The Rise of Artificial Intelligence in Healthcare

The adoption of artificial intelligence in healthcare is rising rapidly, as the industry recognises the opportunities to apply these technologies across the continuum of care. Here, Jeroen Tas, Chief Innovation & Strategy Officer at Philips, discusses how AI-enabled systems are helping to drive improvements in the way in which care is organised and delivered, as it becomes an integral feature across Philips' portfolio of products.

Jeroen Tas has over 30 years of global experience as an entrepreneur and senior executive in the healthcare, information technology and financial services industries. He was appointed to the role of Chief Innovation & Strategy Officer for Philips, in February 2017, driving innovations in smart systems, software and services to improve people's health.

How is Philips utilising AI and what do you see as the significant opportunities for AI in healthcare?

We are already applying AI in many of our solutions and we believe that ultimately the majority of our products will become AI enabled.

A large part of our business is involved with imaging and this is an area where we are increasingly applying AI in order to more effectively analyse those images. Whether it is an image of a foetus, or an image of the heart, we are essentially using AI to, firstly, quantify what we see on the image, to compare it to normal, and then to generate a visualisation from that. Where we automatically find deviations from normal, or identify markers on an image, we can then combine this with patient information that we already have, in order to provide something that we call 'anatomical intelligence'.

We recently launched an AI software product called Illumeo, which can extract relevant information from a patient's investigations and automatically highlight any issues that would be relevant to the clinician. It can also be used to compare different imaging scans to allow a clinician to determine whether treatment regimens have been effective. Something that is extremely difficult to identify with the human eye, owing to the subtle differences between images.

This type of solution is even allowing us to see whether it might be possible to identify a condition like Alzheimer's prior to any onset of symptoms. To do this, the solution can look at imagery from multiple studies to determine the rate of brain atrophy, and determine whether the shrinkage of the brain is actually faster than normal. Similarly, we can analyse the images to check for tiny dots that would indicate plaque developing in the brain. These form very gradually, and ultimately lead to the symptoms of Alzheimer's.

This can also be done on images from pathology. What would have previously been analysed under a microscope, can now be digitised, and we can use artificial intelligence to identify the right tissue, then process the tissue and ultimately identify specific biomarkers within that tissue.

AI can also be used to process genome sequences that are produced from a sequencer and actually bring these three aspects together so that we have a much more precise view of a patient's condition. This means that in an oncology setting, for example, we can look at the anatomy of the cancer, we can look at how the cell structure evolves and we can actually look at the DNA that drives that cancer!

All of that is enabled through artificial intelligence. This means that we are moving to a much more precise diagnosis. We can then again apply AI to identify the right therapy choices, by linking them to a specific diagnosis profile of a patient. This brings us to another use case for AI, whereby if we are trying to get an effective profile of a patient then it is useful for us to be able to analyse all the earlier investigations, tests and reports that have been conducted on that patient. However, the difficulty with healthcare is that more than 75% of all this information is unstructured, for example, these might be reports written by a radiologist or specialist. This is where we can begin to use natural language processing, specifically linked to medical anthologies, so that we can start to interpret what is in a written report and what is actually relevant for this specific patient's care. We therefore use AI to extract the relevant information and make it interoperable.

Another application is where, instead of looking at an individual patient and their medical history and their profile so that we can make a better diagnosis, we begin to actually look at the entire population of patients. For example, we could analyse a million patients within a certain area to see how many of these patients have specific diseases, what are their risk profiles, what are the costs to the system? We can then use AI to start stratifying patients groups in order to begin interpreting complex information that can give us insights into the specific needs of those patient groups.

This type of analysis can also be used to automatically monitor particular patient groups. For example, if we want to monitor elderly patients, with particular chronic conditions, who are living at home, we can stream real-time information that will help us to perform that task.

[At Philips] we have a fall detection monitor that provides this type of information for if a patient has fallen, but the data collected by that device means that we can also use AI as a means of predicting potential falls. If someone is wearing the device and the solution identifies that in the past couple of days they are getting up more slowly, or their gait has changed, or we have monitored them stumbling, then these factors will suggest an increase in the probability that they will fall. By identifying this it means that an intervention can be taken at the right time, to help prevent a fall from occurring.

This is a use case that we can use for people at home but also for people in the hospital. If people are in an intensive care unit and they're connected to monitors we can get a really good insight into the health of that person, and from that we can identify deterioration in that patient. Like the onset of sepsis, or cardiac arrest, and if we see those things happening then it provides a window to intervene and try to avoid those acute situations.

As you can see, we are applying Ai in many of our propositions, some of them are concerned with interpreting images and some of them are involved with interpreting patterns and complex information. Many of the solutions that I have described, we already have in the market, with the AI working behind the scenes.

How do you view the role of AI in healthcare?

I think that the first focus is to improve clinical decision making. Supporting clinicians by streaming data, interpreting data, providing effective visualisations, detecting deviations from normal, providing early warnings – these are all areas where we can use AI to focus on supporting the clinicians to make the right decision at the right time.

But, there are of course processes that can be automated as well. For instance, radiologists used to have to look at an image and if they wanted to compare that image to an earlier investigation then they would have to manually retrieve prior studies and then measure and compare those images. This is now all automated, the software can do it for them and identify any differences and highlight any deviations from normal. As a result I think that this type of technology doesn't automate a job, but it will automate aspects of a job, in this case.

Conversely, when you take a solution like our Lifeline fall detection device and use that to start predicting falls ahead of time, then you are doing something that could never have been done before.

When it comes to other solutions, we have thousands of imaging devices in the field, we have hundreds of thousands of monitors and defibrillators in the field, and of course we want to connect these devices, we want to start automating preventative support and maintenance and we want to help people optimise the workflows, and asset management, around these devices. We recently launched a product called Performance Bridge which does exactly that. It uses AI to help optimise those assets and optimise the workflows around those assets. That also allows you to proactively manage and maintain hardware and software in the field.

What are the challenges of applying AI in healthcare?

We all know that the quality of your AI is only as good as the quality of the data that you feed into it. The quality of the data, ensuring that it is interoperable and then making sure that it is handled with the right privacy and security regulation, which is definitely non-trivial in healthcare, is essential.

I think that there are still some challenges around the regulatory landscape in dealing with these types of algorithms, specifically if these algorithms are not just doing decision support but they are actually applying clinical decision making. The healthcare industry only allows you to deploy this type of technology if you can provide the clinical evidence to support it. This means that the regulators have to find a way to continue to allow you to evolve the different algorithms that you develop, without having to constantly stop and then revalidate. ■