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UBER BUYS A MYSTERIOUS STARTUP TO MAKE ITSELF AN AI COMPANY

 GEOMETRIC INTELLIGENCE

UBER HAS **Geometric Intelligence**, a two-year-old artificial intelligence startup that vows to surpass the deep learning systems under development at internet giants like Google and Facebook. But as this tiny AI lab slips into Uber's increasingly vast and ambitious operation, the startup is still tight-lipped on what its technology actually looks like.

Founded by New York University psychologist Gary Marcus and University of Cambridge professor of information engineering Zoubin Ghahramani, **Geometric Intelligence** spans thirteen other researchers culled from across the academic world. Fourteen of the startup's fifteen employees will move to San Francisco, where Uber is based, serving as the central AI lab for the ride-hailing company. Ghahramani, the mathematician most responsible for the startup's core technology, will remain at Cambridge while spending half his time working for Uber. Terms of the deal were not disclosed.



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Uber already runs a self-driving car lab in Pittsburgh after poaching 40 researchers and scientists from Carnegie Mellon University, and it recently acquired the San Francisco self-driving car company Otto. But Geometric Intelligence will anchor a general artificial intelligence lab that explores technologies well beyond today's autonomous vehicles. This hub will operate much like Google Brain, the team that drives AI research for the search giant, and Facebook's FAIR lab, which does much the same thing for Mark Zuckerberg and company.

"If you look into the future, there are going to be [step-function](#) changes in artificial intelligence that will affect business models and business opportunities," says Uber chief product officer Jeff Holden, who oversees the company's push towards technologies of the future and personally drove the acquisition of Geometric Intelligence. "We very much want to be a part of that."

Oren Etzioni, the CEO of the Allen Institute for AI and a former professor at the University of Washington specializing in artificial intelligence, calls Ghahramani "the real deal." But although Marcus was previously in residence at the Allen Institute, Etzioni says he was never privy to Geometric's technology. Nor is the rest of the AI community.

The Amazon Gambit

Whatever Uber sees in Geometric Intelligence, the acquisition is an example of what Etzioni calls "an Amazon gambit." Just as Amazon transformed itself from an online bookseller into a company that dominates [the world of cloud computing](#)—so much so that the cloud may one day be its most profitable business—Uber is transforming itself from a ride-hailing company into an outfit that does self-driving cars and trucks, hardcore machine learning, even flying automobiles. "They're reinventing themselves as an AI company. They want to join the Big Four," Etzioni says, referring to Google, Amazon, Facebook, and Apple.

Indeed, the Big Four have already built their own dedicated AI operations, in many cases by acquiring startups packed with machine learning researchers. In 2013, Google snapped up DNNresearch and Geoff Hinton, one of the founding fathers of the deep learning movement, and the next year, it bought London's DeepMind for an enormous £400 million. Facebook hired another founding father, Yann LeCun, while Apple played catch-up with a trio of machine learning startups. Not to be outdone, many other major tech companies—including Samsung, Salesforce, and GE—have acquired their own AI labs in recent months. It's a seller's market in the extreme, and Geometric Intelligence has played right into it.

The New York-based startup has all the markings of a company built just for this kind of big acquisition. The company has filed for at least one patent, Marcus says. But it hasn't published research or offered a product. What it has done is assemble a team of fifteen researchers who can be very useful to Uber, including Stanford professor Noah Goodman, who specializes in cognitive science and a field called probabilistic programming, and University of Wyoming's Jeff Clune, an expert in deep neural networks who has also explored robots that can "heal" themselves.

Not that Marcus has kept quiet about the technology his company aims to build. Deep neural networks — pattern recognition systems that can learn tasks by analyzing vast amounts of data — have rapidly reinvented the likes of Google and Facebook. They recognize faces in photos and understand the commands you bark into your smartphone. But Marcus paints deep neural nets as an extremely limited technology, because the vast swaths of data needed to train them aren't always available. Geometric Intelligence, he says, is building technology that can train machines with far smaller amounts of data.



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"There are problems in the domain of language and in driverless cars where you're never going to have enough data to use brute force the way that deep learning does," Marcus says. "Either you can't buy it or it doesn't exist." Geometric's approach could be important with autonomous cars, he says, because there's not enough data describing the rare situations that lead to accidents. He says the company's technology is still in the research phase, but claims it can already learn certain tasks using "half as much data as deep learning."

He declines to describe the technology in detail, saying it's proprietary information. But Zoubin Ghahramani, who studied under Geoff Hinton at the University of Toronto, says the technology is a hybrid of deep neural networks and systems that operate according to specific rules. "If you combine some of the ideas in rule-based learning with ideas in statistical learning and deep learning, then you can get the best of both worlds," he says. "If there is an obvious rule—or even if it's not so obvious—they will eventually catch on to that, and

they'll generalize to new situations. But they can pick up statistical patterns from lots and lots of data as well."

Sparse Data

Other companies are working on a similar technology. The San Francisco startup Vicarious makes much the same pitch as Marcus—and is equally coy about what it has actually built. Meanwhile, [researchers from Facebook](#) and other organizations have published work on systems that can learn from "sparse data." "This is suddenly a hot area," Etzioni says.

But Marcus and Ghahramani, who met as graduate students at MIT in the early 1990s, say they're interested in other areas of research as well. Their team includes researchers who specialize in more established forms of AI, including [Bayesian logic](#), [evolutionary computation](#), and [symbolic artificial intelligence](#) as well as deep learning and probabilistic programming. "We did not want to be a monoculture," Ghahramani says in describing how he and Marcus built the startup. "To solve challenging problems we consider to be AI, we need to bring together a lot of different expertise."

As its research progresses, the team will work in tandem with Uber's autonomous car group in Pittsburgh as well as with groups working on traffic prediction in San Francisco and Palo Alto. Now called Uber AI Labs, the team still shrouds its technology in secrecy, but not its mission. According to Marcus and Ghahramani, they will tackle everything from machine vision to natural language understanding. Like Google and Facebook and so many others, the goal is true AI. If they succeed, Uber could become the Big Four's fifth wheel.

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