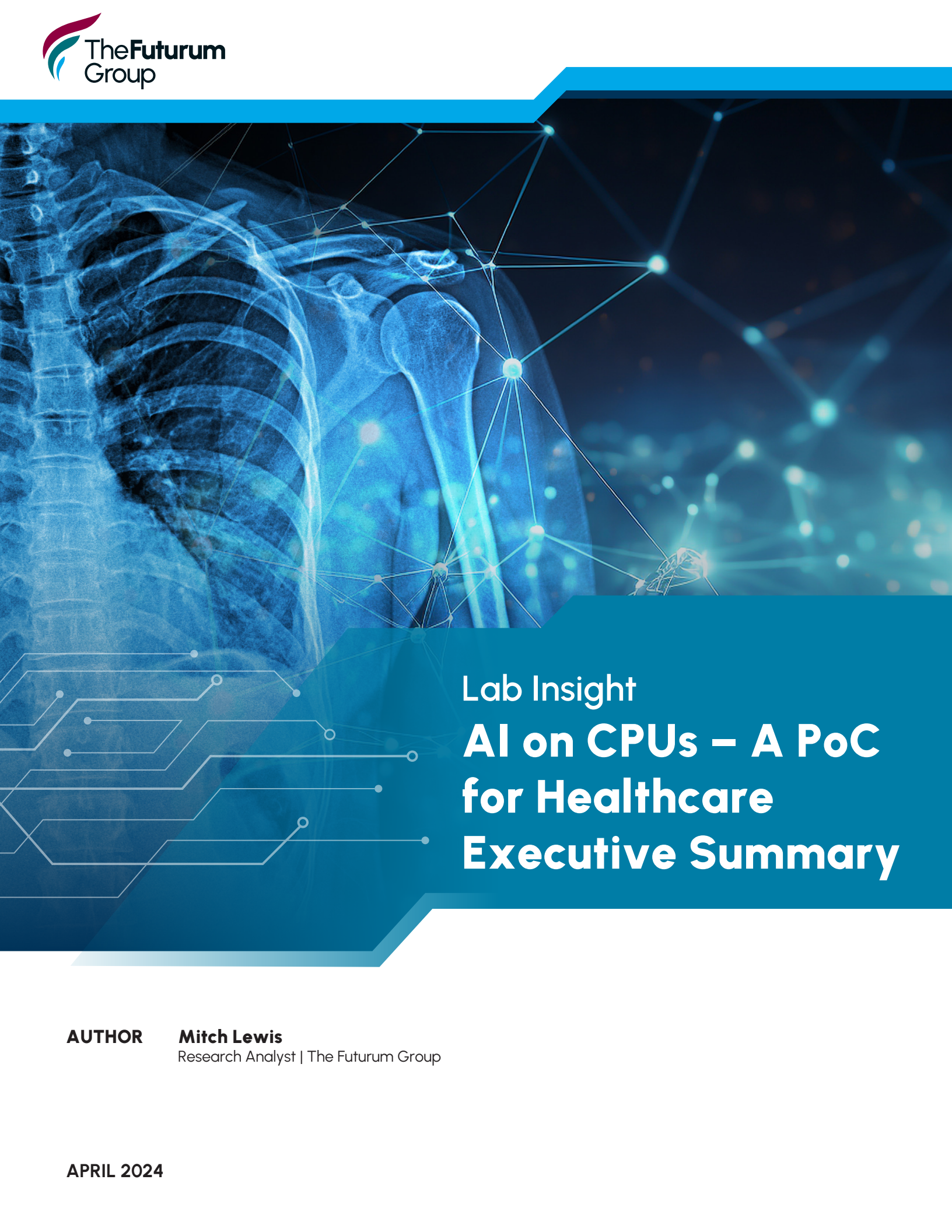




Lab Insight **AI on CPUs – A PoC for Healthcare Executive Summary**

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AI for the Healthcare Market

Technology advances in healthcare drive greater efficiency and accuracy in medical processes and ultimately improve patient outcomes. Such technology advancements are important to moving the healthcare industry forward.

AI, in particular, is a technology with great potential to create significant value in the healthcare sector. The possibilities for applying AI technology to healthcare may extend to a wide range of areas including pharmaceutical research, hospital workflows, and patient experience. Potential uses for AI in healthcare include AI accelerated drug development, predictive analytics for disease prevention, medical focused chatbots, and intelligent hospital staffing systems.

Implementation of AI in healthcare environments, however, may be faced with several challenges, including data privacy and regulation requirements, concerns around AI accuracy, and integration with existing medical infrastructure and practices. Expectations that specialized hardware, such as GPUs or other custom accelerators, are required for AI additionally act as a barrier for many organizations.

The PoC presented in this paper demonstrates an AI implementation for healthcare that addresses these challenges to assist medical organizations in swift adoption of AI.

Solution Overview

To demonstrate a practical implementation of a healthcare focused AI solution, Scalars AI™, in partnership with Dell™, Broadcom™, and The Futurum Group, implemented an AI-powered system for detecting pneumonia in X-ray images.

Medical imaging is a key component in the diagnosis of many conditions, including pneumonia, and is crucial to patient outcomes. Delayed diagnoses can have severe negative impacts on patients, yet doctors and radiologists are challenged with limited bandwidth. By leveraging AI image classification technology alongside the expertise of medical professionals, healthcare organizations can achieve greater efficiency and accuracy when evaluating medical images.

The following provides a high-level overview of the PoC solution:

- X-ray images are captured and stored in a standard DICOM server.
- An AI scheduling service identifies new images and transmits them over Ethernet to an AI model server for inferencing.
- Images undergo inferencing on the AI model server to detect pneumonia. The AI model server utilizes a customized version of the ResNet50 image classification model, deployed using AMD's Unified Inferencing Frontend (UIF). Images are given a binary classification regarding the detection of pneumonia.
- The classified images are then made available for review with a medical imaging viewer, and returned to the DICOM server.

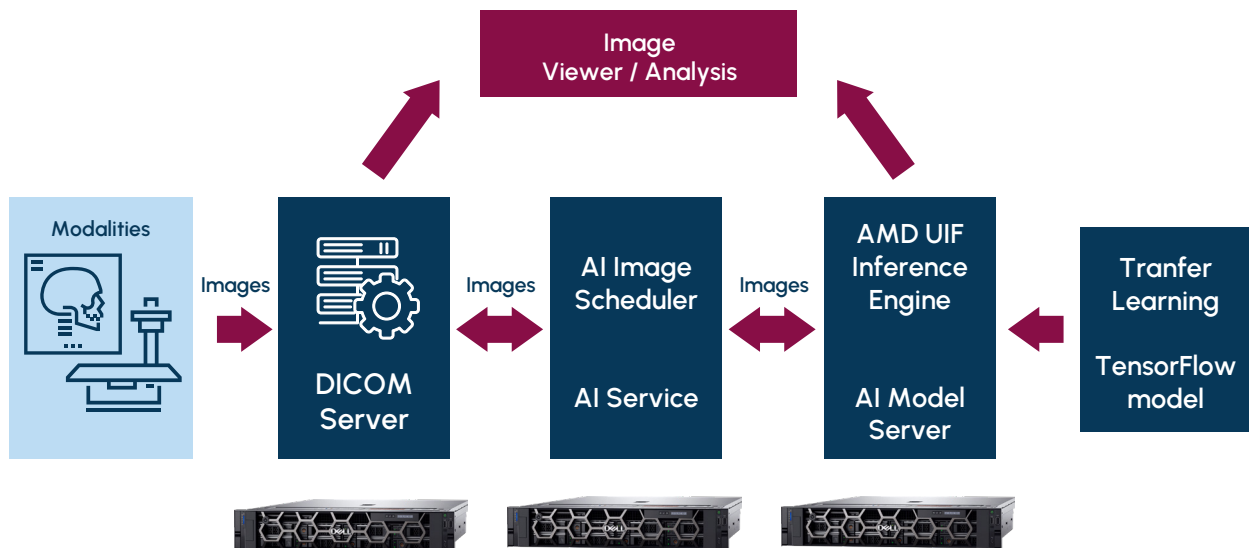


Figure 1: AI Medical Image Analysis PoC Solution (Source: Scalars.AI)

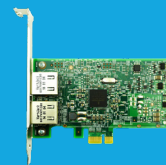
The key hardware components used in the solution included the following:



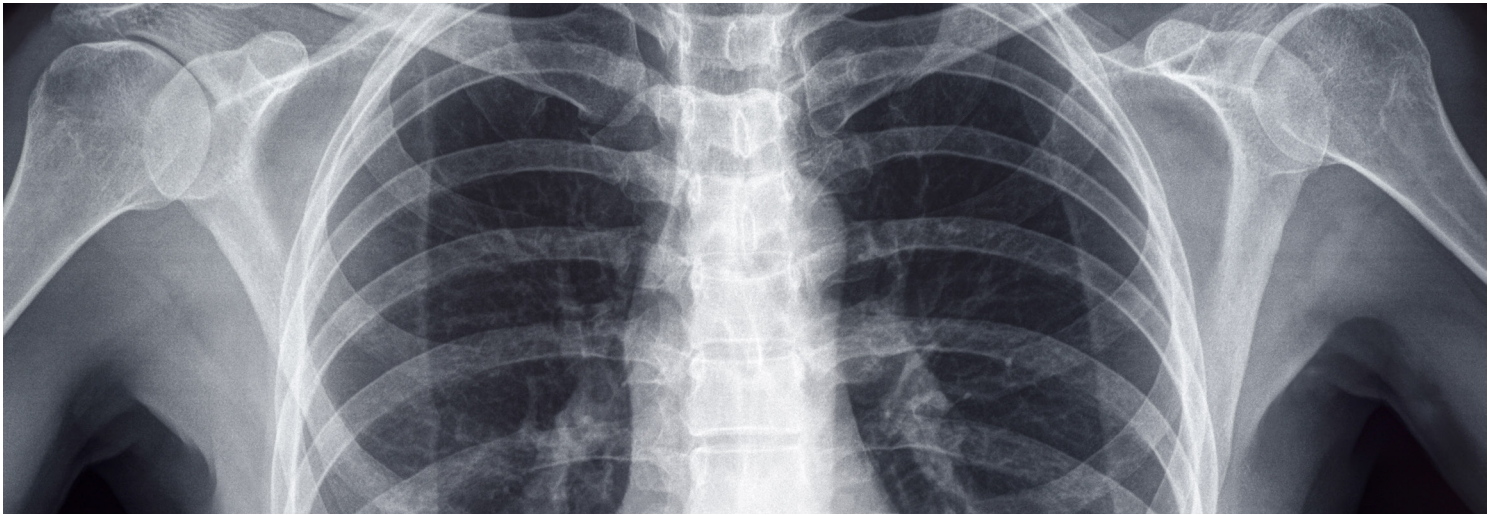
Dell PowerEdge
R7625 servers



AMD™ EPYC 9554
64-core processors



Broadcom NetXtreme NICs



Solution Highlights

The pneumonia detection PoC solution provides valuable insight for both AI practitioners and IT operations professionals working in medical environments. Notable highlights include:

- The PoC was achieved using off the rack, CPU-based Dell servers. No GPUs or specialized accelerators were required.
- The solution was optimized by utilizing AMD's ZenDNN library with Node Pinning. Performance testing demonstrated a 4X throughput increase compared to the default configuration.
- ResNet50 was utilized as a pre-trained image classification model. The model was customized using transfer learning to train the model on medical images. Training on a CPU was completed in 9 hours with 99% training accuracy and 85% validation accuracy.
- Performance testing achieved a throughput of 1,390 X-ray images per second. Broadcom Ethernet provided a high bandwidth connection for image transfer. The high throughput and scalable Ethernet connection provide future adaptability to support larger medical image types.
- The PoC integrated an AI pipeline into a typical medical workflow using a standard DICOM server and image viewer.
- On-premises deployment and built in security features of Dell PowerEdge servers address the data privacy and regulatory needs of healthcare environments.

Conclusion

Strategically applying AI in healthcare has great potential to enhance medical processes and improve patient outcomes, as demonstrated in this successful pneumonia detection PoC. While the PoC example is focused specifically on pneumonia detection from X-ray images, the solution can be further expanded to analyze patient data from various modalities, allowing trained models to detect a wider range of conditions. This PoC demonstrates how AI powered medical applications can be developed and deployed using standard, CPU-based hardware, while addressing challenges specific to healthcare environments.

Important Information About this Report

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