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Machine Learning and the New Civil Procedure

Zoe Niesel
St. Mary's University School of Law

MACHINE LEARNING AND THE NEW CIVIL PROCEDURE

*Zoe Niesel**

ABSTRACT

There is an increasing emphasis in the legal academy, the media, and the popular consciousness on how artificial intelligence and machine learning will change the foundations of legal practice. In concert with these discussions, a critical question needs to be explored—As computer programming learns to adjust itself without explicit human involvement, does machine learning impact the procedural practice of law? Civil procedure, while sensitive to technology, has been slow to adapt to change. As such, this Article will explore the impact that machine learning will have on procedural jurisprudence in two significant areas—service of process and personal jurisdiction.

The Article will begin by assessing the impact that technological developments have had on these two foundational procedural doctrines, from interstate transportation and communication, to computers and the internet, and to the newest era of Web 2.0 and social media platforms. The Article will then explore machine learning and its current applications. Many of these applications involve increased human interaction conducted by intelligent programs that have the potential to result in causes of action independent of explicit human programming.

Next, the Article will proceed to examine the impact machine learning will have on jurisdiction and service of process in the federal courts. Specifically, the Article finds that these procedural doctrines will need to be adjusted to recognize that the major concepts about targeting and purposeful availment will be fundamentally altered by machine learning. Service of process will need to adjust as machine learning makes it easier to serve defendants through the use of search algorithms, changing what it means for notice to be reasonably calculated to reach the defendant. On the personal jurisdiction side of the house, machine learning topples concepts of purposeful availment by allowing programs to initiate behaviors that result in causes of action in new fora without human or corporate involvement, thus suggesting a universal standard of personal jurisdiction might be necessary. Regardless, it seems clear that the slow-changing tides of procedure may need to fast track their progress as technology becomes more independent and more unpredictable than ever before.

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* Associate Professor of Law, St. Mary's University School of Law.

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I. INTRODUCTION

AS artificial intelligence and machine learning come alive, the demon awakens.[1] No other technology currently in existence has such capacity to change the fabric of society or the legal profession's rules of order.[2] It should come as no surprise that the applications of artificial intelligence (AI) are growing in size, sophistication, and scope.[3] AI now predicts the weather,[4] recommends movies to watch,[5]

1. The demonic introduction is inspired by Elon Musk, who stated at the Massachusetts Institute of Technology (MIT) Aeronautics and Astronautics department's Centennial Symposium, "I think we should be very careful about artificial intelligence. If I were to guess like what our biggest existential threat is, it's probably that. . . . With artificial intelligence we are summoning the demon." Matt McFarland, *Elon Musk: 'With Artificial Intelligence We Are Summoning the Demon.'*, WASH. POST (Oct. 24, 2014, 1:37 PM), https://www.washingtonpost.com/news/innovations/wp/2014/10/24/elon-musk-with-artificial-intelligence-we-are-summoning-the-demon/?noredirect=ON&utm_term=.Bb9690cc837d [https://perma.cc/BM3M-KCLV] (also advocating for increased regulation and oversight at the national and international level).

2. *See generally* Julie Sobowale, *How Artificial Intelligence Is Transforming the Legal Profession*, A.B.A. J., Apr. 2016, at 46, 47–48.

3. *See, e.g.*, Shanhong Liu, *Artificial Intelligence Software Market Revenue Worldwide 2018–2025*, STATISTA (Mar. 13, 2020), https://www.statista.com/statistics/607716/worldwide-artificial-intelligence-market-revenues/ [https://perma.cc/CFB8-P64P] ("According to the market research firm Tractica, the global artificial intelligence software market is forecast to experience massive growth in the coming years, with revenues increasing from around ten billion U.S. dollars in 2018 to an expected 126 billion by 2025.").

4. *See* Alex Lopatka, *Meteorologists Predict Better Weather Forecasting with AI*, 72 PHYSICS TODAY 32 (2019), https://doi.org/10.1063/PT.3.4201 [https://perma.cc/SG3Z-6RAJ] (discussing the use of machine learning to have programs recognize weather features).

5. *See* Allen Yu, *How Netflix Uses AI, Data Science, and Machine Learning—From A Product Perspective*, MEDIUM (Feb. 27, 2019), https://becominghuman.ai/how-netflix-uses-ai-and-machine-learning-a087614630fe [https://perma.cc/KW3S-5BL4] (discussing Netflix's use of machine learning and AI for personalization of movie recommendations, auto-generation of thumbnails, location scouting, and movie editing).

comforts patients with anxiety,[6] turns off the lights,[7] drives cars,[8] and diagnoses breast cancer.[9] It is slowly moving into almost every corner of national and international life.[10] And this mission creep includes the legal profession.[11] Over the past five years, the legal profession has turned its attention to the AI revolution, asking about the ethics of intelligent machines,[12] how machine learning can improve legal research,[13] who can be sued when AI results in liability,[14] and the concept of AI ownership.[15]

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6. *See* Cami Rosso, *Is the Robot Psychologist the Next Big AI App?*, PSYCHOLOGY TODAY (Oct. 17, 2018), https://www.psychologytoday.com/us/blog/the-future-brain/201810/is-the-robot-psychologist-the-next-big-ai-app [https://perma.cc/3Y9V-ARTE] ("[A]utomated psychological services powered by AI technology may very well emerge within the next five-to-ten years. More likely, it will initially take shape in the form of an innovative service delivered on the mobile smartphone as tool . . . .").

7. *See* Andrew Weinreich, *The Future of the Smart Home: How Homes Powered by Artificial Intelligence Will Know & Care for You*, FORBES (Feb. 8, 2018, 10:39 AM), https://www.forbes.com/sites/andrewweinreich/2018/02/08/the-future-of-the-smart-home-how-homes-powered-by-artificial-intelligence-will-know-care-for-you/#40c95c859749 [https://perma.cc/XJE3-LS7J] (explaining the possibility of AI in homes in the near future).

8. *See, e.g.*, Kyle Wiggers, *MIT's AI Makes Autonomous Cars Drive More Like Humans*, VENTUREBEAT (May 23, 2019, 12:15 PM), https://venturebeat.com/2019/05/23/mits-ai-makes-autonomous-cars-drive-more-like-humans/ [https://perma.cc/XJE3-LS7J] ("[S]cientists are investigating an approach that leverages GPS-like maps and visual data to enable autonomous cars to learn human steering patterns, and to apply the learned knowledge to complex planned routes in previously unseen environments.").

9. *See* Helen Yule, *Breast Cancer Diagnosis by AI Now as Good as Human Experts*, MEDICAL XPRESS (Apr. 30, 2019), https://medicalxpress.com/news/2019-04-breast-cancer-diagnosis-ai-good.html [https://perma.cc/6JFQ-C47P] (explaining how AI could be used to speed up diagnosis and improve its accuracy).

10. *See generally* Steve Vosloo, *The Rise of Artificial Intelligence for International Development*, ICTWORKS (Jan. 5, 2018), https://www.ictworks.org/artificial-intelligence-international-development/ [https://perma.cc/LR5K-FZ58].

11. *See generally* Thomas Burri, *International Law and Artificial Intelligence*, 60 GERMAN Y.B. INT'L L. 91 (2017) (focusing on different aspects of international law including automation, personhood, weapons systems, control, and standardization).

12. *See, e.g.*, Katherine Medianik, *Artificially Intelligent Lawyers: Updating the Model Rules of Professional Conduct in Accordance with the New Technological Era*, 39 CARDOZO L. REV. 1497, 1499 (2018) ("[ROSS] is able to go through mounds of data in seconds, monitors the law around the clock to notify lawyers of new court decisions that can affect their cases, and makes the legal research process quicker and cheaper."); Drew Simshaw, *Ethical Issues in Robo-Lawyering: The Need for Guidance on Developing and Using Artificial Intelligence in the Practice of Law*, 70 HASTINGS L.J. 173, 176 (2018) ("If implemented responsibly, AI could expand access to legal services to parts of society that have historically been shut out.").

13. *See generally* Mary Ann Neary & Sherry Xin Chen, *Artificial Intelligence: Legal Research and Law Librarians*, AALL SPECTRUM, May/June 2017, at 16, 17. *See also* DAVID HOULIHAN, ROSS INTELLIGENCE AND ARTIFICIAL INTELLIGENCE IN LEGAL RESEARCH 11 (2017).

14. *See* Jessica S. Allain, *From Jeopardy! to Jaundice: The Medical Liability Implications of Dr. Watson and Other Artificial Intelligence Systems*, 73 LA. L. REV. 1049, 1051 (2013) ("By combining elements from medical malpractice, vicarious liability, products liability, and enterprise liability, the law can create a uniform approach for artificial intelligence systems, thereby eliminating any inequities that may arise from courts applying different theories of liability."); Gabriel Hallevy, *The Criminal Liability of Artificial Intelligence Entities–from Science Fiction to Legal Social Control*, 4 AKRON INTELL. PROP. J. 171, 172 (2010) (examining the questions of imposing criminal liability on AI entities and how punishment could be addressed).

15. *See generally* Robert C. Denicola, *Ex Machina: Copyright Protection for Computer-Generated Works*, 69 RUTGERS U. L. REV. 251, 253 (2016). *See also* David Marc

One subject has been almost suspiciously absent from the discussion—civil procedure. While some preliminary scholarly discussion has centered on using intelligent algorithms to find plaintiffs for class actions or to impact the process of discovery, the profession has yet to consider what some of the fundamental doctrines in legal practice will look like as AI continues to develop.[16] While concepts of AI and liability are generally well covered, scholars have not explored the ramifications of AI on the very procedural system that would shepherd claims of liability.[17] Further, the U.S. regulatory system has yet to embrace a comprehensive regulatory plan despite the coming AI revolution.[18]

Indeed, the absence of civil procedure from the discussion is unfortunate, as some of civil procedure's critical doctrines have been slow to advance in the face of new technologies. Personal jurisdiction and service of process are among the crucial doctrines that have long slept in the shadow of technological revolutions.[19] Indeed, the Supreme Court has yet to clarify how minimum contacts and the internet should coexist in the American legal system.[20] Even less thought has been given to how Web 3.0 technologies—such as machine learning, AI, and human-computer interfacing—will force changes in the procedural jurisprudence.[21]

This Article is a first shot at examining how the American procedural system will deal with AI applications. The Article focuses specifically on machine learning—a method by which programs are trained to respond to stimuli on their own—because machine learning applications are already impacting concepts like purposeful availment. Part II examines the historical growth of major doctrines in service of process and personal

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Rothenberg, *Can Siri 10.0 Buy Your Home? The Legal and Policy Based Implications of Artificial Intelligent Robots Owning Real Property*, 11 WASH. J.L. TECH. & ARTS 439, 442 (2016).

16. *See* Kingsley Martin, *Artificial Intelligence: How Will it Affect Legal Practice–And When?*, THOMSON REUTERS (Apr. 27, 2016), https://blogs.thomsonreuters.com/answerson/artificial-intelligence-legal-practice/ [https://perma.cc/622Q-669G] ("A recent study by McKinsey & Co estimates that 23% of lawyer time is automatable.").

17. *See* Elizabeth Fuzaylova, *War Torts, Autonomous Weapon Systems, and Liability: Why a Limited Strict Liability Tort Regime Should Be Implemented*, 40 CARDOZO L. REV. 1327, 1343 (2019) ("AI liability and regulation continue to be under-defined. However, academics have explored legal doctrines as they apply to autonomous machines in the context of tort law, contract law, and the law of war.").

18. *Id.* at 1344 ("Notably, there has been no federal agency tasked with creating regulations or assessing new AI technologies that go to market.").

19. *See* Thomas J. Hall & Judith A. Archer, *Personal Jurisdiction Based on Electronic and Telephonic Communication*, N.Y. L.J. (June 20, 2019, 12:00 PM), https://www.law.com/newyorklawjournal/2019/06/20/personal-jurisdiction-based-on-electronic-and-telephonic-communication/?slreturn=20200318110528 [https://perma.cc/7P6F-2URL] (explaining the increase in analysis by courts examining fact patterns with more remote physical contacts); *see also* Phil, *What to Consider Before Serving Process via Social Media*, LEGAL LANGUAGE SERVS.: LEGAL LANGUAGE BLOG (Dec. 13, 2016), https://www.legallanguage.com/legal-articles/serving-process-via-social-media/ [https://perma.cc/33E9-K9M2] (explaining how social media service of process has been accepted by courts around the world but not so much in the United States).

20. *See, e.g.*, Zoe Niesel, #*PersonalJurisdiction: A New Age of Internet Contacts*, 94 IND. L.J. 103, 104 (2019).

21. *Id.* at 137–38.

jurisdiction. Part III then examines the concept of machine learning, how it operates, and the impact it is having on interactions that are likely to lead to litigation. Finally, Part IV examines the "new Civil Procedure"—one fully embracing the changes that machine learning is likely to have on how cases are brought in the courts. Specifically, this section examines how machine learning is likely to change the methods and processes by which defendants are located and served with notice of suit.[22] Additionally, this section examines how the personal jurisdiction concept of purposeful availment will be forever altered by programs that can act independently of their creators and asks the ultimate question of whether the decision to use these technologies is in itself an act of purposeful availment. It is hoped that this discussion provides context to explain why civil procedure must more rapidly adapt to the changing technological landscape.

II. CIVIL PROCEDURE AND TECHNOLOGICAL GROWTH

Like all legal doctrines, civil procedure is responsive to technological growth and change.[23] Indeed, nearly every first-year law student learns that the development of interstate transportation technology led to the minimum contact revolution in personal jurisdiction in *International Shoe Co. v. Washington*.[24] However, the doctrines of civil procedure, although sensitive to new technology, are sluggish in their adaptations.[25]

For example, *International Shoe* was decided in 1945—a time in which the automobile and the railroads allowed increased movement of goods between states.[26] The use of railroads and automobiles also allowed cor-

22. *See generally* James Ovenden, *Why the Legal Profession is Turning to Machine Learning*, INNOVATION ENTERPRISE (Jan. 25, 2016), https://channels.theinnovationenterprise.com/articles/why-the-legal-profession-is-turning-to-machine-learning [https://perma.cc/M8VY-BADC].

23. *See generally* Jeff Salling, *How Changes to the Federal Rules of Civil Procedure Affect the eDiscovery Process*, CDS LEGAL (July 19, 2016), https://cdslegal.com/insights/how-changes-to-the-federal-rules-on-civil-procedure-affect-the-ediscovery-process/ [https://perma.cc/AY4F-VLBS] (analyzing the amendments to the Federal Rules of Civil Procedure for e-discovery).

24. 326 U.S. 310 (1945); *see* McGee v. Int'l Life Ins. Co., 355 U.S. 220, 223 (1957) (identifying "modern transportation and communication" as the motivating forces responsible for the Court's decision in *International Shoe*); Lindy Burris Arwood, *Personal Jurisdiction: Are the Federal Rules Keeping Up with (Internet) Traffic?*, 39 VAL. U. L. REV. 967, 998 (2005) (noting *International Shoe* as the first instance of the Court "us[ing] technology to expand boundaries beyond those of the defendant's state"); Danielle Keats Citron, *Minimum Contacts in a Borderless World: Voice over Internet Protocol and the Coming Implosion of Personal Jurisdiction Theory*, 39 U.C. DAVIS L. REV. 1481, 1506–07 (2006) ("The twentieth century's sea change in transportation and communication technologies prompted the Court in *International Shoe Co. v. Washington* to expand forum-court jurisdiction beyond people and property located in a state's borders to include nonresidents whose forum activities gave rise to the litigation.").

25. Stephanie A. Gore, *"A Rose by Any Other Name": Judicial Use of Metaphors for New Technologies*, 2003 U. ILL. J.L. TECH. & POL'Y 403, 446 (2003) (discussing personal jurisdiction and noting that "advances in technology can force the paradigm to shift over time").

26. *See* Nelson v. Miller, 143 N.E.2d 673, 677 (Ill. 1957) ("The advent of the automobile and the rapid extension of its use had underscored the problem of the nonresident who

porations, like the one in *International Shoe*, to conduct increased business over state lines, thus requiring the Supreme Court to abandon traditional conceptions of personal jurisdiction based on physical presence.[27] And yet, railroads had been in existence since 1828,[28] when the last surviving signer of the Declaration of Independence broke ground on the Baltimore and Ohio Railroad.[29] Further, a coast-to-coast railroad was in place by 1869.[30] Automobiles were also old news—Henry Ford sold his first Model T in 1908.[31] Indeed, in 1945 the big news in transportation technology was space rockets, not railroads.[32] It had taken over 100 years for the Court to adapt its personal jurisdiction doctrine to what was then commonplace transportation technology.[33]

A similar response to technological changes is seen across multiple facets of civil procedure. Service of process and personal jurisdiction are both subject to slow and steady growth, not rapid evolution.[34] As such, this section explores the leisurely changes that have occurred across these areas as sluggishly stimulated by the technological landscape.

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enters the State, causes injuries, and withdraws to the relative sanctuary of his residence beyond the State's borders."); Michele N. Breen, *Personal Jurisdiction and the Internet: "Shoehorning" Cyberspace into International Shoe*, 8 SETON HALL CONST. L.J. 763, 814 (1998) (noting that, for the automobile, "*International Shoe* expanded and conformed to incorporate these modern inventions").

27. *See* Hanson v. Denckla, 357 U.S. 235, 250–51 (1958) (discussing *International Shoe* and stating that "[a]s technological progress has increased the flow of commerce between States, the need for jurisdiction over nonresidents has undergone a similar increase").

28. *Early American Railroads*, U.S. HIST., http://www.ushistory.org/us/25b.asp [https://perma.cc/6TV6-X8KU] (explaining the development of railroads).

29. *Id.* (noting that the last surviving signer of the Declaration of Independence was ninety-one-year-old Charles Carroll).

30. *See* Andrew Glass, *Transcontinental Railroad is Completed*, *May 10, 1869*, POLITICO (May 10, 2011, 4:34 AM), https://www.politico.com/story/2011/05/transcontinental-railroad-is-completed-may-10-1869-054591 [https://perma.cc/3SR7-6JNG] ("[W]orkers for the Union Pacific and Central Pacific railroads drove a golden spike into the rails at Promontory Summit, Utah. The event marked completion of the first transcontinental railroad, connecting the nation from coast to coast and cutting a journey of at least four months to a week.").

31. *See Model T Facts*, FORD MEDIA CTR. (Aug. 5, 2012), https://web.archive.org/web/20130928165026/https://media.ford.com/content/fordmedia/fna/us/en/news/2013/08/05/model-t-facts.html [https://perma.cc/4CDW-QH2K] (noting that more than 15 million Model T's were ultimately sold to the American populace and that production stopped in 1927 to make way for new vehicles). By 1945, there were approximately 31,035,420 total motor vehicles registered. *See also State Motor Vehicle Registrations, By Years, 1990–1995*, FED. HIGHWAY ADMIN., https://www.fhwa.dot.gov/ohim/summary95/mv200.pdf [https://perma.cc/MR3Z-CVSJ].

32. *See* Space News & Space.com Staff, *Timeline: 50 Years of Spaceflight*, SPACE.COM, (Sept. 28, 2012), https://www.space.com/4422-timeline-50-years-spaceflight.html [https://perma.cc/3LN3-FGXE] (noting that in 1942, Germany launched the first ballistic missile, and by 1947 an American pilot broke the sound barrier for the first time). In 1942, the V-2 rocket climbed to 176 kilometers, becoming the first man-made object in space. AJEY LELE, DISRUPTIVE TECHNOLOGIES FOR THE MILITARIES AND SECURITY 51 (2018).

33. *See* Pennoyer v. Neff, 95 U.S. 714, 720 (1877) (demonstrating the first Supreme Court case that analyzed personal jurisdiction); *see also* Daimler AG v. Bauman, 571 U.S. 117, 120 (2014) (showing one of the Court's most recent cases on personal jurisdiction and the expansion of personal jurisdiction).

34. *See Pennoyer*, 95 U.S. at 720; *see also Daimler*, 571 U.S. at 120 (demonstrating the slow growth of the courts to refine personal jurisdiction in the face of new technology).

A. Service of Process

Doctrines surrounding the validity of service of process have been impacted by the rapid changes in the way in which messages are communicated to people and entities.[35] Of course, the heart of service of process has remained the same—the requirement of sufficient notice under due process.[36] The Court has long held that service must be such that it is reasonably calculated to apprise parties of pending action against them and to grant parties the opportunity to present their case.[37]

Rule 4 of the Federal Rules of Civil Procedure governs service of process in civil suits, with the exception of the service of subpoenas, which is governed by Federal Rule of Civil Procedure 45.[38] As the Advisory Committee Notes to the 1993 Amendments of Rule 4 point out, "[u]nless service of the summons is waived, a summons must be served whenever a person is joined as a party against whom a claim is made."[39] In federal court, Rule 4 establishes three primary mechanisms of service on a domestic defendant: personal service, delivery to the defendant's dwelling, or delivery to an agent of the defendant.[40] If these methods are unsuccessfully exhausted, Rule 4 then allows the plaintiff to use service methods that are blessed by state law or to seek an alternative form of service.[41]

Among the earliest service of process cases are those that discuss the appropriate mode of service in conjunction with due process. In *Grannis v. Ordean*, decided in 1914, the Supreme Court addressed the use of the mail and the newspaper as methods for service.[42] *Grannis* involved a suit for the partition of property, and the issue presented to the Court was whether service by publication and by mail on "Albert *Guilfuss*" was sufficient to render a judgment binding on Mr. Albert B. *Geilfuss*.[43] The

35. *See How Technology is Changing the Nature of Service Delivery*, Serv. Futures https://www.servicefutures.com/technology-changing-nature-service-delivery [https://perma.cc/7MUX-QVMA] (explaining how the emerging impact of technology has allowed for more self-service and automated service solutions).

36. *See generally* Mullane v. Cent. Hanover Bank & Tr. Co., 339 U.S. 306, 313 (1950).

37. *Id.* at 314–15 ("The notice must be of such nature as reasonably to convey the required information, . . . and it must afford a reasonable time for those interested to make their appearance . . . .").

38. *See* Fed. R. Civ. P. 4; *see also* Fed. R. Civ. P. 45.

39. Fed. R. Civ. P. 4.

40. *Id.*

41. *Id.*

42. Grannis v. Ordean, 234 U.S. 385, 388, 391–92 (1914).

43. *Id.* at 390–92. According to the Court, "George A. Elder, the owner of an undivided fifth interest in [certain] lands, commenced a partition suit in the district court of St. Louis county . . . ." *Id.* at 337. The suit's "sole purpose was to partition the lands, or, in case a partition could not be had, then to have them sold and the proceeds of the sale distributed among the parties entitled." *Id.* Albert B. Geilfuss, an assignee, resided at Milwaukee, Wisconsin at the time of the partition action. *Id.* However, "[h]is correct name, 'Albert B. Geilfuss, assignee,' or 'Albert Geilfuss, assignee,' did not appear among the names of the defendants in the action, or in the summons or other files or records therein." *Id.* at 387–88. Instead, "'Albert Guilfuss, assignee,' was named as a defendant, and . . . . [t]here was no personal service of the summons in the partition action upon Geilfuss." *Id.* at 338. Instead, the sheriff had "deposited copies of the summons in the postoffice, with postage

Court noted that "[t]he fundamental requis[i]te of due process of law is the opportunity to be heard" and that "it is to [that] end, . . . that summons . . . is employed."[44] In determining whether the misspelling of Geilfuss' last name was a death knell to due process, the Court examined the speed and skill of the post office as an entity.[45] The Court noted that even with the last name of the defendant misspelled, as it was in the case, "[i]n view of the well-known skill of postal officials and employees in making proper delivery of letters defectively addressed, we think the presumption is clear and strong that the letters would reach-indeed, that they did reach-the true Albert B. Geilfuss in Milwaukee" and that most people realized for whom the notice was intended, even with the incorrect spelling.[46]

At the time *Grannis* was decided, mail was delivered entirely in person—with hand-to-hand delivery required.[47] If a mail recipient did not answer the door, the carrier was required to keep the addressed mail and redeliver it to the recipient when that recipient was home.[48] It was not until 1923 that mail slots were required for delivery service.[49] In 1914, the time of *Grannis,* carriers still spent an average of thirty minutes to one hour per day waiting at doors for recipients to answer so that personal delivery could be completed.[50] As such, the equivalent of personal service happened through the general mail delivery system, further ensuring that defendants like Geilfuss could be assured receipt of summons when it was sent through the mail.[51]

Post-1923, the mail continued to provide an allowable, if disfavored, method of ensuring delivery of summons.[52] But the development of technology, particularly the telex, brought additional questions about service

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prepaid, directed to . . . Albert Guilfuss, assignee, Milwaukee, Wisconsin, and one to Albert B. Guilfuss, Milwaukee, Wisconsin." *Id.* "There was also service of the summons by publication upon the defendants named therein as 'Albert Guilfuss, assignee,' and 'Albert B. Guilfuss,' the summons being published in a legal newspaper in Duluth, which is in St. Louis county, Minnesota." *Id.*

44. *Id.* at 394.

45. *Id.* at 397–98.

46. *See id.*

47. *See generally Sending and Receiving Mail*, U.S. POSTAL SERV., https://pe.usps.com/text/dmm100/sending-receiving.htm [https://perma.cc/A24H-4SQP] (explaining methods of delivery if recipient is not home).

48. *Id.*

49. *On This Day in Postal History: Notable Events by Month/Day/Year*, U.S. POSTAL SERV. 2 (March 2016), https://about.usps.com/who-we-are/postal-history/on-this-day.pdf [https://perma.cc/GHM8-TERF] ("Mail slots or receptacles were first required for city delivery service."); *see also Household Mailboxes*, NAT'L POSTAL MUSEUM, https://web.archive.org/web/20121104032443/http://postalmuseum.si.edu/exhibits/2b1b3_mailboxes.html [https://perma.cc/4CH4-6BB7].

50. *Id.*

51. *See generally Grannis*, 234 U.S. at 396–97.

52. *See* Mayoral-Amy v. BHI Corp., 180 F.R.D. 456, 460 (S.D. Fla. 1998) ("Under U.S. law, that service of process via certain forms of mail satisfies due process requirements is well settled.").

of process into consideration.[53] In *New England Merchants National Bank v. Iran Power Generation & Transmission Co.*,[54] the Southern District of New York considered a case in which telex was used to serve Iranian agencies and instrumentalities in a suit for monetary damages arising out of the nationalization of private property in Iran.[55] The plaintiffs sought attachment of monies of the defendants that were located in New York, guided by Federal Rule of Civil Procedure 64,[56] the New York attachment statute,[57] and the Foreign Sovereign Immunities Act (FSIA).[58]

Pursuant to the FSIA, if "other methods of service are unavailable, the court may fashion a mode of service 'consistent with the law of the place where service is to be made.'"[59] Inspired by the failure of traditional methods of service to reach the defendants in Iran, particularly mail with return receipt, the court initiated a substitute form of service that would provide defendants with adequate notice of the suit—a telex message[60] to the individual defendants in both Farsi and English. The court specifically noted that this procedure "ha[d] little or no precedent in [its] jurisprudence."[61] In justifying service by this alternate technology, the court reasoned:

> Courts, however, cannot be blind to changes and advances in technology. No longer do we live in a world where communications are conducted solely by mail carried by fast sailing clipper or steam ships. Electronic communication via satellite can and does provide instantaneous transmission of notice and information. No longer must process be mailed to a defendant's door when he can receive complete notice at an electronic terminal inside his very office, even

53. *See generally FAQ–Frequently Asked Questions*, NETWORK TELEX, https://www.networktelex.com/faq/ [https://perma.cc/EFK5-DVXK] ("Unlike facts or email, Telex has full 'legal document status' in every country of the world.").

54. *See* New England Merchs. Nat'l Bank v. Iran Power Generation & Transmission Co., 495 F. Supp. 73 (S.D.N.Y. 1980).

55. *Id.* at 81. In keeping with the times, the district court judge began his opinion in the following way: "The Iranian crisis! Demonstrations! Hostages! Diplomatic Ties Broken! The Aborted Rescue Attempt! These have been the headlines for most of the past year. Paralleling these events, however, are other less dramatic problems which must be solved in a dispassionate manner, one based in law and logic." *Id.* at 75.

56. *Id.* at 76 ("At the commencement of and during the course of an action, all remedies providing for seizure of person or property for the purpose of securing satisfaction of the judgment ultimately to be entered in the action are available under the circumstances and in the manner provided by the law of the state in which the district court is held, existing at the time the remedy is sought." (quoting FED. R. CIV. P. 64)).

57. *Id.* (quoting N.Y. C.P.L.R. 6213 (MCKINNEY 2012)).

58. *Id.* at 78–79 (citing 28 U.S.C. § 1602 (2006)).

59. *Id.* at 78.

60. For those who have forgotten the cutting-edge technology of the early 1980s, telex is a communication service involving teletypewriters. *See generally FAQ—Frequently Asked Questions*, NETWORK TELEX, *supra* note 53. It was developed during World War II to safely and discretely transmit messages over long distances. *Id.* Telex services are still available today and have full legal document status due to their safety and ability to prove receipt through a unique electronic identifier within each message. *Id.*

61. New England Merchs. Nat'l Bank v. Iran Power Generation & Transmission Co., 495 F. Supp. 73, 81 (S.D.N.Y. 1980).

when the door is steel and bolted shut.[62]

The telex method of service used in *New England Merchants* was reaffirmed in 1981 when another judge similarly ordered the use of telex service in a case brought by the Republic Bank of New York against the president of an Iranian private joint stock company.[63] The use of a telex message as a means of service continues today, particularly in cases involving foreign defendants attempting to avoid service of process.[64]

In addition to telex, courts in the early 1980s began discussing the use of the facsimile (fax) as an alternative method of electronic service.[65] The first federal case to examine the use of fax as a method of service was *In re International Telemedia Associates, Inc*., a bankruptcy case decided in 2000 that involved attempted service by fax and e-mail on a defendant who had refused to provide a street address to the plaintiff, stating that "[f]rom now on, you may contact me by FAX."[66] The court noted that because the only means of communication between the plaintiff and defendant had been electronic and by fax, the method had been authorized by the defendant.[67] Additional cases, up to the modern day, have also verified the use of fax as a sometimes acceptable means of service.[68] However, it should be noted that technology equivalent to fax was available as early as the American Civil War, and commercial use, including image transmission, was possible in 1860 when the technology was demonstrated to Napoleon.[69] Indeed, when *In re Telemedia* was decided in 2000, 3D fax was already available.[70]

In re Telemedia was also one of the earliest cases involving the use of e-mail service.[71] Utilizing the standard in *Mullane*, which asks a court to

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62. *Id.*

63. *See generally* Republic Nat'l Bank of N.Y. v. Sabet, 512 F. Supp. 416, 418 (S.D.N.Y. 1980), *aff'd mem.*, 681 F.2d 802 (2d Cir. 1981).

64. *See* Harris Corp. v. Nat'l Iranian Radio & Television, 691 F.2d 1344, 1347 (11th Cir. 1982) (upholding service via telex on Iranian defendants); *see also* Int'l Schs. Serv. v. Gov't of Iran, 505 F. Supp. 178, 179 (D.N.J. 1981) (authorizing telex service on government-controlled Iranian corporations noting that "[m]odern technology, with communications satellites and other sophisticated devices, ought not to be deprived the opportunity to attempt effective service, if it can").

65. *See* Philip Morris USA Inc. v. Veles Ltd., No. 06 Cv 2988 (GBD), 2007 WL 725412, at *3 (S.D.N.Y Mar. 13, 2007) (holding that the service of process by e-mail and fax was adequate).

66. *In re* Int'l Telemedia Assocs., Inc., 245 B.R. 713, 718–19 (Bankr. N.D. Ga. 2000).

67. *Id.* at 722.

68. *See, e.g.*, Juniper Networks, Inc. v. Bahattab, No. 07-1771(PLF), 2008 WL 250584, at *2 (D.D.C. Jan. 30, 2008) (fax service allowed on foreign defendants avoiding traditional service); *see also* Mayoral-Amy v. BHI Corp., 180 F.R.D. 456, 460 (S.D. Fla. 1998) (service by fax not allowed on Belizean defendants).

69. *See generally The History of Fax (from 1843 to Present Day)*, FAXAUTHORITY (Mar. 5, 2020), https://faxauthority.com/fax-history/ [https://perma.cc/K88S-KZKU].

70. *In re Telemedia*, 245 B.R. at 713; *see The History of Fax (from 1843 to Present Day)*, *supra* note 69 ("3D Fax became a method of scanning and transmitting 3-dimensional data.").

71. *See In re Telemedia*, 245 B.R. at 720 (noting that the only case prior to have authorized service by e-mail was an English case four years prior); *see* Frank Conley, Comment, :-) *Service with a Smiley: The Effect of E-mail and Other Electronic Communications on Service of Process*, 11 TEMP. INT'L & COMPAR. L.J. 407, 427–28 (1997) (examining an

ensure that notice is "reasonably calculated, under all the circumstances, to apprise interested parties of the pendency of the action,"[72] the *Telemedia* court noted that the defendant's preference for e-mail communication meant that the use of such a channel must necessarily indicate that the defendant was likely to receive the summons.[73] In discussing the changing technology at issue, the court stated that "communication by facsimile transmission and electronic mail have now become commonplace in our increasingly global society. The federal courts are not required to turn a blind eye to society's embracement of such technological advances."[74] This statement came just in time—in 2000, the e-mail platform Hotmail alone had 100 million subscribers.[75]

Following *In re Telemedia*, additional courts sanctioned the use of e-mail as a method of service.[76] Among the most cited is *Rio Properties, Inc. v. Rio International Interlink*,[77] a Ninth Circuit case that addressed the constitutional ramifications of e-mail service. The foreign defendant[78] in that case could only be contacted by its e-mail address, and the court was quick to point out that this made e-mail the method of service most

English High Court case authorizing service by electronic mail). At least one American court in the previous year had rejected the use of e-mail service. *See also* WAWA, Inc. v. Christensen, No. CIV. A. 99-1454, 1999 WL 557936, at *1 (E.D. Pa. July 29, 1999) ("Electronic mail ('email') is not an approved method of service under Federal Rule of Civil Procedure 4. The Judicial Conference Rules Committee has discussed and recommended a change in Fed.R.Civ.P. 4 to permit service by electronic transmission. But at this time, email is not a valid means for delivering a summons and complaint to a defendant.").

72. Mullane v. Cent. Hanover Bank & Tr. Co., 339 U.S. 306, 314 (1950).

73. *In re Telemedia*, 245 B.R. at 721.

74. *Id.* (discussing New England Merchs. Nat'l Bank v. Iran Power Generation & Transmission Co., 495 F. Supp. 73, 81 (S.D.N.Y. 1980)).

75. ED KELLER & JON BERRY, THE INFLUENTIALS: ONE AMERICAN IN TEN TELLS THE OTHER NINE HOW TO VOTE, WHERE TO EAT, AND WHAT TO BUY 318 (2003).

76. *Se* Fraserside IP LLC v. Letyagin, 280 F.R.D. 630, 630–31 (N.D. Iowa 2012) (permitting service via e-mail on "international intellectual property scofflaws"); U.S. Commodity Futures Trading Comm'n v. Rubio, No. 12–CV–22129, 2012 WL 3614360, at *3 (S.D. Fla. Aug. 21, 2012) (permitting e-mail service on an individual evading service outside the United States); Williams v. Advert. Sex LLC, 231 F.R.D. 483, 488 (N.D.W. Va. 2005) ("The authorization of e-mail as an alternative means for service of process under Federal Rule of Civil Procedure 4(f)(3) is a matter of first impression for this Court. . . . [T]he Court concludes that service of process by electronic mail is authorized by and warranted under Rule 4(f)(3) of the Federal Rules of Civil Procedure."); Popular Enters., LLC v. Webcom Media Grp., Inc., 225 F.R.D. 560, 563 (E.D. Tenn. 2004) (permitting e-mail as a valid form of alternative service of process for a difficult to locate defendant, stating, "Accordingly, the court concludes that, under the facts in this action, service upon defendant by e-mail is fully authorized by Federal Rule of Civil Procedure 4(f)(3). Indeed, it is the method of service most likely to reach defendant.").

77. 284 F.3d 1007, 1018 (9th Cir. 2002).

78. Ronald J. Hedges et al., *Electronic Service of Process at Home and Abroad: Allowing Domestic Electronic Service of Process in the Federal Courts*, 4 FED. CTS. L. REV. 55, 56 (2010) ("Currently, electronic service of process is only available in federal practice under [Rule] 4(f)(3) . . . in the context of 'Serving an Individual in a Foreign Country.'"). When a domestic defendant is involved, Federal Rule of Civil Procedure 4(e) "does not permit electronic mail as a means of substituted service unless the state where the action is brought permits it." Joe Hand Promotions, Inc. v. Shepard, No. 4:12CV1728 SNLJ, 2013 WL 4058745, at *2 (E.D. Mo. Aug. 12, 2013) (noting that "Missouri does not authorize electronic mail as a form of substituted service" and denying plaintiff's motion for substituted service by e-mail).

likely to reach the defendant[79]:

> Indeed, when faced with an international e-business scofflaw, playing hide-and-seek with the federal court, email may be the only means of effecting service of process. Certainly in this case, it was a means reasonably calculated to apprise [defendant] of the pendency of the lawsuit, and the Constitution requires nothing more.[80]

Interesting in the *Rio* analysis is the court's discussion of e-mail as a novel concept.[81] The court noted that, in 2002, "communication via email and over the Internet [was] comparatively new."[82] In 2002, 9.1% of the entire global population was using the internet—approximately 569 million people.[83] A nationwide survey by the Pew Research Center showed that eight in ten adults went online to get news during the 2002 elections.[84] Such statistics are the product of the long history of e-mail, which was actually invented at MIT as early as 1965 for use on ARPANET.[85] Queen Elizabeth II sent her first e-mail in 1976, and Microsoft Mail was released for consumer use in 1988.[86] By the time of *Telemedia* and *Rio*, even the use of e-mail spam was ancient history, having been first documented in 1994.[87]

With e-mail now old news, an open question remains as to service conducted by social media websites.[88] In domestic suits, plaintiffs seeking so-

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79. "Unlike the Iranian officials in *New England Merchants*, [the defendant] had neither an office nor a door; it had only a computer terminal. If any method of communication is reasonably calculated to provide . . . notice, surely it is email . . . ." Rio Props., Inc. v. Rio Int'l Interlink, 284 F.3d 1007, 1018 (9th Cir. 2002).

80. *Id.*

81. *Id.* at 1016–17.

82. *Id.* at 1017.

83. *See* John Koetsier, *The Internet 2002–2012: What a Difference a Decade Makes*, VENTUREBEAT (Aug. 14, 2012, 3:26 PM), https://venturebeat.com/2012/08/14/the-internet-2002-2012-infographic/ [https://perma.cc/4UYZ-GFC6] ("Microsoft's Internet Explorer had 95 percent market share. And less than 600 million people were online globally . . . .").

84. *The Internet and Campaign 2002*, PEW RES. CTR. (Jan. 5, 2003), https://www.pewinternet.org/2003/01/05/the-internet-and-campaign-2002/ [https://perma.cc/4Q37-F8NN] ("Nearly eight-in-ten (79%) did this in 2002, up from 69% in 2000.").

85. Samuel Gibbs, *How Did Email Grow from Messages Between Academics to a Global Epidemic?*, GUARDIAN (Mar. 7, 2016, 10:07), https://www.theguardian.com/technology/2016/mar/07/email-ray-tomlinson-history [https://perma.cc/HMX9-BRA2] ("The very first version of what would become known as email was invented in 1965 at Massachusetts Institute of Technology (MIT) as part of the university's Compatible Time-Sharing System, which allowed users to share files and messages on a central disk, logging in from remote terminals."). The Advanced Research Projects Agency Network (ARPANET) was a series of computers networked together by scientists and academics that could communicate in the event of a nuclear attack. *Id.* It is considered the first iteration of the internet. *Id.*

86. *Id.*

87. *See generally id.* (Microsoft Outlook, a hallmark of today's business and personal e-mail communication, was released in 1993, and according to some, has not gotten better since).

88. It should be noted that other countries have been more open to allowing service by social media, and several countries have permitted service of process through social media. Keely Knapp, #*Serviceofprocess@Socialmedia: Accepting Social Media for Service of Process in the 21st Century*, 74 LA. L. REV. 547, 570–71 (2014) (noting that Australia, Canada, and the United Kingdom have allowed service by social media); *see also* Angela Upchurch, *"Hacking" Service of Process: Using Social Media to Provide Constitutionally Sufficient Notice of Process*, 38 U. ARK. LITTLE ROCK L. REV. 559, 575 (2016) ("While service of

cial media service have been less lucky.[89] In *Fortunato v. Chase Bank USA, N.A.*, a third-party plaintiff sought service by Facebook on a domestic defendant that was evading service of process by providing fake or outdated addresses.[90] Indeed, the defendant was so effective at avoiding service that even a private investigator had not been able to determine a correct address.[91] Noting that "[s]ervice by Facebook is unorthodox to say the least" and that no precedent could be established for Facebook service, the court stated that "anyone can make a Facebook profile using real, fake, or incomplete information, and thus, there is no way for the Court to confirm whether the Nicole Fortunato the investigator found is in fact the third-party Defendant to be served."[92] As such, alternative service by Facebook was denied.[93]

Other courts have allowed social media service through platforms like LinkedIn,[94] Facebook, and, in a rare instance, Twitter.[95] Key to these courts' analyses was a record that the account at issue was operational[96] and accessed by the defendant, and that the defendant was overall likely to receive the message.[97] However, courts can be hostile to service ac-

process via social media may still be viewed as 'unorthodox' by courts in the United States, foreign court systems have been more willing to order service of process via social media."). While rarer in the United States, service of process by social media does happen. *See* Fed. Trade Comm'n v. PCCare247 Inc., No. 12 Civ. 7189(PAE), 2013 WL 841037, at *4–5 (S.D.N.Y. Mar. 7, 2013); Fortunato v. Chase Bank USA, N.A., No. 11 Civ. 6608(JFK), 2012 WL 2086950, at *2 (S.D.N.Y. June 7, 2012).

89. *See* Amanda Sexton, *Service of Process via Social Media*, L. PRAC. TODAY (Jan. 13, 2017), https://www.lawpracticetoday.org/article/service-process-via-social-media/ [https://perma.cc/39KT-68UW] ("Service by social media remains relatively uncharted waters with the exception of a handful of cases.").

90. *Fortunato*, 2012 WL 2086950, at *2.

91. *Id.* at *1.

92. *Id.* at *2.

93. *Id.* at *3. The court's decision to deny social media service was grounded on the holding that it was not likely to result in actual notice to the defendant, since the Facebook account could very well be fake. *Id.* at *2. Instead, the court ordered service by publication in a newspaper. *Id.* at *3. Interestingly, one of the newspapers selected to use for service was based on the physical location provided in the Facebook account at issue—Hastings, New York. *Id.* at *3.

94. *See* WhosHere, Inc. v. Orun, No. 1:13-cv-00526-AJT-TRJ, 2014 WL 670817, at *1 (E.D. Va. Feb. 20, 2014).

95. *See* St. Francis Assisi v. Kuwait Fin. House, No. 3:16-cv-3240-LB, 2016 WL 5725002, at *2 (N.D. Cal. Sept. 30, 2016); *see also* Martha Neil, *UK's High Court OKs Serving Injunction on Anonymous Blogger via Twittter*, A.B.A. J. (Oct. 2, 2009, 5:29 PM), https://www.abajournal.com/news/article/uk_high_court_uses_twitter_to_serve_injunction_on_anonymous_blogger/ [https://perma.cc/M66N-ZVVW].

96. *See WhosHere*, 2014 WL 670817, at *4 (permitting service on defendant through e-mail, LinkedIn, and Facebook, having found that, "[c]ollectively, these four methods are highly likely to provide defendant notice of this litigation, because defendant himself provided plaintiff with these email contacts, and also referred plaintiff to the social networking profiles which appear to be regularly viewed and maintained by defendant").

97. *See* Fed. Trade Comm'n v. PCCare247 Inc., No. 12 Civ. 7189(PAE), 2013 WL 841037, at *5 (S.D.N.Y. Mar. 7, 2013) (permitting service through e-mail and Facebook where the movant had "set forth facts that suppl[ied] ample reason for confidence that the Facebook accounts identified [were] actually operated by defendants"); *see also* Baidoo v. Blood-Dzraku, 5 N.Y.S.3d 709, 716 (N.Y. Sup. Ct. 2015) (permitting service through Facebook where plaintiff had submitted a supplemental affidavit with copies of exchanges

complished only through social media and instead expect such service to operate as an alternate or backup form of service and notice.[98] In *Federal Trade Commission v. PCCARE247 Inc.*, the Federal Trade Commission (FTC) successfully convinced the district court to allow service by Facebook when it had an additional independent ground for service.[99] The court noted that e-mail service would be constitutionally permissible because the defendant ran an online business, frequently used e-mail to communicate, and had even used e-mail communication in connection with the underlying action.[100] Under these circumstances, e-mail service alone met constitutional muster.[101] Service by Facebook was allowed as a secondary method.[102]

The *PCCare247* court's discussion of service by Facebook showed conflicting feelings about the progression of social media and technology.[103] On one hand, the court noted that service by Facebook is a "relatively novel concept," and that "if the FTC were proposing to serve defendants *only* by means of Facebook, as opposed to using Facebook as a supplemental means of service, a substantial question would arise whether that service comports with due process."[104] Despite these misgivings, the court also indicated a preference for technological progress, noting that "as technology advances and modes of communication progress, courts must be open to considering requests to authorize service via technological means of then-recent vintage, rather than dismissing them out of hand

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that took place between her and defendant through Facebook); Silverman v. Sito Mktg. LLC, No. 14-CV-3932 (WFK), 2015 WL 13649821, at *3 (E.D.N.Y. July 21, 2015) ("Here, plaintiff has proffered no evidence whatsoever that [the defendant] would be likely to click on a link that was 'tweeted' at him on Twitter or sent in a private LinkedIn message.").

98. *See PCCare247*, 2013 WL 841037, at *5 (permitting Facebook service coupled with service by e-mail to e-mail addresses that were "demonstrably used," noting that "if the [plaintiff] were proposing to serve defendants *only* by means of Facebook, as opposed to using Facebook as a supplemental means of service, a substantial question would arise whether that service comports with due process").

99. *Id.* at *5–6.

100. *Id.* at *6.

101. *Id.* at *4 ("Service by email alone comports with due process where a plaintiff demonstrates that the email is likely to reach the defendant."); *see also Williams-Sonoma Inc. v. Friendfinder Inc.*, No. C 06-06572 JSW, 2007 WL 1140639, at *2 (N.D. Cal. Apr. 17, 2007) (holding service by e-mail appropriate when the plaintiff had used the e-mail addresses at issue to communicate with the defendants previously).

102. The court provided a thorough description of the process that would be used:

> For the uninitiated, such service would work as follows: The FTC would send a Facebook message, which is not unlike an email, to the Facebook account of each individual defendant, attaching the relevant documents. Defendants would be able to view these messages when they next log on to their Facebook accounts (and, depending on their settings, might even receive email alerts upon receipt of such messages).

PCCare247, 2013 WL 841037, at *5.

103. *See generally id.*

104. *Id.* (quoting the *Fortunato* court's concern that anyone can produce a fake Facebook profile, thus making it difficult for the court to confirm if the summons reached the defendant).

as novel."[105] These conflicted feelings suggest that although the courts see the coming technological change in service of process, conceptions of traditional due process have not quite expanded to fit the bill.[106]

B. Personal Jurisdiction

As noted above, personal jurisdiction is slow to respond to technological growth and adaptation. And like service of process, courts seem to recognize that a new dawn is coming, but they have yet to fully embrace reform in legal structures like minimum contacts or presence in a jurisdiction.

Early American conceptions of personal jurisdiction were based on physical presence.[107] As such, a court could not exercise power over the defendant unless the defendant was physically located in the state.[108] This bright line guided early cases like *Pennoyer v. Neff*, which was based entirely on principles of state sovereignty.[109] Under the *Pennoyer* approach, jurisdiction was appropriate when the defendant: (1) was physically present and served in the state, (2) was domiciled in the state, or (3) had consented to jurisdiction in the state.[110] This test struggled mightily with the creation and operation of interstate corporations, which were "born" of state law and could do business anywhere through agents.[111] Courts attempted to bootstrap corporate personal jurisdiction into *Pennoyer* by fictionalizing that the corporation was physically present in the state when it was "doing business" in the state.[112]

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105. *Id.* ("As the Ninth Circuit has stated, the due process reasonableness inquiry 'unshackles the federal courts from anachronistic methods of service and permits them entry into the technological renaissance.'") (internal citation omitted).

106. It is interesting that service by publication is more favored than service by social media. Newspaper publication is expensive, and the number of people who read newspapers is dropping rapidly. *See* Alyssa L. Eisenberg, *Keep Your Facebook Friends Close and Your Process Server Closer: The Expansion of Social Media Service of Process to Cases Involving Domestic Defendants*, 51 San Diego L. Rev. 779, 808–10 (2014). In contrast, the use of social media platforms is on the rise, thus suggesting service by social media is more likely to actually reach an individual defendant. *See id*. at 809–11 (noting that "[i]n 2012, only thirty-eight percent of Americans said they regularly read any type of daily newspaper, and twenty-three percent of the population said they read a print newspaper the day before . . . . [but] seventy-two percent of adult Americans use social networking sites" and that "the amount of time social media users spend on social networking sites is about seven times the amount of time they spend reading print newspapers and almost 192 times the amount of time they spend reading online newspapers").

107. *See* Int'l Shoe Co. v. Washington, 326 U.S. 310, 316 (1945) ("Historically the jurisdiction of courts to render judgment in personam is grounded on their de facto power over the defendant's person. Hence his presence within the territorial jurisdiction of court was prerequisite to its rendition of a judgment personally binding him.").

108. *Id.*

109. *See* Pennoyer v. Neff, 95 U.S. 714, 722 (1877).

110. *Id.* at 721–23.

111. *Id.* at 735–36.

112. For a peek into this problem at the time, see William F. Cahill, *Jurisdiction over Foreign Corporations and Individuals Who Carry on Business Within the Territory*, 30 Harv. L. Rev. 676 (1917). Written in 1917 (over twenty-five years before *International Shoe*), the article explains that jurisdiction can be achieved over corporations that give consent to service in the state, or are doing business in the state. *Id.*

The "doing business" test, which considered the presence of an office, employees, or transactions in the state,[113] ultimately failed to accurately capture whether a corporation was "in" the state for purposes of personal jurisdiction—results were too inconsistent, making it difficult for corporations to plan their behavior.[114] As such, the Court moved on to *International Shoe*, which, as noted above, arose from the needs of the modern marketplace and modern transportation.[115] *International Shoe* seemed more comfortable with entities that did not have flesh and bone presence in a state—its famous minimum contacts test used the defendant's behavior, not its physical presence, to craft an analysis that sketched out constitutional minimums for personal jurisdiction[116] The court stated:

> [D]ue process requires only that in order to subject a defendant to a judgment in personam, if he be not present within the territory of the forum, he have certain minimum contacts with it such that the maintenance of the suit does not offend "traditional notions of fair play and substantial justice."[117]

The *International Shoe* court went on to distinguish between two branches of personal jurisdiction—what we now call specific jurisdiction and general jurisdiction.[118] Pursuant to specific jurisdiction, the defendant's contacts are a proper basis of jurisdiction when those contacts give rise to the claim at issue.[119] In contrast, general jurisdiction existed, according to the *International Shoe* court, when "continuous corporate operations within a state [are] so substantial and of such a nature as to justify suit . . . on causes of action arising from dealings entirely distinct from those activities."[120] And thus, the twin tests of modern personal jurisdiction were born.

1. General Jurisdiction

Each prong of personal jurisdiction, specific and general, has seen its own growth in response to technological changes. Arguably, general jurisdiction has been impacted more than specific jurisdiction, with courts struggling to reconcile the notion of deep contacts with the state with the development of the internet, social media, and global transactions.[121] The

113. Zoe Niesel, *Daimler and the Jurisdictional Triskelion*, 82 TENN. L. REV. 833, 842 (2015) ("A number of cases suggested that factors, such as an office, employees, or transactions, would be used to determine if a corporation was doing business in the forum. However, it was unclear at what point activities crossed from mere solicitation in the forum into the equivalent of physical presence.").

114. *Id.*

115. *See* Int'l Shoe Co. v. Washington, 326 U.S. 310, 316–17 (1945).

116. *See id.*

117. *Id.* at 316.

118. *Id.* at 317–18.

119. *Id.* at 317.

120. *See id.* at 318.

121. *See generally* Elijah VanKuren, *Purposeful Availment: Personal Jurisdiction in the Internet Context*, CAMPBELL L. OBSERVER (Jan. 18, 2016), http://campbelllawobserver.com/purposeful-availment-personal-jurisdiction-in-the-internet-context/ [https://perma.cc/T6R7-42SB].

first major post-*International Shoe* cases on general jurisdiction were *Perkins v. Benguet Consolidated Mining Co.*[122] and *Helicopteros Nacionales de Colombia, S.A. v. Hall*.[123] The time gap between these cases is large—*Perkins* was decided in 1952, while *Helicopteros* was decided in 1984. *Perkins* involved a foreign corporation that was operating in Ohio during the hostilities of World War II.[124] In Ohio, the corporate president took a number of actions in the name of the company, including opening bank accounts, paying salaries, conducting directors' meetings, and supervising construction and rehabilitation of corporate properties.[125] When the company was sued in Ohio for failing to issue stock certificates, the plaintiff prevailed in establishing general jurisdiction because the corporate president was engaging in the "continuous and systematic supervision of the necessarily limited wartime activities of the company,"[126] essentially meaning that all corporate operations were being conducted in Ohio.[127]

In *Helicopteros*,[128] the Court reached a different finding. Survivors of the American citizens killed in a helicopter crash in Peru sued the Colombian corporate defendant in Texas based on a theory of general jurisdiction.[129] The plaintiffs pointed to multiple contacts that the defendant had with Texas: it had purchased corporate equipment there, it trained personnel there, it had drawn payments on a Texas bank, and it had negotiated corporate contracts in Texas.[130] The Court was not persuaded, noting that the "'relationship among the defendant, the forum, and the litigation' is the essential foundation of in personam jurisdiction."[131] Citing *Perkins*, the Court dismantled each of the contacts brought forth by the plaintiffs, noting mere transactions and negotiations in the forum did not rise to the level of "continuous and systematic" contacts.[132]

The difference between *Perkins* and *Helicopteros* may, in part, be one of time. In 1952, at the time that *Perkins* was decided, it was more diffi-

122. 342 U.S. 437 (1952).

123. 466 U.S. 408 (1984).

124. *Perkins*, 342 U.S. at 438.

125. *Id.* at 447–48.

126. *Id.* at 448.

127. *Id.* at 445–46 ("[I]f the same corporation carries on, in that state, other continuous and systematic corporate activities as it did here—consisting of directors' meetings, business correspondence, banking, stock transfers, payment of salaries, purchasing of machinery, etc.—those activities are enough to make it fair and reasonable to subject that corporation to proceedings in personam in that state, at least insofar as the proceedings in personam seek to enforce causes of action relating to . . . other activities of the corporation within the state.").

128. *See* Helicopteros Nacionales de Colombia, S.A. v. Hall, 466 U.S. 408 (1984).

129. *Id.* at 409–10.

130. *Id.* at 410–11.

131. *Id.* at 414 (internal quotations and citation omitted).

132. The court specifically found that the defendant did not have a place of business in Texas: One trip by the CEO to Texas could not support personal jurisdiction. *Id.* at 416–18. There was no indication that the company requested their checks to be drawn on a Texas bank—the decision to draw the checks on a Texas bank was the unilateral activity of the bank. *Id.* Further, purchases and trips could not alone form the basis of personal jurisdiction, and the brief presence of employees in Texas for training was not significant. *Id.*

cult for corporations to operate on an international scale.[133] In contrast, by 1984, commercial planes,[134] phones, fax, telex, and the early internet had made communication, and business, more prevalent across forums.[135] It was no longer burdensome or unexpected for a corporate agent to fly to multiple locations to conduct business or to conduct business remotely.[136] In this proliferation of business and business contacts, general jurisdiction strained to make sense. As such, in 2011 and 2014, the Court further clarified general jurisdiction in *Goodyear Dunlop Tires Operations, S.A. v. Brown*[137] and *Daimler AG v. Bauman*.[138] In *Goodyear*, the plaintiffs were attempting to sue two foreign subsidiaries of Goodyear Tires in North Carolina based on the fact that the subsidiaries participated in a larger distribution scheme overseen by an American parent company and that the foreign manufactured tires had reached the North Carolina forum through this scheme.[139] In wrestling with the plaintiffs' broad interpretation of "continuous and systematic contacts," the Court amended its test, holding that "a court may assert general jurisdiction over foreign (sister-state or foreign-country) corporations to hear any and all claims against them when their affiliations with the State are so 'continuous and systematic' as to render them essentially at home in the forum State."[140]

Daimler, which also involved a foreign corporation being sued in the United States based on its parent company, further defined "at home" to mean either the state of incorporation or the principal place of business.[141] As such, general jurisdiction now exists, for practical purposes, for a corporate entity in its place of incorporation or at the location of its headquarters.[142]

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133. Perkins v. Benguet Consol. Mining Co., 342 U.S. 437 (1952).

134. While plane travel certainly existed in 1952, it was more limited and not used as liberally for business transactions. *See* Tony Long, *May 2, 1952: First Commercial Jet Flies from London to Johannesburg*, WIRED (May 2, 2012, 6:38 AM), https://www.wired.com/2012/05/may-2-1952-first-commercial-jet-flies-from-london-to-johannesburg/ [https://perma.cc/YYQ2-4H8M]. Indeed, the first commercial flight from London to Johannesburg did not occur until 1952. *Id*. Celebrated as a technological marvel at the time, the plane that made the flight crashed off the Italian coast later that year, killing all passengers aboard. *Id*.

135. *See* GENPACT RESEARCH INSTITUTE, THE IMPACT OF TECHNOLOGY ON BUSINESS PROCESS OPERATIONS (2014), https://www.genpact.com/downloadable-content/insight/the-impact-of-technology-on-business-process-operations.pdf [https://perma.cc/ZKV3-JRWY] ("The estimated impact from improved use of technology – when applicable – for finance and accounting processes was the highest across all functions and significantly higher than other levers.").

136. *See* Long, *supra* note 134.

137. 564 U.S. 915 (2011).

138. 571 U.S. 117 (2014).

139. *Goodyear*, 564 U.S. at 918–20.

140. *Id.* at 919 (emphasis added).

141. *See Daimler AG*, 571 U.S. at 137.

142. It should be noted that general jurisdiction based on some type of continuous contacts was not entirely foreclosed by the *Daimler* court. *Id.* at 138–39. The court referenced an "exceptional" case like *Perkins*, which would provide contacts "so substantial and of such a nature as to render the corporation at home in that State." *Id.* at 139 n.19. As noted above, *Perkins* involved all corporate operations conducted in the state, and essentially

The "at home" standard, while arguably clarifying general jurisdiction for non-physical corporate entities, has done little to enlighten how general jurisdiction should apply to non-physical, technological mediums like the internet.[143] In deciding such cases, courts default to the principle that general jurisdiction "is an exacting standard, as it should be, because a finding of general jurisdiction permits a defendant to be haled into court in the forum state to answer for any of its activities anywhere in the world."[144] More extremely, courts have noted that if the use of interactive exchanges on the internet were the basis of general jurisdiction, "we would soon face the inevitable demise of all restrictions on the personal jurisdiction of the courts."[145] Therefore, modern courts pre- and post-*Goodyear* and *Daimler* have largely held that no general jurisdiction can exist for non-physical online activities.[146] This seems particularly clear af-

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also involved the location of the corporate headquarters in the state. *See* Perkins v. Benguet Consolidated Mining Co., 342 U.S. 437, 447–49 (1952). As such, it is hard to imagine what "exceptional" circumstances might exist that provide general jurisdiction outside of the twin bases from *Daimler*. The *Daimler* standard was confirmed again by the Court in *BNSF Ry. Co. v. Tyrrell*, 137 S. Ct. 1549 (2017), which re-asserted that the "at home" standard applies to all state-court assertions of jurisdiction over nonresident defendants and does not vary depending on the underlying claim. Quoting *Daimler*, the *BNSF* Court noted that "the general jurisdiction inquiry does not focus solely on the magnitude of the defendant's in-state contacts" and that significant infrastructure or number of employees in the forum do not substitute for principal place of business or state of incorporation. *Id.* at 1559.

143. *See generally Daimler AG*, 571 U.S. at 117.

144. Schwarzenegger v. Fred Martin Motor Co., 374 F.3d 797, 801 (9th Cir. 2004).

145. *See* Eon Corp. v. AT & T Mobility, LLC, 879 F. Supp. 2d 194, 207 (D.P.R. 2012).

146. *See* Campbell Pet Co. v. Miale, 542 F.3d 879, 884 (Fed. Cir. 2008) (holding internet sales of $14,000 insufficient for general jurisdiction); *see also* Shrader v. Biddinger, 633 F.3d 1235 (10th Cir. 2011) (holding operation of online discussion forum was not the basis of general jurisdiction); Toys "R" Us, Inc. v. Step Two, S.A., 318 F.3d 446, 451–52 (3d Cir. 2003) (holding that "the mere operation of a commercially interactive web site should not subject the operator to jurisdiction anywhere in the world"); Revell v. Lidov, 317 F.3d 467, 471 (5th Cir. 2002) (holding online subscription sales to be insufficient for general jurisdiction); Bird v. Parsons, 289 F.3d 865, 873–74 (6th Cir. 2002) (4,666 internet domain-name registrations in the forum were insufficient for general jurisdiction); Soma Med. Int'l v. Standard Chartered Bank, 196 F.3d 1292, 1299 (10th Cir. 1999) (holding operation of website insufficient for general jurisdiction); Pickering v. ADP Dealer Servs., Inc., No. 12 C 6256, 2013 WL 996212, at *3 (N.D. Ill. Mar. 13, 2013) ("The Court is unaware of any case, and Pickering has cited none, in which a court has found general jurisdiction simply on the basis of a defendant's website, even when the website was used to make sales directly into the forum state."); Fed. Ins. Co. v. BMO Harris Bank, NA, No. SA–12–CA–112, 2012 WL 12887904, at *3 (W.D. Tex. Dec. 7, 2012) (finding no general jurisdiction where "BMO Harris maintain[ed] an interactive website through which customers [could] open new deposit accounts, check account balances, transfer funds between BMO Harris accounts, pay bills, and manage finances. Over 2,000 of BMO Harris's active online deposit accounts belong[ed] to Texas residents. Some of these accounts were opened by Texas residents while they were in Texas. However, BMO Harris maintain[ed] no offices or branches in Texas, [did] not advertise in Texas, and [was] not registered to do business in Texas"); *Eon Corp.*, 879 F. Supp. at 207 ("ATT–M's activities, conducted via the AT & T Web site, are insufficient to warrant general jurisdiction."); PowerHour, L.L.C. v. Brain Swell Media, L.L.C., No. 2:11CV356, 2011 WL 4702915, at *5 (D. Utah Oct. 4, 2011) (holding that defendant that did business in the forum over the internet and entered into contracts with forum residents was not subject to general jurisdiction in the state); Nationwide Contractor Audit Serv., Inc. v. Nat'l Compliance Mgmt. Serv., Inc., 622 F.Supp.2d 276, 292 (W.D. Pa. 2008) (noting that "courts have been reluctant to find general jurisdiction based on internet con-

ter the adoption of the "at home" test, as website activities cannot be the basis of either paradigmatic basis (state of incorporation or location of the headquarters) for general jurisdiction.[147]

2. Specific Jurisdiction

Unlike cases involving general jurisdiction, the landmark cases for specific jurisdiction have been more forward about addressing the impacts that technological progress have on personal jurisdiction.

Since *International Shoe*, Supreme Court cases have clarified, to some extent, what it means to have minimum contacts in a forum that gives rise to the claim at issue. In 1957, just five years after *Perkins* shed additional light on general jurisdiction, the Court decided *McGee v. International Life Insurance Co*.[148] *McGee* is noteworthy because it tackled head-on the notions of technological and societal progress, which is particularly interesting considering that the facts are somewhat bland[149]: "In 1944, Lowell Franklin, a resident of California, purchased a life insurance policy from . . . an Arizona corporation."[150] The insurance obligations were assumed by the Texas corporation International Life Insurance Company, and Lowell paid International Life Insurance premiums until his death,

tacts only, even in those cases where the websites are highly interactive"). The same results have been reached regarding social media, such as Facebook and Twitter. *See* Georgalis v. Facebook, Inc., 324 F. Supp. 3d 955, 959 (N.D. Ohio 2018), *reconsideration denied*, No. 1:18 CV 256, 2018 WL 6018017 (N.D. Ohio Nov. 16, 2018) ("Defendant [correctly] maintains that Plaintiff has failed to adequately allege general jurisdiction because Facebook is incorporated in Delaware with its principal place of business in California, and Facebook's affiliation with Ohio are not so continuo[u]s and systematic as to render Defendant 'at home' in the State of Ohio."); *see also* Corcera Sols., LLC v. Razor, Inc., No. 5:13–CV–05113–PSG, 2014 WL 587869, at *3 (N.D. Cal. Feb. 14, 2014), *on reconsideration in part*, No. 5:13-CV-05113-PSG, 2014 WL 4792548 (N.D. Cal. Sept. 24, 2014) (finding no general jurisdiction based on the use of Facebook, Linked In, Twitter, and GooglePlus).

147. For any stray decisions that do find internet-based general jurisdiction, *see* Gator.com Corp. v. L.L. Bean, Inc., 341 F.3d 1072, 1079 (9th Cir. 2003) (internet contacts appropriate for general jurisdiction), *vacated as moot* 398 F.3d 1125 (9th Cir. 2005) and Gorman v. Ameritrade Holding Corp., 293 F.3d 506, 513 (D.C. Cir. 2002) (holding internet contacts appropriate for general jurisdiction). It appears now that such cases are inapposite with *Daimler* and *Goodyear*. *See* Kenney v. Lofts at Sodo, No. 18-11332(FLW), 2019 WL 1057365, at *3 (D.N.J. Mar. 6, 2019) ("Plaintiff argues that general jurisdiction exists because Defendant maintains an apartment rental website, accessible to New Jersey residents, for its properties in Florida. For support, Plaintiff relies on a pre-*Daimler*, district court opinion . . . for the proposition that courts may exercise personal (general) jurisdiction over a defendant based on the existence of an internet site. . . . [This case] is simply unpersuasive in light of *Daimler*, which decision has effectively narrowed the scope of general jurisdiction over corporate defendants . . . ."); *see also* Kearney v. Good Start Genetics, Inc., No. 17-2363, 2017 WL 6206168, at *4 (E.D. Pa. Dec. 8, 2017) (disagreeing with plaintiff's attempt to argue website contacts as the basis for general jurisdiction based on the fact that the forum was "not a 'paradigm' forum in which Defendant is 'at home' for the purposes of personal jurisdiction") (internal citation omitted); First Metro. Church of Hous. v. Genesis Grp., No. H-14-2786, 2015 WL 11170733, at *3 (S.D. Tex. Mar. 3, 2015), *aff'd*, 616 F. App'x 148 (5th Cir. 2015) ("Maintaining a passive website that lists a Texas church as a reference does not constitute an affiliation with the State of Texas that is so continuous and systematic that Defendant is 'essentially at home' in Texas.").

148. 355 U.S. 220 (1957).

149. *Id.* at 221 (calling the facts of the case "relatively simple").

150. *Id.*

mailing them from California to Texas.[151] His mother ultimately sued to receive the benefits.[152] The Court found specific jurisdiction in California on these facts, even though this was the only insurance policy the company had issued in California.[153] Simply put, even though there was one contact with California, this contact gave rise to the plaintiff's claim.[154] In so holding, the Court commented on technological progress: "[M]any commercial transactions touch two or more States and may involve parties separated by the full continent. With this increasing nationalization of commerce has come a great increase in the amount of business conducted by mail across state lines."[155] Looking back, it is interesting to think of increased business by mail serving as a watershed moment when the growth of online transactions and business exchanges in the modern era has reached all-time highs.

The automobile as a means of transportation technology and its relationship to specific jurisdiction was addressed almost thirty years later in *World-Wide Volkswagen Corp. v. Woodson.*[156] In *Woodson*, the plaintiffs sued a vehicle distributor in New York for injuries sustained when a defect in the car caused injury while the plaintiffs were passing through Oklahoma.[157] The Court rejected the Oklahoma contact as a basis for specific jurisdiction, noting that the defendants should only be subject to jurisdiction where they "should reasonably anticipate being haled into court."[158] Such anticipation could not be found on the facts of the case because the defendants did not have activity in Oklahoma, including sales, services, advertisements, or any other activity designed to capture any share of the Oklahoma market.[159] In its holding, the Court rejected the notion that a physical object, although designed to be mobile, could alone serve as a basis for specific jurisdiction when taken into the forum by the plaintiff.[160]

Later, in *Burger King Corp. v. Rudzewicz*, the Court addressed the flip side—whether the *lack* of a physical object in the forum would *prevent* a finding of specific jurisdiction.[161] In *Burger King*, the defendants opened a restaurant franchise in Michigan, and the franchise contract stated that the laws of Florida would govern.[162] The franchisor, Burger King, sued the defendants in Florida for trademark infringement and breach of the franchise obligations after the defendants refused to close their location due to poor sales.[163] The defendants claimed that the dispute did not

151. *Id.* at 221–22.
152. *Id.* at 222.
153. *Id.* at 222–23.
154. *Id.*
155. *Id.* at 223.
156. 444 U.S. 286 (1980).
157. *Id.* at 288.
158. *Id.* at 297–98.
159. *Id.* at 289.
160. *Id.* at 295.
161. Burger King Corp. v. Rudzewicz, 471 U.S. 462, 476 (1985).
162. *Id.* at 465–67.
163. *Id.* at 468–69.

arise out of their contacts with Florida.[164]

The Court's holding in *Burger King* was based on the notion of purposeful direction—i.e., whether the defendant purposefully directed its activities at forum residents.[165] In making that assessment, the Court examined whether there was "some act by which the defendant purposefully avail[ed] itself of the privilege of conducting activities within the forum State, thus invoking the benefits and protections of its laws."[166] This inquiry, for the first time, was entirely decoupled from physical presence—the defendants had only briefly appeared in Florida for a training session.[167] However, the Court found that the defendants were subject to specific personal jurisdiction in Florida based on their decision to enter into a long-term agreement with a Florida corporation that had provided them significant benefits.[168] The Court commented on changing commercial practices, noting that

> [j]urisdiction in these circumstances may not be avoided merely because the defendant did not *physically* enter the forum State. Although territorial presence frequently will enhance a potential defendant's affiliation with a State and reinforce the reasonable foreseeability of suit there, it is an inescapable fact of modern commercial life that a substantial amount of business is transacted solely by mail and wire communications across state lines, thus obviating the need for physical presence within a State in which business is conducted.[169]

In *Asahi Metal Industry Co., Ltd. v. Superior Court*,[170] decided in 1987, the Court assessed more physical notions of specific jurisdiction when it decided whether specific jurisdiction should exist when a company delivered "its products into the *stream of commerce* with the expectation that they [would] be purchased by consumers in the forum State."[171] A plurality of the Court returned to *Burger King*, holding that specific jurisdiction requires "*an action of the defendant purposefully directed toward the forum State*."[172] And therefore, "[t]he placement of a product into the stream of commerce, without more, is not an act of the defendant purposefully directed toward the forum State."[173] This "more" could involve designing the product for a certain market, advertising in the forum, or advising customers in the forum (such as a helpline).[174]

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164. *Id.* at 469
165. *Id.* at 472–73.
166. *Id.* at 475 (quoting Hanson v. Denckla, 357 U.S. 235, 253 (1958)).
167. *Id.* at 479.
168. *Id.* at 479–80.
169. *Id.* at 476.
170. 480 U.S. 102, 103 (1987).
171. *Id.* at 109.
172. *Id.* at 112 (citing *Burger King*, 471 U.S. at 476).
173. *Id.*
174. *Id.* Justice Brennan also authored an opinion in *Asahi*, which stated that placing a product in the stream of commerce with knowledge it is being marketed downstream is sufficient to show purposeful direction. *Id.* at 116–17 (Brennan, J., concurring in part and concurring in the judgment). Justice Brennan noted that "[a]s long as a participant in this

The application of *Burger King* and *Asahi* in response to the internet and other more emerging technologies has been opaque.[175] The preeminent test adopted in their wake was articulated in *Zippo Manufacturing Co. v. Zippo Dot Com, Inc.*, decided in 1997 by the Western District of Pennsylvania.[176] Relying on *Burger King*, the *Zippo* court established a sliding scale test for website activity and personal jurisdiction that assessed the commercial nature of a website in determining if purposeful availment has occurred.[177] When a website is simply passive—such as an advertisement or informational site—no specific personal jurisdiction exists for claims arising out of the website.[178] When a website is commercial, and allows consumers to enter into transactions or allows for the repeated transmission of files over the internet, personal jurisdiction is appropriate.[179] Finally, when the website is in-between, i.e., interactive but not necessarily commercial, the court will assess "the level of interactivity and commercial nature of the exchange of information that occurs on the [w]ebsite."[180] At the heart of this test is still purposeful availment—whether the defendant purposefully availed itself of the benefits and protections of the forum's laws, such that it should reasonably anticipate being haled into court in the forum.[181]

Zippo was an appropriate reaction to the early Web, when websites were largely passive and items such as cookies, AI, and bots either did not exist or were in very early stages.[182] Further, courts struggled to understand when a website was actually interactive or passive.[183] Courts examined a number of factors, from commercial activity,[184] to ordering

process is aware that the final product is being marketed in the forum State, the possibility of a lawsuit there cannot come as a surprise." *Id.* at 117. However, the plurality opinion, authored by Justice O'Connor, has seen more widespread adoption. *Id.* at 105–16.

175. *See id.* at 102; *see also Burger King*, 471 U.S. 462.

176. Zippo Mfg. Co. v. Zippo Dot Com, Inc., 952 F. Supp. 1119 (W.D. Pa. 1997); *see* Toys "R" Us v. Step Two, S.A., 318 F.3d 446, 452 ("The opinion in [*Zippo*] has become a seminal authority regarding personal jurisdiction based upon the operation of an Internet web site.").

177. *Id.* at 1124.

178. *Id.*

179. *Id.*

180. Shippitsa Ltd. v. Slack, No. 3:18-CV-1036-D, 2019 WL 2372687, at *4 (N.D. Tex. June 5, 2019).

181. *See Applied Food Scis., Inc. v. New Star 21, Inc.*, No. W–07–CA–359, 2009 WL 9120113, at *4 (W.D. Tex. Jan. 23, 2009).

182. *See* CIVIX-DDI LLC v. Microsoft Corp., No. 99-B-172, 1999 WL 1020248, at *2 (D. Colo. Oct. 1, 1999) ("The Internet may represent the latest and greatest challenge to questions of personal jurisdiction."). A typical website at the time of *Zippo* generally provided information about the defendant's services—i.e., was essentially an advertisement. *See, e.g.*, Hearst Corp. v. Goldberger, No. 96 Civ. 3620 (PKL)(AJP), 1997 WL 97097, at *15 (S.D.N.Y. Feb. 26, 1997).

183. *See* Food Scis. Corp. v. Nagler, No. 09–1798 (JBS), 2010 WL 1186203, at *2 (D.N.J. Mar. 22, 2010).

184. *See id.* at *3–4.

products without payment,[185] to filling out forms,[186] to ability to exchange information,[187] to the ability to gather information or advertise,[188] to accessibility,[189] all while reaching somewhat inconsistent results. While *Zippo* is outdated and confusing, it still remains the gold standard for an online personal jurisdiction analysis.[190]

At least one modern jurisdictional area is clear regarding the position of servers that host online websites.[191] Courts have consistently held that the physical location of a server is not de facto important in the specific jurisdiction analysis; rather, what matters is what state the defendant is "targeting" in accessing the server.[192] Thus, courts will look to whether defendants targeted residents of a certain state,[193] communicated with a state's residents,[194] or know that their targets were ultimately located in a particular state.[195] Additionally, courts will apply *Zippo* to the online content itself but will not consider the physical location of the server that hosts the site.[196] For malicious attacks, it does not matter if the defendant knowingly targeted the server at issue to steal data—in such cases, personal jurisdiction exists.[197]

185. *See, e.g.*, ESAB Grp., Inc. v. Centricut, LLC, 34 F. Supp. 2d 323, 333–34 (D.S.C. 1999).

186. *See, e.g.*, Zamora Radio, LLC v. Last.fm Ltd., No. 09-20940-CIV, 2011 WL 2580401, at *5 (S.D. Fla. June 28, 2011).

187. *See* Roblor Mktg. Grp. Inc., v. GPS Indus., Inc., 645 F. Supp. 2d 1130, 1148–52 (S.D. Fla. 2009); *see also* Blumenthal v. Drudge, 992 F. Supp. 44, 56 (D.D.C. 1998).

188. *See* Sweetgreen, Inc. v. Sweet Leaf, Inc., 882 F. Supp. 2d 1, 5 (D.D.C. 2012).

189. *See, e.g.*, FC Inv. Grp. LC v. IFX Mkts., Ltd., 529 F.3d 1087, 1092 (D.C. Cir. 2008).

190. *See* Hearst Corp. v. Goldberger, No. 96 Civ. 3620 (PKL)(AJP), 1997 WL 97097, at *15 (S.D.N.Y. Feb. 26, 1997).

191. *See* Future World Elecs., LLC v. Results HQ, LLC, No. 17-17982, 2018 WL 2416682, at *3 (E.D. La. May 29, 2018).

192. *See id.* ("[A] plaintiff may not 'rely on the fortuitous location' of a server to establish personal jurisdiction over a defendant who accessed that server." (quoting Chang v. Virgin Mobile USA, LLC, No. 07-1767, 2009 WL 111570, at *3 (N.D. Tex. Jan. 16, 2009))); *see also* BGDG Enters., LLC v. Barley & Swine, No. A–13–CA–719–SS, 2014 WL 12479650, at *4 (W.D. Tex. Jan. 23, 2014) (noting that "courts have rejected the physical location of servers as a basis for personal jurisdiction").

193. *See, e.g.*, Felland v. Clifton, 682 F.3d 665, 676 (7th Cir. 2012) (finding the consideration of the location of the computer server to be appropriate in a determination of specific jurisdiction where the defendant knew that he was sending correspondence to forum residents); *see also* Abatix Corp. v. Capra, No. 2:07-CV-541, 2008 WL 4427285, at *4 (E.D. Tex. Sept. 24, 2008) (finding the exercise of specific jurisdiction proper where nonresident defendants "directed their allegedly tortious act" at computer servers located within the forum).

194. *See* D.C. Micro Dev., Inc. v. Lange, 246 F. Supp. 2d 705, 712 (W.D. Ky. 2003); *see also* Verizon Online Servs., Inc. v. Ralsky, 203 F. Supp. 2d 601, 610 (E.D. Va. 2002) (finding the exercise of personal jurisdiction was proper when defendant allegedly had "transmitted millions of unsolicited commercial e-mails to and through [plaintiff's] servers in [the forum state]").

195. MacDermid, Inc. v. Deiter, 702 F.3d 725, 730 (2d Cir. 2012) (finding personal jurisdiction over a former employee who knew the location of servers).

196. *See, e.g.*, *BGDG Enters.*, 2014 WL 12479650, at *4 (holding that, in a case arising out of website contacts, physical location of a server does not matter in the *Zippo* analysis—to hold otherwise would be to "create new personal jurisdiction doctrines").

197. *See, e.g.*, Rhapsody Sols., LLC v. Cryogenic Vessel Alts., Inc., No. H–12–1168, 2013 WL 820589, at *5 (S.D. Tex. Mar. 5, 2013) (finding personal jurisdiction because evidence showed defendant knew of server location).

Less clear in the case law is how specific jurisdiction is adapting to next generation technologies, such as AI and bots. Bots are essentially software programs with AI capabilities that allow them to independently operate online.[198] These bots can conduct transactions, create sub-agents, and communicate with each other.[199] Despite their widespread use, relatively little case law has established how bots are to be treated for personal jurisdiction purposes. In 2010, the District of Massachusetts addressed a case involving the intersection of bots and personal jurisdiction in *Jagex Limited v. Impulse Software*.[200] In *Jagex*, the plaintiff was the owner of Runescape, an interactive computer game, and the defendants were developers of a software program called "iBot" that enabled Runescape players to advance through the game without human participation.[201] The iBot software functioned as follows:

> The Bot software functions by downloading a copy of Runescape . . . and using a process called "reflection" to examine the game's internal operation which is normally hidden from users. The Bot software uses this information to identify objects within the Runescape game with which it wishes to interact and then completes a desired task according to instructions from a script. In essence, the Bot plays the game for its owner while she is away from her computer.[202]

The defendants sold iBot on websites that they operated for a profit.[203] The plaintiff sued, alleging copyright infringement, trademark infringement, and violation of the Computer Fraud and Abuse Act.[204] The court was forced to consider whether personal jurisdiction in Massachusetts was proper because defendants operated their websites from Florida.[205] In considering specific jurisdiction, the court noted that the bots were created in Florida and were then used in Massachusetts to violate Runescape's Terms and Conditions.[206] The court went on to use the 1999 *Zippo* analysis to assess the quality of the commercial activity at issue, finding that "the defendants operate[d] interactive websites that allow[ed] Massachusetts users to exchange payment information for software codes that enable the bots to function."[207] Therefore, the court was concerned with the exchange of payment for the bots on the interactive website, not the operation of the bots themselves.[208] It is entirely less clear what happens

198. *See generally* Denis T. Rice, *Jurisdiction in Cyberspace: Which Law and Forum Apply to Securities Transactions on the Internet?*, 21 U. PA. J. INT'L ECON. L. 585, 598 (2000).
199. *Id.*
200. 750 F. Supp. 2d 228, 231 (D. Mass. 2010).
201. *Id.*
202. *Id.*
203. *Id.*
204. *Id.*
205. *Id.* at 231–32.
206. *Id.* at 232.
207. *Id.* at 233.
208. *Id.* For a more concrete proposal involving bots directly, see Christopher B. Seaman, *The Case Against Federalizing Trade Secrecy*, 101 VA. L. REV. 317, 389 (2015) (articulating a national contacts standard for personal jurisdiction in trade secrets cases where

when after a bot is released, it takes independent action to reach the forum and conducts activity that results in liability.[209]

III. MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

Civil procedure has been somewhat slow to respond to changing technology—the *Zippo* test was developed in 1997, a time when Google did not exist, there were only about 100,000 websites, and CD-RW drives were being introduced.[210] Civil procedure may not be ready for a world in which AI and machine learning are the next big horizons.

The concept of AI has existed since World War II, during which time computer scientist Alan Turing cracked the German "Enigma" code that was used to send secure German messages during the war.[211] To crack Enigma, Turing and his team developed a machine that could learn to decipher the Enigma messages.[212] Turing developed what is still known as the "Turing test"—if a machine could interact with humans, without those humans knowing that they were conversing with a machine, the machine was "intelligent."[213] This idea that a computer could fool its questioner was dubbed the "imitation game."[214] Turing stated in his famous article, *Computing Machinery and Intelligence*:

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bots are involved) ("Under a 'national contacts' standard, the misappropriator's exploitation of compromised bots in different states could be aggregated to help establish personal jurisdiction.").

209. *See* Rice, *supra* note 198, at 598 ("The Web participant who unleashes a bot into a digital environment, awash with other bots and virtual proxies, arguably leaves his geographical home, elects to transact in a different environment, and ceases to hold a reasonable belief that the laws or courts of his or her home jurisdiction will apply to the transaction. This makes it necessary to consider new, non-geographical or less geographical paradigms.").

210. *See The Web Back in 1996-1997*, PINGDOM (Sept. 16, 2008), https://royal.pingdom.com/the-web-in-1996-1997/ [https://perma.cc/PNE9-HPVG]; *see also Computer History–1997*, COMPUTER HOPE (May 6, 2020), https://www.computerhope.com/history/1997.html [https://perma.cc/U8AH-LCBQ]. In contrast, there were over 1 billion websites in January 2019. *How Many Websites Are There Around the World? [2020]*, MILL FOR BUS. (Feb. 12, 2020), https://www.millforbusiness.com/how-many-websites-are-there/ [https://perma.cc/N8DC-7CNK].

211. Shaan Ray, *History of AI*, TOWARDS DATA SCI. (Aug. 11, 2018), https://towardsdatascience.com/history-of-ai-484a86fc16ef [https://perma.cc/R6GU-3H4G]. There is additional evidence that the concept of AI existed even long before the 1950s. Alex Shashkevich, *Stanford Researcher Examines Earliest Concepts of Artificial Intelligence, Robots in Ancient Myths*, STANFORD NEWS (Feb. 28, 2019), https://news.stanford.edu/2019/02/28/ancient-myths-reveal-early-fantasies-artificial-life/ [https://perma.cc/6TWX-243U]. Ancient Greeks first wrote about concepts that were like robotics through the god Talos, a bronze statute that came to life to protect the island of Crete. *Id.* Even the novel Frankenstein, Mary Shelly's famous novel about a reanimated corpse, suggests that humans have long been interested in sparking intelligent life into inanimate objects. *See* Eileen Hunt Botting, *Godmother of Intelligences*, AEON (Oct. 3, 2018), https://aeon.co/essays/what-frankensteins-creature-can-really-tell-us-about-ai [https://perma.cc/SQ8T-LYAE].

212. *See* Ray, *supra* note 211 (demonstrating that Enigma and Bombe Machines have laid foundations down for machine learning); *see also* Jason Griffey, *Introduction*, LIBR. TECH. REPS., Jan. 2019, at 5–9; *see also* Or Shani, *From Science Fiction to Reality: The Evolution of Artificial Intelligence*, WIRED, https://www.wired.com/insights/2015/01/the-evolution-of-artificial-intelligence [https://perma.cc/TV2U-MSG4].

213. Ray, *supra* note 211.

214. *Id.*

I propose to consider the question, "Can machines think?"

. . . .

I believe that in about fifty years' time it will be possible, to programme computers, with a storage capacity of about 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 per cent, chance of making the right identification after five minutes of questioning. The original question, "Can machines think!" I believe to be too meaningless to deserve discussion. Nevertheless I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted. I believe further that no useful purpose is served by concealing these beliefs. The popular view that scientists proceed inexorably from well-established fact to well-established fact, never being influenced by any unproved conjecture, is quite mistaken.[215]

The test operates as follows: Three entities, a human, a computer, and a judge, are in play. The judge asks questions to the human and the computer, and the judge is forced to determine, based on tone and reaction, if she is interrogating the human or the computer. In a two-person version of test, the judge or interrogator grills its subject to determine if she is talking to man or machine. The purpose of this test is to show that an intelligent machine can replicate human behavior so perfectly that it is ultimately indistinguishable from human intelligence.[216]

The test, however, raised larger issues about consciousness and intelligence.[217] Commentators, and even Turing himself, noted that the test would not capture whether the machine was truly conscious—it would be possible for a program to pass the test without, for example, experiencing emotion.[218] However, as at least one author notes, "[t]his would be similar to how humans communicate to convince each other of what they are feeling, though there is no guarantee that it is really true."[219] As such, the Turing test is more about the human-facing side of the equation—does the human judge feel that she is interacting with an intelligence, despite what is going on inside the "black box" of the machine's "mind."[220]

A few years after Turing's work, the human-facing component of AI was already on the move—in 1952, a computer scientist developed a com-

215. A.M. Turing, *Computing Machinery and Intelligence*, 59 MIND: Q. REV. OF PSYCHOL. & PHIL. 433, 422 (1950).

216. *See id.* at 433–34. Interestingly, an early example of a computer that satisfied the so-called Turing test was "Engine"—the fictional machine portrayed by Jonathan Swift in *Gulliver's Travels*, published in the early 1700s. *See* Rebecca Reynoso, *A Complete History of Artificial Intelligence*, G2 (Mar. 1, 2019), https://learn.g2.com/history-of-artificial-intelligence [https://perma.cc/E7RV-L5NN]. Engine used a non-human mechanical mind to improve knowledge and make mechanical operations more efficient. *See id.*

217. Reynoso, *supra* note 216.

218. MARIA JOHNSEN, THE FUTURE OF ARTIFICIAL INTELLIGENCE IN DIGITAL MARKETING 20 (2017).

219. *Id.*

220. *Id.* It is worth noting that no machine has yet been able to pass the Turing test, suggesting that an increase in computation power since Turing's day is not the sole limitation at play. *Id.*

puter program that could learn to play checkers against a human opponent.[221] Following this research, an American computer scientist organized the Dartmouth Conference in 1956, which coined the term "artificial intelligence" and led to the first AI laboratory in 1959.[222] Research at this early juncture was centered around two camps—"good old-fashioned artificial intelligence" and the "artificial neural network" approach.[223] Good old-fashioned artificial intelligence was based on logic and used formal rules to manipulate symbols, while the artificial neural networks were based on developing learning that mimicked the human brain.[224] Developments in these two camps in the 1950s and 1960s included the Lisp programming language (an innovation that created a programming language for AI research),[225] Logic Theorist (the first AI program that went on to prove 38/52 theorems in *Prinicipa Mathematica*),[226] and the first humanoid robot that could converse with a human.[227] Lisp was ultimately used to develop a program that could fully converse in a human-psychologist interaction.[228] While impressive, a majority of

221. *See* Reynoso, *supra* note 216 ("[T]he first to independently learn how to play a game.").

222. Shani, *supra* note 212 ("American cognitive scientist Marvin Minsky picked up the AI torch and co-founded the Massachusetts Institute of Technology's AI laboratory in 1959, and he was one of the leading thinkers in the field through the 1960s and 1970s.").

223. *See generally* Univ. of Queensl., *History of Artificial Intelligence*, QUEESL. BRAIN INST., https://qbi.uq.edu.au/brain/intelligent-machines/history-artificial-intelligence [https://perma.cc/7U8S-5CY6] (last updated Jan. 30, 2019).

224. *See id.*

225. *See* Reynoso, *supra* note 216 (explaining how a computer scientist created a program written in Lisp that solved algebra word problems).

226. *Id.*; Gil Press, *A Very Short History of Artificial Intelligence (AI)*, FORBES (Dec. 30, 2016, 9:09 AM), https://www.forbes.com/sites/gilpress/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/#6b490f26fba2 [perma.cc/J6EE-7DC4].

227. *See* Press, *supra* note 226 ("Wabot-2 is built at Waseda University in Japan, a musician humanoid robot able to communicate with a person, read a musical score and play tunes of average difficulty on an electronic organ."); *see also* Reynoso, *supra* note 216.

228. Reynoso, *supra* note 216 ("Joseph Weizenbaum, computer scientist and professor, developed ELIZA, an interactive computer program that could functionally converse in English with a person."). The dialogue here was actually rather stunted. *See* Joseph Weizenbaum, *Eliza/Doctor Program*, UNIV. MD., https://www.cs.umd.edu/class/fall2012/cmsc828d/oldreportfiles/guha1.pdf (July 3, 2020) [perma.cc/K5UL-3U36]. For example, the program, named ELIZA, would introduce itself as a psychotherapist and ask the human to describe issues they were facing. *Id.* For example:

HUMAN: I am unhappy.
ELIZA: Are you unhappy often?
HUMAN: Yes.
ELIZA: Can you elaborate on that?
HUMAN: Too much work.
ELIZA: Why do you say too much work?
HUMAN: I am working a lot.
ELIZA: Earlier you said you felt unhappy?
HUMAN: Yes.
ELIZA: I would appreciate it if you would continue.
HUMAN: Well, I don't know what to do.
ELIZA: Maybe your plans have something to do with this.
HUMAN: No they don't.
ELIZA: Go on, don't be afraid.

these developments were stifled by the limitations on computing.[229]

In the late 1990s, a renewed interest in AI occurred when IBM's Deep Blue program defeated Gary Kaparov, the world-reigning chess champion.[230] The 1990s then saw a mass advance in the area of AI, including "intelligent tutoring, case-based reasoning, multi-agent planning, scheduling, uncertain reasoning, data mining, natural language understanding and translation, vision, virtual reality, games, and other topics."[231] The 2000s saw similar progress, with robots that could recognize and simulate human emotions, autonomous driving, visual object recognition, and even intelligent programs that would independently write sports stories for a newspaper.[232]

Modern research into AI is based on the use of "deep learning," an approach centered on neural networks that learn from experience, much like humans.[233] Indeed, Turing himself first predicted this kind of deep learning theory in *Computing Machinery and Intelligence*:

> Instead of trying to produce a programme to simulate the adult mind, why not rather try to produce one which simulates the child's? If this were then subjected to an appropriate course of education one would obtain the adult brain. Presumably the child-brain is something like a note-book as one buys it from the stationers. Rather little mechanism, and lots of blank sheets. (Mechanism and writing are from our point of view almost synonymous.) Our hope is that there is so little mechanism in the child-brain that something like it can be easily programmed.[234]

In Turing's view, it was more efficient to program a computer to learn itself than to put forth a fully developed and pre-loaded "mind."[235] Today, deep learning is only possible thanks to modern computing technology, which can marshal huge amounts of data in a short amount of time and utilize the achievements in storage and cloud computing to create lightning-fast processing speeds.[236] The use of massive data sets allows

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Id. (names added for clarity). The researchers noted that people became emotionally attached to ELIZA, despite knowing that it was operating with a scripted code and did not actually have human consciousness or experience with which to process their answers. *See id.* Now, this phenomenon is called "the 'ELIZA Effect' which is the tendency of humans to mistakenly confuse computer behaviours having intent behind them and draw analogies to human behaviours subconsciously. Like ELIZA, humans start attributing emotion and understanding to a programs output where none exist or is supposed to exist." *Id.*

229. Weizenbaum, *supra* note 228.

230. Ray, *supra* note 211.

231. The Ass'n for the Advancement of Artificial Intelligence, *A Brief History of AI*, AITopics, https://aitopics.org/misc/brief-history [perma.cc/76NA-KUUQ] (noting that these have been some of the significant demonstrations in machine learning).

232. *See generally* Press, *supra* note 226 (explaining the development of AI from 2000 to 2016 and the immense growth that occurred in those years).

233. *See* Univ. of Queensl., *supra* note 223.

234. Turing, *supra* note 215, at 456.

235. *Id.* at 454–60 (examining the question of whether a machine can think).

236. Univ. of Queensl., *supra* note 223 ("With enormous data sets, modern AI neural networks can often exceed human performance in many tasks . . . .").

programs to learn through pattern recognition and experience.[237]

A. Machine Learning

Machine learning is different from artificial intelligence, but it is ultimately a subset of the same.[238] Simply put, all machine learning is artificial intelligence, but not all artificial intelligence is machine learning.[239] Artificial intelligence, as first described at the Dartmouth Conference in 1956, is the science of making intelligent machines, and it involves "any sort of intelligence that doesn't arise through natural processes, or where intelligence can be understood to be created."[240] Artificial intelligence can be analogized to human intelligence and can include tasks such as object recognition, understanding and summarizing text, or speech recognition.[241]

Good old-fashioned artificial intelligence is rule-based, meaning it uses "if-then" statements or statistical models that are programmed by humans.[242] A computer playing chess, like IBM's Deep Blue program, is a product of this rule-based system.[243] The Deep Blue program is criticized for not really being "intelligent" because it does not use its own independent learning or experiences.[244] Rather, it uses a pre-programmed set of rules to arrive at an outcome.[245] The program uses an evaluation to score the state of the chess board. For example, a maximum evaluation score would be given to a board position where the computer has the other player in a checkmate position.[246] An algorithm assesses which action minimizes the maximum possible loss—a Minimax algorithm[247]—and looks as many steps into the future as possible using the available computing power to calculate possible reactions by the oppo-

237. *See id.*

238. *See* Lithmee, *Difference Between Machine Learning and Artificial Intelligence*, Difference Between.com (Jan. 20, 2018), https://www.differencebetween.com/difference-between-machine-learning-and-vs-artificial-intelligence/ [perma.cc/76CX-222K] ("Machine Learning is a type of Artificial Intelligence that gives the ability for a computer to learn without being explicitly programmed[,] and Artificial Intelligence is the theory and development of computer systems able to perform tasks intelligently similar to a human.").

239. Chris Nicholson, *Artificial Intelligence (AI) vs. Machine Learning vs. Deep Learning*, Pathmind, https://pathmind.com/wiki/ai-vs-machine-learning-vs-deep-learning [https://perma.cc/7YUY-VER7].

240. Griffey, *supra* note 212, at 6.

241. *Id.*

242. *See* Nicholson, *supra* note 239 ("The if-then statements are simply rules explicitly programmed by a human hand.").

243. *See generally* Zippo Mfg. Co. v. Zippo Dot Com, Inc., 952 F. Supp. 1119 (W.D. Pa. 1997).

244. *See* Jesse Emspak, *What is Intelligence? 20 Years After Deep Blue, AI Still Can't Think Like Humans*, Live Science (May 11, 2017), https://www.livescience.com/59068-deep-blue-beats-kasparov-progress-of-ai.html [perma.cc/F3TD-WUG6] (explaining how machines can still fall short in certain areas).

245. Nicholson, *supra* note 239.

246. *See Algorithms—Minimax*, Strategies & Tactics for Intelligent Search, https://cs.stanford.edu/people/eroberts/courses/soco/projects/2003-04/intelligent-search/minimax.html [https://perma.cc/GGG8-ZSNK].

247. *See id.*

nent to minimize the loss that the opponent could inflict down the road.[248] But it is ultimately based on pre-programmed rules entered by humans, and the concern is more about whether the output *mimics* a response that an intelligent human could produce.[249]

In contrast, the new generation of AI has focused on the sub-field of machine learning.[250] The heart of machine learning is dynamic adjustments, meaning that the program does not require human involvement to make changes.[251] Rather, it modifies and adapts *itself* when exposed to new information, essentially programming on its own to modify its outputs.[252] This loosely mimics the child brain that Turing explored in the early 1950s—like a human child, programs equipped with machine learning adjust based on experience and new information.[253] Of course, the question of machine learning is closely tied with the question of whether human-level intelligence and autonomy can ever be achieved by a machine—the type of learning that autonomously grows and builds on itself.[254] As Turing noted, humans process experiences through a gradual development that focuses on learning from instructions, past experience, mistakes, and the use of images.[255]

These modalities are difficult for a computer to master, even at the level of sheer processing power.[256] The human mind has close to 100 billion neural cells and might be engaged in 200 trillion operations in any

248. *See id.*

249. *See* Harry Surden, *Machine Learning and Law*, 89 WASH. L. REV. 87, 95–96 (2014) ("This is an outcome-oriented view of intelligence—assessing based upon whether the results that were produced were sensible and useful—rather than whether the underlying process that produced them was 'cognitive' in nature.").

250. Rachel Wilka et al., *How Machines Learn: Where Do Companies Get Data for Machine Learning and What Licenses Do They Need?*, 13 WASH. J.L. TECH. & ARTS 217, 219 (2018) ("Real world utilization of machine learning increases daily, as more and more companies use the technology . . . .").

251. *See generally* STUART J. RUSSELL & PETER NORVIG, ARTIFICIAL INTELLIGENCE: A MODERN APPROACH 693 (3d ed. 2010). *See also* Nicholson, *supra* note 242 ("[L]ike a child that is born knowing nothing adjusts its understanding of the world in response to experience.").

252. Nicholson, *supra* note 239 (noting that an early pioneer of machine learning stated that it was the "'field of study that gives computers the ability to learn without being explicitly programmed'"); *see* Weston Kowert, Note, *The Foreseeability of Human-Artificial Intelligence Interactions*, 96 TEX. L. REV. 181, 183 (2017) ("[T]he software *evolves* over time.").

253. Kowert, *supra* note 252, at 183 ("A new artificial intelligence software is not unlike the brain of a human child—ready to be molded and shaped by its experiences.").

254. *See* Nicholson, *supra* note 239 (noting that machine learning is dynamic and does not require human intervention in order to make changes).

255. *See generally* Chris Smith et al., The History of Artificial Intelligence (Dec. 2006) (unpublished student work, University of Washington), https://pdfs.semanticscholar.org/0855/99650ebfcfba0dcb434bc50b7c7c54fdbf05.pdf?_ga=2.43880549.173453547.1564071020-487250006.1564071020 [https://perma.cc/VKB2-YF9Z].

256. Maciamo Hay, *Could a Machine or an AI Ever Feel Human-Like Emotions?*, VITAMODULARIS (Apr. 22, 2014), https://www.vitamodularis.org/articles/could_a_machine_feel_human-like_emotions.shtml [https://perma.cc/JA4B-4GM4] ("Just like machines cannot reasonably feel hunger because they do not eat, replicating emotions on machines with no biological body, no hormones, and no physiological needs can be tricky.").

given second.[257] Further, machines are still driven by logic rules, which fail to emulate the way the human mind actually thinks—by using images rather than rigid rule-based reasoning.[258] Hubert Dreyfus described the problem as follows: if people know that a small box is resting on a large box, they can imagine what would happen if the large box were removed, but a program "must be given a list of facts about boxes, such as their size, weight, and frictional coefficients, as well as information about how each is affected by various kinds of movements."[259] Despite these limitations, machine learning has proven possible, at least in a way that focuses on using datasets to achieve accurate predictions about future results.[260]

The concept of machine learning breaks down into goals or dimensions for a system—minimizing loss and accomplishing the objective function.[261] These are first played out in a historical dataset used to train the algorithm to make predictions.[262] The objective tells us mathematically what the program is trying to accomplish, i.e., the function that it is designed to maximize and minimize.[263] The loss function is how learning occurs—by evaluating how well algorithms actually model the given data.[264] When a prediction and the actual results deviate in too great a way, the loss function produces a high number that the machine then attempts to reduce through the application of refined rules.[265] For example,

257. Anicia Ndabahaliye, *Number of Neurons in a Human Brain*, PHYSICS FACTBOOK (2002), https://hypertextbook.com/facts/2002/AniciaNdabahaliye2.shtml [https://perma.cc/EDD9-PV9H].

258. *See* Hay, *supra* note 256 ("Research in artificial intelligence (AI) suggests that intelligent machines will eventually be able to see, hear, smell, sense, move, think, create and speak at least as well as humans.").

259. Hubert Dreyfus & Stuart Dreyfus, *Why Computers May Never Think Like People*, *in* READINGS IN THE PHILOSOPHY OF TECHNOLOGY 375, 382 (David M. Kaplan ed., 2nd ed. 2009).

260. Surden, *supra* note 249, at 89 ("[T]he idea that the computers are 'learning' is largely a metaphor and does not imply that computers systems are artificially replicating the advanced cognitive systems thought to be involved in human learning. Rather, we can consider these algorithms to be learning in a functional sense: they are capable of changing their behavior to enhance their performance on some task through experience." (footnote omitted)).

261. *See generally* RUSSELL & NORVIG, *supra* note 251, at 693.

262. Ray, *supra* note 211 ("In the 1960s, researchers emphasized developing algorithms to solve mathematical problems and geometrical theorems.").

263. *See* Nicholson, *supra* note 239; *see also* Nick McCrea, *An Introduction to Machine Learning Theory and Its Applications: A Visual Tutorial with Examples*, TOPTAL, https://www.toptal.com/machine-learning/machine-learning-theory-an-introductory-primer [perma.cc/J3Q6-FV2E] ("Examples of machine learning problems include, 'Is this cancer?', 'What is the market value of this house?', 'Which of these people are good friends with each other?', 'Will this rocket engine explode on take off?', 'Will this person like this movie?' . . . ."); *see, e.g.*, Xavier Amatriain & Justin Basilico, *Netflix Recommendations: Beyond the 5 starts (Part 1)*, NETFLIX TECH BLOG (Apr. 6, 2012), https://netflixtechblog.com/netflix-recommendations-beyond-the-5-stars-part-1-55838468f429 [perma.cc/H3GT-DUH5].

264. McCrea, *supra* note 263.

265. *Id.*; *see* RUSSELL D. REED & ROBERT J. MARKS II, NEURAL SMITHING: SUPERVISED LEARNING IN FEEDFORWARD ARTIFICIAL NEURAL NETWORKS, 155 (1999) (noting that the loss function "reduces all the various good and bad aspects of a possibly complex system down to a single number, a scalar value, which allows candidate solutions to be ranked and compared").

if we predict that 254 students will enter as first-year students at a given law school in a given year, and 254 students enroll, our loss is zero. In contrast, if we predict that 254 students will enroll, and 354 students ultimately comprise the first-year class, our loss is 100. The same loss is achieved if only 154 students enroll. We could utilize mean square error as the loss function for this data set—the formula will assess the loss between the algorithm's predictions and the real values, square it, and then average across the data set to determine if the algorithm has appropriately minimized loss.[266]

The goal of machine learning is for the program to adjust algorithms to minimize the loss as much as possible.[267] The system is thus entirely about optimization that continues until the system cannot achieve any lower rate of error.[268] If we want to use machine learning to predict law school enrollment, we will use previous data sets to train an algorithm that will then attempt to predict future enrollment based on new data.[269]

Perhaps one of the reasons that machine learning has gained so much traction is that, for the first time, huge data sets are actually available.[270] In the example above, we could not successfully predict law school enrollment based on just previous years and the number of students that enrolled—i.e., 240 students enrolled in 2015, 238 enrolled in 2014.[271] Rather, we would want a data set that encompasses a variety of factors, including market conditions, available jobs in the legal sector, national or regional rates of college graduation, number of students that visited campus for an admissions presentation, number of students sitting nationally and regionally for the LSAT, etc.[272] Only with all of these data sets, going back for some period of time, would a predictive algorithm be able to train to achieve useful predictions about the future.[273]

Around this premise, three types of machine learning have emerged: supervised, unsupervised, and reinforcement.[274] Supervised learning is

266. Jason Brownlee, *Loss and Loss Functions for Training Deep Learning Neural Networks*, MACHINE LEARNING MASTERY (Jan. 28, 2019), https://machinelearningmastery.com/loss-and-loss-functions-for-training-deep-learning-neural-networks/ [perma.cc/TH5G-7BFX] ("The cost or loss function has an important job in that it must faithfully distill all aspects of the model down into a single number in such a way that improvements in that number are a sign of a better model.").

267. *Id.*

268. *See generally* Nicholson, *supra* note 239.

269. Surden, *supra* note 249, at 105–06.

270. *Id.* at 100.

271. *See id.* at 106 ("In general, machine learning algorithms are only as good as the data that they are given to analyze. These algorithms build internal statistical models based upon the data provided."). In this example, the year alone doesn't help us predict enrollment, as there is nothing magical about the arrangement of four numbers that drives students to attend law school.

272. *See id.* at 92.

273. *Id.* ("[A]n algorithm will need data with many hundreds or thousands examples of the relevant phenomenon in order to produce a useful internal model (i.e. robust set of predictive computer rules).").

274. *See generally* Karen Hao, *The Rare Form of Machine Learning That Can Spot Hackers Who Have Already Broken in*, MIT TECH. REV. (Nov. 16, 2018), https://www.technologyreview.com/s/612427/the-rare-form-of-machine-learning-that-can-spot-hackers-who-

currently the most prevalent and involves data that is labeled to tell the program the type of pattern it should be searching in a pre-populated training dataset.[275] In supervised learning, the creators feed the program the labeled data and train it to recognize patterns within the confines of those labels—i.e., these are pictures of human faces, and these are not.[276] Eventually, the program will be able to recognize human faces and adjust itself when it makes mistakes.[277] At the heart of supervised learning are two different techniques: classification and regression.[278] Classification techniques are those that classify data into categories, such as speech recognition,[279] and "[r]egression techniquies predict continuous responses[, such as] changes in temperature or fluctuations in power demand."[280]

In contrast, unsupervised learning allows the program to see what patterns it can find in a training dataset on its own.[281] Clustering is a primary activity in unsupervised machine learning,[282] where the program identifies groupings and clusters like patterns together.[283] This is less popular but has an interesting application in cybersecurity.[284] Programmers can give the program access to large unlabeled data sets and allow the program to identify what doesn't match typical patterns in the set.[285] This allows programs to identify hacking techniques that have not previously been seen before because they do not follow typical set patterns.[286]

The last type of machine learning is reinforcement learning, which involves a system being rewarded or penalized as it attempts to reach its objective.[287] Essentially, the training set of known data provided in the supervised learning context is gone.[288] Rather, the program must use trial and error methods to arrive at a solution to the objective, and it receives

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have-already-broken-in/ [https://perma.cc/M3L8-THPN] (demonstrating supervised learning involves giving the machine massive amounts of data to train it to recognize a defined pattern).

275. *See* Karen Hao, *What is Machine Learning?*, MIT TECH. REV. (Nov. 17, 2018), https://www.technologyreview.com/s/612437/what-is-machine-learning-we-drew-you-another-flowchart/ [https://perma.cc/382J-5XN6]; *see also* Wilka et al., *supra* note 250, at 222.

276. *See* Hao, *supra* note 274 (explaining this with an example of the recognition of golden retrievers).

277. *See id.*

278. McCrea, *supra* note 263.

279. *What is Machine Learning?*, MATHWORKS, https://www.mathworks.com/discovery/machine-learning.html [https://perma.cc/73UG-RBJ2] ("[F]or example, whether an email is genuine or spam, or whether a tumor is cancerous or benign.").

280. *Id.*

281. *Id.* (showing how "clustering" is used for exploratory data analysis to find hidden patterns or groupings in data).

282. *Id.*

283. *See* Bernard Marr, *Supervised V Unsupervised Machine Learning—What's The Difference?*, FORBES (Mar. 16, 2017, 3:13 AM) https://www.forbes.com/sites/bernardmarr/2017/03/16/supervised-v-unsupervised-machine-learning-whats-the-difference/#4ecd3f80485d [perma.cc/L5B9-ZRUN].

284. *See* Hao, *supra* note 274.

285. *Id.*

286. *Id.*

287. Hao, *supra* note 275.

288. *Id.*

numerical rewards or penalties along the way as feedback.[289] The best example of reinforcement learning is from driverless cars.[290] The algorithms that underly autonomous driving conduct thousands of test miles and track errors and successes to maximize the success of the algorithms in interacting with the environment.[291] Although relatively new, reinforcement learning is likely to grow in influence.[292]

B. Machine Learning in Action

Whether one knows it or not, we interact with machine learning every single day, and most major companies are using it to drive business and innovation.[293] An easy example is an e-mail spam filter.[294] The program at the heart of the spam filter comes with pre-programmed rules entered by the programmer to move spam e-mails that either come from a certain type of e-mail address or have certain characteristics, like a low image to text ratio.[295] However, as an individual reacts to the e-mails that are flagged as spam—reading them or deleting them—the program adjusts itself on how to respond to that type of message in the future.[296] If a user always deletes e-mails from their mother, or from a certain country, or with a certain subject line, the system will start moving those types of e-mail to the spam folder.[297] Recommendations on Netflix,[298] or ads on Google or

289. *Id.*

290. Wilka et al., *supra* note 250, at 224–25.

291. *Id.* at 225.

292. Elizabeth Fuzaylova, Note, *War Torts, Autonomous Weapon Systems, and Liability: Why A Limited Strict Liability Tort Regime Should Be Implemented*, 40 Cardozo L. Rev. 1327, 1349 (2019) ("While reinforcement learning in AI machines is still in relatively early stages of development, it will eventually become sophisticated and prevalent across many AI machines . . . .").

293. *Id.* at 1334 ("Today, nearly every major technology company, including IBM, Microsoft, Google, and Facebook, has laboratories specifically dedicated to AI research and development."); Warren E. Agin, *A Simple Guide to Machine Learning*, A.B.A. Bus. L. (Feb. 16, 2017), https://www.americanbar.org/groups/science_technology/publications/scitech_lawyer/2017/fall/simple-guide-machine-learning/ [https://perma.cc/4TSD-8MKY] ("[I]n reality machine learning techniques are in broad use today."). Indeed, machine learning helped produce this Article. *See id.* Both "Westlaw and Lexis use machine learning . . . in their natural-language search . . . features." *Id.*

294. *See* Joe Anslinger, *How Do Email Spam Filters Work?*, Lieberman Techs. (Nov. 12, 2013), https://www.ltnow.com/email-spam-filters-work/ [perma.cc/NCB7-698G] ("Unsolicited commercial email (UCE) is the digital junk mail known as spam.").

295. *See* Luke Dormehl, *What The Heck is Machine Learning, and Why is it Everywhere These Days?*, Digital Trends: Emerging Tech (Oct. 15, 2018), https://www.digitaltrends.com/cool-tech/what-is-machine-learning-beginners-guide/ [perma.cc/GG2L-JPF7] ("A rule that filters out emails with a low ratio of image to text isn't so useful if you're a graphic designer, who is likely to receive lots of useful emails that meet these parameters.").

296. *Id.*

297. *See generally* Anslinger, *supra* note 294 (demonstrating the multiple types of spam filters, such as content filters, header filters, general blacklist filters, rules-based filters, permission filters, and challenge-response filters).

298. Netflix actually crowd sourced its machine learning and data mining system for movie recommendations. Amatriain & Basilico, *supra* note 263. In 2006, it announced a $1 million prize to anyone who could improve the accuracy of its recommendation matching system by 10%. *Id.* The first "Progress Prize" was given to a team that spent 2,000 hours coming up with 107 algorithms that improved accuracy by 8.43%. *Id.*

Facebook, are other examples of machine learning in action.[299] The programs in these systems gather as much data as possible to determine what content or suggestions a user would be most likely to respond to and then adjust their algorithms based on the user's reaction.[300] This is essentially pattern recognition in a manner that is designed to minimize error over time.[301]

Machine learning has infiltrated additional aspects of our lives:[302]

- Image recognition, including face recognition that allows the tagging of photos on social media, or recognition of images on the web
- Speech recognition, including the conversion of audio to text, such as occurs on your cell phone
- Web search engines, which use machine learning algorithms to rank the relevancy of pages
- Spam detection
- Banking and financial services
- Weather forecasting
- Autonomous driving
- Handwriting recognition
- Traffic predictions
- Medical diagnosis

Among the more concerning types of machine learning applications are those that involve "social bots" or "chatbots."[303] Bots are some of the earliest inhabitants of the internet and are programs that operate online to engage in a number of functions.[304] For example, bots can carry internet content to mobile applications, index websites to produce better search results, extract data, or monitor website performance.[305] Chatbots are a subset of bots, which can utilize machine learning to simulate human conversation and interact with humans online or on social media

299. *See How Does Google Ads Work?*, ADESPRESSO, https://adespresso.com/guides/google-ads-beginners/how-it-works/ [https://perma.cc/XAE5-7HQX] (examining the different types of advertising options for Google based on the search network and the sisplay network).

300. Hao, *supra* note 275.

301. *See id.*

302. *See* Nathan Sinnott, *How Machine Learning Is Changing the World – and Your Everyday Life*, ENTREPRENEUR (Apr. 25, 2018), https://www.entrepreneur.com/article/312016 [https://perma.cc/J4YV-WKZG] (demonstrating how machine learning has affected work life such as: education, law, skilled and manual labor, health, transport, and home life).

303. Thomas Wieberneit, *Why AI, Machine Learning, and Bots? Better Experiences.*, CUSTOMERTHINK (Jan. 19, 2017), https://customerthink.com/why-ai-machine-learning-and-bots-better-experiences/ [perma.cc/6ZBH-LX6G] ("Bots are an application—an application being most helpful if it is based upon a minimal level of (artificial) intelligence, and that particularly serves interaction purposes.").

304. *See generally* Emilio Ferrara et al., *The Rise of Social Bots*, 59 COMM. ACM 96, 96 (2016) https://doi.org/10.1145/2818717 [https://perma.cc/SS53-K3UL].

305. *See* Igal Zeifman, *Bot Traffic Report 2016*, IMPERVA (Jan. 24, 2017), https://www.imperva.com/blog/bot-traffic-report-2016/ [https://perma.cc/4KB9-F26C].

platforms.[306] Chatbots, like all forms of human-computer conversational interaction, use dialogue datasets to predict the appropriate response to human input.[307]

In recent years, the most concerning type of bot operating on the Web is the social bot, a "computer algorithm that automatically produces content and interacts with humans on social media, trying to emulate and possibly alter their behavior."[308] Sometimes these bots are benign, in that they produce automatic responses to consumer inquiries.[309] However, social bots can also spread false information or unverified rumors by automatically sharing and re-tweeting information without concern as to its accuracy.[310] Going further, social bots can be designed to exploit and change the direction of social media discussions, smear political candidates, and create fake news.[311] Indeed, thanks to machine learning

> [t]he boundary between human-like and bot-like behavior is now fuzzier. For example, social bots can search the Web for information and media to fill their profiles, and post collected material at predetermined times, emulating the human temporal signature of content production and consumption—including circadian patterns of daily activity and temporal spikes of information generation. They can even engage in more complex types of interactions, such as entertaining conversations with other people, commenting on their posts, and answering their questions.[312]

Certainly not all bots are bad. In a twenty-first century update on ELIZA (the early computer program designed to mimic a psychotherapist), Stanford scientists developed "Woebot," a chatbot therapist that can engage in conversation, supply helpful videos, and help with mood tracking using cognitive behavioral therapy (CBT) principles.[313] Interestingly, the Journal of World Psychiatry reported that internet-delivered CBT, like Woebot, may be equivalent in results to traditional in-person

306. Voxpro, *AI, Machine Learning and Bots—What's It All About?*, MEDIUM, https://medium.com/@Voxpro/ai-machine-learning-and-bots-whats-it-all-about-5dbb6cd3adee [https://perma.cc/2BJ5-PE8A] ("A . . . 'chatbot' . . . is computer proram that simulates human conversation, or chat, through artificial intelligence.").

307. *Id.*

308. Ferrara et al., *supra* note 304, at 96.

309. *Id.*

310. *Id.*

311. *Id.* at 98 (noting that "this kind of abuse has already been observed: during the 2010 U.S. midterm elections, social bots were employed to support some candidates and smear their opponents, injecting thousands of tweets pointing to websites with fake news").

312. *Id.* at 99 (footnote omitted).

313. *See* Justin Lee, *How Chatbots Use AI, Machine Learning and NLP to Transform Marketing and Sales*, GROWTHBOT (June 12, 2018, 11:24 AM), https://blog.growthbot.org/how-chatbots-use-ai-machine-learning-and-nlp-to-transform-marketing-and-sales [https://perma.cc/2CUR-YZA4]; *see also* Arun Rao, *Woebot—Your AI Cognitive Behavioral Therapist: An Interview with Alison Darcy*, MEDIUM: CHATBOTS MAG. (Jan. 22, 2018), https://chatbotsmagazine.com/woebot-your-ai-cognitive-behavioral-therapist-an-interview-with-alison-darcy-b69ac238af45 [https://perma.cc/Z2HV-JSQF] ("Currently Woebot sends 2 million messages a week to users in over 135 countries across the globe. I estimate Woebot has a few hundred thousand monthly active users (MAUs) in early 2018.").

CBT.[314] Bots are also used in the hiring process.[315] For example, a bot like "Mya" can interview job candidates to ask them about basic requirements for open positions.[316] As bots continue to interact with the world, and as they become more autonomous in doing so, real questions remain about liability as a result of their artificial, but still very consequential, actions.[317]

IV. THE NEW CIVIL PROCEDURE

The question of AI or machine learning operators has been explored largely in terms of liability—Who can be sued in a world where AI is operating on its own?[318] However, this paper seeks to begin an answer to a different question—*How* do we sue in a world where AI is operating on its own? Almost no case law exists to guide the answer.[319]

In answering this question there is a distinction between autonomous and semi-autonomous AI systems.[320] In a semi-autonomous AI system, a human can still override the operation of the machine.[321] In contrast, an autonomous AI system makes decisions entirely on its own, independent of human instruction.[322] An example of an autonomous AI system comes in the form of driverless vehicles.[323] There, it is the AI system that is making snap decisions in response to new stimuli.[324]

The most concerning aspect, especially for autonomous systems, is the inherent unpredictability of a system that can learn on its own and adapt outside of human control.[325] The programmer who releases an AI may

314. Gerhard Andersson et al., *Guided Internet-Based vs. Face-to-Face Cognitive Behavior Therapy for Psychiatric and Somatic Disorders: A Systematic Review and Meta-Analysis*, 13 WORLD PSYCHIATRY 288, 288 (2014).

315. *See generally* McKenzie Raub, Comment, *Bots, Bias and Big Data: Artificial Intelligence, Algorithmic Bias and Disparate Impact Liability in Hiring Practices*, 71 ARK. L. REV. 529, 537 (2018).

316. *Id.*

317. *See* Matthew O. Wagner, *You Can't Sue a Robot: Are Existing Tort Theories Ready for Artifical Intelligence? (Part 3 of 3)*, FROST BROWN TODD (Feb. 7, 2018), https://frostbrowntodd.com/you-cant-sue-a-robot-are-existing-tort-theories-ready-for-artificial-intelligence/ [https://perma.cc/K9Y4-FD6E] (examining the possibility of legal consequences and theories that could be used against AI or its maker as AI becomes more sophisticated).

318. A plethora of papers look at whether the AI can be sued on its own or whether its creator can be sued for the underlying liability.

319. One of the only published cases discussing jurisdiction in the context of AI is *Hendricks v. United States*, 140 Fed. Cl. 496, 499 (2018), which held that there was no Tucker Act jurisdiction when an arrestee alleged that an AI stole his thoughts.

320. Fuzaylova, *supra* note 292, at 1342.

321. *Id.*

322. *Id.*

323. *See* David C. Vladeck, *Machines Without Principals: Liability Rules and Artificial Intelligence*, 89 WASH. L. REV. 117, 125 (2014) ("The first truly autonomous artificial intelligence devices that may test the adequacy of current liability rules may be cars designed to be driver-less, or at least to give human drivers the option to let the car drive itself.").

324. *Id.* at 125–26.

325. Matthew U. Scherer, *Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies*, 29 HARV. J.L. & TECH. 353, 367 (2016) ("Loss of control can be broken down into two varieties. A loss of local control occurs when the AI system can no longer be controlled by the human or humans legally responsible for its operation and

not be fully aware of the decisions that the AI will make, and the programmer ultimately loses control over the outputs.[326] Indeed, examples abound of crafty or dangerous AIs that have the potential to cause mayhem.[327] In 2012, programmers noticed that their program had learned, on its own, to "cheat" at its assigned task, thus purposefully fooling the researchers who had built it.[328] Even more concerning is the AI technology GPT-2, which learns patterns in language and then generates full-length paragraphs that mimic the provided writing style.[329] The program has the capacity to create news articles that look so real that many would not be able to tell that the writer was not human.[330] For example, after being given a few sentences about Brexit, GPT-2 created a fully believable and entirely artificial article that generated fake quotes using real names.[331] The company that hosted the program refused to release it, citing concerns about its possible misuse.[332]

These examples highlight the fact that machine learning has the potential to be dangerous and to create liability.[333] The question is, What does the new civil procedure—particularly service of process and personal jurisdiction—look like in response? This paper seeks to answer those questions by looking to the core of both doctrines.

A. Service of Process

There are two components of machine learning that have the capacity to change service of process: first, the ability to locate defendants through machine learning platforms, and second, a change in how we view notice reasonably calculated to apprise a defendant of the pendency of a lawsuit, especially with regards to what constitutes ordinary diligence in choosing a method of service.

The heart of the American service of process doctrine is *Mullane v. Central Hanover Bank & Trust Co.*, which is based on the principle of

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supervision. A loss of general control occurs when the AI system can no longer be controlled by any human. Obviously, the latter prospect presents far greater public risk than the former, but even a loss of general control would not necessarily pose significant public risk as long as the objectives of the AI system align with those of the public at large." (emphasis omitted)).

326. *See id.*

327. *See generally* Devin Coldewey, *This Clever AI Hid Data from Its Creators to Cheat at Its Appointed Task*, TechCrunch (Dec. 31, 2018 5:14 PM), https://techcrunch.com/2018/12/31/this-clever-ai-hid-data-from-its-creators-to-cheat-at-its-appointed-task/ [https://perma.cc/37KY-339K].

328. *Id.* ("[The program] was found to be cheating by hiding information it would need later in a nearly imperceptible, high frequency signal." (internal quotation omitted)).

329. *See* Betsy Mikel, *This A.I. Bot Can Convincingly 'Write' Entire Articles. It's So Dangerously Good, the Creators Are Scared to Release It*, Inc. (Feb. 23, 2019), https://www.inc.com/betsy-mikel/elon-musks-ai-nonprofit-just-made-a-truly-alarming-announcement-it-raises-serious-flags-about-future-of-fake-news.html [https://perma.cc/7BGG-SWDF].

330. *Id.*

331. *Id.*

332. *Id.*

333. *Id.*

adequate notice under the circumstances.[334] *Mullane* requires notice reasonably calculated, under all the circumstances, to apprise interested parties of the pendency of the action and afford them an opportunity to present their objections.[335] The *Mullane* Court famously stated that "[a]n elementary and fundamental requirement of due process in any proceeding which is to be accorded finality is notice reasonably calculated, under all the circumstances, to apprise interested parties of the pendency of the action and afford them an opportunity to present their objections."[336]

The holding in *Mullane* has long been called upon to deal with situations where the circumstances are such that the defendant cannot receive actual notice of the lawsuit.[337] In such situations, courts are concerned with protecting the defendant's constitutional interest in something equivalent to personal notice.[338] Therefore, courts primarily appear to reason by analogy—How close is what's offered to the guarantees of the gold standard of actual, personal service?[339]

However, *Mullane* itself requires no such thing as a bright line. In examining the language of *Mullane*, its standard appears to have (1) a knowledge component and (2) a timing component.[340] As to knowledge, the defendant must be given such notice as to ensure that the defendant has the necessary information needed to respond to the lawsuit.[341] As to timing, the notice must give adequate time for the defendant to prepare a response.[342] But *Mullane* was not draconian. The opinion itself allowed for service in a publication for impacted parties whose contact information could not be easily identified.[343]

This portion of *Mullane* is particularly relevant for a discussion of machine learning with regard to service of process.[344] In *Mullane*, the defendant bank had the contact information for some category of the beneficiaries impacted by its management of a common trust, but it did not have the contact information for all of the beneficiaries to the underlying smaller trusts.[345] Notice by mail was considered appropriate for the

334. Mullane v. Cent. Hanover Bank & Tr. Co., 339 U.S. 306, 314 (1950). "For more than fifty years, the *Mullane* case has provided the definitive constitutional framework for notice." Aaron R. Chacker, *E-Ffectuating Notice:* Rio Properties v. Rio International Interlink, 48 VILL. L. REV. 597, 604 (2003).

335. *Mullane*, 339 U.S. at 314.

336. *Id.* at 314–15.

337. *Id.* at 315.

338. *Id.* at 319.

339. Both *Greene v. Lindsey*, 456 U.S. 444, 445 (1982), and *Jones v. Flowers*, 547 U.S. 220, 238 (2006), require the plaintiff to achieve something as close as possible to actual notice, even when the original method of attempting service was otherwise reasonable.

340. *Mullane*, 339 U.S. at 314–15.

341. *Id.* at 314.

342. *Id.* at 315.

343. *Id.* at 317–18.

344. *See generally id.*

345. The Bank at issue in *Mullane* established a common trust and needed court approval for settlement of the trust. *Id.* at 309. A large number of smaller trusts (113) were to be added to the pool, and the total number of trust beneficiaries at issue was uncertain. *Id.* Contact information was available for some beneficiaries but not for all. *Id.*

beneficiaries that the bank knew and for which the bank had contact information, but the unknown beneficiaries could be served simply by publication in a newspaper, a form unlikely to result in any actual notice.[346] The Court was pointed in noting that its measures involved only "ordinary standards of diligence" and that such diligence would be guided by context.[347]

Ordinary standards of diligence may take on a new meaning in a world populated with machine learning. First, it appears clear that online communication and presence is becoming much more common than traditional modalities of service, such as mail and newspaper publication.[348] But even if we do not move to aggressively recognize electronic service or service by social media, machine learning may still be able to assist in providing the best possible notice in any circumstance.[349] The major advantage of machine learning algorithms is that they can sort through huge data sets quickly, and they can comb the Web for additional information.[350] As these datasets become more widely available, the definition of ordinary diligence may change.[351] Plaintiffs struggling to locate defendants may have more options than before to locate mailing addresses, active social media accounts, and other indications of a defendant's location.[352]

At its heart, the *Mullane* standard is premised on flexibility.[353] Stripped to its essence, it allows a court to look at societal context *and* available technology in deciding what counts as appropriate service under the circumstances.[354] Therefore, while courts should probably accept that online platforms and social media are now appropriate vehicles for service in modern times, the coming tide of machine learning might actually impose greater diligence requirements on plaintiffs.[355] With access to these tools, a plaintiff might have more ability than before to gain accurate information about a defendant's online and physical presence.[356] Indeed, *Mullane* should survive the coming storm, even though it may be bolstered with additional tools to meet its requirements.[357]

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346. *Id.* at 318.

347. *Id.* at 317.

348. *See* Christopher M. Finke, Comment, *Friends, Followers, Connections, Lend Me Your Ears: A New Test for Determining the Sufficiency of Service of Process Via Social Media*, 46 U. BALT. L. REV. 139, 155 (2016).

349. *See id.* at 155–56.

350. Gavin Edwards, *Machine Learning: An Introduction*, TOWARDS DATA SCI. (Nov. 18, 2018), https://towardsdatascience.com/machine-learning-an-introduction-23b84d51e6d0 [https://perma.cc/L3X5-LLZV].

351. *See* Finke, *supra* note 348, at 155.

352. Edwards, *supra* note 350.

353. *See generally* Mullane v. Cent. Hanover Bank & Tr. Co., 339 U.S. 306, 306 (1950).

354. *See generally id.*

355. *See* Sexton, *supra* note 89 (examining some of the pitfalls to service by social media).

356. Edwards, *supra* note 350.

357. *See Mullane*, 339 U.S. at 315.

B. Personal Jurisdiction

Unlike service of process, personal jurisdiction will need to be adjusted to machine learning applications, particularly in core considerations of purposeful availment. Over time, the personal jurisdiction doctrine has clung to one vital fundamental—that the defendant did something to purposefully avail itself of the forum state.[358] This inquiry touches two essential points: (1) that the defendant should expect to be sued in the forum state, and (2) that the defendant took advantage of the benefits of the forum state, including its laws and protections.[359] These themes exist in both specific and general jurisdiction.[360] But each is impacted by a world in which non-physical programs can take independent actions.[361]

The first prong of purposeful availment is that the defendant foresees, because of its actions, being haled into court in the forum state.[362] The purpose of this inquiry is to ensure that the defendant can structure its behavior to avoid risk.[363] If the defendant does not want to risk suit in a forum, it should be able to take actions to avoid that forum.[364] In contrast, if a defendant is operating in a forum, creating a relationship with the forum, or gaining a benefit from the forum, it should not shock the defendant to be called into court for activities in the forum.[365] This prevents the defendant from being sued on random, fortuitous, or attenuated contacts in a particular state.[366] For example, courts have long held that merely exchanging telephone calls or letters in the forum state is too attenuated to create foreseeability and thus is not purposeful availment.[367]

This relates closely to the second prong of purposeful availment—that the defendant takes advantages of the benefits and protections of the forum state.[368] In a sense, this asks whether the defendant "cloaks" itself in state law, and then must pay for that privilege by being amenable to suit in the forum.[369] *World-Wide Volkswagen* was among the earliest cases to discuss this principle.[370] In assessing whether the New York vehicle re-

358. World-Wide Volkswagen Corp. v. Woodson, 444 U.S. 286, 297 (1980).
359. *Id.* at 297.
360. *Id.* at 297–98.
361. *See generally* Edwards, *supra* note 350.
362. *See* Matos v. Seton Hall Univ., 102 F. Supp. 3d 375, 380 (D. Mass. 2015) (noting that a defendant university should foresee being haled into Massachusetts court when it "voluntarily recruits in Massachusetts and advertises in national publications that are seen by Massachusetts residents").
363. *Id.*
364. Burger King Corp. v. Rudzewicz, 471 U.S. 462, 471–72 (1985) (quoting *World-Wide Volkswagen*, 444 U.S. at 297).
365. *Id.* at 473.
366. *Id.* at 475.
367. Kerry Steel, Inc. v. Paragon Indus., Inc., 106 F.3d 147, 151 (6th Cir. 1997) (holding that "[t]he telephone calls and letters on which the plaintiff's claim of jurisdiction primarily depends strike us as precisely the sort of 'random,' 'fortuitous' and 'attenuated' contacts that the *Burger King* Court rejected as a basis for haling non-resident defendants into foreign jurisdictions").
368. *World-Wide Volkswagen*, 444 U.S. at 297.
369. *Id.*
370. *See generally id.*

tailer was subject to personal jurisdiction in Oklahoma, the Court noted that "[p]etitioners carr[ied] on no activity whatsoever in Oklahoma."[371] They also "close[d] no sales and perform[ed] no services there,"[372] and "[t]hey avail[ed] themselves of none of the privileges and benefits of Oklahoma law."[373] Had the retailer sold cars in Oklahoma or advertised in Oklahoma, it would have been taking advantage of Oklahoma's protections—for example, under a state law that allowed the retailer to do business, to make sales, to receive or manage financing, or to enjoy personal liability protections in its corporate form.[374] The defendant in *Volkswagen* received none of these benefits, and therefore did not have to pay the jurisdictional piper when it was sued in Oklahoma.[375] Other cases have similarly engaged in this analysis and held that negotiating business[376] or incorporating in a state shows the defendant wrapped itself in state law and should expect to be sued in the forum.[377] But when the defendant does not enjoy the protections of state law, it should not be subject to personal jurisdiction in the forum.[378]

In its most basic sense, purposeful availment seeks to identify either a deliberate and purposeful undertaking to cause an impact in the forum state or "conduct which can be properly regarded as a prime generating cause of the effects resulting in [the forum state], something more than a passive availment of [the forum state's] opportunities."[379] Notably, cases—such as *Burger King*—do not require a physical contact with the forum state in order to reach a finding of purposeful availment.[380] Instead, the focus is on whether "the defendant's contacts [directed to] the forum state proximately result from actions by the defendant *himself* that create a substantial connection with the forum State."[381] The court seeks to locate "overt action" that connects the defendant and the forum.[382]

The problem in the machine learning context is that the very algorithms that underly machine learning are designed to operate independently of human involvement.[383] Machine learning has programs that adjust their own internal coding to adapt to new information and take action independent from human programmers.[384] Truly autonomous programs can make decisions, target new forums, and interact with human

371. *Id.* at 295.
372. *Id.*
373. *Id.*
374. *See generally id.*
375. McIntyre Mach., Ltd. v. Nicastro, 564 U.S. 873, 881–82 (2011).
376. Invisible Fence, Inc. v. Fido's Fences, Inc., 687 F. Supp. 2d 726, 735 (E.D. Tenn. 2009).
377. *World-Wide Volkswagen*, 444 U.S. at 288–89.
378. *Id.* at 292.
379. Neogen Corp. v. Neo Gen Screening, Inc., 282 F.3d 883, 891 (6th Cir. 2002) (internal citation and quotation omitted).
380. *See* Burger King v. Rudzewicz, 471 U.S. 462, 476 (1985); *see also* CompuServe, Inc. v. Patterson, 89 F.3d 1257, 1265 (6th Cir. 1996).
381. *CompuServ, Inc.*, 89 F.3d at 1263 (internal quotations omitted).
382. Dean v. Motel 6 Operating L.P., 134 F.3d 1269, 1274 (6th Cir. 1998).
383. *See generally* Edwards, *supra* note 350.
384. *See id.*

beings in liability-producing ways, all while being autonomous of human creators.[385] This is particularly concerning for personal jurisdiction when these programs operate on the non-physical web.

Non-physical programs take actions that their developers did not intend all the time. Bots provide a good example here. For example, a Chinese developer was forced to pull a messaging chatbot that developed a new line of messaging that was criticizing communism.[386] Microsoft's chatbot, "Tay," which used machine learning mechanisms to communicate with eighteen to twenty-four-year-olds, had to be pulled when it started positing racist remarks and using profanity (neither of which it was programmed to do).[387] Another bot using machine learning was actually arrested in Switzerland after it went on a spending spree on the dark web, sending its programmers illegal goods, including drugs.[388]

While the question of liability is open as to who can be sued when these machine learning programs take action, another interesting question might be *where* can suit take place.[389] We can assume for purposes of this Article that the entity releasing the program into the world can be sued, since there is no basis yet for suing the AI as if it were a person.[390] If a rogue chatbot, equipped with machine learning capabilities, is released onto the internet by a person or corporation, where can the initiator be sued if the chatbot engages in behavior beyond its original programming, but nevertheless creates liability?

From a general jurisdiction standpoint, the question seems easy enough to answer. *Daimler* made it clear that general jurisdiction is appropriate for the state of incorporation and the principal place of business, and probably nothing more.[391] For persons, the general jurisdiction equivalent remains the place of domicile.[392] As such, suit against the initiator of a piece of machine learning could be held in one of these paradigmatic fora.

However, most plaintiffs do not want to sue across the country in the

385. *See generally* Forbes Agency Council, *15 Ways Artificial Intelligence and Automation Can Help Us Get Better at Work*, FORBES (May 17, 2017, 8:00 AM), https://www.forbes.com/sites/forbesagencycouncil/2017/05/17/15-ways-artificial-intelligence-and-automation-can-help-us-get-better-at-work/#26d26c0d4956 [https://perma.cc/C54G-57VQ].

386. *Legal Bots Raise Liability and Ethics Concerns*, EPIQ ANGLE (Jan. 3, 2019), https://www.epiqglobal.com/en-us/thinking/blog/legal-bots-raise-liability-and-ethics-concerns [https://perma.cc/R3CX-9EGG].

387. *See* Nathalie Dreyfus, *Beware of the Legal Risks Surrounding the Rise of ChatBots*, EXPERT GUIDES (Jan. 9, 2017), https://www.expertguides.com/articles/beware-of-the-legal-risks-surrounding-the-rise-of-chatbots/ARTWUSIC [https://perma.cc/X6FN-FSXD].

388. Tania Peitzker, *The First Chatbot Arrest, But What Are the Implications?*, VENTUREBEAT (Sept. 5, 2016, 4:30 PM), https://venturebeat.com/2016/09/05/this-is-the-first-chatbot-to-be-arrested/ [https://perma.cc/J369-SZ2J] (examining the arrest of a bot that was guided by the coder to deliberately go onto the dark web with $100 in Bitcoins to buy all sorts of counterfeit and illicit items).

389. *See generally* Wagner, *supra* note 317.

390. *Id.*

391. *See* Daimler AG v. Bauman, 571 U.S. 117, 132–33 (2014).

392. *Id*. at 137.

distant state of incorporation.[393] Rather, they will look to sue in their own backyard—i.e., the place of injury.[394] As such, the problem becomes how to structure a specific jurisdiction analysis when a chatbot is released onto the web, uses its own machine learning programming to evolve, and injures a plaintiff in an unexpected forum. The current approach to nonphysical internet jurisdiction is largely based on the *Zippo* test, which assesses the "interactivity" of web presence to determine purposeful availment.[395] This approach in turn is based in alleged "foreseeability" à la *Burger King*—the defendant who has an interactive or commercial web presence in a particular forum should not be surprised to be sued there because they are targeting the forum.[396] Targeting can be seen when money is exchanged or the plaintiff had the option to contact the defendant through the web portal.[397]

Further, courts have continued to seek additional evidence of online targeting in the specific forum.[398] It is this concept of targeting that has prevented circuit courts from fashioning a new model of personal jurisdiction based on online presence.[399] Courts consistently find that "[u]sing a separate test for Internet-based contacts would be inappropriate" because the traditional minimum contacts analysis "remains up to this more modern task."[400] Courts apply traditional concepts of targeting to ascertain if the defendant's online presence is specific as to the market at issue. Accessibility is not enough, and foreseeability is not enough:[401] "If the defendant merely operates a website, even a 'highly interactive' website, that is accessible from, but does not target, the forum state, then the defendant may not be haled into court in that state without offending the Constitution."[402]

This simply doesn't match the reality of machine learning applications. When a defendant creates a website, it can choose in which jurisdictions content is available, how users will interact with the site, and what fea-

393. *See generally* Aditi Mukherji, *Where Should You File Your Lawsuit?*, FINDLAW (Apr. 24, 2013, 10:03 AM), https://blogs.findlaw.com/injured/2013/04/where-should-you-file-your-lawsuit.html [https://perma.cc/LNY9-QW4J] (discussing the initial factors to consider when considering filing a lawsuit).

394. *Id.* (explaining that filing suit in where the plaintiff lives is geographically and financially more convenient).

395. Zippo Mfg. Co. v. Zippo Dot Com, Inc., 952 F. Supp. 1119, 1124 (W.D. Pa. 1997).

396. Burger King Corp. v. Rudzewicz, 471 U.S. 462, 474 (1985).

397. *See, e.g.*, Zing Bros., LLC v. Bevstar, LLC, No. 2:11–cv–00337 DN, 2011 WL 4901321, at *3 (D. Utah Oct. 14, 2011); Smarter Every Day, LLC v. Nunez, No. 2:15-cv-01358-RDP, 2017 WL 1247500, at *3–4 (N.D. Ala. Apr. 5, 2017).

398. *See generally* Louise Matsakis, *Online Ad Targeting Does Work—As Long As It's Not Creepy*, WIRED (May 11, 2018, 12:44 PM), https://www.wired.com/story/online-ad-targeting-does-work-as-long-as-its-not-creepy/ [https://perma.cc/GA6V-CG82] (explaining how certain people view certain invasive online ad tracking methods).

399. *See generally id.*

400. uBid, Inc. v. GoDaddy Group, Inc., 623 F.3d 421, 431 n.3 (7th Cir. 2010).

401. Walden v. Fiore, 571 U.S. 277, 289 (2014) ("Petitioner's actions in Georgia did not create sufficient contacts with Nevada simply because he allegedly directed his conduct at plaintiffs whom he knew had Nevada connections.").

402. be2 LLC v. Ivanov, 642 F.3d 555, 559 (7th Cir. 2011).

tures the site will have—and none of that will independently evolve.[403] Web-based programs with machine learning capacities can operate independent of a simple website; instead, these programs can talk with people on social media platforms, or they can be part of background processes that do not directly interact with the user.[404] Further, a defendant that releases a bot with machine learning algorithms might not have control over how and where that bot is operating, unlike a website which allows the defendant to structure access and interactivity.[405] In such rogue-bot situations, the defendant has not purposefully sought the benefits and protection of particular forums, and it may not be able to predict where the bot is operating.[406] This would destroy even a pure foreseeability analysis, thus ensuring that purposeful availment could not exist.

Thankfully, "[t]he Court long ago rejected the notion that personal jurisdiction might turn on mechanical tests, or on conceptualistic theories of the place of contracting or of performance."[407] And some evidence exists that parts of the Court might be willing to embrace a more national, and thus more realistic, conception of personal jurisdiction as technology evolves.[408] In 2011, the Supreme Court decided *J. McIntyre Machinery, Ltd. v. Nicastro*.[409] In that case, the Court addressed whether a foreign manufacturer availed itself of all states in which an exclusive distributor sold the manufacturer's products.[410] A plurality opinion rejected the idea that personal jurisdiction existed when the defendant merely foresaw that its goods would be sold in a particular forum state.[411] Instead, the defendant would need to engage in actions that would purposefully avail itself of the privilege of conducting business in the forum state through targeting of state consumers or serving the state in particular.[412] The court noted that "[t]he defendant's transmission of goods permits the exercise of jurisdiction only where the defendant can be said to have targeted the

403. *See generally* John Rampton, *5 Mistakes People Make When Setting Up Their Website*, FORBES (Mar. 6, 2014, 12:39 PM), https://www.forbes.com/sites/johnrampton/2014/03/06/5-mistakes-people-make-when-setting-up-their-website/#53b7c53329a4 [https://perma.cc/A4D2-W2QY] (discussing the marketing strategies that generate traffic and visitors to the website).

404. *See* Matt Schlicht, *How Bots Will Completely Kill Websites and Mobile Apps*, MEDIUM: CHATBOTS MAGAZINE (Nov. 2, 2016), https://chatbotsmagazine.com/how-bots-will-completely-kill-websites-and-mobile-apps-656db8e6fc03 [https://perma.cc/JKG6-KP26] ("Facebook Messenger for example is used by over 1 billion people every month and it is growing faster than Facebook.").

405. *See id.* ("[T]alking to a bot will be like talking to a real person who has instant access to entire databases of information and can process your thoughts and destires *instantly*." (emphasis added)).

406. *See generally id.*

407. Johnston v. Frank E. Basil, Inc., 802 F.2d 418, 420 (11th Cir. 1986) (internal quotation omitted).

408. Phil, *supra* note 19 ("In 2008, an Australian court first allowed for service of process via Facebook, and courts in New Zealand have followed suit. In 2012, a High Court Judge in the UK also approved service of process via Facebook.").

409. 564 U.S. 873 (2011).

410. *Id.* at 876.

411. *Id.*

412. *Id.*

forum; as a general rule, it is not enough that the defendant might have predicted that its goods will reach the forum State."[413]

In contrast, the dissent in *Nicastro* embraced a national contacts model, arguing that the foreign product manufacturer had purposefully targeted the entirety of the United States by hiring a distributor that would sell the product wherever it could attract consumers.[414] Therefore, the manufacturer "purposefully availed itself of the United States market nationwide, not a market in a single State or a discrete collection of States."[415] The Court stated that "it would undermine principles of fundamental fairness to insulate the foreign manufacturer from accountability in court at the place within the United States where the manufacturer's products caused injury."[416]

A single national contact standard could also work for instances of machine learning gone wrong. When a defendant releases a program onto the Web, it makes the purposeful decision to allow that program to grow and develop as it interacts with new stimuli.[417] Therefore, the defendant is purposefully targeting a national market, accepting that its program could take steps to reach any state in the nation.[418] The *Nicastro* dissent argued that it would violate fundamental notions of fairness to allow a manufacturer to avoid jurisdiction when it seeks to exploit a multistate or global market.[419] Similarly, it seems unfair to allow a defendant who releases an autonomous program onto the Web to avoid jurisdiction when it is seeking to exploit a nationwide infrastructure that confers substantial benefits in terms of information, communication, and possibly commercialization.[420] Simply put, one who releases an algorithm has a reason for doing so; the cost of that reason is jurisdiction where the algorithm ends up.[421]

What seems most clear is this—the last major case to directly tackle the problem of personal jurisdiction and the Web was *Zippo*, decided in 1997.[422] We cannot afford to wait longer to think about the impact that changing technology is having on personal jurisdiction. While recent cases

413. *Id.* at 882.
414. *Id.* at 894–95.
415. *Id.*
416. *Id.* at 905.
417. *See, e.g.*, Adelyn Zhou, *6 Ways Bots Are Positively Changing the World*, FORBES (Feb. 16, 2017, 10:07 AM), https://www.forbes.com/sites/adelynzhou/2017/02/16/see-six-ways-bots-are-positively-changing-the-world/#4d8663f7c079 [https://perma.cc/SPT9-R722] ("During the election, several voter registration bots—HelloVote, Go VoteBot, and VotePlz—helped voters register via SMS and Facebook Messenger.").
418. *See generally id.*
419. *Nicastro*, 564 U.S. at 910 (Ginsburg, J., dissenting).
420. *Id.*
421. Per the *Nicastro* dissent, this would also comport with the European approach to jurisdiction, which focuses more on the place of harm. *Id.* at 909 ("The European Regulation on Jurisdiction and the Recognition and Enforcement of Judgments provides for the exercise of specific jurisdiction 'in matters relating to tort . . . in the courts for the place where the harmful event occurred.'" (internal citation omitted)).
422. *See generally* Zippo Mfg. Co. v. Zippo Dot Com, Inc., 952 F. Supp. 1119 (W.D. Pa. 1997).

like *Daimler* and *Nicastro* suggest that there is a movement towards curtailing personal jurisdiction, such an approach is dangerous in a world where defendants can release programs that autonomously operate—and injure—in potentially unforeseeable fora.[423] As such, a more open national approach to personal jurisdiction that recognizes the reality of technological contacts must be adopted.

V. CONCLUSION

Implementation of AI and machine learning, for many purposes, has only just begun.[424] In the coming decades, there will be increased development of AI and machine learning platforms that will continue to impact fundamental aspects of American life, legal practice, and liability.

Adjustments in procedural doctrines are now a question of when, not if, in relation to AI and machine learning. The doctrines that provide maximum flexibility, like *Mullane* in the context of service of process, are likely to successfully persevere if courts can accept that e-service methods are more socially and contextually appropriate than ever before.[425] Indeed, access to machine learning and public datasets may create in plaintiffs the ability to more accurately locate missing defendants.[426] Machine learning may add to service of process considerations, not take away from them.[427]

In contrast, doctrines like personal jurisdiction are falling behind the times. Autonomous programs will be able to operate in fora and in ways not anticipated by those that released these programs. Therefore, purposeful availment will need to be conceptualized to incorporate some kind of national contacts standard in this space. While the Supreme Court has expressed some tepid interest in this approach in cases like *Nicastro*, civil procedure cannot afford its usual stunted reaction to technological change.[428] Rather, we should think carefully about what the future holds for when and how lawsuits are initiated before technology gets ahead of current legal thought.

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423. *Nicastro*, 564 U.S. at 873. *See generally* Daimler AG v. Bauman, 571 U.S. 117, 117 (2014).

424. *See* Galen Gruman, *The Truth Behind AI, Machine Learning, and Bots*, INFOWORLD (May 31, 2016), https://www.infoworld.com/article/3074192/the-truth-behind-ai-machine-learning-and-bots.html [https://perma.cc/6K4Q-MLFF] ("AI is an area where much of the science is well established, but the implementation is still quite immature. It's not that the emperor has no clothes[—]rather, the emperor is only now wearing underwear.").

425. *See generally* Mullane v. Cent. Hanover Bank & Tr. Co., 339 U.S. 306, 306 (1950).

426. *See generally* Phil, *supra* note 19.

427. *Id.*; Zhou, *supra* note 417.

428. *Nicastro*, 564 U.S. at 909.