

ARTIFICIAL INTELLIGENCE: DISCERNING A CHRISTIAN RESPONSE

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Schuurman's essay is intended as an invitation. Readers are encouraged to take up one of the insights or questions, or maybe a related one that was not mentioned, and draft an article (typically about 5,000-8,000 words) that contributes to the conversation. These can be sent to Dr. Schuurman at dschuurman@calvin.edu. He will send the best essays on to peer review and then we will select from those for publication in an Artificial Intelligence theme issue of *Perspectives on Science and Christian Faith*.

The lead editorial in the December 2013 issue of *PSCF* outlines what the journal looks for in article contributions.

For best consideration for inclusion in the theme issue, manuscripts should be received electronically before 31 August 2018.

Looking forward to your contributions,

James C. Peterson, editor-in-chief
Perspectives on Science and Christian Faith

Artificial Intelligence: Discerning a Christian Response

by Derek C. Schuurman, Professor of Computer Science, Calvin College

The movie *Wall-E* is an entertaining tale of a dystopian future of robots, automation and humanity. A polluted earth is left abandoned except for robots like the charming title character *Wall-E*, who are left to clean up the mess. Humans have fled the planet, coddled aboard a massive ark-like spaceship where automated systems take care of their every need. It is striking that the most human-like characters in the movie are the two main robot characters while the human characters are portrayed as obese, feeble and passive, shuttled about in reclining chairs, consuming beverages while perpetually entertained by personal screens. At the climax of the movie the ship's captain valiantly struggles to stand and, unaccustomed to walking, waddles over to the main control panel to wrestle control back from the automated ship. The tension in this climatic moment is driven by one question: will humanity take back control from technology?

For many decades there have been many optimistic predictions about the capabilities of AI (Artificial Intelligence) which have consistently fallen short of expectations. In 1958 Frank Rosenblatt pioneered modeling neurons using simple networks called "perceptrons" which could be trained to classify data.

Later, the pioneering AI researchers Marvin Minsky and Seymour Papert published an influential book titled *Perceptrons* which identified challenges with single layer perceptrons and were skeptical about multi-layer perceptrons. They wrote, “Perceptrons have been widely publicized as 'pattern recognition' or 'learning machines' and as such have been discussed in a large number of books, journal articles, and voluminous 'reports'. Most of this writing ... is without scientific value.”ⁱ As a result, work in this area diminished greatly through the 1970’s during an era sometimes referred to as an “AI winter.” However, interest in multi-layer perceptrons was reignited in the mid 1980’s after some breakthrough papers were published demonstrating how they could be made effective by employing specialized training algorithms (using back-propagation learning algorithms, a form of gradient descent).ⁱⁱ These techniques have since been further refined, and combined with advances in computing power, have led to so-called “deep-learning” methods.ⁱⁱⁱ

Deep learning uses many layers of perceptrons which can be trained using special techniques (such as backpropagation or gradient descent). Deep learning is an approach to machine learning, a field which involves training computers to “learn” patterns without being explicitly programmed for those patterns. The training process will typically employ a labelled set of example training data (in a process called “supervised learning”). Alternately, training can also be performed using a set of unlabeled input data which is then processed to uncover patterns and structures (a process referred to as “unsupervised learning”).

AI techniques employing “deep learning” have recently achieved remarkable strides in tackling more difficult problems. A research team at Google demonstrated these techniques by developing a system that was trained to play the game Go by playing games against itself, eventually surpassing even the best human players.^{iv} Google has recently released its machine learning library, TensorFlow, under an open source license spurring applications in many new areas.^v These tools are not just solving puzzles in the laboratory. They are now being directed towards a plethora of difficult practical problems that traditionally have been beyond the capabilities of prior AI systems. For instance, these systems are showing great promise in diagnosing certain diseases and analyzing medical images, even outperforming human doctors in some tasks.^{vi,vii} The rise of autonomous vehicles is another emerging area where deep-learning has made remarkable progress.

As a book review editor for *PSCF* on topics relating to technology, I have been astounded at the sheer number of books that have been released in recent years about issues surrounding AI and robotics (several of which have been reviewed in these pages). These books include titles such as *Technology vs. Humanity: The Coming Clash between Man and Machine*, *In Our Own Image: Savior or Destroyer? The History and Future of Artificial Intelligence*, and *The Glass Cage: Automation and Us*. Some of these books take an optimistic stance, some are more circumspect, while others paint a darker picture.

Some have suggested that the advance of technology and AI will eventually solve all our problems. The term *technicism* is a word that has been coined to refer to the faith in technology as savior or rescuer of the human condition.^{viii} A recent book titled *Infinite Progress* includes the subtitle: “How technology will ultimately solve ignorance, disease, poverty, hunger, and war.”^{ix} This is essentially a form of idolatry, replacing a trust in the creator with technology. In fact, this trust becomes explicit in the case of the “Way of the Future,” a religious group founded by Anthony Levandowski, a former Google and Uber engineer who is working to “develop and promote the realization of a Godhead based on Artificial Intelligence” and that “through understanding and worship of the Godhead, [to] contribute to the betterment of society.”^x The transhumanist Zoltan Istvan suggests that this new AI deity “will actually exist and hopefully will do things for us.”^{xi} This is essentially a form of idolatry, replacing a

trust in the creator with technology. These sentiments are explicit examples of an observation made by the writer David Noble that “the technological enterprise has been and remains suffused with religious belief.”^{xii} Everyone has a worldview which in turn informs a set of beliefs that shape our conception of reality. Nicholas Wolterstorff suggests it is these “control beliefs” that enable us to commit to a particular theory.^{xiii} These beliefs are also active in our technical work, including the theories related to research in AI (whether explicitly stated or not).

Some engineers and computer scientists believe that technology will even solve the problem of death. According to David Pearce, cofounder of an organization called humanity+ : “If we want to live in paradise, we will have to engineer it ourselves. If we want eternal life, then we’ll need to rewrite our bug-ridden genetic code and become god-like ... only hi-tech solutions can ever eradicate suffering from the world.”^{xiv} Ray Kurzweil, an accomplished computer scientist and author of *The Age of Spiritual Machines*, has suggested that within the present century we will be able to upload our brain into a computer and live forever, free from the limitations of our mortal bodies. This idea has been coined the “rapture of the geeks” and Kurzweil writes, “We don’t always need real bodies. If we happen to be in a virtual environment, then a virtual body will do just fine.”^{xv} David F. Noble observes that “Artificial Intelligence advocates wax eloquent about the possibilities of machine based immortality and resurrection, and their disciples, the architects of virtual reality and cyberspace, exult in their expectation of God-like omnipresence and disembodied perfection.”^{xvi} Psalm 115 states that the makers of idols will become like them, and in the case of the “rapture of the geeks,” the end goal is to literally become software in a computer.

But not everyone shares an optimistic view of the future of AI, and warnings about the dark side of AI can be found in the recent headlines. Stephen Hawking has warned that “The development of full artificial intelligence could spell the end of the human race” and Elon Musk has called AI “our biggest existential threat.” In 2015, an open letter signed by many AI researchers, along with Musk and Hawking, urged that research priorities be made to ensure the beneficial use of AI.^{xvii} The concerns over AI range from the short term risks of putting people out of work to the more dystopian visions of a world where machines turn on their human creators.

The pessimistic view of a dystopian future is frequently portrayed in sci-fi movies. Movies like *The Matrix*, *Terminator*, and *BattleStar Gallactica* paint a picture of a dark future where technology turns on humanity. Other movies and TV shows that have narratives based on the existential threat of Artificial Intelligence (AI) and robotics include *Ex Machina*, *Westworld*, *Blade Runner*, and *I-Robot*. These stories portray different variations on the “Frankenstein narrative” in which technology turns on its human creators and threatens their existence. Many of these shows and movies, including the more recent sequel, *Blade Runner 2049*, raise profound questions about what it means to be human, exploring questions of identity, existence, free will, and how we are distinct from our machines. These cultural stories contribute to a social imaginary about the role and future of technology in our society.

While these threats may seem far-fetched, the more immediate concern is the loss of jobs due to AI, robots, and automation. In the early 2000’s I was doing my graduate studies in the area of computer vision. At the time, I recall thinking that self-driving cars were unlikely to be feasible due to the challenges of real-time vision systems in unstructured environments. However, within a short decade, autonomous vehicles were successfully demonstrated. In the near term, autonomous vehicles are likely to disrupt the labor market, potentially displacing millions of jobs in driving professions. One paper published by researchers from Oxford University predicts that 47 percent of U.S. jobs are at risk of being replaced by AI technologies and computerization.^{xviii} Other sources, such as the Organization for Economic Cooperation and Development (OECD) predict that only 9 percent of jobs are at high risk of

being completely displaced, while many others will change significantly due to automation.^{xix} The issue of job losses due to robots and automation was also the topic of a recent *Christianity Today* article titled “How to Find Hope in the Humanless Economy.”^{xx} Still, some dismiss the threats of a “jobless future,” pointing back to automation already in the early 19th century when the “Luddites” smashed automated weaving machines out of fear for their jobs. They point to the advance of technology throughout the 20th century, and how employment continued to grow. But a growing number of voices are warning that the remarkable success of AI and deep-learning threatens to automate many tasks, including many white collar jobs.

Some might suggest that these technological changes are inevitable, and we must accept the mantra of the Borg on *Star Trek*: “resistance is futile.” However, we must reject a sense of technological determinism, the notion that technology is an autonomous force beyond our control. The famous media theorist Marshall McLuhan suggested that the way to begin is to stand back and scrutinize what technology and media are doing. He likened the forces of media and technology to the swirling storm depicted in Edgar Allen Poe’s “A Descent into the Maelstrom.” In this story, a sailor caught in the swirling vortex of a storm saves himself by carefully observing the behavior of the winds and currents around him. Like the sailor, McLuhan suggests that we need to observe and discern the forces of a changing world to ponder its effects and wisely chart a safe course. “Nothing is inevitable if we are willing to contemplate what is happening.”^{xxi}

In one of his talks, Neil Postman suggested six helpful questions one might ask when thinking about the impact of technology.^{xxii} Adapting these questions to the area of AI yields the following questions:

- What is the problem to which AI is a solution?
- Whose problem is AI solving?
- What problems will AI create even as it solves a problem?
- What people or institutions will be hurt by AI?
- What changes in language are being forced by AI?
- What sort of people and institutions gain special economic and political power through AI?

These six questions are helpful because they force us to consider more issues than just technical ones, helping us uncover some of the biases embedded in a particular technology. By answering these questions it becomes abundantly clear that AI is not just changing the economics of the labor market. The reality is that technology is not neutral, it has a bias and it changes things.^{xxiii} In his book, *Technopoly*, Neil Postman argues that “embedded in every tool is an ideological bias, a predisposition to construct the world as one thing rather than another, to value one thing over another, to amplify one sense or skill or attitude more loudly than another.”^{xxiv} A recent book titled *Weapons of Math Destruction* (previously reviewed in *PSCF*) makes the case that even our mathematical algorithms are not neutral.^{xxv} As we develop AI we must recognize that “we shape our tools and thereafter they shape us.”^{xxvi}

One helpful way to “contemplate what is happening” is to carefully consider the philosophical issues that arise. Many of the basic philosophical questions that arise in AI go back a long time and occupied the minds of philosophers. In the seventeenth century Thomas Hobbes suggested that “cognition is computation” and later Descartes described human beings as “thinking things.” In the mid 20th century, the pioneering computer scientist, Alan Turing, thought about the notion of “thinking machines” and even proposed a test for them (something now referred to as the “Turing Test”).^{xxvii} The questions that frequently arise in AI cover the range of philosophical questions: what is really real? (ontology), how

do I know it? (epistemology), what is right and good? (ethics), and what does it mean to be human? (philosophical anthropology).

The approach one takes to questions in AI is largely shaped by our philosophical presuppositions and our worldview. For instance, it has been suggested that Japan's enthusiastic embrace of robotics can be traced to a culture influenced by Shintoism, a religion that accepts that all things, including inanimate objects, can possess living spirits.^{xxxviii} Another worldview is materialism, the belief that the physical world is all there is. This worldview leads to physicalism, "the philosophy that the human mind is fully explainable with reference only to the biological brain and the laws of physics and chemistry."^{xxxix} A physicalist view of what it means to be human has a variety of significant implications. Matthew Dickerson has provided an insightful and comprehensive critique of a physicalist view in his book, *The Mind and the Machine*. In this book he pushes physicalism to its logical conclusions and shows the troubling implications for free will, creativity, environmental care, and reason.^{xxx}

Some materialists suggest that everything in the real world can be described in terms of computation. Stephen Wolfram, a computer scientist and mathematician, wrote a book titled *A New Kind of Science*, in which he considers the world in terms of computation. Wolfram introduces the "Principle of Computational Equivalence" which suggests that "all processes, whether they are produced by human effort or occur spontaneously in nature, can be viewed as computation."^{xxxxi} One recent theory attempts to explain consciousness in terms of integrated information.^{xxxii} Others have gone even further, musing that the world is a simulation like the one portrayed in the movie *The Matrix*. In his article, "God is the Machine," writer Kevin Kelly explores the idea that everything is essentially a simulation citing those who would suggest the universe is a computer and we are the "killer app."^{xxxiii} Gnosticism, a heresy that once plagued the early church, becomes more fashionable as physical reality is reduced to information.

It has also been suggested that developments in AI will disrupt religions, including Christianity. *Atlantic Magazine* recently published an article with the provocative title, "Is AI a Threat to Christianity?"^{xxxiv} The article brings up a variety of challenges posed by AI by presupposing that intelligent artificial persons are, in fact, possible. Various questions are raised: will machines have the ability to pray (and would God hear those prayers), would an A.I. have a soul, and should Christians seek to evangelize this new technology?

This leads to the question of how a Christian philosophical perspective and worldview might help inform and guide us as we navigate the world of AI. There are many epistemological issues relating to how knowledge is represented in a computer and techniques for machine learning. But perhaps a better starting place is to begin with the ontological issues. In the words of theologian Craig Bartholomew, "We *should* start with ontology – this is our Father's world, and we are creatures made in his image – and then move on to epistemology – as his creatures, how do we go about knowing this world truly."^{xxxv} I think this is helpful advice as we start to explore AI since it is the ontological questions that will help us discern what separates humans from machines.^{xxxvi} We are often captivated by what things can *do*, rather than asking what things *are*. Once we have established the ontological question of who we are and what machines are, we can start asking the questions about the best way to move forward, including questions about the appropriate use of AI.

A Christian worldview recognizes the ontological reality of creation and the value of physical reality. Christ who is "the Word who became flesh" (1 John 3:2) reveals the value God places on physicality and humanity. In the new heavens and earth we will not be disembodied spirits floating in the ether, but in the words of the Apostle's creed, we look forward to the "resurrection of the body and the life

everlasting.”^{xxxvii} A Christian perspective accounts for reality as extending beyond the physical world to include a spiritual realm. This ontological starting point will reject the reductionistic notion that humans are simply complex biochemical machines, while still affirming the value of the physical world.

Engaging with the implications of AI has been raised in previous issues of *PSCF*. In 2008, Russell Bjork wrote an article in this same journal titled “Artificial Intelligence and the Soul” in which he identified three key issues:^{xxxviii}

1. Is there a conflict between AI and biblical teaching about the origin of the human soul?
2. Is there a conflict between AI and biblical teaching about human worth and our being created in the image of God?
3. Does biblical teaching about personhood have any implications for our work in AI?

These are ontological questions that are just as relevant 10 years after that article was written. Without a biblically informed ontological grounding, we are susceptible to all kinds of philosophical pitfalls like physicalism, functionalism, reductionism, and gnosticism. But much more work remains to be done exploring what 2000 years of Christian social thought have to say about modern robots and AI.

Once the ontological questions are addressed, we must then wrestle with the vast array of ethical issues that arise. These include questions about the appropriate application of AI and robotics. A small sample of these issues include the following:

- When an autonomous vehicle crashes, who is responsible? (this harkens to the “trolley problem,” a classic thought experiment in philosophy).^{xxxix}
- Should lethal autonomous robots be permitted in warfare?^{xl}
- How do we approach automation and possible job loss?^{xli}
- Should we support efforts to develop “artificial persons” or machines that mimic humans or animals?
- Are social robots appropriate, and if so, how ought they to be used?^{xlii}
- Should we use robots for child and elder care?^{xliii}
- How do we navigate the privacy, transparency, and justice issues that arise as AI is applied to big data?^{xliv}
- How do we show care for those whose jobs are threatened by automation?^{xlv}

These are just some of the areas where ethical issues arise in the use of AI. We will find a way forward not by asking what technology allows us to do; rather, by starting with ontological questions about who we are and what role technology ought to play. In the words of the early AI pioneer, Joseph Weizenbaum, “there are limits to what computers ought to be put to do.”^{xlvi} In his book, *Humans are Underrated*, Geoff Colvin suggests asking the following question: “What are the activities that we humans, driven by our deepest nature or by the realities of daily life, will simply insist be performed by other humans, regardless of what computers can do?”^{xlvii}

On the other side of the coin, can we imagine some possibilities that AI might open up which can lead to further flourishing? Can AI be responsibly employed in medicine, in research, and environmental monitoring? In what ways can AI be harnessed to assist in Bible translation, to help in humanitarian relief, and search and rescue operations? What new assistive technologies might be possible to help people with disabilities? What other creational possibilities might be uncovered and applied in normative ways?

Fred Brooks, a respected computer scientist and Christian, wrote “It is time to recognize that the original goals of AI were not merely extremely difficult, they were goals that, although glamorous and motivating, *sent the discipline off in the wrong direction*.”^{xlvi} Our call is to help point the discipline in the right direction and help discern a responsible road forward in obedience to God. Left on its own, AI will likely veer in the wrong direction, putting efficiency ahead of people. This approach is what Jacques Ellul called *technique*, the mindset that seeks “absolute efficiency in every field of human activity.”^{xlix} A related tendency is for technology and automation to concentrate power into the hands of fewer people, corporations, and nations. We should heed the warning of C.S. Lewis in *Abolition of Man* where he warns that “Man’s power over Nature” can become “a power exercised by some men over other men with Nature as its instrument.”^l

In response to the many ethical issues that arise in AI, several organizations have been established to engage them. The Future of Humanity Institute at Oxford University is an example of one secular organization whose mission is to wrestle with some of existential threats of machine intelligence.^{li} Another group called the “AI Now Institute” was established “to explore how AI is affecting society at large ... bridging the gap between data scientists, lawyers, sociologists, and economists studying the implementation of artificial intelligence.”^{lii} Likewise, the MIT Media Lab and Harvard University are participating in a global initiative to fund and advance AI research for the public good.^{liii} The IEEE has also established a working group focused on Ethically Aligned Design for autonomous systems and AI.^{liv} In 2016, the United Nations announced it would establish a Centre for Artificial Intelligence and Robotics in The Hague, the Netherlands to provide an international resource dealing with issues related to AI and robotics.^{lv}

As Christians who care about God’s world, we must do more than wax eloquently about the issues or critique them from the sidelines. We need to answer the question, knowing what we know, what will we do?^{lvi} We need to actively join this conversation which has already begun, bringing insights from Scripture and from Christian philosophy and theology to contribute to the common good. In particular, as we wrestle with these new developments, we must remember what Scripture teaches about what it means to be human, the meaning of work, and the kind of world God would have us unfold.

The third Lausanne Congress on World Evangelization took place in 2010 in Cape Town and highlighted the need for “taking the whole gospel to the whole world,” including the area of technology. *The Cape Town Commitment* that came out of the Lausanne congress includes a “call to action” section that specifically identifies technology (and specifically mentions emerging technologies such as AI) as having “deep implications for the Church and its mission, particularly in relation to the biblical truth of what it means to be human.” It encourages us to “promote authentically Christian responses and practical action in the area of public policies, to ensure that technology is used not to manipulate, distort and destroy, but to preserve and better fulfil our humanness.”^{lvii} Among the recommendations is a call for “national or regional ‘think tanks’ or partnerships to engage with new technologies, and to speak into the shaping of public policy with a voice that is biblical and relevant.”^{lviii} The Christian faith shapes a worldview, one that points to norms that inform ethical considerations, which, in turn, can help give shape to policies and regulations.^{lix}

The rapid pace of change adds an additional degree of urgency to this call to engage. In the words of Roy Amara, who helped found the Institute for the Future and coined Amara’s Law: “We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.” At the end of the movie *Wall-E*, the human captain wrestles in the control room to seize control back from the automated system. Likewise, the future of AI is neither inevitable nor unstoppable. However,

Christians will need to join the dialog and be prepared to carry out our responsibility as we unfold these powerful new technologies.

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