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# Researchers eye health benefit from AI

By [Gabi Mills](#)

**W**ESTERN Australia has never been short on entrepreneurial talent. For a small state, population wise, it certainly punches above its weight in a number of fields.

In health care, big data and artificial intelligence are targeting eye conditions, Alzheimer's, heart disease and liver ailments.

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Yogesana Kanagasingam provides one such example.

Recently appointed inaugural chair of digital health and telemedicine at the University of Notre Dame's School of Medicine, Professor Yogesana has developed AI for eye diseases, including a multi-functional ophthalmic diagnostic device called EyeScan.

"It was designed and built in WA," Professor Yogesana told *Business News*.

"This is the only device with front-of- the-eye and retinal imaging possible in one device."

Having secured five patents to this point, EyeScan has already garnered international attention.

"One of my devices is used by NASA at the International Space Station to study the effect of long space travel," Professor Yogesana said.

The device is now licensed to Tele- MedC (offices in Australia, Singapore and Germany), which has obtained approvals from Australia's Therapeutic Goods Administration and Singapore's Health Sciences Authority, as well as CE Marking certification, for its AI-based eye diagnostics and is deploying them to primary care clinics around the world.



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Yogesana Kanagasingam. Photo: Gabriel Oliveira

Professor Yogesan said he identified gaps and issues in health care delivery and used this knowledge to create new solutions and projects.

“One novel project leads to another new project. I find the gap or niche and go for it,” he said.

He’s also working on what he hoped would be a less invasive eye test for Alzheimer’s disease than currently available.

Professor Yogesan has created a hybrid technology for video conferencing telemedicine consultations, which, among other things, is used in China to screen for diabetes.

Telemedicine is an area of particular interest, with Professor Yogesan having identified a gap in the area through his own personal experience.

“GPs are unable to measure many vitals from remote patients when providing telemedicine consultations, so I’m working on a project with my own company – Medivitals – to build AI-based wearable platforms to monitor patients continuously and to send alerts if their disease gets worse,” he said.

Professor Yogesan’s mother lives in an aged care facility in North Fremantle and is trialling one of the new wearables, allowing him to monitor her remotely.

“I can switch on her TV from my house in Nedlands so that she can watch Tamil language programs, something [accessing them] she finds too complicated,” he said.

Professor Yogesan told *Business News* much of his current work was a natural extension of earlier innovations.

“We have been using image analysis and pattern recognition for many years before the concept of AI came along,” he said.

“AI is an ideal tool to identify pathologies much faster in real time. It can identify patterns that are not possible for human eyes to identify, such as age and gender, from retinal photos. That is the reason AI excites me.”

Another local player is [Artrya](#), a start-up targeting heart disease.

Led by co-founders [John Barrington](#) and [John Konstantopoulos](#), managing director and executive director, respectively, the [Artrya](#) team is using AI to more accurately identify patients at risk of coronary artery disease.

“John worked closely with IBM’s Watson health team globally, and my interest in technology has led me to believe that AI is fundamental to the future,” [Mr Barrington](#) said.



"It's that interest which has inspired us to find out how we can harness AI rapidly and develop technology for the good of humanity."

The pair met four years ago and spent 18 months researching the role 'vulnerable plaque' plays in heart disease.

Vulnerable plaque causes unstable blockages in blood vessel walls.

Artrya launched in May 2019 and, perhaps surprisingly in this competitive space, its fundraising efforts were oversubscribed each time they went to the market.

In May, the company raised \$15 million led by Bell Potter.

Artrya's team now includes Girish Dwivedi, a world-leading expert in vulnerable plaque and practising cardiologist, who was brought to WA by the Harry Perkins Institute of Medical Research.

"Girish then introduced us to Abdul Idayhid, a cardiologist and leading researcher in coronary blood flow," Mr Barrington told *Business News*.

It was a perfect storm, he said, of brilliant minds brought together to keep the flywheel spinning.

Artrya co-founder Mr Konstantopoulos said the statistics around heart disease were alarming.

"Sixty-four per cent of women and 50 per cent of men who die of heart attacks have no prior warning, and two thirds of those who die don't exhibit significant narrowing of the arteries but do have build-up of vulnerable plaque," he said.

Artrya has created a diagnostic solution that can identify within minutes if vulnerable plaque is present, as well as assessing blood flow, without the need to insert a wire up through the thigh and into the heart.

"The clinician can refer them to have a CT coronary angiogram, and from there, our AI 'drives' through each of the arteries, assessing faults and other problems," Mr Konstantopoulos said.

The work could contribute to saving lives in clinics globally.

"Heart disease claims 18 million lives a year; it's the biggest cause of death in the world," Mr Barrington said.

"That's where we can contribute to society and create a high growth company in Perth, generating returns for our investors. Wherever the internet is available, you can diagnose using our technology."

Artrya is currently undergoing trials with Wembley based Envision Medical Imaging and is planning national pilots followed by a commercial rollout.

"We've successfully concluded our third capital raising," Mr Barrington said.

"We intended to raise \$10 million, and we had more than \$30 million in applications; we closed at \$15 million.

"This technology is exponential; it's accelerating at an increasing pace over time.

"It's hard to predict where it'll go over the next 10 years, but the capability of AI will dramatically develop beyond our imagination."

## Wellspring

Elsewhere in the area of AI diagnostics, Three Springs Technology has been working closely with WA-based health care company Resonance Health on tools associated with liver disease: FerriSmart and HepaFat-AI.

Three Springs works with businesses such as Resonance Health to develop technology and bring it to market. In the case of FerriScan, data gathered is applied to train AI for the quantification of liver iron concentration.

As a result, it is claimed to be the world's first and only regulatory cleared AI tool for LIC, having secured approval by the Food and Drug Administration in the US.

"These solutions are being used by clinicians all over the world," Three Springs director James Telders said.

"In addition, we market Aquila 3.0, a next-generation, secure and cloud- based radiology workflow management software with access to integrated AI tools."

Half of Three Springs' staff are devoted to its own R&D pipeline of AI solutions in the medical space, closely collaborating with research institutions in Australia and abroad.

Founded in 2016 by Sherief Khorshid, Three Springs began as an AI consulting business working on projects in the mining, oil and gas and medical sectors.

In 2019, it merged with ThinkCDS, a competing WA business run by data scientist Mike Clark.

"I joined the combined business in that same year," Mr Telders told Business News.

"Since 2020, the three partners have made the strategic decision to focus solely on medical innovations, and we see this field as an important opportunity where we will continue to build on the successes the company has achieved."

Self-supervised learning is the future of medical AI, according to Mr Clark.

  
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"Right now, AI is limited by a need for large amounts of human examples," Mr Clark said.

"We want it to save clinicians' time, but to do that it requires they do a lot of work creating examples. This is a big limiting factor, especially for busy doctors.

"The solution is self-supervised learning, in particular contrastive learning, which only requires a hundredth as many examples."

He said every AI project had a lifecycle that must be followed: from acquiring, analysing and cleaning data, to developing and finessing the model. Regulatory clearance followed, with most projects taking at least a year from start to proof of concept.

A new product must have a clinical need, be technologically feasible, and fit the regulatory pathway.

Only when it ticked these boxes did a company start thinking about commercial viability.

Three Springs is one of only a handful of WA companies to build commercially successful, FDA-cleared medical software using AI.

Mr Telders said "We are currently working to integrate our core medical device technology into a clinical decision support and engagement tool, ENABLE, comprising class-leading metabolic testing technology, evidence-informed lifestyle management strategies, and machine learning capabilities to identify and support a metabolic twin approach to improving weight and health."

It's this combination of goals that makes the tool so valuable. ENABLE tackles weight and metabolic issues at the root cause: an inability to use stored body fat for energy.

Its lifestyle programs address long-term weight issues, reduce the need for prescription medications, and lessen the burden of chronic disease, offering a roadmap out of chronic conditions to lifelong improvement.

Despite the progress of AI, however, Mr Wright believes health care remains a human business.

"It is said the key advantage of a human over a machine is doubt and uncertainty, but the flipside of that is confirmation bias," Mr Wright said.

"AI has the ability to augment and improve clinical decision-making and can augment clinicians if used well.

"There may come a day when we do not know if we are talking with a machine or a human about our health decisions, but we are far from that point right now."

"One area WA is falling behind other regions is in capital support for innovation and early-stage development," he said.



"WA has significant wealth gleaned largely from the resources industry and, as a state, it is also over-represented in terms of healthcare innovators and researchers," Mr Wright said.

"However, most early-stage companies have to look interstate and overseas for funding, with many permanently deciding to move out of WA.

"Connecting investment to innovation would provide a significant growth opportunity for the state and allow the development of a thriving health care industry."

Among those to agree with this evaluation is [Artrya's Mr Barrington](#).

He said that, by 2020, the WA government provided \$37 million over three years for medical research.

In comparison, Victoria has a \$2 billion innovation fund, NSW has a \$1.6 billion innovation fund, and Queensland has access to \$750 million per annum for innovation.

"We are being left behind by the other states; it's something I've written about previously and will continue to lobby for more investment in a constructive way," [Mr Barrington](#) said.

"In areas where we have a competitive advantage, we should be pinning back our ears and going for it."

Springs was excited to be in the field at a time when many of the world's health systems were close to collapse from the COVID-19 pandemic.

"Health care systems in many countries are under immense strain due to an exponentially growing population and rising costs of providing adequate patient care," he said.

"We anticipate AI will play an important role in drug discovery, precision medicine and medical diagnostics, but it is important to remember that clinicians and regulators ultimately are the gatekeepers of our industry."

## **The big stage**

WA's part in the global AI movement tends to centre around small startups making big differences on the world stage. Behemoths such as Google and IBM have paved the way for smaller or- ganisations to open up new AI sectors.

"These large companies focus on large problems, and sometimes they do very well; at other times they can become unwieldy," [Mr Clark](#) said. "Unfortunately for us they often overlook smaller markets like Australia, and especially some of our unique qualities like our medical laws or our problems with skin cancer. We see these overlooked problems as places to focus our talents."

Mr Khorshid told *Business News* the relative immaturity of the sector provided Three Springs with an opportunity.

"Smaller companies like ours tend to focus on developing algorithms for specific medical conditions or diseases," he said.

"I think there is plenty of room for all of us, and the field is by no means mature or saturated."

Resonance Health CEO Alison Laws oversees a team that includes physicists, scientists, and software engineers, as well as quality and regulatory affairs experts.

"We are in various stages of the development cycle with several artificial intelligence products, including a radiology tool, ALERT-PE, which performs a fully automated review of chest computed tomography scans of patients with suspected pulmonary embolisms," Ms Laws said.

"ALERT-PE helps radiologists diagnose and can be seamlessly integrated into existing workflows. It may even improve health outcomes in countries lacking medical staff and services.

"Relationships built with companies here and across the world have propelled Resonance to the forefront of its field, thanks largely to the automation of the services it offers through machine learning and AI.

"If an AI solution can reduce the risk of human error and standardise a process so that time can be better spent on treating more patients, then I think this relationship between AI and human input is a positive force in improving health care."

## Staffing

Attracting and keeping talented staff to work on new projects is an ongoing challenge for many AI startups, with PhD students, in particular, highly sought after.

In the case of Metabolic Health Solutions (MHS), four such academics from IPREP/Perth Biodesign worked on the development of machine-learning capabilities within the organisation's metabolic digital health platform.

Led by founder and chief executive John Wright, and Martin Cebis, who mentored the team, MHS is working to commercialise low-cost, metabolic measurement technology to clinically manage obesity, Type 2 Diabetes and other common metabolic disorders.

"We are pioneers in the use of clinical indirect calorimetry to tackle obesity and its related health issues, which cost society trillions of dollars," Mr Wright said.



## Mentioned Organisations

[Artrya](#)

[Startups and Technology Companies](#)

[Three Springs Technology](#)

[Information & Communications Technology](#)

[Resonance Health](#)

[Public Companies - Industrial WA and Technology Companies](#)

[ThinkCDS](#)

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## Mentioned People

[Yogi Kanagasingam](#)

[John Barrington](#)

[John Konstantopoulos](#)

[Sherief Khorshid](#)

[Michael Clark](#)

[James Telders](#)

[Alison Laws](#)

[Martin Cebis](#)

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