CASE STUDY

Finding Value in AI-aided Smart Healthcare

High Performance Computing
Intel® Xeon® Scalable Processors
Intel oneAPI Deep Neural Network Library

AMAX Deep Learning All-in-One Solution

- Intel® Xeon® Gold processors
- Intel Distribution of OpenVINO™ toolkit
- Intel Solid State Drives (SSDs)

Critical Inferencing Work Accelerated by Intel® Xeon® Scalable Processors on AMAX Deep Learning All-In-One Systems using Winning Health Medical Imaging AI software

Deploying AI-assisted applications to support the healthcare community can be immediately impactful. A collaboration between Winning Health Technology Group and AMAX, working with engineers at Intel, resulted in the successful combination of AI technology with medical imaging. This combination will assist in the diagnosis of more than twenty common health conditions that can be identified in medical images. The AMAX Deep Learning All-In-One system, equipped with Intel® Xeon® Scalable processors and Winning Health Medical Imaging AI applications, delivers fast and accurate AI-assisted diagnostic results. These results are used as preliminary medical reports to assist doctors in their diagnosis of conditions. Best of all, these systems help keep costs in check, without sacrificing results, by optimizing performance on existing computing infrastructure.

Challenge

The healthcare industry has increasingly found value in artificial intelligence (AI) technology, but usage can pose challenges in both the integration of the technology with other systems, and with infrastructure spending priorities.

As medical imaging technology has evolved, there has been continuous growth in the use of medical imaging devices. A corresponding explosive growth in the generation of medical imaging data, resulting in increased demand for the analysis of medical images. Fortunately, AI can help address these needs. With AI technology, medical institutions can effectively improve diagnostic accuracy and efficiency, shorten wait time, and reduce treatment cost.

The appeal is clear: Lives are made better when systems alert doctors to critical conditions, and thereby aid in prioritization to avoid delays in treatment.

One challenge is that AI-assisted applications have significant performance needs. Hospitals, doctors' offices, and other healthcare facilities already make extensive use of computer systems for patient care. Controlling healthcare costs is always a goal. Therefore, it is far better if AI-assisted applications can utilize existing computing resources in order to avoid the added costs of investing in new computing systems.

Healthcare organizations are always looking for solutions that fit into their environment and budget, without sacrificing the quality of patient care. How to harness existing computing resources for deep learning deployment is thus a very important topic.

Solution

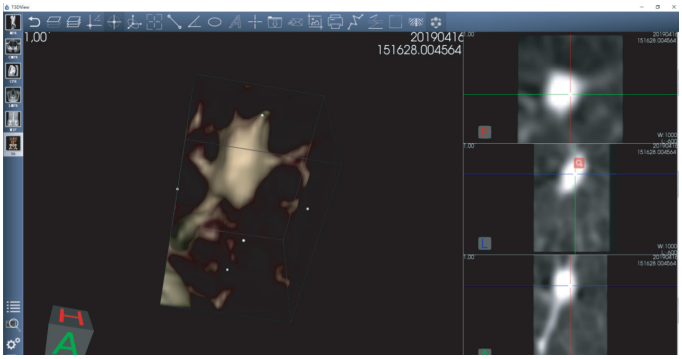
Winning Health brings AI technology to medical imaging applications with its flexible infrastructure. The company's solution is based upon AMAX Deep Learning All-In-One systems equipped with Intel Xeon Gold 6240 Processors, Intel SSDs, the open source OpenVINO toolkit, and the open source oneAPI Deep Neural Network Library (oneDNN).

Result

Healthcare providers already depend upon Intel processor-based systems in their hospitals and other facilities. Healthcare providers will be delighted to see the performance and effectiveness that Intel Xeon Scalable processors bring to AI-assisted healthcare thanks to the collaboration with Winning Health and AMAX.

Thanks to collaboration between medical experts, AMAX, Winning Healthcare, and Intel, optimization and innovation in both software and hardware led to significant efficiency improvements in the Winning Health Medical Imaging AI solution using AMAX Deep Learning All-In-One.

"Powerful Intel Xeon Scalable processors in the existing data center run HPC tasks'" Tony Yu, AMAX Deep Learning All-In-One director observed. "It is a thrill to explore the AI capability of Intel Xeon Scalable processors to fulfill customer requirements in multiple Deep Learning inference scenarios."



Lung nodule screening system. After the lung nodule is automatically detected, doctors need to further observe the shape and characteristics of the nodule. In the system, the algorithm automatically extracts the nodule details and generates the 3D image to assist doctors in their analysis.

A pulmonary nodule is a small round or oval-shaped growth in the lung that is visible on imaging such as an x-ray or a computed tomography scan (CT). Nodules larger than three centimeters (1.2 inches) in diameter are a key indicator of likely cancer. AI-assisted analysis (shown above) helps speed doctors to a diagnosis, so patients can be informed regarding results during their visit and spend more time talking about treatment options.

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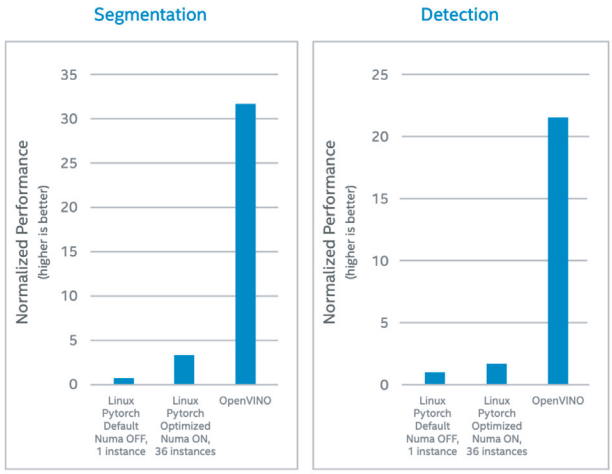

Performance characteristics of two configurations in three test tasks.[1, 2]

AI-aided diagnosis of pulmonary nodule imaging, which previously took more than 30 minutes, now takes less than 2 minutes. Optimization acceleration is broken down in the figure below, highlighting the value of OpenVINO for delivery of AI-assisted healthcare without additional hardware investments.

"The Intel Distribution of the OpenVINO™ toolkit and Intel oneAPI Deep Neural Network Library (Intel oneDNN) gives Winning Health the flexibility to build on," Yu explained. "At the same time it exceeds their performance expectations with its highly efficient use of Intel Xeon Scalable processors. Intel has helped unlock the outstanding performance of AMAX and Intel HPC systems."

After evaluation, the AI system will be integrated into PACS (Picture Archiving and Communicating System), where more than 500 of Winning Health's clients will benefit from the efficient computer-aided lung nodule screening system.

Winning Health and AMAX have successfully extended their high-performance work to additional analysis including bone analysis.

[1] Tested by Winning as of 4/17/2020. 2 socket Intel Xeon Gold 6240 processor, 18 cores, HT ON, Total Memory 384 GB (12 slots/ 32 GB/ 2666 MHz), BIOS: SE5C620.8 6B.02.01.0010.010620200716 (ucode: 0x400002c), CentOS 8,5.6.4-1.el8.elrepo.x86X64, Deep Learning Framework: Pytorch, Compiler: gcc 7.3, MKL DNN version: v0.20.5, precision: FP32, da-taset: 357x4x3x96x512x512, Customized 3D Unet. Configuration 1: Linux Pytorch Default Numa OFF, 1 instance; Configuration 2: Linux Pytorch Optimized Numa ON, 36 instances; Configuration 3: OpenVINO. With OpenVINO, or by using the Intel-optimized distribution of Pytorch, significant speedups can be achieved.

[2] As more tests are conducted, the performance benchmark results may be modified. The results depend on the specific platform configuration and workload. The results do not necessarily represent other performance benchmarks, and other performance benchmarks may be more or less inhibited. Performance results are based on tests as of April 20, 2020 and may not represent all published security updates. Please check the configuration statement for details.

Future collaborations between Healthcare experts, Winning Health, and AMAX will continue to benefit from solutions optimized by the Intel Distribution of the OpenVINO toolkit and oneAPI.

Solution Summary

This work shows how well systems built around Intel Xeon Scalable processors power AI workloads when coupled with the right expertise and optimized software. Prior efforts built on PyTorch interfaces, were improved using the Intel Distribution of the OpenVINO toolkit, which provides highly optimized neural network computing capability.

The AMAX Deep Learning All-In-One employs the concept of software and hardware integration, and deeply integrates a machine learning platform with traditional hardware. AMAX Deep Learning All-In-One features fine-grained authority management and control, safe and efficient data management, and comprehensive and delicate monitoring management capabilities to help users maximize resource utilization.

The core software of AMAX Deep Learning All-In-One is the AI Max platform, which employs the OpenVINO toolkit. For deep learning users, this platform provides functions such as rapid resource scheduling, resource usage monitoring, and distributed interactive development. It also supports highly customizable All-In-One hardware based on Intel Xeon Scalable processors to meet computing demands. AMAX Deep Learning All-In-One integrates and optimizes existing deep learning frameworks, encapsulates a large number of underlying operations, and eases debugging before delivery to provide great out-of-the-box services. This combination helps reduce the technical expertise required for deep learning practitioners.

The Intel Distribution of the OpenVINO toolkit provides a highly optimized neural network computing capability, which is delivered by Intel Deep Learning Deployment Toolkit, Intel DLDT, its main inference optimization module. Intel DLDT contains two modules, Model Optimizer and Inference Engine, which help to realize the best execution capability on target devices. Paired with Intel Xeon Scalable processors, the Intel Distribution of the OpenVINO toolkit can significantly improve deep learning inference capabilities.

According to Yu, Winning Health has received feedback from one of their customers that the open source OpenVINO and Intel Deep Neural Network Library gives them flexibility
they can built upon, while at the same time exceeding their expectations with its highly efficient use of Intel Xeon Scalable processors. Further they claim that Intel has helped unlock the outstanding performance of AMAX and Intel systems.

As the complexity of systems evolves, this approach highlights the value in common open source resources for AI-assisted solutions. There is no need to be locked into a single hardware vendor or style of compute when using OpenVINO toolkit and oneAPI software stacks.

Future collaborations between healthcare experts, Winning Health, and AMAX will continue to benefit from their use of solutions optimized by OpenVINO toolkit and oneAPI. They can tap more into the AI-acceleration in Intel Scalable Xeon processors through quantization work or explore any other hardware assist that their platforms may have, without leaving familiar and productive open source environments. They can achieve great results without having to invest in proprietary software environments.

Solution Ingredients

AMAX AI Max Deep Learning All-in-One:

- Intel Xeon Gold 6240 processor
- Intel Distribution of OpenVINO toolkit
- Intel D3-S4510 SSDs

About Winning Health

Established in 1994, Winning Health specializes in information technology for medical and healthcare. They are committed to providing excellent products and services for medical and healthcare institutions, and continuously improving people's hospital experience and health conditions. Learn more about Winning Health.

About AMAX

AMAX is an award-winning global leader in data center, open-architecture platforms, HPC, Deep Learning, application-tailored cloud and OEM server manufacturing solutions designed towards the highest efficiency and optimal performance. Whether you are a Fortune 1000 company seeking significant cost savings through better efficiency for your global data centers or a software startup seeking an experienced manufacturing partner to design and launch your flagship product, AMAX is your trusted solutions provider, delivering the results you need to meet your specific metrics for success. For more information about AMAX, visit http://www.amax.com.

Learn More

Find additional information on Intel HPC solutions.
Explore the Intel oneAPI Deep Learning Network Library.
Read about the Intel Distribution of OpenVINO toolkit.

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