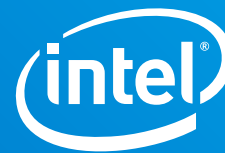
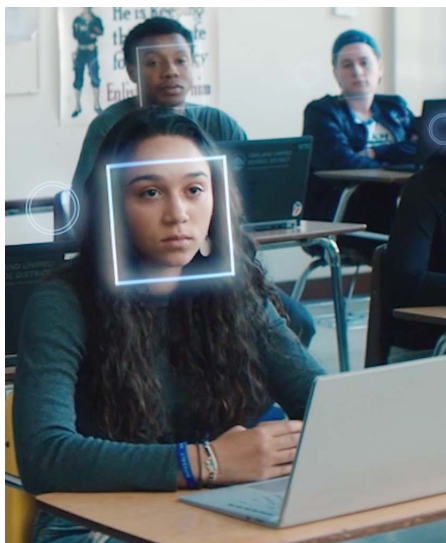


SOLUTION BRIEF

Enterprise Data Science
Model Deployment



Deep Learning Inference with CloudWalk Facial Recognition Technology and Intel® Xeon® Scalable Processors



An enterprise-class solution optimized with Intel® AI technologies

AI-enabled facial recognition technology is gaining market penetration and adoption across many industries. Meanwhile, technical improvements have impacted the face recognition device market. Many new changes are emerging, such as smart phone usage, increased safety awareness, and added requirements for security checks. According to research organization Gen Market Insights' Global Face Recognition Device Market Research Report 2018, the facial recognition market was valued at USD 1.07 billion in 2017 and will grow to USD 7.11 billion by the end of 2025.¹

Facial recognition technology is used in a large array of sectors, including finance, criminal surveillance, public security/smart cities, industry, education, medical scenarios, and more. CloudWalk Technology of China is a leading provider of intelligent facial recognition solutions with customers in financial, security, civil aviation, and other fields.

JuYan Intelligent Camera Recognizes Faces in a Second

CloudWalk's JuYan intelligent facial recognition camera is designed to be implemented in a large network of smart devices as part of an overall computer vision inferencing solution. Running on a Linux* operating system, with data structural processing and recognition built into the camera, it internally infers data streams using facial recognition algorithms.

The miniature camera contains a high resolution imaging sensor with unique hardware and software optimized AI algorithms, optimized for Intel® processors, and designed for computer vision inferencing at the edge. The device leverages Intel® software optimization tools, such as Intel® Optimization for Caffe* and Intel® Math Kernel Library for Deep Neural Networks (Intel® MKL-DNN).

It features precise and fast image recognition, completing inferencing in one to two seconds in the camera. That inference rate eliminates the need for high-bandwidth communications with a data center; the maximum bandwidth requirement is less than 100 kbps.

A wide-angle field of view enables optimal image capture. With successful capture rates of greater than 99.8 percent, the camera maintains a high degree of accuracy in recognition. With a recognition rate of 92 percent, false detection occurs at a rate of less than 0.1 percent, using a 10,000 base image library.



Enabling Enterprise-Grade Recognition Solutions

The CloudWalk biometrics recognition system is a unified management platform providing verification services built on algorithms deployable in many scenarios. The platform enables multiple biometrics algorithms from various parties for facial recognition and verification, fingerprint authentication, finger verification, iris verification, and voiceprint authentication. The platform includes enhanced capabilities such as system management, biometrics feature management, recognition scenarios, facial detection, facial comparison, and query and reporting services. The solution can connect with various business systems and applications, supporting several database vendors.

Intel® Xeon® Scalable processor-based servers power the solution, utilizing Intel Optimization for Caffe to support AI features such as facial recognition and facial matching.

Driving Incredible Performance with Intel® DL Boost

A rapidly growing need for deploying facial recognition solutions is emerging in banking, government, and police environments. Currently the major bottlenecks to accomplishing these deployments are network bandwidth and computing capabilities. This negatively impacts deep learning inference throughput and latency, thereby resulting in less than optimal user experiences.

New 2nd Generation Intel® Xeon® Scalable processors are solving these computing challenges with incredible performance and new Intel® Deep Learning Boost with Vector Neural Network Instruction ([Intel® DL Boost](#)). Intel® DL Boost is a new set of embedded processor technologies designed to accelerate AI deep learning use cases. It extends Intel® Advanced Vector Extensions 512 (Intel® AVX-512) with a new Vector Neural Network Instruction (VNNI) that significantly increases deep learning inference performance over previous generations. Intel DL Boost uses a single instruction to handle INT8 convolutions for deep learning inference workloads which previously would have required three separate AVX-512 instructions in previous generations.

CloudWalk showcased the benefit of this new capability, and the resulting computing power, by testing optimized custom Resnet50 (FP32 and INT8) models on Intel Optimization for Caffe. Compared to unoptimized FP32, Intel DL Boost (on INT8) optimizations helped achieve a speedup of 3.3X in inference latency, for the same batch size and same instance (see figure 1)^{2,3,4}. The application also meets CloudWalk’s desired accuracy requirement (of accuracy loss being less than 0.03%).

In addition to significantly reduced deep learning inference latency, this use case illustrates how CloudWalk customers will benefit from improved performance (i.e., lower latency), while maintaining SLAs for accuracy loss. With Intel DL Boost, Intel is further pushing the envelope of deep learning performance by providing built-in inference acceleration and integrated AI instructions.

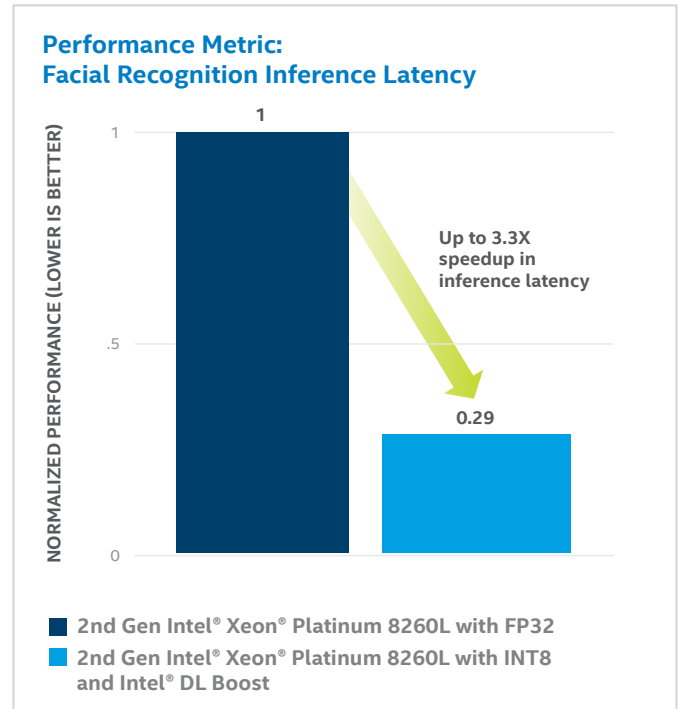


Figure 1.

Conclusion

CloudWalk’s intelligent JuYan Camera is optimized with Intel® AI technologies for rapid inferencing of facial imagery in as little as a second, thereby eliminating the need for high-bandwidth connections to the back end. This is all enabled because of a foundation of Intel Xeon Scalable processors with Intel DL Boost to provide the compute power needed to achieve incredible inference performance. The camera is part of an enterprise-class recognition solution with detection, comparison, query, and reporting service, among others.

Many Chinese government-owned banks benefit from the CloudWalk solution, will make it possible to merge all their source data into a large data lake, which can be shared by other banks or security institutes. The CloudWalk solution has successfully filled the gap of face recognition technologies at the edge. Besides financial scenarios, future deployments will include large shopping malls and security surveillance, which brings opportunities and value in the markets.

Learn More

Intel Xeon Scalable Processor:

<https://www.intel.com/content/www/us/en/products/processors/xeon/scalable.html>

Intel Optimization for Caffe:

<https://github.com/intel/caffe>

Intel MKL-DNN:

<https://github.com/intel/mkl-dnn>

Intel® DL Boost:

<https://www.intel.ai/intel-deep-learning-boost/>



CloudWalk 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, which have a shared mission to accelerate the adoption of artificial intelligence across Intel® platforms.

¹ <https://genmarketinsights.com/report/global-face-recognition-device-market-research-report-2018/41637>

Performance results are based on testing by Intel and CloudWalk on 12/18/18 and may not reflect all publicly available security updates. No product or component can be absolutely secure.

² CloudWalk Facial Recognition* (self-defined workload); OS: CentOS® 7.5 Kernel 3.10.0-957.1.3.el7.x86_64. Testing by Intel and Cloudwalk completed on Dec 18, 2018. Security Mitigations for Variants 1, 2, 3 and L1TF in place.

³ TEST SYSTEM CONFIG: 2nd Gen Intel® Xeon® Platinum processor 8260L, 2.3 GHz, 24 cores, turbo and HT on, BIOS 1.0180, 192 GB total memory, 12 slots/16GB/2666 MT/s/DDR4 LRDIMM, 1 x 480 GB/Intel® SSD Data Center (Intel® SSD DC) S4500 + 1 x 1TB/Intel® SSD DC P4500; Intel® Optimization for Caffe*.

⁴ Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark® and MobileMark®, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to www.intel.com/benchmarks.

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