

# Five Technologies That Will Rock Your World

By CADE METZ NOV. 13, 2017

After the Russian hacking of the 2016 election, many people worry that technology has gone too far. And yet it continues to evolve rapidly.

Largely because of the success of companies like Google, Facebook and Amazon, investment in tech research continues to climb. At the same time, because of the sudden maturation of mathematical methods that can deliver what is commonly called artificial intelligence, the possibilities are expanding.

There is reason for concern, but also for optimism. The new wave of artificial intelligence will reduce jobs, but will also improve your health and products like your smartphone. Here are five areas where tech companies, large and small, will change the way we live.

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Over the last half decade, with help from the complex algorithms deep neural networks, computers have learned to see. Loosely based on the web of neurons in the human brain, a neural network can learn tasks by identifying patterns in vast amounts of data. By analyzing millions of bicycle photos, for instance, a neural network can learn to recognize a bicycle.

This means that services like Facebook and Google Photos can instantly recognize faces and objects in images uploaded to the internet. But artificial intelligence will also lead to a revolution in health care. Using these same techniques, machines can also learn to identify signs of disease and illness in medical scans. By analyzing millions of retinal photos, a neural network can learn to recognize early signs of diabetic blindness. By analyzing CT scans, a neural network can learn to spot lung cancer.

Such technology will improve health care in places where doctors are scarce. But eventually, it will streamline care in the developed world as well. Google is already running tests inside two hospitals in India, and the start-up Infervision has deployed similar technology in hospitals across China.

In the longer term, similar methods promise to rapidly accelerate drug discovery and so many other aspects of health care. “Everything from the nature of the food that we grow and eat to the drugs that we give ourselves to how we monitor the impact of these things is all being transformed by A.I. in deeply profound ways,” said Matt Ocko, a managing partner at DCVC, a San Francisco venture capital firm that has invested heavily in this area.

## Conversational Computing

Neural networks are not limited to image recognition. Far from it. These same techniques are rapidly improving coffee-table gadgets like the Amazon Echo, which can recognize spoken commands from across the room, and online services like Skype, which can instantly translate phone calls from one language to another. They may even eventually produce machines that can carry on a conversation.

Recently, said Luke Zettlemoyer, a University of Washington professor, there has been a “huge phase shift” in the area of natural language understanding — technology that understands the natural way people talk and write. Companies like Google, Facebook, and Microsoft are at the forefront of this movement, which promises to fundamentally change how we interact with phones, cars, and potentially any machine. Many companies are moving down the same path, including Replika, a San Francisco start-up.

With help from machine learning, Replika offers a smartphone “chatbot” that acts as a kind of personal confidante, chatting with you in moments when no one else is around. But the hope is that these techniques will improve to where they serve you in so many other ways. What if Alexa was truly conversational, if you could have a back and forth dialogue? Right now, it is about basic questions and commands. Today, it “recognizes” words very very well. But truly “understanding” complex English sentences is beyond machines at this point. What if machines could carry on a dialogue like Hal in 2001?

## Mind Control

Some people argue there are even better ways of interacting with computers by using brain waves. Rather than telling a computer what you want, many companies say they believe you could just think it.

Using electroencephalography, or EEG — a longstanding means of measuring electrical brain activity from sensors placed on the head — the start-up Neuroable is building a virtual reality game that can be played with the mind. EEG is limited for this kind of use, but other researchers, including at Facebook, aim to build a far more powerful systems using optical sensors. Facebook hopes that, in a few years, this technology will let people type with their minds five times faster than they can with a smartphone keyboard.

These techniques will also face physical limits, and that may bar the way to Facebook’s goal. But various start-ups, including Neuralink, founded by Elon Musk, the chief executive of Tesla, are going several steps further, hoping

to read brain activity from chips implanted inside the skull. At first, they will limit this technology to people with disabilities. But ultimately, Mr. Musk and others hope to also implant chips in healthy people.

“It is implausible that this technology would go straight into healthy people,” said Ed Boyden, an M.I.T. neuroscientist who is also an adviser to Neuralink. “But there is a natural trajectory where, if a medical technology proves effective, it can move into normal individuals as well.”

## The Flying Car

Want more science fiction in your everyday reality? As entrepreneurs like Mr. Musk work to put a chip in your head, others are working to put cars in the skies.

Even as he sets the pace in the race to autonomous cars, Larry Page, the chief executive of Alphabet and a founder of Google, is backing Kitty Hawk, a start-up that wants to move commuting into the air. And many others, including the start-up Joby Aviation, Uber and Airbus, are working on vehicles capable of flying above congested roads. These vehicles take many forms, but generally, they carry a single rider and take off like a helicopter: straight up.

At first, Kitty Hawk will sell its vehicles to hobbyists. But the company hopes it can eventually convince the general public, and regulators, that flying cars make sense. That is no easy task. After all, these cars will require a new kind of air traffic control.

## The Quantum Computer

Even more outlandish? It's the prospect of a quantum computer. Drawing on the seemingly magical properties of quantum physics, such a machine would be exponentially more powerful than computers of today. Think of it this

way: A quantum computer could instantly crack the encryption that protects the world's most private data.

The problem is that these machines are enormously difficult to build. but progress has accelerated. Google, IBM and Intel are investing heavily in this push, as are start-ups like Rigetti Computing.

Researchers say they believe that quantum machines eventually could accelerate drug discovery, streamline financial markets, solve traffic problems and more.

“It is a completely different paradigm for processing information,” said Robert Schoelkopf, who helped invent the techniques that are driving so much of quantum computing research. “So we think that known applications are just the tip of the iceberg.”

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