

ARTIFICIAL INTELLIGENCE

A new generation of AI-powered robots is taking over warehouses

Within a few years, any task that previously required hands to perform could be partially or fully automated away.

By **Karen Hao**

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OSARO

In the months before the first reports of covid-19 would emerge, a new kind of robot headed to work. Built on years of breakthroughs in deep learning, it could pick up all kinds of objects with remarkable accuracy, making it a shoo-in for jobs like sorting products into packages at warehouses.

Previous commercial robots had been limited to performing tasks with little variation: they could move pallets along set paths and perhaps deviate slightly to avoid obstacles along the

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**AI-powered robot warehouse pickers are now ready to go to work**

Covariant, a Berkeley-based startup, has come out of stealth and thinks its robots are ready for the big time.

At the time, the technology was still proving itself. But then the pandemic hit. As e-commerce demand skyrocketed and labor shortages intensified, AI-powered robots went from a nice-to-have to a necessity.

Covariant, one of the many startups working on developing the software to control these robots, says it's now seeing rapidly rising demand in industries like fashion, beauty, pharmaceuticals, and groceries, as is its closest competitor, Osaro. Customers once engaged in pilot programs are moving to integrate AI-powered robots permanently into their production lines.

Knapp, a warehouse logistics technology company and one of Covariant's first customers, which began piloting the technology in late 2019, says it now has "a full pipeline of projects" globally, including retrofitting old warehouses and designing entirely new ones optimized to help Covariant's robot pickers work alongside humans.

For now, somewhere around 2,000 AI-powered robots have been deployed, with a typical warehouse housing one or two, estimates Rian Whitton, who analyzes the industrial robotics market at ABI Research. But the industry has reached a new inflection point, and he predicts that each warehouse will soon house upwards of 10 robots, growing the total to tens of thousands within the next few years. "It's being scaled up pretty quickly," he says. "In part, it's been accelerated by the pandemic."

A new wave of automation

Over the last decade, the online retailing and shipping industries have steadily automated more and more of their warehouses, with the big players leading the way. In 2012, Amazon acquired Kiva Systems, a Massachusetts-based robotics company that produces autonomous mobile robots, known in the industry as AMRs, to move shelves of goods around. In 2018, FedEx began deploying its own AMRs, designed by a different Massachusetts-based startup called Vecna Robotics. The same year, the British online supermarket Ocado made headlines with its highly automated fulfillment center in Andover, England, featuring a giant grid of robots whizzing along metallic scaffolding.

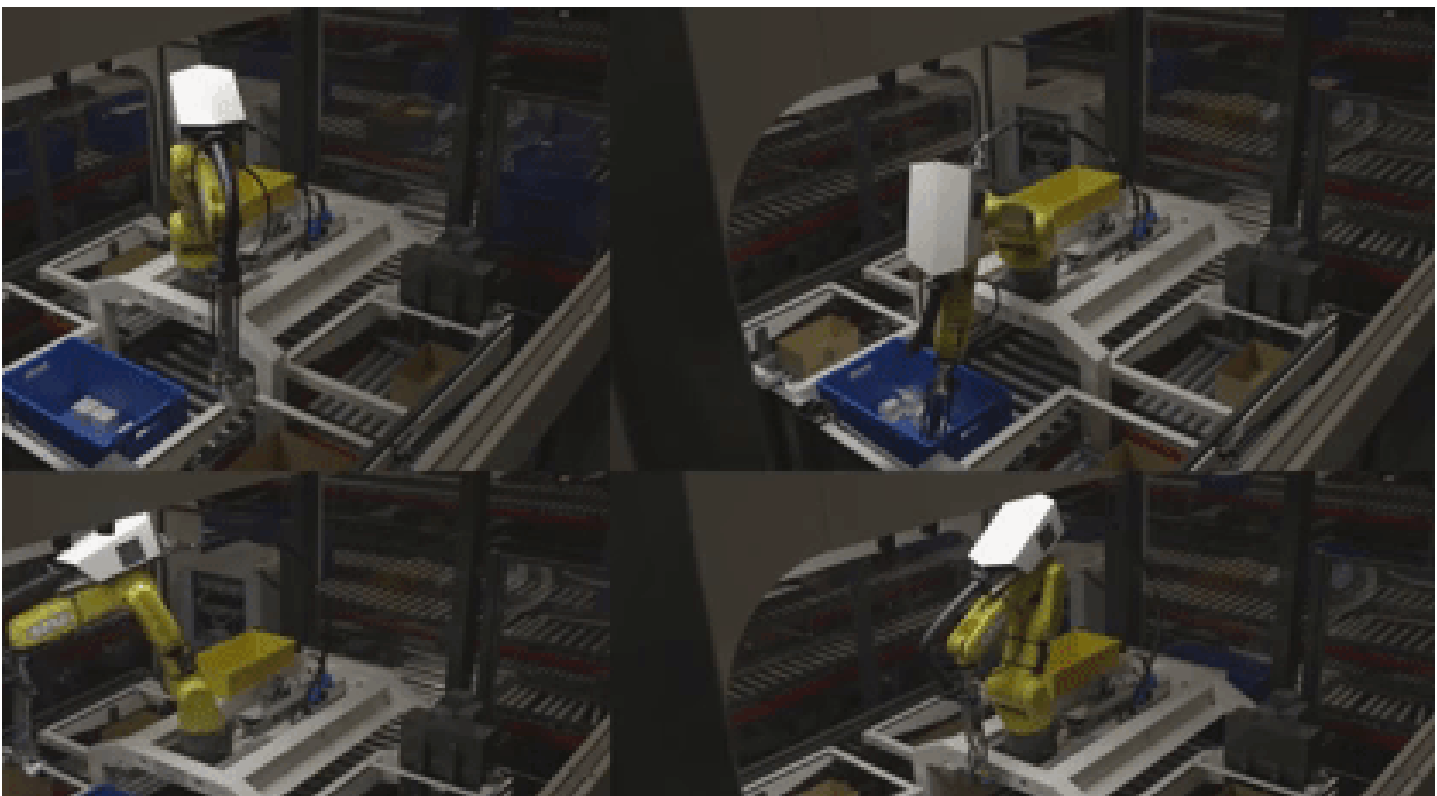
But there's a reason these early waves of automation came primarily in the form of AMRs. From a technical perspective, moving objects from point A to B is one of the easiest robotic challenges to solve. The much harder challenge is manipulating objects to take them off shelves and out of bins, or box them and bag them, the way human workers do so nimbly with their

a technology that didn't become commercially viable until late 2017. Right now such robots are most skilled at simple manipulation tasks, like picking up objects and placing them in boxes, but both startups are already working with customers on more complicated sequences of motions, including auto-bagging, which requires robots to work with crinkly, flimsy, or translucent materials. Within a few years, any task that previously required hands to perform could be partially or fully automated away.

Some companies have already begun redesigning their warehouses to better capitalize on these new capabilities. Knapp, for example, is changing its floor layout and the way it routes goods to factor in which type of worker—robot or human—is better at handling different products. For objects that still stump robots, like a net bag of marbles or delicate pottery, a central routing algorithm would send them to a station with human pickers. More common items, like household goods and school supplies, would go to a station with robots.

Derik Pridmore, cofounder and CEO at Osaro, predicts that in industries like fashion, fully automated warehouses could come online within two years, since clothing is relatively easy for robots to handle.

That doesn't mean all warehouses will soon be automated. There are millions of them around the world, says Michael Chui, a partner at the McKinsey Global Institute who studies the impact of information technologies on the economy. "Retrofitting all of those facilities can't happen overnight," he says.





ariant-enabled robotic arms that Knapp piloted in a warehouse in Berlin, Germany.

Nonetheless, the latest automation push raises questions about the impact on jobs and workers.

Previous waves of automation have given researchers more data about what to expect. [A recent study](#) that analyzed the impact of automation at the firm level for the first time found that companies that adopted robots ahead of others in their industry became more competitive and grew more, which led them to hire more workers. “Any job loss comes from companies who did not adopt robots,” says Lynn Wu, a professor at Wharton who coauthored the paper. “They lose their competitiveness and then lay off workers.”

But as workers at Amazon and FedEx have already seen, jobs for humans will be different. Roles like packing boxes and bags will be displaced, while new ones will appear—some directly related to maintaining and supervising the robots, others from the second-order effects of fulfilling more orders, which would require expanded logistics and delivery operations. In other words, middle-skilled labor will disappear in favor of low- and high-skilled work, says Wu: “We’re breaking the career ladder, and hollowing out the middle.”

But rather than attempt to stop the trend of automation, experts say, it’s better to focus on easing the transition by helping workers reskill and creating new opportunities for career growth. “Because of aging, there are a number of countries in the world where the size of the workforce is decreasing already,” says Chui. “Half of our economic growth has come from more people working over the past 50 years, and that’s going to go away. So there’s a real imperative to increase productivity, and these technologies can help.

“We also just need to make sure that the workers can share the benefits.” **T**

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