PARAVISION

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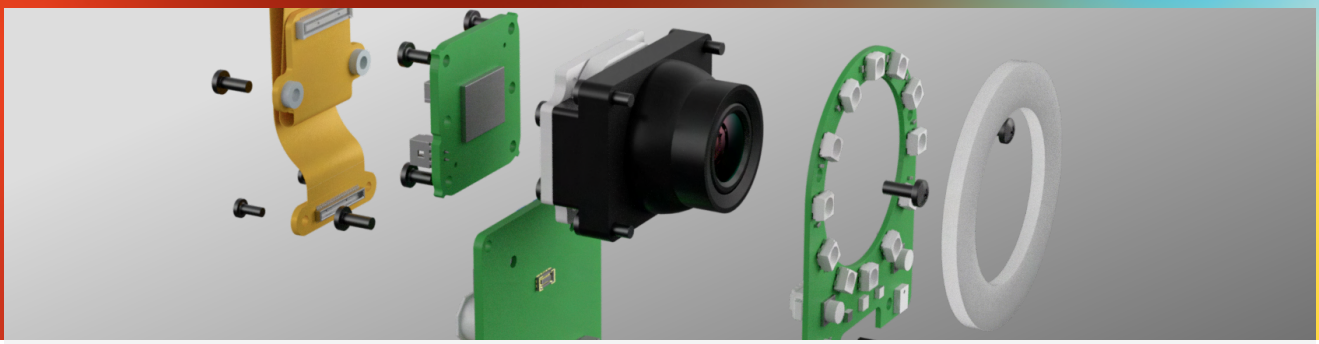
Edge AI Solutions for Face Recognition



From reduced latency and reduced network bandwidth to compelling user experiences and advanced features for privacy and security, edge computing offers myriad benefits for product and solution developers. Now, with recent advances in AI and embedded computing, **Edge AI**—the deployment of advanced artificial intelligence and computer vision functionality in embedded systems—has become a reality. Paravision's Edge AI solutions for face recognition are powering a new generation of no-compromise devices that are ultra-low power and small form factor while extremely fast and accurate.

As with all of our products, Paravision's toolkits for Edge AI are made available as versatile software development kits (SDKs) that allow partners to develop the right face recognition application in the way they see fit. All of the typical functions of a face recognition pipeline are made available, including face detection, landmark detection, image quality assessment, liveness and anti-spoofing (Presentation Attack Detection), template (embedding) creation, and face matching. Paravision has also developed a unique "intent-to-enter" metric that helps to ensure access only when a person specifically is recognized as intending to enter a boundary.

Partners can integrate these functions with backend systems in a hybrid way, for instance running face detection, quality metrics, liveness, intent-to-enter, and image cropping on the Edge while enabling face matching itself on the backend. From Edge to Cloud, Paravision's products are open architecture and interoperable.

Supported Computing Environments

Paravision supports a wide range of computing environments, enabling Edge AI across a wide variety of platforms. Paravision proudly partners with leaders from Silicon Valley to deliver outstanding price, performance, availability, and support:

Ambarella	ARM	NVIDIA	Intel
Ambarella™	arm	NVIDIA INCEPTION PROGRAM	intel partner alliance
Supported Computer Vision Framework			
OpenVINO	TensorRT	CVflow	PyTorch

Building Next-Generation Edge AI Solutions with Ambarella CVflow

Paravision's face recognition SDKs have been fully optimized for Ambarella CVflow SoCs, enabling the latest in ultra-low power, cost-effective, and high precision computer vision:

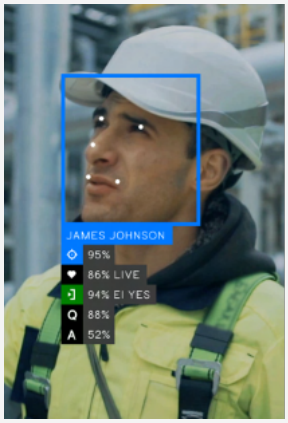
1. Paravision delivers 40 frames per second full pipeline face recognition on CV22-class SoCs and 20 frames per second full pipeline face recognition on CV25. With support for 1:N matching of up to 10,000 records on device, Paravision enables real-time face recognition for the next generation of access control and identity applications.

2. Paravision's liveness and anti-spoofing (i.e. Presentation Attack Detection) toolset has been optimized and advanced for Ambarella CVflow, and in particular Ambarella's RGB / Near IR / 3D reference architectures with On Semiconductor and Lumentum. We are enabling real time, compact, highly accurate liveness and anti-spoofing.

3. Through close partnership with industry-leading Ambarella integration partners, Paravision can help bring Edge AI solutions to market faster, with lower risk and lower investment.

Demo Application for Ambarella CVflow

To support rapid bring-up, evaluation, and use case exploration, Paravision offers a full-featured demo application for Ambarella CVflow.

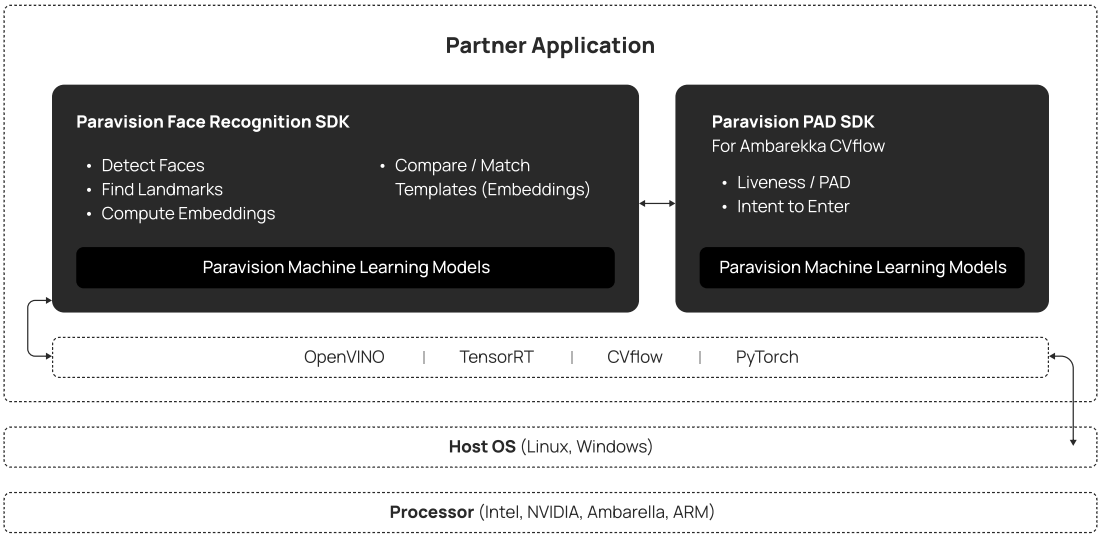


Embedded SDK reference application UI screenshots

The Paravision CVflow demo application includes an integrated UI layer and reporting of key features including:

- Bounding box and landmarks
- Face image quality scores
- Identification results
- Liveness score
- Frontality / Intent-to-Enter scores

System Architecture



Technical Specifications

EMBEDDED - 3D/NIR

Supported operating systems	Linux (Ambarella, NVIDIA, Intel) Windows (Intel) Android (ARM)
Programming languages	C++ / C Wrapper (Linux, Windows) Python (Linux, Windows) Kotlin, C++ (Android)
Supported compute platforms (Computer vision frameworks)	Ambarella (CVflow) Intel CPU (OpenVINO) NVIDIA Jetson-family SOM (TensorRT) ARM (PyTorch)
Supported functions	Face Detection: • Face detection / bounding box detection • Face landmarks detection • Image quality analysis Face Recognition: • Template (embedding) generation • Template matching, supporting 1:1 verification and 1:N identification Related: • Presentation attack detection • Intent-to-enter
PAD (Liveness) Details	Level 1 and Level 2 PAD 3D/NIR liveness based on single face image and pattern from structured light emitter (VCSEL) Supports Ambarella SoC + On Semiconductor CMOS sensor + Lumentum VCSEL reference design