

Is the Dawn of the Robot Lawyer upon us? The Fourth Industrial Revolution and the Future of Lawyers

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Abstract

The practice of law has been largely shielded from technological developments in the course of the past 50 years. While the ways in which legal professionals process and share information have evolved with new technologies — primarily with the emergence of personal computers, email and the internet — these technologies have not fundamentally transformed it. However, if media reports are to be believed, advances in technology in general — and the field known as "Artificial Intelligence" (AI) in particular — are on lawyers' doorsteps, and the legal industry is on the cusp of radical change. Fuelled by big data, increased computing power and more effective algorithms, AI has the potential to fundamentally transform the way in which legal work is done, the way in which law firms conduct business, and the way in which lawyers deal with clients. A number of technologies that fall under the AI umbrella, such as machine learning, natural language processing, deep learning and others, have already brought about the automation of many tasks that were, until recently, performed exclusively by humans because they required human intelligence. AI systems can also be used to perform many tasks that lawyers routinely perform, such as contract analysis, case prediction and e-discovery. And, according to proponents, these emerging technologies can do it cheaper, faster and more efficiently. This contribution examines the notion that recent advances in technology will "disrupt" the legal profession. It first describes the astonishing advances in technological progress, especially the recent rise of AI. It then considers the technologies and areas of legal practice most susceptible to this disruption. It concludes by envisaging what AI might mean for the legal profession, and how current technological trends might, in a relatively short period of time, transform the way in which legal services are delivered.

Keywords

Artificial Intelligence; machine learning; deep learning; natural language processing; legal practice; disruption; Fourth Industrial Revolution.

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*It is simply inconceivable that technology
will alter all corners of our economy and society
and yet somehow legal work will be exempt from change*

- Richard Susskind¹

1 Introduction

In the *Harvard Law Review* in 1897, Oliver Wendell Holmes, Jr² wrote that:

For the rational study of the law the black-letter man may be the man of the present, but the man of the future is the man of statistics and the master of economics.

The future that Holmes foresaw some 120 years ago has arrived. Humanity is fast traversing the chasm between a print-based analogue industrial society, with unreliable, slow and costly communication, and a technology-based internet society, with near universal, real-time and virtually costless communication.³

The set of tasks and activities in which humans are strictly superior to computers is becoming "vanishingly small".⁴ Machines today not only perform mechanical or manual tasks once performed by humans, but they are also performing thinking tasks — tasks long believed to be the exclusive purview of humans, in which human judgment was indispensable. From self-driving cars to self-flying aeroplanes, and from robots performing surgery on a pig, to artificially intelligent personal assistants, so much of what was once unimaginable is now reality.⁵ And, unlike humans, artificially intelligent machines can work ceaselessly around the clock, without sleep or caffeine.⁶

In considering the long-term future of the law, it is difficult to ignore the recent avalanche of interest in AI for lawyers. AI and its applications to law practice are grabbing headlines in the legal industry. Ever since the early success stories of IBM's *Watson*, the legal press has been abuzz with articles that debate whether AI is a threat or a hope, and whether AI will

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¹ Susskind *Tomorrow's Lawyers* 12.

² Holmes 1897 *Harv L Rev* 469.

³ Alarie 2016 *UTLJ* 443.

⁴ Alarie, Niblett and Yoon 2016 *UTLJ* 424.

⁵ Alarie, Niblett and Yoon 2016 *UTLJ* 424.

⁶ McGinnis and Pearce 2014 *Fordham L Rev* 3041.

transform, disrupt, revolutionise or even remake the legal industry.⁷ Barely a week goes by without a new claim in the press or social media about a robot lawyer or AI-based system that is better than or has even replaced traditional human lawyers,⁸ e.g. "Rise of the Robolawyers"⁹; "Why Hire a Lawyer? Machines Are Cheaper"¹⁰; "Armies of Expensive Lawyers Replaced by Cheaper Software"¹¹; and "Artificial Intelligence Will Cause 'Structural Collapse' of Law Firms By 2030".¹² The alarming headlines and predictions of AI replacing lawyers are sending shockwaves through the staid world of legal practice.¹³

This contribution explores the legal implications of this world-changing technology. It foresees a more sanguine future for the legal profession than many pundits predict. I believe that AI will assist in human work, rather than replace it. Technology's influence on lawyers, while already transformative, is hardly complete. Many of the innovations in the recent past focussed on automating the routine tasks of lawyers, such as searching for a particular word or phrase in the discovery process. While these automation technologies will continue to develop, the latest technology focusses rather on facilitating how lawyers understand and analyse legal materials.¹⁴ In effect, this technology enhances what lawyers can do. Moreover, practising law under these technologies is less reliant on law firm economies of scale, empowering solo practitioners and small-firm lawyers as much as their counterparts in large firms. In so doing, emerging technology will increase the accessibility of legal services in ways that can benefit the lawyer and client alike.¹⁵

⁷ Neary and Chen 2017 <https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=2077&context=lsfp>.

⁸ Susskind *Tomorrow's Lawyers* 184.

⁹ Koebler 2017 <https://www.theatlantic.com/magazine/archive/2017/04/rise-of-the-robotlawyers/517794/>.

¹⁰ As quoted in Merchant 2017 *SciTech Lawyer* 21.

¹¹ Anon 2011 https://www.huffpost.com/entry/armies-of-expensive-lawye_n_831993.

¹² Bindman 2014 <https://www.legalfutures.co.uk/latest-news/report-ai-will-transform-legal-world>.

¹³ Merchant 2017 *SciTech Lawyer* 21.

¹⁴ Yoon 2016 *UTLJ* 457.

¹⁵ Yoon 2016 *UTLJ* 457.

2 The Fourth Industrial Revolution

Recent advancements in technology have prompted Klaus Schwab,¹⁶ founder and executive chairman of the World Economic Forum, to suggest that the world is on the cusp of a fourth industrial revolution:

[F]uelled by technology, which is combining physical, digital and biological worlds, and which is likely to create an adverse impact on jobs and security, and increase inequality, unless organisations learn to adapt.

The introduction of AI and its impact in industry, education and society distinguishes the fourth industrial revolution from the third.¹⁷ AI is *the* key transformative technology emerging in the early twenty-first century — the wave of the future that will change forever the world of work, play, living and business as we know it today.¹⁸ It is expected that within the next five years over 50 billion connected machines (the so-called "internet of things") will exist throughout the world.¹⁹ According to the McKinsey Global Institute, a technology think tank, AI is not only contributing to the transformation of society, but compared to the first industrial revolution, the AI revolution is "happening ten times faster and at 300 times the scale, or roughly 3 000 times the impact."²⁰

In their book, *The Second Machine Age*, Eric Brynjolfsson and Andrew McAfee²¹ contend that:

Computers and digital advances are doing for mental power — the ability to use our brains to understand and shape our environments — what the steam engine and its descendants did for muscle power.

As our mental power increases with new technologies, the opportunity for progress expands almost inconceivably quickly.²²

¹⁶ De Souza 2017 <http://www.digitalpolicy.org/transforming-legal-profession-impact-challenges-artificial-intelligence/>.

¹⁷ Pillay 2018 https://www.up.ac.za/news/post_2688680--artificial-intelligence-myth-or-reality-for-the-fourth-industrial-revolution. The 1970s saw the advent of the third industrial revolution, which was characterised by electronics, the computer and nuclear energy. Personal computers and information technology in the form of the internet taking hold in working life ushered in an era of global access to information and the automation of work. Pillay 2018 https://www.up.ac.za/news/post_2688680--artificial-intelligence-myth-or-reality-for-the-fourth-industrial-revolution; Wisskirchen *et al Artificial Intelligence and Robotics* 12.

¹⁸ Botha date unknown <http://www.foresightfordevelopment.org/featured/artificial-intelligence-ii>.

¹⁹ Wisskirchen *et al Artificial Intelligence and Robotics* 12.

²⁰ Barfield "Towards a Law of Artificial Intelligence" 3.

²¹ Brynjolfsson and McAfee *Second Machine Age* 7-8.

²² McKamey 2017 *Appeal* 47.

The legal profession is at a crossroads. Just as the other professions are undergoing tremendous upheaval, so it must be with the law. The legal world of tomorrow will bear little resemblance to that of the present. It will change more in the next twenty years than it has during the past two centuries.²³

In his book, *Tomorrow's Lawyers*, legal technologist Richard Susskind identifies three drivers of change in the legal profession.²⁴ While the 2008 financial crisis can be seen as the precipitating event, developments in legal information technology are actually a root cause of many of the long-term changes in the legal services market.²⁵ This contribution focusses on the next frontier along the path of blistering technological advance, specifically AI.²⁶

At its core, law is information technology — "a code that regulates social life",²⁷ and we are in the middle of an information revolution. In our age, the ability to collect, store, process and analyse data continues to improve at an exponential rate.²⁸ This is the result of "Moore's Law", which is named after Gordon Moore, one of the co-founders of Intel Corporation.²⁹ In 1965 Moore predicted that the number of transistors that could be fitted onto a silicon chip would double every two years. His prediction has proved to be remarkably accurate. Over the past fifty years, computing speed, power and capacity have doubled approximately every two years, while the attendant costs have halved every two years.³⁰ If one compares the first microprocessor with today's models, performance has increased more than 3 500 times, energy efficiency has increased 90 000 times, and price has decreased by a factor of 60 000.³¹

²³ Susskind *Tomorrow's Lawyers* xvii.

²⁴ According to Susskind, the three drivers fuelling change in the legal profession are the "more-for-less" challenge; liberalisation; and technology. Very briefly, the more-for-less challenge describes the increasing pressure on law firms to deliver more legal services for less money. Liberalisation refers to the relaxing of laws and regulations to govern who and what types of businesses could offer legal services. Susskind *Tomorrow's Lawyers* xvii.

²⁵ Katz 2013 *Emory LJ* 909.

²⁶ See McKamey 2017 *Appeal* 45-58.

²⁷ McGinnis and Pearce 2014 *Fordham L Rev* 3041.

²⁸ Alarie, Niblett and Yoon 2016 *UTLJ* 424.

²⁹ Moore 1965 *Electronics* 114.

³⁰ Victorian All-Party Parliamentary Group on Artificial Intelligence 2018 <https://www.parliament.vic.gov.au/publications/research-papers/download/36-research-papers/13863-artificial-intelligence-primer-2>.

³¹ Sprangers 2018 <https://www.johnsonflora.com/recent-articles-media/artificial-intelligence-and-the-law-revolution-or-evolution/>.

It is intuitively difficult for humans to appreciate the immense power of such exponential growth. At first glance, doubling computing speed every two years may not seem that impressive, but these technological improvements have led to gargantuan changes over time. Imagine, for example, that motor vehicles had developed according to Moore's Law. That would mean that they would currently have a top speed of more than 482 000 km/h, fuel efficiency of more than 8 500 000 km/l, and a cost of approximately 4 cents.³²

Recent studies have confirmed that not only has Moore's Law remained remarkably accurate, but telecommunication and the storage of information have also experienced exponential growth. In 2008 a cell phone's computational power was one thousand times greater, and it was one million times less expensive, than the combined computing power at the Massachusetts Institute of Technology in 1965.³³

With dramatic improvements in computer software and hardware, and increasing access to large datasets, it is no wonder that Ray Kurzweil,³⁴ a Google AI expert and well-known futurist, believes that the average desktop computer will surpass human brain power by 2023, and reach "singularity" in 2045 — when the AI in a single computer will surpass the brainpower equivalent to that of all people combined.

The time has indubitably come for lawyers to reconsider some of their working practices.³⁵ Because increases in the power of computing are exponential and not linear, computers may be able to undertake complicated legal tasks relatively sooner than it initially took computers to perform simpler legal tasks.

3 What does it all mean?

Although AI is talked about in the media almost every day, there is still no generally accepted definition of the term. Individual definitions run the gamut from a super-intelligent, sentient, humanoid, world-conquering robot to an

³² Sprangers 2018 <https://www.johnsonflora.com/recent-articles-media/artificial-intelligence-and-the-law-revolution-or-evolution/>.

³³ Sprangers 2018 <https://www.johnsonflora.com/recent-articles-media/artificial-intelligence-and-the-law-revolution-or-evolution/>; McGinnis and Pearce 2014 *Fordham L Rev* 3043.

³⁴ See generally Kurzweil *Singularity is Near*. The Committee on Legal Affairs of the European Parliament has also acknowledged the possibility that, in the long-term, AI could surpass human intellectual capacity. European Parliament 2017 <https://www.europarl.europa.eu/cmsdata/113782/juri-final-report-robotics.pdf> 5.

³⁵ Susskind *Tomorrow's Lawyers* 12.

app that suggests that the weather justifies wearing a coat.³⁶ The term "artificial intelligence" may have been coined by John McCarthy *et al* in a paper first published in 1955. The authors explained that:³⁷

An attempt will be made to find how to make machines use language, from abstractions and concept, solve kinds of problems now reserved for humans, and improve themselves ... For the present purpose the artificial intelligence problem is taken to be that of making a machine behave in ways that would be called intelligent if a human were so behaving.

Thus, in the sense intended in this article, AI refers to a computer's ability to imitate human intelligent behaviour, especially human cognitive functions, such as the ability to reason, discover meaning, generalise and learn from past experience.³⁸

While AI has many attributes useful for its varied applications, at present two are most important in the legal domain. Firstly, "machine learning", the leading innovative force in AI, has proven incredibly efficient, as machines can perform in mere minutes tasks that would otherwise take a team of lawyers tens of hours.³⁹ Machine learning refers to the capability of AI systems to teach themselves and learn from experience. This means, in essence, that AI can do much more than blindly adhere to what it has initially been programmed to do; it can learn from experience and data – so-called "big data" that collectively is almost unimaginably vast in the human context, and far beyond what highly-skilled, experienced workers could reasonably construct on their own – to constantly improve its capabilities.⁴⁰

Machine learning should be envisioned as a spectrum that ranges from relatively simple algorithms to complex self-teaching systems that could eventually mirror the human brain in their complexity, if not their structure. The latter is termed "deep learning".⁴¹ Deep learning relies on what is referred to as "neural networks", an interconnected group of nodes designed to mimic the activity of neurons in the human brain in order to recognise complex patterns in data sets.⁴²

³⁶ Giuffrida, Lederer and Vermerys 2018 *Case W Res L Rev* 752.

³⁷ McCarthy *et al* 2006 *AI Magazine* 12.

³⁸ Alan Turing defined artificial intelligence as the "science and engineering of making intelligent machines, especially intelligent computer programmes". Turing 1950 *Mind* 433.

³⁹ See generally Betts and Jaep 2017 *Duke Law & Tech Rev* 216-233.

⁴⁰ Merchant 2017 *SciTech Lawyer* 21.

⁴¹ Sanito *et al* 2018 <https://www.edx.org/course/deep-learning-explained-microsoft-dat236x-1>. See also Giuffrida, Lederer and Vermerys 2018 *Case W Res L Rev* 755.

⁴² Richie and Duffy "Artificial Intelligence in the Legal Field" 1; Giuffrida, Lederer and Vermerys 2018 *Case W Res L Rev* 755.

Secondly, "natural language processing" is the capability of algorithms and software to interpret, understand and generate spoken and written human language,⁴³ and then to apply and integrate that understanding to perform human-like analysis.⁴⁴ Search engines, speech-to-speech translation, and artificially intelligent assistants, such as iPhone's *Siri*, are built with natural language processing technology for the user's benefit.⁴⁵

4 The story of AI through human games

A long-standing goal of AI was to develop an algorithm that learns, *tabula rasa*, superhuman proficiency in challenging domains.⁴⁶ As a powerful illustration of how this goal has been met, it is worth considering the remarkable success of AI in the arena of human games.

In 1997 Deep Blue – a special-purpose supercomputer developed by IBM to play chess by evaluating 330 million board positions per second⁴⁷ – defeated chess grandmaster and reigning world champion Gary Kasparov by utilising its superior computational brute force.⁴⁸

Next, in a live television broadcast in 2011 *Watson* — IBM's AI system — competed against the two most successful human champions in the general knowledge American television quiz show, *Jeopardy!*⁴⁹ It is hard to understate just how difficult a problem it was for a machine to compete in a game such as *Jeopardy!* It is a game of complexity and breadth. Topics are wide ranging, and include detailed questions in domains such as history, literature, politics, science, and arts and entertainment. Contestants often confront clues that require them to analyse subtle meaning, irony, jokes, rhymes and convoluted and often opaque statements — complexities at

⁴³ Richie and Duffy "Artificial Intelligence in the Legal Field" 1.

⁴⁴ Merchant 2017 *SciTech Lawyer* 21

⁴⁵ Alarie, Niblett and Yoon 2018 *UTLJ* 116.

⁴⁶ Silver *et al* 2017 <https://www.nature.com/articles/nature24270>.

⁴⁷ Koch 2016 <https://www.scientificamerican.com/article/how-the-computer-beat-the-go-master/>.

⁴⁸ Alarie, Niblett and Yoon 2016 *UTLJ* 443, 445; Alarie, Niblett and Yoon 2018 *UTLJ* 116.

⁴⁹ One of the players, Ken Jennings, had won 74 games in a row on the television quiz show. Markoff 2011 <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html>.

which humans excel and computers traditionally did not.⁵⁰ Commenting on Watson's victory, John Markoff⁵¹ in *The New York Times* stated:

For I.B.M., the showdown was not merely a well-publicized stunt and a \$1 million prize, but proof that the company had taken a big step toward a world in which intelligent machines will understand and respond to humans, and perhaps inevitably, replace some of them.

Even more remarkable than *Watson's* victory in *Jeopardy!* in early 2016 an artificially intelligent machine, Google's *AlphaGo*, ruthlessly defeated the human grandmaster, Lee Sedol, in four matches against one in the ancient Chinese board game of Go. The game of Go had remained an inviolably human pursuit for centuries, and one of the most difficult challenges for AI.⁵² This is a game with simple rules⁵³ but profound complexity⁵⁴ — there are more potential moves in Go than there are atoms in the entire observable universe of galaxies, stars, planets, animals, plants and people.⁵⁵ Given this virtually illimitable complexity, a computer was unable to gain a competitive advantage by employing brute force computations.⁵⁶ To play a decent game of Go, a computer had to be endowed with the ability to recognise subtle,

⁵⁰ Katz 2013 *Emory LJ* 926; McGinnis and Pearce 2014 *Fordham L Rev* 3045; Markoff 2011 <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html>.

⁵¹ Markoff 2011 <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html>.

⁵² Murgia 2017 <https://www.ft.com/content/cada14c4-d366-11e6-b06b-680c49b4b4c0>.

⁵³ On its surface, Go seems simple compared to chess. A chess match begins with two facing armies of sixteen pieces each, ranking from pawn to king, on a 64-square board. Each of the six kinds of pieces is allowed to move only in certain ways. In Go, on the other hand, there are few such complications. A game begins with a blank 19-by-19 grid. Each player has access to a bowl of either white or black stones which she then places on the board in turn. The goal of the game, which originated in China more than 2 500 years ago, is to capture a group of the opponent's stones by surrounding it and then removing the cluster from the board. The object is to build complex fence-like structures enclosing as much territory as possible. Out of this sheer simplicity, great beauty arises — complex battles between black and white stone armies that span the entire board. In essence, with chess one starts with all the pieces on the board, while in go one starts with an empty board and then builds. Koch 2016 <https://www.scientificamerican.com/article/how-the-computer-beat-the-go-master/>; Johnson 1997 <https://www.nytimes.com/1997/07/29/science/to-test-a-powerful-computer-play-an-ancient-game.html>.

⁵⁴ Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>; Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>.

⁵⁵ Susskind *Tomorrow's Lawyers* 14; Koch 2016 <https://www.scientificamerican.com/article/how-the-computer-beat-the-go-master/>.

⁵⁶ Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>.

complex patterns and to draw on the kind of intuitive knowledge that is the hallmark of human intelligence.⁵⁷

It is for this reason that Dr Piet Hut⁵⁸ of the Institute for Advanced Study at Princeton predicted in 1997: "It may be a hundred years before a computer beats humans at Go — maybe even longer." At the same time, an article in *The New York Times* declared: "When or if a computer defeats a human Go champion, it will be a sign that artificial intelligence is truly beginning to become as good as the real thing."⁵⁹

Then, in less than 20 years the unthinkable happened. At a press conference in the wake of his defeat to *AlphaGo*, Lee Sedol⁶⁰ said: "Today, I am speechless". In the popular press, *AlphaGo's* victory over the human grandmaster cemented its position as a remarkable scientific feat that came years ahead of scientists' predictions.⁶¹ But its mastery is even more exceptional if one considers the deeper implications of the AI technology that made the computer's victory possible.

AlphaGo sometimes made unexpected moves that the human experts simply could not explain. At first, these moves appeared to be errors. But the AI system then used the surprising positions it generated to dominate the rest of the game.⁶² Such intriguing moves are also sometimes made by human Go masters. They are known in Japanese as *kami no itte* ("the hand of God" or "divine moves"). Thus, here is a system that displays characteristics that a human would describe as "creative" or "innovative".⁶³ Similarly, decisions made by AI-augmented machines to balance an electrical grid or to manage a city's traffic flow are made beyond human processing capabilities. Yoshua Bengio,⁶⁴ a computer scientist at the University of Montreal and often called one of the "fathers of AI", refers to this kind of processing as "artificial intuition".

⁵⁷ Johnson 1997 <https://www.nytimes.com/1997/07/29/science/to-test-a-powerful-computer-play-an-ancient-game.html>.

⁵⁸ Alarie, Niblett and Yoon 2016 *UTLJ* 423.

⁵⁹ Johnson 1997 <https://www.nytimes.com/1997/07/29/science/to-test-a-powerful-computer-play-an-ancient-game.html>.

⁶⁰ As quoted in Murgia 2017 <https://www.ft.com/content/cada14c4-d366-11e6-b06b-680c49b4b4c0>.

⁶¹ Murgia 2017 <https://www.ft.com/content/cada14c4-d366-11e6-b06b-680c49b4b4c0>.

⁶² Anon 2018 <https://www.economist.com/science-and-technology/2018/02/15/for-artificial-intelligence-to-thrive-it-must-explain-itself>.

⁶³ Susskind *Tomorrow's Lawyers* 14.

⁶⁴ Anon 2018 <https://www.economist.com/science-and-technology/2018/02/15/for-artificial-intelligence-to-thrive-it-must-explain-itself>.

Even more astounding, subsequent to *AlphaGo's* victory over Lee Sedol, Deep Mind developed an updated and improved AI Go player called *AlphaGo Zero*. Whereas *AlphaGo's* training required knowledge of expert human gameplay (i.e. "supervised learning"), *AlphaGo Zero* trained itself entirely through "reinforcement learning", i.e. with no human input, data, guidance or domain knowledge whatsoever.⁶⁵ Thus, starting *tabula rasa*, it mastered the game in just three days to superhuman performance levels by playing against itself some 44 million times and outperforming the already superhuman *AlphaGo* by beating it 100 — 0.⁶⁶

This discussion about the advances of AI in human games serves to illustrate that many emerging technologies do not simply computerise and streamline pre-existing and inefficient manual processes. Rather than merely automate, these systems innovate. This means that they allow us to perform tasks that were previously not possible, or even imaginable.⁶⁷ According to Susskind, the message for lawyers is profound — when thinking about technology, the challenge is not simply to automate current working practices that are inefficient. The challenge is to innovate the practice of law in ways that we could not do or even foresee in the past.⁶⁸ These innovative technologies do not simply support traditional ways of working. As discussed below, they are disruptive — these "pervasive, exponentially growing, innovative technologies" will come to fundamentally and radically transform the way in which lawyers work.⁶⁹

5 Death of the billable hour?

Law, as a business, enjoyed almost uninterrupted yearly growth in profit and turnover for the 20 years leading up to 2007.⁷⁰ However, coinciding with the 2008 recession, the legal profession has had a rough go of it in recent years.⁷¹ Like many sectors of the economy, lawyers have experienced a drop in the demand for their services.

At risk is the revenue model common to most law firms. Since the mid-1970s "hourly billing" has been the dominant way of charging for legal services.

⁶⁵ Silver *et al* 2017 <https://www.nature.com/articles/nature24270>; Singh, Okun and Jackson 2017 <https://www.nature.com/articles/550336a>.

⁶⁶ Silver *et al* 2017 <https://www.nature.com/articles/nature24270>; Singh, Okun and Jackson 2017 <https://www.nature.com/articles/550336a>.

⁶⁷ Susskind *Tomorrow's Lawyers* 14.

⁶⁸ Susskind *Tomorrow's Lawyers* 14-15.

⁶⁹ Susskind *Tomorrow's Lawyers* 15.

⁷⁰ Susskind *Tomorrow's Lawyers* 16.

⁷¹ Yoon 2016 *UTLJ* 456.

Rather than a client paying a fixed amount to the lawyer to complete an assignment, irrespective of the lawyer's time expended, hourly billing has the intuitive appeal of paying only for the time the lawyer actually worked.⁷² However, this approach, as has been well-chronicled, creates the potential moral hazard of lawyers billing as many hours as possible to maximise profits.⁷³

Beyond these concerns, the hourly billing model challenges clients' ability to retain legal representation.⁷⁴ Simply put, the cost of lawyering has become too high. Over time, accessibility issues have only worsened, as the cost of legal representation has far outpaced the rate of inflation.⁷⁵ Although the law is central to our lives, at present, effectively, only the very rich or the very poor (through legal aid) have the means to afford the services of lawyers.

Significant amounts of legal work that is administrative or process-based, whether at corporate legal departments or in private practice, are being undertaken by junior lawyers. This work is characterised by process rather than judgment, procedure instead of strategy or creativity; for example, document review in litigation, due diligence work in corporate transactions (such as mergers and acquisitions), basic contract drafting, and rudimentary legal research. Susskind⁷⁶ is of the view that this presents a great opportunity for change. The challenge is to identify work that can be routinised and undertaken more efficiently through computerisation.

In the aftermath of the 2008 recession, lawyers across diverse practice settings — large firms, small firms, government, public interest organisations and corporations — have all explored ways to provide more cost-effective legal representation. Increasingly, lawyers in private practice find that clients are less willing to accept the indeterminacy of hourly billing.⁷⁷ Government and public-interest organisations, in response to budgetary austerity, have been compelled to explore ways to do more with less. The incentive to save costs and increase precision through technology is and will continue to be great.⁷⁸

⁷² Yoon 2016 *UTLJ* 458.

⁷³ See generally Gravett 2012 *Advocate* 43-48.

⁷⁴ Yoon 2016 *UTLJ* 458.

⁷⁵ See Yoon 2016 *UTLJ* 458.

⁷⁶ Susskind *Tomorrow's Lawyers* 21.

⁷⁷ Zhao 2017 <http://stlr.org/2017/10/03/artificial-intelligence-and-its-impacts-on-the-legal-profession/?cn-reloaded=1>.

⁷⁸ Alarie, Niblett and Yoon 2018 *UTLJ* 109.

Ron Dolin,⁷⁹ a senior research fellow at Harvard Law School's Center on the Legal Profession, says that one thing is for certain: the traditional law firm business model based on armies of candidate attorneys and junior associates racking up billable hours doing contract review for mergers and acquisitions transactions is doomed with the advent of AI.

Imagine a computer application that reduces ten hours' worth of legal work into a mere instant. It is this kind of machine intelligence that is substantially "shaking up" the legal profession.⁸⁰ Lawyers who are prepared to change their practices or organisations to take advantage of the lower cost inputs that machines enable will be able to serve an expanding market of legal services for middle-class individuals and small businesses, meeting previously unfulfilled legal needs.⁸¹

6 Decomposing legal services

Essentially two questions come to mind: what are the current applications of AI in the law (i.e. what can machines currently actually do)?; and what, if any, are the limitations of AI as it relates to the practice of law (i.e. will computers continue to evolve, develop, learn and undertake increasingly difficult and nuanced professional legal undertakings)?⁸²

Legal services are not "monolithic, indivisible professional engagements" that lawyers must undertake in only one way. Instead, legal services can be "decomposed" (or "disaggregated" or "unbundled") into various tasks, which lawyers should undertake in as efficient a manner as possible.⁸³

For better or for worse, a nontrivial subset of tasks undertaken by lawyers is subject to automation. The bundle of skills associated with the practice of law falls on a continuum, on which a number of basic tasks have already been displaced by computation, automation, and AI.⁸⁴ For example, Susskind decomposes litigation⁸⁵ into document review; legal research; project management; litigation support; discovery; strategy; tactics; negotiation; and advocacy.⁸⁶ This immediately raises the question: which of

⁷⁹ Donahue 2018 <https://jolt.law.harvard.edu/digest/a-primer-on-using-artificial-intelligence-in-the-legal-profession>.

⁸⁰ McGinnis and Pearce 2014 *Fordham L Rev* 3042.

⁸¹ McGinnis and Pearce 2014 *Fordham L Rev* 3042.

⁸² Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>.

⁸³ Susskind *Tomorrow's Lawyers* 32-33.

⁸⁴ Katz 2013 *Emory LJ* 910.

⁸⁵ This is obviously not the only way of going about it, but it serves to illustrate the point.

⁸⁶ Susskind *Tomorrow's Lawyers* 33-34.

these tasks are lawyers uniquely qualified to perform? At present, the answer is invariably at least strategy, tactics, negotiation and advocacy.⁸⁷

At this time and for the foreseeable future, current AI capabilities permit machines to approach, achieve or exceed only certain but not all human cognitive functions. At this point we can safely say that AI does not have the capacity and will probably not obtain the capacity in the next two or three decades to advise clients, appear in court and be responsive to a particular client's priorities and subjective needs.⁸⁸ Thus, although "knowledge" jobs in the law might fall victim to the advance of AI, "wisdom" jobs will not — at least not in the foreseeable future.

That is why legal skills based on human judgment, inference, common sense, interpersonal skills and experience will remain valuable for the lifetime of any lawyer practising today.⁸⁹ As Phillip Marshall QC, a commercial barrister in London, stated in an interview in *Financial Times*:⁹⁰

In litigation, I can see that developments in [AI] may lead to improvements in the search process in disclosure and in the preparation of some documents. But where judgment is required — for example in written advocacy — I doubt there is much scope for it. The human touch and knowledge of the likely reaction of the tribunal is at a premium.

Matthew Holmes, an Irish barrister, concurs that, in advocacy, the "human touch" will always remain crucial:⁹¹

[R]epresenting clients in court ... is ... a very human thing. No one goes to court because something good has happened ... It can be very emotional for someone to get justice, clear their name or try to stay out of jail. A barrister is going to have to ask very difficult questions, have to comfort them, and be around in times of high stress. Being human is a very important part of that.

But what about the first five tasks set out above — document review, legal research, project management, litigation support and discovery? Take, for example, document review. In the past, large law firms would deploy an army of candidate attorneys and junior associates, at significant hourly rates, to pour over voluminous documents (sometimes millions of pages), often simply to index or classify them.⁹² Similarly, many of the other tasks

⁸⁷ Susskind *Tomorrow's Lawyers* 65.

⁸⁸ Richie and Duffy "Artificial Intelligence in the Legal Field" 1.

⁸⁹ Merchant 2017 *SciTech Lawyer* 21.

⁹⁰ Kroft 2017 <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16>.

⁹¹ Boran 2018 <https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815>.

⁹² Susskind *Tomorrow's Lawyers* 34.

that litigators engage in are routine, repetitive and largely administrative.⁹³ It is in these tasks that no human lawyer stands a chance against the formidable processing power of a mainframe when it comes to sifting through voluminous data.⁹⁴

7 Disruptive legal technologies

In management theory, based on Clayton Christensen's influential book, *The Innovator's Dilemma*,⁹⁵ a distinction is commonly drawn between sustaining and disruptive technologies. Generally, sustaining technologies are those that support and enhance the way in which a business or a market currently operates. In contrast, disruptive technologies fundamentally challenge the functioning of a business or a market sector. An example of the former is computerised accounting systems, which sustain and enhance the work of accountants who previously laboured over paper ledgers. An illustration of the latter is digital camera technology, which famously disrupted and contributed to the eventual downfall of market leader *Kodak*, whose business was based on outdated chemical printing technology.⁹⁶

The introduction of information technology — electronic databases, the internet and e-mail — changed the speed and mode of the delivery of legal communications, and made redundant the need for legal processes and services to take place anywhere in the physical world, instead occurring in cyberspace. However, it did not transform the fundamental nature of legal services or the practice of law, and was thus sustaining in its effect.⁹⁷ On the other hand, AI — as it has had across near enough all industries and all aspects of society — will have a seismic impact on the practice of law. John McGinnis and Russell Pearce argue that machine intelligence will cause a "great disruption" in the market for legal services.⁹⁸ In fact, there already are a number of disruptive technologies in law. Individually, they are challenging the way in which certain legal services are delivered, and collectively, they will transform the practice of law.⁹⁹

⁹³ Susskind *Tomorrow's Lawyers* 36.

⁹⁴ Kolber 2014 *Ind LJ* 841; Donahue 2018 <https://jolt.law.harvard.edu/digest/a-primer-on-using-artificial-intelligence-in-the-legal-profession>.

⁹⁵ Christensen *Innovator's Dilemma*.

⁹⁶ Susskind *Tomorrow's Lawyers* 43.

⁹⁷ Mason 2016 *Modern Law Magazine* 12.

⁹⁸ They posit that five areas of legal services will be affected: discovery; legal search; document generation; brief generation; and the prediction of case outcomes. McGinnis and Pearce 2014 *Fordham L Rev* 3041.

⁹⁹ Susskind *Tomorrow's Lawyers* 44.

A recent survey of managing partners of United States law firms revealed that more than 36% of law firms with 50 or more lawyers, and 90% of mega firms (with more than 1 000 attorneys), are either currently using, or actively exploring, the use of AI in their legal practices.¹⁰⁰ The majority of the "magic circle" firms in the United Kingdom have recently employed one or another AI product and are expressing great hopes for their investments.¹⁰¹ Large South African law firms have also recently started to invest in AI solutions to improve efficiencies in certain key legal processes, particularly in mergers and acquisitions, private equity and compliance areas.¹⁰²

As a cover story in the *American Bar Association Journal* explained:¹⁰³

[AI] is changing the way lawyers think, the way they do business and the way they interact with clients. [AI] is more than legal technology. It is the next great hope that will revolutionize the legal profession.

By the same token, however, this disruption has sparked a fearful murmur across the legal industry. According to Deloitte Insight in a 2016 study, about 114 000 legal sector jobs are likely to be automated in the next twenty years.¹⁰⁴ Deloitte claims that 39% of legal jobs are at "high risk" of being automated in the next two decades, while the McKinsey Global Institute puts the number at 23%.¹⁰⁵ In a 2015 survey by law firm consultant Altman Weil of law firm managing partners, 47% stated that, in the next five to ten years, they could envision a law-focussed AI tool replacing paralegals, and 35% could envision the replacement of first-year associates.¹⁰⁶ A study by the labour economist Frank Levy of the Massachusetts Institute of Technology and University of North Carolina law professor Dana Remus postulates that if all current new legal technologies were implemented at one time, it would result in an estimated thirteen per cent decline in lawyers' hours.¹⁰⁷

So, based on available evidence, what is AI good at today? It is clear that AI's current strength is in its ability to learn from a large dataset and

¹⁰⁰ Clay and Seeger 2017 <http://www.altmanweil.com/LFiT2017/>.

¹⁰¹ Susskind *Tomorrow's Lawyers* 184-185.

¹⁰² Truter 2018 https://www.bowmanslaw.com/press_releases/bowmans-invests-in-artificial-intelligence/.

¹⁰³ Sobowale 2016 http://www.abajournal.com/magazine/article/how_artificial_intelligence_is_transforming_the_legal_profession.

¹⁰⁴ Kroft 2017 <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16>.

¹⁰⁵ Donahue 2018 <https://jolt.law.harvard.edu/digest/a-primer-on-using-artificial-intelligence-in-the-legal-profession>; Lohr 2017 <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html>.

¹⁰⁶ Zhao 2017 <http://stlr.org/2017/10/03/artificial-intelligence-and-its-impacts-on-the-legal-profession/?cn-reloaded=1>.

¹⁰⁷ Remus and Levy 2017 *Geo J Legal Ethics* 536.

recognise patterns.¹⁰⁸ Computers may still be ill-equipped to tackle many basic cognitive tasks, but at the tasks in which they do excel — shifting through vast amounts of data, for example — they dramatically surpass human abilities. Asking whether individual lawyers can be *entirely* replaced by machines is perhaps not the right question. Rather, the question should be whether one lawyer, augmented by machines, can perform the same work that five human lawyers used to do.¹⁰⁹ The answer is simple — it is already happening.

7.1 *E-discovery*

The most mature incursion of technology into the practice of law is technology-assisted review, i.e. using software with specifically programmed algorithms to organise, analyse and search enormous and diverse data sets for e-discovery or other record-intensive investigations.¹¹⁰

Perhaps predictably, lawyers were initially reluctant to give a computer control of a task that could have grave consequences if performed poorly, and insisted on having humans do the work of discovery.¹¹¹ However, Maura Grossman and Gordon Cormack, in their seminal 2011 article, debunked the myth that manual human review of discovery documents is the most accurate form of review. Instead, these scholars found that "technology-assisted review can (and does) yield more accurate results than exhaustive manual review, with much lower effort".¹¹² This finding was confirmed in 2015 by the United States Court of Appeals for the Second Circuit in *Lola v Skadden Arps*.¹¹³ Likewise, in 2016 the United Kingdom High Court ruled in favour of the use of predictive coding¹¹⁴ in electronic disclosure, in the first contested case concerning the admissibility of "machine learning" technology.¹¹⁵

Moreover, the abilities of computers and the nature of discovery are supremely compatible. Take, for example, a case involving two multinational

¹⁰⁸ Loh 2018 *BMJ Leader*.

¹⁰⁹ Quora Contributor 2018 <http://www.forbes.com/sites/quora/2018/08/28/how-will-artificial-intelligence-change-the-legal-system/#72984a046e1a>.

¹¹⁰ Katz 2013 *Emory LJ* 945. McGinnis and Pearce 2014 *Fordham L Rev* 3047.

¹¹¹ McKamey 2017 *Appeal* 49.

¹¹² Grossman and Cormack 2011 *Rich J L & Tech* 11.

¹¹³ *Lola v Skadden Arps* 620 Fed Appx 37 at 45 (2d Cir 2015).

¹¹⁴ See the discussion below.

¹¹⁵ The case is *Pyrrho Investments Ltd v MWB Property Ltd* [2016] EWHC 256 (Ch) (16 February 2016), as discussed in Smith 2016 <https://www.law-gazette.co.uk/practice/high-court-backs-predictive-coding-in-first-contested-case/5055377.article>.

corporations as litigants. The volume of discovery could reach into the millions of pages.¹¹⁶ In the days of traditional discovery, the process was highly labour-intensive, time-consuming and expensive, requiring a small army of lawyers to manually read through boxes of documents in search of information relevant to the litigation.¹¹⁷ However, because most legal documents currently originate in electronic format, through e-discovery,¹¹⁸ the discovery process can now be conducted with a fraction of the time, expense, and need for lawyers, and with even greater accuracy.¹¹⁹ Benjamin Alarie *et al* point out that United States lawyers now spend less than 5 per cent of their time on basic document review.¹²⁰

7.2 Document analysis

Lawyers have traditionally spent much of their time ploughing through documents, not least in preparation for litigation or in due diligence for transactions. However, in the course of the past decade, law firms have turned to computer programmes to analyse lengthy documents, reducing the time and cost of undertaking due diligence and discovery.¹²¹ These emerging systems are proving increasingly impressive, whether in analysing document sets or summarising or extracting key provisions from contracts.¹²² For some years now, in terms of precision and recall, properly primed computer systems have been able to outperform junior lawyers in reviewing voluminous documents and isolating those of relevance,¹²³ and to decrease the amount of time spent in discovery by as much as 75%.¹²⁴

The machine learning capabilities of these AI-augmented systems are disruptive for law firms that have profited from employing human beings to wade through roomfuls of documents (whether on transactions, litigation projects, or contract reviews). As Susskind rightly points out, regardless of how low human labour costs might be, a system of this kind, once implemented, will always be more cost-effective. Law technology (called "legal tech") companies who are pioneering in this field, such as *LawGeex*

¹¹⁶ Boran 2018 <https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815>.

¹¹⁷ Markoff 2011 <https://www.nytimes.com/2011/03/05/science/05legal.html>.

¹¹⁸ E-discovery is the process by which computers search a database for keywords that lawyers agree are marks of relevance. McGinnis and Pearce 2014 *Fordham L Rev* 3047.

¹¹⁹ Alarie, Niblett and Yoon 2018 *UTLJ* 117.

¹²⁰ Alarie, Niblett and Yoon 2018 *UTLJ* 117.

¹²¹ Pasquale and Cashwell 2015 *UCLA L Rev* 34.

¹²² Susskind *Tomorrow's Lawyers* 53.

¹²³ Susskind *Tomorrow's Lawyers* 52.

¹²⁴ Pasquale and Cashwell 2015 *UCLA L Rev* 34.

and *RAVN*, are generating great interest across the spectrum in the legal profession.¹²⁵

The gains in efficiency can be striking.¹²⁶ The international investment bank JPMorganChase recently announced that it had developed and implemented learning software *COIN (CONtract INTelligence)* to review in mere seconds what had previously taken a team of lawyers and loan officers some 360 000 hours to review, resulting in considerable cost-savings.¹²⁷ As if the magnitude of this computing power is not impressive enough, consider the accuracy of the work performed by *LawGeex*, whose AI contract review platform answers the elementary question, "Can I sign this?" According to the company, in February 2018 its AI reviewed five non-disclosure agreements to an accuracy of 94% in 26 seconds, compared to a team of 20 "carbon-based lawyers" with decades of experience, who achieved an average accuracy score of only 85% and on average completed the review of the same five contracts in 92 minutes.¹²⁸ Thus, these AI applications are capable of vastly outperforming human lawyers in reviewing documents in mere seconds, they are less error prone, and they do not get tired, or need to sleep, eat, or rush home to have dinner with the family.¹²⁹

A similar system, *RAVN*, was developed in the United Kingdom and first publicly adopted by the law firm Berwin Leighton Paisner in London in 2015. This software assists solicitors with due diligence in real estate transactions by verifying property details against the UK land registry records.¹³⁰ In the past the firm would have pulled together a small team of junior lawyers and paralegals at short notice, then put them in a room to extract the data from thousands of pages — a process that would have taken weeks. The *RAVN* system reviews and extracts the same information in seconds.¹³¹ According to the solicitor in charge of implementing *RAVN*:¹³²

¹²⁵ Susskind *Tomorrow's Lawyers* 53.

¹²⁶ Lohr 2017 <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html>.

¹²⁷ Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>.

¹²⁸ Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>.

¹²⁹ Merchant 2017 *SciTech Lawyer* 21.

¹³⁰ Merchant 2017 *SciTech Lawyer* 22; Kroft 2017 <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16>.

¹³¹ Kroft 2017 <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16>.

¹³² As quoted in Merchant 2017 *SciTech Lawyer* 22.

[O]nce the program has been trained to identify and work with specific variables, it can complete two weeks' work in around two seconds, making [it] over 12 million times quicker than an associate doing the same task manually.

7.3 *Predictive analytics*

The inimitable Oliver Wendell Holmes, Jr. expressed the value of prediction in legal work: "[P]rophecies of what the courts will do in fact, and nothing more pretentious, are what I mean by the law."¹³³ Holmes' words remind us that litigation is fundamentally about "bargaining in the shadow of the law" — Do we have a case? What is our likely exposure? What is the likelihood of negotiating a settlement? How much is this going to cost? What will happen if we leave this particular provision out of this contract? How can we best staff this particular legal matter?¹³⁴

These prognostications, however carefully reasoned, are often biased, both by the clients' desire to win and their lawyers' own direct and indirect experiences. The development of AI tools will facilitate such prediction.¹³⁵ Machine learning is proving powerful enough to use big data to provide more objective predictions of how courts will decide discrete legal issues¹³⁶ and enable lawyers to provide more impactful advice to clients in connection with dispute resolution issues.¹³⁷

So-called "predictive analytics" is one of the most important trends in AI in the last decade, and is now also coming to the law.¹³⁸ Predictive analytics utilises machine learning techniques to detect patterns and correlations in large quantities of data, and on the basis of this analysis, to predict what will happen in situations that have not yet occurred.¹³⁹

In 2016 the Lord Chief Justice of England and Wales warned jurists that AI will be better at predicting legal outcomes of cases than the "most learned Queen's Counsel, as soon as it has better statistical information".¹⁴⁰ That day may have come. As the work of Daniel Katz and his collaborators has shown, computational statistics (i.e. algorithms working on large bodies of data) can often yield more accurate predictions of the likely behaviour of the

¹³³ Holmes 1897 *Harv L Rev* 469.

¹³⁴ Katz 2013 *Emory LJ* 912; Susskind *Tomorrow's Lawyers* 54.

¹³⁵ Alarie, Niblett and Yoon 2018 *UTLJ* 114.

¹³⁶ Alarie, Niblett and Yoon 2018 *UTLJ* 108. Also see McGinnis and Pearce 2014 *Fordham L Rev* 3052.

¹³⁷ Wagner and Furst 2018 <https://nationalinterest.org/feature/rise-robotlawyers-30972>.

¹³⁸ McGinnis and Pearce 2014 *Fordham L Rev* 3052.

¹³⁹ McGinnis and Pearce 2014 *Fordham L Rev* 3052.

¹⁴⁰ Millan 2017 <https://www.canadianlawyeromag.com/article/artificial-intelligence-3585/>.

United States Supreme Court than the predictions of experienced lawyers engaged in traditional legal research and reasoning.¹⁴¹

In another breakthrough development, in the autumn of 2016 a group of computer scientists, relying on AI, reached the same verdicts as judges of the European Court of Human Rights (ECtHR) in four out of five cases.¹⁴² The ECtHR hears cases in which parties allege that their rights under the articles of the European Convention of Human Rights have been violated and not remedied by their country's courts. The researchers claim that the textual model that they used "can reliably predict ECtHR decisions with high accuracy, i.e., 79% on average".¹⁴³ This was the first time that AI successfully predicted the outcomes of a major international court by analysing case text.¹⁴⁴ The authors of the study note:¹⁴⁵

This can be useful, for both lawyers and judges, as an assisting tool to rapidly identify causes and extract patterns which lead to certain decisions.

Machine learning and data analytics are being employed to predict how courts will decide particular cases. These technologies analyse not only how the facts of particular cases fit into the legal landscape but also how individual judges have decided cases in the past, and how legal doctrines have evolved over time. Some systems can already make better predictions than expert lawyers.

Lex Machina, for instance, can predict trends and outcomes in United States patent litigation more accurately than intellectual property litigators.¹⁴⁶ Major technology companies such as Apple, Cisco, Genentech, Intel, Microsoft, and Oracle funded *Lex Machina's* development of a massive and extensive dataset, with more than 130 000 cases featuring in excess of 6 million docket entries and direct access to more than 4 million documents.¹⁴⁷ It applies natural language processing to the vast data set to find trends that

¹⁴¹ Susskind *Tomorrow's Lawyers* 53-54. Katz *et al* developed a time-evolving random forest classifier that leveraged unique feature engineering to predict more than 240 000 justice votes and 28 000 cases outcomes of the United States Supreme Court over nearly two centuries (1816-2015). Using only data available prior to the decision, they achieved 70.2% accuracy at the case outcome level, compared to 50.9% accuracy by the human experts. Katz, Bommarito and Blackman 2017 *PLoS ONE* 1.

¹⁴² Alteras *et al* 2016 <https://peerj.com/articles/cs-93.pdf>. For a penetrating critique of the study's premise, methods and outcomes, see Pasquale and Cashwell 2015 *UCLA L Rev* 27-48.

¹⁴³ Alteras *et al* 2016 <https://peerj.com/articles/cs-93.pdf>.

¹⁴⁴ Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>.

¹⁴⁵ Alteras *et al* 2016 <https://peerj.com/articles/cs-93.pdf>.

¹⁴⁶ Susskind *Tomorrow's Lawyers* 186.

¹⁴⁷ Katz 2013 *Emory LJ* 940.

law firms can use to their advantage. For example, the software can determine which judges tend to favour plaintiffs, summarise the legal strategy of the opposing lawyers based on their case histories, and determine the arguments most likely to persuade individual judges.¹⁴⁸ The system is now expanding to other types of complex litigation.¹⁴⁹

Advances in predictive analytics make it possible for parties to litigate more effectively, by predicting legal outcomes with greater accuracy and consistency, and at a lower cost.¹⁵⁰ With the advent of predictive analytical tools, authors anticipate significant changes in the types of lawsuits that will be brought before the courts. Benjamin Alarie, the Osler Chair in business law at the University of Toronto, believes that such technologies will change the very nature of litigation. He forecasts that advances in technology would facilitate the settlement of disputes, and that the judge would only have to decide matters that give rise to the most complex of legal questions and that require concrete legal developments.¹⁵¹

7.4 Legal research

Conducting legal research can be tedious, monotonous and time-consuming. But performing timely and comprehensive legal research by combing through texts and precedents has been an important part of legal work for centuries.¹⁵² Machine intelligence will not only perform more of this kind of work than lawyers, but will also perform it more efficiently. Just as computers have progressively replaced humans in doing complex calculations — in fact, a hundred years ago people who made such calculations were called "computers" — so will machine intelligence replace the legal search function of lawyers.¹⁵³

The practice of law is on the verge of being disrupted by systems that answer legal questions in an apparently intelligent manner. One iconic automation disruption in legal technology in this regard has undoubtedly been *ROSS Intelligence*, marketed as the "world's first artificially intelligent

¹⁴⁸ Koebler 2017 <https://www.theatlantic.com/magazine/archive/2017/04/rise-of-the-robotlawyers/517794/>.

¹⁴⁹ Merchant 2017 *SciTech Lawyer* 22.

¹⁵⁰ Alarie, Niblett and Yoon 2018 *UTLJ* 108.

¹⁵¹ Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>.

¹⁵² See Wagner and Furst 2018 <https://nationalinterest.org/feature/rise-robotlawyers-30972>.

¹⁵³ McGinnis and Pearce 2014 *Fordham L Rev* 3048.

attorney".¹⁵⁴ A virtual legal assistant powered by IBM's Watson, *ROSS* utilises natural language processing to understand questions posed by lawyers, and to sift through legislation, case law and secondary sources, to return an evidence-based answer.¹⁵⁵ It can reportedly read and process a million pages per minute.¹⁵⁶ But *ROSS* is capable of much more. It constantly monitors the law and uses its machine learning capabilities to continuously improve its results, which, in turn, produces results more quickly and with greater accuracy.¹⁵⁷

In 2016 United States-based BakerHostetler became the first law firm to "hire" *ROSS*.¹⁵⁸ Although *ROSS* initially joined the ranks of BakerHostetler to assist the 50 human lawyers in its insolvency and restructuring practice with legal research, it is now being used by that firm and several others in other practice areas as well.¹⁵⁹ Skeptical at first, Luis Salazar, a partner at an insolvency law firm in Miami, tested *ROSS* against himself. After ten hours of legal research on electronic databases, he found a case the facts of which nearly mirrored the one he was working on. *ROSS* found the relevant case almost instantly.¹⁶⁰

8 The demise of drudgework?

Exploiting the increased ubiquity of electronic records in commercial transactions, legal tech start-up companies in the United States have developed technologies to automate tasks once within the sole domain of lawyers.¹⁶¹ Disruptive innovations such as *Lex Machina*, *RAVN* and *ROSS* have already found their way into the institutionalised toolkit of large law firms, and are used to bolster lawyers' productivity and remove grunt work.¹⁶² Thus, lower-level employees at law firms — paralegals and junior

¹⁵⁴ Beleuz 2017 <https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robotlawyers-6332ead1f489>; Turner 2016 <https://www.washingtonpost.com/news/innovations/wp/2016/05/16/meet-ross-the-newly-hired-legal-robot/>.

¹⁵⁵ McGinnis and Pearce 2014 *Fordham L Rev* 3049.

¹⁵⁶ Merchant 2017 *SciTech Lawyer* 22.

¹⁵⁷ Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>; Richie and Duffy "Artificial Intelligence in the Legal Field" 1.

¹⁵⁸ Nishith Desai Associates 2018 http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Artificial_Intelligence_and_Robotics.pdf 12; Merchant 2017 *SciTech Lawyer* 22.

¹⁵⁹ Merchant 2017 *SciTech Lawyer* 22.

¹⁶⁰ Lohr 2017 <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html>.

¹⁶¹ Yoon 2016 *UTLJ* 460.

¹⁶² Beleuz 2017 <https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robotlawyers-6332ead1f489>. By grunt work I mean document-heavy reviews that

lawyers — who once did this grunt work, are more likely to feel the effects of downsizing as a result of AI technology — at least in the near term.¹⁶³

However, much of the higher-order legal work has to do with the values of human empathy, credibility and developed trust between the lawyer and the client.¹⁶⁴ Technology that automates tedious tasks, although not a panacea, can free up lawyers' time to perform this higher-level, more intellectually satisfying work that clients are willing to pay for.

James Yoon, a partner at Wilson Sonsini Goodrich & Rosati in Palo Alto, California, stands as proof. He regularly uses AI-augmented software, such as *Lex Machina* and *RAVN*, to guide litigation strategy in his patent cases. However, far from *replacing* human work, this data-driven analysis technology is *augmenting* human work. Indeed, now the work that consumes most of Yoon's time involves strategy, creativity, judgment and empathy — and those efforts cannot yet be automated. When interviewed by *The New York Times* in March 2017, his hourly billing rate was \$1 100 per hour. Mr Yoon commented:¹⁶⁵

For the time being, experience like mine is something people are willing to pay for. What clients don't want to pay for is any routine work.

In terms of the actual quality of legal services in the wake of the wide-spread adoption of AI, however, an acute problem is posed by technology in all fields. If lawyers delegate more and more "grunt work" to AI, their legal skills might atrophy through lack of practice, and they will tend to rely even more heavily on AI. This very fact will make it difficult for lawyers to spot and correct errors when AI makes mistakes. Of course, the best way to develop and maintain legal skills is to use them.¹⁶⁶

There is some merit in junior attorneys performing thankless and menial tasks, because that is, in many ways, how lawyers train to become competent and experienced.¹⁶⁷ For example, junior attorneys should learn how to draft contracts, tedious as the work might be, and should do it

involve thousands of gigabytes of information and long periods of lawyers' time spent on relatively mundane activities. Taylor 2016 *Modern Law Magazine* 22.

¹⁶³ Beleuz 2017 <https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robotlawyers-6332ead1f489>.

¹⁶⁴ Beleuz 2017 <https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robotlawyers-6332ead1f489>.

¹⁶⁵ As quoted in Lohr 2017 <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html>.

¹⁶⁶ Mason 2016 *Modern Law Magazine* 11-12.

¹⁶⁷ Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>; Richie and Duffy "Artificial Intelligence in the Legal Field" 5.

repeatedly to be able to have a solid grasp of the skill. We should thus be circumspect and exercise good judgment with the tasks that we delegate to machines and those that we do not.¹⁶⁸ For example, what happens when we eliminate the early/mid-tier of attorneys by automating routine work? We may then set upon a path of eliminating the early-to-mid-career development of future lawyers by automating the work that these attorneys typically undertake.¹⁶⁹

9 Conclusion

AI may well be a revolution in human affairs, and become the single most influential innovation in history.¹⁷⁰ It is not merely a futuristic vision;¹⁷¹ it is here, and it is already rapidly being deployed in all major sectors of the economy and society, including national defence, medicine, finance, manufacturing, transportation, the media, and arts and entertainment.¹⁷² Given current worldwide economic conditions and the burgeoning, exponential increase in the power of technology, it is unimaginable that the legal profession will remain substantially unchanged over the next decade. Indeed, although humans are notoriously bad at predicting the future, it can confidently be said that the least likely future is that little will change in the world of law.¹⁷³

The initial applications of AI to legal practice are just the early beginnings of what will be a radical technology-based disruption of the practice of law.¹⁷⁴

The Fourth Industrial Revolution heralds an era in which changes in the practice of law will be pervasive, irreversible, and transformational.¹⁷⁵ Susskind believes that by 2036:¹⁷⁶

[T]o pick a date ... that will be mid-career for young lawyers of today, it is neither hyperbolic nor fanciful to expect that the legal profession will have changed beyond recognition.

¹⁶⁸ Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>.

¹⁶⁹ Burdon 2018 <http://www.jatl.org/blog/2018/3/8/interview-with-mark-burdon-artificial-intelligence-and-the-law>.

¹⁷⁰ West and Allen 2018 <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/>.

¹⁷¹ Cross 2015 <https://www.raconteur.net/risk-management/time-for-technology-to-take-ver>.

¹⁷² Merchant 2017 *SciTech Lawyer* 21.

¹⁷³ Susskind *Tomorrow's Lawyers* 190-191.

¹⁷⁴ Merchant 2017 *SciTech Lawyer* 22.

¹⁷⁵ Susskind *Tomorrow's Lawyers* 184.

¹⁷⁶ Susskind *Tomorrow's Lawyers* 184.

This contribution accepts as its premise the idea that technology has, and will continue to have, a significant effect on the legal profession.¹⁷⁷ Emerging technology will continue to be disruptive, but also holds the promise of making lawyers more productive, and enabling more lawyers to perform services that were traditionally the domain of large law firms or viewed as economically non-viable. In so doing, emerging technology can democratise the legal profession in a way that benefits lawyers and clients alike.¹⁷⁸

The innately conservative legal system is traditionally risk-averse and tends to be slower to adopt new technologies. However, there is every sign that a combination of technological advances and market pressure will push law firms into the AI age.¹⁷⁹ Highly capable systems will assume a steadily increasing share of law firm billable hours, be applied to an ever-expanding set of legal tasks, and require knowledge and abilities beyond the existing skill set of most lawyers practising today.¹⁸⁰ This will be the context and backdrop of the careers and working lives of tomorrow's lawyers.¹⁸¹

However, it is important to steer the dialogue away from alarmist sentiments about "robot lawyers" and into the realm of how lawyers can leverage this new wave of technology in their day-to-day workflows.¹⁸² It is not that computer systems will replace all legal work by 2025. But from now on it will increasingly become commonplace across the legal profession for successful legal businesses to convert their business processes "from human handcrafting to ever more sophisticated and capable technology-based production".¹⁸³

The wisest course seems to be for lawyers to embrace AI now, so that it can be a tool as opposed to an impediment. In future, aided by artificially intelligent machines, lawyers will be able to play a valuable advisory role for their clients, as the more structured and routine work can both be expedited and performed to a higher degree of accuracy.¹⁸⁴

¹⁷⁷ Yoon 2016 *UTLJ* 471.

¹⁷⁸ Yoon 2016 *UTLJ* 471.

¹⁷⁹ Cross 2015 <https://www.raconteur.net/risk-management/time-for-technology-to-take-ver>.

¹⁸⁰ Merchant 2017 *SciTech Lawyer* 22.

¹⁸¹ Susskind *Tomorrow's Lawyers* 91.

¹⁸² Boran 2018 <https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815>.

¹⁸³ Susskind *Tomorrow's Lawyers* 91.

¹⁸⁴ Boran 2018 <https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815>.

Much of the debate surrounding the impact of AI on the practice of law has centred on *automation*, and not *augmentation*. This distinction is key. Automation will initially have the greatest impact on areas that are relatively formulaic and process- or volume-driven, such as due diligence, document review and legal research.¹⁸⁵ With augmentation, the AI systems facilitate the lawyer's work. While the automation of certain tasks may lead to some job losses, a lawyer's tasks also include several other elements, such as strategy, creativity, judgment and empathy that are required in advising, negotiating, and oral advocacy, none of which can yet be automated.¹⁸⁶ In other words, AI will not be using data to formulate complex adversarial arguments in the near future. Human elements — intuition, judgment, emotion, memory, and perception — are all integral to that process.¹⁸⁷

AI will augment the work of lawyers in three ways. Firstly, lawyers will be able to do more in the same period of time. Their increased efficiency could enable them to perform additional work on behalf of existing clients, or perhaps help more clients. Secondly, because AI will enable them to perform certain tasks in minutes that historically took hours, smaller firms can perform as capably as larger firms, because AI increasingly obviates the need for the massive labour power emblematic of large law firms. Thirdly, lawyers may be able to broaden, rather than narrow, their areas of specialisation. Unshackled from the daunting task of staying abreast of a growing corpus of materials, lawyers will be able use AI not only to maintain areas of expertise, but also to develop new ones.¹⁸⁸

At the moment, AI creates an advantage for law firms and their clients who can afford to pay for the service.¹⁸⁹ But for consumers at every level, advances in machine intelligence are good news indeed. AI has every potential to democratise the legal services sector. Machine intelligence will help lawyers to increasingly deliver low-priced services, and by fuelling the development of self-help applications that are directly targeted at non-lawyers.¹⁹⁰ Most legal needs of low- and middle-income citizens go unmet because they cannot afford the cost of legal services. These legal needs

¹⁸⁵ Anon 2018 <https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law>.

¹⁸⁶ De Souza 2017 <http://www.digitalpolicy.org/transforming-legal-profession-impact-challenges-artificial-intelligence/>.

¹⁸⁷ Anon 2018 <https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law>.

¹⁸⁸ Alarie, Niblett and Yoon 2018 *UTLJ* 121.

¹⁸⁹ Anon 2018 <https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law>.

¹⁹⁰ Anon 2018 <https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law>.

include matters as varied as counselling on how to establish a small business, and drafting a prenuptial agreement. Technological advancement in legal practice will enable the underserved middle class and even the poor to access legal services that they can afford.¹⁹¹

Navigating these issues is not easy. However, it is a task that we must take on if we are committed to maintaining not only a legal system that is efficient and cost-effective, but also a legal profession that is properly equipped to deal with social conditions in what is a time of extraordinary technological innovation.¹⁹²

In the short term, the development of new technologies will empower lawyers to work more efficiently, deepen and broaden their areas of expertise, and provide greater access to justice and more value to clients. In the longer term, it is unclear exactly how dramatic the impact of artificially intelligent tools will be: "Such predictions are difficult for us to make. We are, after all, only human".¹⁹³

Bibliography

Literature

Alarie 2016 *UTLJ*

Alarie B "The Path of the Law: Towards Legal Singularity" 2016 *UTLJ* 443-455

Alarie, Niblett and Yoon 2016 *UTLJ*

Alarie B, Niblett A and Yoon AH "Law in the Future" 2016 *UTLJ* 423-428

Alarie, Niblett and Yoon 2018 *UTLJ*

Alarie B, A Niblett A and Yoon AH "How Artificial Intelligence Will Affect the Practice of Law" 2018 *UTLJ* 106-124

Barfield "Towards a Law of Artificial Intelligence"

Barfield W "Towards a Law of Artificial Intelligence" in Barfield W and Pagallo U (eds) *Research Handbook on the Law of Artificial Intelligence* (Edward Elgar Cheltenham 2018) 2-39

¹⁹¹ McGinnis and Pearce 2014 *Fordham L Rev* 3055.

¹⁹² Beazley 2017 http://www.supremecourt.justice.nsw.gov.au/Documents/Publications/Speeches/2017%20Speeches/Beazley_20170921.pdf 20.

¹⁹³ Alarie, Niblett and Yoon 2018 *UTLJ* 124.

Betts and Jaep 2017 *Duke L & Tech Rev*

Betts KD and Jaep KR "Dawn of Fully Automated Contract Drafting: Machine Learning Breathes New Life into a Decade-Old Promise" 2017 *Duke L & Tech Rev* 216-233

Brynjolfsson and McAfee *Second Machine Age*

Brynjolfsson E and McAfee A *The Second Machine Age: Work, Process and Prosperity in a Time of Brilliant Technologies* (WW Norton New York 2014)

Christensen *Innovator's Dilemma*

Christensen C *The Innovator's Dilemma: The Revolutionary Book that will Change the Way You Do Business* (HarperCollins New York 2000)

Giuffrida, Lederer and Vermerys 2018 *Case W Res L Rev*

Giuffrida I, Lederer F and Vermerys N "A Legal Perspective on the Trials and Tribulations of AI: How Artificial Intelligence, the Internet of Things, Smart Contracts, and Other Technologies will Affect the Law" 2018 *Case W Res L Rev* 747-781

Gravett 2012 *Advocate*

Gravett WH "'I am not Overcompensated Enough': The Moral Compass of the American Lawyer" 2012 *Advocate – The South African Bar Journal* 43-48

Grossman and Cormack 2011 *Rich J L & Tech*

Grossman MR and Cormack G "Technology-assisted Review in E-Discovery can be More Effective than Exhaustive Manual Review" 2011 *Rich J L & Tech* 1-48

Holmes 1897 *Harv L Rev*

Holmes OW Jr "The Path of the Law" 1897 *Harv L Rev* 457-476

Katz 2013 *Emory LJ*

Katz DM "Quantitative Legal Prediction — or — how I Learned to Stop Worrying and Start Preparing for the Data-driven Future of the Legal Services Industry" 2013 *Emory LJ* 909-966

Katz, Bommarito and Blackman 2017 *PLoS ONE*

Katz DM, Bommarito MJ and Blackman J "A General Approach for Predicting the Behavior of the Supreme Court of the United States" 2017 *PLoS ONE* 1-18

Kolber 2014 *Ind LJ*

Kolber AJ "Will there be a Neurolaw Revolution?" 2014 *Ind LJ* 807-845

Kurzweil *Singularity is Near*

Kurzweil R *The Singularity is Near: When Humans Transcend Biology* (Viking Penguin New York 2006)

Loh 2018 *BMJ Leader*

Loh E "Medicine and the Rise of the Robots: A Qualitative Review of Recent Advances of Artificial Intelligence in Health" 2018 *BMJ Leader* 59-63

Mason 2016 *Modern Law Magazine*

Mason L "Interview" December 2016 *Modern Law Magazine Artificial Intelligence Supplement 2016* 1-30

McCarthy *et al* 2006 *AI Magazine*

McCarthy J *et al* "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence: August 31 1955" 2006 *AI Magazine* 12-14

McGinnis and Pearce 2014 *Fordham L Rev*

McGinnis JO and Pearce RG "The Great Disruption: How Machine Intelligence will Transform the Role of Lawyers in the Delivery of Legal Services" 2014 *Fordham L Rev* 3041-3066

McKamey 2017 *Appeal*

McKamey M "Legal Technology: Artificial Intelligence and the Future of Law Practice" 2017 *Appeal* 45-58

Merchant 2017 *SciTech Lawyer*

Merchant GE "Artificial Intelligence and the Future of Legal Practice" 2017 *The SciTech Lawyer* 21-23

Moore 1965 *Electronics*

Moore GE "Cramming more Components onto Integrated Circuits" 19 April 1965 *Electronics* 114, reprinted in 86 Proc IEEE 82 (1998)

Pasquale and Cashwell 2015 *UCLA L Rev*

Pasquale F and Cashwell G "Four Futures of Legal Automation" 2015 *UCLA L Rev* 27-48

Remus and Levy 2017 *Geo J Legal Ethics*

Remus D and Levy F "Can Robots be Lawyers: Computers, Lawyers and the Practice of Law" 2017 *Geo J Legal Ethics* 501-558

Richie and Duffy "Artificial Intelligence in the Legal Field"

Richie DR and Duffy JD "Artificial Intelligence in the Legal Field" in Association of Corporate Counsel *Greater Philadelphia In-House Counsel Conference* (25 April 2018) 1-8

Susskind *Tomorrow's Lawyers*

Susskind R *Tomorrow's Lawyers: An Introduction to your Future* (Oxford University Press Oxford 2017)

Taylor 2016 *Modern Law Magazine*

Taylor B "How AI will Deliver Law Firms Improved Profitability" December 2016 *Modern Law Magazine Artificial Intelligence Supplement 2016* 22-23

Turing 1950 *Mind*

Turing AM "Computing Machinery and Intelligence" 1950 *Mind* 433-460

Wisskirchen *et al Artificial Intelligence and Robotics*

Wisskirchen G *et al Artificial Intelligence and Robotics and their Impact on the Workplace* (International Bar Association Global Employment Institute London 2017)

Yoon 2016 *UTLJ*

Yoon AH "The Post-modern Lawyer: Technology and the Democratization of Legal Representation" 2016 *UTLJ* 456-471

Case law

Lola v Skadden Arps 620 Fed Appx 37 at 45 (2d Cir 2015)

Pyrrho Investments Ltd v MWB Property Ltd [2016] EWHC 256 (Ch) (16 February 2016)

Internet sources

Alteras *et al* 2016 <https://peerj.com/articles/cs-93.pdf>

Alteras N *et al* 2016 *Predicting Judicial Decisions of the European Court of Human Rights: A Natural Language Processing Perspective* <https://peerj.com/articles/cs-93.pdf> accessed on 19 April 2019

Anon 2011 https://www.huffpost.com/entry/armies-of-expensive-lawye_n_831993

Anon 2011 *Armies of Expensive Lawyers Replaced by Cheaper Software* https://www.huffpost.com/entry/armies-of-expensive-lawye_n_831993 accessed 24 June 2019

Anon 2018 <https://www.economist.com/science-and-technology/2018/02/15/for-artificial-intelligence-to-thrive-it-must-explain-itself>

Anon 2018 *For Artificial Intelligence to Thrive, It must Explain Itself*
<https://www.economist.com/science-and-technology/2018/02/15/for-artificial-intelligence-to-thrive-it-must-explain-itself> accessed on 9 May 2019

Anon 2018 <https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law>

Anon 2018 *Legal Analytics — When Big Data Meets Big Law*
<https://www.theguardian.com/legal-horizons/2018/nov/30/legal-analytics-when-big-data-meets-big-law> accessed on 27 June 2019

Beazley 2017 http://www.supremecourt.justice.nsw.gov.au/Documents/Publications/Speeches/2017%20Speeches/Beazley_20170921.pdf

Beazley MJ 2017 *Law in the Age of Algorithm - State of the Profession Address, New South Wales Young Lawyers, Sydney*
http://www.supremecourt.justice.nsw.gov.au/Documents/Publications/Speeches/2017%20Speeches/Beazley_20170921.pdf accessed 12 May 2020

Beleuz 2017 <https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robolawyers-6332ead1f489>

Beleuz S 2017 *Rise of the Planet of the RoboLawyers?*
<https://medium.com/@sabinabeleuz/rise-of-the-planet-of-the-robolawyers-6332ead1f489> accessed on 24 June 2019

Bindman 2014 <https://www.legalfutures.co.uk/latest-news/report-ai-will-transform-legal-world>

Bindman 2014 *Report: Artificial Intelligence will Cause 'Structural Collapse' of Law Firms by 2030*
<https://www.legalfutures.co.uk/latest-news/report-ai-will-transform-legal-world> accessed on 4 February 2019

Boran 2018 <https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815>

Boran M 2018 *Making a Case for Artificial Intelligence in the Legal Profession*
<https://www.irishtimes.com/business/technology/making-a-case-for-artificial-intelligence-in-the-legal-profession-1.3533815> accessed on 21 January 2019

Botha date unknown <http://www.foresightfordevelopment.org/featured/artificial-intelligence-ii>

Botha AP date unknown *Artificial Intelligence II: The Future of Artificial Intelligence*
<http://www.foresightfordevelopment.org/featured/artificial-intelligence-ii> accessed on 9 April 2019

Burdon 2018 <http://www.jatl.org/blog/2018/3/8/interview-with-mark-burdon-artificial-intelligence-and-the-law>

Burdon M 2018 *Interview with Mark Burdon: Artificial Intelligence and the Law* <http://www.jatl.org/blog/2018/3/8/interview-with-mark-burdon-artificial-intelligence-and-the-law> accessed on 16 April 2019

Clay and Seeger 2017 <http://www.altmanweil.com/LFiT2017/>

Clay T and Seeger EA 2017 *Altman Weil In., 2017: Law Firms in Transition* <http://www.altmanweil.com/LFiT2017/> accessed on 25 June 2019

Cross 2015 <https://www.raconteur.net/risk-management/time-for-technology-to-take-ver>

Cross M 2015 *Role of Artificial Intelligence in Law* <https://www.raconteur.net/risk-management/time-for-technology-to-take-ver> accessed on 3 April 2019

De Souza 2017 <http://www.digitalpolicy.org/transforming-legal-profession-impact-challenges-artificial-intelligence/>

De Souza SP 2017 *Transforming the Legal Profession: The Impact and Challenges of Artificial Intelligence* <http://www.digitalpolicy.org/transforming-legal-profession-impact-challenges-artificial-intelligence/> accessed on 27 June 2019

Donahue 2018 <https://jolt.law.harvard.edu/digest/a-primer-on-using-artificial-intelligence-in-the-legal-profession>

Donahue L 2018 *A Primer on Using Artificial Intelligence in the Legal Profession* <https://jolt.law.harvard.edu/digest/a-primer-on-using-artificial-intelligence-in-the-legal-profession> accessed on 1 July 2019

European Parliament 2017 <https://www.europarl.europa.eu/cmsdata/113782/juri-final-report-robotics.pdf>

European Parliament Committee on Legal Affairs 2017 *Report with Recommendations to the Commission on Civil Law Rules on Robotics (PE582.443v03-00)* <https://www.europarl.europa.eu/cmsdata/113782/juri-final-report-robotics.pdf> accessed 12 May 2020

Johnson 1997 <https://www.nytimes.com/1997/07/29/science/to-test-a-powerful-computer-play-an-ancient-game.html>

Johnson G 1997 *To Test a Powerful Computer, Play and Ancient Game* <https://www.nytimes.com/1997/07/29/science/to-test-a-powerful-computer-play-an-ancient-game.html> accessed on 20 May 2019

Koch 2016 <https://www.scientificamerican.com/article/how-the-computer-beat-the-go-master/>

Koch C 2016 *How the Computer Beat the Go Master* <https://www.scientificamerican.com/article/how-the-computer-beat-the-go-master/> accessed on 7 June 2019

Koebler 2017 <https://www.theatlantic.com/magazine/archive/2017/04/rise-of-the-robotlawyers/517794/>

Koebler J 2017 *Rise of the Robotlawyers* <https://www.theatlantic.com/magazine/archive/2017/04/rise-of-the-robotlawyers/517794/> accessed on 24 June 2019

Kroft 2017 <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16>

Kroft J 2017 *Artificial Intelligence Closes in on the Work of Junior Lawyers* <https://www.ft.com/content/f809870c-26a1-11e7-8691-d5f7e0cd0a16> accessed on 22 January 2019

Lew 2018 <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee>

Lew C 2018 *Artificial Intelligence and the Evolution of Law* <http://www.forbes.com/sites/forbeslacouncil/2018/07/17/artificial-intelligence-and-the-evolution-of-law/#6329c24e36ee> accessed on 4 March 2019

Lohr 2017 <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html>

Lohr S 2017 *AI is Doing Legal Work. But It won't Replace Lawyers, Yet* <https://www.nytimes.com/2017/03/19/technology/lawyers-artificial-intelligence.html> accessed on 22 January 2019

Markoff 2011 <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html>

Markoff J 2011 *Computer Wins on 'Jeopardy!': Trivial, it's not* <https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html> accessed on 20 June 2019

Markoff 2011 <https://www.nytimes.com/2011/03/05/science/05legal.html>

Markoff J 2011 *Armies of Expensive Lawyers, Replaced by Cheaper Software* <https://www.nytimes.com/2011/03/05/science/05legal.html> accessed 22 January 2019

Millan 2017 <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/>

Millan L 2017 *Artificial Intelligence* <https://www.canadianlawyermag.com/article/artificial-intelligence-3585/> accessed on 2 July 2019

Murgia 2017 <https://www.ft.com/content/cada14c4-d366-11e6-b06b-680c49b4b4c0>

Murgia M 2017 *DeepMind's Social Agenda Plays to its AI Strengths* <https://www.ft.com/content/cada14c4-d366-11e6-b06b-680c49b4b4c0> accessed on 20 May 2019

Neary and Chen 2017 <https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=2077&context=lsfp>

Neary MA and Chen SX 2017 *Artificial Intelligence: Legal Research and Law Librarians* <https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=2077&context=lsfp> accessed 4 February 2019

Nishith Desai Associates 2018 http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Artificial_Intelligence_and_Robotics.pdf

Nishith Desai Associates 2018 *The Future Is Here: Artificial Intelligence and Robotics* http://www.nishithdesai.com/fileadmin/user_upload/pdfs/Research_Papers/Artificial_Intelligence_and_Robotics.pdf accessed 12 May 2020

Pillay 2018 https://www.up.ac.za/news/post_2688680--artificial-intelligence-myth-or-reality-for-the-fourth-industrial-revolution

Pillay N 2018 *Artificial Intelligence: Myth or Reality for the Fourth Industrial Revolution?* https://www.up.ac.za/news/post_2688680--artificial-intelligence-myth-or-reality-for-the-fourth-industrial-revolution accessed on 27 March 2019

Quora Contributor 2018 <http://www.forbes.com/sites/quora/2018/08/28/how-will-artificial-intelligence-change-the-legal-system/#72984a046e1a>

Quora Contributor 2018 *How will Artificial Intelligence Change the Legal System?* <http://www.forbes.com/sites/quora/2018/08/28/how-will-artificial-intelligence-change-the-legal-system/#72984a046e1a> accessed on 4 March 2019

Sanito *et al* 2018 <https://www.edx.org/course/deep-learning-explained-microsoft-dat236x-1>

Sanito J *et al* 2018 *Deep Learning Explained*
<https://www.edx.org/course/deep-learning-explained-microsoft-dat236x-1>
accessed on 17 March 2019

Silver *et al* 2017 <https://www.nature.com/articles/nature24270>
Silver D *et al* 2017 *Mastering the Game of Go without Human Knowledge*
<https://www.nature.com/articles/nature24270> accessed on 7 June 2019

Singh, Okun and Jackson 2017 <https://www.nature.com/articles/550336a>
Singh S, Okun A and Jackson A 2017 *Learning to Play Go from Scratch*
<https://www.nature.com/articles/550336a> accessed on 7 June 2019

Smith 2016 <https://www.lawgazette.co.uk/practice/high-court-backs-predictive-coding-in-first-contested-case/5055377.article>
Smith C 2016 *High Court Backs Predictive Coding in First Contested Case*
<https://www.lawgazette.co.uk/practice/high-court-backs-predictive-coding-in-first-contested-case/5055377.article> accessed on 2 July 2019

Sobowale 2016 http://www.abajournal.com/magazine/article/how_artificial_intelligence_is_transforming_the_legal_profession
Sobowale J 2016 *Beyond Imagination: How Artificial Intelligence is Transforming the Legal Profession* http://www.abajournal.com/magazine/article/how_artificial_intelligence_is_transforming_the_legal_profession
accessed on 22 January 2019

Sprangers 2018 <https://www.johnsonflora.com/recent-articles-media/artificial-intelligence-and-the-law-revolution-or-evolution/>
Sprangers M 2018 *Artificial Intelligence and the Law — Revolution or Evolution* <https://www.johnsonflora.com/recent-articles-media/artificial-intelligence-and-the-law-revolution-or-evolution/> accessed on 17 April 2019

Truter 2018 https://www.bowmanslaw.com/press_releases/bowmans-invests-in-artificial-intelligence/
Truter C 2018 *Bowmans among the First in Africa's Legal Market to Invest in Artificial Intelligence* https://www.bowmanslaw.com/press_releases/bowmans-invests-in-artificial-intelligence/ accessed on 2 June 2019

Turner 2016 <https://www.washingtonpost.com/news/innovations/wp/2016/05/16/meet-ross-the-newly-hired-legal-robot/>
Turner K 2016 *Meet ROSS, the Newly Hired Legal Robot* <https://www.washingtonpost.com/news/innovations/wp/2016/05/16/meet-ross-the-newly-hired-legal-robot/> accessed on 24 June 2019

Victorian All-Party Parliamentary Group on Artificial Intelligence 2018 <https://www.parliament.vic.gov.au/publications/research-papers/download/36-research-papers/13863-artificial-intelligence-primer>
Victorian All-Party Parliamentary Group on Artificial Intelligence 2018 *Artificial Intelligence Primer* <https://www.parliament.vic.gov.au/publications/research-papers/download/36-research-papers/13863-artificial-intelligence-primer> accessed 12 May 2020

Wagner and Furst 2018 <https://nationalinterest.org/feature/rise-robotlawyers-30972>

Wagner D and Furst K 2018 *The Rise of the Robotlawyers* <https://nationalinterest.org/feature/rise-robotlawyers-30972> accessed on 27 June 2019

West and Allen 2018 <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/>

West DM and Allen JR 2018 *How Artificial Intelligence is Transforming the World* <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/> accessed on 21 March 2019

Zhao 2017 <http://stlr.org/2017/10/03/artificial-intelligence-and-its-impacts-on-the-legal-profession/?cn-reloaded=1>

Zhao L 2017 *Artificial Intelligence and its Impacts on the Legal Profession* <http://stlr.org/2017/10/03/artificial-intelligence-and-its-impacts-on-the-legal-profession/?cn-reloaded=1> accessed on 22 January 2019

List of Abbreviations

AI	Artificial Intelligence
Case W Res L Rev	Case Western Reserve Law Review
Duke L & Tech Rev	Duke Law and Technology Review
Emory LJ	Emory Law Journal
ECtHR	European Court of Human Rights
Fordham L Rev	Fordham Law Review
Harv L Rev	Harvard Law Review
Geo J Legal Ethics	Georgetown Journal of Legal Ethics
Ind LJ	Indiana Law Journal
Rich J L & Tech	Richmond Journal of Law and Technology
UCLA L Rev	UCLA Law Review
UTLJ	University of Toronto Law Journal