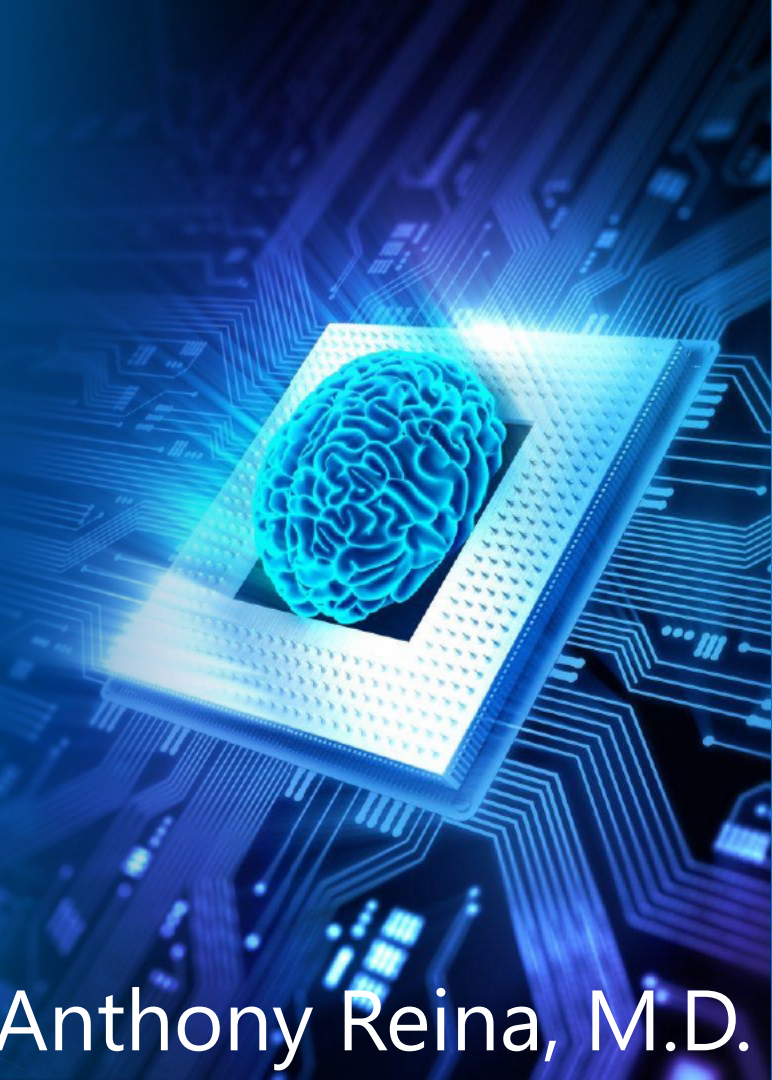
intel AI

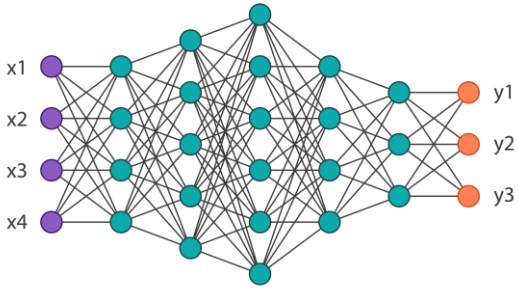
Optimizing Deep Learning Models



G Anthony Reina, M.D.

Q:

Which of these devices use AI?



A:

All of them thanks to Intel® AI.

OpenVINO™

INTEL® DISTRIBUTION OF OPENVINO™ TOOLKIT

OpenVINO™

DEEP LEARNING

Caffe · TensorFlow · ONNX · mxnet · KALDI

- Model Optimizer
- Inference Engine
- Supports 100+ public models, incl. 30+ pretrained models

COMPUTER VISION

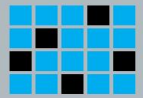
OpenCV · OpenCL™ · OpenVX™

- Computer vision library (kernel & graphic APIs)
- Optimized media encode/decode functions

SUPPORTS MAJOR AI FRAMEWORKS

Rapid adoption by developers

CROSS-PLATFORM FLEXIBILITY



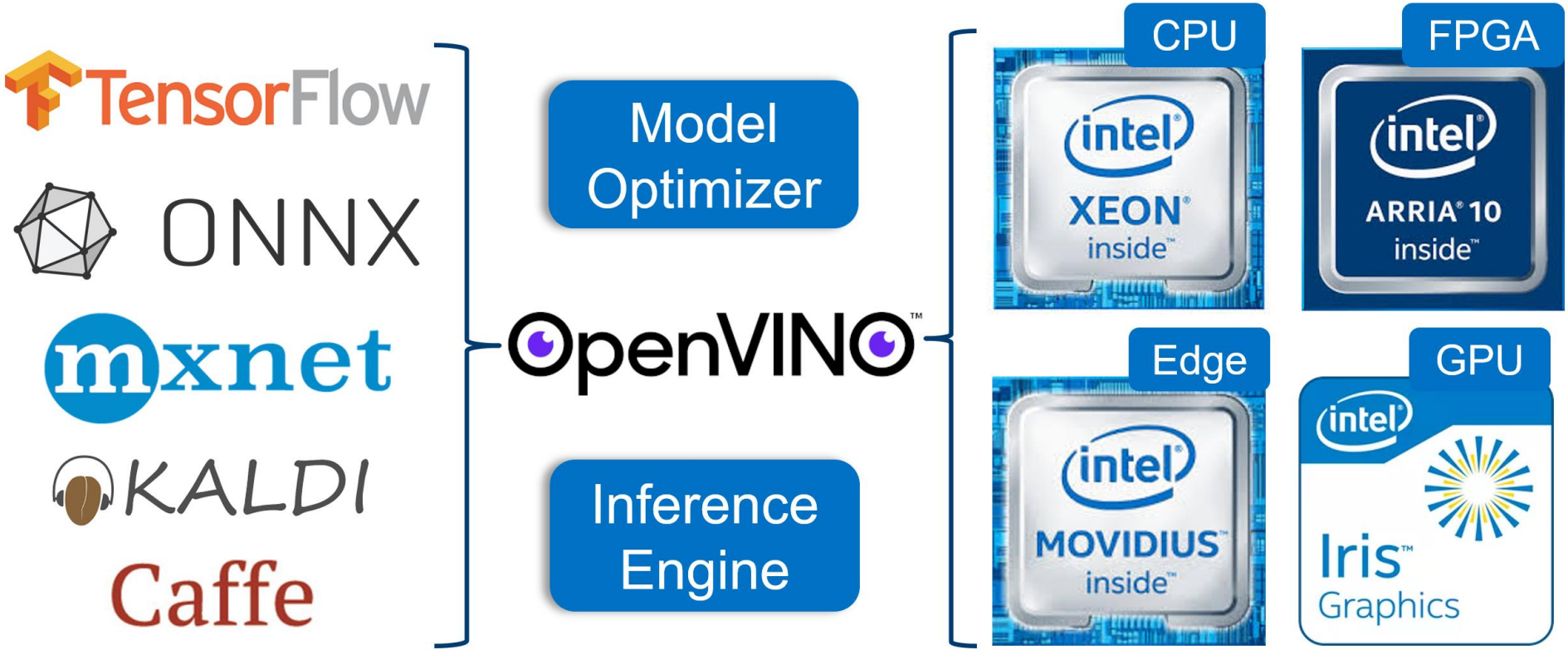
Multiple products launched based on this toolkit

HIGH PERFORMANCE, HIGH EFFICIENCY

Breadth of product portfolio

software.intel.com/content/www/us/en/develop/tools/openvino-toolkit.html

WRITE ONCE. DEPLOY & SCALE DIVERSELY



OpenVINO™

Model Optimizer

Inference Engine

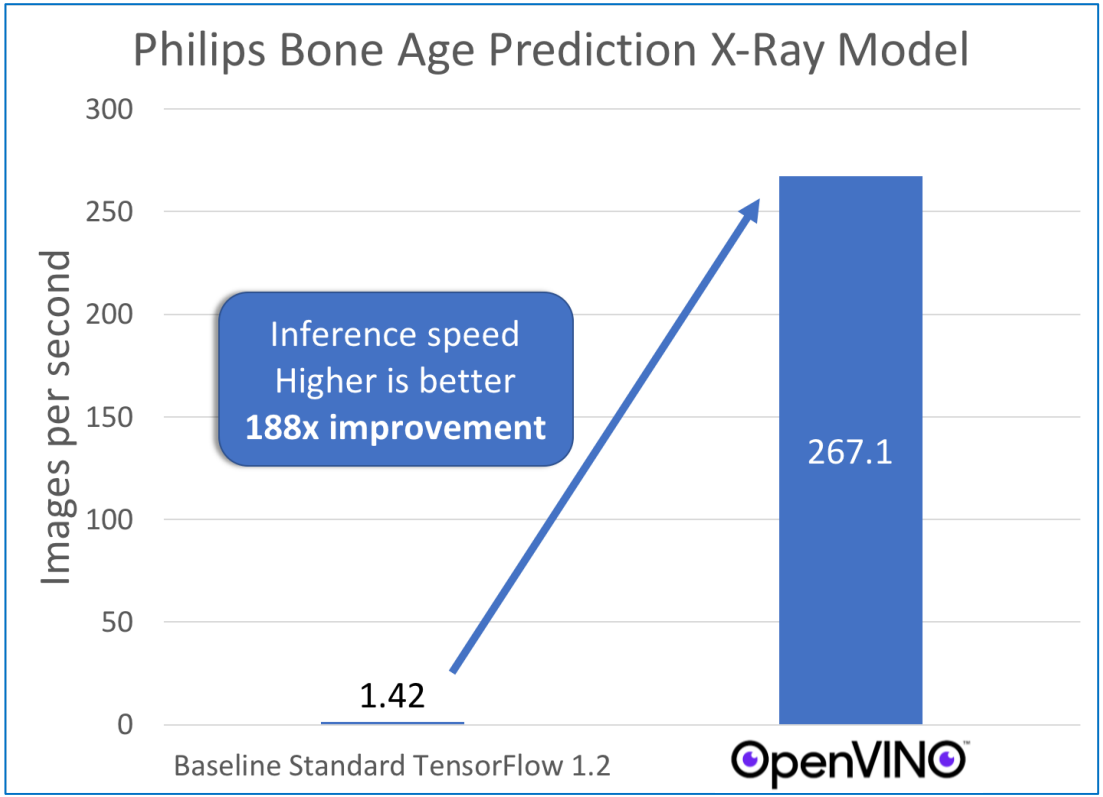
$$\frac{X^5}{X^3}$$

Memory Blocking (Reordering)

USE CASE

"Intel® Xeon® Scalable processors appear to be the right solution for this type of AI workload. Our customers can use their existing hardware to its maximum potential, while still aiming to achieve quality output resolution at exceptional speeds."

–Vijayananda J., Chief Architect and Fellow, Data Science and AI at Philips HealthSuite Insights



https://newsroom.intel.com/news/intel-philips-accelerate-deep-learning-inference-cpus-key-medical-imaging-uses

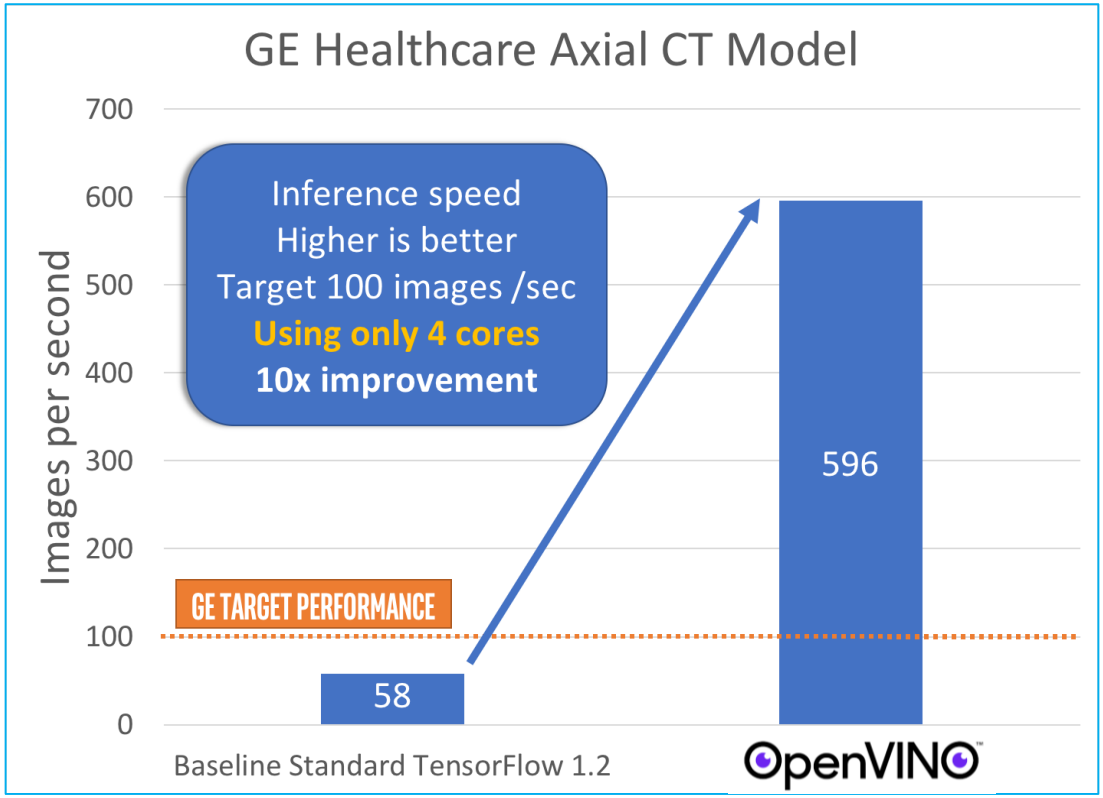
Intel® Xeon® Platinum 8168 processor at 2.70 GHz, Intel® Hyper-Threading Technology (Intel® HT Technology) disabled
Baseline: TensorFlow 1.2 (standard, no Intel optimizations)

USE CASE

GE Healthcare

"We think using general-purpose processors, tools, and frameworks from Intel® can offer a cost-effective way to leverage AI in medical imaging in new and meaningful ways."

David Chevalier, Principal Engineer, GE Healthcare



https://www.intel.ai/ai-enhanced-medical-imaging-to-improve-radiology-workflows

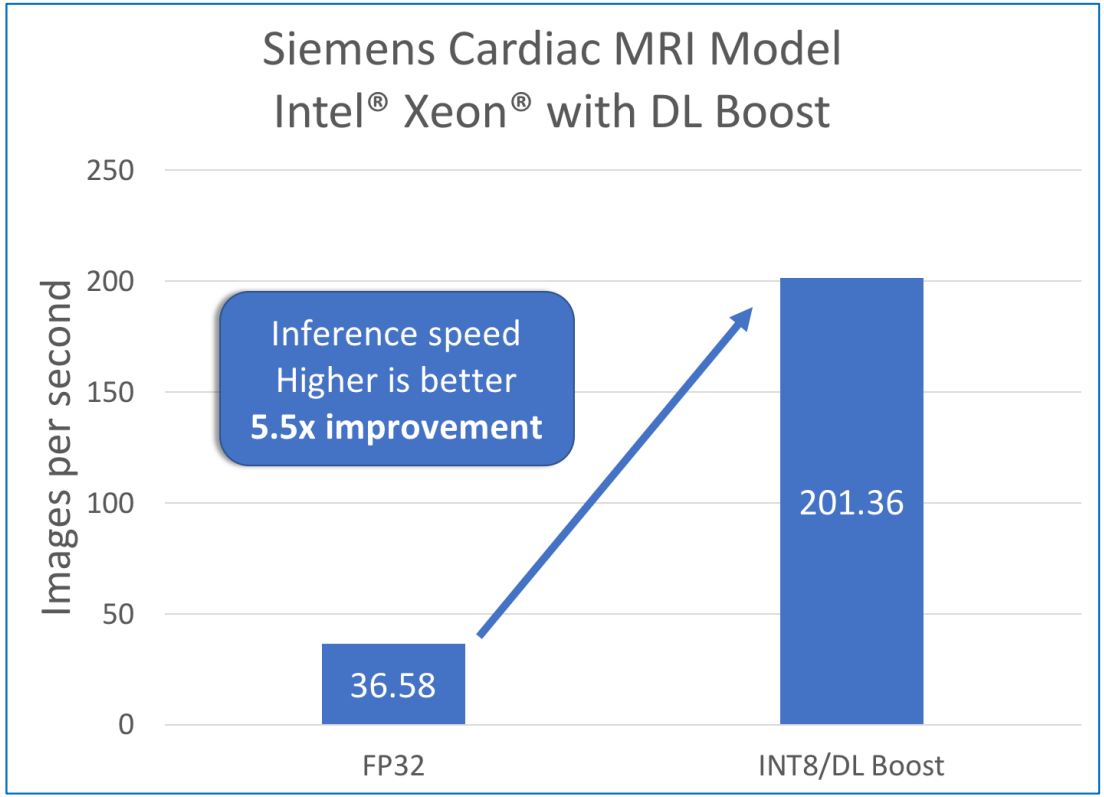
Intel® Xeon® E5-2650 v4 using only 4 cores
Baseline: TensorFlow 1.2 (standard, no Intel optimizations)

USE CASE

SIEMENS Healthineers

"Siemens Healthineers and Intel have a shared goal to improve healthcare by applying AI where the data is generated — right at the edge using 2nd-generation Intel® Xeon® Scalable processors with Intel® Deep Learning (DL) Boost and the Intel® Distribution for OpenVINO™. This enables real-time applications of cardiac MRI, making data interpretation available right after it's collected."

David Ryan, General Manager, Health and Life Sciences Sector, Internet of Things Group, Intel



https://newsroom.intel.com/news/siemens-healthineers-intel-demonstrate-potential-of-ai-real-time-cardiac-mri-diagnosis

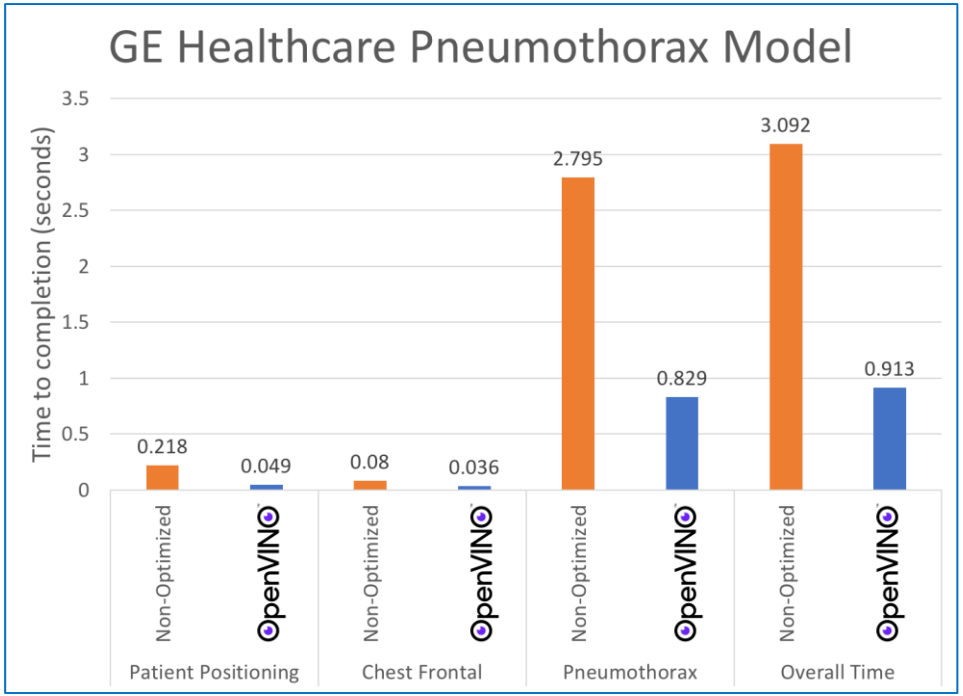
USE CASE

GE Healthcare

Optima XR240amx

"With the OpenVINO toolkit running on existing Intel processors, in early testing GE Healthcare achieved a 3.3x improvement in deep learning optimization, which enables early prioritization and escalation of critical conditions to ensure faster treatment for our patients. Intel technologies will enable GE Healthcare to extend AI solutions across multiple imaging modalities to transform radiologist workflows and patient care."

– Karley Yoder, VP & GM
Artificial Intelligence, GE Healthcare



https://www.intel.ai/wp-content/uploads/sites/69/GEHC_PTX_SolutionBrief.pdf

Intel® Core™ i5-4590S CPU @ 3GHZ, 16GB

GE Healthcare

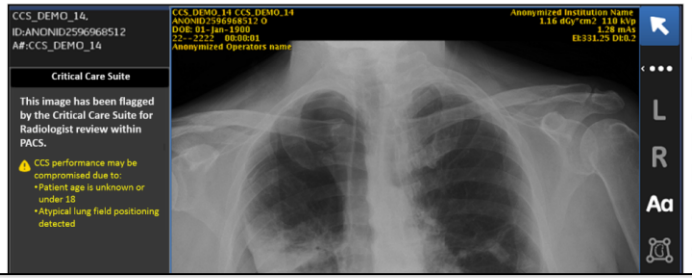
General Electric Healthcare Chooses UH to Clinically Evaluate First-of-its-kind Imaging System

Tuesday, July 07, 2020

Artificial intelligence identifies collapsed lungs, alerts radiologists

GE Healthcare (GEHC) chose University Hospitals (UH) Cleveland Medical Center in November of 2019 as the first hospital in the US to evaluate its new mobile x-ray system enabled with Critical Care Suite, the world's first on-device AI solution for triage & notification of critical findings and quality errors. The tool is designed to quickly identify and prioritize cases such as pneumothorax (collapsed lung), which is crucial as ICUs see an increase in patients during the COVID-19 crisis.

When a lung doesn't inflate, it can't bring oxygen into the bloodstream or remove carbon dioxide from the body. A person with a collapsed lung may experience shortness of breath, discomfort when breathing or chest pain on one side. In severe cases, a person may go into shock, which is a life-threatening condition. A chest x-ray is needed to confirm pneumothorax, but patients also need a rapid diagnosis.



Radiologists at UH Cleveland Medical Center read dozens of images every day. This process takes several hours. To assist them, GEHC's Critical Care Suite software acts as artificial intelligence on board the AMX 240 mobile x-ray unit. Once a chest x-ray is taken, it recognizes if a patient has a collapsed lung and flags the image for immediate reading, helping set the patient on a rapid path to treatment.

"Employing this equipment means better care for our patients," said Amit Gupta, MD, Modality Director, Diagnostic Radiography

Optima XR240amx

https://news.uhhospitals.org/news-releases/general-electric-healthcare-chooses-uh-to-clinically-evaluate-first-of-its-kind-imaging-system.htm

https://devcloud.intel.com

Intel Software Developer Zone

Search our content library...

INTEL® DEVCLOUD
Workloads

A DEVELOPMENT SANDBOX FOR DATA CENTER TO EDGE WORKLOADS

Develop, test, and run your workloads on a cluster of the latest Intel® hardware and software. With integrated Intel® optimized frameworks, tools, and libraries, you'll have everything you need for your projects.

Overview | Data Center | Edge | FPGA

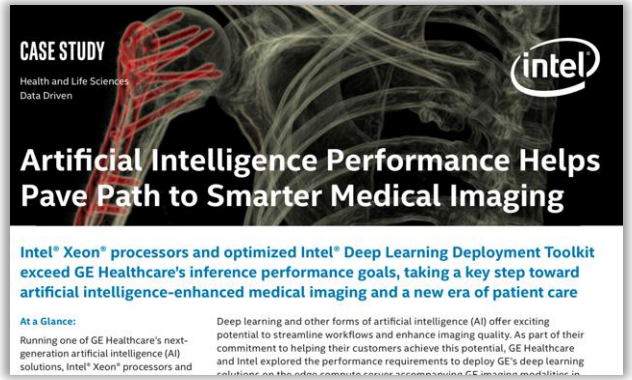
Try Out the Latest Intel® Hardware

Expand your skills and experiment with this state-of-the-art cluster that offers capabilities such as natural language processing and time-series analysis, as well as edge acceleration hardware.

Use Popular AI Frameworks

TensorFlow | PYTORCH | PaddlePaddle

Learn more at ai.intel.com



CASE STUDY

Health and Life Sciences
Data Driven

Artificial Intelligence Performance Helps Pave Path to Smarter Medical Imaging

Intel® Xeon® processors and optimized Intel® Deep Learning Deployment Toolkit exceed GE Healthcare's inference performance goals, taking a key step toward artificial intelligence-enhanced medical imaging and a new era of patient care

At a Glance:

Running one of GE Healthcare's next-generation artificial intelligence (AI) solutions, Intel® Xeon® processors and

Deep learning and other forms of artificial intelligence (AI) offer exciting potential to streamline workflows and enhance imaging quality. As part of their commitment to helping their customers achieve this potential, GE Healthcare and Intel explored the performance requirements to deploy GE's deep learning

SOLUTION BRIEF

Health and Life Sciences

Siemens Healthineers Accelerates AI for Cardiology, Powered by 2nd Generation Intel® Xeon® Scalable Processors with Intel® Deep Learning Boost

Authors

Dr. Bogdan Georgescu, principal research scientist, Siemens Healthineers

Gianluca Paladini, senior director, Engineering, Siemens Healthineers

Prashant Shah, engineering director, Health and Life Sciences AI, Intel Corporation

Dmitry Rizshkov, engineer, Deep Learning Software, Intel Corporation

Christian Schmidt, global account executive, Intel Corporation

Dr. Dorin Comaniciu, senior VP, Artificial Intelligence and Digital Innovation

AI optimized with Intel® technologies gains 5.5x speedup for quantifying heart function in cardiac MRI[1]

Executive summary

The health and life sciences industry is digitizing healthcare and leveraging artificial intelligence (AI) to accelerate clinical workflows, help improve accuracy and diagnosis, reduce hospital costs, and support medical research. AI can quickly provide visibility into anatomical systems and identify abnormalities, which helps clinicians know where to focus patient care.

Radiologists and cardiologists are utilizing AI techniques such as object detection

CASE STUDY

Intel® AI
Intel® Xeon® Scalable processors
OpenVINO™ toolkit

Perform AI-Driven Medical Imaging Efficiently and Cost-Effectively on Intel® CPU–Based Systems

Philips demonstrated breakthrough performance for AI inferencing of health-care workloads run on servers powered by Intel® Xeon® Scalable processors and optimized with the OpenVINO™ toolkit.

Bone-Age-Prediction Model

188X INCREASE

in Images per Second

Lung-Segmentation Model

38X INCREASE

in Images per Second

Intel teamed up with Philips to show that servers powered by Intel® Xeon® Scalable processors could be used to efficiently perform deep learning inference on patients' X-rays and computed tomography (CT) scans, without the need for accelerators. The ultimate goal for Philips is to offer artificial intelligence (AI) to its end customers without significantly increasing the cost of the customers' systems and without requiring modifications to the hardware deployed in the field.

The companies tested two healthcare use cases for deep learning inference models: one on X-rays of bones for bone-age-prediction modeling, and the other on CT scans of lungs for lung segmentation. Using the OpenVINO™ toolkit and other optimizations, along with efficient multi-core processing from Intel Xeon Scalable processors, Philips was able to achieve a speed improvement of 188.1x

White Paper

Philips Healthcare Uses the Intel® Distribution of OpenVINO® Toolkit and the Intel® DevCloud at the Edge to Accelerate Compressed Sensing Image Reconstruction Algorithms for MRI.

Authors

G Anthony Reina
Intel

Maurice Stassen
Philips Research

Nicola Pezzotti
Philips Research, TU Eindhoven

Dennis Moolenaar
Philips Research

Dmitry Kurtaev

Abstract

Compressed sensing (CS) is a signal processing technique that enables faster scan times in medical imaging. Philips Healthcare integrated CS methods into their magnetic resonance imaging (MRI) scanners to reduce scan time by up to 50 percent for 2D and 3D sequences, compared to Philips scans without Compressed SENSE, with virtually equal image quality. Recently, deep learning methods have been explored for reconstructing MRI images, showing good results in terms of image quality and speed of reconstruction. Philips Healthcare and Intel report on two hybrid frequency-domain/image-domain encoder/decoder architectures that produce excellent results in MRI reconstruction. We show how these two neural networks can be accelerated on Intel® hardware through use of the Intel® Distribution of OpenVINO™ Toolkit. The toolkit allows Philips Healthcare to speed

SOLUTION BRIEF

Healthcare
Intel® Technologies

GEHC Accelerates Pneumothorax Detection at Point of Care with Intel® Technologies

GEHC leverages Intel® Distribution of OpenVINO™ Toolkit to optimize inferencing of X-ray image in under one second on Intel® processors

GE imagination at work

Executive Summary

Hospitals produce 50 petabytes of data per year.[1] A staggering 90 percent of that is medical imaging, and 50 percent of medical imaging data is from X-ray scanners.[2] This is a flood of data for radiology departments, resulting in potentially long turn-around-time (TAT)—even when the scan is considered STAT. In critical conditions, such as pneumothorax, escalation of interpretation is essential to accelerate treatment.

Intel® Select Solutions for Genomics Analytics

Access performance, scale, and ease of deployment for genomics insight and discovery.

intel select solution

BROAD INSTITUTE

Advancements in genomics are opening new doors for understanding human diseases, and they are increasingly informing innovative precision treatment plans. Discoveries are dependent on processing, storing, and analyzing a growing amount of genomic sequencing data. In 2015, worldwide sequencing storage capacity approached a petabyte per year, and it continues to double every seven months.[1,2] At this rate, genomics sequencing will generate hundreds of petabytes per year in the next five years, and could require nearly a zettabyte of storage per year by 2025.[1,2]

The Broad Institute of MIT and Harvard (broadinstitute.org) is one of the world's largest producers of human genomic data, creating about 24 TB of new data per day. Currently, Broad Institute manages more than 50 PB of data.

Researchers require tools to analyze these enormous volumes of data in a timely