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"Danger, Will Robinson"? Artificial Intelligence in the Practice of Law: An Analysis and Proof of Concept Experiment

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"Danger, Will Robinson"?[1]

[1] Lost in Space (1965–1968) Quotes, IMDB, http://www.imdb.com/title/tt0058824/quotes, *archived at* https://perma.cc/J8RH-UYSB (last visited Sept. 16, 2016) (quoting "Robot: "Danger, Will Robinson! Danger!").

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Artificial Intelligence in the Practice of Law: An Analysis and Proof of Concept Experiment

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"Artificial intelligence is our biggest existential threat"

– Elon Musk[2]

I. INTRODUCTION: WHAT IS ARTIFICIAL INTELLIGENCE?

[1] In this position paper, we seek to provide a preliminary outline of the ethical, legal, and social implications facing society in light of the growing engagement of artificial intelligence ("AI") in our everyday lives as attorneys. In particular, we investigated these implications by developing, in collaboration with the IBM Watson team, a proof of concept. In this proof of concept, we aimed to specifically demonstrate the usefulness of AI in analyzing case law in the field of intellectual property, particularly within copyright fair use. To this end, we have extensively reviewed the relevant literature in an effort to pose pertinent and challenging questions regarding the implications of AI in all areas of law.

[2] AI is a sub-field of computer science;"[3] it can be broadly characterized as intelligence by machines and software.[4] Intelligence

[2] Samuel Gibbs, *Elon Musk: Artificial Intelligence is Our Biggest Existential Threat*, THE GUARDIAN (Oct. 27 2014, 6:26), https://www.theguardian.com/technology/2014/oct/27/elon-musk-artificial-intelligence-ai-biggest-existential-threat, *archived at* https://perma.cc/MSN2-5TWC.

refers to many types of abilities, yet is often constrained to the definition of human intelligence. It involves mechanisms, some that are fully discovered and understood by scientists and engineers, and some that are not.[5]

[3] AI is playing an increasingly important role in our everyday lives.[6] It is asserted that in the near-future AI will replace or enhance various human professions.[7] One of the overarching goals of the AI discipline is to improve machines and systems so that they can reason, learn, self-collect information, create knowledge, communicate autonomously, and manipulate their environment in unexpected fashions.[8] During the past two decades, AI has advanced to make major and influential improvements in quality and efficiency for services and manfucturing procedures.

[4] Some researchers hope AI will closely approximate or even surpass human intelligence, via an emphasis on problem solving and goals

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[3] Kris Hammond, *What is Artificial Intelligence*?, COMPUTERWORLD (Apr. 10, 2015, 4:05 AM), http://www.computerworld.com/article/2906336/emerging-technology/what-is-artificial-intelligence.html, *archived at* https://perma.cc/J7VS-HG43.

[4] *See id.; see, e.g.*, STUART JONATHAN RUSSELL & PETER NORVIG, ARTIFICIAL INTELLIGENCE: A MODERN APPROACH 18 (3rd ed. 2010) (discussing important aspects of A.I.).

[5] *See* John McCarthy, What Is Artificial Intelligence? 2–3 (Nov. 12, 2007) (unpublished manuscript) (on file with Stanford University), http://www-formal.stanford.edu/jmc/whatisai.pdf, *archived at* https://perma.cc/XF9R-UHKV.

[6] *See* Ido Roll & Ruth Wylie, *Evolution and Revolution in Artificial Intelligence in Education,* 26 INT'L J. ARTIFICIAL INTELLIGENCE IN EDUC. 582, 583 (2016); *see* Monika Hengstler, Ellen Enkel & Selina Duelli, *Applied Artificial Intelligence and Trust—The Case of Autonomous Vehicles and Medical Assistance Devices*, 105 TECHNOLOGICAL FORECASTING & SOCIAL CHANGE 105, 114 (2016).

[7] *See* Karamjit S. Gill, *Artificial Super Intelligence: Beyond Rhetoric*, 31 AI & SOCIETY 137, 137 (2016).

[8] *See* Avneet Pannu, *Artificial Intelligence and its Application in Different Areas*, 4 INT'L J. ENGINEERING & INNOVATIVE TECH. (IJEIT) 79, 79, 84 (2015).

achievement.[9] Both are possible, and AI may even reach computing levels more complicated than the human mind could ever reach.[10]

[5] Many claim we are still far from achieving this objective, and that fundamental new ideas and paradigm shifts are required in order to push this field forward.[11] These aims notwithstanding, AI studies thus far continue to progress in the direction of understanding and "modeling human consciousness and the inner mind."[12]

II. DISCIPLINES & RECENT DEVELOPMENTS

[6] To understand the field of AI we must first understand how researchers and philosophers observe this field. They divide AI into two categories: strong and weak.[13] *Strong AI* further divides into human formed AI and non-human formed AI.[14] The first refers to the ability of computers to think, reason, and deduce in a manner similar to humans, and the latter refers to the ability to reason independently, without similarity to the human brain.[15] *Weak AI* refers to computers mimicking thinking and reasoning abilities, without actually having these abilities. [16]

[9] *See id.* at 5.

[10] *See id.* at 3.

[11] *See id.* at 5.

[12] Katie Hafner, *Still a Long Way from Checkmate,* N.Y. TIMES, Dec. 28, 2000, http://www.nytimes.com/2000/12/28/technology/28ARTI.html?pagewanted=1, *archived at* https://perma.cc/X2PX-25EW.

[13] *See* RUSSELL & NORVIG, *supra* note 4, at 1020.

[14] *See id.*

[15] *See id.*; *see* JOHN FRANK WEAVER, ROBOTS ARE PEOPLE TOO: HOW SIRI, GOOGLE CAR, AND ARTIFICIAL INTELLIGENCE WILL FORCE US TO CHANGE OUR LAWS 3 (2014) [hereinafter ROBOTS ARE PEOPLE TOO].

[16] *See* RUSSELL & NORVIG, *supra* note 4, at 1020; *see* ROBOTS ARE PEOPLE TOO, *supra* note 15, at 3.

Understanding these observations is important when discussing issues of AI, thinking, and consciousness.

[7] The main progress made so far has been within weak AI. However, some computer scientists are not "holding their breath" to attribute actual thinking and reasoning abilities to a machine with AI.[17] To quote Edsger W. Dijkstra–a member of computer science's founding generation–"[t]he question of whether Machines Can Think (…) is about as relevant as the question of whether Submarines Can Swim."[18] Analogically, computer scientists argue that planes are tested on how well they fly, not whether they fly as birds. Essentially, these scientists believe that we need to step out of the current linguistic frameworks. Can a submarine swim? Can an airplane fly? Can a machine think? Many scientists claim these distinctions are meaningless–when we refer to machines as 'acting' intelligently, we are actually saying that they do not possess a mind or a consciousness.[19]

[8] There are various AI applications each different from the other. For example: speech recognition, language understanding, problem solving, game playing, computer vision (two-dimensional vs three-dimensional), expert systems, heuristic classification, and more.[20] These applications comprise two interest groups. One involves narrow applications (such as speech recognition), and the other is broader

[17] *See* RUSSELL & NORVIG, *supra* note 4, at 1026; *see* ROBOTS ARE PEOPLE TOO, *supra* note 15, at 3.

[18] E.W. Dijkstra, *The Threats to Computing Science (EWD898)*, E.W. Dijkstra Archive. USA: Center for American History, University of Texas at Austin, http://www.cs.utexas.edu/users/EWD/transcriptions/EWD08xx/EWD898.html, *archived at* https://perma.cc/ZU8Y-26TY.

[19] RUSSELL & NORVIG, *supra* note 4, at 1026.

[20] McCarthy, *supra* note 5, at 10–11.

(artificial general intelligence (AGI), including autonomous agent possibilities).[21]

[9] Currently, most AI applications are narrow (i.e., highly specialized entities used to carry out specific tasks).[22] In contrast, the human brain excels in many different environments and combines strategies across applications. Current AI examples include a word processing program that automatically corrects spelling, a computer that learns and plays a video game, a chess-playing computer (e.g. Deep Blue, IBM's chess-playing computer),[23] or a GO playing system (e.g. AlphaGo, Google's GO playing system).[24]

[10] Due to the obvious distinction from human intelligence, society generally sees this type of AI as posing no immediate danger or threat. Yet, it is important to understand that even the current state of AI is represented by a broad spectrum of applications–including "smart washing machines and coffeepots"[25] (assessing one simple task); "speech recognition programs,…collaborative filtering software, like that used by Amazon.com…";[26] "Aaron, a robotic artist that produces paintings that

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[21] *See* Richard Thomason, *Logic and Artificial Intelligence,* STANFORD ENCYCLOPEDIA OF PHILOSOPHY, http://plato.stanford.edu/entries/logic-ai/, *archived at* https://perma.cc/3RPH-PVKV, (last updated Oct. 30, 2013); *see* RAYMOND REITER, KNOWLEDGE IN ACTION: LOGICAL FOUNDATIONS FOR SPECIFYING AND IMPLEMENTING DYNAMICAL SYSTEMS 133 (2001).

[22] *See* David Senior, *Narrow AI: Automating The Future of Information Retrieval*, TECHCRUNCH, Jan. 31, 2015, https://techcrunch.com/2015/01/31/narrow-ai-cant-do-that-or-can-it/, *archived at* https://perma.cc/LP5K-Z47X.

[23] *See generally* Feng-hsiung Hsu, *IBM's Deep Blue Chess Grandmaster Chips*, 19 IEEE MICRO 70, 70 (1999) (describing IBM's Deep Blue super computer and discussing the main source of its computation power).

[24] *See generally* Aviva Rutkin, *Anything You Can Do . . .*, 229 NEW SCIENTIST 20,20 (2016) (discussing how artificial intelligence has developed and advanced).

[25] Hafner, *supra* note 12.

[26] *Id.*

could easily pass for human work;"[27] IBM's Watson,[28] eBay's computerized arbitration Modria;[29] and much more. All of these narrow AI applications range in capability from one simple task to intricate intelligent procedures.[30]

[11] One explanation for the vast immersion of AI within current society may be the process of incorporating basic science researchers (such as computer scientists) in high tech companies.[31] Here, scientists have quickly learned to appreciate that in order for AI to become accepted in human society, the emphasis must be on its benefits as a bridge for what could not have been achieved thus far – assisting and contributing to humans–instead of on how AI could replace them.[32] This is in stark contrast to AI in fiction.[33]

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[27] *Id.*

[28] *See generally* ROB HIGH, THE ERA OF COGNITIVE SYSTEMS: AN INSIDE LOOK AT IBM WATSON AND HOW IT WORKS (IBM Corp. ed., 2012) (providing a detail analysis on how Watson works).

[29] *See* MODRIA, http://modria.com/product/, *archived at* https://perma.cc/RKN5-LPWT (last visited Nov. 1, 2016).

[30] *See* Hafner, *supra* note 12.

[31] *See id.*

[32] *See id.*

[33] *See, e.g.*, Robert Fisher, *Representations of Artificial Intelligence in Cinema*, UNIVERSITY OF EDINBURGH–SCHOOL OF INFORMATICS, http://homepages.inf.ed.ac.uk/rbf/AIMOVIES/AImovies.htm, *archived at* https://perma.cc/Y7KC-XHP3 (last updated Apr. 16, 2015); *see* Kathleen Richardson, *Rebranding the Robot*, 4 ENGINEERING & TECHNOLOGY 42 (2009); *see* Robert B. Fisher, *AI and Cinema Does Artificial Insanity Rule?*, *in* TWELFTH IRISH CONF. ON ARTIFICIAL INTELLIGENCE AND COGNITIVE SCIENCE (2001); *see* Elinor Dixon, Constructing the Identity of AI: A Discussion of the AI Debate and its Shaping by Science Fiction (May 28, 2015) (unpublished Bachelor thesis, Leiden University) (on file with the Leiden University Repository),

[12] In fiction and cinema, AI is frequently portrayed as an ominous entity entwined with danger (e.g. HAL in "2001: A Space Odyssey,"[34] Agent Smith in "The Matrix,"[35] and the T1000 in "The Terminator").[36] In many of these plots, AI is depicted as fully autonomous machines acting out in a way that is harmful to human beings.[37] However, there are also movies, such as Spielberg's "A.I.,"[38] that portray machines in a softer, more humanlike light. Other films use AI simply for comedic relief, such as Star Wars[39] or its spoof, Spaceballs.[40] While reality is still far from the entities portrayed in science fiction, there are already AI machines that can cause injuries or death (e.g. autonomous cars), act as home and service robots (e.g., iRobot's Roomba, Anny the CareBot), or serve in the private, finance, and governmental sectors.[41]

[13] In light of all of the bad press it gets, it is important to understand how AI is being presented to society, what people think about it, and what

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https://openaccess.leidenuniv.nl/bitstream/handle/1887/33582/Elinor%20Dixon%20BA%20Thesis%20Final.pdf?sequence=1, *archived at* https://perma.cc/H2P7-NXVC.

[34] 2001: A SPACE ODYSSEY, (Stanley Kubrick Productions 1968).

[35] THE MATRIX, (Village Roadshow Pictures, Groucho II Film Partnership & Silver Pictures 1999).

[36] THE TERMINATOR (Cinema '84 & Pacific Western 1984).

[37] *See* Jean- Baptiste Jeangène Vilmer, *Terminator Ethics: Should We Ban "Killer Robots"* ETHICS & INT'L AFFAIRS, Mar. 23, 2015, https://www.ethicsandinternationalaffairs.org/2015/terminator-ethics-ban-killer-robots/, *archived at* https://perma.cc/8XSE-BNVC.

[38] A.I. ARTIFICIAL INTELLIGENCE (Amblin Entertainment & Stanley Kubrick Productions 2001).

[39] STAR WARS: EPISODE IV – A NEW HOPE (Lucasfilm Ltd. 1977).

[40] SPACEBALLS (Brooksfilms 1987).

[41] *See* WENDELL WALLACH & COLIN ALLEN, MORAL MACHINES: TEACHING ROBOTS RIGHT FROM WRONG 7–8 (2009).

needs to be considered nowadays in order to promote innovation in this area.

III. ETHICS & PHILOSOPHY

[14] The use of AI poses many important ethical questions. The philosopher John Searle, in his famed Chinese Room Argument, noted that the idea of a non-biological machine being intelligent is incoherent: "[t]he point is not that computers cannot think. The point is rather that computation as standardly defined in terms of the manipulation of formal symbols is not by itself constitutive of, nor sufficient for, thinking."[42] Further the eminent computer scientist, Joseph Weizenbaum, warned that "the idea [of an AI] is obscene, anti-human and immoral."[43]

[15] Many philosophers, scientists, and others have deliberated on such ethical and existential dilemmas. The *artificial intelligence control problem* for example, was discussed in a book published in 2014 by Swedish philosopher Nick Bostom, titled "*Superintelligence: Paths, Dangers, Strategies*."[44] It hypothesizes that AI could evolve into a form of super intelligent entities that outsmart human intelligence,[45] and are even capable of self-improvement.[46] In that process, he suggests the entities might become uncontrollable and lead to a human existential catastrophe.[47]

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[42] John Searle, *The Chinese Room Argument*, 4 SCHOLARPEDIA 3100 (2009), http://www.scholarpedia.org/article/Chinese_room_argument, *archived at* https://perma.cc/FK4A-5X7Q.

[43] David Adrian Sanders & Giles Eric Tewkesbury, *It Is Artificial Idiocy That Is Alarming: Not Artificial Intelligence*, *in* PROC. OF THE 11TH INT'L CONF. ON WEB INFO. SYS. AND TECHNOLOGIES 345, 347 (2015).

[44] *See* NICK BOSTROM, SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES (2014).

[45] *See id.* at 26, 155.

[46] *See id.* at 29.

[47] *See id.* at 140.

[16] Two foundational concepts in the evolution of AI that tend to come up when people refer to the dangers of AI are technological singularity and swarm intelligence. *Technological singularity* refers to the point at which technological progress will become incomprehensibly rapid and complicated beyond our human capabilities.[48] The AI, in a feedback loop of ever accelerating self-improvement, will surpass us in its intelligence and become too smart for us to control. [49] The term was first used in this context by the mathematician John von Neumann, and was published in 1958 when Stanislaw Ulam wrote about a conversation he had with Neumann.[50]

[17] When we speak about technological singularity in the AI context, we speak about the point at which the intelligence will surpass all human control or understanding, becoming too immeasurable and profound for humans to grasp – an "intelligence explosion."[51] It can occur either when AI enters into a "runaway effect" of ever accelerating self-improvement, or when AI is autonomously capable of building other more intelligent and powerful entities.[52]

[18] The second term, *swarm intelligence*, refers to incorporation of self-replicating machines in all aspects of life, science, industry, and even

[48] *See* SINGULARITY HYPOTHESES: A SCIENTIFIC AND PHILOSOPHICAL ASSESSMENT 1–4 (Amnon H. Eden et al. eds., 2012) [hereinafter SINGULARITY HYPOTHESES]

[49] *See id.* at 28–29.

[50] *See* Stanislaw Ulam, *John Von Neumann*, 64 BULL. OF THE AM. MATHEMATICAL SOC'Y 1, 5 (May 1958), http://www.ams.org/journals/bull/1958-64-03/S0002-9904-1958-10189-5/S0002-9904-1958-10189-5.pdf, *archived at* https://perma.cc/AV9D-EJ3T.

[51] Guia Marie Del Prado, *Stephen Hawking Warns of an 'Intelligence Explosion,'* BUS. INSIDER (Oct. 9, 2015, 2:17 PM), http://www.businessinsider.com/stephen-hawking-prediction-reddit-ama-intelligent-machines-2015-10, *archived at* https://perma.cc/P4NL-2AJ2.

[52] SINGULARITY HYPOTHESES, *supra* note 48, at 3.

politics.[53] The swarm will become a decentralized, self-organizing system.[54] In the Terminator movies, this is Cyberdyne: a swarm of self-improving AI machines that take over the world. [55]

[19] In addition to the ethical dangers of AI machines, there are also complicated existential questions, that raise not only questions regarding AI, but also humanity. Can machines have, or act as though they have, human intelligence? And if so, then do they have a mind? If they have a conscience, or self-awareness, do they have rights?

[20] Consciousness relates to abilities of understanding and thinking. Nevertheless, consciousness is still a widely unknown concept. Should a machine be aware of its mental state and actions? Can it be aware? Is it even relevant? Can *minds* be artificially created? (as John Searle stated[56]) And how about free will? Even in some fields of philosophy it is debatable whether humans have free will, so how does it reflect on artificial entities? And if we consider AI entities as entities with consciousness or minds, then does it become immoral to dismantle them? And then how do we program them with an understanding of right and wrong? [57]

[21] The vast majority of AI researchers do not pay attention to most of these ethical and social questions. Whether the machines actually think is

[53] *See* Hazem Ahmed & Janice Glasgow, *Swarm Intelligence: Concepts, Models and Applications: Technical Report 2012-585*, QUEEN'S UNIV. SCHOOL OF COMPUTING 2 (2012), http://ftp.qucis.queensu.ca/TechReports/Reports/2012-585.pdf, *archived at* https://perma.cc/8APG-T4ZX.

[54] *See* ERIC BONABEAU, MARCO DORIGO & GUY THERAULAZ, SWARM INTELLIGENCE: FROM NATURAL TO ARTIFICIAL SYSTEMS 19 (1999).

[55] *See* Vilmer, *supra* note 37.

[56] *See* John Searle, *Minds, Brains, and Computers*, 3 THE BEHAVIORAL & BRAIN SCIENCES 349, 353 (1980), http://faculty.arts.ubc.ca/rjohns/searle.pdf, *archived at* https://perma.cc/7K9U-98FA (stating that the equation "mind is to brain as program is to hardware" is flawed).

[57] *See* RUSSELL & NORVIG, *supra* note 4, at 36–37.

not a concern for them, as long as the machines function properly.[58] Yet, philosophers urge all researchers to consider the ethical and social implications of their modus operandi.[59]

[22] When examining the connection between society and science, history shows us dreadful events regarding ethics and responsibility. However, the science of AI raises new intricacies – regarding employment, rights, duties, and accountability. For example, are we as a society obligated to establish robot rights? This is not so implausible. For instance, the UK Office of Science and Innovation commissioned a report in 2006 dealing with robo-rights and possible future implications on law and politics.[60]

[23] All of the above questions and discussions are yet to be answered, and as long as deeper understanding in the subject is not evident, strong AI will likely remain controversial.[61]

[24] Evolving new technologies come with both a risk and a utility. It is unclear what AI will look like in the years to come. However, today we have the ability to try and lay the groundwork for a future in which man and machine will function together, and quite possibly as one.

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[58] *See* Michael R. LaChat, *Artificial Intelligence and Ethics: An Exercise in the Moral Imagination*, 7 AI MAG. 70, 70–71 (1986), http://www.aaai.org/ojs/index.php/aimagazine/article/view/540/476, *archived at* https://perma.cc/YQ72-FAXG ("[T]he possibility of constructing a personal AI raises many ethical and religious questions that have been dealt with seriously only by imaginative works of fiction; they have largely been ignored by technical experts and by philosophical and theological ethicists").

[59] RUSSELL & NORVIG, *supra* note 4, at 1020.

[60] *See* NICK BOSTROM, ROBOTS & RIGHTS: WILL ARTIFICIAL INTELLIGENCE CHANGE THE MEANING OF HUMAN RIGHTS? 5, 5 (Matt James & Kyle Scott eds., 2008).

[61] *See* RUSSELL & NORVIG, *supra* note 4, at 331.

IV. THE EMERGENCE OF ARTIFICIAL INTELLIGENCE, ITS PIONEERS, AND THE BEGINNING OF ITS IMPLICATIONS

[25] The AI field began evolving after World War II when a number of people, among them the English mathematician Alan Turing, independently started working on intelligent machines.[62]

A. The Turing Test

[26] It is argued that Alan Turing's publication entitled "*Computing Machinery and Intelligence*,"[63] published in 1950, was the first significant milestone in the AI field. [64] In his book, Turing presented what is now known as the Turing Test.[65] The goal of the test is to determine, to a satisfactory level, whether a computer has intelligence.[66] Succinctly, to pass the test an observer has to be unable to determine if he is interacting with a computer or a human.[67] There are three test participants – a 'judge' played by a human being, and two entities, a human and a computer.[68] The judge asks both entities questions through a computer terminal, and if he cannot distinguish between the human and the computer, then the

[62] *See* István S. N. Berkeley, *What is Artificial Intelligence?*, UNIV. OF LA. AT LAFAYETTE (1997), http://www.ucs.louisiana.edu/~isb9112/dept/phil341/wisai/WhatisAI.html, *archived at* https://perma.cc/2ZGB-L8P7.

[63] *See* ALAN M. TURING, COMPUTING MACHINERY AND INTELLIGENCE (1950).

[64] *See* Berkeley, *supra* note 62.

[65] *See* Daniel C. Dennett, *Can Machines Think?*, *in* HOW WE KNOW (Michael Shafto ed., 1985), http://www.nyu.edu/gsas/dept/philo/courses/mindsandmachines/Papers/dennettcanmach.pdf, *archived at* https://perma.cc/4JWH-XK3K (last visited Sept. 22, 2016).

[66] *See id.*

[67] *See id.*

[68] *See id.*

computer is said to have passed the test and is considered to have intelligence.[69]

[27] The Turing test is both highly acknowledged and highly criticized We have already witnessed situations in which computers have outsmarted man: IBM's Deep Blue won a chess game in 1996 against one of the world's best players and IBM's Watson won the U.S. trivia game-show Jeopardy in 2011 against two former winners.[70]

[28] In his relatively simple test, Turing aimed to elegantly examine a narrow range of AI capabilities including thinking, natural language processing, logic, and learning.[71]

[69] *See id.*

[70] *See* Jo Best, *IBM Watson: The Inside Story of How the Jeopardy-Winning Supercomputer was Born and What it Wants to do Next* TECHREPUBLIC, (Sept. 9, 2013, 8:45 AM), http://www.techrepublic.com/article/ibm-watson-the-inside-story-of-how-the-jeopardy-winning-supercomputer-was-born-and-what-it-wants-to-do-next/, *archived at* https://perma.cc/Z6MD-ZGUA.

[71] *See* Stuart Russell, *Introduction to AI: A Modern Approach*, UNIV. OF CA- BERKELEY, https://people.eecs.berkeley.edu/~russell/intro.html, *archived at* https://perma.cc/R2DQ-94R3 (last visited Oct. 31, 2016).

[29] The Test also has its critics who claim that the comparison to human intelligence is deficient in two respects: first, the comparison includes non-intelligent human behavior, and second, it does not include non-human intelligent behavior.[72] For the second reason, a number of alternative tests have been designed to assess super-intelligent non-human computational capabilities:

- **C-tests, or Comprehension Tests:** designed to test comprehension abilities – a main component of intelligence – while formulating information with new given data.[73]

- **Universal Anytime Intelligence Tests:** aim to examine intelligence of any present or future biological or artificial system.[74]

- **The Winograd Schema Challenge**: conceived by Levesque Hector, a professor of Computer Science at the University of Toronto, is based on a series of multiple choice questions (i.e. linguistic antecedents) which require spatial and interpersonal skills, preliminary knowledge, and other commonsense insights.[75]

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[72] *See* Gary Fostel, *The Turing Test is For the Birds*, 4 SIGART BULL. 7, 8 (1993).

[73] Jose Hernandez-Orallo, *Beyond the Turing Test,* 9 J. OF LOGIC, LANGUAGE & INFO. 447, 447-466, 458 (2000).

[74] *See* José Hernández-Orallo & David L. Dowe, *Measuring Universal Intelligence: Towards an Anytime Intelligence Test,* 174 ARTIFICIAL INTELLIGENCE 1508, 1509 (2010), http://ac.els-cdn.com/S0004370210001554/1-s2.0-S0004370210001554-main.pdf?_tid=179c084e-83e4-11e6-b8dd-00000aacb362&acdnat=1474892815_a27d3e23a8991e0587ff0c3a6c4c0086, *archived at* https://perma.cc/C3PW-438Q.

[75] *See* Hector J. Levesque, Ernest Davis, & Leora Morgenstern, *The Winograd Schema Challenge*, PROC. OF THE THIRTEENTH INT'L CONF. ON PRINCIPLES OF KNOWLEDGE REPRESENTATION & REASONING 552, 554, 557–58 (2012), http://www.aaai.org/ocs/index.php/KR/KR12/paper/viewFile/4492/4924/, *archived at* https://perma.cc/4VWX-7SYY.

- **The Logic Theorist System:** demonstrated by Alan Newell and Herb Simon, is engineered to mimic the problem solving skills of humans and the determination of high-order intellectual processes.[76]

- **The Lovelace 2.0 Test:** conceived in 2001 by Selmer Bringsjord and colleagues (and perfected in 2014 by Mark Riedl, a Georgia Tech professor),[77] examines intelligence by measuring creativity under the assumption that there are works of art that require intelligence in order to create them.[78]

[30] Another aspect of the Turing Test that received criticism is human misidentification,[79] meaning it is not uncommon for humans to be misidentified as machines. One explanation for this is judge bias based on the answers he expects to receive.[80]

B. The Roots of Artificial Intelligence

[76] *See generally* Allen Newell & Herbert Simon, *The Logic Theory Machine—A Complex Information Processing System*, 2 IRE TRANSACTIONS ON INFO. THEORY 61, (1956), https://www.u-picardie.fr/~furst/docs/Newell_Simon_Logic_Theory_Machine_1956.pdf, *archived at* https://perma.cc/NM8Q-LJZS (detailing logic theorist system).

[77] *See generally* Mark O. Riedl, *The Lovelace 2.0 Test of Artificial Creativity and Intelligence*, ARXIV: 1410.6142 (2014), http://arxiv.org/pdf/1410.6142v3.pdf, *archived at* https://perma.cc/9HC5-HYF3 (detailing the Lovelace 2.0 test).

[78] *See id.*

[79] *See* Kevin Warwick & Huma Shah, *Human Misidentification in Turing Tests,* 27 J. EXP. & THEORETICAL ARTIFICIAL INTELLIGENCE 123, 124–25 (2014) http://www.tandfonline.com/doi/pdf/10.1080/0952813X.2014.921734, *archived at* https://perma.cc/53VP-42NZ.

[80] *See* Kevin Warwick & Huma Shah, *Can Machines Think? A Report on Turing Test Experiments at the Royal Society,* 27 J. EXP. & THEORETICAL ARTIFICIAL INTELLIGENCE 1, 17 (2015) http://www.tandfonline.com/doi/pdf/10.1080/0952813X.2015.1055826?needAccess=true , *archived at* https://perma.cc/V279-8BRN.

[31] The 1955 Dartmouth Summer Research Project on Artificial Intelligence is considered the birthplace of AI as a discipline.[81] Amongst its participants were John McCarthy and Marvin Minsky.[82]

[32] John McCarthy, who is typically thought to have coined the term *artificial intelligence*, was an American computer scientist and cognitive scientist, and one of the founders of the AI discipline.[83] In 1979 McCarthy published "*Ascribing Mental Qualities to Machines*," where he argued that "[m]achines as simple as thermostats can be said to have beliefs, and having beliefs seems to be a characteristic of most machines capable of problem solving performance."[84]

[33] Marvin Lee Minsky was an American cognitive scientist in the field of AI and one of the main AI theorists.[85] Minsky believed that computers were not fundamentally different than the human mind.[86] Amongst his achievements was the construction of robotic arms and

[81] *See generally* John McCarthy et al., *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955*, 27 AI MAGAZINE 12, 13–14 (2006), http://www.aaai.org/ojs/index.php/aimagazine/article/view/1904/1802, *archived at* https://perma.cc/WA82-QMSZ (reproducing part of the Dartmouth summer research project and summarizing its proposal); *see also* Berkeley, *supra* note 62.

[82] *See* Berkeley, *supra* note 62.

[83] *See* Interview by Jeffrey Mishlove with John McCarthy, Ph.D., *Thinking Allowed, Conversations on the Leading Edge of Knowledge and Discovery: Artificial Intelligence* (1989), http://www.intuition.org/txt/mccarthy.htm, *archived at* https://perma.cc/3LCQ-KYW5.

[84] John McCarthy, *Ascribing Mental Qualities to Machines*, STAN. ARTIFICIAL INTELLIGENCE LAB. 1, 2 (1979), http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA071423, *archived at* https://perma.cc/HJ9K-VC8V.

[85] *See Marvin Minsky, 'Father of Artificial Intelligence,' Dies at 88*, MIT NEWS, Jan. 25, 2016, http://news.mit.edu/2016/marvin-minsky-obituary-0125, *archived at* https://perma.cc/AS9V-GN4S.

[86] *See* Will Knight, *What Marvin Minsky Still Means for AI*, MIT TECHNOLOGY REV., Jan. 26, 2016, https://www.technologyreview.com/s/546116/what-marvin-minsky-still-means-for-ai/, *archived at* https://perma.cc/BN2U-AXE5.

grippers, computer vision systems, and the first electronic learning system.[87] In 1969, Minsky, along with Seymour Papet, published the book *"Perceptrons"*[88] in which he emphasized critical issues that he felt prevented developmental research of the neural networks.[89] Minsky was also an active contributor to the symbolic approach (described below) and the research of human intelligence.[90] In general, Minksy had a positive outlook regarding the future humanlike intelligence capabilities of AI.[91]

C. Physical Symbol Systems Hypothesis

[34] The "*Physical Symbol Systems Hypothesis*" was developed in 1976 by Newell and Simon, and later became a core part of AI.[92] The hypothesis states that "[i]ntelligence is the work of symbol systems…a physical symbol system has the necessary and sufficient means for general intelligent action."[93] AI computers, as recognized physical symbol systems, are able to exhibit intelligence, and humans, as intelligent beings,

[87] *See id.*

[88] *See* Jan Mycielski, *Book Reviews, Perceptrons, An Introduction to Computational Geometry*, 78 BULL. OF THE AM. MATHEMATICAL SOC'Y 12, 12 (1972), http://www.ams.org/journals/bull/1972-78-01/S0002-9904-1972-12831-3/S0002-9904-1972-12831-3.pdf, *archived at* https://perma.cc/ZT2X-X8JS (reviewing *Perceptrons* by Minsky and Papert); *see also* Jordan B. Pollack, Book Review, *No Harm Intended*, 33 J. MATHEMATICAL PSYCHOLOG. 358, 358 (1988), http://www.demo.cs.brandeis.edu/papers/perceptron.pdf, *archived at* https://perma.cc/99US-9KK8 (reviewing the expanded edition of *Perceptrons* by Minsky and Papert).

[89] *See* Knight, *supra* note 86.

[90] *See id.*

[91] *See id.*

[92] *See* Allen Newell & Herbert A. Simon, *Computer Science as Empirical Inquiry: Symbols and Search*, 19 COMM. ACM 113, 116 (1976).

[93] HERBERT A. SIMON, THE SCIENCES OF THE ARTIFICIAL 23 (3rd ed. 1996).

must also be physical symbol systems, and therefore similar to computers.[94] Both are capable of processing structures of symbols.[95]

[35] One problem related to the Physical Symbol Systems Hypothesis, is that some activities human beings find hard or challenging–like mathematics–are easy for computers; while some activities that human beings find easy–like face recognition–are difficult for computers.[96] This problem led researchers to develop a strategy that later became known as the "*Artificial Neural Network*" (also known as Connectionism) which aims to create systems with brain-like characteristics that are capable of learning.[97] These particular efforts embrace some key elements from Machine Learning Strategy and provide partial answers for "The Common Sense Knowledge Problem" through an effort to create a database containing all of the general common sense knowledge a human possesses, presentable in an AI retrievable fashion.[98]

D. Computational intelligence

[94] *See id.* at 22.

[95] *See* Nils Nilsson, *The Physical Symbol System Hypothesis: Status and Prospects*, *in* 50 YEARS OF AI 9, 11 (Max Lungarella, Fumiya Iida, Josh Bongard & Rolf Pfeifer eds., 2007).

[96] *See* David S. Touretzky & Dean A. Pomerleau, *Reconstructing Physical Symbol Systems*, 18 COGNITIVE SCIENCE, 345, 349 (1994).

[97] *See generally* Alexander Singer, *Implementations of Artificial Neural Networks on the Connection Machine,* 14 PARALLEL COMPUTING 305 (1990) (discussing the practical implementation of artificial neural networks on the Connection Machine and the natural match between the two concepts).

[98] *See* DAVIS ERNEST, REPRESENTATIONS OF COMMONSENSE KNOWLEDGE 2 (Ronald J. Brachman ed., 1990); *see* John McCarthy *Applications of Circumscription to Formalizing Common-Sense Knowledge*, DEP'T OF COMPUTER SCIENCE, STAN. UNIV. (1986), http://www-formal.stanford.edu/jmc/applications.pdf, *archived at* https://perma.cc/NZG6-6ZN3.

[36] Computational intelligence aims to understand the principles that enable intelligent behavior in artificial systems. According to this area of research, AI has the following four common features:

- Ability and flexibility to change in the environment;
- Evidential reasoning and perception;
- Ability to plan and execute goals; and
- Ability to learn.[99]

[37] The early AI successes left researchers optimistic; however, in the late 1950's the field began to encounter obstacles and difficulties. One concern that is still highly relevant today is the "Common Sense Knowledge Problem": a system only "knows" the information that it explicitly receives, and it is often incapable of making trivial connections on its own.[100] To this end, many research strategies are trying to find a way around this problem, including limited domain systems and machine learning.[101]

E. Child Machine

[38] The idea of a "*Child Machine*" was first introduced in the 1950's.[102] A child machine aims to emulate the learning experience of a human child and implement it on an AI computer.[103] In that way, a computer starts as a "child" and improves by acquiring experiences and

[99] *See* DAVID LYNTON POOLE, ALAN K. MACKWORTH & RANDY GOEBEL, COMPUTATIONAL INTELLIGENCE: A LOGICAL APPROACH 1, 18 (1998).

[100] *See* Nilssson, *supra* note 95, at 11; *see* BO GÖRANZON, ARTIFICIAL INTELLIGENCE, CULTURE AND LANGUAGE: ON EDUCATION AND WORK 220 (Magnus Florin ed., 1990).

[101] *See* Berkeley, *supra* note 62.

[102] *See* John McCarthy, *The Well-Designed Child*, 172 ARTIFICIAL INTELLIGENCE 2003, 2011 (2008).

[103] *See id.*

knowledge.[104] Yet current programs still have many drawbacks regarding physical experiences and language skills, which hinder the desired successful outcome.[105]

[39] Even though there has been substantial progress in the science of AI, high hurdles remain. Difficult issues and thought-provoking questions that were raised over two decades ago are still far from receiving answers. Achieving human-level abilities, such as described in the common sense knowledge problem above, is still far from being reached.[106] While some types of human reasoning have been emulated to varying degrees, overall progress remains relatively sluggish.[107]

[40] In order for AI to further evolve, it is necessary to continue researching different implementation techniques of common reasoning such as: logical analysis, handcrafted large scale databases, web mining, and crowd sourcing.[108]

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[104] *See* Brenden M. Lake et al., *Building Machines That Learn and Think Like People.* CENTER FOR BRAINS, MINDS, AND MACHINES MEMO NO. 046, at 7 (2016), http://www.mit.edu/~tomeru/papers/machines_that_think.pdf, *archived at* https://perma.cc/3Q9P-87XD.

[105] *See* McCarthy, *supra* note 4.

[106] *See* Ernest Davis & Gary Marcus, *Commonsense Reasoning and Commonsense Knowledge in Artificial Intelligence*, 58 COMMUNICATIONS OF THE ACM 92, 93 (2015) http://cacm.acm.org/magazines/2015/9/191169-commonsense-reasoning-and-commonsense-knowledge-in-artificial-intelligence/fulltext#, *archived at* https://perma.cc/7PJH-KZP6.

[107] *See* Vincent C. Müller & Nick Bostrom, *Future Progress In Artificial Intelligence: A Survey of Expert Opinion,* FUNDAMENTAL ISSUES OF ARTIFICIAL INTELLIGENCE, 553, 553 (2016) ("The median estimate of respondents was for a one in two chance that high-level machine intelligence will be developed around 2040–2050, rising to a nine in ten chance by 2075. Experts expect that systems will move on to superintelligence in less than 30 years thereafter"), http://www.nickbostrom.com/papers/survey.pdf, *archived at* https://perma.cc/UA4E-P6GP.

[108] *See* Davis & Marcus, *supra* note 106, at 99–102.

[41] The next sections examine and analyze the involvement of AI in the field of law, including its ethical, legal, and social implications in both the short term and the long term. Further, the third chapter discusses the fair use doctrine (a subfield of copyright law) which is used as a test-case to demonstrate AI abilities.[109] The proof of concept was conducted through IBM's Watson with the guidance of IBM Israel.[110]

V. ARTIFICIAL INTELLIGENCE AND ITS IMPLICATIONS IN LAW

"Of course I've got lawyers. They are like nuclear weapons; I've got them 'cause everyone else has. But as soon as you use them they screw everything up."

– Danny DeVito.[111]

[42] Notwithstanding the dire lack of paradigm shifting progress described above, AI technologies are still progressing rapidly, not only theoretically, but also practically. Developers in both large corporations and in start-ups aim to create learning and computerized thinking algorithms that will disrupt our reality.[112] While some of these algorithms encompass the future of mankind's welfare, others pose dramatic and imminent threats.[113]

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[109] *See infra* text accompanying notes 240–42.

[110] *See Education in Communities*, IBM CORP. RESP. REP. (2014), http://www.ibm.com/ibm/responsibility/2014/communities/education-in-communities.html, *archived at* https://perma.cc/P2W6-RHFD.

[111] Other People's Money (Warner Bros. 1991).

[112] *See generally,* Mark Bergen, *Another AI Startup Wants to Replace Hedge Funds,* RECODE, (Aug. 7, 2016, 11:15 AM), http://www.recode.net/2016/8/7/12391180/artificial-intelligence-emma-hedge-fund, *archived at* https://perma.cc/924G-F822 (explaining how a company aiming to integrate artificial intelligence in stock market trading is a part of a larger wave of start-ups attempting to integrate AI learning in financial markets).

[113] *See generally* Jacob Brogan, *What's the Deal With Artificial Intelligence Killing Humans?* SLATE, (April 1 2016, 7:03 AM), http://www.slate.com/articles/technology/future_tense/2016/04/will_artificial_intelligence_kill_us_all_an_explainer.html, *archived at* https://perma.cc/9HSE-XA7Z (explaining

[43] This chapter depicts the rationale that brought forth and promoted the 'invasion' of AI into the world of law.[114] After reviewing the causes, we depict the technologies and companies worthy of the title 'game-changing', that might bring great value to society, followed by dramatic shifts - ethically, socially and legally.

[44] In the final part of this chapter we discuss what these dramatic societal shifts can offer, both as opportunities and threats.

[45] Market failure provides a great opportunity for AI to come in to the field of law with a big impact on it. Our analysis focuses mainly on the United States market.

A. Market Failure

[46] Legal systems around the world are collapsing under an ever-growing workload.[115] It is not a secret that the United States is currently leads the world in number of lawyers per-capita and has dramatically

the differing views on the danger of AI in a variety of fields); *see also* Heather M. Roff, *Killer Robots on the Battlefield*, SLATE (April 7, 2016 11:45 AM), http://www.slate.com/articles/technology/future_tense/2016/04/the_danger_of_using_an_attrition_strategy_with_autonomous_weapons.html, *archived at* https://perma.cc/Q3FR-M8J2 (discussing the fears and benefits that accompany the prospect of autonomous weapons that engage targets entirely independent of human operation).

[114] *See* John O. McGinnis & Russell G. Pearce, *The Great Disruption: How Machine Intelligence Will Transform the Role of Lawyers in the Delivery of Legal Services*, 82 FORDHAM L. REV. 3041, 3055 (2014) (discussing the possible disruptions that the legal profession may face as a result of integration of A.I. into the legal profession).

[115] *See e.g.*, *Overloaded Courts, Not Enough Judges: The Impact on Real People*, PEOPLE FOR THE AM. WAY, http://www.pfaw.org/sites/default/files/lower_federal_courts.pdf, *archived at* https://perma.cc/8CPY-4LGP (last visited Oct. 31, 2016) (explaining the current strain on the American judiciary).

overloaded judicial systems. [116] The fact remains, the judicial process is time consuming, inefficient, and cannot keep up with the speed and scalability in which conflicts grow.[117] Add to that the legal tactics lawyers use to stall, earn time, and sometimes 'dry' their opponents out of resources, and you have a very dysfunctional system. The system's own frequent users, lawyers, are active partners in creating the inability to function.[118]

[47] Although this realization is not news to most, the fact remains that with the current population growth, as well as the ever process of the internet, the worldwide potential for legal conflicts continues to grow as many judicial systems cannot keep up to face this growth.

B. The Vast Market Size

[48] The United States is among the largest consumers of legal services in the world.[119] The market size in estimated to be 437 billion USD annually.[120] Additionally, in recent years there is an on-going shift of power. While in the past large law firms controlled most of the market, today, nimble boutique firms are gaining an ever-increasing market

[116] *See Guilty as Charged*, THE ECONOMIST (Feb 2, 2013, 4:02 PM), http://www.economist.com/news/leaders/21571141-cheaper-legal-education-and-more-liberal-rules-would-benefit-americas-lawyersand-their, *archived at* https://perma.cc/Z7KX-Y6S9 ("America has more lawyers per person of its population than any of 29 countries studied (except Greece)").

[117] *See* Maria L. Marcus, *Judicial Overload: The Reasons and the Remedies,* 28 BUFFALO L. REV 111, 112–15, 120 (1978).

[118] *See id.* at 111.

[119] *See How Big is the US Legal Services Market?*, THOMPSON REUTERS (2015) http://legalexecutiveinstitute.com/wp-content/uploads/2016/01/How-Big-is-the-US-Legal-Services-Market.pdf, *archived at* https://perma.cc/6LH8-AXGN [hereinafter U.S. Legal Services Market]

[120] *Id.*

share.[121] The potential to compete with the largest firms empowers young and small firms to innovate, become more efficient, and even try new services, enabling them to gain a competitive edge.[122]

C. Funding

[49] The legal industry is currently witnessing two trends in funding which make the invasion of AI into the world of law a fait accompli. First, reaching a five-year record, 2015's fourth quarter had the highest funding levels for the entire area of AI.[123] In addition, funding for legal tech start-ups has grown from seven million USD in 2009 to a whopping one hundred-fifty million in 2013.[124]

[50] These account for a fertile ground in which technological solutions can arise, solving big scale problems like the ones portrayed by the judicial systems around the world. [125]

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[121] *See* William D. Henderson, *From Big Law to Lean Law*, 38 INT'L REV. OF L. & ECON. 1, 3–5, 10, 11 (2014). *But c.f.,* Russell G. Pearce & Eli Wald, *The Relational Infrastructure of Law Firm Culture and Regulation: The Exaggerated Death of Big Law,* 42 HOFSTRA L. REV 109, 110 (2013) (discussing how death of big law is not dying and present contradicting evidence).

[122] *See* U.S. Legal Services Market, *supra* note 119.

[123] *See Artificial Intelligence Global Quarterly Financing History 2010-2015*, CB INSIGHTS (2016), https://cbi-blog.s3.amazonaws.com/blog/wp-content/uploads/2016/02/AI_quarterly_finance_20160203.jpg, *archived at* https://perma.cc/7W29-26UG.

[124] *See* Christine Magee, *The Jury is Out on Legal Startups*, TECHCRUNCH, Aug. 5 2014 http://techcrunch.com/2014/08/05/the-jury-is-out-on-legal-startups/, *archived at* https://perma.cc/Y95J-C2U9.

[125] *See* Raymond H. Brescia, et al. *Embracing Disruption: How Technological Change in the Delivery of Legal Services Can Improve Access to Justice,* 78 ALBANY L. REV. 553, 553–55 (2014); *see generally,* JOAN C. WILLIAMS, AARON PLATT & JESSICA LEE, DISRUPTIVE INNOVATION: NEW MODELS OF LEGAL PRACTICE, at 2–3 (2015) http://ssrn.com/abstract=2601133, *archived at* https://perma.cc/4SVK-YMFX (explaining the impact of new business models and technology on legal access).

[51] While the use of computation and software is not new to the field of law, [126] we can now identify three main technological fields–Machine Learning, Natural Language Processing, and Big Data–which may enable AI to reign the world of law.

[52] Some of these technologies comprise different pieces of the puzzle which AI will soon piece together. When applied in a holistic manner these technologies may replace most lawyers and judges.[127] These changes will not be in the short term, but rather in years to come.[128] Yet, we believe it will be faster than expected. The three main technological fields are:

- **Machine Learning:**[129] A computer science subfield in which computer generated algorithms are trained to recognize patterns within data.[130] This usually involves massive amounts of data in all areas–from visuals, to categorizing language patterns within human conversations, to written data.[131]

[126] *See* JULIUS STONE, LEGAL SYSTEM AND LAWYERS' REASONINGS 37–41 (1964).

[127] *But see,* Jonathan Smithers, President of the Law Society, Speech at the Union Internationale des Avocats (UIA) Conference: Lawyers Replaced by Robots: Will Artificial Intelligence Replace the Judgement and Independence of Lawyers? (Oct. 30, 2015) http://www.lawsociety.org.uk/news/speeches/lawyers-replaced-by-robots-artificial-intelligence-replace-judgment/, *archived at* https://perma.cc/EV4A-RYBV.

[128] *See* Ian Lopez, *Can AI Replace Lawyers?*, LAW.COM, Apr. 8, 2016, http://www.law.com/sites/articles/2016/04/08/can-ai-replace-lawyers-vanderbilt-law-event-to-address-legal-machines/?slreturn=20160414054949, *archived at* https://perma.cc/UY4Q-U8FY.

[129]*See Machine Learning: What it is and Why it Matters*, SAS INSTITUTE, http://www.sas.com/en_us/insights/analytics/machine-learning.html, *archived at* https://perma.cc/X5VD-4WPW (last visited Sept. 26, 2016).

[130] *See id*.

[131] *See id*.

- **Natural Language Processing:** (NLP)[132] A sub-category within AI and machine learning.[133] In essence, NLP is heavily reliant on machine learning.[134] This form of research integrates computer science, psychology, and the interaction between the two.[135] Research in this field seeks to 'teach' computers how to comprehend human language, seek patterns, and perform deductions based on language patterns and reasoning.[136] The difference between NLP and machine learning is the added value from interactions with human behavior, human language, and even human biases and other psychological traits.[137]

- **Big Data:** This field typically refers to data sets too excessive to deal with and analyze via traditional data analytics.[138] Big data sets are relatively young and likely due in part to the accumulation of

[132] *See* Prakash M. Nadkarni, Lucila Ohno-Machado & Wendy W. Chapman, *Natural Language Processing: An Introduction,* 18 J. AM. MED. INFORMATICS ASS'N. 544, 544 (2011), http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3168328/, *archived at* https://perma.cc/3D53-TFM4.

[133] *See id.*

[134] *See id.* at 545–46.

[135] *See* Elizabeth D. Liddy, *Natural Language Processing*, SURFACE (Syracuse Univ. Research Facility and Collaborative Env't) (2001) http://surface.syr.edu/cgi/viewcontent.cgi?article=1043&context=istpub, *archived at* https://perma.cc/MTC7-HHYK.

[136] *See* Nadkarni et al., *supra* note 132, at 544–45; *see* Steve Lohr, *Aiming to Learn as We Do, a Machine Teaches Itself*, N.Y. TIMES, Oct. 4, 2010, http://www.nytimes.com/2010/10/05/science/05compute.html?hpw=&pagewanted=all&_r=0, *archived at* https://perma.cc/KNP8-KWPE.

[137] *See* Nadkarni et al., *supra* note 132, at 549.

[138] *See Big Data: What It is and Why It Matters*, SAS INSTITUTE, http://www.sas.com/en_us/insights/big-data/what-is-big-data.html, *archived at* https://perma.cc/G3N7-566N (last visited Sept. 26, 2016).

> legal data, which has accelerated greatly since the beginning of the digital storage age (2002).[139] These data sets are used to create predictive analysis algorithms in various fields, from business trends to target audience marketing methods.[140] It can also be used to analyze legal claims, judicial opinions, and more.[141] This type of data usually exists in public records.[142]

[53] We are now on the verge of a legal renaissance.[143] Market failure mixed with an immense market, growing funding for start-ups, and available and rapidly growing technology is a volatile concoction, which will likely create dramatic and disruptive changes in the nearby future.[144]

[54] Authors Buchanan and Thomas first raised the notion of using AI in the legal field in November 1970 in their article *"Some Speculation about Artificial Intelligence and Legal Reasoning."*[145] In their research, they suggest the use of computers to model human thought processes and

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[139] *See* Martin Hilbert & Priscila Lopez, *The World's Technological Capacity to Store, Communicate, and Compute Information: Tracking the Global Capacity of 60 Analog and Digital Technologies During the Period from 1986 to 2007*, MARTINHILBERT.NET, Apr. 1, 2011, http://www.martinhilbert.net/WorldInfoCapacity.html/, *archived at* https://perma.cc/D5MK-CF5L (last visited Sept. 26, 2016).

[140] *See* SAS INSTITUTE, *supra* note 138.

[141] *See* Bernard Marr, *How Big Data is Disrupting Law Firms and The Legal Profession*, FORBES (Jan. 20, 2016, 2:31 AM), http://www.forbes.com/sites/bernardmarr/2016/01/20/how-big-data-is-disrupting-law-firms-and-the-legal-profession/#57a63cf35ed6, *archived at* https://perma.cc/9WLW-7EZV.

[142] *See* SAS INSTITUTE, *supra* note 138.

[143] *See Why Artificial Intelligence is Enjoying a Renaissance*, THE ECONOMIST (July 15, 2016, 4:26) http://www.economist.com/blogs/economist-explains/2016/07/economist-explains-11, *archived at* https://perma.cc/J63S-RGKH.

[144] *See id.*

[145] *See* Bruce G. Buchanan & Thomas E. Headrick, *Some Speculation About Artificial Intelligence and Legal Reasoning,* 23 STAN. L. REV. 40, 40–41 (1970).

as a direct outcome, also help lawyers in their reasoning processes.[146] Later, an experiment was conducted by Thorne McCarty who created a program that was capable of performing a narrow form of legal reasoning in the specific area of corporate reorganization taxation.[147] Given a 'description' of the 'facts' of a corporate reorganization case, the program could implement an analysis of these facts in terms of several legal concepts.[148]

[55] Today, in this subfield of AI and law there are already numerous technologies such as:

- **IBM's Watson Debater:**[149] The debater is a new feature of IBM's well-known Watson computer.[150] When asked to discuss any topic, it can autonomously scan its knowledge database for relevant content, 'understand' the data, select what it believes are the strongest arguments, and then construct sentences in natural language to illustrate the points it had selected, in favor and against the topic. Using that process, it can assist lawyers by suggesting the most persuasive arguments and precedents when dealing with a legal matter.[151]

[146] *See id.* at 40.

[147] *See* L. Thorne McCarty, *The Taxman Project: Towards a Cognitive Theory of Legal Argument, in* COMPUTER SCIENCE & LAW: AN ADVANCED COURSE 23, 23 (Brian Niblett ed., 1980).

[148] *See id.*

[149] *See* Olaf Mw, *IBM Debating Technologies,* YOUTUBE (May 6, 2014), https://www.youtube.com/watch?v=7g59PJxbGhY, *archived at* https://perma.cc/L3MF-FJYV (excerpt from the 2014 Milken Institute).

[150] *See* IBM Watson, *IBM Watson: How it Works*, YOUTUBE (Oct. 7, 2014), https://www.youtube.com/watch?v=_Xcmh1LQB9I, *archived at* https://perma.cc/68XU-J3D6.

[151] *See* Ruty Rinott et al., *Show Me Your Evidence - An Automatic Method for Context Dependent Evidence Detection*, *in* PROCEEDINGS OF THE 2015 CONFERENCE ON EMPIRICAL METHODS IN NATURAL LANGUAGE PROCESSING 440, 440 (2015).

- **ROSS Intelligence:**[152] "SIRI for the law"[153] was developed in IBM's Watson labs. ROSS is a legal research tool that enables users to obtain legal answers from thousands of legal documents, statutes, and cases.[154] The question can be asked in plain English and not necessarily in legal form. Ross's responses include legal citations, suggested articles for further reading, and calculated ratings to help lawyers prepare for cases.[155] Because Ross is a cognitive computing platform, it learns from past interactions, i.e. Ross's responses increase in accuracy as lawyers continue to use it. This feature can help lawyers reduce the time spent on research.[156]

- **ModusP:**[157] An Israeli startup which has created an advanced search engine using sophisticated algorithms based on AI. The

[152] ROSS INTELLIGENCE, http://www.rossintelligence.com/, *archived at* https://perma.cc/8Q63-XBAQ (last visited Sep. 26, 2016)[hereinafter ROSS INTELLIGENCE].

[153] ROSS INTELLIGENCE, https://wefunder.me/ross, *archived at* https://perma.cc/ZBG4-6JBX. "What they do: ROSS is an A.I. lawyer built on top of Watson, IBM's cognitive computer, that provides cited legal answers instantly. Ross works much like Siri. With ROSS, lawyers ask a simple question the system sifts through its database of legal documents and spits out an answer paired with a confidence rating. Why it's a big deal: Legal research is time-consuming and expensive. It erodes law firms' profits and prices clients of [sic] out of services—Law firms spend $9.6 billion on research annually. Up until now the current research databases have relied heavily on the flawed system of keyword search. With Ross it's as easy as asking a question. Ross has the potential to save both lawyers and clients billions every year. If they succeed, Ross will be the first ever artificial [sic] intelligence research and indexing software."

[154] ROSS INTELLIGENCE, *supra* note 152.

[155] *See id.; see* Karen Turner, *Meet 'Ross,' the Newly Hired Legal Robot*, WASH. POST, May, 16, 2016, https://www.washingtonpost.com/news/innovations/wp/2016/05/16/meet-ross-the-newly-hired-legal-robot//, *archived at* https://perma.cc/J2US-RP9M.

[156] *See id.;* ROSS INTELLIGENCE, *supra* note 152.

[157] MODUSP, http://modusp.com/, *archived at* https://perma.cc/7BSM-54AT (last visited Sep. 26, 2016).

search function helps jurists reduce legal research hours by finding legal knowledge and insights more efficiently.[158]

- **Lex Machina:**[159] An intellectual property ("IP") research company that helps companies anticipate, manage, and win patent and other IP lawsuits by comparing cases to a database of information and helping their customers draw valuable conclusions that inform winning business and legal strategies.[160] The technology compiles data and documents from court cases and converts them into searchable text files.[161] After a keyword, patent, or party is searched for, data and documents are sent back out.[162] It gives lawyers more information on specific judges, a client's history, and information on what they can do to have a better chance at winning.[163]

- **Modria:**[164] A cloud based platform, initially developed for eBay and PayPal, functions as Online Dispute Resolution ("ODR").[165] It enables companies "to deliver fast and fair resolutions to disputes of any type and volume."[166] This technology aims to prevent

[158] *See id.*

[159] LEX MACHINA: A LEXISNEXIS COMPANY, https://lexmachina.com/, *archived at* https://perma.cc/QLF2-SM8V (last visited Sept. 26, 2016).

[160] *See* John R. Allison et al., *Understanding the Realities of Modern Patent Litigation.*, 92 TEX. L. REV. 1769, 1772–73 (2014).

[161] *See id.*

[162] *See id.*

[163] *See id.* at 1773.

[164] *See Product*, MODRIA, http://www.modria.com/product/, *archived at* https://perma.cc/K5AE-DS9L (last visited Sept. 26, 2016).

[165] *See id.*

[166] *Id.*

submission of lawsuits, by providing easily accessible alternatives for dispute resolution.[167] Modria aims to create fair ODRs, based on the knowledge and insights from millions of cases and other disputes that the system has already solved.[168]

- **Premonition:**[169] A technology which utilizes Big Data and AI to expose which lawyers win the most cases and before which judges.[170]

- **BEAGLE:**[171] A technology that uses AI to quickly highlight the most important clauses in a contract and also provides a real-time collaboration platform that enables lawyers to easily negotiate a contract or pass it around an organization for quick feedback.[172] Beagle's learning process allows the program to adapt to focus on what users care about most.[173]

- **Legal Robot:**[174] A platform that enables users to check, analyze, and spot problems in contracts before signing them.[175] The

[167] *See id.*

[168] *See* Ben Barton, *Modria and the Future of Dispute Resolution*, BLOOMBERG LAW, Oct 1, 2015, https://bol.bna.com/modria-and-the-future-of-dispute-resolution/, *archived at* https://perma.cc/9J3D-N5UU.

[169] *See Solutions*, PREMONITION, http://premonition.ai/law/, *archived at* https://perma.cc/MXW5-B7RR (last visited Sept. 26, 2016).

[170] *See id.*

[171] *See How It Helps*, BEAGLE, http://beagle.ai/, *archived at* https://perma.cc/WY6X-CGV8 (last visited Sept. 26, 2016).

[172] *See id.*

[173] *See id.*

[174] *See* LEGAL ROBOT, http://www.legalrobot.com, *archived at* https://perma.cc/9NJE-JZ6J (last visited Sep. 22, 2016).

[175] *See id.*

> platform is also meant to help users understand complex legal language by parsing legal documents and translating them into accessible language by transforming them into numeric expressions, so statistical and machine learning techniques can derive meaning.[176] It is also designed to compare thousands of documents in order to build a legal language model to be used as a tool for referencing and analyzing contracts.[177]

[56] The development of the field of AI and law starts with programs that analyze cases and continues with technologies that make lawyers' tasks efficient, solve disputes, and replace human intervention. Surveying this course of development, we can predict that in the long run, AI technologies using machine learning and deep learning techniques may replace lawyers, arbitrators, mediators, and even judges. Computers could do the work of a lawyer – examining a case, analyzing the issues it raises, conducting legal research, and even deciding on a strategy.

VI. THE REALITY AS WE SEE IT, THE DAY AFTER ARTIFICIAL INTELLIGENCE

A. Judges and Physical Courts

[57] Judges and their courts will become less necessary.[178] Most commercial disputes and criminal sentencing will be run by algorithms and wizards,[179] enabling algorithms like Modria to construct conflict

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[176] *See id.*

[177] *See id.*

[178] *See* Mohammad Raihanul Islam et al., *Could Antonin Scalia be replaced by an AI? Researchers reveal system that can already predict how Supreme Court justices will vote*, DAILY MAIL (Mar.11, 2016), http://www.dailymail.co.uk/sciencetech/article-3488508/Could-Antonin-Scalia-replaced-AI-Researchers-reveal-smart-predict-justices-vote.html, *archived at* https://perma.cc/3YWP-8SQ3.

[179] *See* Ephraim Nissan, *Digital Technologies and Artificial Intelligence's Present and Foreseeable Impact on Lawyering, Judging, Policing and Law Enforcement*, AI &

resolutions in a much healthier and down to earth manner. After all, they reportedly solve over fifty million disputes every year without any human intervention.[180] Most disputes can then be solved by an AI algorithm to determine the amount of damages to be paid to each side. Similar processes can occur in divorce hearings–algorithms can automatically asses the individuals' property, financial background, and calculate the amount of time spent together to create a fair agreement of divorce.

[58] One of the biggest problems with conflict resolution is the fact that it is run by human beings– prone to effects of emotion, fatigue, and general current mood.[181] When a legal claim is first constructed by algorithms instead of human beings, the outcomes are likely to be more productive. For example, Modria is able to resolve hundreds of millions of commercial disputes yearly without the intervention of third party human beings providing a verdict.[182] Claimants will, of course, be able to appeal to a human judge, but the need for those should dramatically decrease over time as machine learning algorithms gain better understandings of the statistical meaning of justice. To reduce the amount of appeals in tort cases, a government can create a fund to financially accommodate damages in order to facilitate a 'sense of justice' in the claimants' minds.

[59] Some judges may remain in office to rule on algorithm cases not brought to a decision suitable to both sides, and in cases where entirely new issues are being presented.

B. Lawyers

SOC'Y (Oct. 14, 2015), http://link.springer.com/article/10.1007/s00146-015-0596-5/fulltext.html, *archived at* https://perma.cc/ZJ6G-YRSE.

[180] *See, About Us*, MODRIA, http://modria.com/about-us/, *archived at* https://perma.cc/2PHR-RLH6 (last visited Sep. 22, 2016).

[181] *See* Peter Reilly, *Mindfulness, Emotions, and Ethics in Law and Dispute Resolution: Mindfulness, Emotions, and Mental Models: Theory that Leads to More Effective Dispute Resolution*, 10 NEV. L.J. 433, 438, 447 (2010).

[182] *See Frequently Asked Questions*, MODRIA, http://modria.com/faq/, *archived at* https://perma.cc/9JEM-FYKC (last visited Sep. 22, 2016).

[60] Lawyers may also become a dying breed,[183] as algorithms learn how to structure claims, check contracts for problematic caveats, negotiate deals, predict legal strategies, and more. Using AI to create simple, optimally designed regulations and laws that are easier to learn, understand, and litigate by computer, will further the winnowing of the legal profession.[184]

[61] Lawyers–or something similar–will still be necessary, however they will focus mainly on risk engineering instead of litigation and contracts.[185] Lawyers will need to use intuition and skills not *yet* available to machines to analyze exposure and various aspects of performing business and civil actions.[186] They will, however, be helped by AIs that have already sifted through all the relevant data. Until AI is able to integrate the data into a nuanced analysis that requires some form of higher thinking, creativity, and predicting likely outcomes based on human reactions, we still need lawyers. In the future, all but the most skilled litigation and corporate lawyers will become unemployed as computer algorithms learn to emulate earlier successful strategies and avoid unsuccessful strategies to achieve optimal outcomes.[187] Young

[183] *See* Mark Wilson, *The Latest in 'Technology Will Make Lawyers Obsolete!'*, FINDLAW (Jan. 6, 2015, 11:39 AM), http://blogs.findlaw.com/technologist/2015/01/the-latest-in-technology-will-make-lawyers-obsolete.html#sthash.nkz8BvRE.dpuf, *archived at* https://perma.cc/GX98-4LY7.

[184] *See id.*

[185] *See* Dominic Carman, *'We're not even at the fear stage' - Richard Susskind on a very different future for the legal profession,* LEGALWEEK (Nov. 16, 2015), http://www.legalweek.com/sites/legalweek/2015/11/16/were-not-even-at-the-fear-stage-richard-susskind-on-a-very-different-future-for-the-legal-profession/, *archived at* https://perma.cc/S3RA-MSVU.

[186] *See* Jane Croft, *Legal firms unleash office automatons*, FIN. TIMES (May 16, 2016), https://www.ft.com/content/19807d3e-1765-11e6-9d98-00386a18e39d, *archived at* https://perma.cc/5E6L-7E7K.

[187] See *Id.*

(often overpaid) associates will become unnecessary as much of their grunt work will be doable by machine.[188]

[62] In some areas of the law, lawyers may take longer to disappear entirely. In areas without clear precedent, cases may be deemed too delicate to be dealt with by computers. Some clients may never trust computers and insist on using humans; it will take time until we are willing to entrust our freedom (or our lives, in certain states in the United States) in the hands of algorithms.[189]

[188] *See* Frank A. Pasquale & Glyn Cashwell, *Four Futures of Legal Automation,* 63 UCLA L. REV DISCOURSE 26, 28 (2015); *see also*, David Kravets, *Law Firm Bosses Envision Watson-Type Computers Replacing Young Lawyers*, ARS TECHNICA (Sept. 26, 2015), http://arstechnica.com/tech-policy/2015/10/law-firm-bosses-envision-watson-type-computers-replacing-young-lawyers/, *archived at* https://perma.cc/J3TN-64R3 (discussing the possibility of IBM Watson-like computers replacing lawyers and paralegals within the next ten years).

[189] *See* Erik Sherman, '*Highly Creative' Professionals Won't Lose their Jobs to Robots, Study Finds,* Fortune (Apr. 22, 2015), http://fortune.com/2015/04/22/robots-white-collar-ai, *archived at* https://perma.cc/GH8F-7YEU.

C. Jury

[63] Juries, like the other members of the legal system, will not be needed for most cases as there will be fewer trials.[190] The majority of legal issues will be solved by algorithms. In addition, technology may ensure that juries are designed to represent society, perhaps even mimicking human biases involving race, background, and life experience.[191] Such a jury could easily be instructed to disregard information, or weigh some data differently than others.[192]

D. Law School

[64] Law schools will change dramatically, not least because we will need fewer lawyers. Moreover, the nature of legal learning will change to include subjects that are not taught in law schools today–creativity, understanding of statistics, big data analysis, and more.[193]

VII. SPECIFIC ETHICAL, LEGAL, AND SOCIAL IMPLICATIONS

[65] When considering these technologies and the changes they bring to the legal field, we must refer to the ethical, legal, and social implications that they create:

[190] *See* Jacob Gershman, *Could Robots Replace Jurors?*, WALL ST. J. L. BLOG (Mar. 6, 2013, 1:30 PM), http://blogs.wsj.com/law/2013/03/06/could-robots-replace-jurors/, *archived at* https://perma.cc/5LT5-JBAP.

[191] *See* Anthony D'Amato, *Can/Should Computers Replace Judges?*, 11 GA. L. REV. 1277, 1280–81 (1977).

[192] See *id*. at 1292.

[193] *See* Michael Horm, *Disruption Looms For Law* Schools, FORBES (Mar. 17, 2016, 8:23 AM), http://www.forbes.com/sites/michaelhorn/2016/03/17/disruption-looms-for-law-schools/#6f77e6002708, *archived at* https://perma.cc/JY9M-FJ53.

[66] Today, the legal profession—lawyers, judges, and legal education—faces a disruption, mostly because of the growth of AI technology, both in power and capacity.[194]

[67] An example of this disruption is that today, computers can review documents, a task which human lawyers did in the past. The role of AI is growing exponentially, so it is predicted that technology will evolve to a level that will enable computers to replace more complex legal tasks such as legal document generation and predicting litigation outcomes in litigation.[195] These implementations will become possible as the learning abilities of the machine intelligence becomes better and better. Already, fifty-eight percent of respondents to the question "Is your firm doing any of the following to increase efficiency of legal service delivery" responded saying "Using technology tools to replace human resources."[196] More specifically, forty-seven percent saw Watson replacing paralegals, thirty-five percent thought the same for first year associates. Thirteen and a half percent even though Watson could replace experienced legal partners.[197] Notably, while twenty percent said that computers will never replace human practitioners,[198] that number has gone down from forty-six percent in 2011.[199]

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[194] *See id*.

[195] IBM Watson computer is an example of a machine with strong computation skills, represented in hardware, software and connectivity. *See What is Watson?*, IBM, http://www.ibm.com/watson/what-is-watson.html, *archived at* https://perma.cc/8WCK-X3G7 (last visited Oct. 31, 2016).

[196] Thomas S. Clay & Eric A. Seeger, *2015 Law Firms in Transition: An Altman Weil Flash Survey*, ALTMAN WEIL, 55 (2015), http://www.altmanweil.com/index.cfm/fa/r.resource_detail/oid/1c789ef2-5cff-463a-863a-2248d23882a7/resources/Law_Firms_in_Transition_2015_An_Altman_Weil_Flash_Survey.cfm, *archived at* https://perma.cc/6YRC-BFBP.

[197] *See id.* at 82.

[198] *See id*.

[199] *See id*. at 83.

[68] There are some benefits which derive from these implications. First, they will increase competition in the legal services market, which will increase efficiency.[200] Second, today the pricing process of lawyer's services is very ambiguous because it is hard to predict the total required services. This implication could enable price comparisons and entrance of new players to the legal services market.[201]

[69] The forecast is that these implications will affect the following legal areas:[202]

- **Legal Discovery:** Machine searches will enhance the legal discovery process by making the review of legal documents more efficient. There are already a handful of software tools that use predictive coding to minimize lawyerly interference in the e-discovery process, including, Relativity,[203] Modus,[204] OpenText,[205] kCura,[206] and others.[207] The courts have also acknowledged the use and promise of predictive coding.[208]

[200] *See* RICHARD SUSSKIND, TOMORROW'S LAWYERS: AN INTRODUCTION TO YOUR FUTURE 8 (2013).

[201] *See id*.

[202] *See* McGinnis & Pearce, *supra* note 114, at 3046.

[203] *See* RELATIVITY, https://www.kcura.com/relativity/, *archived at* https://perma.cc/5N67-ERGV (last visited Nov. 7, 2016).

[204] *See Overview,* MODUS, www.discovermodus.com/overview/, *archived at* https://perma.cc/8VRG-TRN6 (last visited Oct. 31, 2016).

[205] *See Who We Are*, OPENTEXT, http://www.recommind.com/products/ediscovery-review-analysis, *archived at* https://perma.cc/3D9A-MBTW (last visited Oct. 31, 2016).

[206] *See* KCURA, http://contentanalyst.com/, *archived at* https://perma.cc/E5NC-BWG4 (last visited Oct. 31, 2016).

[207] *See* Gordon V. Cormack & Maura R. Grossman, *Evaluation of Machine-Learning Protocols for Technology-Assisted Review in Electronic Discovery*, Proceedings of the 37th International ACM SIGIR Conference on Research & Development in Information Retrieval (2014).

- **Legal Search:** Search tools as Lexis[209] and Westlaw[210] were the first legal search engines to use an intelligence search tool. Afterward, Watson enabled searching using semantics instead of keywords.[211] Semantic search allows searching natural language

[208] *See* Da Silva Moore v. Publicis Groupe, 287 F.R.D. 182, 193 (S.D.N.Y. 2012) ("This Opinion appears to be the first in which a Court has approved of the use of computer-assisted review. That does not mean computer-assisted review must be used in all cases, or that the exact ESI protocol approved here will be appropriate in all future cases that utilize computer-assisted review. . . What the Bar should take away from this Opinion is that computer-assisted review is an available tool and should be seriously considered for use in large-data-volume cases where it may save the producing party (or both parties) significant amounts of legal fees in document review."); *see also* Rio Tinto PLC v. Vale S.A., 306 F.R.D. 125, 126 (S.D.N.Y. 2015) ("This judicial opinion now recognizes that computer-assisted review [i.e., TAR][Technology Assisted Review] is an acceptable way to search for relevant ESI in appropriate cases."); *see also* Dynamo Holdings Ltd. P'ship v. Comm'r, 143 T.C. 183, 190 (T.C. 2014) ("We find a potential happy medium in petitioners' proposed use of predictive coding. Predictive coding is an expedited and efficient form of computer-assisted review that allows parties in litigation to avoid the time and costs associated with the traditional, manual review of large volumes of documents. Through the coding of a relatively small sample of documents, computers can predict the relevance of documents to a discovery request and then identify which documents are and are not responsive."); *see also*, *id* at 191–92 ("Respondent asserts that predictive coding should not be used in these cases because it is an 'unproven technology.' We disagree. Although predictive coding is a relatively new technique, and a technique that has yet to be sanctioned (let alone mentioned) by this Court in a published Opinion, the understanding of e-discovery and electronic media has advanced significantly in the last few years, thus making predictive coding more acceptable in the technology industry than it may have previously been. In fact, we understand that the technology industry now considers predictive coding to be widely accepted for limiting e-discovery to relevant documents and effecting discovery of ESI without an undue burden.").

[209] *See* Lexis, www.lexis.com, *archived at* https://perma.cc/L3T7-PTFG (last visited Oct. 31, 2016).

[210] *See* Westlaw, www.westlaw.com, *archived at* https://perma.cc/EU3U-6B6Q (last visited Oct. 31, 2016).

[211] *See* Mathieu d'Aquin & Enrico Motta, *Watson, More than A Semantic Web Search Engine*. 2 SEMANTIC WEB 55 (2011), http://www.semantic-web-journal.net/sites/default/files/swj96_1.pdf, *archived at* https://perma.cc/NV5S-NNV9.

queries and the computer responds semantically with relevant legal information.[212] Ross, mentioned above, is an example of this kind of system.[213] Advanced features provide information about the strength of a precedent, considering how much others rely on it, and enabling an effective use of it.[214] Eventually AI will even be able to issue spot, based on the searches conducted.[215]

- **Compliance:** Legal and regulatory compliance is often socially and morally required, not to mention the penalties that are due for non-compliance.[216] As such, many corporations employ teams of lawyers to confirm that they comply with the applicable regulatory regimes. AI machines are already being employed in this area,

[212] *See id*.

[213] *See* ROSS INTELLIGENCE, *supra* note 152.

[214] *See, e.g.*, Anthony Sills, *ROSS and Watson Tackle the Law*, IBM WATSON BLOG (Jan. 14, 2016), https://www.ibm.com/blogs/watson/2016/01/ross-and-watson-tackle-the-law/, *archived at* https://perma.cc/J4WZ-353U ("The ROSS application works by allowing lawyers to research by asking questions in natural language, just as they would with each other. Because it's built upon a cognitive computing system, ROSS is able to sift through over a billion text documents a second and return the exact passage the user needs. Gone are the days of manually poring through endless Internet and database search result. . . Not only can ROSS sort through more than a billion text documents each second, it also learns from feedback and gets smarter over time. To put it another way, ROSS and Watson are learning to understand the law, not just translate words and syntax into search results. That means ROSS will only become more valuable to its users over time, providing much of the heavy lifting that was delegated to all those unfortunate associates.").

[215] *See* McGinnis & Pearce, *supra* note 114, at 3050.

[216] *See, e.g.*, Jon G. Sutinen & Keith Kuperan, *A Socio-Economic Theory of Regulatory Compliance*, 26 INT'L J. SOC. ECON. 174, 174–75 (1999). PARENTHETICAL NEEDED

including Neota Logic,[217] which powers other companies' AI regulatory compliance systems, such as, Compliance HR for employment regulations[218] or Foley and Lardner Global Risk Solutions (GRS) for Foreign Corrupt Practices Act of 1977 (FCPA) compliance.[219]

- **Legal document Generation:** In the past, the usage of templates helped reduce the cost of these legal services. Machine intelligence will evolve to generate documents that answer the specific needs of an individual. When these files are reviewed in court, AI will be able to improve the documents by tracking their effectiveness, using his learning abilities.[220]
- **Document Analysis:** In addition to generating documents, AI can and will continue to assess the liabilities and risks associated with particular contracts, as well as determining ways for companies to

[217] *See* NEOTA LOGIC, http://www.neotalogic.com/, *archived at* https://perma.cc/LW4M-LRBE ("Applications created in Neota Logic are executed by the Reasoning Engine, which contains many integrated, hybrid reasoning methods. All reasoning methods are automatically integrated and prioritized." Neota Logic claims to "[e]nsure compliance with regulations, policies, and procedures" and to "[m]eet changing requirements, rapidly and inexpensively.")

[218] *See* COMPLIANCEHR, http://compliancehr.com/, *archived at* https://perma.cc/GD3Q-SD6Z ("[ComplianceHR is] a revolutionary approach to employment law compliance designed by, and for, legal professionals. Our unique suite of intelligent, web-based compliance applications, covering all U.S. jurisdictions, combine the unparalleled experience and knowledge of Littler, the world's largest global employment law practice, with the power of Neota Logic's expert system software platform.)

[219] *See* FOLEY GLOBAL RISK SOLUTIONS, https://www.foley.com/grs/, *archived at* https://perma.cc/45EB-45EL (last visited Oct. 31, 2016).

[220] *See* McGinnis & Pearce, *supra* note 114, at 3050.

optimize contracts to reduce costs.[221] Nowadays Companies such as eBrevia[222] and LegalSifter[223] are doing just that.

- **Brief and Memos Generation:** Machine intelligence will be able to create drafts and memos that will then be revised and shaped by lawyers. In the future it will create much more accurate briefs and memos, assisted by legal research programs which will provide useful data.[224] Some have even suggested using AI to draft legislative documents.[225]

- **Legal Analytics:** Companies such as Lex Machina,[226] Lex Predict,[227] and Legal Operations Company, LLC[228] already combine data and analysis abilities to predict the outcomes of situations that have not yet occurred. There are areas of law such

[221] *See id*. at 3052.

[222] *See* EBREVIA, http://ebrevia.com/#overview/, *archived at* https://perma.cc/FP9X-CHXZ (last visited Oct. 31, 2016) ("eBrevia uses industry-leading artificial intelligence, including machine learning and natural language processing technology, developed at Columbia University to extract data from contracts, bringing unprecedented accuracy and speed to contract analysis, due diligence, and lease abstraction.").

[223] *See* LEGAL SIFTER, https://www.legalsifter.com/, *archived at* https://perma.cc/DZP4-DAZN (last visited Oct. 31, 2016).

[224] *See* McGinnis & Pearce, *supra* note 114 at 3046.

[225] *See* Wim Voermans, *Lex ex Machina: Using Computertechnology for Legislative Drafting*, 5 Tilburg Foreign L. Rev. 69, 69 (1996).

[226] *See* Lyria Bennett Moses & Janet Chan, *Using Big Data for Legal and Law Enforcement Decisions: Testing the New Tools*, 37 U. NEW SOUTH WALES L. J. 643, 644 (2014).

[227] *See* LEXPREDICT, https://lexpredict.com/, *archived at* https://perma.cc/LBD3-X5K7 (last visited Sept. 21, 2016).

[228] *See* Casey Sullivan, *AIG to Launch Data-Driven Legal Ops Business in 2016*, BLOOMBERG LAW (Oct. 20, 2015), https://bol.bna.com/aig-to-launch-data-driven-legal-ops-business-in-2016/, *archived at* https://perma.cc/9TU7-Q23A.

> as copyright and fair use, which will be discussed next that are easier to model because the data related to this subject revolves around specific, easily predictable.[229] Combining the exponential improvement of computers and their learning abilities, these models and predictions will evolve to support more complex areas of law, and to make prediction of case outcomes.[230]

[70] These changes will not only affect access to hard to obtain legal representation,[231] they also affect the workplace of lawyers. Those who practice these tasks and do not assimilate these shifts could lose their jobs.[232] Additionally, in the future, fewer substandard lawyers will be needed. On the other hand, super-star lawyers or bespoke attorneys[233] will be more easily identifiable (because of the legal analytics which can monitor lawyers success rate) and will use these technologies to their use. Even though machines could replace many tasks of a lawyer, they cannot speak in courts in the foreseeable future, so litigators will be needed.[234] Moreover, there are some areas of law that are subject to a rapid legal change, so even intelligence machines won't be able to learn them that fast, so lawyers will be needed in those specialized areas. Also, lawyers' human judgments may still add value to computer predictions.[235]

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[229] *See, e.g.,* LEX MACHINA, https://lexmachina.com/legal-analytics/, *archived at* https://perma.cc/G5J4-Z53Q (last visited Oct. 31, 2016) (illustrating the levels of specificity described above, such as a particular judge's likelihood of ruling on a specific motion).

[230] *See* McGinnis & Pearce, *supra* note 114 at 3046.

[231] *See* Deborah L. Rhode, *Access to Justice*, 69 FORDHAM L. REV. 1785, 1785 (2001).

[232] *See* Susskind, *supra* note 200, at 3.

[233] *See* Raymond T. Brescia, *What We Know and Need to Know About Disruptive Innovation*, 67 S. CAROLINA L. REV. 203, 206 (2016).

[234] *See id.*

[235] *See id.* at 213.

[71] As a result of these changes, predicting case outcomes will be easier and more accurate, cases will be more likely to get settled, and fewer trials will be conducted. So it follows that the number of physical courtrooms may also reduce dramatically.

[72] Another change will occur in law schools. As a result of the changes mentioned above, fewer jurists will be needed and only in certain areas of law. Therefore, law schools should change their aim and focus on the necessities of the new legal profession including technical expertise and an ability to interact with and efficiently use the new multidisciplinary AI technology.[236]

VIII. ARTIFICIAL INTELLIGENCE IN FAIR USE–AN EARLY STAGE PROOF OF CONCEPT

[73] In our quest to explore the social, legal, and ethical implications of AI we partnered with the IBM Watson team which is creating a workable software product in the area of the AI and law. Being students with a strong orientation to other disciplines such as law, psychology, business, and government–we were naturally drawn to the field of conflict resolution. First, in the words of Steve Jobs, we had to create a "stupid-simple" legal analysis scheme.[237] In this scheme we aim to effectively explain how lawyers and law students approach a case, to the engineering staff at IBM Watson.

[74] We drilled down on the set of questions one asks himself when reading a ruling. As a rule, the more features or details one adds to the algorithm, the more data needs to be analyzed in order for Watson to effectively learn how the data was initially analyzed. To summarize this point, if we just needed Watson to identify a win or loss, the task would be relatively easy. However, we wanted Watson to analyze *why* someone won or lost, which is orders of magnitude more complex.

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[236] *See id.* at 222.

[237] *See* Liz Stinson, *This Tool Makes it Stupid Simple to Turn Data into Charts*, WIRED (Apr. 8, 2016, 2:15 PM), https://www.wired.com/2016/04/tool-makes-turning-data-charts-stupid-simple/, *archived at* https://perma.cc/8LKT-YB86.

Model 1 - Case Law Analysis Scheme:

[75] The logical process of analyzing case law is roughly similar, independent of the law, but requires a process of specific sets of stages in order to analyze the case at hand. After learning that process, the system creates a data set in certain legal topics, thus gaining the ability to analyze new cases.

Stage 1: Identifying the case type variables

[76] In this stage the focus is on the details of the case and establishing the specific normative framework.

- Variable 1: Court type. The algorithm must identify in which court, state, or jurisdiction the case is being tried. This is imperative, since the court hierarchy dictates if an earlier ruling is binding for different lower courts. For example: United States Supreme Court case law is considered precedent for all lower courts. Any ruling that conflicts with binding precedent case law will not hold up on appeal. In addition, there are different approaches to the case in each court – district courts find facts and then apply the law, while in most appellate courts, previously found facts are applied to their understanding of the law.

- Variable 2: Location & Date. The general rules in legal precedent are that new rulings overturn old rulings at that same judicial level and below, and that specific rulings overturn general rulings. This is why it is imperative for the machine learning algorithm to appreciate the source of each ruling.

- Variable 3: Parties. The algorithm must identify which of the parties is the plaintiff and which is the defendant. This differentiation is imperative to refine which claims have been accepted by the court and which have not. In addition, different degrees of proof may be applied to different stakeholders in a case.

- Variable 4: Legislative Standards. This should be categorized by both federal law and state law. The labeling of case laws and statuses makes it easier to locate cases with similar issues. In this variable, it must be remembered that there is also a hierarchy in legal sources.

- Variable 5: Rulings & Other Case Law. IBM's algorithms need to identify other case law cited within each case as persuasive precedent or unpersuasive precedent. This enables the algorithm to develop a broad network structure, enabling it to understand which ties between rulings are relevant and to suggest more cases, which can be addressed in a legal matter.

- Variable 6: Secondary Sources. Legal literature such as academic articles, books, and blogs, provide valuable academic information, enabling the user of a search engine to find new ideas for forming his claims or to find opinions that oppose binding precedents (which will be valuable when dealing with a case that is being tried in a court with the same jurisdictional level as the court who ruled the existing precedent).

- Variable 7: The Judiciary. The algorithm should identify the names of the judges and if they ruled with the majority or minority. In some instances, it should be determined whether a dissenting opinion could be used in another case to provide valuable insights into which claims might be taken under consideration by specific judges. As the famous saying goes, "*A good lawyer knows the law; a great lawyer knows the judge*." [238]

[77] We have left out some critical factors in this document which might dramatically influence the form in which IBM's algorithms approaches cases. However, it was essential to create a relatively simplified approach for the algorithm to read the available case law, in order for it to understand the basic ground rules. Factors related to whether laws are general or specific, the times in which they were legislated,

[238] Unattributed.

history of upholding and overturning a particular ruling, and other factors have been left out for the sake of creating an initial proof of concept which can predict or evaluate real legal claims to an extent greater than chance. Another important consideration for this effort is the size of the data set– additional factors exponentially increase the amount of training data necessary to teach the algorithm how to think like a lawyer.

Stage 2: Selecting the Field of Dispute for the Case Law Data Set

[78] The second stage required to create the proof of concept was finding a relatively structured area of law with hard and fast, consistent, factors, which have not changed much over recent years. A legal area with a very simple and clear list of standards would be the optimal tool to assure that no claims have been skipped regarding a respective field of dispute. Further, we sought a field of law defined mostly by federal law rather than state law, as that would require us to create a different schema for every state.

[79] Lastly, we wanted to challenge ourselves and find an area of law that would be of interest to the general public and that could result in a usable product. We eventually chose to pursue the creation of an AI algorithm in the field of fair use in publishing, under the Copyright Act. The fair use doctrine incorporates all of the above requirements, and also plays an important societal role due to the public's misunderstanding and content owners' misuse of the doctrine, which contribute to copyright's continued and expanding burden on free speech.[239]

[239] *See, e.g.,* Golan v. Holder, 132 S. Ct. 873, 890 (2012) (noting how copyright protection is designed to be a protection for fair use); *see* Stewart v. Abend, 495 U. S. 207, 236 (1990) (citations omitted) (noting how the fair use doctrine "permits courts to avoid rigid application of the copyright statute when, on occasion, it would stifle the very creativity which that law is designed to foster"). *See generally* Daniel P. Fernandez, et al., *Copyright Infringement and the Fair Use Defense: Navigating the Legal Maze,* 27 U. FLA. J.L. & PUB. POL'Y 135, 137 (2016) (analyzing the issues that are presented when dealing with copyrighted materials within the scope of the fair use defense); *see* Joseph P. Liu, *Fair Use, Notice Failure, and the Limits of Copyright as Property*, 96 B.U. L. REV. 833, 834 (2016) (identifying and discussing the relationship between the fair use doctrine and notice failure); *see* Hannibal Travis, *Free Speech Institutions and Fair Use: A New Agenda for Copyright Reform*, 33 CARDOZO ARTS & ENT. L. J, 673, 677 (2015)

Stage 3: Defining the Fair Use Analysis Scheme

[80] In order to teach Watson how to analyze a fair use case, we have created, based on various resources (text books, articles, and the web), a fair use analysis scheme depicting the rationale and analysis performed by lawyers when approaching such claims. One particularly helpful site was the Stanford Copyright and Fair Use Center[240] and Cornell's Fair Use Checklist.[241]

- Fair Use in Publishing - Analysis Scheme: As part of the first model for our case law analysis scheme, we built a data set of fair use in publishing based on verdicts from all of the United States federal circuit courts. Although we had initially attempted to limit this to just the Second and Ninth Circuits, these two circuits did not provide sufficient case law for the analysis.
- Copyright in a Nutshell: Copyright protection in the United States is legislated under the Copyright Act of 1976.[242] Section 102 of this act elaborates which works of authorship fall under the copyright protection.[243] Section 104 of the act deals with the question of when a work becomes the subject matter of copyright.[244] Section 104(a) rules that unpublished works specified by

(exploring the idea that ongoing issues in the area of copyrights are directly and negatively affecting free speech).

[240] *See* STANFORD COPYRIGHT AND FAIR USE CENTER, http://fairuse.stanford.edu/, *archived at* https://perma.cc/UM3X-399J (last visited Sept. 23, 2016).

[241] *See Fair Use Checklist*, CORNELL UNIVERSITY, http://copyright.cornell.edu/policies/docs/Fair_Use_Checklist.pdf, *archived at* https://perma.cc/FTV4-3LZK (last visited Oct. 31, 2016).

[242] *See* Copyright Act of 1976, Pub. L. No. 94-553 (1976) (codified at 17 U.S.C. § 101–810 (2016)).

[243] *See* 17 U. S. C. § 102 (2016).

[244] *See* 17 U. S. C. § 104 (2016).

section 102 and/or section 103 are subject to copyright protection under this act, without regard to the nationality or domicile of the author.[245] Regarding published works, section 104(b) elaborates on when copyright protection will apply regarding the nature of the work and the nationality or domicile of the author.[246] Section 106 covers the exclusive rights of the author, like the right to reproduce copies of the copyrighted work, prepare derivative works based upon the copyrighted work, distribute copies to the public, and more. [247] The Copyright Act provides for limitations to these exclusive rights, like reproduction by libraries and archives[248] and transfers of particular copy after the first sale[249] (e.g. selling a CD that you bought from a store). The fair use doctrine in U.S. law is based on Section 107.[250] The fair use doctrine provides a defense for infringement–"Fair use was traditionally defined as 'a privilege in others than the owner of the copyright to use the copyrighted material in a reasonable manner without his consent'"[251]—the application of the formerly judicial doctrine[252] requires the balancing of four statutory factors:

[245] *See* 17 U. S. C. § 104(a) (2016).

[246] *See* 17 U. S. C. § 104(b) (2016).

[247] *See* 17 U. S. C. § 106 (2016).

[248] *See* 17 U.S.C. § 108 (2016).

[249] *See* 17 U.S.C. § 109 (2016).

[250] *See* 17 U.S.C. § 107 (2016).

[251] Harper & Row, Publishers, Inc. v. Nation Enterprises, 471 U.S. 539, 549 (1985).

[252] *See*, *e.g.*, Folsom v. Marsh, 9 F. Cas. 342, 344–45 (1841); *see also* Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569, 577 (1994) (noting that "Congress meant § 107 'to restate the present judicial doctrine of fair use, not to change, narrow, or enlarge it in any way' and intended that courts continue the common-law tradition of fair use adjudication.").

- (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
- (2) the nature of the copyrighted work;
- (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
- (4) the effect of the use upon the potential market or value of the copyrighted work.[253]

[83] The court decides each factor, ruling in favor or against the fair use. Then, each of the four factors is weighed against the total weight of the other factors.[254] This is not a trivial process, even for an experienced judge: "the four statutory factors be [may not] treated in isolation, one from another. All are to be explored, and the results weighed together, in light of the purposes of copyright."[255] As such, it is an optimal exercise for an AI.

Stage 4: Method of the analysis

[84] In each case law verdict, we examine and analyze each sentence and categorize it within the fair use doctrine analysis (i.e. marking which factor each sentence relates to and determining whether it supports the claims of the plaintiff or the defendant). Some sentences are deemed irrelevant to either side and are categorized as dicta or as support for the judge's ruling.

[85] Each sentence is then electronically tagged with information such as whether it favored the plaintiff or defendant in each factor. After reviewing the checklist with the Watson team, we concluded that in order to teach Watson to understand which sentences favor or oppose each factor –Purpose, Nature, Amount, and Effect – without going into the details of each sub-factor, there is a need for approximately five hundred

[253] 17 U. S. C. § 107 (2011).

[254] *See* Campbell, 510 U.S. at 577–78.

[255] *Id.* at 578.

analyzed and marked verdicts with tags. This produced approximately ten thousand sentences as a learning set for Watson.

[86] Through examining various fair use cases, most of which concentrate in the Second and Ninth circuits (most of the relevant IP claims are filed in these courts which encompass New York and California —the centers of literature and film, respectively) we note that each case, in the aspect of the fair use doctrine, has roughly twenty to twenty-five sentences relating to the subject. Following the examination, we analyzed all relevant cases, marking each relevant sentence in each case that discussed fair use doctrine. This marking included determinations for each sentence in the following categories:

- Data: The minimal amount of words needed to classify the sentence under the Factor label or the Side label, as discussed in the following articles.
- Factor: Purpose / Nature / Amount / Effect / Ratio / Dicta.[256]
- Side: Plaintiff / Defendant / Neutral.

For example, Figure 1.

	A	B	C
1	Sentence Text:	Factors:	favors/opposes
2	In determining whether a use is fair, courts engage in a case-by-case analysis and a flexible balancing of the following four non-exclusive factors	Ratio	neutral
3	The first factor in a fair use inquiry requires the court to consider "the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educatic	F1-Purpose	neutral
4	Although not controlling, the fact that the work is used for a commercial or profit-making purpose as opposed to a non-profit purpose weighs against a finding of fair use	F1-Purpose	opposes
5	The "degree to which the new user exploits the copyright for commercial gain—as opposed to incidental use as part of a commercial enterprise—affects the weight" afforded to commer	F1-Purpose	neutral
6	The crux of the profit/nonprofit distinction is not whether the sole motive of the use is monetary gain but whether the user stands to profit from exploitation of the copyrighted material wit	F1-Purpose	neutral
7	The court must also inquire into whether the new work is transformative and does not simply "supplant" the original work. Mattel, 353 F.3d at 800	F1-Purpose	favors
8	the section on training, in which plaintiff's Work is found, is a small portion of the book as a whole, and the commercial value of the book is not based entirely on plaintiff's Work	F1-Purpose	opposes
9	while the book is being sold for profit and the use of plaintiff's Work may have contributed to its value, the manner of commercial use does not weigh strongly against a fair use determina	F1-Purpose	opposes
10	The more important inquiry under the first factor is to determine whether and to what extent the new work is "tranformative	F1-Purpose	neutral
11	A work is transformative when the new work does not merely supersede the objects of the original creation but rather adds something new, with a further purpose or different characte	F1-Purpose	neutral
12			
13	The more transformative the new work, the less the significance of other factors that weigh against fair use, such as use of a commercial nature	F1-Purpose	favors
14	Not only were plaintiff's sentences edited, clarified, and generally polished for publication, but also they form a very small portion of the book	F1-Purpose	favors
15		F1-Purpose	favors
16	The second factor in a fair use inquiry requires the court to consider the "nature of the copyrighted work	F2-Nature	neutral
17	Works that are creative in nature are closer to the core of intended copyright protection than are more fact-based works	F2-Nature	opposes
18	the fact that a work is published or unpublished is also a critical element of its nature because the author's right to control the first public appearance of her work weighs against the use	F2-Nature	neutral
19		F2-Nature	
20	When dealing with transformative uses, this factor is not terribly significant in the overall fair use balancing. See Mattel, 353 F.3d at 803	F1-Purpose	neutral
21	Thus, the fact that the fact-based Work was unpublished weighs slightly, but not considerably, against a finding of fair use	F2-Nature	opposes
22	The third factor in a fair use inquiry requires the court to examine the "amount and substantiality of the portion used in relation to the copyrighted work as a whole	F3-Amount	neutral
23	the amount of the copyrighted Work used in the book was significant	F3-Amount	opposes
24	The fourth factor in a fair use inquiry focuses on "the effect of the use upon the potential market for or value of the copyrighted work	F4-Effect	neutral
25	This factor is "undoubtedly the single most important element of fair use	F4-Effect	neutral
26	This factor requires courts to consider not only the extent of market harm caused by the particular actions of the alleged infringer, but also whether unrestricted and widespread conduct	F4-Effect	

[87] We are currently conducting a pattern analysis via the AI algorithms of Watson in order to identify patterns in the rational of judges based on the given data. After incorporating this vast data set, Watson can

[256] *We have added more categories as some sentences do not relate to any distinct factor and serve as 'negative' language from which the computer can distinct between relevant data and irrelevant data.

provide, for a hypothetical case, exactly which claims and arguments are best, depending on whether we argue for the plaintiff or the defendant.

[88] This entire project is complex and will take substantial time to complete. Nevertheless, with the planning phase complete and complications accounted for, the next step is to implement the technology.

IX. CONCLUSION AND RECOMMENDATIONS FOR COURSES OF ACTION

[89] The fruits of AI research are often attributed to other fields, as new revelations rapidly turn into mundane computer science inventions. However, we must remember that there is much more to explore and reveal within the yet unknown realms of AI.

[90] In this paper we reviewed what defines AI and how it came about and evolved. We covered recent developments in AI relevant to the field of law and how they are leading to changes such as: automated cases analysis, increased efficiency in judicial tasks, replacing or minimizing human intervention in solving disputes, etc.

[91] It is gradually becoming more conceivable that AI will change the world of law and the profession of lawyers in the near future. We are ready for it in two ways: via the market and technology. First, market failure has resulted in a judicial system overload. Second, funding for legal tech start-ups has grown from 7 million USD in 2009 to a whopping 450 million in 2013.[257] Market failures and technological achievements will work together to pave the way for a new version of the legal profession.

[257] *See* Nicole Bradick, *All Rise: The Era of Legal Startups is Now in Session*, VENTURE BEAT (Apr. 13, 2014, 8:32AM), at http://venturebeat.com/2014/04/13/all-rise-the-era-of-legal-startups-is-now-in-session/, *archived at* https://perma.cc/YE29-7K6L.