Publication date: September 18, 2015

The Real Impact of Artificial Intelligence

Machines that can think have long captured our imaginations, entertained us, and occasionally scared us. Think of the calmly sociopathic HAL 9000 from *2001: A Space Odyssey*, the endearingly emotionless Data from *Star Trek: The Next Generation*, or the strangely captivating operating system, Samantha, from the movie *Her*. Often in the media and popular entertainment, the rise of intelligent machines has a dark side, although we have little evidence for that (yet) in the real world. Putting certain pessimistic predictions of the so-called singularity–when artificial intelligence (AI) will overtake our own, with apparently dire consequences–aside, there is much to be optimistic about when it comes to AI. Online searches are an example of a form of AI without which many of us would feel lost. Many modern cars contain AI systems that keep you safe, as do the autopilots in most airplanes.

In its most basic form, AI receives input from the environment and acts based on that information. The object doing the acting is often called the "agent." Ideally, the agent is perfectly rational and therefore able to find the best solution. However, the sheer number of mathematic calculations required to be perfectly rational is not practical; a more realistic goal is to find the best possible, but not perfect, solution given the constraints in time and processing power. As computers are refined and improved, researchers are able to get closer to the perfect solution, as when IBM's Deep Blue was finally able to beat chess grandmaster Garry Kasparov in 1997. However, this was a fairly simple, constrained environment in which the computer could very quickly weigh the relative benefits of millions of moves. Perhaps more impressive is Watson, another IBM creation, trumping *Jeopardy!* game show champions Ken Jennings and Brad Rutter in 2011. Perhaps. This is an example of brute force computing power–albeit at a higher level than Deep Blue–in a very specific arena, something known as artificial narrow intelligence, or weak AI. Still not achieved is true human intelligence as we understand it, i.e., utilizing understanding and insight in decision-making, rather than just running through millions of available options (also called artificial strong intelligence, or strong AI). So even if a computer *seems* to be thinking, it often is not, at least not in the way humans think.

Some researchers, therefore, believe that the best way to develop strong AI is to find a way to mimic the way the human brain works. Enter so-called natural intelligence (NI). NI attempts to duplicate *in silico* what we do naturally *in vivo*, namely the processing of knowledge in both a deductive and reductive way. Current research hopes to find mathematical algorithms that more closely match how our brain performs this natural knowledge processing, enabling future NI machines to use far fewer resources (time, power, and memory) while also providing more context-appropriate answers.

I hope that this poster provides a thought-provoking introduction to AI and NI, stimulates discussion, and possibly even encourages the next generation of scientists to explore this fascinating and exciting topic.

Sean Sanders, PH.D.
Editor, Custom Publishing, *Science*

Writer: Jeffrey Perkel, PH.D. • Designer: Mica Duran, M.S., C.M.I. • Editor: Sean Sanders, PH.D.

Science AAAS Produced by the *Science*/AAAS Custom Publishing Office

Sponsored by 未名集团 SINOBIOWAY