

2020
embedded
VISION
summit®

OpenCV : Rapid Growth and Evolution Beyond the Library

Satya Mallick, CEO

OpenCV

Sep 24, 2020



OpenCV turns 20!

- ❖ 2000 – The first public release
- ❖ 2005 – DARPA Challenge
- ❖ 2009 - OpenCV 2.0: Mobile and Python
- ❖ 2015 - OpenCV 3.0 and T-API
- ❖ 2016 - DNN module and JavaScript support
- ❖ 2018 - OpenCV 4.0 and C++11
- ❖ 2020 - OpenCV 5.0





45k stars on
GitHub



Installs
per week



Embedded
vision engineers



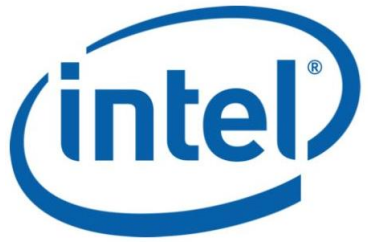
Algorithms



OpenCV Sponsorships & Partnerships



OpenCV Gold Sponsorship Program



Companies committed to open source software development.

A donation of **\$100k** in cash, developer time, or other resources.



OpenCV Gold Sponsorship Program



- A seat at the OpenCV advisory committee
- Press release and promotions via our email newsletter
- Option to contribute training courses, tutorials and blog posts
- Website mention
- Discount for Hardware Partnership
- GitHub pull request priority review



OpenCV Development Partnership Program



Companies who want to actively contribute to OpenCV's software and hardware development efforts.

The annual fee is between **\$50k - \$100k**.

Development partners will also assign a few engineers to support the open source hardware or software effort they are interested in.



OpenCV Development Partnership Program



- Weekly technical meetings
- Will be designated **OpenCV Development Expert** after contributing employees pass requirement
- Press release and website mention
- Acknowledgement in release notes and change logs on GitHub and website
- Option to contribute training courses, tutorials and blog posts

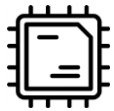


OpenCV Hardware Partnership Program

Companies who want to submit hardware for OpenCV compliance.

One time set up fee of \$50k for continuous testing.

Annual fee of \$200k or more. The fee for your specific hardware will be evaluated during the initial setup.



CPUs (e.g. Intel, AMD, ARM)



GPUs (e. g. NVIDIA, Intel, AMD, ARM)



Neural accelerators (e. g. Movidius, Jetson, Coral)



Smart cameras



OpenCV hardware compliance logo

Technical meetings as needed

Press release and website mention

Option to contribute training courses, tutorials and blog posts

Paid consulting



OpenCV Content Partnership Program

Designed for companies who want to create high quality content on OpenCV.org for their software library, device, or framework.

OpenCV team will create the content, publish it on OpenCV.org, and promote it to newsletter subscribers and social media followers.

Type	Frequency	Price
3 blog-post series	1 per month	\$17,999
6 blog-post series	1 or 2 per month	\$29,999
12 blog-post series	1 or 2 per month	\$54,999



EVOLUTION BEYOND THE LIBRARY



1

**Computer Vision I:
Introduction**

2

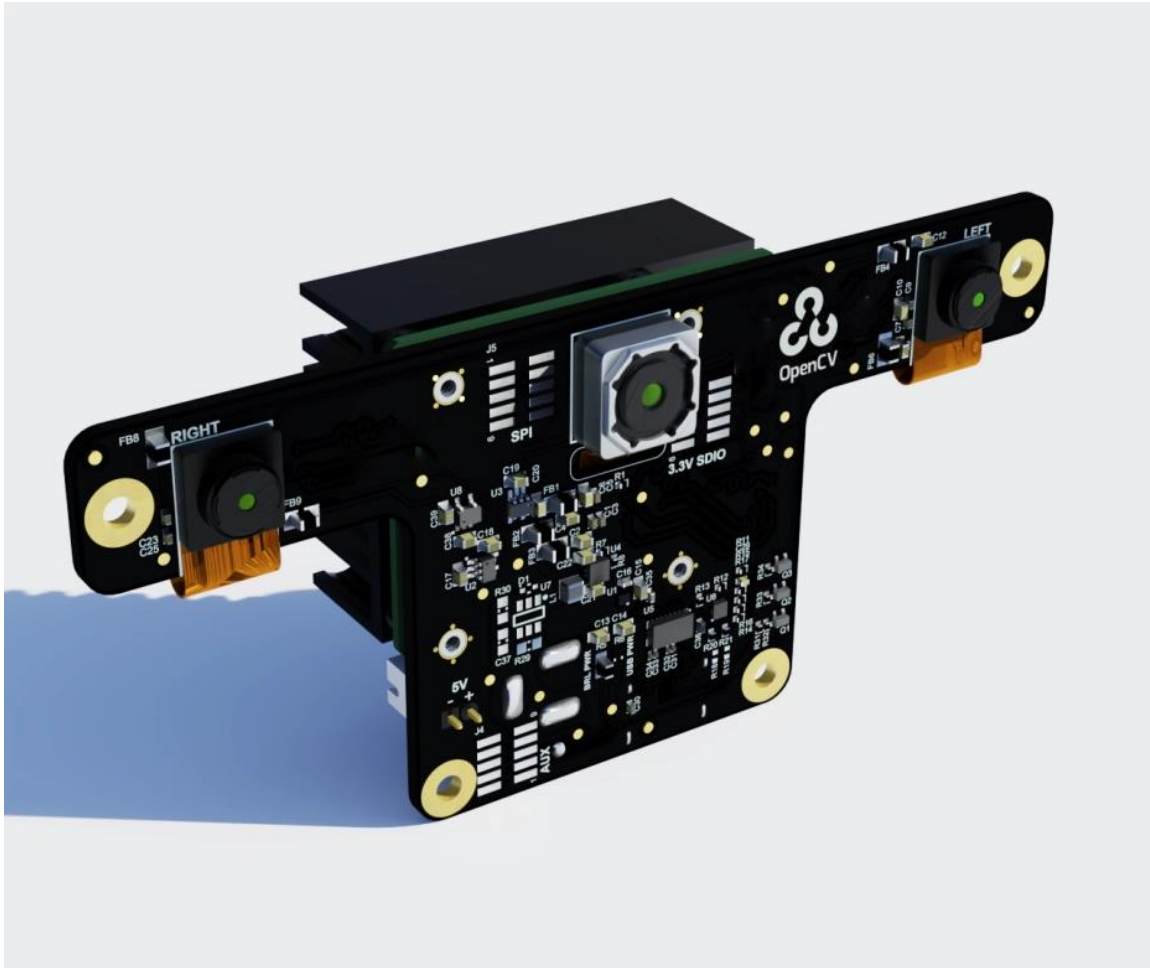
**Computer Vision
II:
Applications**

3

**Deep Learning
with
PyTorch**



OpenCV Ecosystem : OpenCV AI Kit (OAK)



KICKSTARTER

\$1, 358, 318

6,564 backers





OAK-1

Smart Camera with real-time
Neural Inference



OAK-D

Smart Camera with real-time
Neural Inference + Depth Perception



OpenCV.org



Non-profit

- Library development
- Membership program
- Courses
- Community

OpenCV.ai



For-profit

- Consulting services
- AI model marketplace
- Newsletter
- Products and APIs





Dr. Gary Bradski

President



Dr. Satya Mallick

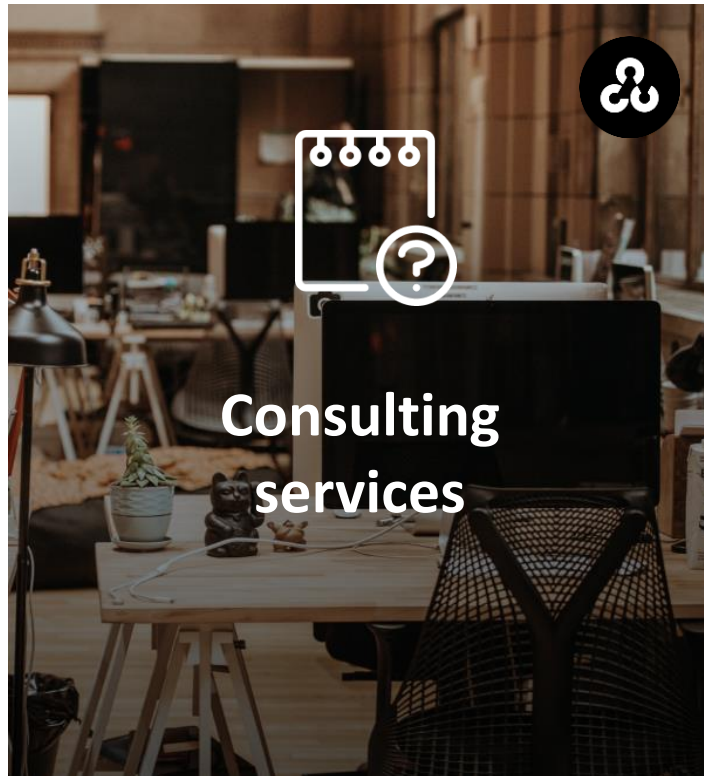
CEO



Anna Petrovicheva

CTO





Traditional computer vision algorithms

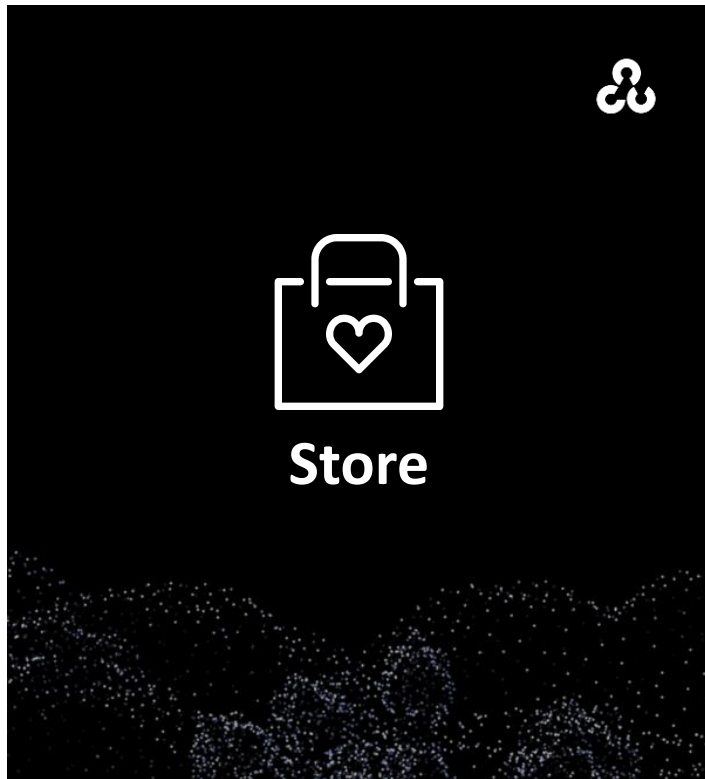
Deep learning

- Training new models

- Optimizing models for speed, accuracy, and size

Edge AI solutions

- CPU, GPU, VPU, FPGA



Hardware

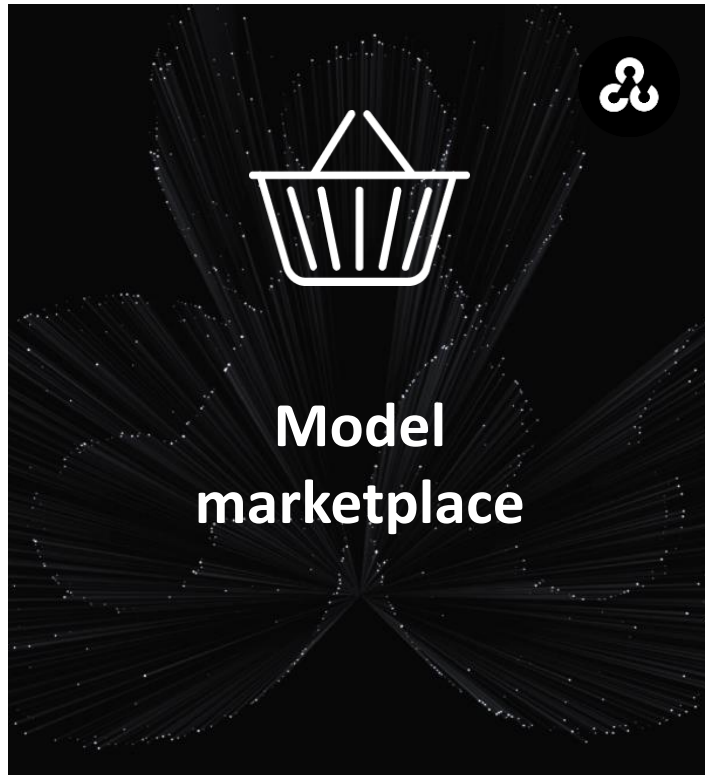
Smart cameras

Development boards

VPU's

Computer vision software

Courseware



A marketplace for sharing AI models with the community

Models will be benchmarked by OpenCV

Models will be wrapped in a web API for each trial

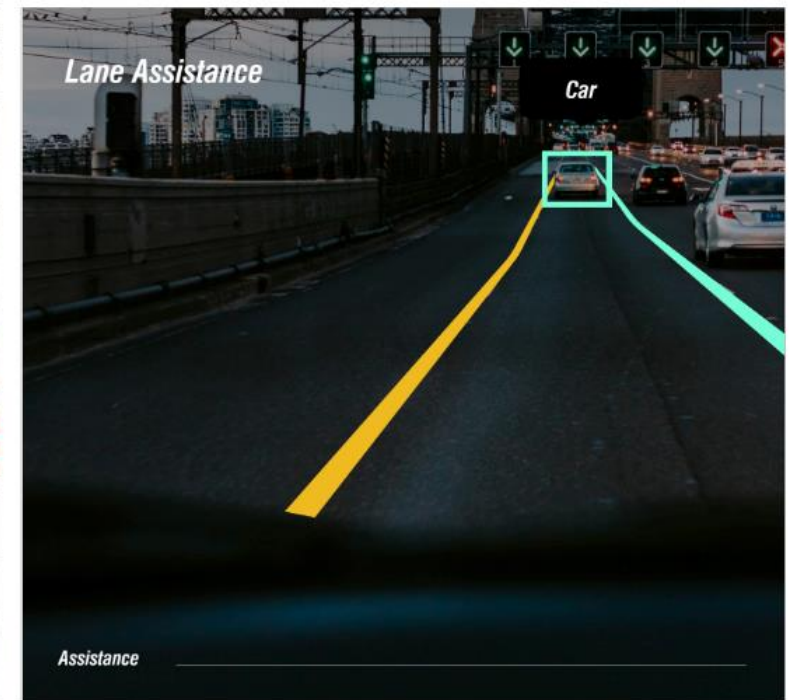
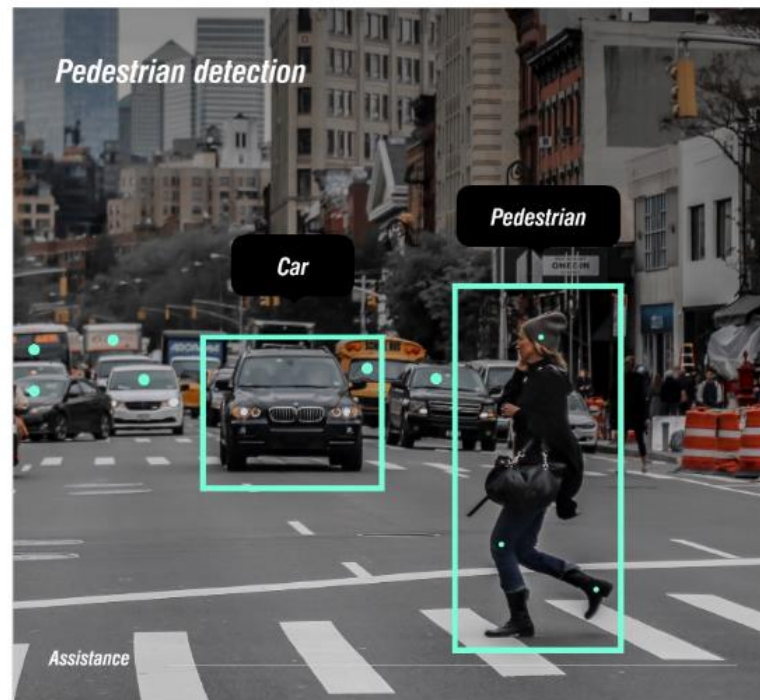
Revenue sharing on paid models

Project Portfolio

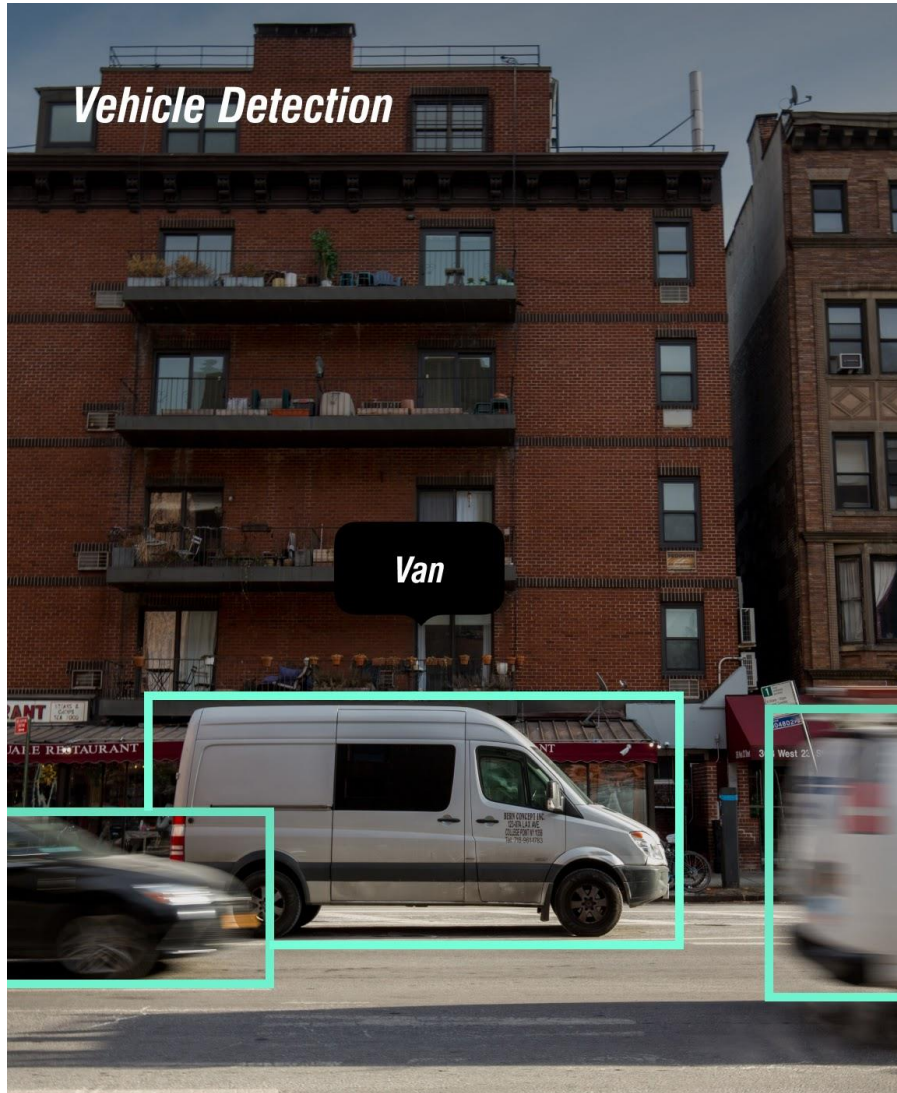


Advanced Driver Assistance System

Traffic light recognition, traffic sign detection and recognition, pedestrian and vehicle detection, lane departure warning implemented on a real car.



Neural Network Pruning for Vehicle Detection



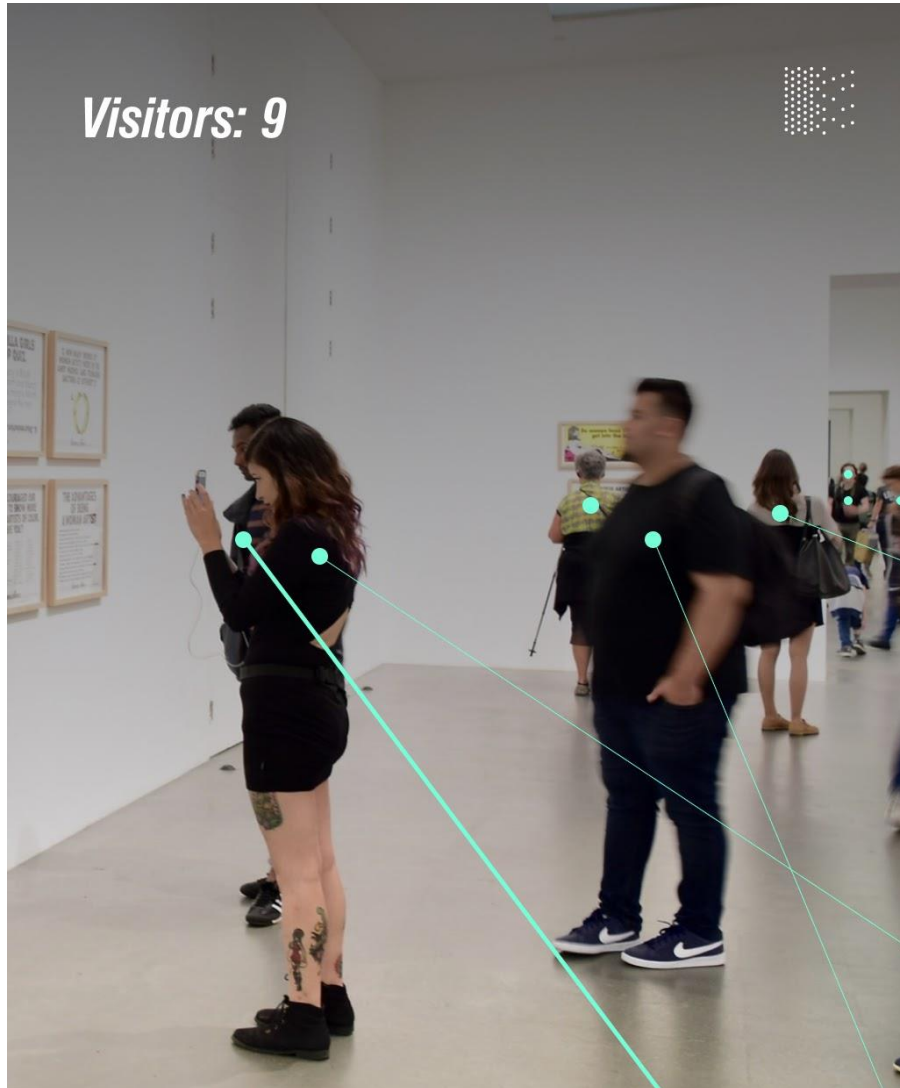
TOP 5

In DETRAC AVSS17 vehicle detection challenge

> 10x

Smaller network than others in top-5

People Counting in Videos

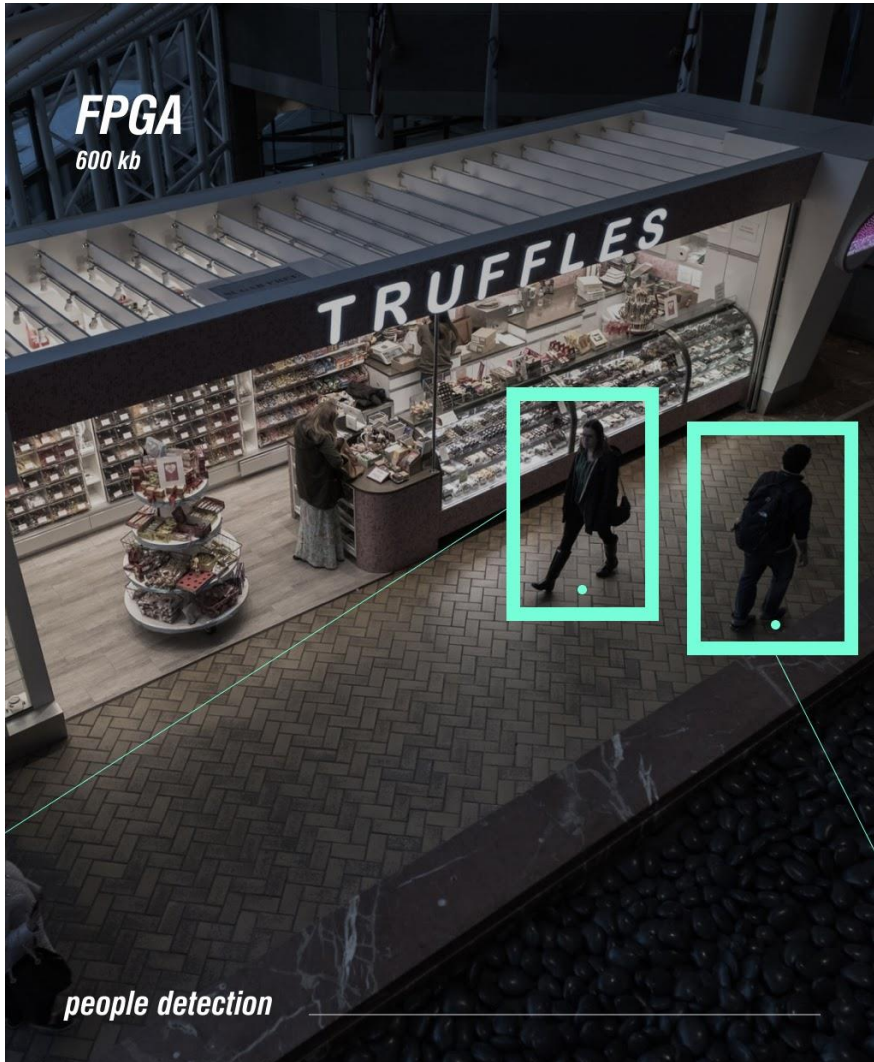


50x
LESS WEIGHTS

370x
LESS COMPUTATIONS



People Detection on FPGA



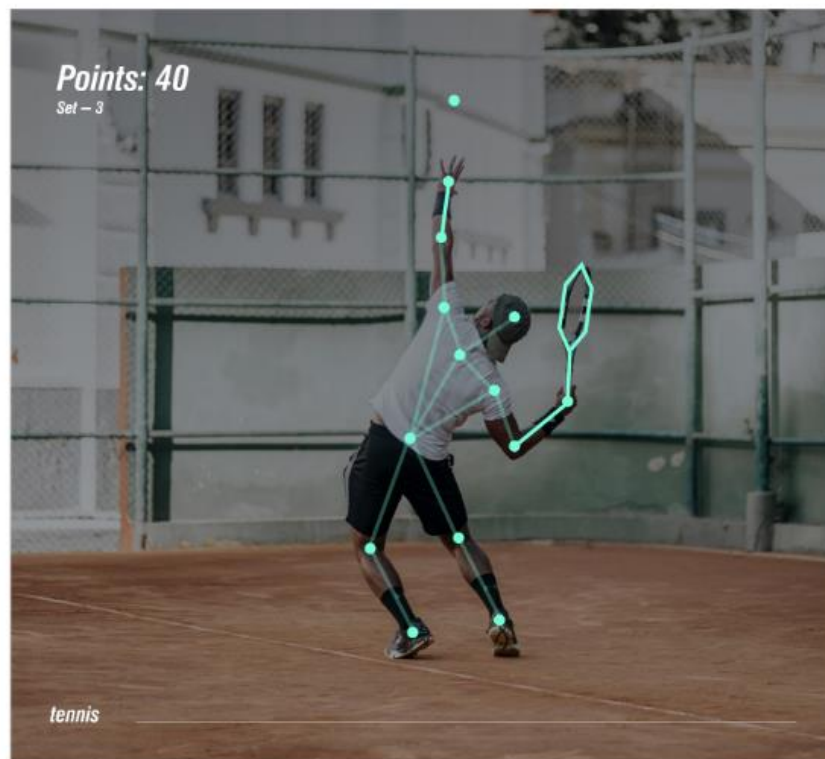
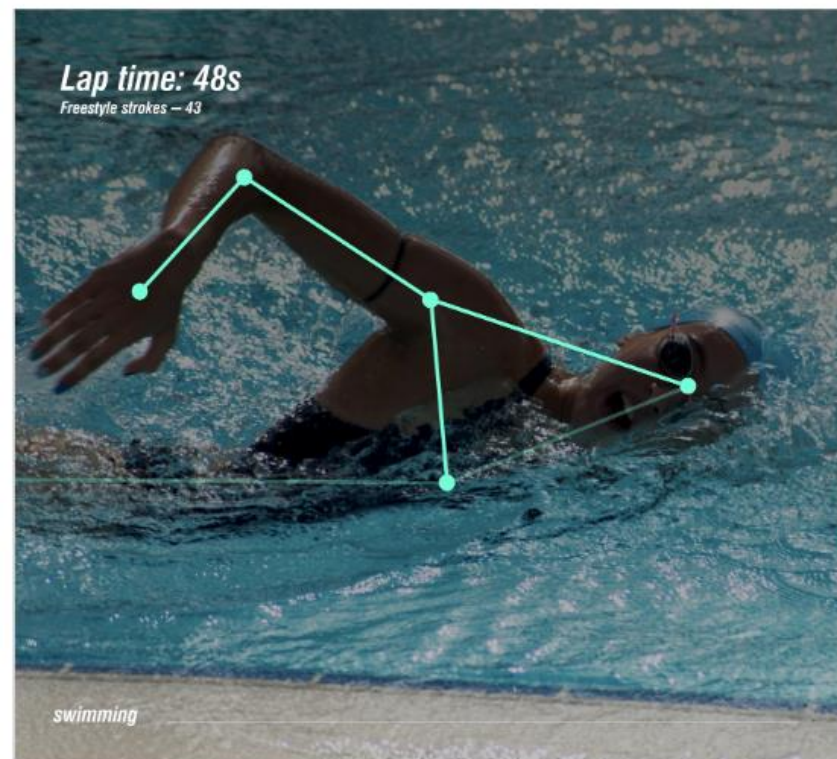
600 Kb
Model Size

Implemented on an FPGA

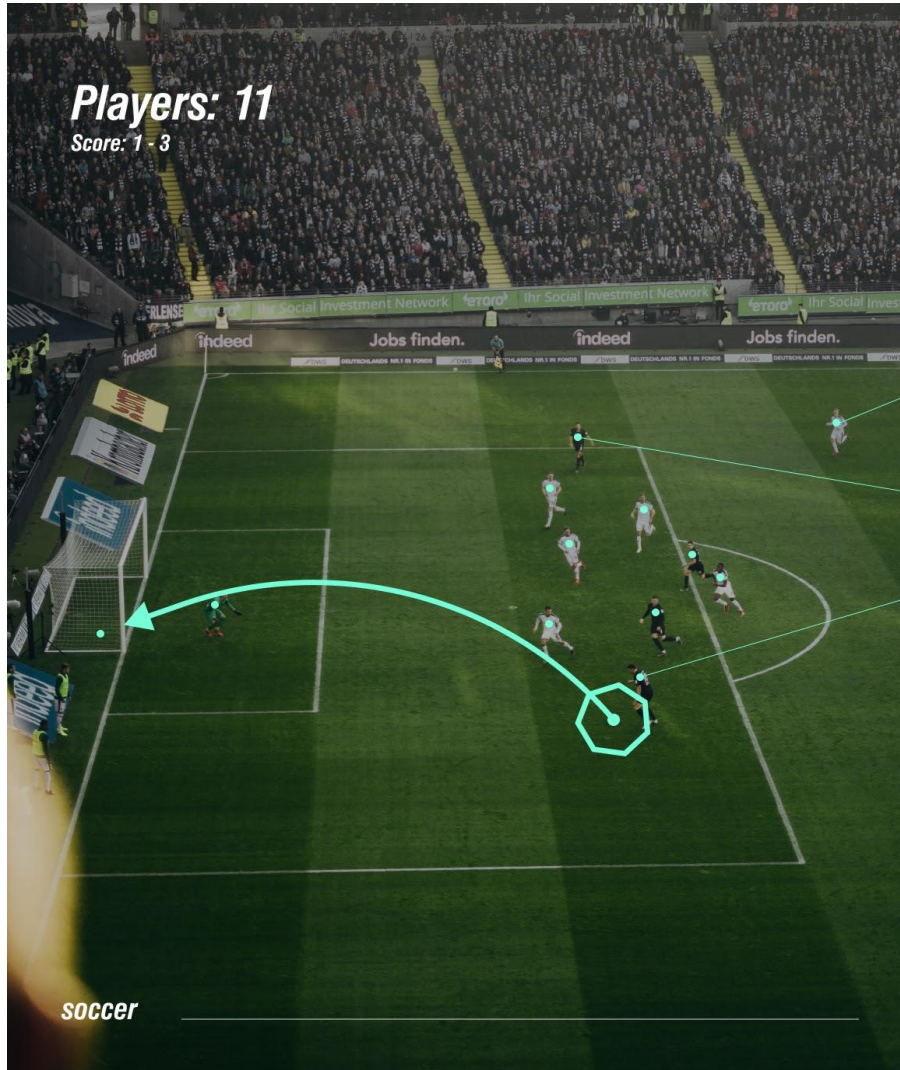
Small model size

Also computed a precise view-agnostic projection to the 2D floor map — that can be used to analyze space utilization.

Sports Training



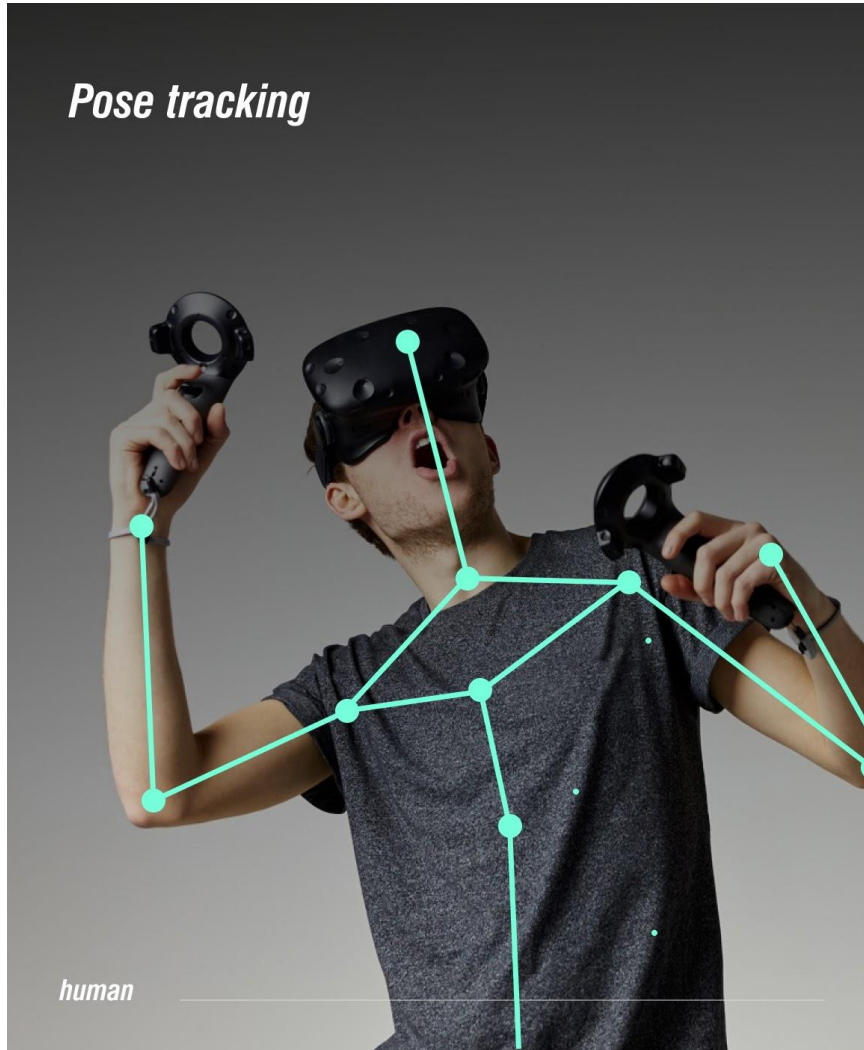
Automated Sports Production



The system detects the players and the ball and automatically move the camera — so that every movement is captured and broadcasted in a fully automated way.

The system works in real-time and is used all over the world.





TOP 10

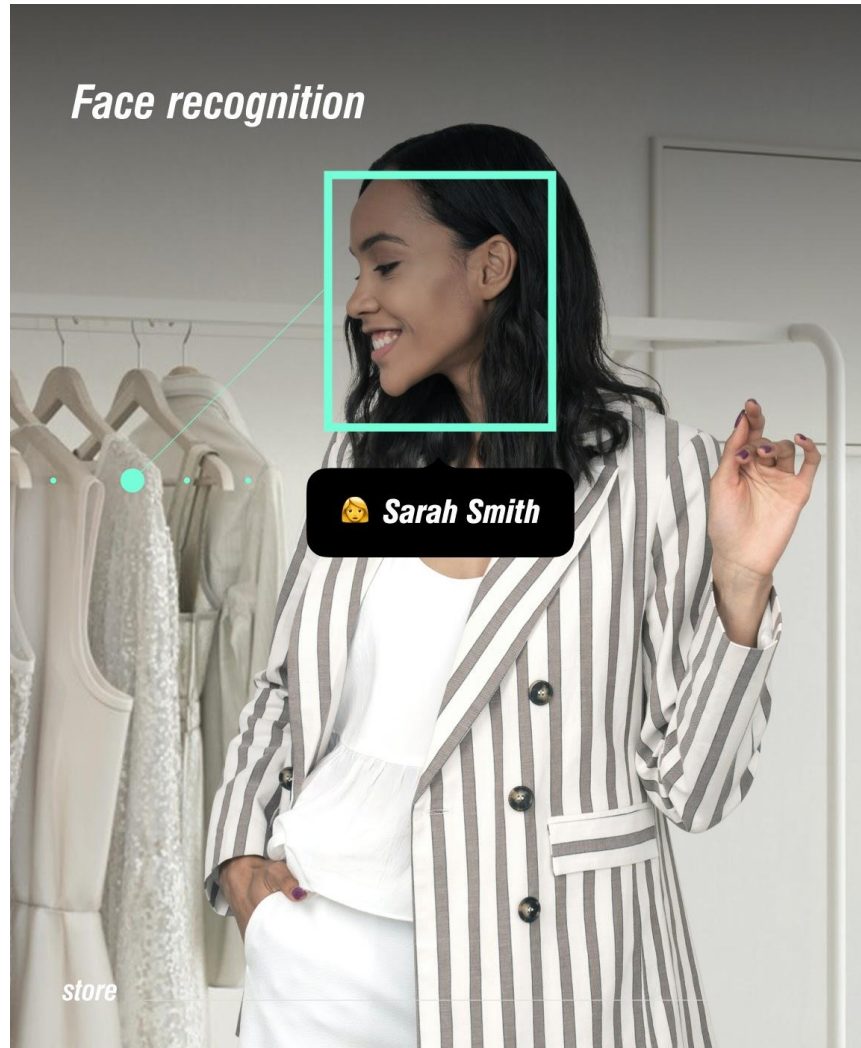
CVPR19 LOOK INTO PERSON CHALLENGE

Pose tracking algorithms for human body pose analysis

Top 10 in CVPR19 Look-Into-Person challenge.

Highly optimized and fast





512 Kb

RAM is enough for inference

Face Re-ID application

Low-power RISC-V device implementation

Model fits into **512 Kb** L2 cache.

Showcased in ICCV 2019

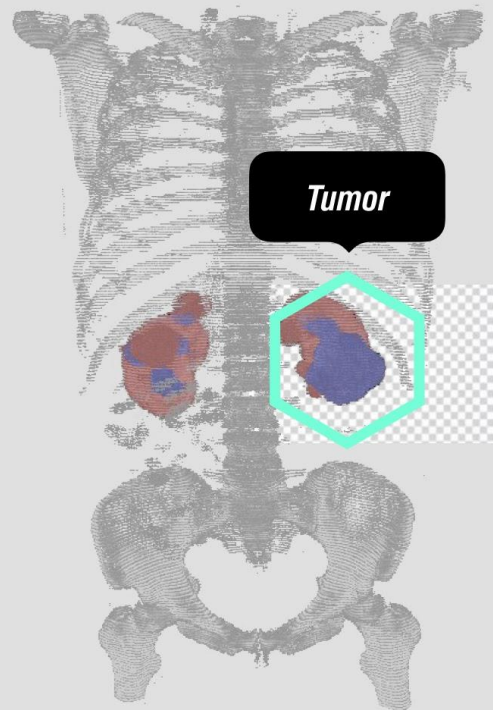


RANKED 1ST

Our solution for indoor scene understanding was **ranked no. 1** on the biggest public benchmark in furniture segmentation in 2019.



3D Tomography



Analysis

RANKED 1ST

LNDB Tomography Segmentation
Challenge, 2020

Our algorithms recognize tumors in liver, kidney
and lungs.

We won one of the challenges in LNDb — a big
public benchmark on computer tomography
segmentation.

The paper is to be published on ICIAR2020
conference in June.



OpenCV library

- OpenCV 5.0
- Full support for ARM, GPU, FPGA, Movidius, NXP

OpenCV 20th anniversary celebrations

- OpenCV spatial AI competition sponsored by Intel
- Video series with luminaries

Newsletter and forum

- 1M registered users by 2021

OpenCV.ai

- Consulting services
- Store
- AI model marketplace

Courses

- Deep learning with Tensorflow
- Getting started with OpenCV AI Kit



OpenCV.ai

<https://opencv.ai>

OpenCV.org

<https://opencv.org>

OpenCV Courses

<https://opencv.org/courses>

OpenCV AI Kit (OAK)

<https://opencv.org/opencv-ai-kit>

OpenCV 20th Anniversary

<https://opencv.org/anniversary>

2020 Embedded Vision Summit

“OpenCV : Rapid Growth and Evolution
Beyond the Library”

Sep 2020



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VISION
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Thank you

Satya Mallick, CEO OpenCV

