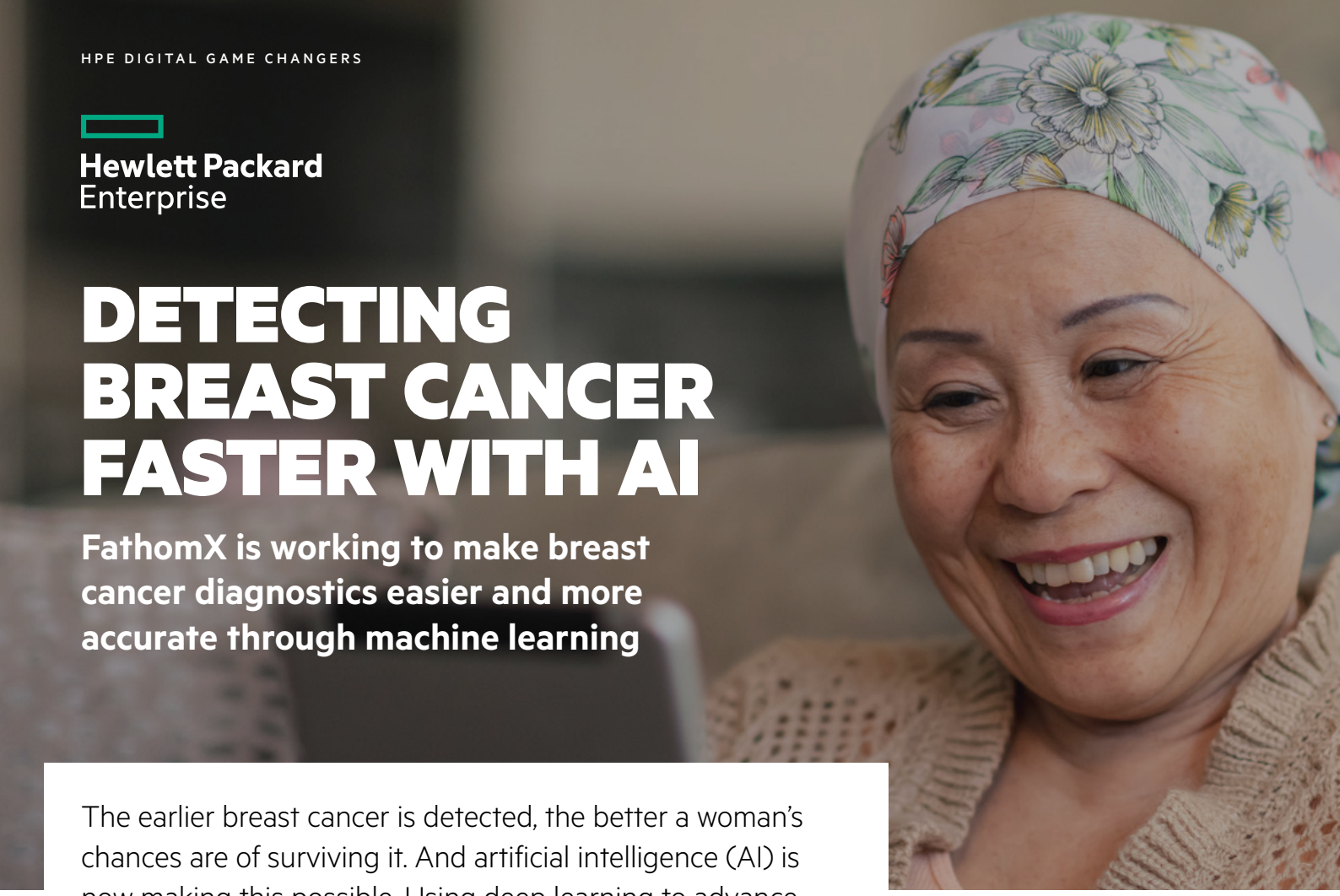
Hewlett Packard Enterprise

DETECTING BREAST CANCER FASTER WITH AI

FathomX is working to make breast cancer diagnostics easier and more accurate through machine learning



The earlier breast cancer is detected, the better a woman's chances are of surviving it. And artificial intelligence (AI) is now making this possible. Using deep learning to advance mammographic screening, startup FathomX is aiming to improve breast cancer diagnoses and deliver results more quickly, potentially reducing women's anxiety and breast cancer deaths, and helping clinicians provide better, faster care.

Mammograms can save lives. But the process of going through screening and getting a conclusive breast cancer diagnosis can be fraught with anxiety.

"If you're a woman and you finally gather the energy to go for mammographic screening, it's uncomfortable and sometimes can be painful. And then you have to wait for a result," says Mikael Hartman, a breast surgeon at Singapore's National University Hospital.

It's the waiting time—which can be up to two weeks in standard screening programs—that leaves many women on the edge. However, that often pales in comparison to what comes next for some patients: being asked to do further diagnostic work.

"One in 10 get a letter saying, 'We saw something on your mammogram. You have to come back and do additional tests'," notes Hartman.

Further screening means another two weeks or so of waiting for these women—and worrying if they have breast cancer. Yet most of these results turn out to be false positives, meaning the women don't have cancer.

While mammography remains the best tool to detect breast cancer, it's not 100% accurate. Traditional screening programs rely on manual readings, which can be prone to human error. In fact, many of today's screening methods suffer from a false positive rate of around 9%.

FATHOMX

INDUSTRY: HEALTHCARE

REGION: SINGAPORE

VISION

Improve women's health outcomes through better and faster detection of breast cancer

STRATEGY

Develop an AI tool that improves the accuracy of diagnoses and delivers results more quickly

EXPECTED OUTCOMES

- Cut false positives as well as false negatives for interval cancer cases in mammographic screening
- Accelerate the process of reading mammograms by more than 10x, from half an hour to as little as 2 minutes
- Reduce patient anxiety and breast cancer mortality rate and improve women's quality of life

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"So, that's one month of meaningless anxiety for a woman who's done something good for her health," says Hartman. "With an AI solution, the process can actually be cut down to minutes."

Improving women's health

Hartman is also co-founder and clinical lead of Singapore-based FathomX. The medical imaging startup aims to improve health outcomes for women by making breast cancer diagnosis faster and easier, using AI. FathomX's target is to significantly reduce false positives as well as false negatives for interval cancer cases and to cut diagnosis times by 50%, so women won't have to go through unnecessary worry.

Interpreting mammograms takes time because it requires multiple radiologists to read each image, a process that can take up to 30 minutes. Reading screens can also be visually taxing and challenging, even to skilled and experienced radiologists.

"It's a delivery issue," says Hartman. "Radiologists don't tend to read the mammograms as they come in. They batch them, and then they will sit down and read maybe 20 to 50 at a time. They can't read more in one sitting because they get tired."

Reducing deaths through faster diagnoses

Besides creating longer waiting times, the current process can cause a productivity gap. "Not all radiologists are trained to read mammograms, and to qualify, they need to pass more stringent requirements," says Feng Mengling, co-founder and chief scientific officer of FathomX.

In Singapore, the limited pool of radiologists qualified to interpret mammograms also contributes to the waiting time. "We definitely don't have enough radiologists to diagnose screening images fast enough," says Feng. "And that's under the backdrop of our current adoption rate of only about 40 percent for regular screening. Assuming we'll do a good job of promoting mammography and reach 80+ percent, we could expect a much longer waiting time or heavier burden on our system."

"So, we do see a productivity gap that needs to be filled. And that's why we think AI could be helpful," adds Feng, who is also an assistant professor at the National University of Singapore (NUS) Saw Swee Hock School of Public Health.

Transforming cancer screening through AI

The team at FathomX believes AI can increase radiologists' efficiency by reducing interpretation times and enabling them to read more screens in one sitting. Through advances in machine learning, clinicians can now deliver more accurate diagnoses and detect breast cancer earlier.

"Ultimately, this can reduce anxiety, healthcare costs, and breast cancer mortality, as well as improve women's overall quality of life," says Feng.

FathomX has been developing deep learning algorithms to speed up and improve the analysis of mammograms. It is working to create an AI assistant that can automatically analyze mammograms, generate a heat map of abnormal lesions, and estimate a patient's risk of breast cancer through imaging and analysis of medical history records.

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>
> – **MIKAEL HARTMAN**, CO-FOUNDER AND CLINICAL LEAD, FATHOMX

This kind of technology can cut reading times per image down to two minutes for most cases and 10 minutes for complex ones, potentially transforming breast cancer screening.

"We're now on the brink of a tectonic shift in how healthcare is going to be delivered and how women's health is going to be cared for," says Hartman, who is also the program leader for breast cancer prevention at the NUS Saw Swee Hock School of Public Health.

Using AI to read mammograms

FathomX doesn't expect AI to make human interpretation entirely unnecessary. Its vision is to have an AI assistant that can conduct the initial reading of mammograms.

"Consider AI as an assistant or junior doctor who reads all these mammograms before a senior radiologist comes to the office," says Feng. "Overnight, the assistant reads all the images, makes diagnoses, prepares a report, highlights all the suspected lesions nicely, and presents it to the radiologist."

With the AI tool doing the initial reading, the radiologist can then focus on cases that need more attention, such as those that show abnormalities.

"Towards the end of his duty, the radiologist can look at cases that the AI assistant very confidently identified as normal," says Feng. "Hopefully, he can just click a button and say, 'I agree with the AI diagnosis, the case is normal based on my quick read.' That's the whole scenario we're imagining."

Training algorithms faster

To train its AI model, FathomX has built a secure production-level data infrastructure. Through a co-development partnership with HPE Asia Pacific Innovation Center, it has deployed computing platforms to accelerate data processing and ensure data security.

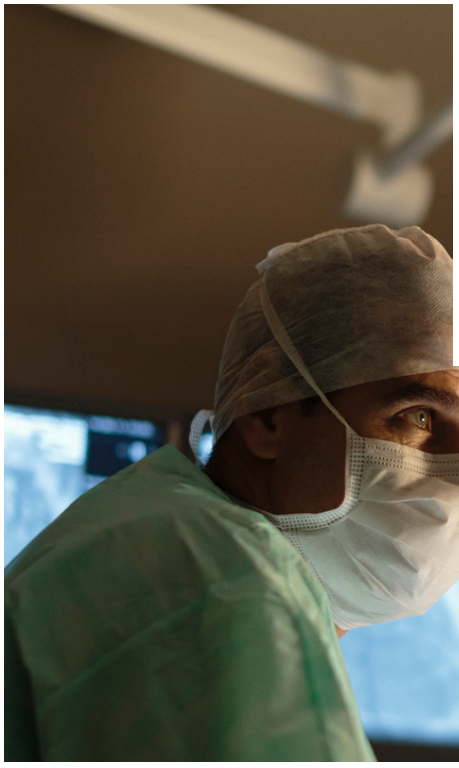
FathomX's compute infrastructure consists of HPE Edgeline EL1000 Converged Edge systems with NVIDIA® T4 graphics processing units (GPUs) and an HPE Apollo 6500 system with NVIDIA A100 GPUs.

Using a GPU-accelerated system, the firm can process huge volumes of medical images to train its algorithms. Mammography requires very high-resolution images to be able to capture microcalcifications, which are minuscule deposits of calcium in the breast that might indicate an early stage of cancer. These images typically have a resolution of about 3000 x 3000 dpi, requiring powerful GPU servers with a large memory to process and analyze them.

"The HPE Apollo system provides us with the ability to train our AI model with larger batch sizes of images," says Hao Du, FathomX's chief technology officer. "This means that the model learns faster and can reach an optimal point to identify lesions in a mammogram."

On-site, real-time diagnosis through edge computing

For inference, FathomX uses HPE Edgeline systems to enable its AI assistant to analyze mammograms and estimate a patient's risk of breast cancer right at a clinic or hospital, accelerating screening.



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"This way, we wouldn't need to transfer mammograms from a hospital to our call server for inference and then back," says Hao. "This eliminates cybersecurity issues and delays in data transfer and processing."

Healthcare institutions such as hospitals are often cautious about uploading patient data to the cloud, preferring an on-premises deployment of a solution.

"While deploying a rack-based server is always troublesome and difficult to execute, we're seeing that we can easily deploy the Edgeline device to hospitals," says Feng. "It's very compact and serves its purpose for inference. And it works very well."

FathomX is now seeking regulatory approvals before rolling out its AI assistant to different markets.

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SOLUTION

HARDWARE

- HPE Edgeline EL1000 Converged Edge systems with NVIDIA T4 GPUs
- HPE Apollo 6500 system with NVIDIA A100 GPUs

KEY PARTNERS

- HPE Asia Pacific Innovation Center

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a50005139ENW, November 2021

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