

CUSTOMER SUCCESS STORY | HARRISON.AI

HARRISON.AI BOOSTS IVF SUCCESS WITH AI TECHNOLOGY FOR EMBRYO SELECTION



Harrison.AI





ABOUT HARRISON.AI

Harrison.AI is a clinician-led healthcare artificial intelligence (AI) company developing and deploying AI-as-medical-device solutions to address persistent healthcare challenges.

Harrison.AI's first success is in the field of fertility. Together with its partner, [Virtus Health Limited](#) (Australia's and world's largest IVF provider), Harrison.ai successfully developed, validated and deployed an AI technology ('Ivy') capable of predicting the likelihood of pregnancy from analysing embryo videos. Research on Ivy has been presented and published in top international conferences and medical journals. The technology is currently being deployed across Virtus clinics in Australia to help improve pregnancy outcomes for couples undergoing IVF treatment.

Building on this success, Harrison.AI is growing its research and development activities into new healthcare domains where AI can improve patient outcomes globally.

While the introduction of in vitro fertilization (IVF) in 1977 gave hope to women who wanted to conceive using assisted reproductive technology, the result was a bit of hit-and-miss with success rate of implantation for five-day embryos under 50%. Australia-based Healthcare artificial intelligence (AI) company, Harrison.ai, has upped the chance of success to 93 percent by leveraging AI trained on NVIDIA GPUs. (Reference: [Human Reproduction](#), Volume 34, Issue 6, June 2019, Pages 1011-1018)

The deep learning model, called IVY, is now deployed across Australia in clinics run by Virtus Health, the world's largest IVF provider and Harrison.ai's partner in the development of the technology.

Founded by brothers Aengus and Dimitry Tran, Harrison.ai aims to continuously innovate and commercialize more efficient and more affordable healthcare products and services to healthcare providers and patients. Harrison.ai empowers physicians and healthcare providers with customised AI-enabled tools that integrate into existing clinical workflows, which ultimately lead to improved patient outcomes.

A SPEECH STARTS A SPARK

INDUSTRY

Health Care

LOCATION

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PRODUCTS

> Deep Learning Framework

PyTorch, TensorFlow

> Software / SDK

NVIDIA GPU Cloud

> Hardware

NVIDIA DGX Station

NVIDIA V100 Tensor Core GPUs

NVIDIA GeForce 1080 Ti GPUs

As a medical student in Australia, Aengus Tran did a paediatric rotation at Sydney Children's Hospital where he attended a talk on IVF by Dr Simon Cooke of Virtus Health. Dr Cooke spoke about an embryo selection technology that uses a camera to capture time-lapse images of a human embryo growing inside a test tube for five days.

Sparked by what he had heard, Tran, who was intrigued by deep learning, thought that was "a perfect problem for AI".

"A critical decision that is not made very well but ultimately has consequential outcome for both patients and healthcare providers is a perfect problem for AI to solve," he recalled.

Harrison.ai was set up to deliver the impossible healthcare, not just in fertility but wherever AI can be deployed to improve prediction.

Is the patient sick or not? Should the patient be sent home?
Should the patient stay in the hospital?

These are just some of the many instances where Tran feels AI can make a difference.

"Every time there's a decision to be made and there's good data, we believe there's an opportunity to make it better using AI," said Tran, co-founder and Medical AI Director, Harrison.ai

A VERY BIG PROBLEM

CUSTOMER QUOTES

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Dr. Aengus Tran

Founder and CEO at Harrison.AI

“Nothing beats having something that’s powerful yet whisper quiet like the NVIDIA DGX Station. It just sits at the desk to give so much power at the fingertip.”

Dimitry Tran

Co-Founder

From Dr Cooke’s talk, Tran learnt that selecting embryo is a non-standard process in human IVF.

A woman typically ovulates only one egg per month. With IVF treatment, a woman can ovulate multiple eggs in one cycle. These eggs are fertilized with sperms to create human embryos and incubated for five days.

At the end of the incubation period, the most viable egg is selected to create a pregnancy. As there is no guarantee that the chosen egg is the best of the lot, embryologists would pick three or four to increase the odds of a successful pregnancy.

However, this approach has resulted in a higher occurrence of multiple pregnancies, which can result in dangerous complications such as late miscarriage, high blood pressure and pre-eclampsia for the mother.

“The goal of IVF is to have one embryo transfer leading to one pregnancy. As we are not good at selecting embryo manually, there’s a need for technology such as Ivy to help the embryologist in identifying the best chance possible for women to get pregnant quicker,” said Tran.

IVF is also very emotionally and financially taxing process for all involved – the couple and their families.



Dr. Aengus Tran

The uncertainty makes it emotionally draining for the woman. If the best embryo does not result in pregnancy, another from the batch needs to be selected and the process is repeated. It may take many attempts before a pregnancy is achieved.

Financially, it costs the same amount of time and money for each attempt.

“If we can predict which of those embryos would work and go for that one first, the probability of woman getting pregnant improves significantly. The whole idea behind Ivy is to help in the selection process,” said Tran.

ANALYZING TIME-LAPSE VIDEOS

CUSTOMER QUOTES

“When we have larger scale workload for training, we turn to the NVIDIA GPU Cloud, which is amazing for us. We can import Docker containers that have the same software stack optimized by NVIDIA. The seamless experience allows us to cloud burst if we need to, giving us continuity of working across multiple platforms.”

Dimitry Tran
Co-Founder

Ivy is a self-improving deep neural network that analyzes time-lapse videos of embryos growing in the incubator, and predicts whether that embryo will form a fetal heart after six weeks on an ultrasound test. It acts as an assistive tool for embryologists and doctors to identify the most viable embryo to give patients the best possible chance for success the first time around.

Collaborating with Virtus Health gave Harrison.ai access to a data set of more than 10,000 human embryos, across four countries, growing in the incubator. It’s not just the volume but the diversity of data that is representative of the populations, allowing the models to be robust and avoid any bias.

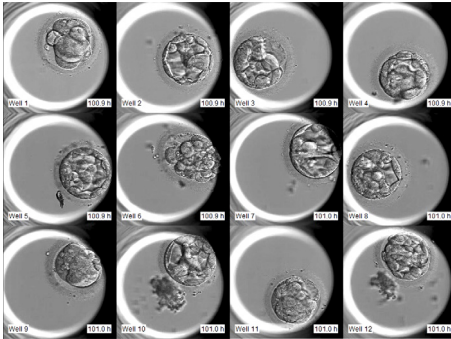
Using NVIDIA technology, Ivy was trained to make better predictions on which embryo was likely to work.

Traditionally, embryologists analyze the last image of the embryo development for suitability assessment.

According to Tran, that approach is not very informative because the critical event could have happened days before the final day as the damage could have already been done earlier.

“Ivy looks at the entire video sequence across the five-day period to make a prediction. Hence, it is more robust compared to just looking at the single slice of the video,” he said.

POWERFUL YET WHISPER QUIET



Harrison.ai has deployed Ivy in Virtus Health's clinics across Australia

Jumping from 2D images to videos is a massive challenge that requires four times the compute power.

Harrison.ai started out with two NVIDIA GeForce 1080Ti GPUs, which were the most economical version and popular among AI enthusiasts then.

Two more cards were quickly added before it upgraded to the NVIDIA DGX Station, the world's fastest workstation for leading-edge AI development, which allowed the team to work on bigger models and batch sizes for better results on training on the data set.

It took four days to train the initial models using the NVIDIA GeForce 1080Ti GPUs. However, the more powerful NVIDIA DGX Station optimized for deep learning with Tensor Core architecture greatly boosted productivity by reducing training time to just one day.

“Nothing beats having something that's powerful yet whisper quiet like the NVIDIA DGX Station. It just sits at the desk to give so much power at the fingertip,” said Tran. “And when we have larger scale workload for training, we turn to the NVIDIA GPU Cloud, which is amazing for us. We can import Docker containers that have the same software stack optimized by NVIDIA. The seamless experience allows us to cloud burst if we need to, giving us continuity of working across multiple platforms.

SLASHING THE ODDS

CUSTOMER QUOTES

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Under the collaboration, Harrison.ai has deployed Ivy in Virtus Health’s clinics across Australia. Using a simple interface, embryologists can study the human embryos and make routine predictions. Inferencing is done using consumer grade GPUs in the clinics.

Ivy has been used to assess thousands of cases in Australia.

Human Reproduction, a leading IVF, obstetrics and gynaecology journal, has named deep learning as a novel approach in predicting embryo fetal heart.

The publication pointed out that Ivy was able to predict fetal heart pregnancy from time-lapse videos with 93 percent success, compared to less than 50% success rate of implantation for five-day embryos.

LOOKING AHEAD

Harrison.ai is also teaming up with Vitrolife, the manufacturer of an incubator device called EmbryoScope that captures embryo images, to deploy Ivy to the edge to give embryologists a more seamless workflow.

“We are not looking at replacing clinicians. What we envision is a symbiotic relationship between doctors and machine, where the machine aids them with the predictions, allowing them to deliver care that was previously impossible,” says Dr. Aengus Tran