Robotics

Uber Launches an AI Lab

Uber AI Labs shows the company's determination not to fall behind in efforts to develop self-driving vehicles.

by Will Knight   December 5, 2016

Uber is creating a new AI research lab dedicated to exploring the frontiers of machine learning and applying key advances to its business.

The lab will be based in Silicon Valley and will be led by Gary Marcus, a professor at NYU and the CEO of Geometric Intelligence, a company Uber is acquiring for an undisclosed sum. The Uber AI lab will also employ another big-name AI researcher, Zoubin Ghahramani, who will retain a part-time post as a professor at the University of Cambridge in the U.K. The company's other cofounders are Ken Stanley, an associate professor at the University of Central Florida, and Doug Bemis, a recent NYU graduate with a PhD in neurolinguistics.

The new lab will have 15 founding members, and it will explore a range of fundamental challenges, including developing forms of machine learning that need less data; training AI systems using not only data but also explicit rules; and designing machine-learning systems that explain their decisions. Advances in these areas could be vital to self-driving cars but might also help improve Uber's existing business by, for instance, helping route cars or match customers in an Uber pool more efficiently.

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Travis Kalanick, Uber's CEO, will announce the new division, called Uber AI Labs, in a blog post today. The decision was driven by the growing importance of AI to Uber as a business. But it also seems to reflect a realization that despite stunning progress in recent years, developing reliable driverless cars will require further fundamental advances (see "What to Know Before You Get in a Self-Driving Car").

"There's going to be a long period of time before self-driving cars can handle all of the possible scenarios in the world," says Jeff Holden, chief product officer at Uber. Holden points to future advances in machine learning that "are going to allow us to do radically different kinds of things." He adds, "The question is, what role are we going to play in that?"

Holden says he learned about Marcus and Geometric Intelligence at *MIT Technology Review*'s AI-focused event, EmTech Digital, which was held in San Francisco in May.

Uber has grown at breathtaking speed since its founding in 2009, thanks to a smartphone app that has completely overturned the conventional taxi industry in the U.S. and elsewhere. More recently the company has invested heavily in research in such areas as driverless cars, hoping to sustain rapid growth, to avoid being disrupted itself, and to maintain a favorable image among financiers as losses mount. It has primarily focused on developing the hardware and software required for autonomous driving, although Uber has also promoted other research efforts, including flying vehicles and drone-based advertising (see "Uber's Ad-Toting Drones Are Heckling Drivers Stuck in Traffic").

Marcus is a prominent figure in the world of artificial intelligence who has sometimes stirred controversy by criticizing the field's focus on data-heavy approaches that rely on neural networks or deep learning. He founded Geometric Intelligence to pursue other avenues, including approaches inspired by cognitive science research, which could be a lot less data hungry (Marcus gave *MIT Technology Review* exclusive access to his company last year; see "Can This Man Make AI More Human?").

Marcus says his team will continue focusing on challenges that existing systems can't solve. "We're especially interested in the edge cases—in what happens if the lighting is different, or it's a vehicle you haven't seen before," he says. "We're going to be working a lot on those problems."

Marcus hasn't revealed many details about what Geometric Intelligence has been developing, and the company hasn't published any of its work. But among other things, his team has been working on a form of deep learning that requires less data (see "Algorithms That Learn with Less Data Could Expand AI's Power"). He says such approaches could prove useful to both Uber's current business and its long-term research objectives. "There are always going to be cases where you don't have enough data. You might have enough information to predict what happens at nine in the morning, but what happens at 2 a.m. and there's less data?" Marcus says. "And [in automated driving] there's not so much data when you get into the edge cases."

Marcus is also interested in combining newer areas of AI, such as deep learning (a form of machine learning that has proved very powerful in recent years), with older AI traditions, including approaches that involve giving machines explicit rules. He says this could be important for a self-driving car, making it possible to teach it about local rules of the road.

In addition, his team will aim to develop machine-learning systems that are capable of explaining their decisions or actions, Marcus adds. This has become an important area of research, and one that could be crucial for building trust in self-driving cars. "We're very interested in transparency and interpretability—how do you get a system where you understand why it did what it did?" he says.

"It's clear there are fundamental technical issues that cut across many of the problems Uber is facing," says Karl Iagnemma, a former research scientist at MIT and the founder and CEO of a company called nuTonomy, which is testing self-driving taxis in Singapore and the U.S. "Identifying and solving those problems would give Uber a significant competitive advantage compared to the rest of the field."

But it's far from certain that fundamental research will pay off, Iagnemma says. "It's very much an arms race," he adds. "If your competitors are doing it, even if you're unsure of the likelihood that fundamental research will lead to significant impact on your product, you can't afford not to compete."

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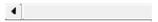

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