-bleed cover.

Of Flesh, Steel, and Wishful Thinking

A field guide to the age of robots — the fact, the fiction, and the small matter of who fixes them.

An essay in two voices — the wonder and the raised eyebrow · Published in the **Agence.io Journal** ·
justinjames.agencie.io

The receipt, not the pirouette

Money is pouring into humanoid robots; finished machines are not yet pouring out. Roughly **\$6.5 billion** flowed into thirteen humanoid startups between mid-2025 and mid-2026 — yet the entire world shipped only about **13,318** humanoids in 2025, two Chinese firms accounting for the overwhelming bulk while the celebrated Western names shipped on the order of **150 units** apiece. This essay separates the fact from the fiction: it credits the genuine wonder of pouring code into steel, then weighs it against the unglamorous realities that decide whether a robot survives an ordinary Tuesday afternoon — worn gearboxes, short batteries, thin service networks, safety, trust, and the sharper moral questions that arrive when the same machines are sent to a border. The through-line: robots already succeed brilliantly wherever the world is **structured** or a **human stays in the loop**, and struggle the instant either condition fails. The most consequential fact about the modern robot may be its price tag, not its dexterity.

~\$6.5B

Into 13 humanoid startups (mid-25 → mid-26; upper-bound est.)

13,318

Humanoids shipped worldwide in 2025 (Omdia)

\$5,900

Unitree R1 — vs \$20K–\$40K+ rivals

4.66M

Industrial robots already in operation

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All figures verified July 2026. Where a widely-shared number proved cumulative, estimated, or dated, it is flagged as such in the text.

[HERO IMAGE 1 — full width]

Two worlds: a calm robotic arm inside a bright factory on the left; a war-torn plain with a military UGV and drone on the right, divided by a concrete wall.

Two worlds, one technology — the caged factory arm and the machine sent to the frontier.

There is a particular species of photograph that has come to define our decade. In it, a humanoid robot stands in a spotlight warehouse, its posture uncannily poised, one hand extended toward a cardboard box as though it were reaching not for a parcel but for the future itself. The lighting is cinematic. The music, you feel certain, is orchestral. And somewhere just off-frame — this is the part the photograph never shows you — a very tired engineer is holding a laptop, a spare battery, and quite possibly a mop.

We are living through one of those rare and thrilling moments when something that lived for a century inside the pages of science fiction begins, haltingly and with a great deal of whirring, to walk into the room. It would take a heart of the most thoroughly rusted iron not to feel some flicker of wonder at it. Here is code — that abstract, weightless stuff of logic and electricity — given legs, given hands, given the audacity to attempt the physical world. And yet wonder, as any good scientist will tell you, is not the same thing as belief. The universe is under no obligation to arrange itself according to our press releases. So let us do something that the spotlight photographs never quite invite us to do: let us look closely, and let us look *honestly*.

The humanoid debate is usually staged as a shouting match between two camps: the believers, for whom the machines are about to remake civilisation, and the sceptics, for whom they are expensive theatre. Both, I think, are asking the less interesting question. Robotics manifestly already works — it transforms whole industries the moment the task, the environment, the safety case and the maintenance network have all been designed around what the machine can genuinely do. The real uncertainty is narrower and more human than "are robots coming": it is whether the *general-purpose humanoid* can walk off the stage, survive the glorious disorder of ordinary life, and earn back the cost of all the people required to keep it standing.

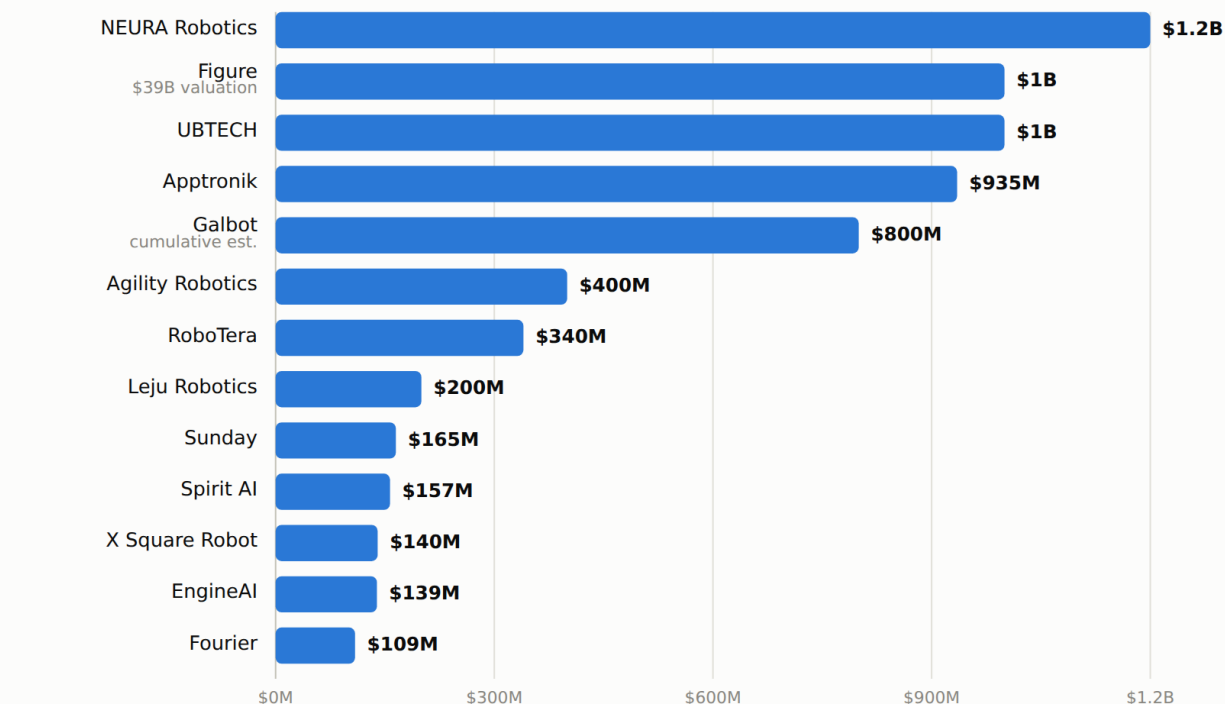
The great humanoid gold rush

First, the money, because the money is genuinely astonishing and it is where the story properly begins. By my own count, publicly announced humanoid-robot funding rounds between roughly mid-2025 and mid-2026 total on the order of **\$6.5 billion** — though that figure is best treated as an upper bound rather than a settled fact. It is an aggregate assembled from thirteen announced rounds, and aggregates of that kind flatter themselves: some rounds were described as "up to" a given sum, an announcement is not the same as money that has fully closed, and it is fatally easy to fold in extensions, debt, or general-robotics cash that was never strictly humanoid. Draw the line instead at the calendar year 2025, on firmer ground, and the total lands nearer **\$4.6 billion** — still very nearly triple the year before.

The gold rush: ~\$6.5B into 13 humanoid startups

Publicly announced funding rounds, ~mid-2025 to mid-2026 (USD).

An upper-bound aggregate: some figures are "up to" amounts or extensions, and Galbot's total is cumulative across rounds rather than a single raise.



[Show data table](#)

Sources: The Robot Report, TechCrunch, Forbes, New Market Pitch tracker.

Figure 1 — Publicly announced humanoid funding rounds, mid-2025 to mid-2026. An upper-bound aggregate; Galbot's total is cumulative.

The individual rounds are real enough, and they are large. Germany's NEURA Robotics raised up to €1.2 billion. Figure closed a round north of a billion dollars at a valuation of \$39 billion — for a company whose robots you cannot yet buy. Apptronik has now gathered some \$935 million; UBTECH secured a billion of its own; Agility Robotics, whose bipedal Digit actually shuffles about in real warehouses, took roughly \$400 million. Behind them trails a constellation of mostly Chinese names — Galbot, RoboTera, EngineAI, Fourier, Unitree — each hoovering

up hundreds of millions apiece. It is the sort of ledger that separates a careful analyst from a breathless one, and we should like, on the whole, to be the former.

*"Here is code given legs, given hands, given the audacity to attempt the physical world.
And yet wonder is not the same thing as belief."*

Two robots, and then a very long tail

Money, however, is not the same as machines that leave the loading dock. When we turn from investment to shipments, the picture rearranges itself. The market-watchers at Omdia counted **13,318 humanoid shipments worldwide in 2025**. Other trackers run higher, and the gap is itself revealing: there is not yet a universally agreed definition of what even *counts* as a humanoid. Take the most defensible single figure and the headline is still startling — thirteen thousand, not thirteen million, for the entire planet, in the most hyped robotics category in history.

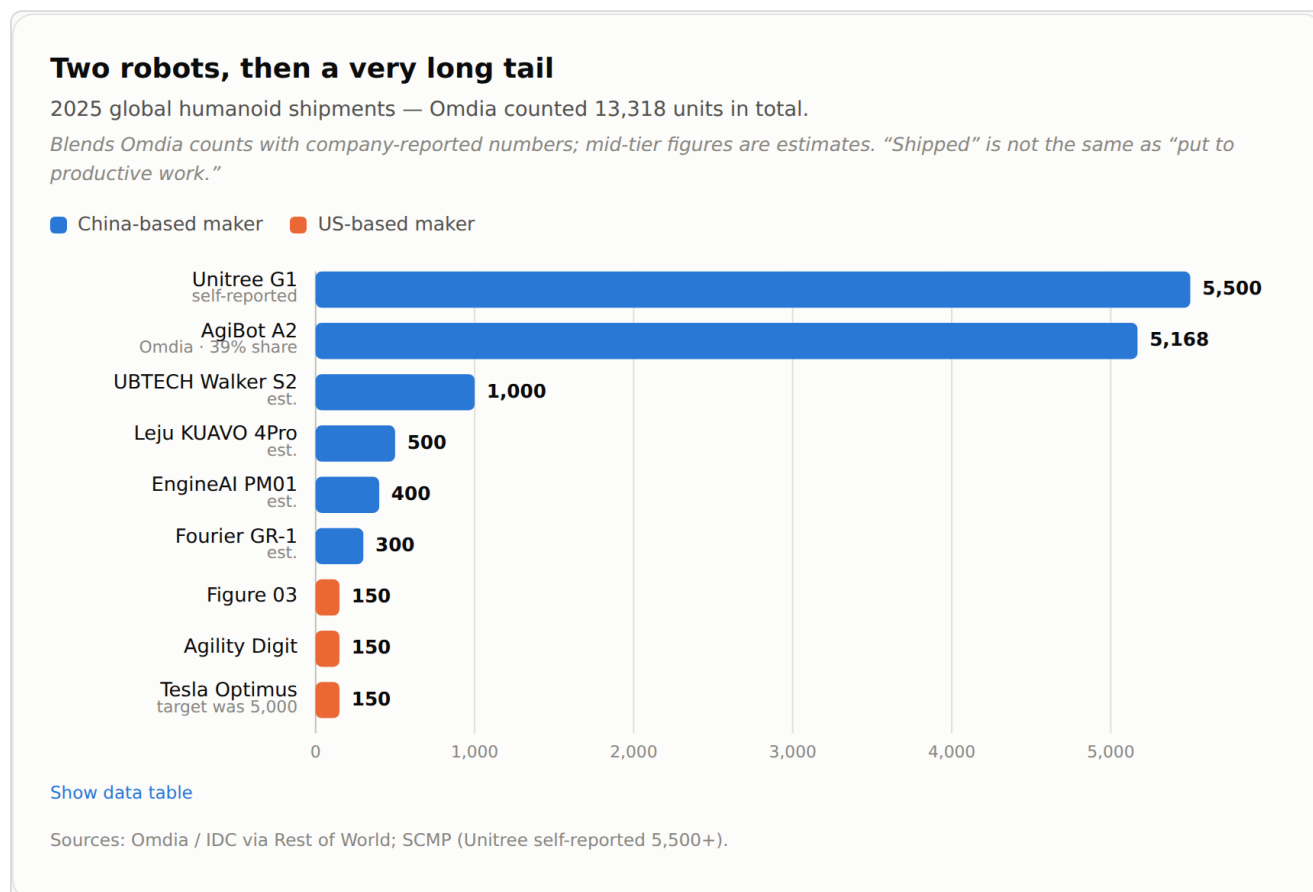


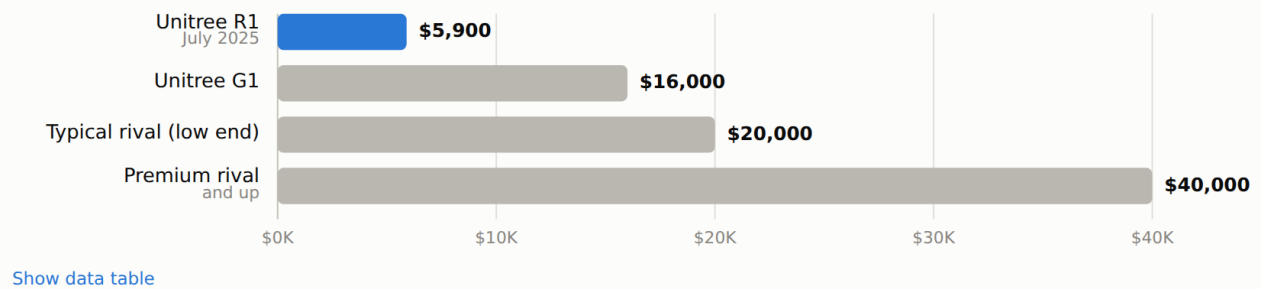
Figure 2 — 2025 global humanoid shipments. Two Chinese makers dwarf the ~150-unit Western names. Mid-tier figures are estimates.

On Omdia's count, China's AgiBot alone shipped 5,168 units and held some 39 per cent of the market; Unitree separately reported more than 5,500. The famous Western names — Figure, Agility, and Tesla's much-teased Optimus — each shipped on the order of **150 units**. Tesla had set itself a target of 5,000 and did not come close. A necessary caveat sits under all of these: these are *shipped or company-reported* figures, not audited counts of robots doing productive work.

The receipt is the revolution

Sticker price of a full-size humanoid (USD). Unitree's R1 undercuts the field by an order of magnitude.

Rival figures are a typical market range, not single named products; "premium" models run to \$40,000 and beyond.



Source: South China Morning Post (Unitree R1 launch, July 2025).

Figure 3 — The price collapse. Unitree's R1 undercuts the field by an order of magnitude.

There is a genuine revolution hiding inside these numbers, and it is not the one the headlines chose. Unitree's cheapest full-size humanoid, the R1, launched in July 2025 at **\$5,900** — less than a decent second-hand motorcycle, against rivals asking \$20,000 to well over \$40,000. If humanoids ever do become ordinary, it will likely be because someone drove the price into the ground, not because someone perfected the pirouette. The most consequential thing about the modern robot may turn out to be its receipt.

The fact, the fiction, and the theatre in between

Now we arrive at the delicate part, where enthusiasm and evidence must be gently prised apart. Because a great deal of what the public has seen of humanoid robots is, to borrow a wonderfully deflating phrase from the roboticist Rodney Brooks, "*humanoid theatre*." Brooks — who co-founded iRobot — looks at the glossy demonstration videos and sees not a milestone but the inflating skin of a classic bubble. It is his assessment, not a settled verdict; but it comes from a man with unusually good reasons to hold it.

Consider Tesla's "We, Robot" event of October 2024, at which Optimus robots mingled with the crowd, poured drinks, and made small talk. Attendees and subsequent reporting established that the robots relied heavily on **remote human operation** for those interactions. For the behaviours that most impressed the crowd, then, the robots were closer to extremely sophisticated puppets than to autonomous workers. This is not fraud; it is showmanship. But it matters, because the single hardest problem in robotics is precisely the one a human puppeteer quietly solves for the cameras: doing the thing *on its own*, in a world that refuses to hold still.

The deep reason was named decades ago and has never stopped being true. It is called **Moravec's paradox**. We assumed the mark of intelligence was the cerebral stuff — chess, calculus, logic. Those, it turns out, are easy for machines. What is monstrously hard is the thing a toddler does without thinking: picking up an unfamiliar object, judging its weight, not crushing the egg. A billion years of evolution tuned our sensorimotor systems to a pitch a century of engineering has barely begun to approach. Brooks puts the human hand at around seventeen thousand touch receptors, reporting pressure, slip, and texture faster than thought. The deeper difficulty is not that robotics ignores touch, but that rich, large-scale *tactile* training data is far harder to gather than the oceans of video we already have.

"What is monstrously hard is the thing a toddler does without thinking: picking up an unfamiliar object, judging its weight, not crushing the egg."

Where the magic is quietly, genuinely real

Before we descend into the failures, it would be a betrayal of the wonder we started with to let you imagine robots are all theatre and no substance. They are not. The trick is to notice *where* they succeed — and the pattern has been clear for a very long time.

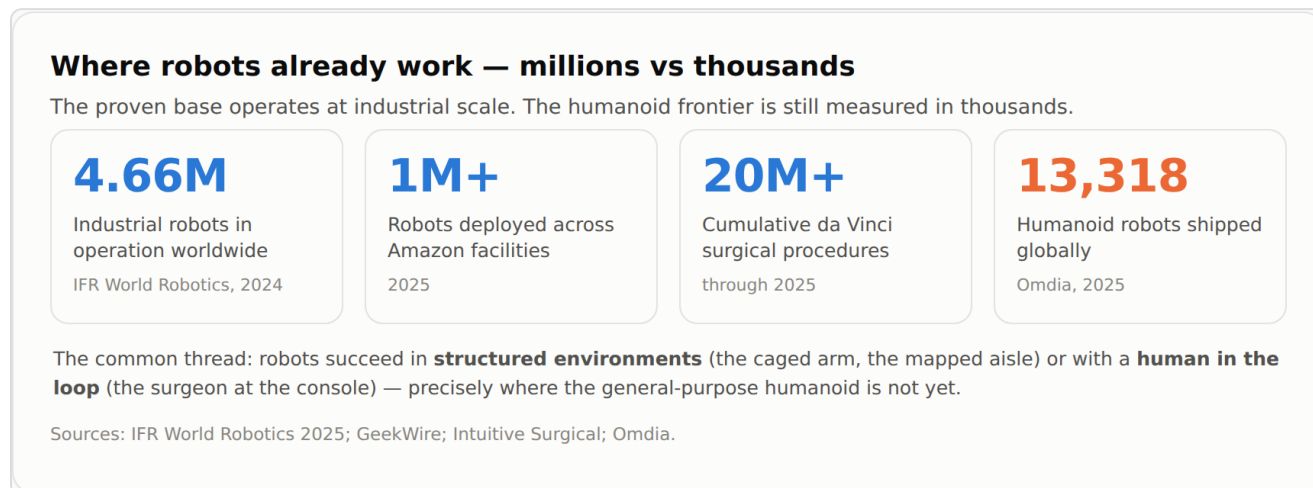


Figure 4 — The proven base operates at industrial scale; the humanoid frontier is still measured in thousands.

Robots have been welding and hauling on car lines since the **Unimate** first swung its arm at General Motors in 1961 — sixty-five years of unglamorous, wildly productive labour. Today the IFR counts some **4.66 million industrial robots** at work worldwide, with half a million more installed yearly. Amazon has deployed **more than a million robots** across 300-plus facilities; and da Vinci surgical systems have assisted in over **twenty million procedures**, human surgeons wielding robotic instruments with a precision no unaided hand could match.

It helps to say plainly what the marketing blurs: these are not the same creature. An industrial arm in a cage, a warehouse robot on a mapped aisle, a surgeon's teleoperated da Vinci, a remotely driven military mule, and an aspirationally autonomous humanoid differ wildly in autonomy, in human proximity, and in maturity. Lumping them together as "robots" is how one smuggles the proven success of the caged arm into an argument for the untested humanoid. Look at the triumphs and the common thread hums: each happens in a **structured, bounded environment** or with a **human firmly in the loop**. The robot is superb where the world has been tamed for it — and struggles the instant it turns wild. An inch of snow is still enough to defeat a fleet of delivery robots. The universe keeps its edge cases in inexhaustible supply.

What actually happens on Tuesday afternoon

Suppose we set aside the philosophy. Suppose you have bought your humanoid, and it is standing in your facility on an ordinary Tuesday. Because a robot is not a piece of software. It is a *machine*, and machines, like all of us, wear out.

Start with the joints. Many compact, high-torque robot joints rely on a beautiful bit of gearing called a **harmonic drive**, which brings several well-understood failure modes: the flexspline, a thin flexing steel cup, is prone to fatigue fracture; bearings pit; lubricant degrades and sheds contaminating particles; and under overload the teeth can "ratchet." No single one need be common for the problem to bite, because of arithmetic: a humanoid carries *dozens* of heavily loaded joints, and is only available for work if every one stays within tolerance. Reliability that would be fine in a single arm becomes precarious when you multiply it forty ways.

Then the humblest tyrant: the battery. Published runtimes vary enormously, but many current humanoids manage only **a few hours** before they must charge or swap packs. Ask the machine to actually lift and carry and that figure falls; warm the room and it falls again, as thermal management throttles the motors. Agility's Digit copes with hot-swappable packs — a sensible answer, and a quiet admission that your tireless worker needs a tea break every couple of hours.

And when something breaks, we reach the question asked far too rarely: *who fixes it?* The industrial-arm world spent sixty years building the unglamorous scaffolding — FANUC, ABB, and KUKA run global field-service, preventive maintenance, and deep shelves of spare parts. For the shiny new humanoids, that scaffolding barely exists. This, more than any question of artificial intelligence, is why buyers prefer to *lease*. The winner may not be the firm with the best launch video, but the dull, magnificent one that can deliver a replacement actuator to Birmingham, Bangkok, or Boise by Wednesday morning. Leasing costs more over an asset's life; buyers accept the premium because it hands the risk back to the supplier. If the robots don't work, you stop paying. The customer is not buying a worker — they are buying the right to send the worker back.

The 300-pound question of trust

Would you have a robot up here — in the space where actual humans walk and occasionally trip? In July 2016, a 136-kilogram Knightscope security robot in a Silicon Valley mall **knocked down and rolled over a sixteen-month-old child**. The boy escaped with a scraped leg. And the robot simply continued on its programmed way — the truly instructive part, because it exposes the gap between *possessing* sensors and correctly interpreting, and safely acting upon, what they report. A machine can bristle with cameras and still fail to do the one thing that matters: stop.

This is why Brooks advises keeping at least three metres from a full-size walking humanoid — his counsel, not a codified rule, but a well-reasoned one. A machine that walks by controlling its own falling stores a frightening amount of kinetic energy, and doubling its height multiplies its mass roughly eightfold. In 2025 the core industrial-robot safety standard, ISO 10218, received its most substantial revision since 2011. That is genuine progress — but an *update* to a discipline maturing for decades, not the belated arrival of adult supervision. And it exposes a larger gap: ISO 10218 governs *industrial* robots and expressly excludes the military, medical, law-enforcement, and public-facing settings into which embodied machines now wander. The rulebook for the robot in the cage is being sharpened. The rulebook for the robot on the pavement has scarcely been written.

[HERO IMAGE 3 — full width]

*Menacing military robots — humanoid mechs, a robot dog, a UGV — advancing across a grim battlefield,
absurdly drenched in rainbow paint and glitter; civilians with paint cannons on the ridge.*

Counter-autonomy, entry level: the million-dollar war machine undone by the contents of a craft shop.

SECTION 07

The department of war, and the arithmetic of disposability

Here, if we are unflinching, we turn to the darkest application of all — where the calculus of the tired engineer gives way to a colder arithmetic. For there is one domain in which every disadvantage we have catalogued can flip into an advantage: defence.

Take the disputed Himalayan frontier between China and India. Reports dating to **late 2021** claimed the People's Liberation Army had moved unmanned ground vehicles into Tibet in meaningful numbers — some 88 NORINCO "Sharp Claw" reconnaissance robots and roughly 120 "Mule-200" logistics platforms, each hauling around 200 kilograms across fifty kilometres of punishing terrain. Those precise numbers have been repeated endlessly since; they should not be mistaken for a confirmed, current inventory, and the original source is an interested party. Around the same theme sit better-attested developments: the PLA has publicly trialled armed robot "dogs" and issued powered exoskeletons to help soldiers carry loads through thin, freezing air. The rationale is candid — the plateau's cold and altitude are hard on human troops. The machines do not suffer altitude sickness, though the cold visits engineering punishments of its own.

So how *effective* is any of this? The honest answer is that we largely do not know. A great deal is drill footage and strategic theatre. The same brutal realities — batteries that wilt in the cold, gearboxes that fatigue, sensors baffled by snow — do not suspend themselves at a border. A robot mule that freezes at 5,000 metres is not a soldier; it is a very expensive sledge. And yet the strategic logic is undeniable. The grim appeal of the machine is that it is **disposable in a way a human being is not** — or ought never to be. A robot sentinel that is destroyed costs a procurement officer a form and a manufacturer another production order; it does not send a coffin home.

But we should be honest about the shadow. History is disfigured by wars in which human capital was already a number in a ledger, the soldier reduced to a casualty column with no more ceremony than an inventory write-down. The danger of the disposable machine is not only that it dies in our place, which is good, but that it lowers the threshold at which we are willing to start the dying at all. If a nation can wage a war without the politically inconvenient business of body bags, the ancient, blood-paid restraint that has always made leaders hesitate begins, quietly, to erode. The robot that spares a life on the battlefield may, by that very mercy, make the battlefield easier to reach for. That is not an engineering problem. It is a moral one, and no service contract covers it.

The thoughts of humans employing robots

So where does this leave the person — you, perhaps — standing in a facility or a command post, holding a brochure? It leaves you in a place of clear-eyed, rather cheerful realism, which is a far better place than either the true believers or the sneering cynics manage to reach.

The honest calculus: a robot today is not a person you hire; it is a **capital asset you maintain**, with all the servicing schedules, downtime, spare-parts anxiety, battery swaps, and safety-case paperwork that phrase implies. It will excel at the dull, the repetitive, the structured, and the dangerous — where its tirelessness is a gift and its limited judgement has been engineered out of the problem in advance. It will disappoint you the moment the work demands the improvisational dexterity your least experienced human employee possesses without thinking. And the trust you are asked to extend — to a heavy, fast-moving machine that cannot feel the toddler at its feet, nor the difference between a combatant and a child — is being earned incrementally, standard by standard. But it is not there yet.

"A robot today is not a person you hire; it is a capital asset you maintain."

And yet. And yet. It would be a failure of imagination to end on the ledger. The thing that makes this moment thrilling is the sheer, improbable audacity of the attempt — the taking of code and pouring it into steel and actuator and sensor until it reaches out, clumsily, gloriously, and touches the physical world. We have done it before, in the caged arms and the surgical wrists, and each time the magic became so reliable that we stopped calling it magic and started calling it Tuesday. That is the trajectory of every technology worth having: from miracle, to product, to plumbing.

The humanoids in the spotlight photographs are not there yet. They are, for now, a promise wearing a very good suit — overhyped, undercooked, and quietly overtaking their own marketing in ways that have nothing to do with dancing. Whether that promise is used to unload a lorry or to hold a frozen frontier, the same stubborn physics applies, and the same hard moral questions wait at the end of it. But somewhere in that unglamorous struggle — in the tired engineer with the laptop and the mop, in the price of the Unitree R1 falling through the floor, in the boring, beautiful safety standard growing sharper at last — the future is being built. Not with a flourish. With a spanner. And honestly, when you think about what it is we are attempting here, that may be the most wondrous thing of all.

Sources & verification

Figures checked as of July 2026. Where a widely-shared number proved cumulative, estimated, or dated, it is flagged in the text.

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About & further reading

"Building trust for an autonomous world."

This essay was published in the **Agencie.io Journal** by **Justin James** — Founder & CEO of Agencie.io Labs and Fractional CTO — whose work explores how we make increasingly autonomous systems secure, accountable, and human-centered. The central question running through this piece is the same one at the heart of that work: *how do we make increasingly autonomous systems trustworthy?*

For more essays on physical AI, autonomy, security, and the trust questions they raise, read the full Journal:

justinjames.agencie.io/journal

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