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techUK AI Week
Considering the UK's AI future
#AIfuture

Contents

Foreword	04
AI, Ethics and Trust	05
Automating Work. Humanising Jobs	06
What AI Will Mean to the Workplace	07
Augmented Intelligence in Increasing the Productivity of UK plc	08
Evolving Technology Means We Need a Step Change in Britain’s Digital Skills	09
I - AI is the New UI	10
AI meets Cyber Security	12
How Ransomware Sparked a Surge in Machine Learning Security	13
Hope and Responsibility: The Promise of AI	14
Communicating the Future of AI Through the Wisdom of Our Children	15
Conversational Applications Deliver the Intelligence Your Business Needs	17
The Opportunities Presented by Machine Learning, Following the Publication of a New Report from the Royal Society	18
Friend not Foe: Robotic Workforces Could Boost - Not Break - Our Working World	19
Machine Learning: Delivering on the Promise of Big Data	20
Access to Data is Key to Creating a Competitive AI Market	21

Foreword

Sue Daley | Head of Programme | Cloud, Data, Analytics and AI



New technologies such as predictive data analytics, machine learning and Artificial Intelligence (AI) have the potential to be significant drivers of change across the UK economy and society. This ranges from personalising shopping experiences to improving public services delivery to increasing business efficiencies.

techUK's AI Week explored the opportunities and benefits that the technology can bring to the UK. Throughout the week, members and key stakeholders gave their views on the value AI can bring to UK organisations, both in the public and private sector, and its role in increasing the UK's digital productivity and economic growth.

This is, however, just the start of the conversation with techUK members. It is vitally important that all businesses and citizens feel ready and able to take advantage of these evolving technologies, now and in the future.

Through briefing sessions, roundtable meetings and events, techUK is raising greater awareness and understanding of the opportunities offered through the application of AI technologies in different sectors, and discussing with members how to create the right environment for AI companies to thrive and grow.

The publication in October of the independent review commissioned by Government, Growing the Artificial Intelligence Industry in the UK, is an important step in identifying where the UK must strengthen its technical, academic and research leadership to make it the best nation in the world for AI companies to thrive. techUK has welcomed the report's recommendations which include a role for techUK in supporting the uptake of AI in the UK, a task that will be a focus of our 2018 AI activities.

With the technology sector increasingly being looked to for answers on key issues such as digital and data ethics, techUK is holding a Digital Ethics Summit in December to discuss the ethical issues raised by AI. This Summit will bring together philosophers, academics, industry and policy makers to consider the digital and data ethics questions being asked today and identify future ethical issues that may need to be addressed.

If you would like to get involved and help drive forward techUK's AI work and activities, including our 2018 AI Week, please do get in touch. In the meantime, I hope that you enjoy reading these insights.

AI, Ethics and Trust

Robert Bond | Partner | Bristows LLP

The increased reliance upon algorithms and artificial intelligence (AI) to produce outcomes and profiling in big data projects such as humanitarian actions, healthcare plans, financing decisions, connected autonomous vehicle infrastructures and generally in marketing and advertising, raise ethical and trust questions around the risks associated with a lack of emotional human intervention.

A recent report by the Alan Turing Institute in London and the University of Oxford has suggested that there is a need for the creation of an AI watchdog to act as an independent third party that can intervene where automated decisions create discrimination. The report indicates that where there is no human intervention in an outcome based on algorithmic automated decisions, then the results may be flawed or discriminatory because the data samples are too small or based upon incorrect or incomplete assumptions or statistics.

Leaving aside the question of whether or not AI needs the watchdog that the Report above calls for, there is the further question as to whether or not individuals have the right to know how algorithms are working that may impact upon their data protection and human and consumer rights. Well there are such rights under the current Data Protection Act 1998. Section 12 gives individuals the right to understand the methodology applied to automated decision making such as performance at work, creditworthiness, reliability or conduct. However this right has seldom been used, and historically there has always been human intervention in profiling activities. Now however, the advances in profiling technology mean that AI functions more and more without human intervention. The Report above and guidance from the Information Commissioner's Office reinforce the need for individuals to have enforceable rights and for data controllers to comply those rights.

The EU General Data Protection Regulation (GDPR) specifically deals with automated decision making in Article 22, although it is a limited right in that an individual can only object where the algorithm or AI produces a legal or similar outcome that adversely affects the individual. There is no right to object where the profiling is necessary for the entering into a contract or where the individual has expressly consented to the automated decision making. GDPR does, however, place strict obligations on businesses that use AI to put in place security by design and privacy by default to protect the human rights and privacy of individuals, and where AI and profiling uses sensitive data such as biometrics, religious and philosophical beliefs, health data and criminal records, then in addition to security and privacy, the business must have obtained explicit consent to the processing.

Whilst GDPR focuses on aspects of automated decision making, it leaves controllers to take responsibility for compliance and ethics in the use of AI and profiling. It does not expand in Article 22 on how privacy by design nor privacy impact assessments must be applied to automated decision making practices. GDPR does however generally require adherence to privacy by design, security and privacy impact assessments. So controllers and in some cases, processors, must put in place policies and procedures in anticipation of the exercise of rights by individuals under not only current law but also GDPR from 2018.

As individuals begin to understand their enhanced data subject rights under GDPR, such as the right to object to automated decision making but also the rights of erasure, rectification and information, then they will also realise they have rights to compensation for not only actual but also emotional damages where their personal data is abused. So we may see a growth in compensation claims by aggrieved individuals who feel that AI and profiling may have unfairly discriminated against them and businesses that are not prepared to respond to such claims may find themselves not only embarrassed in court but also subject to further investigation by the relevant data protection authority.

Automating Work. Humanising Jobs.

Andrew Cleminson | Business Development Director | Agilisys

The UK government's recent announcement of £270m of funding for the development of Artificial Intelligence (AI), is great news. Now's the time to understand the opportunity on offer and to take the first steps in realising the benefits. Andrew Cleminson, business development director at Agilisys – digital transformation specialist for the public sector - considers the possibilities.

What's happening?

We have reached a new crossroads. Increasingly, clever software carries out routine admin tasks, reducing the need for us to do these things ourselves. We are all taking advantage of this new capability whether it's in finding our way to a chosen destination, meeting friends or receiving real-time information just when we need it. Artificially intelligent software has finally become intelligent.

In the world of work, high performance systems are enabling us to provide our clients with better service whilst reducing errors, exceptions, transactions times and cost. Application forms, claims, complaints and requests for information can all be read by software. More importantly, software can understand the language used and work out what needs to happen next. In doing so, it can validate data by looking in other systems, read and process supporting evidence and present agents and case workers with data summaries to help them make quick, secure and safe decisions.

What's the opportunity?

New capability means new opportunity. The question on most people's minds is: How do we make the most of it? I'm sure you've seen articles stating that robots will replace us and jobs will disappear. As with any industrial revolution, that's only part of the story. The other side of the coin says that 65% of children entering primary school today will work in jobs that currently don't exist [1]. And that's the key point – new types of work are coming and we need to embrace the change and create the digital skills to take advantage of new possibilities.

Where next?

The race is on to work out how to use intelligent and robotic software to our own advantage. There's nothing wrong with getting it to do the jobs we no longer want to do ourselves. In some cases, it's simply better as well. Where we've deployed our automation tools we've found that we can improve business performance by an average of 74%, whilst also making people's lives easier. Frankly, most people go to work to make a difference rather than sift through piles of paper or emails hour after hour, day after day. That's where the opportunity lies. Get software to complete repetitive, structured tasks, whilst we manage the ones that need our skill, expertise, insight and empathy.

Agreeing a new division of labour, with our intelligent software friends, will enable us to recast our working lives. As with previous industrial revolutions, we can automate work. This time around we can also humanise jobs. That's the difference. We stand on the threshold of a new world, one where we can increase engagement, serve citizens better and as a result, attain greater levels of fulfilment in our working lives. Let's make the most of it.

References

[1] The World Economic Forum – The Future of Jobs and Skills, 2016

What AI Will Mean to the Workplace

Milena Sakowicz | Marketing Manager | G1ANT

The inventor of the world wide web, Sir Tim Berners-Lee, recently warned that artificial intelligence could develop decision-making capabilities that impact the fairness of economic systems, if allowed to operate at a high level of business.

Although data gathered by artificial intelligence is often used to inform decisions made at board-level, such as the predicted growth of demand for a product within a particular industry, AI is a long way from calling the shots. Presently, decision-making AI in offices remains limited to repeatable, mundane tasks like formatting and filing documents.

A recent report from PwC predicts that up to 30% of jobs in the UK are at risk of being taken over by AI and robots by early 2030. While this might come as a surprise to some, IT departments will already be aware that they need to prepare their systems for the technology. Most CIOs and IT decision makers understand that AI and automation will change the job market as we know it, but also realise this won't happen overnight.

While it's easy to attribute the varied impacts of workplace transformation to AI, what the technology's introduction means for a particular industry is the responsibility of regulators and businesses. AI will be used to replace jobs, however, the surplus capital achieved by introducing AI could be reinvested into training workers to develop skills that hone the company's competitive edge.

For example, Newcastle-based software provider Sage will launch an artificial intelligence training programme called BotCamp, through which 100 school leavers will be educated on the skills they need to work in the industry and an understanding of their skills' impact on the UK's changing economy.

By enabling employees to focus on stimulating work rather than menial back-office processes, they will be happier and more productive. Ultimately, the advantage AI offers most businesses won't be gained from the costs cut with the technology (which will be widely available), but from the more challenging, profitable tasks that employees will have more time to dedicate to.

Although we're already experiencing many of AI's benefits in our home through virtual assistants such as Google Home and Amazon Echo, the term is still conjures associations of a dystopian sci-fi future where human ability comes in second place. In actuality, like many other technologies, AI's impact on the workplace in the near future will be limited to predictable processes that support more valuable human-led activities.

Augmented Intelligence in Increasing the Productivity of UK plc

Kim Nilsson | CEO | Pivigo

The last twelve months have seen a lot of hype around artificial intelligence. This is in part justified by recent advances in deep learning, image and speech recognition and algorithm advancement, and in part by individuals excited about the potential of data but perhaps uncertain of the difference between machine-learning, deep learning, artificial intelligence etc. The question that is on mine, and many others', minds is how artificial intelligence can impact on the productivity and growth of our Economy; how, how soon, and how much?

In short, I think the answers to the second two questions are 'very soon' and 'a lot', but I think the greatest question is 'How?'. In my work, I speak with a lot of organisations; from corporate multi-nationals, through SME's, to fast-growing start-ups. Each category of business has different challenges. Corporates have typically jumped on the data science trend, with teams of data scientists working on novel applications to their data, but wondering how to find use for the latest technologies internally. Start-ups in this space are often the first to adopt new methodologies, and in a 'research-style' environment explore new applications, but they often struggle with access to data on a scale that can fuel their growth. Personally, I am particularly interested in the development of data capabilities in SME's. To most SME's, even the concept of data science, let alone artificial intelligence, is new and unfamiliar territory, and the threshold to get started that much greater.

I believe we are a long way away from true artificial intelligence, and that the debate should focus on what I like to call "augmented intelligence" instead. Data science, machine-learning and algorithms should be developed to augment human decision-making, rather than replace it with something artificial. Consider the difference between virtual reality and augmented reality. In virtual reality, the experience is driven entirely by what is seen on the screen, what is machine-created, whereas in augmented reality, machine-developed data is overlaid on reality, with the user able to select whether to focus on the machine reality, or the true world. It is my firm opinion that we are at a point in history where we are not able or ready to rely fully on machine intelligence, but what we can do is to use machine-learning results, overlaid on human processes, to enhance our decision making for faster, better, more efficient and more unbiased decisions.

One SME client we worked with last year was typical in all of these respects. A mid-sized business doing well, based in northern England, keen to make better use of their data but lacking the skills internally to know how to get started. Connecting them with a team of data scientists, they got started with looking at pricing strategies using the database of sales made over the past ten years. The price to sell each item for was set on the spot for each sale, by the sales person on the phone with a buyer. In a short period of time, the data science team was able to use off-the-shelf machine-learning algorithms to propose an optimum price for each item to sell at, based on day of the week, client details, stock levels etc. The analysis showed that the potential increase in revenue, going straight through to the bottom line, was in the multi-millions of pounds. What is important to note is that this system is not designed to replace the sales people, but merely to support the sales people in their price decision making - to augment their intelligence.

This case is particularly poignant because it displays an answer to all three questions; how, how soon and how much. For this business, it was a matter of using relatively simple techniques to set prices, which can deliver a significant increase in the profitability of this company in the next 12 months. Now imagine if these applications were rolled out across all of UK plc. The gains could be enormous and fuel an economy that is in great uncertainty.

In conclusion, the debate around artificial intelligence will serve our community best if focused on real world applications and how they can augment decision making. I would also suggest that very few organisations actually need the latest tools or technologies, and that a great deal of value and productivity lies in a wider spread adoption of simple techniques, and in simple use cases. Let us dream about a future when machines can think for us, but let us implement machine-supported decision making and reap the benefits today.

Evolving Technology Means We Need a Step Change in Britain's Digital Skills

Gavin Mee | Senior Vice President, Enterprise Sales and Head of UK | Salesforce

Ten years ago, Steve Jobs stood on stage and famously said "We're introducing three revolutionary products.... These are not three separate devices, this is one device, and we are calling it the iPhone."

Yes, it's been just 10 short years since the launch of the first iPhone. In those years our use of smartphone technology has evolved enormously, changing the way we shop, communicate and find our way around. Fast forward to 2017 and we're seeing a new wave of technology emerge that will alter our lives even more.

Cloud computing and digitisation are disrupting everything, the lines are blurring between Artificial Intelligence (AI) and humans and, thanks to 3D printing, we can reproduce pretty much anything. New innovation is emerging faster than our imaginations with IDC estimating that the AI market will grow from \$8 billion in 2016 to more than \$47 billion in 2020. We are truly seeing the dawn of the Fourth Industrial Revolution. And while many people are quite concerned about AI replacing the workforce, we need to look past the initial fear to imagine the benefits. The workforce will become more efficient and can focus on more high-level tasks - tasks that allow us to bring our brains to bear.

With this fast pace of innovation, the key question isn't just what kind of world will we be living in 50 years' from now. It's how we ensure that as a nation we're ready for this change and properly train people so and no-one is left behind.

I believe the answer lies in our core competencies. With technology at the heart of everything, it is digital literacy and skills that will be most critical to making sure our workforce is ready for what's next.

The most recent Global Innovation Index ranks Great Britain as the third most innovative country in the world - an achievement we should all be very proud of. It would be easy to think that we're already well positioned to benefit from the Fourth Industrial Revolution.

However, within the ranking we scored considerably lower when it came to skills and education. We might have some of the best universities in the world for research and the most innovative creative industries, but that doesn't mean the average Briton has solid digital skills.

This matters a great deal, not just for our competitiveness as a nation, but because today's secondary school pupils will soon find themselves in a world of work largely based around technologies their parents once saw as science fiction - from driverless cars and robot assistants to nanotechnology.

Sounds far-fetched? According to the World Economic Forum, 65% of today's children will have jobs that haven't been invented yet. It might be hard to comprehend this statistic, but one thing is clear: without up-to-date digital skills our children will be left behind.

In the UK specifically, we're seeing a massive boom in the formation of AI businesses with the number of companies focusing specifically on AI doubling from 2014 - 2016, compared to the prior period 2011 - 2013.

We owe it to these growing sectors, and our children, to help them succeed in a technology focused economy.

For our part, Salesforce offers free high-tech and business skills training through Trailhead, an online programme that trains participants on Salesforce and other tech and business expertise. It aims to prepare them for the nearly 140,000 Salesforce-based jobs that we expect to be created in the UK between 2015 and 2020.

To date, more than 25,000 people have used Trailhead in Europe, with many retraining from different industries. Other tech companies are also stepping up and offering digital apprenticeships and free training.

But as we're only at the beginning of the fourth industrial revolution there's much more to do to help everyone keep pace with it. We're living in a time of amazing possibilities, but also of serious risk in terms of inclusion and equality. It's therefore a time when we all need to do our bit to ensure future generations are well-equipped to do so in a prosperous, competitive nation.

I hope that by 2027, when we celebrate the 20th anniversary of the iPhone (even if by then it will inevitably be a museum piece) we're part of a digital-savvy nation where everyone has the skills to participate and embrace change fully.

I - AI is the New UI

Emma Kendrew | AI Lead | Accenture Technology UK

AI is no longer about how your company does things – it's who you are.

Technology is no longer simply about automation or large scale systems nailed onto the organisation. It's about the experience of your customers, and that of your employees. It's about what you are, not what you've bolted on.

Accenture's Technology Vision 2017 explores the emerging technology trends we predict will have the greatest impact on organisations in the next three years. Trend 1, AI is the New UI looks at how artificial intelligence will quickly become more than just an underlying technology capability. Over the next few years, AI is likely to become the 'digital spokesperson' for companies across the globe.

With each customer interaction becoming more personalised, powerful, and natural, AI moves into an even more prominent role. It becomes a fundamental tool for daily engagement with people – both customers and employees. It will become a key point of distinction for businesses versus competitors, and so must be considered a core competency demanding of C-level investment and strategy. Much more than just another technology tool to help increase efficiency or generate value, AI is no longer about how your company does things—it's who you are.

Simplifying Natural Interactions

Once upon a time, Siri was just the app you might use for scoping out takeaway places in a new area. Fast forward five years, and artificial intelligence has taken on a whole new dimension. Today, more than three million people happily chat with Amazon Echo's conversation-based assistant, Alexa. Echo acts as a personal DJ, manages home and diary, or orders a car for a trip – and throughout all of it, people simply talk to Alexa.

From autonomous driving vehicles that use computer vision, to live translations made possible by artificial neural networks, Artificial Intelligence is making every interface smart and simple, and is setting the bar high for how future communication with brands will work.

Instead of interacting with one person at a time like a human representative, an AI system can interact with an infinite number of people, based on the skills built for it. Not only can it create and maintain a powerful brand experience through every interaction, it can use learning capabilities to deliver a hyper-personalised, smart and seamless customer experience.

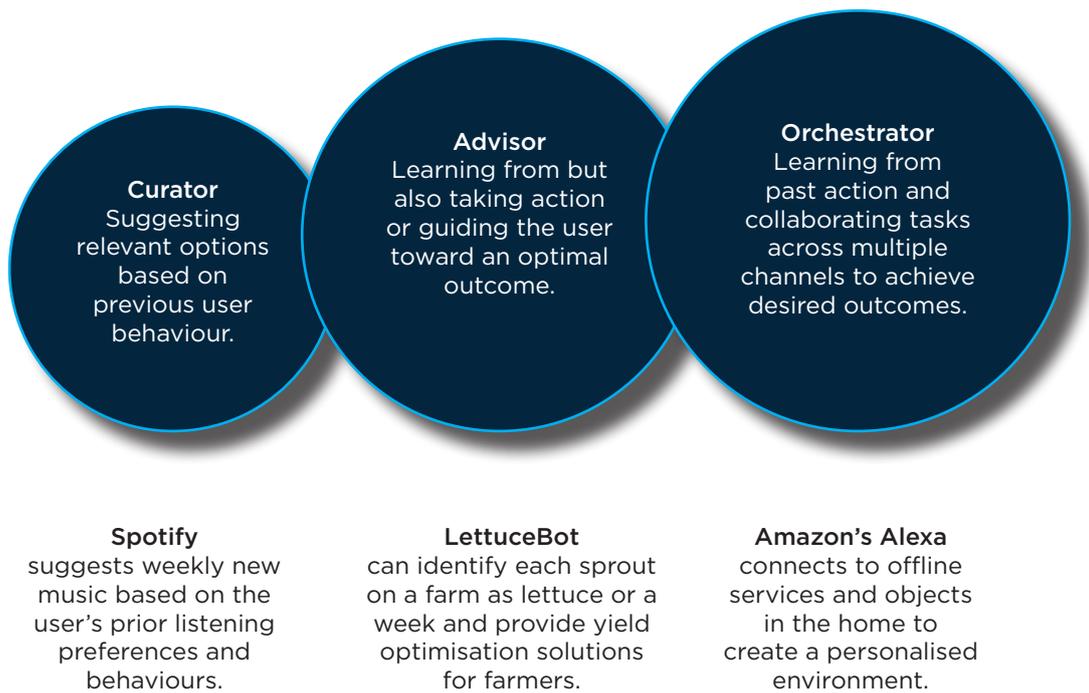
According to Accenture's research, US businesses lose an estimated \$1.6 trillion annually due to poor customer service, while 68% of consumers report they will not go back to a company once they have switched. For companies that use AI to get customer service right, and harness its capabilities in a responsible way, the opportunities are endless.

Evolving Role of AI

The user experience is at the heart of technology, and AI is already playing a variety of roles in this. At the simplest level, it curates content for people, through apps like Spotify suggesting new music based on previous listening choices (see Figure 1).

But it also goes much deeper, by applying machine learning to guide actions towards the optimum outcome. For example- farmers are improving yields by implementing AI-enabled crop management systems, using advanced algorithms to achieve optimal growing conditions. The same concept can be applied to any industry or activity – from recommending a mortgage to advising an optimal medical treatment plan - and that's what's driving a burgeoning interest in AI development. As an advisor, AI can help people make the best choices, based on the best information, to deliver the best outcome.

At the height of sophistication, AI works as an orchestrator. It collaborates across experiences and channels, often behind the scenes, to accomplish tasks – and learns from interactions to help anticipate, suggest and complete new tasks.



Building Responsible AI

Whether as a curator, advisor or an orchestrator AI is transforming the relationship between people and technology. As it becomes people's "go-to" technology, it will require enterprises to step up to a new challenge: creating responsible AI. AI will be successful only if it's adopted by people, and it will only be successful if it helps provide better outcomes for people and society.

As machines become smarter, it's time to reevaluate our relationship and communications with them, to learn how we can better deliver our overall objectives. AI is transforming the way we interact, and how organisations use it will define not just who they are, but send a powerful message to customers and employees about who they want to be.

AI Meets Cyber Security

Andy Powell | VP and Head of Cyber Security | Capgemini UK

As AI meets Cyber Security, organisations and hackers will be forced to compete for the upper hand, says Andy Powell, VP and Head of Cyber Security at Capgemini UK.

The use of Artificial Intelligence (AI) has found its place in the infrastructure of business and government with increasing prominence in recent years. As its application in cybersecurity becomes more apparent, we are starting to see businesses and hackers go head-to-head. Hackers are able to develop more sophisticated threats, and businesses are using the technology for prevention and remedy.

Businesses must tighten their defences

With large-scale security breaches increasing in number over recent years, businesses need to act now to tighten up cyber defences. Over the next year, we'll see a rise in AI systems being adopted to bolster organisation's defences, performing tasks including re-writing encryption keys continuously - preventing them from being unlocked by hackers.

These more practical uses for AI are allowing organisations to anticipate issues before they arise through threat analysis, detection and modelling. A human manually checking systems for signs of outside breaches could take several weeks, whereas the use of AI adds an extra layer of protection and allows organisations to react much quicker to any breach.

Hackers must find new tactics

Where vulnerabilities in software and online have previously been numerous, we will see these diminish as businesses minimise the gaps within their organisation's defences. This will force hackers to up their game, using AI technology to launch more sophisticated attacks. An example of this can be seen in phishing emails, which use data from the target to replicate human mannerisms and content. This will make it harder for businesses and individuals to recognise when they're being hacked.

AI and insider threats

Insider threats have always been a cause for concern, but AI can now help to detect a break from normal employee behaviour and breaches in corporate policy. This technology could be used to discover employees that are accessing certain company information without authorisation, and evidence of them transferring this information outside of organisation walls. Exact sentiment will be difficult to detect from AI technology alone, and privacy laws will be key here if organisations are to avoid breaches in employee law themselves.

Future proofing the industry

Although the risk of cyberattacks is increasing, there is much to be said for simple cyber hygiene as a defence against many threats. But as the nature and complexity of AI grows, businesses should consider how to incorporate this new technology into their cybersecurity strategies.

A combined effort is needed. Investment in preventative AI is promising, but the Government must continue to back the education of future technology professionals. A recent report by the Centre for Cyber Safety and Education revealed that a widening gap is emerging, with a shortfall of 1.8 million cybersecurity professionals expected by 2022. In a society whose future is bound with technology, change is needed rapidly to avoid having a technology without the professionals that know how to use it.

How Ransomware Sparked a Surge in Machine Learning Security

Dr Jon Oliver | Data Scientist | Trend Micro

There appear to be many “next generation” security companies using machine learning in their marketing campaigns. But why now? After all, machine learning has been around for years. In my opinion, it’s because of the evolution of ransomware.

The ransomware business model

There has been a fundamental shift in the commodity malware industry. Consider the ways that you can monetise a malware infection. They include:

- Renting out the infected server, to send spam/launch DDOS attacks/mine for Bitcoins etc.
- Directly stealing money – such as via a banking Trojan
- Stealing valuable customer data/intellectual property
- Hold to ransom the computer you have just infected

There are a few issues with the first three strategies. Renting out stolen servers requires a lot of infrastructure to control and maintain – and the return on this investment is relatively low. Directly stealing money from people’s banks accounts requires a complex system of money mules to launder the money itself, and many banks have systems in place to detect and block suspicious transactions. Stealing intellectual property requires you be able to identify the valuable and find a buyer – all of which may take considerable time.

On the other hand, if a cyber-criminal ransoms the computer and its data, they get a premium price per infection. The hacker gets paid right now in Bitcoin, which can be quickly anonymised with a Bitcoin scrambler. In fact, the introduction of Bitcoin and other crypto currencies has rapidly accelerated the adoption of the ransomware business model.

The benefits of ransomware

Ransomware has some features which distinguishes it from cyberthreats of the past. It is:

- Highly visible to the victim
- Highly disruptive – as bad as a critical false positive in the OS which causes a BSOD or similar
- Has a high ROI, which enables attackers to invest in extraordinary levels of evasion from cybersecurity products

Many of these evasion techniques are well known, but there is one I want to mention. The Cerber malware factory creates a new Cerber ransomware malware instance every 15 seconds. This must cost quite a bit, but apparently it is worth it for the bad guys.

Enter machine learning

Against this back drop we have machine learning: our knight in shining armour riding into town to save the day. Now machine learning technology in cybersecurity is currently very good at spotting and blocking threats at time zero. But on the minus side, it might have a higher false alarm rate than other techniques.

Prior to the rise of crypto-ransomware – in late 2014/15 – the security community took a more conservative attitude. Most people reckoned that it was more important to avoid false positives (especially of the business critical variety) than get every last detection, so machine learning was deemed too risky.

However, this all changed as crypto-ransomware began to take hold. Customers began to take a more balanced view of false positives versus missed detections. Both crypto-ransomware infections and business critical false positives in the OS are very bad, of course. But false positives relating to executables in web downloads and email are relatively minor. And machine learning can be configured to minimize false positives and advances in whitelisting technology can be adapted to further minimise the risk of FPs.

In short, the money the bad guys are investing in evasion capabilities has made time-zero protection essential. And that’s where machine learning comes right into its own.

Hope and Responsibility: The Promise of AI

Michael Wignall | National Technology Officer | Microsoft UK

Imagine in your hurried dash between meetings, you take the two spare minutes in your morning schedule to swing by your personal assistant's desk and say "yeah, I have to get to Cambridge." That's all the time you have, but behind the scenes - while you go about your busy day - your personal assistant knows you and your schedule well enough to know that "Cambridge" means Cambridge, Massachusetts, not England and you need to go there because you're set to speak with a colleague at MIT about industrial robotics in three weeks. And that your friend from Uni lives just up the road in Newton (Massachusetts, not Derbyshire).

Of course, for most of us our jobs don't come with the perks of having our own personal assistants. But with artificial intelligence, we could. The work of checking pricing and availability of hotel and plane tickets, scheduling and pulling together materials for meetings, tracking down conversations you've had on industrial robotics and making dinner reservations with your old Uni friend can all happen with AI that is (or soon will be) available to everyone.

Describing a scenario like this usually elicits one of two responses. Either one sees the promise of AI (to increase productivity or give us our time back), or the threat (will that personal assistant lose his job to technology?) In my role as National Technology Officer in Public Sector for Microsoft UK, I'd say I have cause to be quite hopeful.

First, I'm optimistic because I recognise the tremendous potential of AI as a force for economic growth. According to research by Accenture, "the impact of AI technologies on business is projected to increase labor productivity by up to 40 percent and enable people to make more efficient use of their time". I'm also hopeful because I see the kind of work Microsoft is doing in AI for the benefit of society; initiatives such as Project Premonition that uses machine learning to predict and prevent disease outbreaks around the globe.

I'm also hopeful about the impact it will have on the labour force as Microsoft's vision for AI (really the mission for the whole company) is about empowering people and organisations. In other words, it's not about humans versus machines, but rather humans and machines. AI - this practical set of tools, technology and techniques we use to achieve more - allows us to focus on the skills that are uniquely human such as empathy, creativity and accountability.

Coming back to the example of the personal assistant, while AI may be great at automating all the travel pricing and scheduling - it may not be so good at deciding to delay your trip so that you can meet with a direct report having a crisis. Things like the empathy needed to understand the needs of the employee, the foresight to see the impact on the broader organisation, the creativity to juggle your schedule so you make the most important bits of your meetings, and the accountability to stand behind your decision; these are all human traits that machines cannot replicate. But working together, humans and machines, that personal assistant may have time freed up to help that employee work through their crisis.

As Microsoft continues to invest heavily in the future of AI - in AI agents, applications, services and infrastructure - the sense of responsibility remains at the centre of that vision. It underpins the message that Microsoft CEO Satya Nadella laid out 10 "Rules" for AI in "The Partnership of the Future," his article for Slate. I won't share all these principles here, but the one that stood out most for me is this "A.I. must be designed to assist humanity: As we build more autonomous machines, we need to respect human autonomy."

Communicating the Future of AI Through the Wisdom of Our Children

Rob McCargow | AI Programme Leader | PwC

It's becoming increasingly clear that the recent flood of technological breakthroughs, principally the growing maturity of AI, are going to fundamentally reshape our world and how we live and work in the future.

And how we collectively respond will have profound implications for future generations.

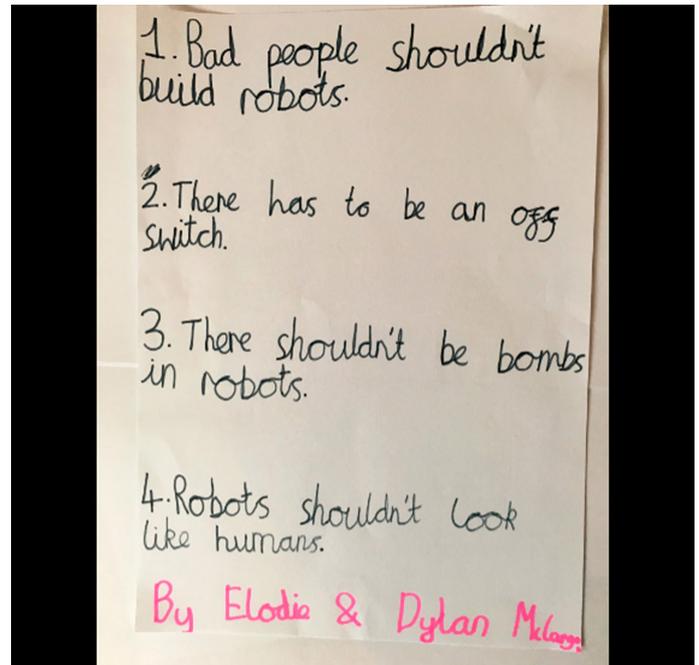
Some of the planet's greatest minds are working tirelessly in an attempt to steer us through this labyrinthine challenge. It's also high on the government's agenda. The new All-Party Parliamentary Group (APPG) on AI has been set up to bring different people together to debate, educate and inform future policy. I'm privileged to sit on the advisory board of this group and consulted extensively with our experts whilst preparing our evidence for the launch meeting, which posed the question: What is AI to you?

But it occurred to me in all the consultation that we're doing - have we actually spoken to our future generations who will be most impacted by these changes?

A few weekends ago I turned to my 7 year-old daughter and 5 year-old son and asked them: "What is AI to you?". After a few seconds of utter bewilderment and serious concern for Daddy's welfare, my daughter said "But what is AI?". The best that I could come up with was to describe it as 'the brains of a robot'.

This subsequently led to one of the most inspiring conversations I've ever had on the ethical considerations of autonomous systems. I was forced to think hard about how to make the subject accessible, inclusive, and engaging.

The following morning they handed me a piece of paper that took my breath away and led to me producing the following tweet:



I've been stunned by the online debate that has since ensued. It's attracted glowing praise and gentle challenge from hundreds of people around the world.

This has taught me an important lesson. The language that experts use to talk about AI is often indecipherable to the general public and this presents the risk of disenfranchisement.

Communicating the Future of AI Through the Wisdom of Our Children (continued...)

There are vital questions to be asked and to be answered:

- How do we ensure that the benefits reaped through AI are spread equally across all parts of our society?
- How do we effectively measure and plan for the likely significant changes to our future job market?
- How do we equip our children with the skills that give them the best chance of success in an uncertain world?
- And - of most immediate importance - how do we build society's trust in AI?

We need to ignite a big and inclusive conversation about the fuel that powers the AI engines. The fuel in this case being data. How do we reconcile data privacy with the huge benefits we might accrue from liberating big data? Who owns our data? How do we square important data regulations, such as GDPR, with commercial pressures and IT architectural shortcomings? .

Of course, alongside these data considerations, we are also moving into a phase of trying to make sense of a raft of broader ethical quandaries. At PwC UK we launched our Responsible Technology approach this week to make sure we're taking these bigger questions into consideration when looking at technology adoption across the firm

My experience here has taught me one thing: When trying to answer complicated questions, seek the advice of your children.

It is their pure untainted wisdom that distills clarity from complexity.

And with this clarity, we will do our best to build a future for them that matters.

Conversational Applications Deliver the Intelligence Your Business Needs

Andy Peart | Chief Marketing & Strategy Officer | Artificial Solutions

Natural language is at a tipping point and digital employees, bots and the IoT are only the start. By 2020, natural language will be a key interface between you, your staff and your customers, interacting through a myriad of applications and services from artificially intelligent digital employees to a speech-enabled cohesive IoT ecosystem.

Applications, services and devices are changing the technology landscape, and with it people's expectations. Fuelled by smart devices in the home, using their voice to control devices and intelligent interactions with smart city devices, consumers are already used to technology understanding them and simplify their lives. Now they are expecting the same service from the companies they interact with everyday.

For businesses this is good news. People reveal a huge amount of information in natural language conversations, which opens up new revenue streams and opportunities to forge a closer relationship with customers. By analysing conversational data in real-time, organisations can not only study trends, but react immediately and personalise the interaction.

But it does require a rethink about how to deliver the smooth, effortless and fast interaction that customers expect – simple layering a mobile app over existing channels won't cut it anymore.

Developing a consistent, cross-channel way of interfacing with technology that delivers AI type understanding such as implicit personalization, requires a deeper interaction than most speech enabled apps deliver today. This deep understanding is achieved through real-time interpretation of natural language conversations, combined with the ability to access specific information related to an individual from other data sources. These might include a CRM system or a third party app that the user has authorized to link together.

Until recently, embarking on this type of implementation was a lengthy and complex process, only undertaken by computational linguistic specialists and technical experts. The end application was typically a fixed solution with no fast way to adapt to changing requirements. This rigid approach has stopped many fledgling projects in their tracks, as businesses realize the end results would be a sub-par product, incapable of doing its intended task.

But it doesn't have to be that way.

The technology that enterprises choose to develop, deploy and analyze their natural language solutions will have a significant impact on how fast they can react in the future.

Delivering natural language applications to evolve with a business requires a reliable development and analytics solution that is scalable, multi-lingual and device independent; one that can seamlessly integrate with back end systems and third party applications. It also needs to be easy to use, delivering as much intelligence "under the hood" as it does to the end user.

Developing a strong natural language foundation that benefits you and your customers today will pay dividends in the next few years. And while, if they open up their APIs, you could develop applications to work alongside the tech giants such as Amazon or Facebook, there are still several questions to be answered. The most important one is—who owns the data?

Companies that act now and develop their own natural applications will not only have a closer interaction with their customers, but will remain in control of the future of their business.

The Opportunities Presented by Machine Learning, Following the Publication of a New Report from the Royal Society

Jessica Montgomery | Senior Policy Adviser | The Royal Society

What is the potential of machine learning over the next 5-10 years? And how can we develop this technology in a way that benefits everyone?

The Royal Society has been investigating these questions, and this week launched a report setting out the action needed to maintain the UK's role in advancing this technology while ensuring careful stewardship of its development.

Machine learning is already a part of our everyday lives

Recent years have seen significant advances in the capabilities of machine learning, following technical developments in the field, increased availability of data, and increased computing power. As a result of these advances, systems which only a few years ago struggled to achieve accurate results can now outperform humans at specific tasks. There now exist voice and object recognition systems that can perform better than humans at certain tasks, though these benchmark tasks are constrained in nature.

Many people now interact with machine learning-driven systems on a daily basis: in image recognition systems, such as those used to tag photos on social media; in voice recognition systems, such as those used by virtual personal assistants; and in recommender systems, such as those used by online retailers. While most people who took part in the Royal Society's public dialogues about the technology had not heard the term 'machine learning' – only 9% recognised it – the majority of respondents had come across at least some of its applications in their day-to-day life. For example, 76% of people surveyed had heard about computers that can recognise speech and answer questions.

There are indications of its potential across industry sectors

As the field develops further, machine learning shows promise of supporting potentially transformative advances in a range of areas, and the social and economic opportunities which follow are significant.

In healthcare, machine learning is creating systems that can help doctors give more accurate or effective diagnoses for certain conditions. In transport, it is supporting the development of autonomous vehicles, and helping to make existing transport networks more efficient. For public services it has the potential to target support more effectively to those in need, or to tailor services to users. And in science, machine learning is helping to make sense of the vast amount of data available to researchers today, offering new insights into biology, physics, medicine, the social sciences, and more.

Now is the time to shape how it develops

The UK has a strong history of leadership in machine learning. From early thinkers in the field, through to recent commercial successes, the UK has supported excellence in research and development, which has contributed to the recent advances in machine learning that promise such potential.

There is a vast range of potential benefits from further uptake of machine learning across industry sectors, and the economic effects of this technology could play a central role in helping to address the UK's productivity gap.

Ensuring the best possible environment for the safe and rapid deployment of machine learning will be essential for enhancing the UK's economic growth, wellbeing, and security, and for unlocking the value of 'big data'. Action is needed in key areas – shaping the data landscape, building skills, supporting business, maintaining public confidence, and advancing research.

One of the clearest messages from the Royal Society's public dialogues is that the public do not have a single view of machine learning; attitudes, positive or negative, vary depending on the circumstances in which machine learning is being used.

Careful stewardship will be necessary to help ensure that the benefits from machine learning are shared across society.

Friend not Foe: Robotic Workforces Could Boost – Not Break – Our Working World

Alastair Bathgate | Group CEO | Blue Prism

Pressure is mounting on us, wherever we work to outperform peers, fend off threats from new challengers and remain competitive. That's modern life – but each of us is only human. We can't do everything at once. Some things we just don't want to do, maybe even ought not to do. In any event, every now and then something's got to give.

In the past 20 years, Business Process Outsourcing cast itself as the saviour of productivity – sometimes even of corporate sanity. Companies large and small took a long hard look at themselves, at the places where they added value (and where they leaked it) and looked to outside talent to work harder, smarter, faster.

Today, that outside talent alone isn't enough. The future of work is changing at a faster pace than any of us have ever known. Virtually every company on earth is now looking at 'what's next' – and increasingly that's software robots.

Robots attract a great deal of emotion. We imagine sci-fi figures from TV and film. We fear replacement, not emancipation, from machines much better at work than we are. But, just like the fears that accompanied BPO in its infancy, the truth and potential around software robotics is far more exciting than this imagery allows.

Robotic Process Automation (RPA) is the game-changer. We've all seen industrial robots make waves in manufacturing, deliver efficiency in supply chains and improve product quality. We are now seeing software robots do the same elsewhere.

Software robots put process where process belongs, inside smart systems. They free each of us up to apply our human brains to tasks far more valuable. Let's face it: traditional IT systems can often creak under the simplest of pressures. There are gaps, flaws, missing links – and all too often human intervention isn't the best way to mitigate for those failings.

Smart software robots are far better suited to the task. Rather than have employees stretch time and resource to marginally improve an already broken system, what if you could simply add extra robotic capacity to do all that for you? Robots that feed on process, scalability and compliance.

But that's just the beginning. Imagine a robotic ecosystem where users can leverage best-of-breed solutions for AI, cognitive and cloud technology. Consider the benefits to an a la carte menu of services and capabilities that would let you free up the creativity of people to do more valuable tasks: seek out that new market, revitalize sales, spot new opportunity and double output with virtually zero cost.

Doesn't this sound like good news for business, not bad? Couldn't it be good news for productivity, for people and for process? We think so. Increasingly the biggest players in business think so too. Perhaps it's time we put sci-fi to one side and gave robotics a fresh look...?

Machine Learning: Delivering on the Promise of Big Data

Chris Francis | Head of Government Relations | SAP UKI

From digital transformation to the Internet of Things, we are moving towards an exciting, more connected future. As digital processes, devices and sensors proliferate, so too does the volume of data they create. At the forefront of this are connected appliances and monitoring systems in smart homes, traffic sensors and public transport, as well as sensor-laden autonomous vehicles that will generate 4,000 GB of data per day, every day.

Here in London, IoT and emerging technologies have an important role in future-proofing the city. According to City Hall's Smart London Plan, the capital's population is set to rise to 10 million people by 2030. This is going to cause widespread issues, such as increased strain on healthcare, transport, and the management of energy, utilities, and waste and pollution, unless smart solutions can be found.

But progress is being limited by the sheer scale of the data today's technologies produce. The technology that grew up to help analyse the first generation of big data back in the early 2000s isn't fast or robust enough to handle the constant, enormous and repetitious volumes flowing from the vast, always-on IoT networks and 24 /7 digital processes. The solution: machine learning.

Machine learning systems learn from data. Rather than follow explicitly programmed instructions, machine learning algorithms improve with use and experience, making them a key component of tomorrow's systems. They can "learn" the normal patterns of activity present from medical monitoring, public transport and financial transactions, and focus on the anomalies or patterns outside the norm. From billions of data points, machine learning can separate the "signal from the noise" in vast data flows and help decision makers focus on what's meaningful - saving a life, avoiding a crash or even capturing a fraud.

Some of these effects will be highly visible - improving human reactions and decision making, augmenting people and easing day to day routine tasks. Some will be embedded and simply produce better services in public and private sector alike - more appropriate personalised responses or quicker, enhanced handling of invoices leading to faster payments.

Public bodies need to ensure they have digital processes in place as well as proper governance of their data assets. Taking heed from digital leaders, they should ensure they have the digital core creating the data that is the feed stock for machine learning. Leading innovators need to start investigating where and how machine learning can best be deployed, as well as how to modify and develop monitoring and feedback systems.

It's exciting to think how machine learning is already revolutionising the way we interact with technology - from powering Facebook's news feed, to making Amazon's recommendations on what book or movie you may enjoy. The next generation of data driven machine learning is going to improve everyday life, so long as we can successfully power machine learning whilst maintaining trust and accountability.

Access to Data is Key to Creating a Competitive AI Market

Peter Wells | Head of Policy | Open Data Institute

Artificial intelligence and machine learning are already in use and have been for a while. You can see it in the image recognition software that social media services use to suggest which of your friends are in a picture as well as in cars that can park for you. AI is seeing rapid growth because of a data revolution. The large digital platforms that dominate the internet have access to large volumes of data that places them at an advantage for developing AI. Increasing access to data is key to creating a competitive and equitable AI market where small businesses and innovation can flourish.

Artificial intelligence relies on data

The coming years and decades will see a rapid growth of AI driven services across our societies, partly as a result of a data revolution.

We are going through a data revolution due to the growth of the web and internet coupled with the drop in the price of software and hardware. Data has become a new form of infrastructure for a 21st century economy.

Artificial intelligence relies on access to that data. People use data to train AI services and those services use data to make decisions or find insights when needed.

If you do not have ready access to data, and cannot make a deal with someone who does, then it can be impossible to enter the AI market. This brings with it the risk that this exciting new sector will be dominated by the large digital platforms who currently dominate the internet. This will reduce competition and innovation. It will reduce the diversity of the problems to which AI solutions are applied. It will stifle the energy and fresh ideas that startups and SMEs bring. It will reduce the overall size of the AI market and the benefits that AI could bring to all of us.

Increasing access to data will help create a competitive AI market

We can increase access to data by making it as open as possible while respecting privacy.

Some data can be published openly, for anyone to access, use or share - such as bus timetables or the music catalogue that underpins Spotify. Some personal data needs to be securely shared with researchers for the good of society, for example to produce national statistics that benefit everyone.

When other data is provided, this needs to be with a level of control that protects people's privacy and gives them the ability to decide whether or not they want their data to be shared.

All these levels of sharing may be used to provide data for machine learning. People and organisations who hold data may make different choices about sharing or opening data based on what the AI will do and who controls it. I may be reluctant to share my health record to improve the targetting of adverts but choose to share it with multiple organisations for medical research in the public interest.

In our recent submission to the UK government's Industrial Strategy both the Open Data Institute and the Digital Catapult asked government to help create a competitive AI market by increasing access to its data and incentivising the private sector to open up access to its data too. Government's data - whether it's in the BBC, the NHS or local government - is incredibly valuable and should be used to benefit everyone in society. Private sector data is also incredibly useful and we can create more value by making it flow freely. This should be done while preserving people's privacy and ensuring that access is equitable.

The message is also an important one for other countries and the private sector to heed. They can decide to open up data and get the benefits of open innovation too.

Artificial intelligence promises to do great things to improve our societies, but we need to increase equity of access to data if we are to create the competitive market that will be necessary to make it work for everyone.

Data is changing the world. The Open Data Institute can help you adapt and thrive

Organisations collect ever increasing amounts of data. To realise its full value, however, that data has to easily flow to those who can make good use of it. At the Open Data Institute we help companies and governments around the world get data to people who need it. Get in touch with us to learn more at info@theodi.org

techUK's Cloud, Data, Analytics and AI programme focuses on the key drivers of the digital economy, which will be particularly crucial as we move towards a data driven economy.

Our work programme looks at how to maximise the value and adoption of these technologies and identify risks and challenges that may prevent the UK from becoming a leader in these fields.

www.techuk.org/focus/programmes/cloud-data-analytics-and-ai



```
mirror_ob = modifier_ob and modifier_ob.type != "CURVE"
mirror_ob.select = False # set to mirror_ob, hope the other is a mesh
modifier_ob = bpy.context.selected_objects[0]
#mirror_ob
mirror_ob = bpy.context.active_object
mirror_ob.select = False # pop modifier_ob from sel_stack
print("popped")
#modifier_ob
modifier_ob = bpy.context.selected_objects[0]
print("Modifier object:" +str(modifier_ob.name))
#modifier_ob.select=1
print("mirror_ob",mirror_ob)
print("modifier_ob",modifier_ob)
t mirror modifier on modifier_ob
mirror_mod = modifier_ob.modifiers.new("mirror_mirror","MIRROR")
t mirror object to mirror_ob
mirror_mod.mirror_object = mirror_ob
operation == "MIRROR_X":
mirror_mod.use_x = True
mirror_mod.use_y = False
mirror_mod.use_z = False
```



techUK represents the companies and technologies that are defining today the world that we will live in tomorrow.

950 companies are members of techUK. Collectively they employ more than 700,000 people, about half of all tech sector jobs in the UK.

These companies range from leading FTSE 100 companies to new innovative start-ups. The majority of our members are small and medium sized businesses.

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