

The promise and threat of artificial intelligence

My View

By Anthony J. Marolda

Our minds work in a very complex fashion. We use the information coming to us from our five senses, process all of that data in our brains, conclude what it means and then take the appropriate actions. This is done instantaneously and continuously. Driving a car is a good example of how this process works with a human being in control. It is hard to believe that machines could ever have these capabilities. Yet, we are fast approaching that reality. And it will be as a result of artificial intelligence.

Science fiction, in the form of books and movies, shows us what the impact on our lives of AI could be like. A hit cult movie last year was "Ex Machina," about a robotic woman whose "mind" was so advanced that it was not possible in a conversation to distinguish her from a real person.

On the other side of the coin, the Arnold Schwarzenegger "Terminator" movies showed what happens when machines reach a level of intelligence where they become self-aware, turn against their creators and "take over the world."

We are not anywhere near the level of technological development where the reality shown in these movies would be possible. We are getting closer, however, and current AI research is heading in that direction.

But even with the current state of the art, our world is on the verge of seeing a myriad of innovations where machines will be making their own decisions and carrying out actions that have, until now, only been done by human beings. And, yes, it is an exciting, but, at the same time, scary prospect.

For example, we will soon have driverless cars on our roads. Autonomous and interactive machine intelligence systems are under development by Google and other companies to do just that. Demonstration cars are now being tested on San Francisco highways. The prototypes are easily recognizable. They look like ordinary vehicles, but have a laser turret on the roof for determining the vehicles precise position relative to other cars and the edges of the road. And it is done instantaneously and on a continuous basis. Also visible on the cars are cameras, radar and GPS antennae, jutting out in various spots. These systems provide the sensory input to the onboard AI computer. The "brain" receives the data, makes judgments and issues commands to the car's controls to guide it on its way. The passengers sit inside in comfortable seats, with no sign of a

steering wheel or control pedals on the floor. Sergey Brin, one of Google's founders, believes that by the 2020s, driverless cars will be in mass production. As you can imagine, a major factor will be getting people to accept the idea that a driverless car is safe.

We have heard a lot about drones lately, both military and civilian types. Currently, these intricate machines have human pilots on the ground, controlling the craft remotely. But autonomous drones are also under development by a number of companies, and ominously, the military. Like driverless cars, these drones need detailed sensor input, but in three dimensions, and a sophisticated onboard AI computer to analyze the data and direct the craft safely to its destination. Amazon, for example, is well on the way to developing autonomous drones that will deliver small packages to customers' doorsteps in 30 minutes or less after ordering.

All of this AI technology is also being employed by military organizations around the world to create a whole range of "lethal autonomous weapons" (LAWS). They include mobile, track-propelled, tank-like machines mounted with heavy fire power, and jet-propelled combat drones that can autonomously search, identify, locate and destroy enemies. Other autonomous weapon systems are being developed to work on and under the sea, as well as in space.

The capabilities of intelligent machines will only increase as computers and their software continue on their exponential trajectory of improvements. The most sophisticated of these new machines are currently capable of learning, but they do so in a very different way, and much more slowly than a human being. For example, "deep machine learning" allows the systems to learn what to do beyond their initial programming, so they can keep getting better at their tasks. As this capability increases, we come closer to realizing the dreams of the science fiction writers, for better or for worse. And high-level research is underway to do just that.

Recently, Harvard University was awarded a major contract to make AI systems faster, smarter and act even more like human brains. The project is combining research in brain science with computer science. A detailed neural map of the brain is being generated. The researchers will then work on understanding how connections between neurons allow the brain to process information. The result will be new algorithms that will vastly outperform current AI capabilities.

As AI machines approach even more human-like capabilities, their impact on the world

will be deeper and more widespread. Robots have already played a significant role in automation, displacing many workers. The advent of industrial robots started in the '80s. Now, there are about 200,000 industrial robots in the United States. But that is just scratching the surface. As robots become more intelligent, capable of seeing, listening and learning, the more they will be able to take over for humans in complex manufacturing and service tasks. And, as a result, more people will lose their jobs. For example, as previously noted, self-driving cars and trucks will be common in the next 25 years. Uber and taxi drivers will be replaced. Driverless long-haul trucks will make cross country runs faster and cheaper than with humans.

Perhaps of even more concern to the future of mankind than the loss of jobs is the use of military artificial intelligence systems that incorporate advanced learning software. As previously noted, the U.S. military has already invested billions of dollars in LAWS, and that investment is increasing significantly each year. The military of other countries, especially Russia and China, are following suit. Some fear that it could lead to a new AI arms race.

All of these developments have spawned a great deal of concern among some scientists and ethicists. Will humans lose control of the artificial intelligence? The famous British astrophysicist, Stephen Hawking, is afraid of that possibility. Last year, he speculated that "It (AI) would take off on its own, and re-design itself at an ever-increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded. The development of full, artificial intelligence could spell the end of the human race," concluded Hawking. Other scientists agree. But not all.

The Wellesley-based technology genius, Ray Kurzweil, sees it differently than Hawking. Kurzweil has been studying and using AI for many years in his myriad of products, including his original text-to-voice reading machines for the blind. He is currently director of engineering at Google, heading a team developing machine intelligence and natural language understanding. He recognizes the potential dangers of AI, but believes that there are strategies we can deploy to keep emerging technologies safe.

Kurzweil's bottom line is that we have a moral imperative to realize the promise of AI, while controlling its peril. "It won't be the first time we've succeeded in doing this."

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