



Artificial Hype

GE HEALTHCARE
SPECIAL SUPPLEMENT

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Artificial Intelligence: a next way forward for healthcare

The promise and the reality and how to combine the two for efficient and patient-centred hospital care

By harnessing new insights and benefits offered by AOI and Machine Learning, Leeds Teaching Hospital is upgrading the precision of its healthcare information to enable a new world of prediction and analysis that sees the delivery of a new citizen focus in the care that is delivered



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Digital technology constantly changes, grows and delivers, but some of the promises of digital technology are ethereal when it comes to healthcare. Since 2010 IBM has had the promise of Artificial Intelligence (AI) in healthcare through the Watson initiative. IBM would describe Watson as a solution to the big healthcare problems, but which healthcare problems? Sometimes Watson has felt just out of the grasp of the front line digital leadership in all but the richest of healthcare systems, and for so long Watson has been 'code' for AI in healthcare.

In 2018 the UK minister for health talked up the virtues of AI as a solution to the General Practitioner resource issues hitting primary care delivery in the National Health Service (NHS) for the last decade, maybe even more. Almost in complete contrast, the NHS England team asked that digital leaders stopped considering the 'shiny things' like AI and concentrated on the foundations of good technology, like getting information to the centre on time. At the same time the NHS's national digital body added to the confusion by announcing a change in their focus and organisational structure to provide expertise on the same list of shiny things that NHS England has asked the frontline to stop worrying about; all this at a time when the Google CEO says, 'artificial intelligence will be more important than humans learning how to light fire and collect water' (Clifford 2019).

It feels like the time to ask Alexa, Cortana, Siri and their colleagues for help in understanding the landscape.

One thing the digital health system of the NHS has been good at over the last two decades is making the best of a confused landscape. As we head into the earliest part of 2019 I can put my finger on five AI developments, all of which to me seem to be promising or already delivering some real foundations for a new frontier.

“ONE THING THE DIGITAL HEALTH SYSTEM OF THE NHS HAS BEEN GOOD AT OVER THE LAST TWO DECADES IS MAKING THE BEST OF A CONFUSED LANDSCAPE”

A lot has been said about the possibilities for AI in the space of clinical research, and in return for the promise of what the science can achieve. The front line has been clear that this will only work when the quality of data improves, but it is improving - and at a rapid rate. For example more and more trusts are able to declare themselves as 100% digital in Pathology departments. The opportunity of AI in this space is tremendous. Systematised Nomenclature of Medicine coding (SNOMED), even clinical coding delivered by AI and Natural Language Processing in itself will improve the opportunities. In all honesty, it no longer

feels like a leap of faith to get to this, just a little more hard and focused work created against a considered (and not excitable) backdrop. Being able to use AI to consider pathology images as a research tool is something that we, in Leeds, can get to in 2019. It feels like the benefits can be huge, but today we can't quite determine what they will be, and therefore that requires us to take a bet. We do know, though, that ensuring that the 'A' in AI stands for augmented and not artificial, will be key to taking the academics and clinical team on the journey with the digital capability and its promise in research.

The work we can deliver today in health, though, is perhaps best described as the UK edition of ITSMF's ServiceTalk magazine. The publication described Artificial Narrow Intelligence (ANI), in the autumn of 2018 as simple(ish) automation of repeatable tasks now often branded as AI (Karu 2018). The reality is, there is very little need for the intelligence to truly be stretched and the focus is on a single domain or task type. When we take the next step and arrive at Artificial General Intelligence (AGI), that's when new benefits and new insights will be possible rather than fostering old ways of doing what we have always done.

Perhaps more exciting though is when we hook the Gartner-esque definition of digital trends of big data, machine learning and Robotic Process Automation (RPA) together. We can overlay them on some of the operational problems rather than the overtly clinical issues we are faced with daily.

Take the 'wicked' problem of Did Not Attend (DNA) for example. Algorithmic work done in a large London trust has been able to create a predictive model that has been shown to be over 70% accurate in identifying the person type, operation type and previous response to healthcare that is most likely to resort to not attending for a clinical event. By adding an RPA reminder to the process of those likely to DNA and with the ability to alter bookings within the automated process, the trust is able to make fundamental changes to its rota and roster system and manage its capacity with a level of efficiency unheard of without this innovation. This is one of the key actions we are all, every healthcare system in the world, trying to achieve. In Ireland, further still, the RPA process has been added to a short video of the consultant or lead clinician being appended to the message welcoming the patient to the clinical setting they will be visiting the next day, putting to bed some of the last-minute jitters and seeing a marked difference in the DNA response. Not quite the full suite to give us AGI but

clearly getting there.

Yet again as digital professionals in healthcare we marvel at the difference this makes in frontline healthcare where we have deployed it with two key elements missing from the position statement; firstly, if this is possible and works why is it that there isn't a national solution that can be deployed to achieve this? Secondly, let's face it - this isn't that new or cutting edge. My barber has been doing it for years. Why can't we do this together and at a greater speed so that the patient gets a standard and expected experience, possibly removing some of the dystopian fear that goes with AI in healthcare?

Developing algorithms through a depth of machine learning in the AI space is something that we can not only dream of but now truly begin to deliver. The NHS can gain benefit from its 'crowd' if the way of working that the London trust has instigated can be put into practice. One NHS organisation does the work on DNA problems with AI experimentation whilst another begins to consider something else that can be delivered, aiding in the process of building more and more algorithmic responses to the issues at hand. These experimental solutions can be shared to be proven in different environments, ensuring that the differences we all know exist across the NHS don't skew and fail the algorithm. In theory, as more data is added to the pool, the algorithm gets more and more accurate.

Leeds Teaching Hospitals Trust has taken this way of working on board; the work they have started with machine learning in the AI space will focus on predicting a date and time of discharge at the point of admission. Leeds has a great set of live open data on environmental elements, weather, traffic, air quality, school holidays and festivities going on in the local area. All of these elements have some effect in some way on the ability to make patients well again and the timeliness of this. By mixing these data points with the health records, with performance data, with the daily capacity and capability of the trust we believe we can predict a date that each patient will be 'medically fit for discharge' (MFFD). The 'so what' for this innovation, though, is fascinating; first and foremost the ability for the hospital to work with other healthcare partners across the city to ensure patients can be supported on the day they are medically fit to leave will go some way to removing the concept of the stranded patient. The solution to stranded patients has always been for the system to 'pull' them out of the hospital, but identifying them has often been difficult. With an agreed

and working algorithm for MFFD, the patients can be identified and a plan created at the point of admission that is no longer based on guesswork and can be built on to become more and more reliable.

However there is another unintended consequence of this date being available; telling the patient the date and time they should also be striving for has been suggested to impact on their own desire to be well and away from hospital, the data equivalent to 'get up and get dressed' and the 'PJ Paralysis' campaigns seen in many hospitals in 2018.

“ DEVELOPING ALGORITHMS THROUGH A DEPTH OF MACHINE LEARNING IN THE AI SPACE IS SOMETHING THAT WE CAN NOT ONLY DREAM OF BUT NOW TRULY BEGIN TO DELIVER ”

However in the same way, as the DNA data described earlier, it's important that Leeds now moves to share the algorithm and the data inputs it has applied. The system needs to be provided with better data to reduce the algorithmic bias that will be the first answer of the 'powered by AI production line.' Testing the concept in an AI lab is the next stage for Leeds but, at the same time the trust is looking for partners to bring their learning to the table so that the initial build can truly have the impact everyone wants it to have.

The final example of AI being developed now is the stretch exam question: how to create a machine learning solution that delivers a clinically sound summary based on the records stored in an EHR? It's the panacea for so many clinical systems, to remove the clinical search time. How do we take the structured and unstructured data of a longitudinal record and allow the system to ask the question, 'Show me something interesting?' Once we can do this how do we make sure the data generating bias in the algorithm can be improved, because herein lies the problem. Although AI can learn, it's only really as good as the data we input, and old data has at best old data quality standards applied to it.

However in Leeds we have a wealth of data. We accept a dearth of information in the cancer area in particular. AI, though, allows us to shed a light on how decisions were made and recorded in the past and therefore 'correct the past' and improve the quality. Clear governance needs to be applied to this but in doing this we have targeted the ability to have an AI-generated cancer summary inside the EHR here in Leeds by December 2019. This summary learns and has links to patient and clinician proximity and with elements of suggestive RPA applied. What we think is total AGI.

Having given space to the Google CEO, I believe it only right to enable the next driving force in AI to be quoted to end this piece: "AI will be useful wherever intelligence is useful; helping us to be more productive in nearly every field of human endeavour and leading to economic growth." These were the words of Brad Smith and Harry Shum in the Microsoft publication, *The Future Computed: Artificial Intelligence and its role in society* (Smith 2018; Shum 2018). ■

KEY POINTS

- ✓ Sometimes AI's potential in healthcare is intangible, leading to stagnation
- ✓ There are big opportunities for AI application in pathology
- ✓ Leeds is using machine learning in the AI to predict date and time of discharge at the point of admission
- ✓ AI is only as good as the inputted data; old data does not offer optimal solutions
- ✓ By the end of 2019, Leeds aims to establish an AI-generated EHR cancer summary



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