

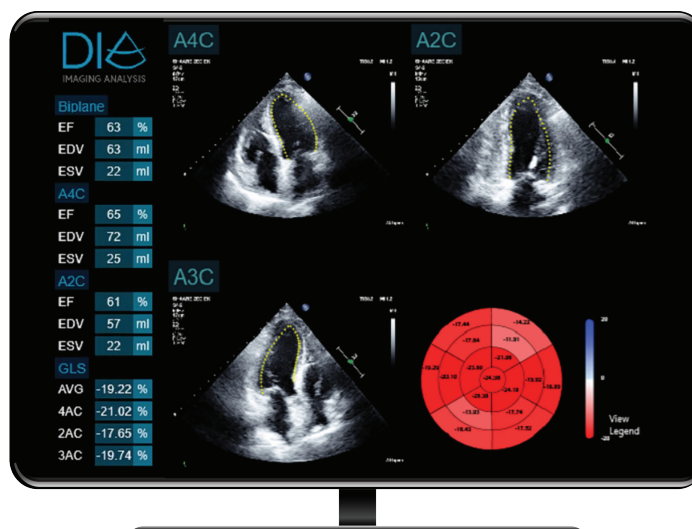
DiA Imaging Analysis Improves Speed of AI-Based Cardiac Ultrasound Analysis Software Using Intel Technology



DiA Imaging Analysis has created LVivo Seamless, an AI-based software solution that automatically analyzes ultrasound images as part of a standard echocardiography exam workflow. Also known as echo tests, echocardiograms are ultrasounds of the heart used by medical professionals to investigate signs or symptoms of heart diseases. The LVivo Seamless algorithm runs behind the scenes on cardiac ultrasound exams, automatically selecting and analyzing the optimal apical views to generate key measurements of cardiac indications including ejection fraction (EF) and myocardial strain, enabling right ventricle (RV) size and function analysis in a click. LVivo Seamless uses AI-based models to automate this analysis, which is commonly performed manually. As time management is critical to conducting echo tests, DiA's solutions operate seamlessly and automatically to provide quick and reliable results, helping clinicians analyze a large volume of exams. By using the Intel® Distribution of OpenVINO™ Toolkit to optimize the performance of software on Intel CPUs, DiA reduced the time it takes to get clinical results by 43 percent without impacting accuracy.¹

Challenge

- DiA's LVivo Seamless software generates automated key measurements from echocardiogram exam using AI models. The software is installed and run on a hospital's existing information technology (IT) infrastructure.
- Running time is dependent on the hospital's infrastructure. In most cases, hospitals, imaging centers, and other provider organizations use Intel processor-based servers—but processing speed can vary depending on the institution's existing hardware. The ability to access clinical key measurements as quickly as possible after each scan is vital to the echo lab's workflow, leading to adoption of AI-based technologies like LVivo Seamless.



Solution

- After adding the OpenVINO toolkit to the LVivo Seamless solution, DiA was able to optimize the running time of its AI-based models without requiring the use of a discrete graphics processing unit (GPU).
- The OpenVINO toolkit, a software package that facilitates the optimization of deep learning inference models, helped DiA improve AI model time performance without straining hospital IT infrastructures by adding hardware complexity.

Results

- By running the OpenVINO toolkit on 11th Gen Intel® Core™ i5 processor-based platforms with integrated GPUs, LVivo Seamless demonstrated a 43 percent reduction of processing time utilizing the hospital's existing IT infrastructure.

Using AI to make automated cardiac ultrasound analysis more accessible

Echocardiography is the most common imaging exam used to assess cardiac abnormalities related to damage from myocardial infarction, hypertension, and heart valve diseases, and to manage patients with heart failure and other heart-related issues. This form of cardiac ultrasound imaging provides cardiologists with a non-invasive way to view a patient's heart function including vital key measurements that play an important role in clinicians' decision-making process, like EF, GLS, and RV size and function.

The global burden of cardiovascular disease is steadily rising and is expected to continue to do so, especially in the wake of the COVID-19 pandemic and its associated long-term cardiovascular symptoms. Yet, while advances in ultrasound technology have made echocardiograms more widely available in hospitals, the measurement process and subsequent analysis of different heart-related metrics remains challenging. To start, these measurements are commonly obtained in a manual, visual fashion that is time-consuming, highly subjective, and dependent on the operator's experience. This often creates highly variable echocardiogram analysis results across different operators and platforms. In addition, operator fatigue and limited scanning time of patients may result in restricting the availability of more complex analyses, like GLS, to a smaller number of patients.

DiA Imaging Analysis' LVivo Seamless AI-based software addresses these challenges and automatically performs key measurements from all echocardiography studies, providing clinicians with fast and reproducible results to better support their decision-making process.

Overcoming analysis challenges with AI

When conducting an echocardiography study, medical professionals will scan and record up to 40 to 80 clips of the heart in motion. These include scans of cardiac apical views (4CH/2CH/3CH) that allow the qualitative and quantitative evaluation of left ventricle (LV) function, gaining key metrics like EF, GLS, and RV size and function. Clinicians rely on these qualitative and quantitative evaluations to appraise heart function abnormalities after cardiac events such as a myocardial infarction.

In the past, acquiring these measurements required many manual steps, including selecting the appropriate clips before taking appropriate measurements for each view selected. These processes are incredibly time-consuming for clinicians, not to mention subjective and user-dependent.

For example, the measurement of GLS is highly recommended by leading imaging and cardiology associations for the evaluation of various cardiac conditions. Taking the measurement requires the ultrasound operator to select three apical views with optimal image quality, which is time-consuming and requires additional training. Therefore, many providers will only perform these measurements for a relatively small population of patients, limiting their information for making clinical decisions.

Echo labs also face challenges when relying on previous echocardiography studies from other facilities and providers for patient follow-up. These studies are often performed on different cardiac ultrasound devices that use their own analysis methods and algorithms with results that may be inconsistent with the results from other devices. This kind of variability across different solutions may lead to missed diagnoses as well as suboptimal treatment selection.

DiA addressed these challenges by developing LVivo Seamless, an AI-based software solution that provides automated, fast, and reproducible cardiac measurements. It can be run on both previous and new exams, making it more accessible to a broader group of patients. LVivo Seamless is a vendor-neutral platform that is agnostic to image device source. It automates and standardizes the cardiac key measurements workflow by selecting and analyzing the most optimal views and delivering results directly to any picture archiving and communication system (PACS) viewer. Most importantly, LVivo Seamless can perform these functions in the background, without user involvement or any change to the scanning workflow.

Built for speed

DiA Imaging Analysis uses advanced pattern recognition, deep learning, and machine learning algorithms to mimic the way experienced cardiologists identify borders and motion in echocardiography studies. The solution uses the Intel Distribution of OpenVINO toolkit to improve LVivo Seamless' run time by optimizing the model inference performance for more rapid results.

LVivo Seamless runs classification AI models over the dozens of clips collected in a typical echocardiography study as part of its view selection and analysis. The OpenVINO toolkit optimizes the analysis process, providing significant time savings in the AI model's inference time. After adding the toolkit to LVivo Seamless, DiA was able to improve the performance time by 43 percent when installed on hardware powered by an Intel Core i5 processor.

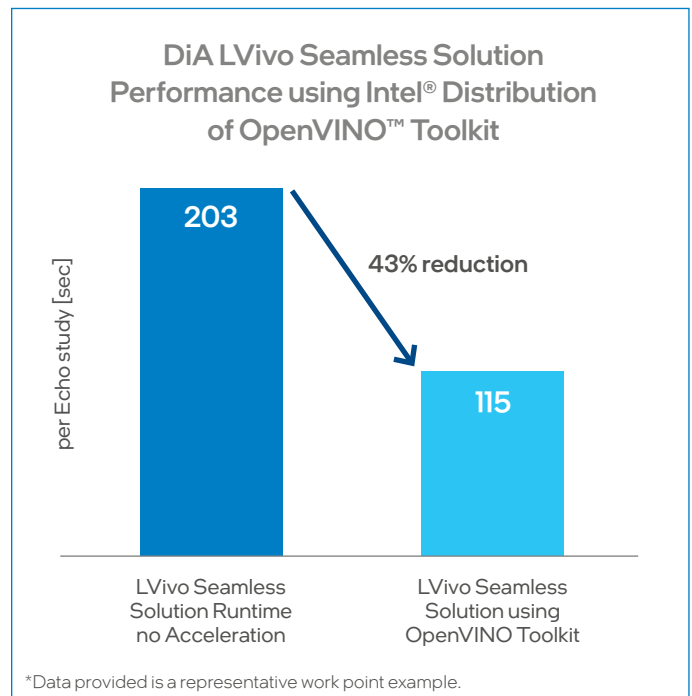
The ability to run AI models on discrete GPUs in existing hospital systems can be limited due to the complexity and expense of configuration. Furthermore, while cloud computation can help accelerate the analysis process, it may be less accessible for many health organizations due to regulatory and security concerns. That's why it was so important to DiA Imaging Analysis to optimize LVivo Seamless on Intel CPUs that are already widely deployed in hospital environments and echo labs.

The 11th Generation Intel Core i5 processor features Intel UHD Graphics that acts as an integrated AI accelerator, providing powerful support for real-time computing and analysis. The accelerated deep learning inference performance of the Intel Core processor combined with the OpenVINO toolkit gives provider organizations the ability

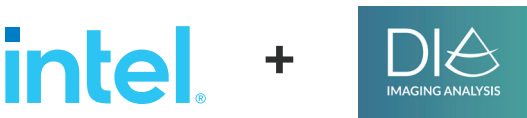
to achieve the desired performance results from cardiac ultrasound analysis using their existing IT infrastructure. The solution can run using processors commonly found on standard desktop computers without any compromise to processing speed. The result is improved physician access to rapid, accurate analysis of echocardiography studies using LVivo Seamless software. DiA Imaging Analysis expects even greater performance gains when LVivo Seamless is installed on systems with more powerful Intel CPUs.

Every minute counts in busy clinical environments. An automatic, vendor-neutral AI solution that runs behind the scenes on existing IT infrastructure eliminates many of the manual steps involved with cardiac ultrasound view selection and measurement. LVivo Seamless, fueled by the OpenVINO toolkit, is designed to provide results in a fast, accurate, and objective manner.

Immediate cardiac ultrasound image analysis is available to clinicians using LVivo Seamless, with its enhanced computer vision and inference modelling capabilities powered by the OpenVINO toolkit. When installed on hardware containing an Intel Core i5 processor with integrated GPU, performance improved by 43 percent by utilizing optimizations provided by the OpenVINO toolkit. These gains will not only help cardiologists diagnose cardiovascular disease earlier but also, ultimately, improve clinical outcomes for all patients.



Solution provided by:



DiA Imaging Analysis

DiA Imaging Analysis is the world's leading provider of advanced AI-based software solutions for ultrasound analysis, making the use and analysis of ultrasound images smarter, faster, and more accessible. The company's LVivo product line for cardiac and abdominal automated analysis allows clinicians with various levels of ultrasound experience to use and analyze ultrasound images on their ultrasound devices or healthcare IT systems with increased speed, efficiency and accuracy.

Learn more about LVivo Seamless software:
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¹ Testing performed by DiA Imaging in February 2022. Testing platform: 11th Gen Intel® Core™ i5-11600KF Processor @ 3.90 GHz 3.91 GHz, 16GB RAM, 64-bit system, Windows 10 operating system. Testing done of DiA LVivo Seamless Solution with and without Intel® Distribution of OpenVINO™ Toolkit v. 2021.4.582

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