The University of Hawaii Cancer Center, located in Honolulu, HI

CASE STUDY

University of Hawai'i Cancer Center Leverages Data and AI in the Fight to Understand Breast Cancer

UNIVERSITY OF HAWAI'I CANCER CENTER

SHEPHERD RESEARCH LAB

Challenge

- UHCC needs a storage infrastructure that accommodates massive medical databases for cancer research
- UHCC needs to ensure patient information, clinical data and large mammogram images are easily accessible but securely stored to protect patient privacy

Solution

A highly reliable and scalable solution for AI healthcare research

- Western Digital Ultrastar® Data60 hybrid storage platform
- Western Digital Ultrastar DC HC520 12TB[1] HDDs
- Nvidia DGX-1

Key Results

- Simplified storage infrastructure with capacity to handle massive mammogram databases and AI databases
- Increased storage reliability delivered by Western Digital's innovative technologies and latest low failure rate drives, reducing time spent managing the storage
- Flexibility to easily upgrade to higher capacity and/or more performance in the future by simply upgrading to higher capacity HDDs or by daisy-chaining additional storage platforms

University of Hawai'i Cancer Center (UHCC)

With one of the most diverse populations in the world, Hawai'i is an ideal environment for medical research, specifically cancer research. At the University of Hawai'i, scientists are studying why some ethnic populations are more likely to contract certain types of cancer, as well as how this predisposition interacts with environmental factors to produce cancer risk. This volume of diverse data is ideal for artificial intelligence (AI) to process, analyze and draw insights from.

John Shepherd, PhD, helped found the AI Precision Health Institute (AI-PHI) in Hawai'i in 2018. In parallel with the University of Hawai'i Cancer Center, AI-PHI is committed to leveraging AI, machine learning and deep learning to help relieve the increasing prevalence of cancer in the Pacific region.

A Diverse and Unique Database for AI

Native Hawaiian women statistically fare worse with breast cancer compared to nearly every other ethnic group. To begin to understand this challenge, the Hawai'i Pacific Islands Mammography Registry was created as the first mammography database to focus on women in Hawai'i, including Native Hawaiians and Pacific Islanders. Elsewhere in the world, there are seven or eight existing databases with mammography data robust enough to train AI, but those databases are curated from a predominantly white population and are not representative of the diverse ethnic population of Hawai'i. Correcting this data bias is critical to determine why different ethnicities of women experience such different breast cancer outcomes, and how medical professionals can help vulnerable groups.

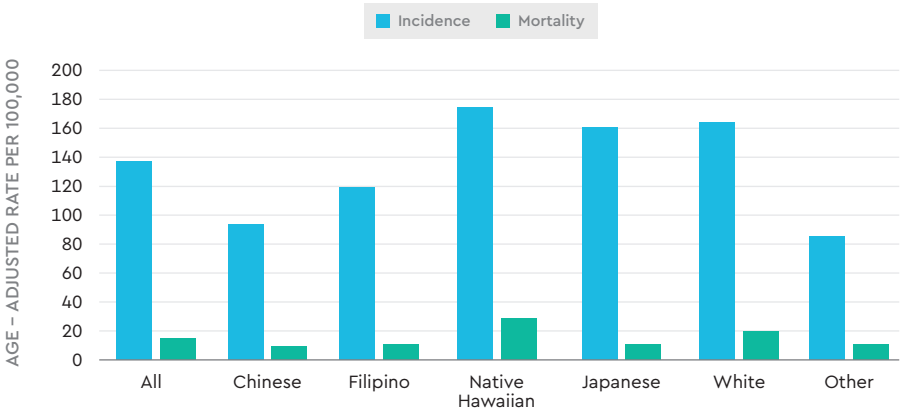
Breast cancer usually reveals itself in mammography as an asymmetry between the left and right breast. But there's a limit to how well (or how finely) a human can read these asymmetries. For example, the human eye can only see 256 levels of shades out of a mammogram's 65,000. AI can see all 65,000 shades of a mammogram and compare 1,000 variables for relevance to cancer outcomes. The first step in training AI to find cancerous differences in mammograms is to train AI to ignore healthy differences in mammograms. The AI neural network is trained with images from the mammogram database multiple times with variations in granulation, shading, scale and perspective, a process called "augmenting." The mammography database must be massive and diverse so that over time scientists can find the novel imaging biomarkers in mammograms as well as quantify cancer risk factors. Because this database contains individuals' clinical information, the storage infrastructure must securely store this data to protect patient privacy.

[1] One terabyte (TB) is equal to 1,000GB (one trillion bytes). Actual user capacity may be less due to operating environment.

"Because of the uniqueness of Hawai'i, we have this really broad demographic of ethnicities, races, BMIs, and cultures, and if you train an AI model with that broad amount of data, it should deliver models that are useful anywhere in the world."

John Shepherd, PhD, AI-PHI

Breast Cancer Incidence and Mortality[2]
by Race/Ethnicity, Hawai'i, 2012–2016



Reliable Storage for Massive AI Databases

To ensure the long-term reliability and efficiency of their mammogram database, the AI-PHI has partnered with Western Digital. They chose an Ultrastar Data60 Hybrid Storage Platform filled with 720TB of Ultrastar DC HC520 HelioSeal® hard drives to complement their Nvidia DGX-1 for deep learning workloads. Western Digital storage platform innovations, such as patented IsoVibe™ and ArcticFlow™ deliver real-world benefits of better cooling, lower fan speeds, less noise and reduced power consumption. IsoVibe technology provides a vibration-isolating suspension for drives in the chassis, helping them maintain consistent performance even when all drives are working. ArcticFlow thermal zone cooling reduces fan speeds, vibration, and power consumption to improve reliability. Together, these innovations have translated to a 62% lower return rate for hard drives than in previous-generation enclosures. Ultrastar HelioSeal HDDs enable higher capacities to serve AI databases, while offering higher reliability compared to air-filled HDDs.

Shepherd and his team at the AI-PHI are working to develop, curate and share this massive medical database to aid researchers in solving this unique problem for Hawaiian women. With the improved performance provided by Western Digital solutions, his team has fast access to large amounts of data needed by AI workflows.

"AI has changed everything in terms of how we addressed problems with Big Data," Shepherd says. "When you're going to examine six million images, it takes a lot of time. With fast and reliable access to large amounts of data and the power of AI, you can say 'Okay, there's an outcome difference between these two images, which may ultimately help us pick out the women who may develop cancer versus those that won't.'"

To learn more about the AI Precision Health Institute, please visit www.shepherdresearchlab.org

[2] Source: https://www.uhcancercenter.org/pdf/htr/Hawaii%20Cancer%20at%20a%20Glance%202012_2016.pdf Hawai'i Tumor Registry, University of Hawai'i Cancer Center. All cases are invasive. Rates are over the 5-year period and are per 100,000 and age-adjusted to the 2000 U.S. Standard Population

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