

Ken Goldberg

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Meet the Berkeley professor who's helping robots get a grip

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A "grasping" robot from Ambi Robotics can quickly pick and place a wide range of items for packages at warehouse fulfillment centers. (Niall David Photography)

Many people remember embarrassing moments from childhood. Few use them to inspire research that could reshape a massive segment of American commerce.

UC Berkeley professor, inventor, and researcher Ken Goldberg has been studying the so-called “grasping robot problem” for over 35 years. He was a clumsy kid, he says, who struggled to do so much as catch a ball thrown his way. Robots face a similar challenge, which makes teaching them to pick up packages of different shapes, sizes, and textures one of the most sophisticated problems in the field.

With the rise of Amazon, grasping robots may soon serve an important commercial purpose, too. Robots that can quickly pick and place a wide range of items are incredibly useful at warehouse fulfillment centers that deal with a diverse array of packages, where they could replace or assist human employees that sort and rearrange items.

“I think I was wired to end up studying grasping because it was something I was not particularly good at,” Goldberg said. Running his Berkeley robotics company, Ambi Robotics, is “so exciting because we’re actually putting this into practice.”



Ken Goldberg is a professor at UC Berkeley and a co-founder of Ambi Robotics. (Niall David Photography)

Ambi Robotics — shortened from the company’s previous name, Ambidextrous — makes two types of robots. One, called AmbiSort, can sort different shaped and sized packages; the other, called AmbiKit, can pick out individual items from bulk bins to package them for kits. While Goldberg never says his robots can pick up anything on earth, he claims they can grasp most things other than a paperclip.

Goldberg is tight-lipped about the company’s clients, but admits Pitney Bowes, the software and commerce company behind fulfillment services for companies like eBay, Gildan Brands, and World Wrestling Entertainment, started using AmbiSort this year. Additionally, Amazon tried to acquire the company in 2018. If Goldberg had let them, Ambi robots would likely be performing a good portion of the tasks at [Amazon’s proposed Mission Bay facility](#). Ambi Robotics also announced a \$26 million Series A fundraising round in January, led by VC firm Tiger Global.

It’s clear why investors are jazzed about the tech.

“On an assembly line at GM, we’ve had robots for a long time, and they do pick things up — but they pick up the same thing over and over again,” said Goldberg. Ambi robots, on the other hand, can be used “where every single package is different. Maybe there’s two packages that are the same, but they’re not in the same position or orientation.”

This is crucial for companies like Amazon, which employs about 950,000 U.S. workers to execute complex tasks robots cannot. Increased pressure to offer a broad range of stock items, referred to as “SKU proliferation,” means fulfillment centers must pick, handle, and move items of a greater range of shapes and sizes. While Amazon famously uses autonomous robots to move shelves in their warehouses, it’s people who repeatedly reach into bulk bins to pick and sort individual items.



The AmbiSort robot is used at fulfillment centers by companies such as eBay, World Wrestling Entertainment and Gildan Brands. (Ambi Robotics photo)

As more Americans shop online and e-commerce companies consolidate, SKU proliferation accelerates, and grasping robots become all the more valuable. This year, e-commerce sales in the United States have increased 16.4%.

Autonomous robots are typically “taught” to perform certain tasks by being shown millions of examples which, in a typical lab, means having a test robot pick up millions of physical items. But Ambi Robotics stands out because it uses software based upon that which Goldberg and his business partner Jeff Mahler — then Goldberg’s doctorate student — devised at UC Berkeley.

The software allows their robots to learn with simulated examples in a fraction of the time other robots do practicing with real-world items. Goldberg and his team can create a simulated environment, run the software, and program a robot to pick up

new items overnight. The rudimentary software was called Dex Net, while Ambi's newer more evolved version is called AmbiOS.

"It's like it (the robot) dreams how to grasp, and then it can wake up and grasp," said Goldberg. "This idea, called 'sim to real,' is really at the core of Ambi."

Oxford Economics estimates autonomous robots this skilled could displace 20 million global jobs by 2030, but Goldberg considers that little more than a red herring — he aims to make robots that help people, not replace people, he says. His colleagues and he settled on building robots for warehouses after touring dozens of different settings, and warehouse fulfillment centers presented the clearest problem autonomous, grasping robots could solve.

"To make a robot do something that's efficient, cost effective, and reliable takes a huge amount of engineering, and that's what we pride ourselves on," said Goldberg. "We want to solve those problems at a fundamental level."

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