WATSONISATION 2.0—ONE OF FIVE TRENDS SHAPING INNOVATION

THE EXPONENTIAL PULL OF INNOVATION

Asset management and the upside of disruption

SEI New ways. New answers.®

ADVANCING THE STATE OF THE ART

> *"You never change things by fighting the existing reality.* ***To change something, build a new model that makes the existing model obsolete."***
>
> — R. Buckminster Fuller

Asset management firms are built to withstand revolutions, not embrace them. The objective, after all, is to preserve and grow capital. Despite its staid reputation, the investment business is not static, with regulatory changes and competitive pressures periodically spurring change. Now, the introduction of new technologies and business models is making change a constant and causing the industry to be reorganised, re-engineered, and reinvented before our very eyes.

Successfully harnessing technology in a complex and heavily regulated industry is not easy, even when there is great enthusiasm for it. Generous budgets at incumbent firms can be undermined by cultures that prioritise stability over creativity. Insurgents, often the innovators, can be hobbled by inexperience with how the investment business really works. Like most revolutions, the transformation of financial services is inevitably turning out to be a messy affair.

It isn't clear who will survive or emerge victorious, but the basic contours of change are coming into focus. Data plays a central role and is being analysed with increasingly sophisticated tools that include various types of artificial intelligence. If other sectors are any indication, the already pivotal role of platforms is set to expand even further. Social media is causing communications to be remade and reconsidered. Even the gig economy is nibbling at the edges of an industry that, for all of its corporate behemoths, has always been open to scrappy startups.

We addressed these topics in 2016 with *The Upside of Disruption: Why the Future of Asset Management Depends on Innovation*. The themes remain relevant, but a flood of venture capital and widespread adoption of new technologies in the intervening years—compounded by the unexpected arrival of COVID-19—accelerated the pace of change. The net result is a vastly more complex ecosystem populated by thousands of firms at all stages of development. Progress has not been linear. For every genuine innovation, there are countervailing examples of fraudulent or poorly conceived technologies, reminding us to stay sceptical and temper our expectations.

To capture a balanced and up-to-date picture of innovation in asset management, SEI collaborated with ANZU Research to revisit the five ongoing developments that are redrawing the industry's competitive environment.

Released serially over the upcoming months, each of the following themes—dubbed as follows—will be explored in detail, with a particular focus on recent developments:

1	**Watsonisation**	Artificial intelligence is quickly transitioning from curiosity to critical cog in efforts to monetise data and power applications from front to back office.
2	**Googlisation**	Data-smart companies are learning how to access, aggregate and distil competitive knowledge from a vast sea of previously inaccessible information.
3	**Amazonisation**	Online platforms are reshaping business dynamics, putting customers in charge and forever altering the customer experience.
4	**Uberisation**	By rethinking the value chain, a fast-emerging business model points to new ways of creating value and gaining scale.
5	**Twitterisation**	Corporate communication is no longer a one-way street. Technology has transformed how businesses communicate with—and learn from—their customers.

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THE EXPONENTIAL PULL OF INNOVATION

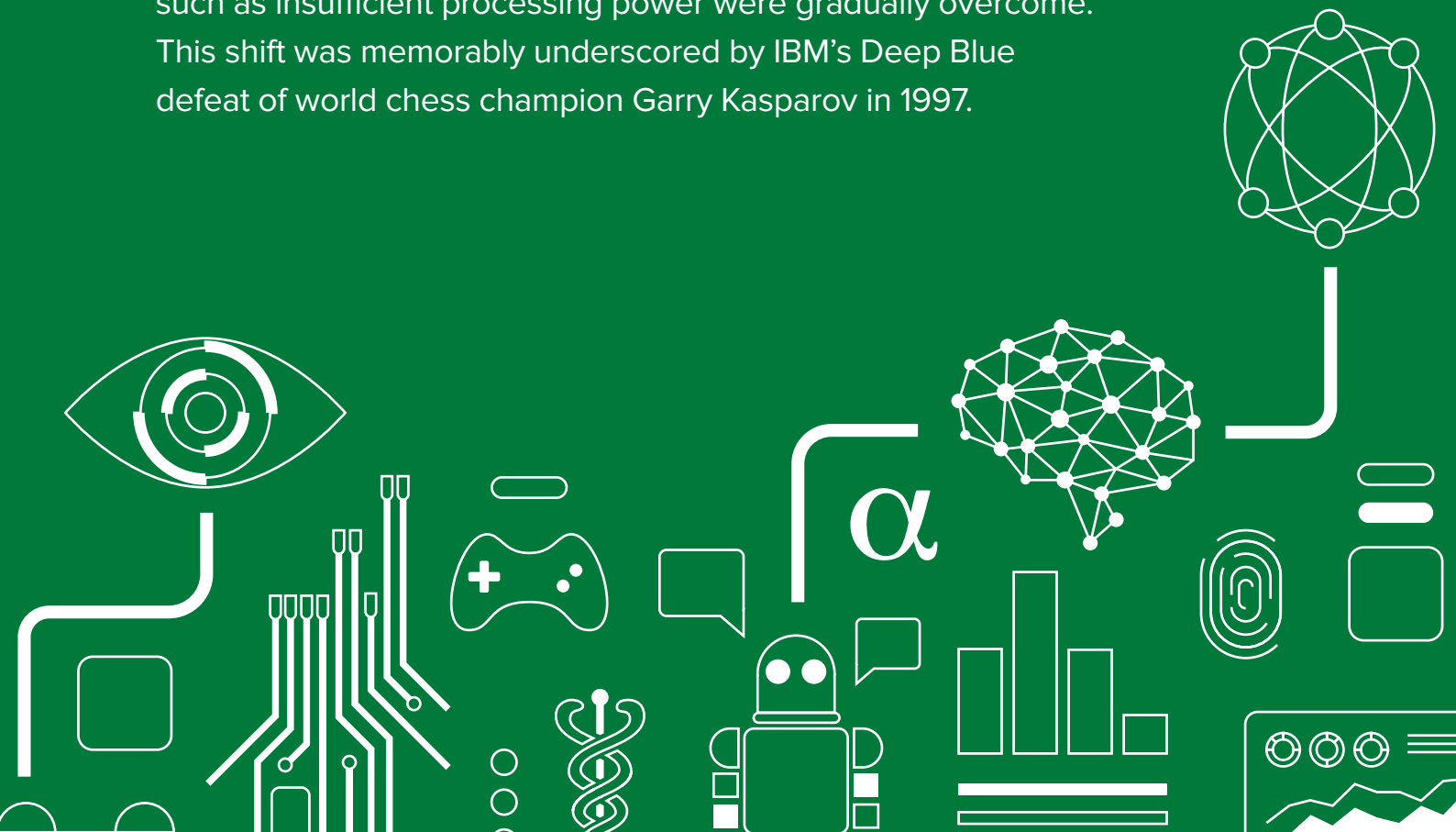
WATSONISATION 2.0

AI in Asset Management

A BRIEF HISTORY

Even millennials can recall a time when artificial intelligence (AI) was just a concept. An idea with roots in antiquity, AI is a familiar theme to legions of science fiction fans. Despite numerous efforts since the development of computers in the mid-twentieth century, however, an electronic brain proved elusive over the ensuing decades.

As the new millennium drew close, previously significant hurdles such as insufficient processing power were gradually overcome. This shift was memorably underscored by IBM's Deep Blue defeat of world chess champion Garry Kasparov in 1997.



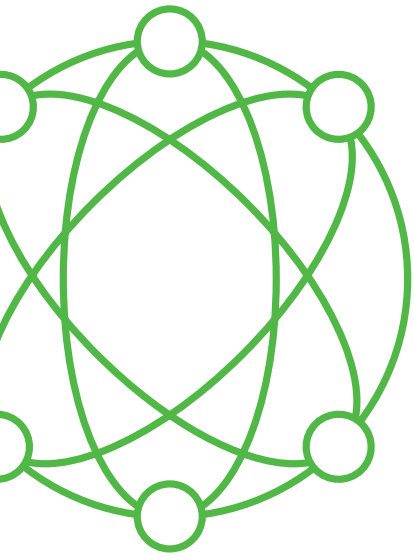
A BRIEF HISTORY

Subsequent developments came fast and furious, with advances in everything from language translation to vehicle automation. Within twenty years, *The New York Times* suggested that interest in all things AI had become a "frenzy."[1]

One reason for this label was public interest in the undeniably impressive performance of IBM's Watson supercomputer, which soundly defeated its human opponents in an episode of *Jeopardy!*, the US television quiz show. Our original white paper, *The Upside of Disruption: Why the Future of Asset Management Depends on Innovation,* introduced "Watsonisation" as a convenient metaphor for the powerful impact that artificial intelligence (along with adjacent concepts such as deep learning) was likely to have on the financial services landscape.

In the spring of 2019, *Jeopardy!* was once again in the news as a (human) participant racked up wins at an unprecedented pace, getting the correct answer (well, question) 97% of the time over 33 consecutive appearances. Cognitive computing has also evolved at an exceptional rate over the three years since our first deep dive into innovation in asset management. The recent *Jeopardy!* uber-champion, James Holzhauer, would be even more hard pressed to notch a win against Watson in 2019.

Watson has gone on to be commercialised, providing the cognitive computing foundation for myriad enterprises and applications.



Brimming with potential, Watson has gone on to be commercialised, providing the cognitive computing foundation for myriad enterprises and applications. **It promises to transform aspects of healthcare and is being harnessed by educators for use as assistants and tutors.** Other applications range widely from weather forecasts to fashion design.[2] The meaning of the term "Watsonisation" may inevitably be diluted as dramatically more intelligent machines emerge, but IBM's handiwork continues to serve as an important and familiar touchstone.

RECENT DEVELOPMENTS

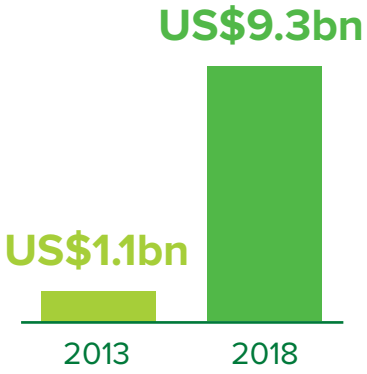
IBM is hardly alone in advancing the state of the art. The field is evolving quickly, in part because of the growing number of participants. In the realm of games alone, there have been more impressive wins by "Team Machine." AI's growing dominance of chess is well chronicled. Google's AlphaGo became the first computer program to defeat a professional Go player without handicaps in 2015 and went on to defeat the number-one ranked player in the world. Even more impressively, its self-taught successor AlphaGo Zero beat the champion-defeating AlphaGo 100-0 at the singularly complex game, whose potential moves famously outnumber all of the atoms in the universe.[3] Similarly, Google's DeepMind has posted significant wins against human opponents across a range of video games. Even Scrabble, Rubik's Cube, and poker are not safe. And Pluribus, jointly developed by Carnegie Mellon University and Facebook, recently demonstrated the extent to which AIs are capable of learning and applying nuanced strategies by roundly beating its human opponents in a popular and notoriously complex version of six-player no-limit Texas Hold'em.[4]

The real power of AI isn't just that it's faster and more accurate.

It is inclined to do things differently.

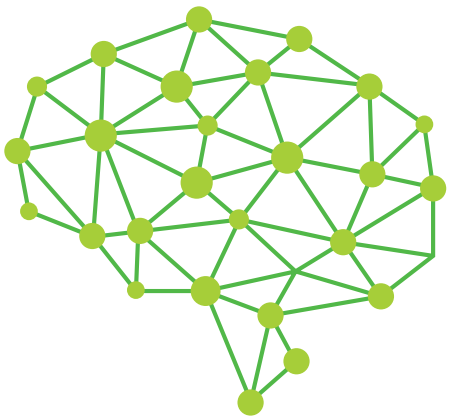
Every new win is a reminder of the growing power of AI. That, however, is old news. It takes a closer look to reveal more interesting developments. Analysts of AlphaGo's play, for example, **noted that it played with a unique style that set it apart from human players, taking a relatively conservative approach punctuated with odd moves**.[5] This underscores the real power of AI. It is not just faster and more accurate. It is inclined to do things differently. Discussing another convincing win by an AI (in the real-time strategy game StarCraft II), an observer said, "It is actually exciting if AI finds new ways to play a game optimally. This is one of the reasons one builds AI, after all."[6]

Investments in Artificial Intelligence Startups



For proof that they approach things differently, one need only look at industrial designs generated by AIs for things like engine blocks, which resemble mysterious life forms from a Ridley Scott film more than something designed by an engineer in Detroit, Toyoda City or Ingolstadt.[7] Design exercises are eye-opening, but after years inhabiting the twilight between academia and science fiction, AI is being applied to real-life problems across a range of industries. Autodesk, for example, has applied AI to a generative design system dubbed Dreamcatcher.[8]

With real-world successes piling up, artificial intelligence now appears poised for prime time and is attracting vast quantities of capital. In our original report, we noted rising interest in AI among venture capitalists. Interest has turned into action as, according to PwC, investments in AI startups grew more than eightfold from US$1.1 billion in 2013 to more than US$9.3 billion in 2018.[9] This stunning figure accounted for almost 10% of all VC activity in 2018.



WIDE-RANGING APPLICATIONS

Many impressive breakthroughs have been fueled by these massive investments. Falling firmly in the skunkworks category just five years ago, AI is now being rolled out in various commercial guises. The proliferation of vendors and growing commercialisation is nothing short of remarkable. Tech titans have the advantage now as they lure top thinkers in the field to the private sector, setting them loose with big budgets and even bigger data sets. But as more startups crowd the space and cloud-based platforms and apps take root, we are likely to see expertise and usage quickly spill over to smaller enterprises as well. **At least one recent estimate puts the number of companies innovating in AI at more than one thousand.**[10]

Farming, logistics and law are only some of the myriad sectors **being transformed by AI.**

Prior to AI resembling anything like reality, it was often conceived as a sort of general, omniscient intelligence. HAL 9000 from the film *2001: A Space Odyssey* is perhaps the most famous example of this model. This is still a goal for some[11], but advances today are more likely to reflect much narrower ambitions. Many people may not even be aware that machine intelligence is operating behind some of the technologies they use regularly. In a global survey of IT and line-of-business executives conducted by Deloitte in 2020, 97% said they are currently using or planning to use machine learning in the next year.[12] Farming, logistics and law are only some of the myriad sectors already being transformed by AI. Enterprise functions ranging from marketing and client service to security and recruiting are close behind. Robots, for example, have played a significant role in the global economy for decades. The thousands of robots currently toiling in factories around the world, however, are typically developed to do programmable, stationary, repetitive tasks. Providing robots with mobility and intelligence changes the game, empowering machines to do an array of tasks almost unthinkable until very recently. **Medicine is another field being transformed by AI,** enabling diagnosticians to enhance their own perspective with the more informed and unbiased opinion of an AI.

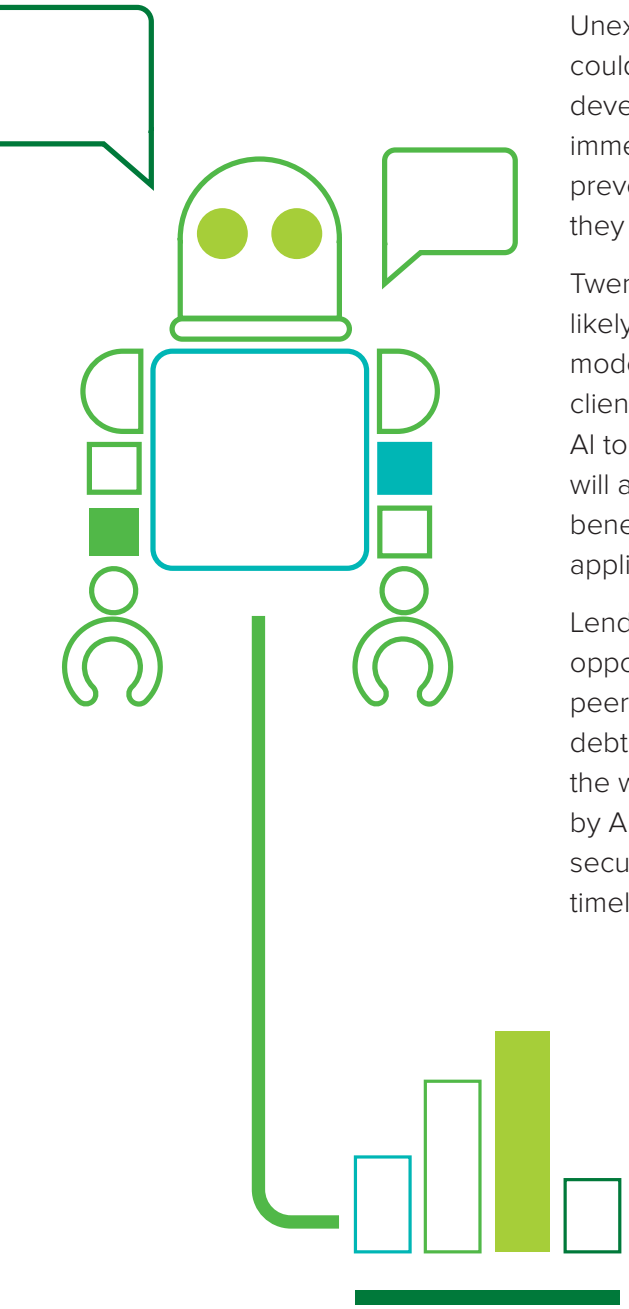
Some applications are so complex that they would never have even been possible without AI. Autonomous vehicles are a good example. Self-driving cars may not quite be ready for prime time on a mass scale, but significant recent advances in safety, comfort and convenience have already filtered down from luxury marques to less exclusive ones. It is no longer shocking when a driver takes their hands off the steering wheel or has their car park itself in tight spaces. When one considers advances in drone technology, autonomous navigation and material science, even the elusive Jetsons-style flying car begins to seem plausible.

Less dramatic but perhaps more profound is the rise of the virtual personal assistant. Kindergarteners and their grandparents alike now routinely seek the advice of Alexa (or Siri or Google) by making requests into seemingly thin air. What was until

recently a clunky but amusing novelty is quickly embedding itself indispensably in people's lives. Natural language processing, image recognition, contextual understanding, engagement and recommendations are all becoming eerily easy, accurate and time-saving thanks to AI.

AI IN FINANCIAL SERVICES

The rise of virtual assistants has been mirrored by the emergence of robo-advisers in the financial sector. The first generation of "robos" may have been relatively simplistic, but it is easy to see the potential for AI to make a difference, **weighing the impact of every life event in real time on an investment portfolio.** Unexpected injuries, the birth of triplets, or surprise inheritances could seamlessly be integrated into a financial plan. Geopolitical developments affecting risk parameters could be reflected immediately. Nor is AI limited to personal finance. With nothing preventing AIs from scaling up or coping with more complexity, they are already being put to work for institutional investors as well.



Twenty years ago, some insightful industry analysts noted the likely shift toward a more objective, less relationship-driven advice model. They dubbed it "HAL vs. Golf."[13] Ironically, advisers and their clients alike may have more time for golf as firms increasingly use AI to enhance human relationships rather than replace them. There will almost certainly be more unintended consequences—both beneficial and otherwise—as AIs are deployed across a variety of applications in the financial services sector.

Lending is one activity that is already being reinvented as credit opportunities are assessed with increasing sophistication. Peer-to-peer retail lending will benefit, as will the already booming private debt market among institutions. Insurance companies will change the way they do business, as actuarial processes are enhanced by AI. Regulatory compliance will become increasingly proactive, security is likely to improve and fraud detection will become more timely and accurate.

AI is making natural language processing, image recognition, contextual understanding, engagement and recommendations **easy, accurate and time-saving.**

Many of these transformations rely on AI's ability to better understand the likely outcome of specific circumstances. This predictive quality is of tremendous interest to asset managers, which is why we see portfolio management teams increasingly augmented with quantitative specialists who bring new tools to bear on significantly larger sets of data. Growing transparency and liquidity are making it more difficult for active managers to generate alpha, but AI offers an edge to anybody savvy enough to use it effectively in their chosen niche.

In some ways, asset management seems perfectly suited for the widespread adoption of artificial intelligence. Data is its lifeblood, and there is an abundance of historic and real time data from a huge variety of sources (both public and private/internal). Traditional sources of structured data are always useful but ripe for more automated analytics. Unstructured data of various types (e.g. satellite feeds, debit transactions or traffic data) also hold out promise. Furthermore, objectives and performance metrics are relatively straightforward in a business where success is measured by absolute or relative performance. If one approach does not work, there will be ten alternative approaches vying for the same investor's attention.

However, several factors work against what should be an effortless bond. The business of money management is inherently conservative, with the retention of capital just as important as asset gathering. New technology can be embraced, but adoption is likely to be cautious and incremental. Legacy systems challenge implementation. There is also the very real possibility that portfolio management may be a much higher hurdle for AI to overcome than chess or video games, for the simple reason that research has shown capital markets to be "constantly adaptive."[14] Any information advantage gained can quickly evaporate, particularly in an environment populated by a growing number of AIs. This theoretical roadblock has not deterred people from trying. Pure play AI/machine learning firms managed US$10 billion of assets through the end of 2017.[15]

Given asset management's reliance on efficient data processing, rapid decision making and accurate reporting, there are myriad ways **machine intelligence can have an impact.**

A competitive edge in stock picking or trading strategy may or may not be sustainable or profitable, but there is no shortage of other opportunities for asset management firms. Given that the asset management business hinges on efficient data processing, rapid decision making and accurate reporting, there are myriad ways machine intelligence can have an impact. All of these are areas in which AIs shine. The biggest hurdle may be transparency, which is sometimes in short supply: **Even engineers who design AIs can sometimes struggle to explain their behaviour.**

Machines are learning to listen, read, think and write. They are increasingly able to deal in ambiguity and make decisions among an arbitrary number of choices. They can plan ahead. Some are even creating art (that is quickly snapped up by collectors). If a machine can produce paintings, develop recipes or write songs, there are surely ways it will change finance that have not yet been imagined. It is never easy to predict where emerging technologies may take us, and it is entirely possible that killer applications may "sneak up on us."[16] Powerful enabling tools already exist. Industry leaders are beginning to put them to work finding efficiencies, improving the client experience and identifying new sources of alpha. The mainstreaming of AI in asset management is underway. For the asset management industry, the global AI market is expected to reach US$13.43 billion by 2027, according to Grand View Research.[17]

AI Industries

Finance
Healthcare & life sciences
Media & entertainment
Cybersecurity
Manufacturing
Agriculture
Education
Transportation

AI Components

Machine learning
Autonomous vehicles
Neural network
Natural language processing
Robotics
Data mining
Deep learning
Chatbots

ASSET MANAGEMENT **EXAMPLES**

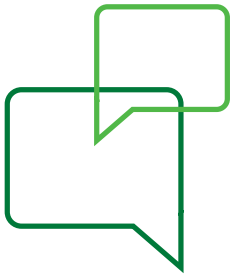
CLIENT EXPERIENCE

Investment firms and wealth advisory businesses are **experimenting with bots in growing numbers.**

AI-powered chatbots (bots) can increasingly be found across a range of businesses, where they are being used to enhance client service and support. Access is 24/7, queries can be answered in real time, accuracy is virtually guaranteed, and the ability to make sound recommendations means the client's financial wellbeing is proactively addressed. As a result, investment firms and wealth advisory businesses are experimenting with bots in growing numbers.

Getting started is not complicated, thanks to tools like **IBM's** Wealth Management Chatbot starter kit, which enables users to query their investments and perform scenario analyses. **Kasisto** provides a turnkey solution with KAI, a conversational AI platform that they describe as "fluent in finance." **IPSoft** has developed a virtual assistant called Amelia with expertise in financial services that the company claims is a jack of all trades, ready to help with advice, reports, onboarding and portfolio diversification. **Abe AI** has been integrated with many popular assistants such as Amazon's Alexa to provide simplified financial advice and banking.

FINANCIAL ADVICE



Chatbots can assist with many aspects of investing, but they are not generally deployed as full-fledged financial advisers. This is an area of keen interest to some of the biggest names in the industry. **Vanguard** and **Schwab** have both launched AI-powered services for their clients, called Personal Advisor Services and Intelligent Portfolios Premium respectively. Independent robo-advisers, who captured the collective imagination with their low-cost, technology-driven introduction in the wake of the global financial crisis, are also looking at AI for a way to make their client offering more compelling and their business models more efficient. It is easy to see how AI could drive further growth and expansion of firms like **Betterment** or **Wealthfront**.

PORTFOLIO MANAGEMENT

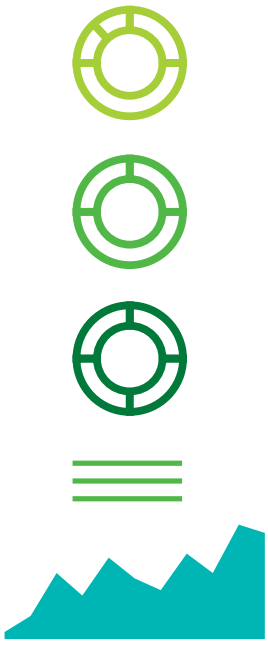
Many hedge fund managers are launching funds with an **AI serving as portfolio manager.**

Asset managers have employed quantitative strategies for decades, and algorithms already manage high-frequency trading systems that account for a sizable portion of the market's total transaction volume. Whilst the rise in computing power enabled faster and more sophisticated strategies, AI offers something different. It is difficult to say no to the promise of a virtual team of portfolio managers who never sleep, systematically parse vast amounts of data, and quickly apply lessons learned in an adaptive environment. Machine learning is particularly intriguing for hedge fund managers, who enjoy many advantages over their more US SEC-regulated 1940 Act brethren whilst facing an extremely competitive environment and widespread disappointing returns in recent years. Many are exploring how to best integrate AI into their strategies, whilst others are launching funds with an AI serving as portfolio manager. Firms such as the **Man Group**, **Bridgewater Associates** and **Renaissance Technologies** already use AIs to varying degrees.[18] This relatively cautious approach is understandable from industry titans, but a more direct and dramatic approach has been taken by younger upstarts. **Sentient Investment Management** was one of the more prominent

PORTFOLIO MANAGEMENT (CONTINUED)

AI-driven funds, but closed down after less than two years in business. This could be taken as a cautionary tale about the dangers of letting AIs manage money, but it may have had more to do with the fact that Sentient's fund was designed to be market neutral, a category that was struggling to attract assets anyway. Whilst quantitative managers have existed across structures and regulatory regimes, the use of AI had predominantly been limited to hedge funds. Today there are now multiple ETFs managed by AIs, including **AIEQ**, which is powered by none other than IBM's Watson.

INVESTMENT RESEARCH



Information advantages can be tenuous or short-lived propositions. One of the attractive things about AI is its ability to power predictive analytics. Firms with deep pockets will develop proprietary AIs to gain an edge, but even smaller firms can benefit, as infomediaries roll out their own technology. The ubiquitous **Bloomberg**, for example, partnered with **Alpaca** to introduce a price forecasting app dubbed the Alpaca Forecast AI Prediction Matrix.

Because forecasting is susceptible to countless biases, AIs offer the prospect of not only more informed predictions, but less clouded decision making. AIs have been shown to occasionally reflect the prejudices (conscious or otherwise) of their programmers (e.g. worse facial recognition for minority women), but they are less likely than the typical investor to suffer from irrational exuberance or paralysis. Free of these human behavioural quirks, AIs are better able to illuminate variables, probabilistically predict outcomes and suggest a sensible course of action. Recently acquired by Standard & Poor's, **Kensho Technologies** is a leader in this space and already working with most of the world's leading financial institutions. **Kavout** crunches massive amounts of structured and unstructured data to generate what it calls the Kai Score, a stock ranker predicting outperformance.

CREDIT ANALYSIS

Lenders are looking for **a new way to optimise their assessments of borrowers.**

Fueled by a global slowdown in bank lending and investors eagerly seeking new sources of yield, alternative debt has had a remarkable run in recent years. Institutional investors are pouring their assets into private debt funds, whilst smaller retail investors feed the growing market for peer-to-peer loans. All of this activity means lenders are looking for ways to optimise their assessments of borrowers. AI offers the potential to make quick and accurate assessments at low cost, using an array of factors not considered in traditional credit analysis. Companies in this category use AI for robust credit scoring and lending applications. **ZestFinance** offers an underwriting solution that permits lenders to better gauge the creditworthiness of borrowers with limited credit history. **Scienaptic Systems** and **Underwrite.AI** also assist in credit scoring, even when traditional data points are missing.

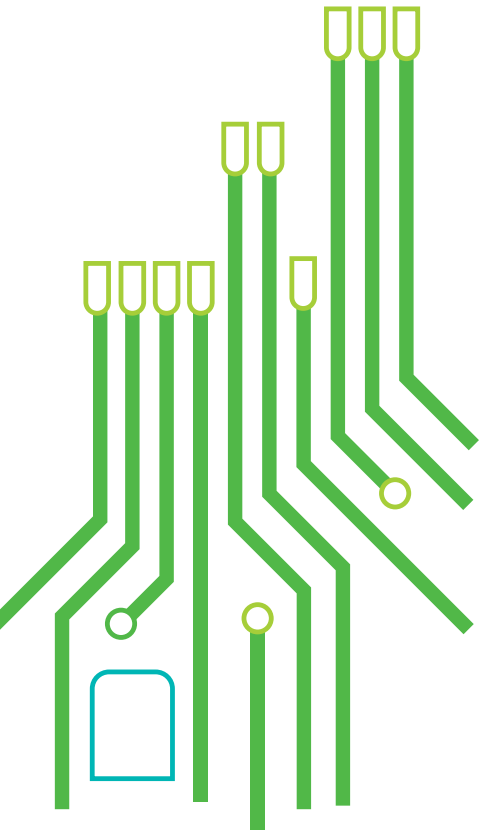
RISK MANAGEMENT

AI is ideally suited for portfolio as well as enterprise risk analysis. Its ability to analyse massive amounts of structured and unstructured data in real time means the impact of existing risk factors can be monitored vigilantly even as new ones are pinpointed with confidence. **Ayasdi** uses AI to help financial firms manage enterprise risk on multiple fronts, not least of all by fighting money laundering through early detection. **BlackRock**, concerned about adequate risk management of client portfolios, rolled out Aladdin Risk, a portfolio construction and monitoring tool that tracks thousands of risk factors for individual and institutional investors.

OPERATIONS

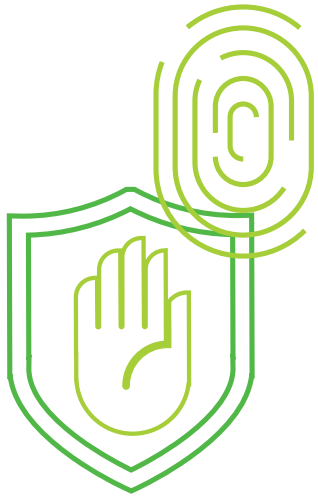
Asset management operations are becoming increasingly complex. Diversification into a wide range of strategies, the proliferation of investment vehicles, regulatory scrutiny, demanding clients and a globalising market mean front-, middle-, and back-office operations might bewilder anyone more accustomed to the way things were done 20 years ago. Outsourced service providers and technology vendors have helped managers adapt to this new reality, but it can nevertheless be distracting and expensive. AI can alleviate some of this burden with automation and fail-safing, performing operational tasks with greater efficiency and accuracy. Implementation may not be straightforward, given the likely presence of legacy systems. These systems will in many cases need to be replaced with agile ones before companies can reap the benefits of AI.

There is another fundamental reason that AI has not yet been widely adopted in the back office. Probabilistic outcomes are fine for security analysis or sales pipelines, but accounting, reconciliation and regulatory compliance are much more exacting. Nevertheless, pattern recognition and machine learning should eventually be able to optimise even the most complex operating environments. This potential is magnified many times over by the prospect of linking the terabytes of data cycling through the back- and middle-office more intelligently with market- or client-facing functions.



Low-code platforms like **Appian** are positioning themselves to capitalise on these trends, promising speedy development of cloud-based apps to meet a variety of enterprise needs. Intelligent automation is critical to greater operational effectiveness and is now being future-proofed by the introduction of AI capabilities, courtesy of **Google Cloud Platform**.[19] **WorkFusion** is another firm relying on AI to create more efficient workflows by allowing users to quickly and easily automate business processes.

SECURITY & REGULATORY COMPLIANCE



Cybersecurity is a priority for all types of businesses, but with their access to troves of sensitive data, financial firms are among those most acutely concerned with vulnerability. The criminals, vandals and state-sponsored actors posing a threat are endlessly creative, ensuring that security is a running battle. Spotting anomalous behaviour can often be a hit-or-miss proposition, and fraud might be detected only months after a breach, if at all. With AI, investment firms now have a powerful new weapon at their disposal.

Cutting-edge providers of security rely on AI to not only predict and assess threats, but to also recommend courses of action or even respond automatically. **Plaid**, a company whose widget links financial institutions to enable streamlined and secure transactions, fights fraud with algorithms that can "analyse interactions under different conditions and variables and build multiple unique patterns that are updated in real time."[20] **Vectra** offers a threat detection system called Cognito, that uses AI.

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*Based on *Pensions & Investments*' Largest Money Managers 2019 ranking

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