

Robots and Computers Enhance Us More Than They Replace Us

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journals.sagepub.com/home/aex**Arthur M. Diamond, Jr.** 

Abstract

Past fears that robots and computers would cause large increases in secular unemployment have proven unfounded. Some well-respected economists and other technology and labor analysts are worried again. Advances in algorithms have proven impressive, but experts on the mind and neuroscience remain skeptical about the extent to which robots and computers will be able to duplicate or surpass humans in areas of insight, judgment, and creativity. Certainly, for the foreseeable future, robots and computers will be more complements to human labor, than they will be substitutes for human labor, enhancing us more than replacing us. If we use the precautionary principle to justify heavy regulation of robots and computers, the benefits of enhancement will be fewer and will be delayed.

JEL Classifications: J63, O33, L51, D83, O31

Keywords

robots, artificial intelligence, AI, algorithms, neuroscience, technological unemployment, regulations, precautionary principle

Introduction

For many decades, the fear has waxed and waned that artificial computer intelligence in general, and intelligent robots in particular, will cause widespread unemployment or, in the nightmare of the Terminator movies, actually attempt to exterminate humanity. Norbert Weiner, who invented the word “cybernetics,” wrote in 1947 that with advances in computing, the mass of ordinary humans may find themselves without employable skills (Weiner as cited in Kidder, 1981, pp. 240–241). In 1964, Nobel Prize winners Linus Pauling and Gunnar Myrdal signed a memo to President Lyndon Johnson warning of “the likelihood that computers would soon create mass unemployment” (Levy & Murnane, 2013, p. 6; see also Taylor, 2013, p. 215). The fear and foreboding are further fostered by a huge science fiction literature of short stories, novels, and films that imagine powerful evil robots run amuck (IBM cognitive computer expert Guruduth Banavar as interviewed in Greenwald, 2015). A more credible expression of job market fears was presented in an extended *60 Minutes* episode that featured MIT economist Erik Brynjolfsson (Kroft, 2013). The episode expressed the worries in Erik Brynjolfsson and Andrew McAfee’s (2011)

¹University of Nebraska Omaha, USA

Corresponding Author:

Arthur M. Diamond, Jr., Department of Economics, University of Nebraska Omaha, 6708 Pine Street, Omaha, NE 68182-0048, USA.

Email: adiamond@unomaha.edu

Race Against the Machine book, that artificial intelligence (AI) and robotics might result in large and long-lasting unemployment.

It is reassuring that so far, the long line of worriers about technology causing mass unemployment have been wrong (Rattner, 2014). But we are justified in taking another look at the worries, because of the credibility of those, such as Brynjolfsson and McAfee, who are currently saying that this time will be different. Two crucial points are worth elaboration. The first is that AI and robots have serious limitations, and there are strong reasons to believe those limitations will continue. The second is that the most promising developments of AI and robots are as tools to complement human actions, not as substitutes to replace human actions.

The Limits of AI

Economists Brynjolfsson and McAfee (2011, 2014) have received substantial attention for their worries that computers and robots are a major threat to jobs (see also Cowen, 2014). But even they grant that humans beat computers in “ideation, large-frame pattern recognition, and the most complex forms of communication,” and they grant further that this is likely to remain true “for some time to come” (Brynjolfsson & McAfee, 2014, p. 193). MIT economist David Autor, who co-authored an important paper on the changing composition of skills used in the U.S. labor market, believes that computers and robots will probably never match humans in skills such as “common sense, adaptability and creativity” (Autor as paraphrased in Miller, 2014, p. A3; see also Autor, Levy, & Murnane, 2003; see also Metz, 2018).

Jeff Hawkins, as the successful Palm personal data assistant (PDA) entrepreneur who later founded a start-up to actually create more intelligent machines, may have more credibility than most economists on the future capabilities of intelligent machines. To provide a solid foundation for his efforts, he has developed a new theory of human intelligence. He is working hard to create more intelligent machines and believes that the effort is on the cusp of breakthroughs. His efforts have convinced him how hard and expensive it will be to create robots that can move or talk with anything approaching the fluidity of human beings. His optimism, unrealized at this writing, is mainly that AI may be able to help us make faster progress in specific domains of knowledge, such as physics and mathematics (Hawkins & Blakeslee, 2004).

Hawkins provides a thoughtful and nuanced account of why we need not worry about a threat from intelligent machines (Hawkins & Blakeslee, 2004). Because of his thoughtfulness and nuance, and especially because of his credibility, I will summarize some of the main points of his account. First, there is the general past history that worries about steam engines and AI turned out to be massively overblown. Second, there is no reason to think that the machines will be self-replicating. Intelligence does not imply self-replication, and we are nowhere close to understanding how to make them self-replicating, even if we wanted to. Third, they will not have motives, because motives depend on traits of human beings that go beyond intelligence, for example, our emotions. We may be starting to understand the neocortex but are nowhere close to understanding the parts of the brain having to do with emotions.

Even if we knew how to make machines that shared our emotions, why would we do it? It would be extremely hard and extremely expensive. Although we cannot predict technology with precision any further than the obvious extrapolations of capabilities 2 or 3 years out, we are much more likely to build specialized machines that do specific tasks that we are not good at, or that we find boring or unpleasant.

MIT robot expert Rodney Brooks, the founder of two robot start-ups, has pointed out that successful autonomous robots only have been autonomous at very simple tasks, such as vacuuming (Markoff, 2015). AI programs and robots are hopelessly inferior to humans at developing the kind of quick intuition, based on experience, which allowed Chesley Sullenberger to quickly land his A320 in the Hudson River after geese disabled the engines (Carr, 2015; see also Hawkins &

Blakeslee, 2004). NYU professor of psychology and neuroscience, Gary Marcus observes that the best AI programs are good at the narrowly defined tasks for which they were programmed, but “lack the flexibility of human thinking” (Marcus, 2014, p. A11). He concludes that “although the field of A.I. is exploding with microdiscoveries, progress toward the robustness and flexibility of human cognition remains elusive” (Marcus, 2017, p. 6; see also Marcus & Davis, 2018, p. A21).

The commonplace test of whether AI has achieved human intelligence is the Turing Test, which asks whether a human “conversing” with the AI program can tell whether she or he is talking to a computer or a human (Baggini, 2011, p. A17; see also Christian, 2011). In some settings where the conversations are brief enough and constrained enough in topics, some AI programs have fooled some humans. But Hawkins persuasively argues that the Turing Test is too easy a test. John Searle’s famous Chinese Room story shows that you can sometimes produce intelligible-seeming results, without an intelligence producing them (Hawkins & Blakeslee, 2004; Isaacson, 2014; Searle, 1980).

In his story, Searle imagines he is shut in a room into which a Chinese person sends questions expressed only in Chinese characters. Searle knows no Chinese but has a book that tells him what string of characters to slip out under the door, to “answer” the questions. As long as the Chinese person sends questions that are included in the book, Searle can send out correct answers, passing the Turing Test, even though he has no clue of the meaning of the questions sent in, or of the answers that he himself sends out. Most significantly, if a question is sent in that is not in the book, Searle will not be able to send out the answer.

The faux intelligence of the Chinese Room is not enough to threaten human intelligence in the labor market, because humans will always have both a comparative and an absolute advantage in creating and responding to the genuinely novel. Mathematician Barry Cooper (2003), who is a leading scholar on Turing, and the author of *Computability Theory*, has concluded from his research that “there is some scientific basis for the view that humans are doing something that a machine isn’t doing—and that we don’t even want our machine to do” (Cooper as quoted in Mims, 2014, p. B4).

Jaron Lanier, the entrepreneur, information technology expert, virtual reality guru and futurist, at Microsoft as of this writing, believes that “people are and will always be needed,” but that it may appear that technology is pushing humans around, because we are not honestly valuing what humans contribute (Lanier, 2013, p. 135). If we continue on that path, we will be guilty of “massive accounting fraud” (Lanier, 2013, p. 135). Lanier emphasizes that AI and robotic intelligence follows algorithms, and even the best algorithms will only succeed at using incremental explorations to find local maxima (Lanier, 2013). To find the unexpected global maxima, you need the diversity of human personalities that can pursue new hunches or analogies to take leaps that sometimes lead to distant, but higher peaks.

Early hopes for AI programs were high, but after several decades of effort, the programs “turned out to be of limited use and didn’t exhibit anything close to generalized intelligence” (Hawkins & Blakeslee, 2004, p. 17). The algorithms used in AI and used to analyze the currently popular “big data” do not tell us what data to collect and ignore issues for which data are hard to collect (Peysakhovich & Stephens-Davidowitz, 2015, pp. 6-7).

The poster child of successful AI is IBM’s Deep Blue supercomputer, which beat Garry Kasparov in chess and won a Jeopardy competition with humans. Tomaso Poggio, a leading expert on AI and the director of MIT’s Center for Brains, Minds and Machines, has observed that “these recent achievements have, ironically, underscored the limitations of computer science and artificial intelligence” (Poggio as quoted in Isaacson, 2014, p. 471). He goes on to reach the key conclusion: “We do not yet understand how the brain gives rise to intelligence, nor do we know how to build machines that are as broadly intelligent as we are” (Poggio as quoted in Isaacson, 2014, p. 471).

Accepting a harder challenge than chess or Jeopardy, in 2016 Google's AlphaGo AI program beat one of the best human players at the more complex Chinese game of Go. But AlphaGo only made progress after humans programmed a metric for it that measured how much territory AlphaGo had protected from the human player. Without such a metric, machine-learning algorithms have no way to judge improved performance, and in real life such metrics often do not exist (Hernandez, 2017). John Giannandrea, Google's chief of AI until he was hired by Apple in April 2018, says he sees "no technological basis" for the "assumption that we will leap to some kind of superintelligent system that will then make humans obsolete" (Giannandrea as quoted in Nicas & Metz, 2018, p. B3).

Collaborators More Than Competitors

It is illuminating that even though IBM's supercomputer Deep Blue beat chess grandmaster Garry Kasparov, Kasparov got his revenge. In a tournament that allowed human-only players, computer-only players, and human-computer collaboration players, the consistent winners were the human-computer collaborators, even when the collaboration consisted of humans who were far from being grandmasters and computers that were far from being super (Brynjolfsson & McAfee, 2014; see also Thompson, 2013; Isaacson, 2014). PayPal fighting fraud, and later Palantir fighting terrorism, used a similar approach, combining an algorithm with human analysts (Thiel & Masters, 2014). As with chess, the symbiotic approach was more successful than either computers or humans on their own. In the future, an even closer symbiosis may be possible, if current efforts succeed for humans to control computers by having their brains more directly connected to the computers (theoretical physicist Michio Kaku as quoted in Murphy, 2014, p. 2; see also Nicolelis, 2011).

Ken Goldberg, Berkeley robot expert, suggests that the value of intelligent machines will be in collaboration with humans, not competition with them (Markoff, 2015). Many other experts on computers, software, computability, and neuroscience, agree with Goldberg, including J. C. R. Licklider (1960, *passim*), Barry Cooper (Cooper as quoted in Mims, 2014, p. B4), Nicholas Carr (Carr, 2015), Walter Isaacson (Isaacson, 2014), and Peter Thiel (Thiel & Masters, 2014). Nobel Prize winner Robert Shiller has personally experienced the complementarity between computers and humans, through his work on an online finance course at Yale (Shiller, 2015). Although productivity in 60% of occupations can be improved by some degree of automation, this complementarity between computers and humans explains why only less than 5% of occupations are at any risk of complete automation (McKinsey report as summarized in Weber, 2017; see also Goodman, 2017).

But assume for a moment that robots develop further and faster than the preceding discussion strongly suggests, to the point where robots can do everything better than humans. Even in that case, as Nobel Prize winner Herbert Simon first pointed out, though robots might have an absolute advantage in all tasks, they would only have a comparative advantage in some tasks, leaving humans with a comparative advantage in other tasks (Simon, 1960; see also: Cowen, 2014; Langlois, 2003; Levy & Murnane, 2004a; 2004b). So the economists' tried-and-true Law of Comparative Advantage implies that humans would continue to be employed in those tasks where they had a comparative advantage.

Conclusion

Drilling deep into the capabilities and motives of humans and robots, reassures us that humans are not in danger of being substantially replaced by robots. At first glance, this conclusion seems at odds with recent unpublished stylized econometric analysis that suggests that automation reduces the share of output attributable to labor (Autor & Salomons, 2018). Future research can

explore whether the reason for the decline in labor's share, is that growing government regulations have reduced the productivity of humans more than they have reduced the productivity of robots and computers. Although awaiting that future research, it is at least reassuring that the Autor and Salomons' working paper also found that an increase in automation does *not* increase unemployment (Autor & Salomons, 2018).

Instead of advocating less regulation of labor, some have advocated more regulation of robots and computers. Elon Musk famously predicted that "robots will be able to do everything better than us" (as quoted in Clifford, 2017) and warned that government needs to regulate AI "before it's too late" (as quoted in Breland, 2017). And yet when he tried to extend the reach of robots to the final assembly of his Tesla Model 3 cars, he was only able to build far less than half of the cars per week that he had promised. Later, in an April 2018 tweet, Musk admitted "yes, excessive automation at Tesla was a mistake . . . Humans are underrated" (as quoted in Wilkes, 2018, p. A8).

When a robot killed an assembly line worker in Germany in June 2015, it was not from Terminator-like intent, but from an inability to distinguish between inert metal and human flesh (Max Tegmark as quoted by Hardy, 2015, p. B6). The greater danger usually is not AI, but artificial stupidity (paraphrase of MIT physics Professor Max Tegmark as quoted in Hardy, 2015, p. B6).

In the short-to-medium term, the limitations of AI and robots are varied and substantial enough to allay fears that they pose a large labor market threat to humans. In the much longer term, say into the 22nd century, the robotic future is much less knowable (Thiel & Masters, 2014), and not everyone will allow themselves to be reassured by Herbert Simon's clever application of the economists' Law of Comparative Advantage. But what should most strongly reassure us is that in the past, when we have allowed ourselves to be entrepreneurial, humans have been inventive and resilient at adapting to new unexpected challenges. As entrepreneur Kevin Ashton says, the solution to a technological problem, is new and better technology (Ashton, 2015).

Some argue that in the face of the unknown, it is prudent to adopt a regulatory "precautionary principle" that bans an innovation unless it can be proven that the innovation will cause no harm. But if we had adopted such a principle in the past, we would never have developed steamboats, airplanes, or vaccines (Sunstein, 2005; see also Thierer, 2016). And if we now allow ourselves to be mesmerized by long-term robot fears, then we will hobble current efforts to achieve those possible, wonderfully enabling machines that can help us to know more, go further, and live longer, more interesting lives.

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ORCID iD

Arthur M. Diamond  <https://orcid.org/0000-0002-6428-3666>

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Author Biography

Arthur M. Diamond Jr. is a professor of economics at the University of Nebraska Omaha. His *Openness to Creative Destruction: Sustaining Innovative Dynamism* is forthcoming with Oxford University Press. He has published many journal articles on issues in labor economics, history of economic thought, economics of technology, and economics of entrepreneurship.