

ALGORITHMS & FIDUCIARIES: EXISTING AND PROPOSED REGULATORY APPROACHES TO ARTIFICIALLY INTELLIGENT FINANCIAL PLANNERS

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ABSTRACT

Artificial intelligence is no longer solely in the realm of science fiction. Today, basic forms of machine learning algorithms are commonly used by a variety of companies. Also, advanced forms of machine learning are increasingly making their way into the consumer sphere and promise to optimize existing markets. For financial advising, machine learning algorithms promise to make advice available 24–7 and significantly reduce costs, thereby opening the market for financial advice to lower-income individuals. However, the use of machine learning algorithms also raises concerns. Among them, whether these machine learning algorithms can meet the existing fiduciary standard imposed on human financial advisers and how responsibility and liability should be partitioned when an autonomous algorithm falls short of the fiduciary standard and harms a client. After summarizing the applicable law regulating investment advisers and the current state of robo-advising, this Note evaluates whether robo-advisers can meet the fiduciary standard and proposes alternate liability schemes for dealing with increasingly sophisticated machine learning algorithms.

*We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956. . . . The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.*¹

INTRODUCTION

Imagine it is a Friday afternoon and, after reviewing her investment portfolio, Alex realizes she would like to make a couple of changes. She calls her financial adviser and gets sent straight to voicemail. She has a small account, and her adviser has multiple clients. It is 3:24 PM ET. The chances of any changes happening today are slim. Alex may like her financial adviser, but he is only human and may not always be available when needed. And as a small account holder, Alex may be a lower priority to her adviser than his high net worth clients or his family. The adviser may have a young family. And balancing the needs of high net worth clients, Alex, and small children may result in Alex falling lower on the totem pole of priority. It is likely that Alex will not hear back from her adviser until Monday—not a catastrophic delay, but an unnecessary one in a world where a tap of her smart watch can pay for dinner.

Enter robo-advisers. These services often use sophisticated machine learning algorithms to provide personalized investment advice and monitoring 24–7. Although the first iterations of robo-advisers did little more than provide suggested portfolio allocations,² today’s robo-advisers have become increasingly sophisticated. They use algorithms to construct and manage portfolios to “satisfy pre-defined investment strategies” while a human investment adviser merely oversees those algorithms.³ Additionally, robo-advisers generally offer lower rates than their human alternatives, possibly encouraging lower-income investors to enter the market and

1. John McCarthy, Marvin L. Minsky, Nathaniel Rochester & Claude E. Shannon, *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence*, AI MAG., Winter 2006, at 12, 12 (reproducing the proposal of Dartmouth researchers drafted on August 31, 1955).

2. See *The Expansion of Robo-Advisory in Wealth Management*, DELOITTE 2–4 (Aug. 2016), <https://www2.deloitte.com/content/dam/Deloitte/de/Documents/financial-services/Deloitte-Robo-safe.pdf> [<https://perma.cc/49S3-52Y2>] (providing a breakdown of the different iterations of robo-advising).

3. *Id.* at 2–3.

incentivizing current investors to switch platforms.⁴ As robo-advisers become more popular,⁵ larger wealth managers are beginning to take notice and develop their own robo-advisory services.⁶

Robo-advisers operate in a legal regime that revolves around providing a fiduciary duty to clients.⁷ Few legal concepts appear as uniquely “human” as the trusted fiduciary who acts in the best interest of another. The dissimilarity between a trusted family financial planner and a cold, calculating computer algorithm has spurred a lively debate about whether a robo-adviser can meet the highest standard of fiduciary duty, applicable to human investment advisers—continuously acting in the best interest of a client.

This Note explores whether a robo-adviser can meet the fiduciary standard imposed on registered investment advisers and examines who should bear the cost when a robo-adviser falls short of meeting the standard. This analysis hopes to add to the growing scholarship on this topic⁸ by further considering additional liability schemes that may become necessary in the near future. As algorithms become more autonomous and prevalent in financial services, this Note argues that additional liability schemes are appropriate. Invariably, this discussion touches on questions about how the law should treat artificial intelligence (AI) generally. Because robo-advisers will continue to

4. Do not be fooled—robo-advisers are not just gimmicks focused on one type of investor. Some focus specifically on high net worth individuals. Suleman Din, *AI-powered Robo Advisor Takes Aim at the Richest Clients*, FINANCIALPLANNING (Oct. 19, 2016, 11:38 AM), <http://www.financial-planning.com/news/ai-powered-robo-advisor-takes-aim-at-rich-clients> [<https://perma.cc/J9DZ-8TEG>] (“For 30 basis points, [the robo-adviser] will work for client accounts with a minimum of \$1 million to analyze their securities, aggregate all of their financial data, create tax efficient transfers, apply automated downside protection on any current holdings, and perform tax efficient trading and tax-loss harvesting.”).

5. Business Insider forecasts “that robo advisors will manage around 10% of total global assets under management (AUM) by 2020.” Sarah Kocianski, *The Robo Advisor Report: Market Forecasts, Key Growth Drivers, and How Automated Asset Managers Will Change the Advisory Industry*, BUS. INSIDER (June 9, 2016, 12:02 AM), <http://www.businessinsider.com/the-robo-advising-report-market-forecasts-key-growth-drivers-and-how-automated-asset-management-will-change-the-advisory-industry-2016-6> [<https://perma.cc/CY28-XVCV>]. “This equates to around \$8 trillion [assets].” *Id.*

6. *Id.* (“Large incumbent wealth managers . . . are embracing the technology and launching their own products, which are scaling quickly.”).

7. Because they provide investment advice for compensation, robo-advisers, barring certain exceptions, are required to register as investment advisers under the Investment Advisers Act of 1940, 15 U.S.C. §§ 80b-1–80b-21 (2012).

8. See generally, e.g., Megan Ji, Note, *Are Robots Good Fiduciaries? Regulating Robo-Advisers Under the Investment Advisers Act of 1940*, 117 COLUM. L. REV. 1543, 1545 (arguing that “regulators should . . . focus on policing robo-advisor conflicts of interest” instead of focusing on “the quality of robo-advisor advice”).

advance toward “stronger” AI,⁹ a preview of future legal schemes is not only appropriate, but necessary.¹⁰

In Part I, this Note summarizes the relevant laws concerning an investment adviser’s fiduciary duty. Part II then provides a short history on the development of machine learning and robo-advisers, providing a chronological context meant to highlight the rapid pace of these developments. Part III applies existing law to robo-advisers and concludes that robo-advisory tools can fulfill the obligations of a fiduciary. Finally, Part IV demonstrates the gaps in current law as applied to increasingly advanced algorithms and proposes a liability framework to use going forward.

I. THE FEDERAL FIDUCIARY DUTY

A basic understanding of the relevant legal obligations of investment advisers, companies, and broker-dealers lays the groundwork for a critique of the fiduciary capacity of robo-advisory services. While many financial professionals are subject to varying levels of fiduciary duties, the duty incumbent on a registered investment adviser is the highest. This has been fleshed out into three main components, requiring an adviser to provide personalized investment advice, disclose conflicts of interest, and seek the best execution of transactions. Some robo-advisers are registered as investment advisers and are thus subject to the highest fiduciary standard. But broker-dealers, subject to a less rigorous standard, also use robo-advisory tools. As a result, robo-advisers appear to be subject to varying standards depending on who is providing the service. But, if robo-advisers can satisfy the highest fiduciary duty—belonging to investment advisers—presumably less strict fiduciary obligations are also satisfied. This Note focuses on whether robo-advisers can meet the higher standard, therefore only the fiduciary obligations of investment advisers are relevant here.

An investment adviser provides personalized, “competent, unbiased, and continuous advice regarding the sound management of

9. “Strong” or “true” artificial intelligence (AI) refers to a state of AI which is similar to human intelligence.

10. This Note does not take any position on whether “true” AI will ever be reached. It does suppose that as machine learning advances, the processes and determinations will become more autonomous and independent such that humans will not be required to exercise direct control over the algorithm. This is already the case to some extent for several robo-advisory services.

[a client’s] investments.”¹¹ Often, these individuals hold themselves out as “financial planners” and provide advice regarding various aspects of a client’s financial situation.¹² If the individual is employed by a firm, the firm itself is registered at either the federal or state level as an investment adviser and owes its clients a fiduciary duty, while the client-facing employees register as “investment adviser representatives.”¹³ Advisers often consider a broad range of investment strategies, from helping individuals choose between different classes of securities to explaining the tax implications of different investment plans. Providing investment advice requires knowledge about the client’s personal needs, wants, and financial circumstances. The number and age of a client’s children, for example, can play into an adviser’s recommendation. Parents with young children, for instance, would have different investment horizons than parents with teenagers, for whom college tuition payments are in the near future.

Of course, some investment advisers do not offer the all-encompassing services described above, and instead provide information and analysis on a narrow range of securities.¹⁴ Some advisers manage their clients’ investment portfolios for them and others do not.¹⁵ Unfortunately for the lay investor, the many definitions associated with financial professionals—that is, financial planners, investment advisers, brokers, and so on—may not clearly signal what

11. U.S. SEC. & EXCH. COMM’N, REPORT OF THE SEC, PURSUANT TO § 30 OF THE PUBLIC UTILITY HOLDING COMPANY ACT OF 1935, ON INVESTMENT COUNSEL, INVESTMENT MANAGEMENT, INVESTMENT SUPERVISORY, AND INVESTMENT ADVISORY SERVICES, H.R. DOC. NO. 76-477, at 23 (1939) (internal quotation marks omitted).

12. *Investment Advisers: What You Need To Know Before Choosing One*, U.S. SEC. & EXCHANGE COMMISSION (Aug. 7, 2012), <https://www.sec.gov/investor/pubs/invadvisers.html> [<https://perma.cc/9W26-JRKQ>] [hereinafter SEC, *What You Need To Know*].

13. 15 U.S.C. § 80b-3a(b)(1)(A) (2012); 17 C.F.R. § 275.203A-3(a)(1) (2017); see *Investment Advisor Guide*, N. AM. SEC. ADMIN. ASS’N, <http://www.nasaa.org/industry-resources/investment-advisers/investment-adviser-guide> [<https://perma.cc/63RL-EP62>] (“It is important to note that the investment adviser firm holds the registration/license but the investment adviser representative[] is the individual who performs services on behalf of the registered/licensed investment adviser firm.”). Investment adviser representatives register with the state where the firm is located, and may be subject to different “state registration, licensing or qualification requirements.” U.S. SEC. & EXCH. COMM’N, STUDY ON INVESTMENT ADVISERS AND BROKER-DEALERS, at iv (2011), <https://www.sec.gov/news/studies/2011/913studyfinal.pdf> [<https://perma.cc/3M9Q-ZW9E>] [hereinafter SEC STUDY].

14. SEC, *What You Need To Know*, *supra* note 12.

15. *Id.*

services the individual performs or the applicable standard of care.¹⁶ Simply put, however, an investment adviser provides analysis and recommendations on investments based on a client's individual circumstances.

To preserve the important and trusted relationship between an investment adviser and a client, Congress passed the Investment Advisers Act of 1940¹⁷ (the Act) based on an extensive survey by the Securities and Exchange Commission (SEC).¹⁸ Under the Act, an investment adviser is defined as someone "who, for compensation, engages in the business of advising others . . . as to the value of securities or as to the advisability of investing in, purchasing or selling securities" or "issues . . . analyses or reports concerning securities" in the regular course of business.¹⁹ The SEC has interpreted this definition broadly.²⁰ Any investment adviser that meets this definition must register with the SEC and is subject to the federal fiduciary standard.²¹ The Act also provides several exceptions, both to the definition of an investment adviser, and to the registration requirements for certain investment advisers. For instance, brokers who provide advice "solely incidental to the conduct of his business as a broker" and who do not receive any "special compensation" for that advice are exempt from the definition of investment adviser.²² Similarly, advisers who only practice and serve clients within the same

16. This is one of the reasons the Securities and Exchange Commission (SEC) encourages potential investors to seek out and question the financial planner or adviser with whom they are considering investing. *Id.*; see also SEC STUDY, *supra* note 13, at i ("Retail investors generally are not aware of these differences or their legal implications. Many investors are also confused by the different standards of care that apply to investment advisers and broker-dealers. That investor confusion has been a source of concern for regulators and Congress.").

17. Investment Advisers Act of 1940, 15 U.S.C. §§ 80b-1-80b-21 (2012).

18. SEC v. Capital Gains Research Bureau, Inc., 375 U.S. 180, 187 (1963) ("[T]he Commission made an exhaustive study and report which included consideration of investment counsel and investment advisory services.").

19. 15 U.S.C. § 80b-2(a)(11).

20. See, e.g., The Maratta Advisory, Inc., SEC No-Action Letter, Fed. Sec. L. Rep. ¶ 77,035 (July 16, 1981) (determining that providing general market-timing advice "from time to time" when no securities are mentioned by name still makes one an investment adviser under the Act).

21. 15 U.S.C. § 80b-3(a).

22. *Id.* § 80b-2(a)(11). However, the SEC will scrutinize whether any investment advice is truly incidental to the brokerage service. See Financial Planning and Advisory Services, SEC No-Action Letter, 1979 WL 13190, at *1 (Dec. 11, 1979) (defining "investment adviser" to include "the provision of 'financial planning' and 'general investment advisory services' to clients in connection with its primary activities as an insurance broker").

state are exempt from registering with the SEC.²³ Notably, regardless of whether the adviser must or does register as an investment adviser, the anti-fraud provisions of the Act apply to anyone falling under the Act's definition of an investment adviser.²⁴

As noted previously, registration subjects the adviser to “the delicate fiduciary nature of an investment advisory relationship.”²⁵ The federal statutory fiduciary standard derives from “centuries-old trust law”²⁶ and requires advisers to comply with an “affirmative duty of ‘utmost good faith, and full and fair disclosure of all material facts,’ as well as an affirmative obligation ‘to employ reasonable care to avoid misleading’ [their] clients.”²⁷ Congress passed the Act to stop abuses that arose from advisory relationships prior to and during the Great Depression,²⁸ but the statute's definition of a fiduciary duty is flexible enough to reach other conduct not specifically listed, such as “conflicts of interest which might incline an investment adviser—consciously or unconsciously—to render advice which was not disinterested.”²⁹ In return for meeting the federal fiduciary standard, registered investment advisers need not meet varying state regulations when they operate nationwide.³⁰

23. 15 U.S.C. § 80b-3(b)(1). Due to the advent of the internet, most investment advisers and certainly any FinTech companies would cater to individuals outside of a single state. Thus, a robo-advising firm will likely need to register with the SEC unless it has less than \$100 million in assets under management. *Id.* § 80b-3(a)(2)(B).

24. *Id.* § 80b-6; *United States v. Miller*, 833 F.3d 274, 283 (3d Cir. 2016) (“[T]he Act prohibits fraud by ‘any’ investment adviser, regardless of registration.”). Note that this would apply the anti-fraud provisions to individuals who are exempt from registration, but meet the definition of an investment adviser. It would not apply the anti-fraud provisions to individuals who are specifically exempt from the definition of an investment adviser. *Miller*, 833 F.3d at 280–84.

25. *SEC v. Capital Gains Research Bureau, Inc.*, 375 U.S. 180, 191 (1963) (internal quotation marks omitted).

26. Arthur B. Laby, *Fiduciary Obligations of Broker-Dealers and Investment Advisers*, 55 VILL. L. REV. 701, 717 (2010).

27. *Capital Gains*, 375 U.S. at 194 (quoting WILLIAM L. PROSSER, HANDBOOK OF THE LAW OF TORTS 534–35 (1955); then quoting 1 HARPER AND JAMES, THE LAW OF TORTS 541 (1956)).

28. *SEC v. Wall St. Transcript Corp.*, 422 F.2d 1371, 1376 (2d Cir. 1970) (“[S]ubstantive provisions contained in §§ 205, 206 and 207 of the Act are designed to eliminate several specific practices labelled as abuses found to have existed at the time of the law's enactment.”). Justice Harlan Stone noted in 1934 that most of the problems from the Great Depression “will be ascribed to the failure to observe the fiduciary principle, the precept as old as holy writ, that ‘a man cannot serve two masters.’” Harlan F. Stone, *The Public Influence of the Bar*, 48 HARV. L. REV. 1, 8 (1934).

29. *Capital Gains*, 375 U.S. at 191–92.

30. 15 U.S.C. § 80b-18(b), (c) (2012). A common difference among state regulations is the requirement to retain capital. *Compare Alabama*, N. AM. SEC. ADMIN. ASS'N., <http://www.nasaa.org/industry-resources/investment-advisers/ia-switch-resources/state->

While the federal statutory fiduciary standard may not incorporate the full fiduciary standard developed at common law,³¹ certain aspects of the common law have clearly been adopted. For instance, the adviser must act in the “best interest” of his client.³² This includes disclosing any conflicts of interest that may prejudice his advice,³³ seeking the lowest cost execution of securities trades,³⁴ and providing “suitable” recommendations³⁵ that have a reasonable basis in the client’s specific financial situation.³⁶ Collectively, these requirements make up the bulk of an adviser’s duty to his client.

II. THE RISE OF MACHINE LEARNING–BASED FINTECH

In developing a legal framework to decide a robo-adviser’s liability, the rapid advancement of the underlying technology makes a strong case that building flexibility into that framework is essential. Innovations, like the development of artificial neural networks and massive data collection and creation spurred by the adoption of tech in

investment-adviser-registration-information/alabama [https://perma.cc/6P32-R6S3] (stating an investment adviser must maintain \$10,000 or a surety bond for \$50,000 in Alabama), with *New York*, N. AM. SEC. ADMIN. ASS’N, <http://www.nasaa.org/industry-resources/investment-advisers/ia-switch-resources/state-investment-adviser-registration-information/new-york> [https://perma.cc/M3TU-WWSU] (stating an investment adviser is not required to maintain any kind of bond in New York).

31. Federal case law supports the notion that the federal fiduciary standard is not an adoption of the cumulative state case law. *See, e.g., Laird v. Integrated Res., Inc.*, 897 F.2d 826, 837 (5th Cir. 1990) (stating that an adviser’s fiduciary duty is a “developed federal standard” and “does not require reference to . . . the state law of fiduciary relationships”); *Steadman v. SEC*, 603 F.2d 1126, 1142 (5th Cir. 1979) (holding that although *Capital Gains* interpreted the fiduciary duty as negating the need to prove scienter it does not follow that the Act is a “vehicle to reach all breaches of fiduciary trust”).

32. SEC STUDY, *supra* note 13, at 22 (“The [adviser’s] duty of loyalty requires an adviser to serve the best interests of its clients . . .”).

33. *Belmont v. MB Inv. Partners, Inc.*, 708 F.3d 470, 503 (3d Cir. 2013) (“[T]he federal fiduciary standard thus focuses on the avoidance or disclosure of conflicts of interest between the investment adviser and the advisory client.”); *see also Information for Newly-Registered Investment Advisers*, U.S. SEC. & EXCHANGE COMMISSION (Nov. 23, 2010), <https://www.sec.gov/divisions/investment/advoverview.htm> [https://perma.cc/JFP5-BCE8] (stating that an adviser has “a fundamental obligation to act in the best interests of [her] clients and to provide investment advice in [her] clients’ best interests”).

34. 17 C.F.R. § 275.206(3)-2(c) (2017) (acknowledging the duty to seek “the best price and execution for [a] particular transaction”).

35. *See* George E. Brooks & Assocs., Inc., Investment Advisers Act Release No. 1746, 1998 WL 479756, at *4 (Aug. 17, 1998) (bringing action against an adviser who purchased risky securities for elderly, risk-averse clientele).

36. *See* Alfred C. Rizzo, Investment Advisers Act Release No. 897, 1984 WL 470013, at *3 (Jan. 11, 1984) (“[A] registered investment adviser . . . [is] required to have a reasonable basis for his investment advice.”).

all areas of life,³⁷ allow the field of machine learning to grow at exponential rates. It may be illogical to expect exponential growth rates to continue ad infinitum,³⁸ but any legal framework developed for AI should anticipate future growth. Highlighting the technology's history below illustrates how quickly the field of AI has grown, and how quick this growth will continue to be, especially in light of modern increases in investment activity. What was little more than a plot device in the 1950s is now reality.

A. *Development of Machine Learning*

In 1950, computer scientist Alan Turing made preliminary suggestions that machines were capable of thinking, and he was not taken seriously.³⁹ But by 1955, a group of researchers had assembled at Dartmouth and pledged themselves to investigating AI.⁴⁰ Four years later, one of those researchers, Marvin Minsky, created the first AI lab at the Massachusetts Institute of Technology.⁴¹ Just before that, in 1958, psychologist Frank Rosenblatt created the first artificial neural network modeled after the human brain.⁴² Computer scientists later adopted Rosenblatt's architecture to provide the structure for machine learning algorithms.⁴³

37. See Ralph Jacobson, *2.5 Quintillion Bytes of Data Created Every Day. How Does CPG & Retail Manage It?*, IBM (Apr. 24, 2013), <https://www.ibm.com/blogs/insights-on-business/consumer-products/2-5-quintillion-bytes-of-data-created-every-day-how-does-cpg-retail-manage-it> [<https://perma.cc/4HS7-XE68>] (noting that 2.5 quintillion bytes of data are created daily by sources like "sensors used to gather shopper information, posts to social media sites, digital pictures and videos, purchase transaction, and cell phone GPS signals to name a few").

38. For a discussion of why growth probably will not continue at this pace, see Luciano Floridi, *Should We Be Afraid of AI?*, AEON (May 9, 2016), <https://aeon.co/essays/true-ai-is-both-logically-possible-and-utterly-implausible> [<https://perma.cc/P6BP-P3RB>]. Additionally, it is difficult to theorize exactly when we will have reached a level of AI that would classify as true AI. For an overview of the disagreement on when science will be able to create true AI, see Luke Muehlhauser, *When Will Artificial Intelligence Be Created?*, MACHINE INTELLIGENCE RES. INST. (May 15, 2013), <https://intelligence.org/2013/05/15/when-will-ai-be-created> [<https://perma.cc/GW2E-TW9X>].

39. 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/Y2UX-ZV7U>].

40. See generally McCarthy et al., *supra* note 1 (reproducing the proposal of Dartmouth researchers drafted on August 31, 1955).

41. Shani, *supra* note 39.

42. Alexx Kay, *Artificial Neural Networks*, COMPUTERWORLD (Feb. 12, 2001, 12:00 AM), <http://www.computerworld.com/article/2591759/app-development/artificial-neural-networks.html> [<https://perma.cc/LP4E-CDWS>].

43. *Id.*

It is unnecessary to understand the intricacies of artificial neural networks for the purposes of this Note,⁴⁴ but one important takeaway is that neural networks have begun to reach levels of complexity at which it is questionable whether humans can understand how the neural networks process information.⁴⁵ As deep neural networks evolve, the potential of these tools to accomplish complex tasks absent human guidance grows exponentially.⁴⁶

Unlike classic code where a programmer provides precise instructions for every possible scenario, machine learning revolves around “training” the algorithm.⁴⁷ For example, an artificial neural network can be trained to recognize images of cancerous cells by continuously showing the program pictures of cancerous cells.⁴⁸ The programmer continues to train the algorithm until it does not misclassify cancerous and noncancerous cells. In doing so, the programmer does not rewrite the algorithm; rather, the provision of additional pictures adds to the catalog of data points the algorithm will refer to in making future classifications.⁴⁹ Chances are, *everyone* has helped train one of these tools without knowing it. Responding to a

44. For a useful primer on neural networks, see *id.* at 128–43. The basic premise is that hidden layers are made up of nodes which apply various models or formula to inputs to make them usable as they progress through the model. See IAN GOODFELLOW, YOSHUA BENGIO & AARON COURVILLE, DEEP LEARNING 6 fig.1.2 (2016). A neural network’s structure varies depending on the tool’s goal. See Fjodor Van Veen, *The Neural Network Zoo*, ASIMOV INST. (Sept. 14, 2016), <http://www.asimovinstitute.org/neural-network-zoo> [<https://perma.cc/DRB3-VXDE>] (providing explanations for different neural network architectures).

45. Aaron M. Bornstein, *Is Artificial Intelligence Permanently Inscrutable?*, NAUTILUS (Sept. 1, 2016), <http://nautil.us/issue/40/learning/is-artificial-intelligence-permanently-inscrutable> [<https://perma.cc/6MNT-M254>] (“At the moment, though we can know everything there is to know about what neural networks are doing—they are, after all, just computer programs—we can discern very little about how or why they are doing it.”).

46. Jason Tanz, *Soon We Won’t Program Computers. We’ll Train Them Like Dogs*, WIRED (May 17, 2016, 6:50 AM), <https://www.wired.com/2016/05/the-end-of-code> [<https://perma.cc/3G54-QCGM>] (noting that machine learning “has recently become immensely more powerful, thanks in part to the rise of deep neural networks”).

47. For a simple breakdown of machine learning and its relation to AI, see Lee Bell, *Machine Learning Versus AI: What’s the Difference?*, WIRED (Dec. 1, 2016), <http://www.wired.co.uk/article/machine-learning-ai-explained> [<https://perma.cc/D7EA-ZQJA>].

48. For two examples of neural network architecture and the steps required to manipulate data in order to train the algorithm, see SAMER HIJAZI, RISHI KUMAR & CHRIS ROWEN, CADENCE, USING CONVOLUTIONAL NEURAL NETWORKS FOR IMAGE RECOGNITION (2015), https://ip.cadence.com/uploads/901/cnn_wp-pdf [<https://perma.cc/5SP2-JBVB>] and Robert L. Harvey, Paul N. DiCaprio & Karl G. Heinemann, *A Neural Network Architecture for General Image Recognition*, 4 LINCOLN LABORATORY J. 189 (1991), https://www.ll.mit.edu/publications/journal/pdf/vol04_no2/4.2.5.neuralnetwork.pdf [<https://perma.cc/UV6C-D52P>].

49. Bell, *supra* note 47.

Captcha—the test asking internet users to verify that they are not robots by selecting all pictures in a named category, for example, all pictures of a car—enables the sort of machine learning described above.⁵⁰

The development of machine learning can be traced back to the 1950s, but deep learning has only recently become plausible due to increases in “computational power” and data available for this training process.⁵¹ The most well-known example of deep learning is IBM’s Watson, which is already “working in fields like health care, finance, entertainment and retail,”⁵² and which burst onto millions of television screens in 2011 when it handily beat two *Jeopardy!* champions, Ken Jennings and Brad Rutter, at their own game.⁵³ Watson has gone on to tackle new challenges, as IBM acquired Promontory Financial Group—arguably the most prestigious financial regulatory consulting firm—to train Watson on financial regulation.⁵⁴

Investors are also taking notice of advances in AI. Technology firms like Microsoft, which “launched a new fund for AI startups” in 2016, and Google, which bought AI startup DeepMind in 2014 for \$400

50. Hal Hodson, *Google’s New Bot-trap Trains Machines To See the World*, NEW SCIENTIST (Dec. 10, 2014), <https://www.newscientist.com/article/mg22429992-400-googles-new-bot-trap-trains-machines-to-see-the-world> [<https://perma.cc/H9T4-PYTN>] (highlighting that Google’s updated Captchas would be used to “build data sets that can be fed to algorithms”).

51. Roger Parloff, *Why Deep Learning Is Suddenly Changing Your Life*, FORTUNE (Sept. 28, 2016, 5:00 PM), <http://fortune.com/ai-artificial-intelligence-deep-machine-learning> [<https://perma.cc/GGD4-HWCQ>] (noting that “today computer scientists have finally harnessed both the vast computational power and the enormous storehouses of data—images, video, audio, and text files strewn across the Internet—that, it turns out, are essential to making neural nets work well”).

52. Sharon Gaudin, *IBM: In 5 Years, Watson A.I. Will Be Behind Your Every Decision*, COMPUTERWORLD (Oct. 27, 2016, 4:30 AM), <http://www.computerworld.com/article/3135852/artificial-intelligence/ibm-in-5-years-watson-ai-will-be-behind-your-every-decision.html> [<https://perma.cc/TB5V-TCW8>]; see also Jeff Stimpson, *Block Applies IBM’s Watson To Tax Prep*, ACCT. TODAY (Feb. 3, 2017, 11:12 AM), <https://www.accountingtoday.com/news/block-applies-ibms-watson-to-tax-prep> [<https://perma.cc/6B8H-XRFM>] (discussing H&R Block’s use of Watson in its tax preparation services).

53. John Markoff, *Computer Wins on ‘Jeopardy!’: Trivial, It’s Not*, N.Y. TIMES (Feb. 16, 2011), <http://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html?pagewanted=all> [<https://perma.cc/4KTG-3G79>] (noting Watson’s win prompted “Ken Jennings, famous for winning 74 games in a row on the TV quiz show, [to] acknowledge[] ‘I, for one, welcome our new computer overlords’”). Similarly, Google’s AI AlphaGo defeated arguably the world’s best Go player in 2016. Cade Metz, *Google’s AI Wins Fifth and Final Game Against Go Genius Lee Sedol*, WIRED (Mar. 15, 2016, 5:01 AM), <https://www.wired.com/2016/03/googles-ai-wins-fifth-final-game-go-genius-lee-sedol> [<https://perma.cc/E2CF-5APD>].

54. Lucinda Shen, *IBM is Buying One of the Most Influential Firms on Wall Street*, FORTUNE (Sept. 29, 2016), <http://fortune.com/2016/09/29/promontory-financial-wall-street-ibm> [<https://perma.cc/7ZWL-QS46>].

million, seem poised to continue their investment in the field.⁵⁵ Even Ford, which has not traditionally been considered a technology company, has agreed to a \$1 billion investment in an AI startup called Argo AI.⁵⁶ Beyond American companies, Chinese venture capital firms are expected to continue their investment in AI, building off trends from 2016.⁵⁷ As a result of the growing interest in AI, Forrester Research, a marketing research company, forecasts that investment in AI will more than triple in 2017.⁵⁸

Since the AI industry has developed so rapidly and is poised to continue developing at an increasingly alarming rate, applicable legal regimes may struggle to keep up. Considering one specific corner of the AI industry, such as robo-advising, provides an opportunity to assess the relevant, broader issues of autonomy with a concrete example. Although a proposed regulatory solution following from this investigation may be tailored to robo-advising, many of the proposed solutions are applicable to other uses of AI .

B. *Current State of Robo-Advising*

Robo-advisory services have only recently begun to garner public attention, although not to the same degree as deep learning projects like IBM's Watson. The slow rise to popularity makes sense, as the first iterations of robo-advisers did little more than provide suggested portfolio allocations, which clients then had to implement themselves.⁵⁹ Today, robo-advisory services have become increasingly sophisticated,

55. See Christina Mercer, *10 Tech Giants Investing in Artificial Intelligence: Microsoft, Google, Uber and More Are Investing in AI: What Is Their Plan and Who Are the Other Key Players?*, TECHWORLD (July 11, 2017), <http://www.techworld.com/picture-gallery/big-data/tech-giants-investing-in-artificial-intelligence-3629737> [<https://perma.cc/J8DU-T7LB>] (highlighting purchases and investments made by large tech firms in AI).

56. Sam Abuelsamid, *Ford Makes \$1 Billion Bet on Artificial Intelligence Startup as Recruiting Tool*, FORBES (Feb. 13, 2017, 9:51 AM), <https://www.forbes.com/sites/pikerresearch/2017/02/13/ford-makes-1-billion-bet/#3f6e2d077e5a> [<https://perma.cc/W9HL-DFUE>].

57. In 2016, Chinese venture capitalist firms increased funding to AI startups by 19 percent, up to \$31 billion from the year prior, “spurred by a central government mandate” encouraging investment in startups. Huileng Tan, *Artificial Intelligence To Drive China VC Investments in 2017: KPMG*, CNBC (Jan. 18, 2017, 11:57 PM), <http://www.cnbc.com/2017/01/18/artificial-intelligence-to-drive-china-vc-investments-in-2017-kpmg.html> [<https://perma.cc/K9WJ-389W>].

58. James McCormick, *Predictions 2017: Artificial Intelligence Will Drive the Insights Revolution*, FORRESTER RES. (Nov. 2, 2016), https://go.forrester.com/wp-content/uploads/Forrester_Predictions_2017_-_Artificial_Intelligence_Will_Drive_The_Insights_Revolution.pdf [<https://perma.cc/XUZ2-87KV>].

59. *The Expansion of Robo-Advisory in Wealth Management*, *supra* note 2, at 2.

warranting closer public attention.⁶⁰ In a common robo-adviser model, clients provide the relevant information and the robo-adviser uses that information to construct and manage portfolios that “satisfy pre-defined investment strategies.”⁶¹ Human investment advisers take a back seat in this context, overseeing the algorithms—for now, anyway.⁶² More complex robo-advisers rely on machine learning algorithms to attain skills, allowing them to continually manage client portfolios absent human oversight.⁶³

Regardless of how complex the robo-adviser is, a prospective client can expect a pretty standard process when starting the service. When opening a robo-advisory account, a client answers a series of questions to formulate an overall investment strategy.⁶⁴ Thus, the robo-adviser’s advice “is limited by the information it requests and receives from” the client.⁶⁵ Within that scope, the robo-adviser suggests a portfolio of securities,⁶⁶ although many robo-advisers rely solely on exchange-traded funds.⁶⁷ This is where many of the similarities end. Different robo-advisers have shown different returns and investment strategies.⁶⁸ Robo-advisers also differ regarding the level of human

60. It should be noted that while robo-advisers have become more complex, they are not as complex as intricate deep learning networks like Watson.

61. *Id.* at 2.

62. *Id.* Deloitte classifies this stage of technology as robo-advising 3.0. *Id.* In 2016, Deloitte suggested that these services made up “about 80% of German, EU, UK and US Robo-Advisors.” *Id.* at 3.

63. Deloitte has coined this stage of technology “Robo-Advisor 4.0.” *Id.* at 3.

64. U.S. SEC. & EXCH. COMM’N, DIVISION OF INVESTMENT MANAGEMENT, GUIDANCE UPDATE: ROBO-ADVISERS, NO. 2017-02 (Feb. 2017) [hereinafter SEC GUIDANCE UPDATE].

65. Office of Inv’r Educ. & Advocacy, *Investor Bulletin: Robo-Advisers*, INVESTOR.GOV (Feb. 23, 2017), <https://www.investor.gov/additional-resources/news-alerts/alerts-bulletins/investor-bulletin-robo-advisers> [<https://perma.cc/9V3P-GL9M>].

66. *Id.*

67. *See, e.g.*, WEALTHFRONT, WEALTHFRONT INVESTMENT METHODOLOGY WHITE PAPER, <https://research.wealthfront.com/whitepapers/investment-methodology> [<https://perma.cc/2X2K-P2BP>] (“Each of our selected asset classes is represented by a low cost, passive ETF.”); *This Is Why an ETF Portfolio Serves You Better*, BETTERMENT (Apr. 23, 2014), <https://www.betterment.com/resources/investment-strategy/etfs/five-ways-an-etf-portfolio-serves-you-better> [<https://perma.cc/FY98-B826>] (“ETFs make up the core of Betterment’s portfolios.”); WISEBANYAN, <https://wisebanyan.com> [<https://perma.cc/RVB5-H9HP>] (“As a WiseBanyan client, your financial plan is invested into well-diversified portfolios of exchange-traded funds”); Dayana Yochim, *Schwab Intelligent Portfolios Review 2017*, NERDWALLET (Jan. 3, 2017), <https://www.nerdwallet.com/blog/investing/charles-schwab-intelligent-portfolios-review> [<https://perma.cc/XG5P-B5R7>] (describing that a portfolio is “[b]uilt from up to 53 ETFs covering up to 20 asset classes”).

68. *See* Tom Anderson, *Returns Vary Widely for Robo-Advisors with Similar Risk*, CNBC (Sept. 7, 2016), <http://www.cnbc.com/2016/09/07/returns-vary-widely-for-robo-advisors-with->

involvement,⁶⁹ the fees,⁷⁰ or the provision of other related services like “tax-loss harvesting.”⁷¹ These differences in robo-advisers make it challenging to apply a legal regime that applies a one-size-fits-all approach to both robo-advisers and human advisers.

III. APPLYING EXISTING LAW TO ROBO-ADVISERS

*Providing financial advisory services electronically is different than the traditional adviser model, but in many respects our assessment of robo-advisers is no different than for a human-based investment adviser.*⁷²

Applying existing law to robo-advisory services requires answering two questions. Can a computer algorithm meet the same fiduciary standards generally applied to human advisers and, if so, who is ultimately liable for the robo-adviser’s actions? Both inquiries, especially the latter, strain our conceptions of personhood and responsibility in the context of a truly autonomous computer algorithm. Regardless, guidance from the SEC and the Financial Industry Regulatory Authority (FINRA) suggests that robo-advisers can indeed meet the fiduciary standard. This begs the more complex question of how to attribute liability. This Part assesses a robo-adviser’s ability to satisfy the fiduciary standard and, briefly, whether robo-advisers would further need to register as investment companies.

A. *Can Robo-Advisers Satisfy the Fiduciary Standard?*

Whether a robo-adviser can meet a fiduciary standard is a point of contention between robo-advisers’ supporters and critics. Supporters,

similar-risk.html [https://perma.cc/JP9K-CPWL] (detailing a study showing “[f]ive popular robo-advisors generated wide-ranging returns for the first eight months of 2016 with portfolios that had a 60/40 mix of stocks and bonds”).

69. See BLACKROCK, DIGITAL INVESTMENT ADVICE: ROBO ADVISORS COME OF AGE 4 (2016), <https://www.blackrock.com/corporate/en-at/literature/whitepaper/viewpoint-digital-investment-advice-september-2016.pdf> [https://perma.cc/7C6M-6L4Y] (“Though some digital advisers are fully automated, many offer consumers multiple ways of engaging with a human professional, such as by online chat, phone call, or video call, even outside of traditional office hours.”).

70. See Arielle O’Shea, *Best Robo-Advisors: 2017 Top Picks*, NERDWALLET (Jan. 5, 2017), <https://www.nerdwallet.com/blog/investing/best-robo-advisors> [https://perma.cc/32T7-DPSS] (giving an overview of different robo-advisers and their fees).

71. See *id.* (highlighting which robo-advisers provide tax loss harvesting services or similar services).

72. Mary Jo White, Chairman, SEC, Keynote Address at the SEC-Rock Center on Corporate Governance Silicon Valley Initiative (Mar. 31, 2016), <https://www.sec.gov/news/speech/chair-white-silicon-valley-initiative-3-31-16.html> [https://perma.cc/8KZG-APJR].

like Jon Stein, the founder of a leading robo-adviser named Betterment, argue that robo-advisers meet the fiduciary standard.⁷³ Critics like Melanie Fein, former senior counsel to the Board of Governors of the Federal Reserve, criticize robo-advisory services for not providing significantly personalized investment advice.⁷⁴ After reviewing multiple robo-advisory terms of use, Fein found that robo-advisers, advertised as a low cost alternative to investment advisers, consistently provided disclaimers that attempted to skirt the fiduciary duties imposed upon their human counterparts. Some examples of these disclaimers include: the “[c]lient understands and agrees that . . . [the c]lient has not engaged [the robo-adviser] to provide any individual financial planning services”;⁷⁵ the “[c]lient is responsible for determining that investments are in the best interests of [the c]lient’s financial needs”;⁷⁶ and that “[a]ll brokerage transactions . . . will be routed to [the robo-adviser’s brokerage affiliate] for execution, which may not always obtain as favorable a price as another broker-dealer.”⁷⁷ Fein identified more disclaimers, but these examples sufficiently illustrate her general criticism that robo-advisory services do not provide what is traditionally considered personalized investment advice⁷⁸ and that they engage in “self-dealing transactions.”⁷⁹

Yet the conflicts that necessitate legal enforcement of fiduciary duties are faced equally by robo-advisers and human advisers, and both use similar methods to overcome those conflicts. Thus, properly designed robo-advisers are not inherently unable to meet the fiduciary duty any more than human advisers are. Three specific duties impressed upon investment adviser fiduciaries—a duty to reasonably recommend suitable securities,⁸⁰ a duty to fully disclose conflicts of

73. *Betterment’s Public Comment to the DOL: No More Conflicted Advice*, BETTERMENT (Sept. 25, 2015), <https://www.betterment.com/resources/inside-betterment/betterments-public-comment-to-the-dol-no-more-conflicted-advice> [<https://perma.cc/VQ26-LXXE>] (stating that Betterment’s “precise, consistent and unconflicted algorithms make recommendations to clients on how to reach their goals, tailored to each client’s personal circumstances”).

74. Melanie L. Fein, *Robo-Advisors: A Closer Look* 8 (June 30, 2015) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2658701 [<https://perma.cc/75TF-3UF6>].

75. *Id.* at 9.

76. *Id.*

77. *Id.* at 15.

78. *Id.* at 8.

79. *Id.* at 15.

80. Alfred C. Rizzo, *Investment Advisers Act Release No. 897*, 1984 WL 470013, at *3 (Jan 11, 1984).

interest,⁸¹ and a duty to seek best execution for transactions⁸²—serve as examples to illustrate this assertion.

1. *Do Robo-Advisors Provide Personalized Investment Advice?*

Fein may be correct that robo-advisors do not provide the same level of personalized investment advice as an *ideal* human adviser. Robo-advisors only have as much information as they ask for and clients provide. A client may not include some outside investments, and a human adviser *may* think to ask if any exist, but not every human adviser is an ideal adviser, and being less than ideal does not mean the adviser cannot meet the minimum fiduciary standard.

Additionally, even though robo-advisors can automatically rebalance portfolios, robo-advisors do not engage in ongoing review of a client's financial situation by constantly reaching out to that client. According to Fein, these failures preclude a robo-adviser from rendering personalized investment advice, and therefore robo-advisors violate the fiduciary responsibility to act in the client's best interest.⁸³

Fein is by no means the only commentator to make these arguments. Because of this failure to consider “an investor's 360 [degree] financial picture and goals,” David Lyon, CEO of Oranj, “a digital practice management software tool for advisors,” similarly argued that robo-advisors “are really an investment brokerage service” due to their inability to meet the higher fiduciary standard.⁸⁴ Arthur Laby, a law professor at Rutgers and a former assistant general counsel at the SEC, cautions that robo-advisors cannot “address subtleties that may arise in conversation.”⁸⁵ For instance, if a client mentions “I might be inheriting assets in the next 12 months,” or “I may need to care for

81. SEC v. Capital Gains Research Bureau, Inc., 375 U.S. 180, 187 (1963).

82. SEC STUDY, *supra* note 13, at 28.

83. Fein, *supra* note 74, at 4. For further discussion on what acting in a client's “best interest” entails, see *supra* Part I.A.

84. Melanie Waddell, *Can Robo-Advisors Really Be Fiduciaries?*, THINKADVISOR (Nov. 30, 2015), <http://www.thinkadvisor.com/2015/11/30/can-robot-advisors-really-be-fiduciaries> [https://perma.cc/EVQ2-TA8F]. However, it is unlikely that robo-advisors can only register as brokers. In 1985, the SEC stated that a firm that provided “general or specific recommendations with respect to securities” using statistical tools that considered “investors' particular circumstances” would have to register as an investment advisor. Computer Research Language, Inc., SEC No-Action Letter, Fed. Sec. L. Rep. ¶ 78,185, 1985 WL 55756, at *1 (Nov. 26, 1985).

85. Tara Siegel Bernard, *The Pros and Cons of Using a Robot as an Investment Adviser*, N.Y. TIMES (Apr. 29, 2016) (internal quotation marks omitted), https://www.nytimes.com/2016/04/30/your-money/the-pros-and-cons-of-using-a-robot-as-an-investment-adviser.html?_r=0 [https://perma.cc/AJ2W-UNQJ].

a sick parent,” the robo-adviser may not identify these passing comments as “impact[ing] the cash [the client] need[s].”⁸⁶

In response, Adam Nash, the CEO of Wealthfront, a leading robo-advisory service, argues that although some advisers provide guidance on all aspects of a client’s financial life, not all advisers have to.⁸⁷ Curiously, the SEC has never explicitly stated what constitutes “personalized investment advice.”⁸⁸ The SEC, in a guidance update issued in early 2017, seems more focused on ensuring that robo-advisers disclose their limitations rather than on ensuring that they adopt more comprehensive methods to evaluate a client’s financial position.⁸⁹ So, looking only at existing regulatory boundaries, it is clear that advisers “must make a reasonable determination that the investment advice provided is suitable for the client,” but it is not clear that using questionnaires to elicit client information is an unreasonable determination of suitability that falls short of the fiduciary standard.⁹⁰ Robo-advisers, like human advisers, must take steps to ensure that they are getting “sufficient information to allow the robo-advisor to” make reasonable and suitable advice.⁹¹ This may include having clients clarify any conflicting responses or provide feedback if they choose to disregard the adviser’s suggestion.⁹² So although the SEC has not defined what personalized advice is, the robo-advisory method of eliciting information through questionnaires likely does not violate the advisor’s fiduciary duty absent a failure to elicit sufficient information.

Human advisers also face challenges in collecting sufficient client information and rely on questionnaires and interviews to elicit that information. In other words, just like a robo-adviser, a human adviser relies on information provided by the client. So long as a robo-adviser or a human adviser asks the right questions, which may only require asking questions all investment advisers commonly ask, and clarifies conflicting information, humans and machines can both meet this fiduciary requirement. Further, a human adviser faces the same issues

86. *Id.*

87. *Id.* (quoting Adam Nash saying that being a “fiduciary is not about the types of service you offer, it’s about the quality of service”).

88. SEC STUDY, *supra* note 13, at vii (stating that the “Commission should engage in rulemaking and/or issue interpretive guidance to explain what it means to provide ‘personalized investment advice about securities’”).

89. SEC GUIDANCE UPDATE, *supra* note 64, at 5.

90. *Id.* at 6.

91. *Id.* at 7.

92. *Id.*

as the robo-adviser in staying updated on the client's financial position. Clients are not in constant contact with their human advisers, and clients using passive investment strategies are even less likely to be in touch. Procedures to update customer preferences provide the same opportunities for clients to update their human advisers or robo-advisers and communicate any changes relevant to their financial goals.

2. *Do Robo-Advisers Sufficiently Disclose Conflicts of Interest?*

However, it is questionable whether robo-advisory firms have the same potential for conflicts of interest as human advisers. These conflicts of interest generally occur when an adviser recommends that a client purchase financial products or engage in transactions that generate compensation for the adviser. Fein justifiably criticizes robo-advisers who bury their conflicts in small print.⁹³ Generally investment advisers disclose conflicts of interest in their Form ADV, which they must file with the SEC and make available to their clients.⁹⁴ To an average client, the parts of the Form ADV and other brochures alerting clients to an adviser's conflict may not be any more readable than small print, but it satisfies the requirement that investment advisers "either eliminat[e] that conflict or fully disclos[e] . . . all material facts relating to the conflict."⁹⁵ Thus, a robo-adviser, like a human adviser, can use an affiliated broker so long as it discloses that relationship and updates its Form ADV if the conflict changes.⁹⁶

Perhaps in response to Fein's critique, the SEC's guidance on robo-advisers stresses that although robo-advisory firms need not "make investment advisory personnel available to clients to highlight and explain important concepts," the disclosures must be such that users see and understand them.⁹⁷ Some suggestions include using "interactive text" or "pop-up boxes."⁹⁸ Again, just as robo-advisory

93. Fein, *supra* note 74, at 24–25.

94. 17 C.F.R. § 275.204-3 (2017). Investment advisers provide Part 2A and Part 2B of the Form ADV to clients prior to entering into an investment advisory contract. *Id.*; *General Information on the Regulation of Investment Advisers*, U.S. SEC. & EXCHANGE COMMISSION (Mar. 11, 2011), <https://www.sec.gov/divisions/investment/iaregulation/memoia.htm> [<https://perma.cc/4J7A-ADYT>].

95. SEC STUDY, *supra* note 13, at iii.

96. *Id.* at 29.

97. SEC GUIDANCE UPDATE, *supra* note 64, at 5–6. The disclosures should be "in plain English." *Id.* at 3 n.14. Cognizant that robo-advisers will primarily communicate with clients online or through email, the SEC suggests taking advantage of this platform to make disclosures more apparent. *See id.* at 5–6.

98. *Id.* at 5–6.

firms and human advisers face the same potential for engaging in conflicts of interest, so too can both fulfill their respective duties through sufficient disclosure, including updating their Form ADVs. Interestingly, a robo-adviser's interface may allow for clearer disclosure than a human adviser.

3. *Can Robo-Advisers Fulfill the Requirements of Best Execution?*

Best execution requires an adviser to identify the brokerage service with the lowest total cost to the client under the circumstances to carry out the transaction.⁹⁹ This is a continuous duty, meaning that advisers should periodically review their policies to ensure they are getting the best deal for their clients.¹⁰⁰ This duty does not mean that an adviser cannot use an affiliated or specific broker, although any conflicts of interest must be disclosed, as discussed above.¹⁰¹ So long as the robo-advisory service periodically reviews its methods for executing client transactions, like a human adviser, it should not violate this duty. Like the two specific duties detailed above, concerns related to the best execution duty are neither unique to robo-advisers nor insurmountable.

B. *Should Robo-Advisers Register as Investment Companies?*

One common criticism against robo-advisers is that they may be operating as unregistered investment companies.¹⁰² While tangential to the discussion of whether robo-advisers can fulfill the fiduciary standard, this Note briefly weighs in on the debate. Robo-advisers clearly perform tasks requiring them to register and comply as investment advisers, but it is less clear whether robo-advisers also need to register as investment companies under the Investment Company Act of 1940.¹⁰³ This analysis depends on whether robo-advisers qualify for the safe harbor provided by Rule 3a-4, which in turn depends on how robo-advisers manage their clients' accounts.¹⁰⁴ Rule 3a-4 exempts firms that *individually* manage client accounts on "the basis of the client's financial situation and investment objectives."¹⁰⁵ Given that

99. See SEC STUDY, *supra* note 13, at 28.

100. *Id.* at 29.

101. *Id.*

102. See, e.g., Fein, *supra* note 74, at 29–30 ("Robo-advisors may be acting as unregistered investment companies . . .").

103. Investment Company Act of 1940, 15 U.S.C. §§ 80a-1–80a-64 (2012).

104. 17 C.F.R. § 270.3a-4 (2017).

105. *Id.*

investment companies generally “pool” client assets,¹⁰⁶ this distinction between individual management and management by pooling assets is important.

When Rule 3a-4 was released for public comment, the SEC indicated that advisory firms that did not pool client assets should not be classified as investment companies.¹⁰⁷ Assets are not pooled if “clients maintain all indicia of ownership of the securities in their accounts.”¹⁰⁸ For most robo-advisers this standard is easily met because client accounts are kept separate and the robo-advisory service provides personalized advice for each separate account. Ultimately, Rule 3a-4 provides a nonexclusive safe harbor, so robo-advisers can ostensibly avoid these registration requirements in other ways.¹⁰⁹ Further, the SEC has encouraged robo-advisory firms to “contact[] the [s]taff for further guidance,” if they are concerned their “unique” model may “not [be] addressed by Rule 3a-4.”¹¹⁰

Due to the personalized nature of robo-advisory services and the history of Rule 3a-4, it is unlikely that a robo-adviser would be required to register as an investment company.¹¹¹ During Rule 3a-4’s adoption, the SEC echoed that its primary concern is whether the accounts are truly separate and not pooled together for investment purposes. The robo-advisers described in this Note clearly do not pool accounts.

106. For further discussion, see *supra* Part I.B.

107. Status of Investment Advisory Programs, Investment Company Act Release No. 21,260, 1995 WL 447507, at *6 (July 27, 1995) (“The Advisory Committee published a report generally concluding that an investment advisory program should not be required to register under the Investment Company Act as long as the program’s clients maintain all indicia of ownership of the securities in their accounts, thereby avoiding the ‘pooling’ of client assets.” (footnotes omitted)).

108. *Id.*

109. The SEC stated that even firms that do not meet the requirements of Rule 3a-4 should “not [necessarily] be regulated as investment companies.” *Id.* at 9. This suggests the SEC did not want the Investment Company Act to expand further than regulating mutual funds, exchange traded funds, closed-end funds and unit investment trusts.

110. 17 C.F.R. § 270.3a-4; SEC GUIDANCE UPDATE, *supra* note 64, at 2.

111. Rule 3a-4 has other requirements; for example, clients must be able to impose certain restrictions on their account, 17 C.F.R. § 270.3a-4(a)(3), and employees must be “reasonably available to the client for consultation.” 17 C.F.R. § 270.3a-4(a)(2)(iv). A robo-adviser could easily structure itself so that clients can impose their own restrictions, but it might not have an employee available who is familiar with the client’s account. To the latter point, however, at least one service—Betterment—already makes human employees available to its clientele. Ryan Neal, *Betterment Pivots Toward a Human-Robo Hybrid*, WEALTHMANAGEMENT.COM (Jan. 31 2017), <http://www.wealthmanagement.com/technology/betterment-pivots-toward-human-robo-hybrid> [<https://perma.cc/V4JH-6B7U>].

IV. SUGGESTED FRAMEWORK MOVING FORWARD

If robo-advisers can meet a fiduciary standard, it begs the question of who can be held liable when robo-advisers fail to meet that standard. The advent of AI raises many profound questions about legal quasi-personhood and related theories of liability, but robo-advisers exist solely for one purpose—creating and effectuating financial strategies for clients. Fortunately, the fiduciary standard examined above provides an appropriate liability scheme. If an investment adviser representative, working for a firm registered as an investment adviser, gave unsuitable advice or profited from trades with clients, the representative’s conduct breaches the firm’s fiduciary duty. The firm is liable for that breach of fiduciary duty, because the federal duty attaches to the firm registered as an investment adviser.¹¹²

Per the SEC’s guidance, a robo-adviser’s poor design—for example, a failure to disclose conflicts, or an inaccurate algorithm—may similarly give rise to robo-adviser conduct that breaches the firm’s fiduciary duty.¹¹³ As a human investment adviser’s firm bears responsibility for its representatives, so too would a robo-adviser’s firm be subject to liability corresponding to its role in creating and using the algorithms. Thus, investors have a means to recovery for injuries caused by the algorithms from the firm as the registered investment adviser. But it is possible that as robo-advisers become more complex, an alternate liability scheme will be needed to fill gaps in the current liability framework. This Part first illustrates possible ways such gaps might arise and then explores possible alternative liability schemes.

A. Illustrating the Need To Think Outside the Box for Robo-Adviser Liability

As an algorithm learns, the reasoning behind its selections may become impossible for an investment firm, or any human, to explain. This failure to explain the algorithm’s reasoning, which influences the robo-adviser’s conduct on a client’s behalf, would likely violate the firm’s fiduciary duty. Current robo-advisory architecture is not as sophisticated as some of the more complex artificial neural networks used for tasks like image recognition. But it is not unrealistic to expect that in the near future a robo-adviser could be designed to work in

112. The investment adviser is any “person” which is defined as either a natural person or company. 15 U.S.C. §§ 80b-2(a)(11), (16) (2012). By definition, the actual algorithm could not be the registered “investment adviser.”

113. For further discussion, see *supra* Part III.A.2.

tandem with other data collection services, generating algorithmic complexity and making the robo-adviser's conduct increasingly difficult to explain.

For instance, suppose that to allow the robo-adviser to get a better idea of a client's financial picture, the robo-adviser's algorithm collects data from that user's online bank accounts or financial aggregator services like Mint. Based on spending habits, the algorithm would learn to ask more direct or probing questions to get a fuller view of the consumer's financial health. If the robo-adviser notices higher levels of entertainment spending, it may ask if the client has come into more money. Or, if the user is spending more frequent and larger amounts at home improvement stores, the algorithm may ask if there is a renovation or new home purchase upcoming and if there has been a change in the user's debt level.

Basically, as the algorithm develops for cross-platform integration, the architecture underlying those abilities will change, becoming more complex and, likely, harder to explain. If that happens, developers must ensure that the firm can still easily explain to a client why the algorithm chose to make a trade. A market shock which dramatically, and quickly, changes the algorithm's weighting scheme could affect an adviser's ability to explain the algorithm's actions.

It becomes more difficult to assign liability if the robo-adviser provides services beyond merely providing investment advice. Imagine that a robo-adviser has already achieved cross-platform integration, and it flags suspicious spending as it monitors the client's spending patterns and reports those suspicious transactions to the bank. Then, imagine the local power company was recently the unwitting victim of hackers who used the collected account information to charge client accounts. The data collected from other platforms allows the algorithm to see that fraudulent transactions with the power company were constantly cancelled by users and banks. The algorithm might then report for cancellation all power company charges on the client's account, one of which was legitimate and goes unpaid. The client is then charged a late fee.

Realistically, a power bill late fee may not be expensive enough to inspire a client to file suit against the robo-adviser. But imagine for the sake of argument that the client did. This credit monitoring service falls outside of the fiduciary liability scheme of a financial adviser, despite it using the client's spending patterns to better inform its investment advice. As a result, the fiduciary standard does not provide a liability framework. The rest of this Note imagines this sort of sophisticated

robo-adviser, which is integrated into multiple aspects of a person's finances, to evaluate alternate theories of liability.¹¹⁴

B. Alternate Liability Schemes

When considering the rapid development of AI more generally, it is necessary to consider alternate theories of liability that can keep pace. Of course, as robo-advisers become more sophisticated, these alternative schemes may also apply to robo-advisers to cover any gaps left by the fiduciary framework. Possible legal schemes include passing legislation that creates a legal regime granting sophisticated AIs quasi-personhood as a means to partition liability, developing a strict liability approach, mandating insurance for AI owners, and requiring AI owners to pay into compensation funds.

1. *AI and Quasi-Personhood.* If a robo-adviser's algorithm is effectively taking the place of a human employee, why should the law treat the two differently for liability purposes? Adopting a legal fiction that the AI implementation itself is a quasi-person may seem far-fetched at first, but the law has previously considered other artificial entities, like corporations, as person-like.¹¹⁵ Notably unlike a corporation, which can only act through human agents, AI can make decisions and act independently by means of technology.¹¹⁶

114. Although this hypothetical is forward looking, financial technology startups are already playing with the idea of an AI-based financial planner that is not focused on purely managing investments. See Natalia Wojcik, *Pefin, A Fintech Start-up, Is Using A.I. to Offer Financial Advice. Just Don't Call It A 'Robo Advisor.'*, CNBC: MAKE IT. (Sept. 9, 2017, 3:00 PM), <https://www.cnbc.com/2017/09/08/fintech-start-up-pefin-uses-a-i-to-offer-financial-advice.html> [<https://perma.cc/EC5J-G7CV>] (describing Pefin, an AI based financial planner which "receives three months of [a client's] spending data" to "help[] the AI tailor its plan to [the client's] particular spending habits").

115. See David Millon, *Theories of the Corporation*, 1990 DUKE L.J. 201, 206 ("The idea of the corporation as an entity is also apparent in courts' routine statutory construction of the term 'persons' to include corporate as well as natural persons."); see also Lawrence B. Solum, *Legal Personhood for Artificial Intelligences*, 70 N.C. L. REV. 1231, 1238-40 (1992) (providing historical examples in which different societies conferred legal rights on inanimate things); Nina Totenberg, *When Did Companies Become People? Excavating The Legal Evolution*, NPR (July 28, 2014, 4:57 AM), <http://www.npr.org/2014/07/28/335288388/when-did-companies-become-people-excavating-the-legal-evolution> [<https://perma.cc/JU5L-3A3P>] (providing a brief summary of the legal evolution of corporations possessing rights previously reserved for natural persons). In the case of corporations, the Dictionary Act was amended to clarify that a person "include[s] corporations." Dictionary Act, 1 U.S.C. § 1 (2012).

116. This distinction becomes even more important as the Internet of Things continues to develop. Increased communication between machines means that there are more opportunities for AI. For background on the Internet of Things and its possible applications, see Daniel Burrus, *The Internet of Things Is Far Bigger Than Anyone Realizes*, WIRED,

Clear defects in the AI's development might lend the AI to a strict or product liability analysis,¹¹⁷ but this Note posits that the more complex issues surrounding AI will arise when the developer has done everything right, but a sophisticated artificial neural network makes an autonomous decision to change its reasoning. For instance, a sophisticated robo-adviser may reprogram itself because of market shocks, leading the program to tweak its allocation, selection criteria, or more drastically, its stated investing strategy, depending on its architecture.¹¹⁸ If the program takes large steps to redesign itself, should the robo-advisory firm still be liable despite the program's true autonomy?

The European Parliament has considered this question in other contexts and suggested that "in the long run," the European Commission should "creat[e] a specific legal status for robots" and AI to apply in cases "where robots make autonomous decisions or otherwise interact with third parties independently."¹¹⁹ The United States should follow suit. Like the European Union (EU), the United States should investigate how electronic personhood would work with its current liability schemes, with the goal of creating a legislative scheme for quasi-personhood.¹²⁰

<https://www.wired.com/insights/2014/11/the-internet-of-things-bigger> [https://perma.cc/J7YC-TCLY] and Mark Jaffe, *IoT Won't Work Without Artificial Intelligence*, WIRED, <https://www.wired.com/insights/2014/11/iot-wont-work-without-artificial-intelligence> [https://perma.cc/ZZT6-HN9D].

117. Some autonomous machines, like self-driving cars, may better lend themselves to assigning fault based on failures of human design—a kind of product liability or enterprise liability analysis. For an application of product liability theory to autonomous vehicles, see generally David C. Vladeck, *Machines Without Principals: Liability Rules and Artificial Intelligence*, 89 WASH. L. REV. 117 (2014). Another example in which semiautonomous tools were considered under a product liability lens is the Da Vinci surgical robot. *O'Brien v. Intuitive Surgical, Inc.*, 2011 WL 3040479, at *1–3 (N.D. Ill. July 25, 2011).

118. Current robo-advisers likely lack the ability to fundamentally change their coded investment strategies. Yet they continuously tweak their allocation and selection criteria. How this technology responds to market shocks is unknown, and likely will not be fully understood until it happens. This hypothetical poses an interesting issue for robo-advisers. As artificial neural networks become more sophisticated, humans' ability to explain why a network reached a certain decision decreases, depending on the network's architecture. Thus, shifts in selection criteria that the robo-adviser's human supervisor cannot explain to the client likely violates the firm's fiduciary duty given that it could not be sure that the selection was in the "best interest" of the investor. As a result, robo-advisers should ensure that changing market conditions do not leave the firm unable to explain the algorithm's actions.

119. Resolution on Civil Law Rules on Robotics, PARL. EUR. DOC. P8_TA(2017)0051, para. 59(f) (2017) [hereinafter European Parliament Report].

120. This may be as simple as amending the Dictionary Act to include categories of autonomous machine learning algorithms in its definition of "person." U.S. courts would then

General agency law states that an employer may be liable for an employee's actions if that action is "within the scope of employment."¹²¹ This standard means that the conduct must be generally the same kind that the employee was hired to perform, must "occur[] substantially within the authorized time and space limits," and must be done "at least in part" to serve the employer.¹²² Operating under the legal fiction that the AI is a quasi-person, vicarious liability could apply in many cases. The test would be whether the autonomous decisionmaker acted, at least in part, to serve the company that utilizes it. It would be hard to imagine a situation in which the AI was not at least in part serving the employer, because the machine learning algorithm constantly works to achieve a certain objective that is beneficial to the employer.

This theory considers the machine learning algorithm as a stand-alone entity before imparting liability. If an algorithm injures a person while working to fulfill an objective of its creator, liability is directed toward the party that can most effectively bear the loss, in this case, the firm that is benefiting from the algorithm and unleashed it on the public. This incentivizes the firm to oversee the algorithm and ensure it complies with the applicable laws. At the same time, unlike strict liability, this proposal would not automatically impart liability to the firm, because liability hinges on the actions of the algorithm. It is likely that liability will almost always be placed on the firm, but this approach could allow a firm to escape liability if the algorithm was hacked—thereby acting outside of the scope of its "employment"—or if the algorithm autonomously redesigns itself so significantly that society no longer believes the employer is really at fault.

2. *Strict Liability.* There are compelling arguments for adopting a strict liability framework. Although adopting a pure strict liability rule might seem like a shortsighted fix, considering the robo-adviser's independence highlighted above, neural networks are quickly reaching points at which it is impossible to properly understand how the model came to a certain result.¹²³ On one hand, the robo-adviser could act in

decide whether the specific law at issue should be read conjunction with this definition. *See Burwell v. Hobby Lobby Stores, Inc.*, 134 S. Ct. 2751, 2768 (2014) ("[U]nless there is something about the [act's] context that 'indicates otherwise,' the Dictionary Act provides a quick, clear and affirmative answer . . .").

121. RESTATEMENT (SECOND) OF AGENCY § 228 (AM. LAW INST. 1958).

122. *Id.*

123. For further discussion on the development of neural networks, see *supra* Part II.A.

ways so removed from its firm's original instructions that it does not seem fair to hold the firm responsible. On the other hand, the algorithm would not have been in a position to injure someone if the firm had not implemented it. Also, a larger company is in a better position to cover any losses because the company stands to profit from the algorithm's use.

Employers benefit from the use of AI because they avoid paying wages and applicable taxes for the algorithms. These cost savings better enable employers to shoulder the costs of injuries caused by their implementations of AI. Of course, firms that are built around the use of AI do not necessarily operate at higher profit margins than their counterparts, given that they often offer lower-cost alternatives than their competitors. Robo-advisers are a good example of this—these cost savings explain why their services are significantly cheaper than their human counterparts.¹²⁴

The EU's strict liability framework covers instances in which the "damage [is] caused by a robot's manufacturing defects and on condition that the injured person is able to prove the actual damage, the defect in the product and the causal relationship between damage and defect."¹²⁵ The European Parliament also acknowledges that as robotics and AI evolve to the point at which they "autonomously learn from their own variable experience and interact with their environment in a unique and unforeseeable manner," strict liability may no longer be appropriate.¹²⁶ After assigning liability, the European Parliament has suggested alternate schemes like requiring employers and owners to purchase insurance plans or to pay into compensation funds, thereby providing owners limited liability and victims a means to recover.¹²⁷

Whereas strict liability may work well in product liability scenarios, in the United States current strict liability regimes generally bar claims for purely economic damage and thus may not be an apt fit for robo-advisers, capable of exclusively economic injuries.¹²⁸ So, in

124. Libby Kane, *Robo-Advisors Vs. Financial Advisors: Which Is Better for Your Money?*, BUS. INSIDER (July 21, 2014, 4:40 PM), <http://www.businessinsider.com/robo-advisors-vs-financial-advisors-2014-7> [<https://perma.cc/YH64-26QP>].

125. European Parliament Report, *supra* note 119, para. AH.

126. *Id.* para. AI.

127. *Id.* para. 59.

128. This is known as the economic loss doctrine. *See, e.g., Grund v. Del. Charter Guarantee & Tr. Co.*, 788 F. Supp. 2d 226, 246 (S.D.N.Y. 2011) ("Where plaintiffs allege primarily economic loss as an injury in a tort claim, 'the usual means of redress is an action for breach of contract; a

claims against robo-advisers, plaintiffs would have to convince a court to recognize a loss in a portfolio's value as property damage. In other contexts, such as divorce, stock portfolios are often considered property,¹²⁹ but it is not clear how open courts would be to this argument, especially because recognizing investment portfolios as property for tort suits would appear to open state courts to securities litigation on a much broader scale.

Even if courts were to accept such a theory, strict liability may cripple innovation. As a result, U.S. lawmakers should pursue alternate liability schemes that can remedy injured consumers and encourage firm oversight of algorithms, while not disincentivizing or bankrupting firms with massive liability.

3. *Mandatory Insurance and Compensation Funds.* Other mechanisms to ensure payment, such as mandating insurance for employers and owners of AI or requiring payment into compensation funds, could mitigate concerns that strict liability rules could cripple innovation, particularly if those payment requirements are coupled with limited liability for the developer—much like the European Parliament has suggested. These mechanisms could operate similarly to worker compensation funds, so that employers using AI could pay a percentage of their cost savings from utilizing the programs to float the funds, in return for a shield from tort liability.¹³⁰

This approach seems the most feasible. The use of AI provides cost savings, and although those savings are generally passed on to the consumer, a portion of those savings would be put aside to pay for either an insurance premium or a compensation fund. In return, the firm would receive limited liability if the AI were to develop and engage in an action that, first, the firm could not reasonably foresee, and, second, was not because of any design flaw. The injured party could recover all, or a percentage, of actual and provable damages. In return, the firm would not be responsible for any incidental or consequential damages. Further, total liability could be capped at a

tort action for economic loss will not lie.” (quoting *In re Adelphia Commc'ns Corp.*, No. 02-41729(REG), 2007 WL 2403553, at *9 (Bankr. S.D.N.Y. Aug. 17, 2007)).

129. See, e.g., *Kapler v. Kapler*, 755 A.2d 502, 504 (Me. 2000) (describing how to “distribute[] the couple’s marital property” including a stock portfolio).

130. As workers’ compensation is created under state law, different states may treat the programs differently. For an overview of the fifty states’ workers’ compensation regimes, see *Workers’ Compensation Law Compendium*, ALFA INT’L, <http://www.alfainternational.com/workers-compensation-law-compendium> [<https://perma.cc/HN2M-H6Y5>].

certain amount per claim. This properly puts the burden of overseeing the AI on the firm, but also encourages experimenting with complex neural nets by limiting total liability in the case where the AI acts in a truly autonomous and unforeseeable manner.

This compensatory scheme should be layered on the alternate schemes discussed above aside from strict liability which appears to strike an inappropriate balance between protecting innovation and compensating victims. Were this compensatory scheme to apply, in the event of an injury the firm would be liable for any breaches of fiduciary duty under the federal fiduciary standard, as well as any applicable state law fiduciary standards. And, for actions outside the scope of the fiduciary duty, the firm would be responsible for actions that should be attributed to the firm under existing theories of agency, by legally recognizing autonomous algorithms and machines as quasi-persons. Finally, when an algorithm acts outside the scope of agency law, the injured party would have access to a compensation fund. The firm is therefore incentivized to restructure the algorithm but it is not driven to bankruptcy. Innovation can continue, and the injured party is granted some relief.

CONCLUSION

As machine learning algorithms become more advanced, consumers should expect to see more of them employed in innovative ways. Robo-advisers are merely another example of these algorithms replacing a traditionally “human” role. When the Department of Labor raised the applicable fiduciary standard for financial advisers and brokers that handle Employee Retirement Income Security Act accounts, robo-advisers cheered the change, believing they already met the standard.¹³¹ This resulted in many financial professionals and legal commentators questioning how a machine algorithm could possibly meet this standard.

However, as this Note argues, robo-advisers are no less likely to meet this fiduciary standard than human advisers. With the help of recent SEC and FINRA guidance, robo-advisory firms can design their programs to mitigate the concerns that gave rise to the fiduciary standard. Accordingly, the fiduciary standard provides an adequate

131. Jamie Hopkins, *New Fiduciary Rule for Financial Advisors Moves the Needle, but in Which Direction?*, FORBES (June 14, 2017, 3:26 PM), <https://www.forbes.com/sites/jamiehopkins/2017/06/14/new-fiduciary-rule-for-financial-advisors-moves-the-needle-but-in-which-direction/#7f92368e4caa> [https://perma.cc/Z6XE-GUYS].

liability scheme for current robo-advisers, ensuring that victims of algorithms falling short of the standard can recover from the registered investment adviser who can best shoulder the cost; that is, the firm.

As machine algorithms grow in sophistication, the law will consistently face questions of who should be held at fault for increasingly more independent and truly autonomous decisionmakers. Thus, the United States should follow in Europe's footsteps and design a legal regime for autonomous machines. As this scheme is developed, alternate liability regimes, like implementing a compensation fund, could ensure that victims of autonomous machines receive relief. These schemes could also provide some protection to manufacturers and developers by providing limited liability in return for payments to the fund.

Regardless of the scheme adopted, lawmakers should not adopt a quick fix and fail to investigate longer-term solutions to the more nuanced legal issues originating from truly autonomous algorithms. Thus, U.S. courts and Congress should take steps to create an appropriate legal framework, like a mandatory insurance or compensation scheme as described above, and adopt changes that can handle this increasing complexity, thereby paving the way for a legal regime with the capacity to handle truly autonomous technology.