

SOLUTION BRIEF

Healthcare
Medical Image Analysis



JianPei Tech Accelerates AI Medical Image Diagnosis with Intel® Optimizations for TensorFlow*

AI-based Platform Accelerates Image Reading Performance by 8X,¹ Launching Innovative Medical Diagnostic System Across China



In China, Artificial Intelligence (AI) has deeply penetrated many industries, including medical care. This is motivated by the fact that 80 percent of medical data in China is imaging,² which requires analysis and diagnosis based on the patient scans.

China faces two challenges with image processing: 1) there are not enough practitioners for human review to keep up with the growth of image volume, which currently expands by 30 percent³ per year; and 2) current computer-aided analysis lacks accuracy; manual review and subjective interpretation is inevitable.

AI in Medical Imaging Science

The application of AI inferencing in medical imaging is complicated, requiring powerful processing capabilities for such challenges as data diversification, deep analysis, and complicated labeling. Medical image analysis requires support of 3D—or even 4D—deep neural network (DNN) architectures, which rely heavily on platform memory during processing. GPUs are often unable to handle the tremendous number of workloads required to process 3D and 4D image data. Therefore, medical teams may reduce the pixels of 3D image data and split them into multiple small blocks for sequential recognition. The TensorFlow* deep learning framework used to train algorithms on imaging data can benefit from optimizations for Intel® Xeon® Scalable processors.

The Intel Xeon Scalable processor family is well-suited for deep learning applications. It can directly read up to 384 GB of memory to accommodate fast access to imaging data for inferencing. Thus, it can better meet the requirements of AI-based CT image analysis compared to other AI processing technologies.

Intel® Optimization for TensorFlow* leverages the Intel® Math Kernel Library for Deep Neural Networks (Intel® MKL-DNN) to help improve performance on image data processing. Plus, it has customized 5,000 new features to provide better support for medical image analysis issues.



Introducing an Image-Reading Robot

JianPei Tech LTD's image analysis robot is built on advanced AI algorithms and deep learning technologies, enabling highly accurate image recognition. Assisting doctors in locating diseases, analyzing conditions, and guiding operations, the image reading robot is part of a clinical decision-making system and is at the frontier of medical science and medical technology development within the country. With the AI-enabled robot, the time needed to complete radiologist diagnoses have reduced immensely. This application has also substantially increased diagnostic accuracy using Intel optimizations. Such impact can advance precision medicine greatly in China.

Accelerating AI-Enabled Imaging Analytics and Diagnoses

Intel worked with JianPei Tech to optimize their image-reading robot on Intel Xeon Scalable processors for inferencing of X-ray, CT, MRI, and other medical imaging sources. To accelerate image analysis, JianPei Tech's plat-

form was migrated to Intel® Xeon® Gold 6140 processors and optimized with Intel Optimization for TensorFlow, which includes the Intel MKL-DNN library.

As shown in Figure 1, the collaborative work resulted in achieving an 8X performance improvement on DICOM (Digital Imaging and Communications in Medicine) images (identified as DCM in Figure 1).¹ The speedups were a result of using Faster R-CNN* (Region Convolutional Neural Network) instead of UNet* and optimizing the Faster R-CNN algorithms for Intel Xeon Scalable processors.

Faster R-CNN has also played a role in segmentation analytics in the medical field. Faster R-CNN is well optimized by Intel Optimization for TensorFlow and Intel MKL-DNN, which results in a performance gain of 6X compared to UNet* (see Figure 2).

Optimum memory capacity and image data batch size also enhanced processing performance for faster R-CNN as shown in Figure 3.

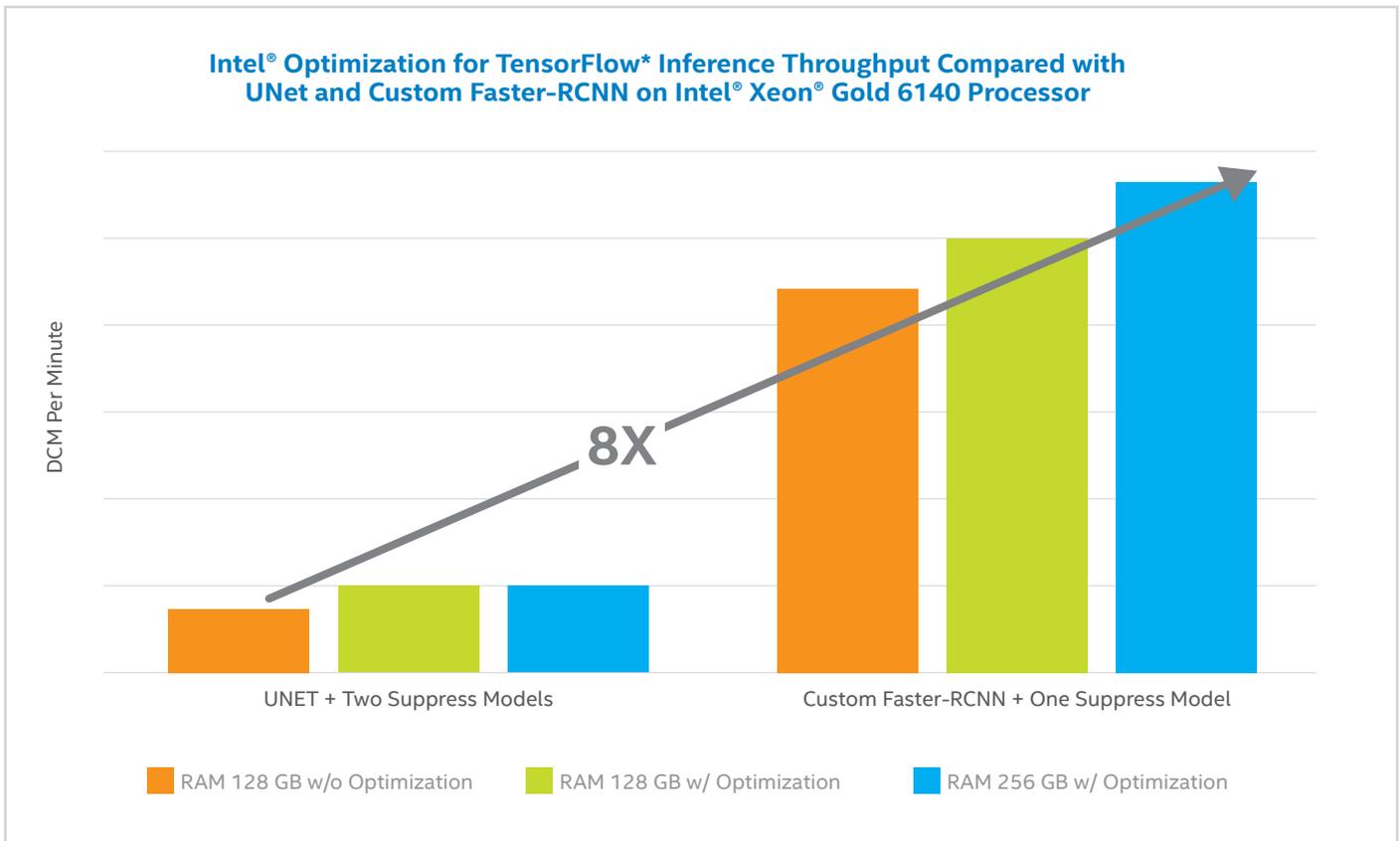


Figure 1. Inferencing performance throughput with optimized Faster R-CNN algorithm.

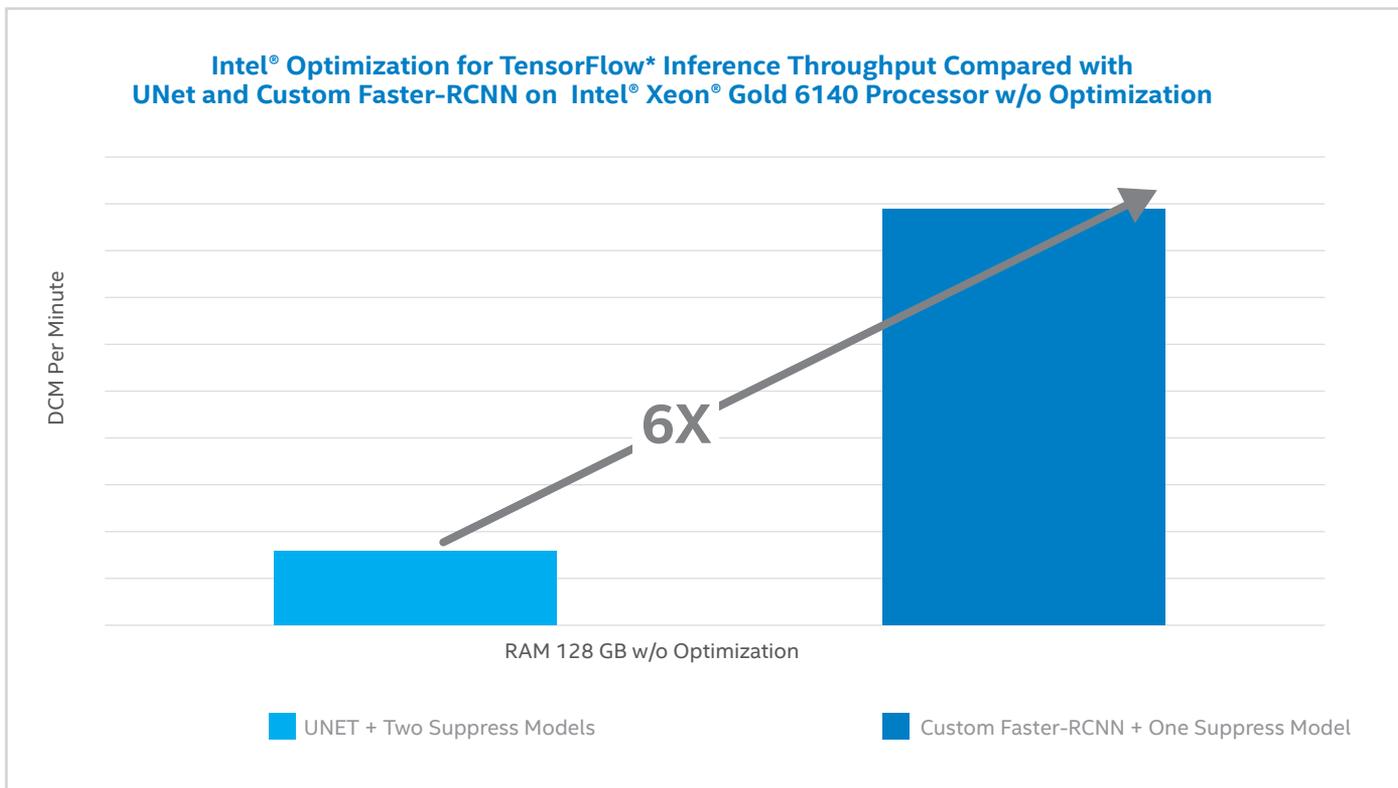


Figure 2. TensorFlow inference performance for optimized Faster R-CNN compared to UNet on Intel® Xeon® Gold 6140 processor.

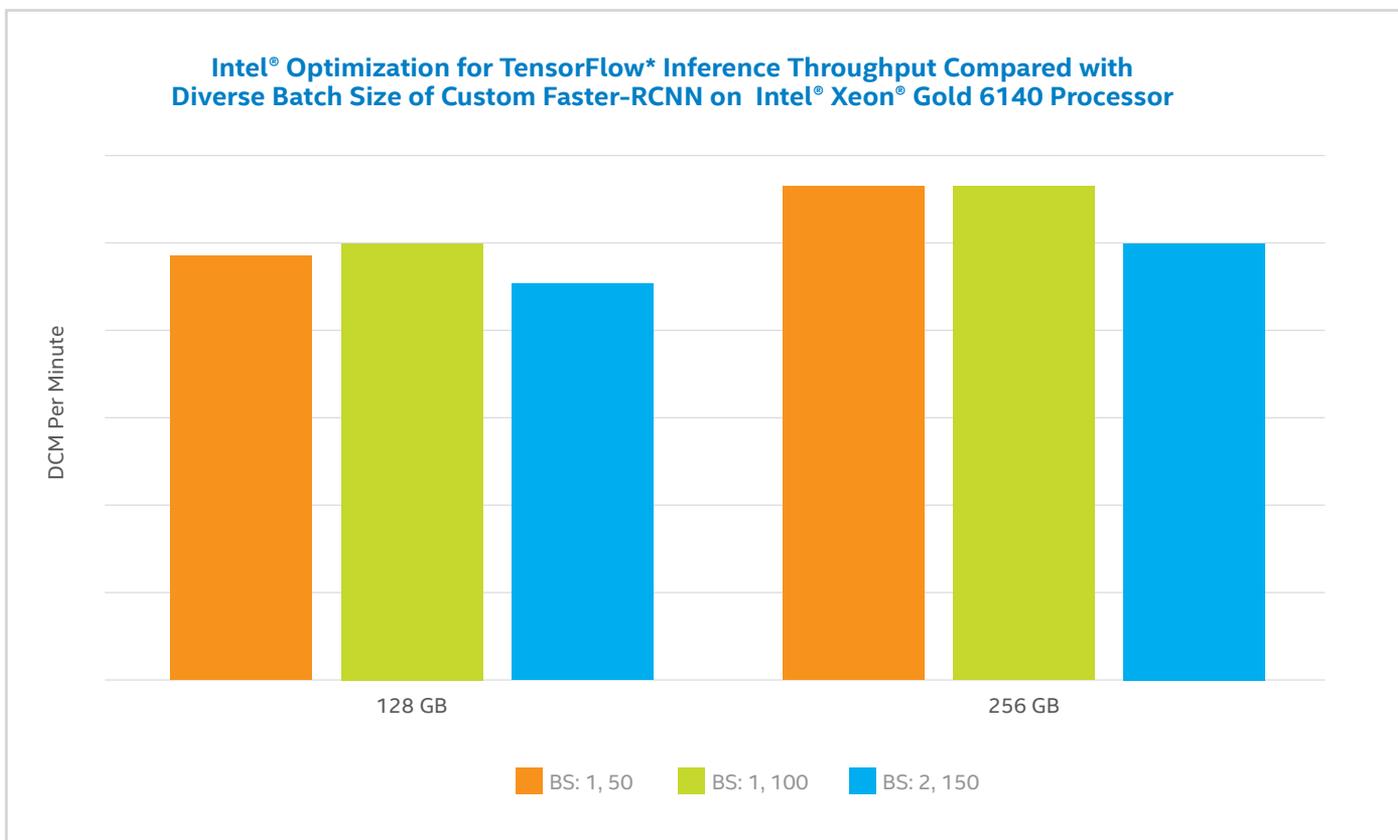


Figure 3. Performance is enhanced with optimum memory capacity (256 GB) and image data batch size (1, 100) for Faster R-CNN.

Conclusion

Working with Intel, JianPei Tech has successfully migrated their image-reading robot to Intel Xeon Scalable processors—for both on-premise systems or cloud-based medical data platforms. JianPei Tech has achieved breakthroughs in technology and outstanding results for automated image analysis and diagnosis, which has helped launch their solution into hospitals across the country.

According to JianPei Tech, the company has more than 200 hospital customers using its scan-reading robots, with an average hospital diagnosis volume of 80 cases/per day/per hospital. This technology has been widely welcomed by customers because of its ease of use, accuracy, and efficiency, greatly accelerating its adoption as a medical image AI solution in China.

Learn More

For more information about the image reading robot, visit

<https://www.jianpeicn.com/category/yuepianjiqiren>

Visit [here](#) to learn more about Intel® Optimization for TensorFlow*

www.intel.com/XeonScalable



JianPei is a member of the [Intel® AI Builders Program](#), an ecosystem of industry leading independent software vendors (ISVs), system integrators (SIs), original equipment manufacturers (OEMs), and enterprise end users who have a shared mission to accelerate the adoption of artificial intelligence across Intel® platforms.

¹ Configuration for testing: Intel® Xeon® Gold 6140 processor, 2.3-3.7 GHz, dual socket with 18 cores each; 128 to 256 GB memory, 800GB SSD. Intel® Optimizations for TensorFlow*. Dataset used customer DICOM images (DCM) (avg. 200MB) with 300-500 sequenced images WRT clinical case: image size 512x512; each epoch of inference included totally 59 DCMs.

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Performance results are based on testing as of dates shown in configuration and may not reflect all publicly available security updates. No product can be absolutely secure. See configuration disclosure for details.

² 2017 medical big data and AI industrial report (abridged) by JianPei Tech. <https://vcbeat.net/Yzk1NjQ2MGlzYzUxNTg2NjlxZDQ1Nzg3MTA4MjUxMTk>

³ http://m.sohu.com/a/208846715_620847

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