



# Man or Machine – Who's really driving your portfolio?

February 2019

**Artificial intelligence (AI) is an increasingly popular topic for the finance industry. Despite recent advances, many applications of this extraordinarily expansive area of computer science are still in their infancy. This is particularly the case with regard to AI and Asset Management. It is our belief that the real source of help to the industry is Intelligence Augmentation (IA), which uses AI to help humans make decisions, rather than making the decisions for them. Here, we explore the ways in which human led data science can be used in a sustainable and repeatable way to improve outcomes for investors.**

**Mark Ainsworth**  
Head of Data Insights  
and Analytics



AI is a popular topic. Coverage of driverless cars, for example, has fostered excitement and sparked the imagination of what may be to come. From a consumer perspective, these and other AI advancements are an advert for how technology might shape the future. Within the investment industry, such innovations have created intrigue as to whether machines will replace human portfolio managers. 'Robo-advisers' already exist, providing basic financial advice using algorithms calculated from questions being asked. Computing power continues to grow and a vast library of historical market information is now at our disposal from which we can attempt to predict future outcomes with greater accuracy. So is AI-driven asset management that far off?

Despite the advances in this area, we believe that some reservation is warranted before we give our fiduciary responsibilities (and our capital) over to machines.

One type of AI that has potential for the investment industry is Machine Learning: the use of statistical algorithms and techniques to learn, and systematically improve, outcomes for a given task without any explicit programming. One of the most common commercial applications of machine learning is predictive analytics, i.e. using existing data to help forecast what future results might be. AI is a heterogeneous computer science and there are a number of different types of predictive analytics systems within it. It is worth comparing how the use of IA and AI could be applied to investing.

## License and registration, please

Conceptually, driving a car and investing have some similarities – both involve getting from A to B as quickly and easily as possible without taking too many risks. In the case of investing, 'B' (the destination) can be capital preservation or retirement planning.

In the field of autonomous driving, the type of AI used is called an Autonomous Driving Platform (ADP). While the ADP – the AI component – is technically what simulates the human, that is "drives" the driverless car, it is in fact the various external factors (Component 01 in Figure 1 on the next page) being instantaneously and continuously collected which deliver the critical component in the driving system. These external inputs are fed into the ADP (Component 02) which, along with a pre-loaded guidance database, produce a synthetic driving behaviour similar to that of a human driver, such as adherence to traffic signals, acceleration or deceleration, and responding to obstacles in or near the path of the car.

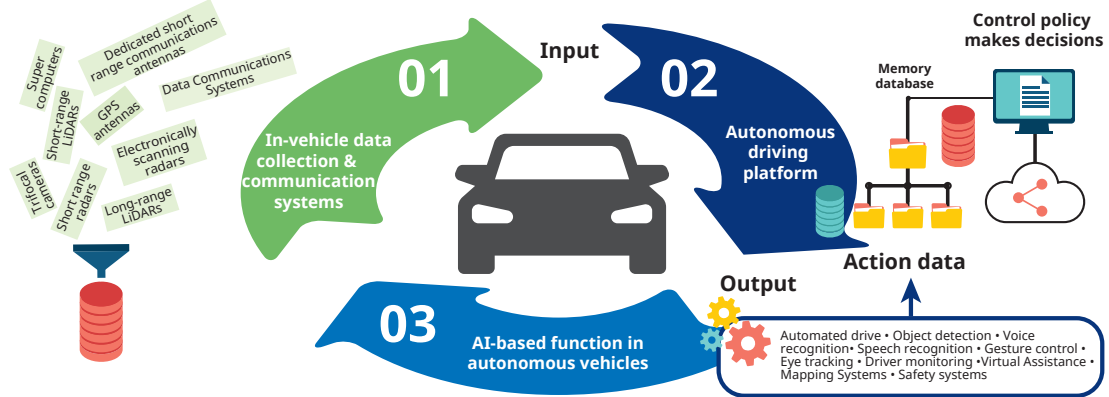
This is referred to as a Perception-Action Cycle. What makes the ADP unique is that all of the information is stored and constantly re-evaluated in order to refine the external output. That is, the system "learns" how to be a better driver with each mile driven.

What determines the quality of learning is the quality of the input. When it comes to obtaining optimal AI outputs, there are five key computation parameters:

1. A constant environment where the rules are fixed and don't change
2. The data is digital and quantifiable
3. Data is abundant (this could vary by industry)
4. There is low uncertainty
5. Objectives are clear

In our view, these elements are necessary for AI to succeed.

## Perception-Action Cycle example for autonomus driving models



AI computing systems like IBM's Watson and Deep Blue, and Google's AlphaGo have been highly publicised successes in the gaming sector and in this domain AI has performed well. Some hedge funds also employ algorithmic AI trading strategies which seek to predict patterns in short-term market trends and exploit these trends through thousands of trade executions.

However, what makes these systems so powerful in areas like gaming and problem solving is that they are, for the most part, bound within a closed informational universe. Games have rules (a constant environment), little to no uncertainty around these rules, a clearly defined objective, and there is a calculable (albeit overwhelming) number of quantifiable moves, countermoves, and so forth that can be drawn upon. But what happens when the rules change, or the context of the inputs changes?

While AI platforms make for great headlines, the reality is that many produce incorrect outputs and almost all of them require some additional human intervention – coding and algorithm amendments – in order to function properly. If we refer back to those five parameters, most AI systems (especially investment-driven programs) do not adhere to all of them.

IA on the other hand, which has been around for about the same time as AI, has a strong track record and can be observed in virtually all areas of our daily lives. IA is simply the enhancement of intelligence through technological means. Returning to the example of driving, cars have had features that augment a human's abilities for many decades. They include everyday features like mirrors, temperature warning lights or speedometers that provide timely information about the state of the car. They are all designed to help the human drivers of the vehicles make better decisions about how to drive. Contemporary cars are full of much more sophisticated features: seatbelt sensors, parking sensors, blind spot collision alerts and of course, satellite navigation (or satnav). These are modern examples of IA.

## What's in an acronym: How AI and IA work together

For investors, IA is a much more relevant area of science than AI. It enables us to extract insights few others can discern – even with the data being in plain sight. This has tremendous advantages when it comes to fundamental investing. Note that in many of the driving examples above the driver is made aware of things that are otherwise hidden or hard to perceive – (a car in a blind spot, traffic on the route of a journey). You can drive your car without this information but you will drive it to your destination more quickly and safely if you have this additional information.

Any fund manager in considering an investment has access to many useful pieces of information about a company – its financial state, its revenues, the stated plans of its management. But there are other important things that investors do not currently have access to through traditional channels. For example:

- What do consumers really think about a particular brand?
- How are consumers' opinions being influenced by a company's strategic initiatives or a scandal that might have occurred?
- What demographic group does it currently most appeal to, and is its growth going to be achieved by focusing on them or expanding to other groups?
- Are its retail outlets located in the areas within driving distance of its target consumers?

The companies themselves will be able to answer those questions, as it is central to how they plan their corporate strategic goals. Whole departments are dedicated to mapping and analysing data on local populations, running surveys and examining loyalty card data to inform their strategic plans. However, most investors only get to see fragments of this information in company reports and earnings guidance, rather than a complete picture of that company and their sector.

However, if the datasets that can fill these blind spots are publically available (as they are sold by research agencies, published by governments and circulated by industry bodies) very little remains proprietary to an individual investor.

How then does any one investor gain an advantage? The main issue is that these datasets are far too big and too unstructured for an investment professional to utilise. Turning the data into insight, to fill a blind spot, requires deep expertise in statistical methods, data engineering and mathematical modelling. Imagine seeing the GPS traces of millions of phones when really you want to know is if the roads have a traffic jam. In order to condense data into something that can augment intelligence and help a human to make a better decision, an IA interface is required.

Returning to the five conditions required for AI tools to succeed, we believe that long-term investing will remain a human task because the following conditions for AI to be effective are often lacking:

1. **Constant environment:** This isn't the case for investing. Markets are always changing, with continuous innovations in structure, regulations and the behaviour of market participants.
2. **Abundant data:** This can be the case for short-term trading but it would be difficult to apply this to fundamental investing as good quality company data only goes back a few decades. This is not nearly enough for any algorithm to tease out any complex relationships. The global financial crisis of 2007-08 played out more like the 1930s depression than more recent recessions but there are few data sets that go as far back as that. Even if such data sets were available, there is doubt as to how they would provide any

discernible insights given how many other things now are completely different following 80 years of social, financial and technological developments.

3. **Low uncertainty:** This is not applicable for investing. Financial markets are volatile and unpredictable with prices driven by investors operating on multiple different time horizons and thrown by market impacts and irrational biases. Complex networks of algorithms can trigger flash crashes, adding to market volatility.
4. **A clear objective:** For investing as a general concept this is clear, but for individual funds with different objectives, there is no single moment in time when any given investment has succeeded or not. Due to fluctuating prices, it is difficult to evaluate whether a security may or may not eventually yield a profit. Investment objectives are dependent on the audience: for example a closed defined benefit pension fund is unlikely to want the volatility of a Small Cap Equities fund, while the same fund may be very appealing to those with a larger risk appetite.
5. **Digital information:** Good investors synthesize all the relevant information available to them (including, but not limited to: research reports, their understanding of market forces, the effects of company management, regulators and politicians, the mood of the market). However the nuances of that information and particularly the more qualitative aspects are difficult to digitise.

## Conclusion

**We believe the biggest opportunity to achieve better investment outcomes for asset owners, using artificial intelligence and machine learning, is for data scientists to augment the intelligence of fund managers, closing their blind spots and allowing them to see further, more clearly and more reliably. The information edge is particularly significant when many market participants lack the ability to close these blind spots, whether through lack of technology, initiative, scale or structure. And there are ample opportunities to use 'AI' techniques such as Machine Learning to refine and sustain this information edge.**

**It is still up to the individual fund manager whether to buy or sell a security. But think how good it feels to exit the motorway a mile before congestion and take a traffic-free detour while everyone else sits in their cars because they didn't know the jam was there. Conversely, an even more well-informed driver, with specific familiarity of a newly opened route or upcoming incident, might elect not to blindly follow the guidance that his or her GPS system instructs them to take – in some instances a rather dubious detour based solely on an unattended algorithm. This, in our view, is where AI and IA find their optimal balance.**

### Important Information

The views and opinions contained herein are those of the authors as at the date of publication and are subject to change due to market and other conditions. Such views and opinions may not necessarily represent those expressed or reflected in other Schroders communications, strategies or funds.

This document is intended to be for information purposes only. The material is not intended as an offer or solicitation for the purchase or sale of any financial instrument or security or to adopt any investment strategy. The information provided is not intended to constitute investment advice, an investment recommendation or investment research and does not take into account

specific circumstances of any recipient. The material is not intended to provide, and should not be relied on for, accounting, legal or tax advice.

Information herein is believed to be reliable but Schroders does not represent or warrant its completeness or accuracy. No responsibility or liability is accepted by Schroders, its officers, employees or agents for errors of fact or opinion or for any loss arising from use of all or any part of the information in this document. No reliance should be placed on the views and information in the document when taking individual investment and/or strategic decisions. Schroders has no obligation to notify any recipient should any information contained herein changes or subsequently becomes inaccurate.

Unless otherwise authorised by Schroders, any reproduction of all or part of the information in this document is prohibited.

Any data contained in this document has been obtained from sources we consider to be reliable. Schroders has not independently verified or validated such data and it should be independently verified before further publication or use. Schroders does not represent or warrant the accuracy or completeness of any such data.

All investing involves risk including the possible loss of principal.

Third party data are owned or licensed by the data provider and may not be reproduced or extracted and used for any other purpose without the data provider's consent. Third party data are provided without any warranties of any kind. The data provider and issuer of the document shall have no liability in connection with the third party data. [www.schroders.com](http://www.schroders.com) contains additional disclaimers which apply to the third party data.

Past performance is not a guide to future performance and may not be repeated. The value of investments and the income from them may go down as well as up and investors may not get back the amounts originally invested. Exchange rate changes may cause the value of any overseas investments to rise or fall. This document may contain "forward-looking" information, such as forecasts or projections. Please note that any such information is not a guarantee of any future performance and there is no assurance that any forecast or projection will be realised.

**European Union/European Economic Area:** Issued by Schroder Investment Management Limited, 1 London Wall Place, London, EC2Y 5AU. Registered Number 1893220 England. Authorised and regulated by the Financial Conduct Authority.

**Note to Readers in Hong Kong:** Schroder Investment Management (Hong Kong) Limited, Level 33, Two Pacific Place 88 Queensway, Hong Kong. Central Entity Number (CE No.) ACJ591. Regulated by the Securities and Futures Commission.

**Note to Readers in Indonesia:** PT Schroder Investment Management Indonesia, Indonesia Stock Exchange Building Tower 1, 30th Floor, Jalan Jend. Sudirman Kav 52-53 Jakarta 12190 Indonesia. Registered / Company Number by Bapepam Chairman's Decree No: KEP-04/PM/MI/1997 dated April 25, 1997 on the investment management activities and Regulated by Otoritas Jasa Keuangan ("OJK"), formerly the Capital Market and Financial Institution Supervisory Agency ("Bapepam dan LK").

**Note to Readers in Japan:** Schroder Investment Management (Japan) Limited, 21st Floor, Marunouchi Trust Tower Main, 1-8-3 Marunouchi, Chiyoda-Ku, Tokyo 100-0005, Japan. Registered as a Financial Instruments Business Operator regulated by the Financial Services Agency of Japan. Kanto Local Finance Bureau (FIBO) No. 90.

**Note to Readers in People's Republic of China:** Schroder Investment Management (Shanghai) Co., Ltd., RM1101 11/F Shanghai IFC Phase (HSBC Building) 8 Century Avenue, Pudong, Shanghai, China, AMAC registration NO. P1066560. Regulated by Asset Management Association of China.

**Note to Readers in Singapore:** Schroder Investment Management (Singapore) Ltd, 138 Market Street #23-01, CapitaGreen, Singapore 048946. Company Registration No. 199201080H. Regulated by the Monetary Authority of Singapore.

**Note to Readers in South Korea:** Schroders Korea Limited, 26th Floor, 136, Sejong-daero, (Taepyeongno 1-ga, Seoul Finance Center), Jung-gu, Seoul 100-768, South Korea. Registered and regulated by Financial Supervisory Service of Korea.

**Note to Readers in Switzerland:** Schroder Investment Management (Switzerland) AG, Central 2, CH-8001 Zürich, Postfach 1820, CH-8021 Zürich, Switzerland. Enterprise identification number (UID) CHE-101.447.114, reference number CH02039235704. Authorised and regulated by the Swiss Financial Market Supervisory Authority (FINMA).

**Note to Readers in Taiwan:** Schroder Investment Management (Taiwan) Limited, 9F, 108, Sec.5, Hsin-Yi Road, Hsin-YI District, Taipei 11047 Taiwan, R.O.C. Registered as a Securities Investment Trust Enterprise regulated by the Securities and Futures Bureau, Financial Supervisory Commission, R.O.C.

**Note to Readers in the United Arab Emirates:** Schroder Investment Management Limited, 1st Floor, Gate Village Six, Dubai International Financial Centre, PO Box 506612 Dubai, United Arab Emirates. Registered Number 1893220 England. Authorised and regulated by the Financial Conduct Authority.

CS1076