AI talent and Life expectancy: An interview with Benyamin Deldar and David Hanbury

Paul Ferretti spoke to Dr. Benyamin Deldar and David Hanbury Meng MSc, Co-Founders of Deep Medical, about helping patient get access to care, predicting human behaviour and going the extra mile.

Temps de lecture : minute

12 April 2024

Can you tell our readers more about Deep Medical's mission?

Benyamin: There are 5.8 million people waiting for a patient appointment in the NHS. When you look at the 8 million missed appointments in the system each year, you realise that we really need to start thinking about why patients are struggling to access care.

There is the need for a solution that's focused not just on reminding, but actually unpicking at the reasons as to why people struggle. What we've done at _Deep Medical_ is that we've created an AI system that can identify those patients ahead of time, and with the key element of "what can you do about it". We've built solutions focused on how to ensure that a steady stream of patients is seen weekly, and how to challenge those underlying inequalities that result in patients not being able to access care.

I did mention 8 million people, but only 8% of our patients miss their appointments, which means that we've got one of the best attendance rates in the world. But when you think about that as a macro scale, not

only is there a huge waste of resources each year, but also an opportunity for us to think about how we can better engage and offer patients access to healthcare.

How can you understand and anticipate human behaviour?

David: Predicting human behaviour is notoriously difficult, and there are several reasons that go into our actions and how we decide to behave. It is a very difficult task for a human to do, but the perfect task for machine learning and AI.

Benyamin: We are at the cutting opportunity to start predicting human behaviour. Because we have such a large volume of attendance data on how people have engaged historically, we're able to group that in three factors:

- The patient: What levels of deprivation do people live in? What's their access to transportation? What is the traffic like on the day? What's the weather like? What type of work do people do? What religion do they practise, and do they influence their health beliefs?
- The healthcare provider themselves: How far are they booking things? What are their booking processes?
- The doctor: What's their customer success rate if we were to compare them with their colleagues?

As Danny said, it's the way that all of these factors affect each other in a non-linear manner. So it's not just the fact that it's "Miss Higgins" and she missed an appointment before. It's the fact that she's 84, she lives 9 miles away, she's booked an 8:30 appointment and she's got to go through rush hour traffic to get through.

David: All of these data are very hard for a human to put together and see

how they interact, but what we do is we take hundreds of millions of historical data points, and we train machine learning accurately on it. It's also worth noting that we don't touch any sensitive healthcare data or any personally identifiable data, which is really important for us.

Benyamin: Patient compliance behaviour is something that has been studied quite significantly. That's the difference between why often two patients may progress in different rates of disease. It's maybe because one of them doesn't take the medications as often as they should. Maybe it's because one of them hasn't been able to take time off work to get to their appointment on time. So it's actually a combination.

When you look at the data, you do see that if you can't turn up for timely care, you have worse outcomes. Significant studies looked at cohort of patients that all had long term conditions and they compared them with their counterparts who missed two appointments a year. The ones that missed two appointments a year had an 8 times increase in all caused mortality. What you're able to pick up there is a larger health inequality piece that we need to be addressing.

Why did you choose to work with the NHS rather than private clinics?

Benyamin: We were born from the NHS in some ways. I'm an NHS practising doctor. From my own experience, we were sometimes sitting and twirling our thumbs and at other times we are overrun in a clinic until 5pm. There's something wrong here in terms of how we're delivering care and so we really started from that.

We then gained quite a bit of support given the current needs from a backlog perspective from NHS hospitals and from Central NHS England as well, so we were put on to a programme called the NHS clinical entrepreneur programme, which was there to help and support solutions

that are really beneficial to systems like the NHS. And then, access to the historical attendance data is also something that the NHS has, much more than private hospitals, which we can get to build, tailor and personalise those models and apply it there first before we then scale it out to the rest of the world.

Where do you think the issue stems in the British healthcare system?

Benyamin: It's a tough question. You first have to go down to what the British healthcare system is. You know there are no other experiments for free healthcare at the source of delivery for everybody that is running at this scale in the world.

The NHS becomes a vision that people hold things to almost like a religion.

However, I think that as care demands go up and as things like COVID-19 took place, a lot of inefficiencies have come to the surface. We cancelled 24.7 million appointments over COVID-19 for over a year.

What that's resulted in is in the backlog, but it's also resulted in a lot of good people solving problems in the healthcare system that has gone deplete in this country now. What need to solve issues through policy, which I'll leave to the politicians to solve, but also technology.

It makes no sense for anyone to be able to book a flight from here to wherever they want to go, but we can't book a hospital appointment for a patient. We need to get people behind that vision so that we can start to get the right incentives together to keep the NHS alive. I think it's a combination of the fact that it means so much to everybody in this country, that it's so talked about, but also the fact that it's ripe for some real change that needs to happen.

Do you have plans to expand outside of the UK?

Benyamin: We definitely got it in our plans to be expanding outside of the UK. It's not that we're not a UK focused or centric company, but we have the best AI talent in the world. Being able to prove it here, to test it here and then scale it globally is something that we are really excited to do. Non-attendance is a global issue and it's not an issue that's going away. More and more people are getting older and the number of doctors is not rising to the same rate as that, and so we've got some real supply demand issues that we need to think differently about. We can really help address some of those immediate access issues that take place all over the world.

The inequalities that take place here in the UK are taking place in larger scale in the US, and in parts of Europe. It doesn't make sense that two patients based on where they live have a life expectancy difference of 10, 15, or 20 years.

How does Deep Medical aim to alleviate the strain on healthcare systems during winter?

Benyamin: I suppose you've got to think about this in the case of the setting. So as we mentioned, if you can't get to timely care, you have worse outcomes. We know that especially with patients with long term conditions, but also psychiatric patients who struggle to access services.

They're more likely to end up in A&E. What we need to be able to do is to get those patients who are waiting for care into appointments they can go to. There's a real opportunity here to think differently about our scheduling, about how we think about capacity, to ensure that patients get access, which would them relieve the system when winter comes and

reduce the number of patients that end up in crisis in A&E.

How can cutting edge AI processes optimise resource allocation?

David: As Ben mentioned, there are 8 million missed appointments every year. If you then look at late notice cancellations, which is another thing that we predict, i.e. people who cancel within 48 hours of the appointment, that's an additional 4 million empty slots to happen every year. So essentially, you've got 12% of the NHS which is being not used. It's about £165 per missed appointment, so that works out at about a £2B cost that's going completely to waste in the NHS.

If you can accurately predict where those gaps are going to happen, the first thing you can do is try and reach out to those people and get them to come into the slots, but where that's not possible, you can get one of the people off the huge backup that we have at the moment into those slots instead. This is how you can increase the entire capacity of the NHS at no extra cost.

Is there anyone who inspires you?

David: I very much get inspired by our adviser, _Professor Lionel Tarassenko_, who taught me electrical engineering back in 2005. But Lionel was one of the true visionaries in Artificial intelligence and he's been building deep learning networks based on the human brain since the 1980s.

In 1996, he received a British Computer Society medal for his work on neural network for the analysis of sleep disorders. And what's amazing about this is that there's still a very much active area of research right now and the work that he did in 1996 is just as applicable now as it was back then.

Benyamin: I have a lot of people that inspire me, especially from my time practising as a doctor, the people that would go the extra mile for the patients and be there to really deliver the best quality standards of care.

There's so many people that I've seen in our journey, but I think specifically about _Professor Tony Young_, who's the national clinical director for innovation across the whole country. He set up the _NHS Clinical Entrepreneur Programme_, which has grown the UK life science industry by 5%. It also started to create a spark where clinicians like myself can have a path to innovation and actually affect change. That allowed us to shape what we think healthcare should be for the future.

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