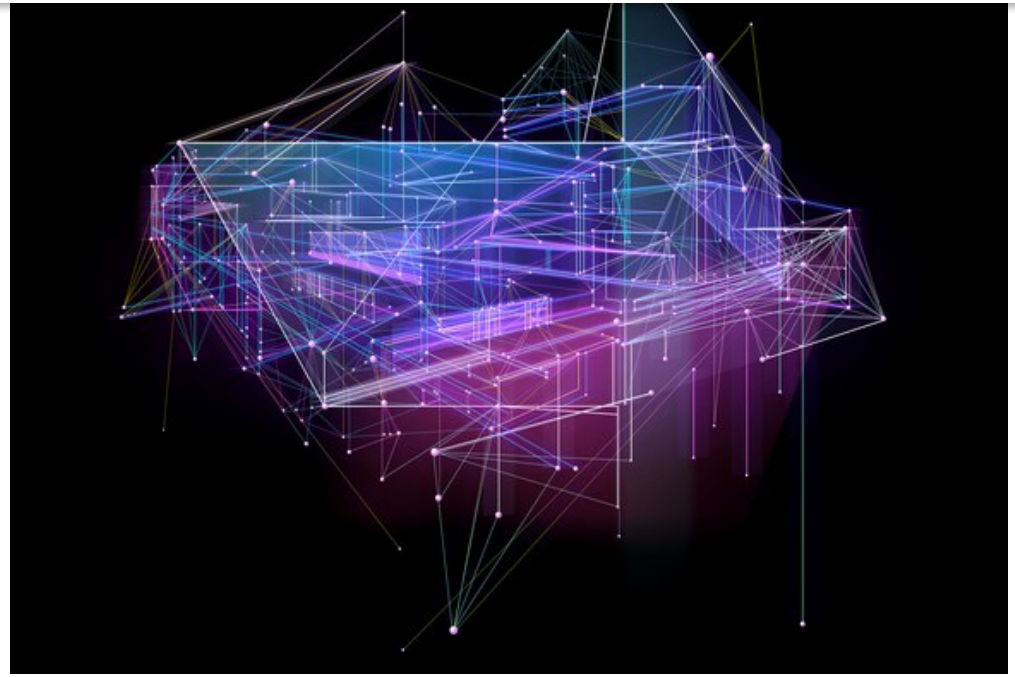
CADE METZ BUSINESS 02.14.17 08:00 AM

AI'S FACTIONS GET FEISTY. BUT REALLY, THEY'RE ALL ON THE SAME TEAM



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ARTIFICIAL INTELLIGENCE IS not one thing, but many, spanning several schools of thought. In his book *The Master Algorithm*, Pedro Domingos calls them the tribes of AI.

As the University of Washington computer scientist explains, each tribe fashions what would seem to be very different technology. Evolutionists, for example, believe they can build AI by recreating natural selection in the digital realm. Symbolists spend their time coding specific knowledge into machines, one rule at a time.

AI.

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Take Ben Vigoda, the CEO and founder of Gamalon. He's a Bayesian, part of the tribe that believes in creating AI through the scientific method. Rather than building neural networks that analyze data and reach conclusions on their own, he and his team use probabilistic programming, a technique in which they start with their own hypotheses and then use data to refine them. His startup, backed by Darpa, emerged from stealth mode this morning.

Gamalon's tech can translate from one language to another, and the company is developing tools that businesses can use to extract meaning from raw streams of text. Vigoda claims his particular breed of probabilistic programming can produce AI that learns more quickly than neural networks, using much smaller amounts of data. "You can be very careful about what you teach it," he says, "and can edit what you've taught it."

As others point out, an approach along these lines is essential to the rise of machines capable of truly thinking like humans. Neural networks require enormous amounts of carefully labelled data, and this isn't always available. Vigoda

programming. Of Gaussian processes. Of evolutionary computation. Of reinforcement learning.

Sometimes, the AI tribes badmouth each other. Sometimes, they play up their technology at the expense of the others. But the reality is that AI will rise from many technologies working together. Despite the competition, everyone is working toward the same goal.

Probabilistic programming lets researchers build machine learning algorithms more like coders build computer programs. But the real power of the technique lies in its ability to deal with uncertainty. This can allow AI to learn from less data, but it can also help researchers understand why an AI reaches particular decisions—and more easily tweak the AI if they don't agree with those decisions. True AI will need all that, whether it powers a chatbot trying to carry on a human-like conversation or an autonomous car trying to avoid an accident.

But neural networks have proven their worth with, among other things, image and speech recognition, and they're not necessarily in competition with techniques like probabilistic programming. In fact, Google researchers are building systems that combine the two. Their strengths complement one another. "Deep neural networks and probabilistic models are

lot of probabilistic modeling happening *inside* neural networks.

Inevitably, the best AI will combine several technologies. Take AlphaGo, the breakthrough system built by Google's DeepMind lab. It combined neural networks with reinforcement learning and other techniques. Blei, for one, doesn't see a world of tribes. "It doesn't exist for me," he says. He sees a world in which everyone is reaching for the same master algorithm.

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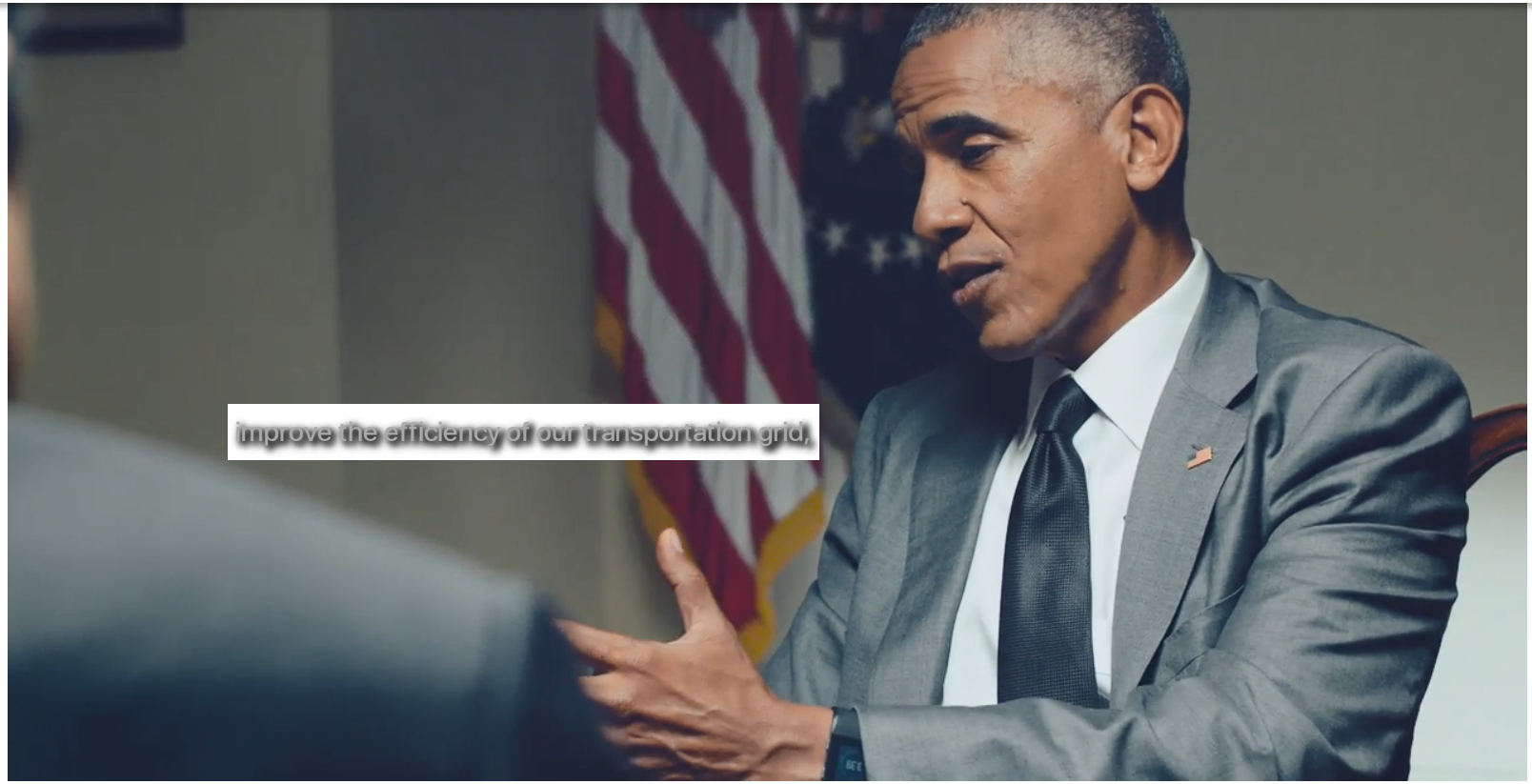

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