UK: +44 (0)207 989 0813
NA: +1 646 896 3065
AU +61 2 9280 0700
action@proactiveinvestors.com.au

Artrya Ltd

08:35 22 Dec 2022

The rise of artificial intelligence in healthcare

Access to data, repetition and continued testing are preconditions for machine learning and - with the breadth and depth of data it consumes - the medical and healthcare industry provides AI with plenty of practice.

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Huge strides in public health

Public health also happens to be where AI can make the most difference in terms of clinical need and cost-effectiveness of treatments. This of course is balanced with a need for rigorous testing because we're talking about human health rather than lower-stakes activities like gaming.

As most biotech companies know, ethical and clinical testing is foundational to ensuring the safety of a therapy before it is unleashed on the public.

COVID-19 taught us that population-level health solutions are the way of the future and AI, which works best at scale, can be used to optimise and speed up research and drug development and assist in the deployment of mass public health interventions. It, therefore, has a key role in disease surveillance and outbreak response.

The World Health Organization's inaugural report on AI in healthcare, Ethics and governance of artificial intelligence for health, states: "For AI to have a beneficial impact on public health and medicine, ethical considerations must be placed at the centre of the design, development and deployment of AI technologies for health.

"The evidence generated from the development and deployment of these devices must be robust and transparent, supporting claims for safety and performance."

The report goes on to recognise the inherent unconscious biases that can be built into AI systems, saying: "AI must be generalisable and work to improve outcomes for all populations. Existing biases in healthcare based on race, ethnicity, age, socioeconomic status and gender, that are encoded in data used to train algorithms, must be overcome."

AI is nevertheless the big new frontier and a huge opportunity for the sector and can be deployed in the form of clinical decision support tools, diagnostics and workflow optimisation solutions.

As long as we keep a handle on unintended consequences - health insurance data leaks, anyone? - machine learning in healthcare has the potential to increase equity and substantially reduce the strain on the human workforce.

Australian biotech leader and Artrya Ltd (ASX:AYA) CEO John Barrington sees AI as integral to the delivery of

Price:	0.39
Market Cap:	$30.58 m

1 Year Share Price Graph

Share Information

Code:		AYA
Listing:		ASX
52 week	**High**	**Low**
	1.36	**0.32**
Sector:		**Pharma & Biotech**
Website:		**www.artrya.com**

Company Synopsis:

Artrya Ltd (ASX:AYA) is an AI-driven health-tech company focused on disrupting how coronary artery disease is diagnosed.

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healthcare at scale in the future, seeing it as imperative that we get the settings right.

"AI is at the core of a wide range of the technologies of the future," he says. "The question then is where do you best deploy this to benefit humanity?

Barrington says there is undeniable fear of the unknown where AI is concerned but he believes that the benefit to human health at scale far outweighs counterveiling arguments about risk in this space.

Fighting non-communicable disease

AI can be deployed in the battle to slow the tide of non-communicable diseases such as diabetes, heart disease and cancer, and there are plenty of examples of this around the world.

Machine-based diagnostic tools are in use around the world, assisted not only by data but by the wealth of existing research information, which AI is able to absorb and interpret.

In Japan, more than $100 million is being channelled into state-of-the-art AI-based hospitals over the next five years, to reduce labour overheads and ease doctor shortages while minimising human error.

Ten model hospitals were planned for 2022 alone, with AI being embedded in day-to-day workstreams such as processing diagnostic images, updating patient charts and analysing tests.

Cervical cancer screening is another easy win for AI. Testing is a simple, repeatable activity and a use-case which generates evidence to quickly scale up the efficiency of an AI application.

In the west, cases of the cancer are dwindling because of excellent screening programs but it is still one of the most common cancers in women worldwide with the bulk of the cases in emerging economies.

AI is now replicating the West's success in combating this cancer in developing countries, at low cost and at scale, aided by the wealth of existing information about the cause of the disease and its high preventability - it's the perfect test case for AI diagnostics.

Tackling coronary artery disease at scale

If scale is a key factor in useful AI healthcare solutions, then Australian biotech Artrya's solution is a great fit.

"We saw an opportunity to make a difference in the world, to exploit technology to address a problem that has been around for generations and hasn't been solved," Barrington says.

The biotech is deploying machine learning to combat the single largest cause of death in the world - coronary artery disease - a disease that accounts for one in every three deaths annually.

Diagnosis of the killer soft plaque that causes death is tricky with the naked eye but AI makes it easy. Artrya's cloud-based software diagnostic - Salix - can detect coronary artery disease early and in a non-invasive way.

Salix is driven by AI - fed by thousands of computed tomography coronary angiography (CTCA) scans - that analyses imaging at a pixel level to detect the plaque.

It can rapidly detect the biomarkers that point to the presence of disease, such as stenosis (a narrowing or restriction of a blood vessel or valve) and report the problem within minutes.

The Therapeutic Goods Administration (TGA) has ticked off approval for Salix here in Australia and the software is now being trialled at sites around the country. In the US, Artrya has signed a clinical partnership and is primed to move the technology towards commercialisation.

In the UK, Salix has captured an important market following the inking of a two-year agreement with the prestigious NHS, allowing the cost-efficient technology to be used in 1,250 NHS trust hospitals across the UK.

"AI develops exponentially, so we need to harness it to the benefits of humans," Barrington says. "We can't afford to let it get away from us."

"There's a massive shortage of clinicians, increasing expectations of an ageing and educated population, and rising costs of healthcare," he says. "We need to use AI to address some of these issues."

Cost is a huge factor in diagnostics: "We are able to assess coronary blood flows off a single CT scan, which would otherwise require an invasive hospital visit, 58% of which are not necessary. Of course, in the US, this means exponential costs."

Use of AI in clinical trials

Randomised clinical trials are at the centre of any new development in healthcare and a necessary part of bringing any new drug or therapy to market.

It's a costly and time-consuming process and requires preclinical testing, participant recruitment and several phases of randomised testing, all of which can take years.

Associate Professor Sunil Gupta and the team at the Applied Artificial Intelligence Institute at Deakin University have been working on adaptive trials using machine learning to look at previous impacts based on existing data.

AI is the methodology enabling this process. It minimises the harm to participants while increasing the statistical probability of a good outcome.

"Randomised clinical trials have been at the core of trialling any drugs, treatments, interventions for healthcare," says Gupta. "Traditional fixed allocation trials are largely inefficient, costly and even unethical, which hinders the discovery of new knowledge.

"Another issue with randomised clinical trials is that they cannot be conducted using existing data, they always need to go live."

Gupta's work tackles these challenges by using adaptive clinical trials, which maximise trial participants' welfare and outcomes, avoid allocations to sub-optimal interventions and achieve the necessary statistical outcome more quickly.

"AI-based methods allow for personalised solutions, unlike a 'one-size-fits-all' approach," says Gupta. "AI methods are capable of working with pre-existing offline data, in scenarios where recruiting certain types of subjects is not possible or trialling the interventions are risky.

"AI methods can predict the effects of an intervention for a target population based on its learning from data from a related population."

A current trial is testing mental health interventions for university students for indications such as depression, anxiety and stress reduction. In partnership with the Black Dog Institute and UNSW, Gupta and his colleagues have funding to develop a platform on which they can implement and run adaptive trials.

The trial uses contextual multi-arm bandit AI technology to allocate interventions to trial participants. This is lean-data technology, and the term comes from gambling. The proposition is that a set of resources must be allocated between competing choices in a way that maximises their expected gain, where each choices properties are only partially known at the time of allocation.

"You could try different interventions on a fixed set of people, but here what we are doing is using the AI methodology to

optimise allocation of treatments to individuals," says Gupta. "So instead of trialling a fixed number of people with a fixed set of therapies, we're trying to maximise allocation of the intervention that is working well, through AI, to participants."

The need for medical workforce doesn't evaporate because of the efficient use of AI to deploy these solutions.

"We still need a medical workforce - what AI is helping us with here is figuring out, if a person joins the trial, which intervention this person should be allocated to," Gupta says.

"Two things then happen - this person has an overall good experience and benefits from the intervention and secondly, we, as scientists, find out quickly which interventions are working and which are not, in the smallest length of the trial. AI is the underlying technology which is ensuring this.

"Recent developments in technology have allowed this to happen. Awareness of AI in the healthcare community has rapidly advanced in the last five to 10 years."

The FDA approved adaptive trials two years ago. "Since then, people have felt a bit more comfortable about the involvement of AI in a sector as sensitive as healthcare," says Gupta. "There has been a shift in public perception about whether AI has the capability to do this."

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Contact us +61 (0)2 9280 0700 action@proactiveinvestors.com.au

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