

Introduction: Artificial Intelligence and the Law

The rise of powerful AI will be either the best or the worst thing ever to happen to humanity. We don't yet know which.

– Stephen Hawking

Artificial intelligence (AI) is doing more than ever before, and often doing it cheaper, faster, and better than people are. In 2017, the company DeepMind developed an AI, AlphaGo Master, that beat the world champion of the board game Go. Many experts had predicted AI's Go dominance would take another decade given the game's complexity. There are more possible board configurations in Go than there are atoms in the universe. Later in 2017, a revised version of AlphaGo, AlphaGo Zero, beat AlphaGo Master one hundred games to zero. It did this after training for just three days by playing against itself. Unlike its predecessors, AlphaGo Zero never learned from human examples.

Go was the last traditional board game at which people could outperform machines. There is now an entire field of activity at which AI dramatically surpasses people. While AlphaGo's victory was an exciting technical landmark, it has had limited social impact because playing board games is not the most practical endeavor. But they are one of the oldest measures of machine intelligence, and AI's ascendancy hints that it may soon automate a broader range of tasks, perhaps sooner than many anticipate, and it may do so in spectacular fashion.

Alphabet, which owns DeepMind, is not investing in AI to dominate the field for competitive board games. In principle, if an AI can be trained to recognize patterns in Go, then it can be trained to recognize pneumonia in an X-ray or pedestrians on a road. Indeed, DeepMind is already being applied to solve practical challenges. In 2018, DeepMind's AI AlphaFold outperformed all of its ninety-eight competitors in a challenge aimed at predicting the three-dimensional structure of proteins – a task critical to drug discovery. Unlike playing Go, predicting protein folding is an important, common, and real-life scientific problem. Similarly, again in 2018, researchers found that another DeepMind AI correctly referred patients with more than fifty

distinct eye diseases for specialist care in 94 percent of cases, matching the performance of expert clinicians. In 2019, DeepMind AI was able to consistently predict development of acute kidney failure forty-eight hours earlier than human physicians, which could ultimately prevent around 30 percent of cases from ever occurring.

The future social impact of these advances will be tremendous. Already, impressive-sounding era titles such as the Fourth Industrial Revolution, the Second Machine Age, and the Automation Revolution are being used to describe the coming disruption. Among other things, AI is predicted to generate a massive amount of wealth by changing the future of work. This has long been the experience with AI's automating physical work, such as in automobile manufacturing, but AI is now moving into automating mental work, and not only relatively simple service activities like operating a cash register at McDonald's. AI is completing tasks performed by doctors, lawyers, and scientists.

IBM's flagship AI Watson, which famously won a game of *Jeopardy!* in 2011, works in a range of fields. In health care, Watson (now a brand comprised of a variety of AI systems) analyzes the genetics of cancer patients to help select appropriate drug treatments, a task that a group of human experts can also do but which remains a complex and demanding activity. For some patients, it can require around 160 collective work hours by a team of highly trained health care providers. By contrast, a 2017 study reports that Watson can outperform the standard practice and that it only requires about 10 minutes to do so,¹ although Watson's performance has proven controversial.²

Several companies claim their AI can already outdo human doctors in certain areas of medical practice. This is not surprising. Machines are able to memorize every bit of medical literature ever created and process practice experience from countless human lifetimes. Plus, they never need a rest break. In 2017, a Chinese company reported its robot Xiao Yi took and passed, by a wide margin, the National Medical Licensing Examination, the test required to become a medical doctor in China. Xiao Yi knows the contents of dozens of medical textbooks, millions of medical records, and hundreds of thousands of articles, but to pass the test it also had to learn, reason, and make judgments by itself. Researchers at IBM have even reported that Watson quietly passed the equivalent exam in the United States after being prohibited from formally taking it.

Of course, just passing tests does not make someone, or something, a doctor. Once AI is consistently better than a doctor at diagnosing certain diseases, managing prescriptions, or performing surgeries, AI is still unlikely to completely automate medical care. But these developments suggest that there are already aspects of medical care susceptible to automation, and that fewer doctors will be needed once there are more efficient doctors augmented by AI.

1 AI LEGAL NEUTRALITY

The law plays a critical role in the use and development of AI. Laws establish binding rules and standards of behavior to ensure social well-being and protect

individual rights, and they can help us realize the benefits of AI while minimizing its risks – which are significant. AI has been involved in flash crashes in the stock market, cybercrime, and social and political manipulation. Famous technologists like Elon Musk and academics like Stephen Hawking have even argued that AI may doom the human race. Most concerns, however, focus on nearer-term and more practical problems such as technological unemployment, discrimination, and safety.

Although the risks and benefits of AI are widely acknowledged, there is little consensus about how best to regulate AI and jurisdictions around the world are grappling with what actions to take. Already, there is significant international division regarding the extent to which AI can be used in state surveillance of its residents, whether companies or consumers “own” personal data vital to AI development, and when individuals have a right to an explanation for decisions made by AI (ranging from credit approval to criminal sentencing).

It is tempting to hope that AI will fit seamlessly into existing rules, but laws designed to regulate the behavior of human actors often have unintended and negative consequences once machines start acting like people. Despite this, AI-centric laws have been slow to develop, due in part to a concern that an overly burdensome regulatory environment would deter innovation. Yet AI is already subject to regulations that may have been created decades ago to deal with issues like privacy, security, and unfair competition. What is needed is not necessarily more or less law but the right law.

In 1925, Judge Benjamin Cardozo admonished a graduating law school class that “the new generations bring with them their new problems which call for new rules, to be patterned, indeed, after the rules of the past, and yet adapted to the needs and justice of another day and hour.”³ This is the case for AI, even if it only differs in degree from other disruptive technologies like personal computers and the Internet. A legal regime optimized for AI is even more important if AI turns out to be different in kind.

There is not likely to be a single legal change, such as granting AI legal personality similar to a corporation, that will solve matters in every area of the law, which is why it is necessary to do the difficult work of thinking through the implications of AI in different settings. In this respect, it is promising that there have been efforts in recent years to articulate policy standards or best principles such as trustworthiness and sustainability specifically for AI regulation by governments, think tanks, and industry. For example, the Organisation for Economic Co-operation and Development (OECD) adopted Principles on Artificial Intelligence in May 2019,⁴ and one month later the G20 adopted human-centered AI principles guided by those outlined by the OECD.⁵

The central thesis of this book contends that there needs to be a new guiding tenet to AI regulation, a principle of *AI legal neutrality* asserting that the law should not discriminate between AI and human behavior. Currently, the legal system is not

neutral. An AI that is significantly safer than a person may be the best choice for driving a vehicle, but existing laws may prohibit driverless vehicles. A person may be a better choice for manufacturing goods, but a business may automate because it saves on taxes. AI may be better at generating certain types of innovation, but businesses may not want to use AI if this restricts ownership of intellectual property rights. In all these instances, neutral legal treatment would ultimately benefit human well-being by helping the law better achieve its underlying policy goals.

AI can behave like a person, but it is not like a person. Differences between AI and people will occasionally require differential rules. The most important difference is that AI, which lacks humanlike consciousness and interests, does not morally deserve rights, so treating AI as if it does should only be justified if this would benefit people. An example of this would be if autonomous vehicles needed to directly hold insurance policies or other forms of security to cover potential injury to pedestrians. This is essentially the rationale for corporations' being allowed to enter into contracts and own property. Their legal rights exist only to improve the efficiency of human activities such as commerce and entrepreneurship, and like AI corporations do not morally deserve rights. They are a member of our legal community but not our moral community.

Consequently, this book does not advocate for AI's having rights or legal personhood. Nor is a principle of AI legal neutrality a moral principle of nondiscrimination in the way that term is traditionally used. Antidiscrimination laws have helped improve conditions for historically marginalized groups, primarily as a matter of fairness. However, antidiscrimination laws can also promote competition and efficiency.

Certainly, AI legal neutrality should not be the driving force behind every decision. It should not come at the expense of other principles such as transparency and accountability. A person may be more efficient at mining minerals in hazardous conditions, but automation could be preferable based on safety considerations. An AI may be more efficient at identifying and eliminating military targets, but there could be other reasons not to delegate life and death decisions to an AI.

Rather than a dispositive policymaking principle, AI legal neutrality is an appropriate default that may be departed from when there are good reasons for so doing. This book examines how such a principle would impact four areas of the law – tax, tort, intellectual property, and criminal – and argues that as AI increasingly occupies roles once reserved for people, AI will need to be treated more like people, and sometimes people will need to be treated more like AI.

2 TAX

Automation involves much more than putting people out of work, what economist John Maynard Keynes terms “technological unemployment,” but it is one of the things people are most concerned about. Today, this is a frequent topic of scholarship

on labor markets, some that predicts long-term technological unemployment and some that does not. It is also an old concern. The Luddites, a group of English workers, were opposed to automation's eliminating jobs, periodically destroying machinery in acts of protest during the First Industrial Revolution. History has shown their fears were misplaced, at least in regard to concerns about long-term unemployment. In the end, the machines resulted not just in vast gains in productivity but also in more jobs for everyone, and ever since new technologies have consistently resulted in overall job creation. Steam engines, electrical power, and personal computers all eliminated jobs, but they created more jobs than they eliminated.

At the turn of the twentieth century, some 40 percent of the US workforce was employed in agriculture. Now, less than 2 percent of the workforce works in agriculture. This has not translated to a 38 percent increase in unemployment. In fact, even as agriculture-based employment and agriculture's relative contribution to the economy have decreased, the productivity of farmworkers has skyrocketed and agriculture's absolute contribution to the economy has increased.

For the Fourth Industrial Revolution, history's repeating itself may not be so bad. Despite some naysaying, the risks of automation may be overstated and again result in long-term employment gains. Nevertheless, the First Industrial Revolution was accompanied by decades of pervasive social unrest, widening income disparities, and individual suffering. A proactive regulatory approach should allow us to make the most of automation while limiting some of its harmful effects – all the more important if AI results in a new type of industrial revolution with permanently increased long-term unemployment.

But for all the debate about AI's putting people out of work, it turns out this may occur for a very surprising reason. Tax laws treat people and automation technologies differently even when they are performing the same tasks. For instance, automation allows businesses to avoid employee and employer wage taxes. So, if a chatbot costs Sephora the same or even a bit more before taxes than an employee who does the same job, it actually costs the company less to automate after taxes.

In addition to avoiding wage taxes, businesses can accelerate tax deductions for some AI when it has a physical component or falls under certain exceptions for software – but not for human workers. In other words, employers can claim a large portion of the cost of some AI up-front as a tax deduction, which may be more valuable to some large companies than delaying wage expenses over time. Finally, employers also receive a variety of indirect tax incentives to automate. In short, our tax laws keep people and AI from competing on their merits. While the system was not designed to do this, it does primarily tax labor rather than capital. This has had the unintended effect of inefficiently incentivizing automation, since AI has been assuming the role of both the capital and the labor.

What is more concerning is that AI does not pay taxes! This sounds ridiculous, but income and employment taxes are the largest sources of revenue for the government, together accounting for almost 90 percent of total federal tax revenue. By contrast,

business income taxes generate less than 8 percent of federal revenue. Under the 2017 Tax Cuts and Jobs Act, the statutory corporate tax rate was cut to 21 percent, and corporate tax revenue has been trending sharply downward. Whatever the statutory rate, the effective corporate tax rate – what companies pay after taking tax breaks into account – is substantially less.

In 2018, the S&P 500 annual tax rate, which refers to 500 large companies that have common stock listed on one of the three major US stock exchanges, was less than 18 percent.⁶ However, this includes all taxes from the federal and state levels as well as from foreign authorities. Amazon drew unwanted attention that year by reporting a US pretax profit of \$11.2 billion together with a negative tax bill of \$129 million.⁷ Amazon's total effective tax rate for 2018 was 11 percent including foreign, state, and deferred taxes.

So, AI does not pay income taxes or generate employment taxes. It does not purchase goods and services, so it is not charged sales taxes. It does not purchase or own property, so it does not pay property taxes. AI is simply not a taxpayer, at least not to the same extent as a human worker. If all work were to be automated tomorrow, most of the tax base would immediately disappear. What happens is that when businesses automate, the government loses revenue – potentially hundreds of billions of dollars in the aggregate. This may be enough to significantly constrain the government's ability to pay for things like social security, national defense, and health care. In the long run, the revenue loss should balance out if people rendered unemployed eventually return to similar types of work, and there should ultimately be revenue gains if automation makes businesses more productive and if people go on to find better-paying types of work. This will not be the case if we are headed to a future of work with higher unemployment rates, unless increased productivity dramatically outstrips unemployment.

Only recently has public debate surfaced about taxing AI, and it has mainly been in relation to slowing the rate of automation, not as an attempt to craft tax-neutral policies or ensure government revenue. The question of how the law should respond remains. Automation should not be discouraged on principle; in fact, it should be welcomed when it improves efficiency. But, automating for the purpose of tax savings may not make businesses any more productive or result in any consumer benefits, and it may result in productivity decreases to reduce tax burdens. This is not socially beneficial.

The options, once policymakers agree that they do not want to advantage AI over human workers, could be to reduce the tax benefits AI receives over people or reduce existing taxes that only apply to human workers. For instance, payroll taxes could be eliminated, which may be a better way of achieving neutrality since it reduces tax complexity and ends taxation of something of social value – namely human labor. However, this would eliminate around 35 percent of the US federal government's current tax revenue.

There are many ways to ensure adequate tax revenue, such as by increasing property or sales taxes, which may be a more progressive way to collect funds because it would tax income regardless of its source – labor or capital. It could certainly be

progressively designed by applying relatively higher property taxes for higher-value properties and higher sales taxes for, say, luxury goods. Income taxes could also be increased either by raising the marginal statutory tax rates for high earners or the effective tax rates through the elimination of things like the step-up in basis rule that reduces tax liability for inherited assets.

More ambitiously, AI legal neutrality may prompt a more fundamental change in the way labor versus capital and workers versus businesses are taxed. New tax regimes could target AI, as well as other automation technologies to which similar considerations apply, but this would likely increase compliance costs and tax complexity. It would also “tax innovation” in the sense that it may penalize business models that are legitimately more productive with less human labor. A better solution would be to increase capital gains taxes and corporate tax rates to reduce reliance on labor taxes. Before AI entered the scene, there had been long-standing criticism about the extent to which capital is favored over labor in tax policy. The Fourth Industrial Revolution may provide the necessary impetus to finally address this issue.

The downside of increased capital taxation is largely a concern about international tax competition. There is a historic belief that labor should be taxed over capital, because capital is more mobile and will leave jurisdictions with higher tax rates. These concerns may be overstated, particularly in large, developed markets such as the United States. Historically, relatively high corporate tax rates have not been a barrier to US-based investments.

The United States, which has the world’s largest economy, does not have a relatively progressive tax system – which is to say one based on a person’s ability to pay. Wider wealth disparities exist in the United States than in any other developed country. With AI likely to result in massive but poorly distributed financial gains, AI will both require and enable us to rethink how we allocate resources and redistribute wealth. If we do choose to reduce income inequality, this should be accomplished primarily through taxation. New laws to ensure that AI contributes its fair share to government revenue could fund retraining programs for workers and enhance social benefits. If AI does cause increased long-term unemployment, subsequent tax revenue could even support a universal basic income that would enable governments to pay every citizen regardless of their employment.

3 TORT

AI will do all sorts of things that only a person used to do like driving. It is difficult to say exactly when this will happen. Companies like Uber and Tesla claimed they would be using or selling fully autonomous vehicles (AVs) before 2020. Other automobile manufacturers now state they will be selling AVs in the early 2020s. By contrast, a European Commission expert group predicts that fully driverless vehicles will not be commercially available before 2030.⁸ Regardless of when self-driving cars become mainstream, survey research often reports negative public attitudes about

them. Most people say they would feel unsafe being driven around by their car, yet AVs may already be safer than people. Human drivers are dangerous – about 94 percent of crashes involve human error. Worldwide, more than a million people die each year in motor vehicle accidents, and tens of millions are injured. This is almost exclusively the result of people’s being terrible drivers.

There has been at least one fatality caused by an AV. Operated by Uber, the AV collided with a pedestrian in Arizona because it failed to detect her in time to stop. More recently, regulators reported that a Tesla “Autopilot” system may have been at fault in a March 2019 fatality. A Tesla spokesperson noted in response that Tesla drivers have logged more than a billion miles with Autopilot engaged, and that Autopilot tends to make drivers safer.⁹ Earlier reported AV fatalities involving Tesla’s Autopilot system were ultimately determined by regulators not to be the AV’s fault. However, those incidents speak to the challenges of human-machine interaction – human drivers are supposed to be prepared to retake control of the vehicle on short notice, but it is difficult for people to remain alert and engaged while an AV is driving.

Inevitably, self-driving cars will cause fatalities. But the perfect should not be the enemy of the good. AVs do not need to be harmless to make people safer; they just need to be better drivers than people. Whether in 2025, 2035, or 2045, AVs will not only be safer drivers than people but much safer than people. AVs are rapidly improving and human drivers are not, which is important with respect to legal liability for wrongful acts.

Tort law defines what constitutes a legal injury and determines those cases in which someone may be held civilly as opposed to criminally, accountable. Accidents caused by people generally require negligence for liability. Negligence means that someone’s actions fell below the standard of a reasonable person. To apply this test, over the course of centuries, courts have developed the concept of a hypothetical reasonable person who sets the standard for human behavior. Thus, if a driver is sued for colliding with a child who ran out into the street, and a reasonable person would have avoided the child, then the driver would be held liable. If a reasonable person would not have avoided the child, then the driver would not be held liable. The reasonable person is not exclusive to torts; it is a standard that applies in many areas, including criminal and contract law.

People mention tort liability when speaking about the law and self-driving cars, often in the context of worrying that no one – or nothing – will be held liable for accidents caused by self-driving cars. Those concerns are misplaced. AVs are products, and there is already a legal regime built around injuries caused by products. Product liability law could simply be applied to self-driving car accidents. To oversimplify, there is a different standard for accidents caused by people than for accidents caused by products. The law holds manufacturers and retailers of products strictly liable for harms caused when a machine is defective, or when its properties are misrepresented.

Strict liability refers to the fact that liability is based on causation without requiring negligence: Did the AI cause an injury regardless of whether a manufacturer's conduct was socially blameworthy? Strict liability is a lower bar for liability, which is a good rule for most products. There is more liability for manufacturers, thus incentivizing manufacturers to make safer products, since they are in the best position to improve product safety and profit from decreasing accidents. However, more liability for manufacturers does not necessarily translate to fewer accidents if a product is safer than the existing standard. In that case, product liability law would make people less safe. When AI has more liability than a person, it makes automation costlier. This is not a desirable outcome. Automation should be encouraged, or at least not discouraged, through tort liability in situations where it would improve safety.

Instead of the law's applying standard product liability law to AI, the law should evaluate accidents caused by AI under a negligence standard. In a sense, this would treat AI like a person and focus on the AI's act rather than its design. The law would ask whether the AI behaved in such a way that if a person had done the same, the act would have fallen below the standard of a reasonable person. If so, then the AI's manufacturer would be financially liable. As with human defendants, the law does not usually concern itself with what a person was thinking or whether he thought what he was doing seemed reasonable. The law looks objectively at whether a reasonable person would have committed the act.

Here, as with tax law, AI and people compete at the same sorts of activities and exhibit similar behaviors. Tax law currently encourages automation, whereas tort law discourages automation. A principle of AI legal neutrality that holds AI behavior to a negligence standard would encourage the development and adoption of safer technologies. Again, this would not treat AI and people directly the same legally in that AI would not be personally liable for injuries. AI is owned as property, does not have financial resources, and is not influenced by the specter of liability the way people are. Negligence-based liability for AI would function as a market-based mechanism to encourage the introduction of technologies that improve safety with the benefit of not requiring government funding, additional regulatory burdens on industry, or new administrative responsibilities.

Applying a negligence framework to AI is the least important part of the torts story. The time will come when AI performance will be not just safer but substantially safer than a person's – to the point where self-driving cars may almost never cause accidents, and almost any accident caused by a person would be negligent by comparison to an AI. When this happens, it will not matter which liability regime the law applies to AI; it will matter which liability regime we apply to ourselves because by then we – people – will be the biggest danger on the road. The courts, at this point, should hold human drivers to the standard of self-driving cars – the reasonable robot standard, although it may be more accurate, if less catchy, to call it the reasonable AI standard. Today, if a child runs in front of a person's car while

she is driving at night and is unable to stop, the person probably would not be liable. However, in a future where the reasonable person standard is represented by an AI that would have been able to stop, then she would be liable.

Self-driving cars are only one example of how AI will disrupt tort law. With escalating health care costs and evidence suggesting AI can outperform people at some aspects of health care, people may soon be going to see Doctor Watson for care. Right now, AI can only prevail over people at very narrow aspects of medical practice, but it is getting better quickly, and human doctors are not. What should be remembered is that Watson does not have to be perfect to improve safety – just a little bit better than human doctors, and that bar is low. Make no mistake, human doctors are downright dangerous. People should not stop seeing doctors, but medical error kills far more people than car accidents. In fact, for doctors who take an oath to first do no harm, it will be unethical to allow them to compete with vastly safer AI.

4 INTELLECTUAL PROPERTY

It should come as little surprise that AI has been autonomously generating scientific inventions for decades. But while the law provides intellectual property rights – entitlements to certain intangible creations such as copyrights for books and music or patents for certain types of discoveries – for human output, the law remains backward looking when AI creates “products of the mind.” Legally, it is unclear whether AI-generated inventions, those made without traditional inventors, are eligible for patent protection.

In most cases, the existence of a patent requires an inventor be a natural person (an individual human) and the initial owner of that right. Inventors do have the ability to transfer their rights to others; this can happen automatically when employees create something within the scope of employment. As a matter of fact, most patents are owned by artificial persons in the form of companies. Still, the requirement that an inventor be a natural person ensures the right of human creators to be acknowledged even when businesses own related intellectual property rights.

These laws were not designed with AI in mind, and as of 2019, there is no law specifically about AI-generated invention in any jurisdiction. As a result, it is unclear whether an AI-generated invention could be patentable, who the owner of such a patent could be, and who – or what – could be considered an inventor. These are not just academic questions. In 2019, Siemens reported that it had been unable to file for protection on multiple AI-generated inventions because it could not identify a natural person who qualified as an inventor.¹⁰ Meanwhile, patent offices have likely been granting patents on AI-generated inventions for decades – but only because no one’s disclosing AI’s involvement.

The law should permit patents for AI-generated inventions and even recognize AI as an inventor when the AI otherwise meets inventorship criteria. The primary