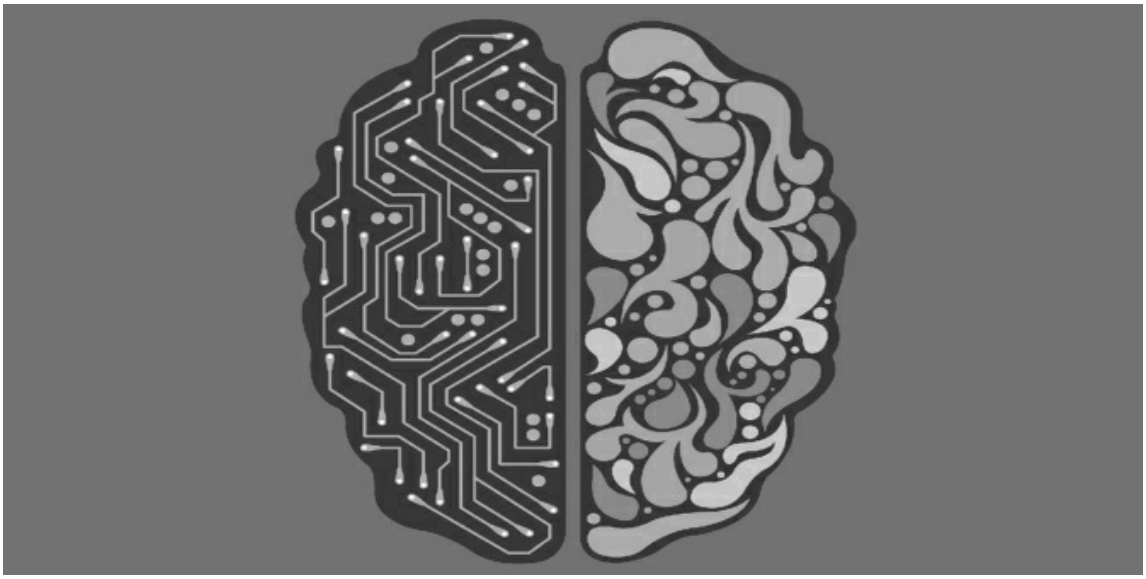
Human in the loop: why we will be needed to complement artificial intelligence



Along with artificial intelligence (AI), it is likely most readers will have observed the increased press coverage around automation. More recently these two terms are being used jointly to present a world where AI can significantly push the envelope of what is possible to be automated today. Whilst I believe this is true, it is worth analysing the state of automation today without AI, and then overlaying where AI can genuinely be additive to an organisation. The article concludes by examining a possible limitation of AI that presents an opportunity for mutually beneficial human and machine co-existence.

It is not just about reducing cost

Let's ask the question 'why automate'? Take a simple business process that happens today in your organisation, and that involves human effort. What are the advantages of fully or even partially automating this process through the use of technology? From an organisation perspective the answer largely boils down to three factors. The first, which most readers will see as the obvious one, is cost; simply put, being able to produce the same economic output where skilled human capital has been substituted for cheaper technological capital. As well as reducing the cost per unit, technology has the beauty of scaling in a way human capital simply cannot. Take an asset manager that doubles the amount of client money under management. Traditionally the firm would have to ramp up staffing, i.e. double the number of execution traders to manage increased trading turnover. However, with a trade automation technology in place, it could manage that extra inflow with a lesser increase in headcount. In this example automation is used as a way to scale the business up. More humans are required, but at much reduced ratio.

Secondly, if we take a highly repetitive yet business critical process that humans have to do, for example, analysing trades for reconciliation errors, it is not hard to imagine human errors creeping into the process and negatively affecting the company from a monetary as well as reputational stance. With rules-based automation, the chances of trivial mistakes should be fully eliminated.

Finally, the most interesting benefit discussed in the business and academic press is in situations where automation can be used to free up human bandwidth from repetitive monotonous tasks and direct it to higher value functions. Whereas the other two benefits were focused on cost reduction, this one has a revenue-increasing potential. Continuing with the trading desk example above, with automation in place the execution traders have more time to spend on other business activities. These could be working more closely with portfolio managers in the idea-construction phase to help steer how market liquidity might affect instrument selection, or being available to present at investor pitches to help secure further capital to manage.

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Defining automation

A technology product that delivers automation can go into two camps: 'as-is' automation versus 'new' automation. In 'as-is' automation the existing software applications currently used by humans to perform a function can be automated by a 3rd party technology. These technologies are specifically programmed by an end user to deal with specific scenarios that may require a human to interact with a single application — or a number of them — on their desktop. This is classified as Robotics Process Automation (RPA). This type of technology is relatively easy for organisations to adopt, especially at grass root levels, since it doesn't require the involvement of in-house development teams. The payback thus can be quick and sizeable, proving why it is an attractive first step into automation. For example, the insurance industry has embraced RPA to perform tasks from reducing the time it takes to issue new policies to managing the claims-handling process. The retail industry is using RPA to reduce the cost of processing customer returns, which usually requires a worker to update independent inventory and billing systems.

'New' automation products are software applications that are designed from scratch to automate a specific function or series of functions that deliver client value, like for example trade automation software. As these applications are designed anew, the actual business process being automated can be reimagined to see if it makes sense in a digital world. Steps that once required human interaction can just be eliminated through systematic database lookups and multiple application interactions. This last benefit is largely thanks to the advancement of Application Protocol Interfaces (APIs), which enable different software applications that make up the business process to talk to each other programmatically. In the financial world it cannot be underestimated how industry-sponsored initiatives such as Financial Information eXchange (FIX) and Financial Products Markup Language (FpML) have helped to advance this cause by providing industry-standard languages on how financial applications can talk to each other.

Overlaying AI

AI comes into play with automation because it allows more tasks to be automated, especially functions that are more complex and which require more ability to make judgement calls than a simple 'if-then-else' rule could allow for. This judgement can be seen as a skill that humans possess in their field of expertise and can take years if not decades to acquire and perfect. Armed with data and novel machine-learning modelling techniques, technology can now replicate this judgement and make predictions with a degree of accuracy that was simply not possible a few years ago – whether it is to apply the brakes, in the case of a driverless car, to positively identify a tumour as malignant from an MRI scan or to respond to a customer via a chatbot. Going back to our trading example, AI could be used to learn which brokers provide optimal execution in a certain asset class, where the machine could automatically route new orders to those brokers rather than being explicitly programmed through rules-based logic. With more trades taking place, it can continuously learn and improve is algorithm.

Robot vs cobot

AI fuelled automation has been driving a lot of the current press articles that can paint a dismal view of human jobs. Some publications, however, provide a more balanced and arguably realistic picture of how jobs will be affected. For example, a recent study by Harvard Business Review found that the benefits of AI really come into play only when humans and machine work together in collaboration. It recognises that the roles of humans in the workplace will change, from just being 'doers' to becoming 'trainers' for their virtual colleagues. A report published last month by the World Economic Forum also portrays a similar vision of the future though positively noting that 133 million new roles may emerge to replace the estimated 75 million that will be displaced from being done by humans to machines.

Co-existence in practice

So how will humans thrive in co-existence with their robot counterparts? One area where we humans excel over machines at present is our ability to be creative and use our imagination. To illustrate this, I recall a recent scenario at home where, after I unpacked yet another Amazon delivery, my 15-month-old daughter immediately sat in what I saw as a dull brown box and started to 'row her boat', the box instantly transformed in a vessel sailing the oceans.

Figure 1. A boat!

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I was curious to see what the AI would make of the same box; would the state-of-the-art algorithms deployed by the leading technology companies be able to see the potential of the box, or, just see a box. The results below, ran against a number of vision algorithm providers shows the raw values returned by their API after processing the image of the box.

Figure 2. Image of a box and AI readings of it

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AI Technology	API Return Values after seeing image of box

Google	"labelAnnotations": [
	{
	"description": "box",
	"score": 0.7284952,
	},
	{
	"description": "floor",
	"score": 0.7193532,
	},
	{
	"description": "plywood",
	"score": 0.6713846,
	}

Microsoft	"tags": [
	{
	"name": "box",
	"confidence": 0.9032381772994995
	},
	{
	"name": "container",
	"confidence": 0.6838579773902893
	}

Amazon	"Labels": [{ "Name": "Box", "Confidence": 86.03479766845703 }, { "Name": "Cardboard", "Confidence": 86.03479766845703 }, { "Name": "Carton", "Confidence": 86.03479766845703

In fairness, that was a tough ask. To give the AI a chance I decided to hack together a mast for the box so the image looks more representative of a boat and then re-run the experiment.

Figure 2. Image of a box with a mast and AI readings of it

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AI Technology	API Return Values after seeing image of box with a mast

Google	"labelAnnotations": [
	{
	"description": "floor",
	"score": 0.81978875,
	},
	{
	"description": "box",
	"score": 0.781327,
	},
	{
	"description": "furniture",
	"score": 0.7391288,
	}

Microsoft	"tags": [
	{
	"name": "box",
	"confidence": 0.9335464835166931
	},
	{
	"name": "square",
	"confidence": 0.15637145936489105
	}

Amazon	"Labels": [{ "Name": "Furniture", "Confidence": 52.64271926879883 }, { "Name": "Plywood", "Confidence": 51.3547477722168 }, {

Despite the addition of a makeshift mast the AI is left lacking in imagination. The results may not be surprising but they conveniently illustrate the point that even the best machine-learning algorithms are unable to see the potential of something in the same way a human can.

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Another key advantage for the home team is our ability to make highly accurate predictions from very limited training data. The AI community recognises this and proposes Human in the Loop (HITL) as a way to overcome this limitation of AI by preserving the human in the process. In systems that adopt HITL the AI is asked first to make the prediction with an associated confidence score. If the score is less than an acceptable threshold a human is brought into the loop to make the inference instead. The machine then learns (referred to as 'active learning') from the human and consequently the quality of its predictions should get better.

It is our ability of being creative, curious and making quality judgements with less learned data that will be key attributes to complement our AI colleagues in coming years.

All views expressed are my own.

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