



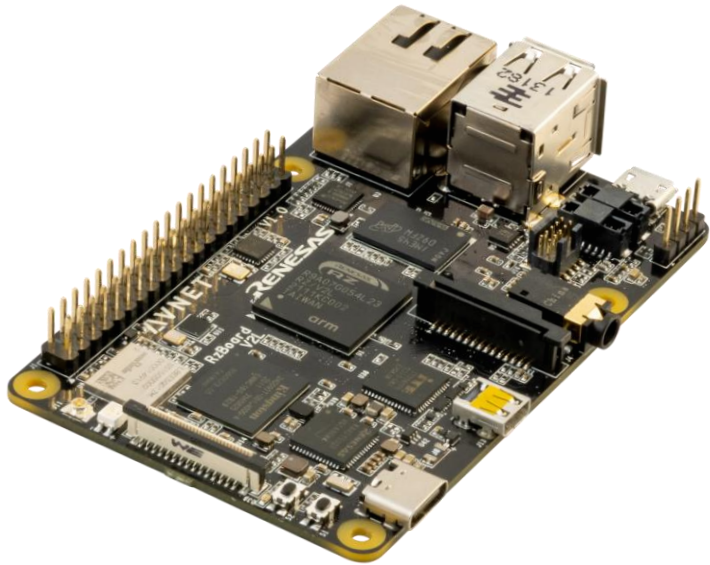
Jumpstart Your Edge AI Vision Application with New Development Kits from Avnet

Monica Houston
Manager, Technical Solutions Engineering
Avnet

Machine Vision Avnet SBC Boards

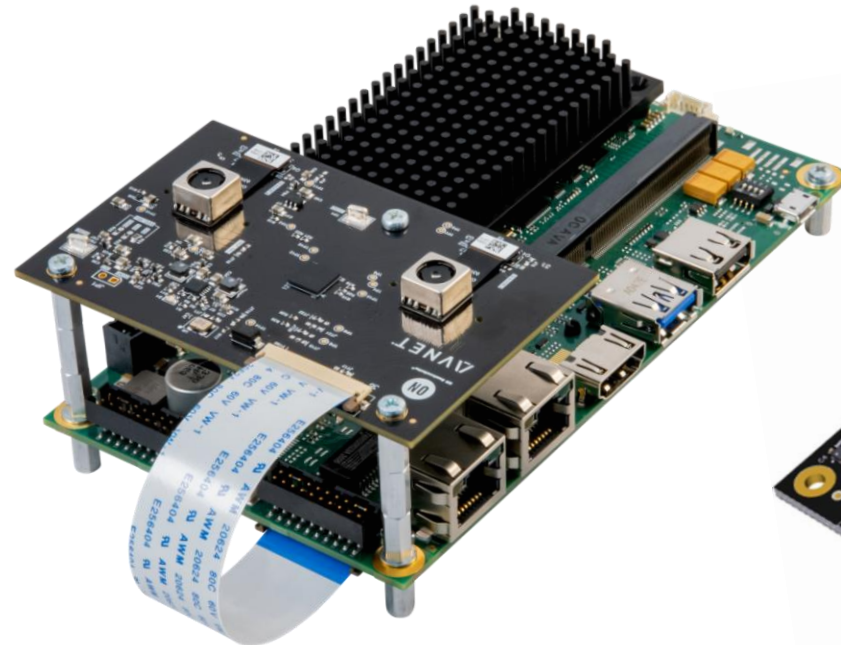


RzBoard V2L



RENESAS

8M Plus Edge AI Kit



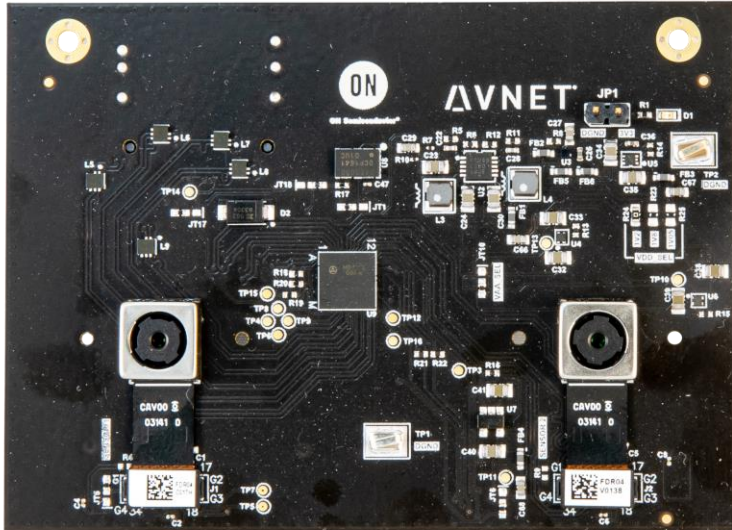
NXP

ZUboard 1CG



AMD
XILINX

AVNET®

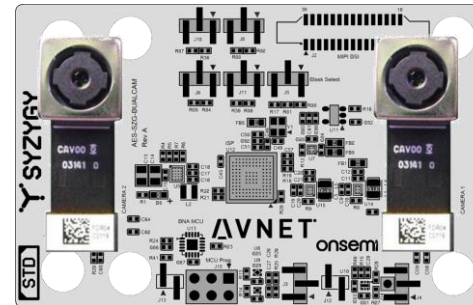


Dual IAS camera adapter

- 2x onsemi AR1335 IAS camera modules
- 1x onsemi AP1302 ISP coprocessor
- Supports stereo 4K video (4K 30 fps, 1080P 60 fps, 720P 120 fps)

SYZYGY dual IAS camera adapter

- 2x onsemi AR0144 IAS camera modules
- 1x onsemi AP1302 ISP coprocessor



Pi IAS camera adapter

- 1x onsemi AS0260 IAS camera module (includes onchip ISP coprocessor)
- Supports HD video (1080p / 30 fps or 720p / 60 fps)

Energy-efficient Vision AI Using RzBoard V2L

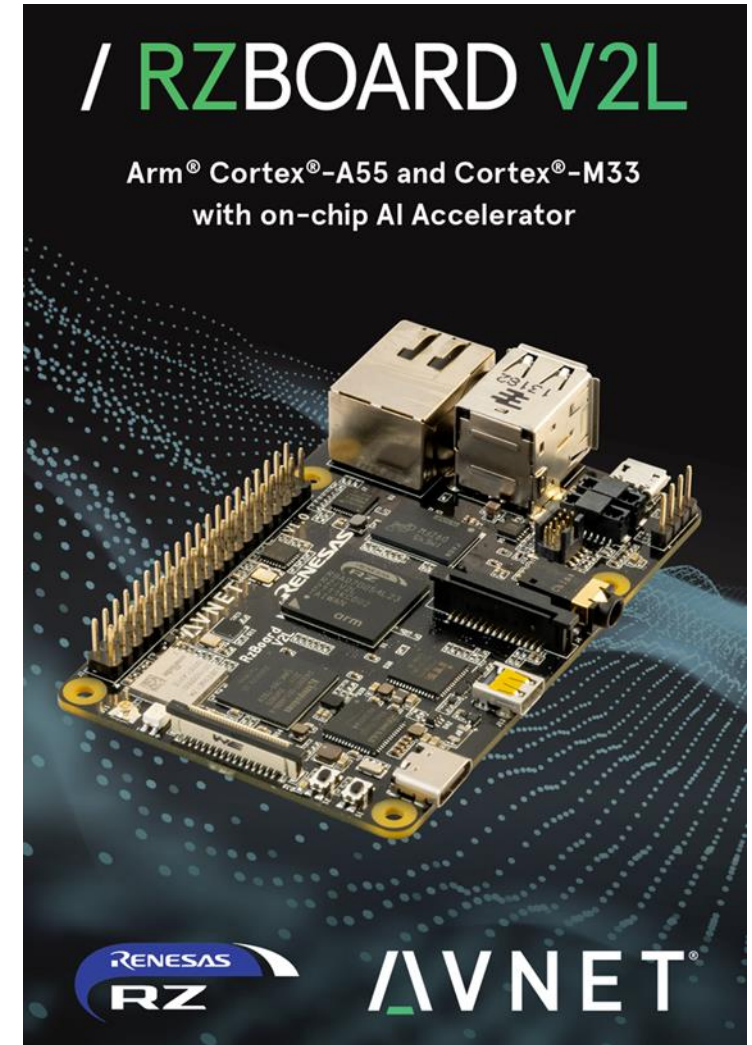
What is RzBoard V2L?



- Avnet-designed development board, engineered in compact Raspberry Pi-4 (MaaXBoard) form-factor
- Facilitates development of Vision-AI applications based on energy-efficient **Renesas RZ/V2L** SoC
- Efficient on-chip DRP-AI accelerator (1 TOPS/W), capable of Tiny YOLOv2 object-detection at 28 fps
- Supports Mikroe click boards and Raspberry Pi Hats

Applications

- Barcode scanning
- Object detection
- Pose detection
- SLAM



Renesas RZ/V2L DRP-AI

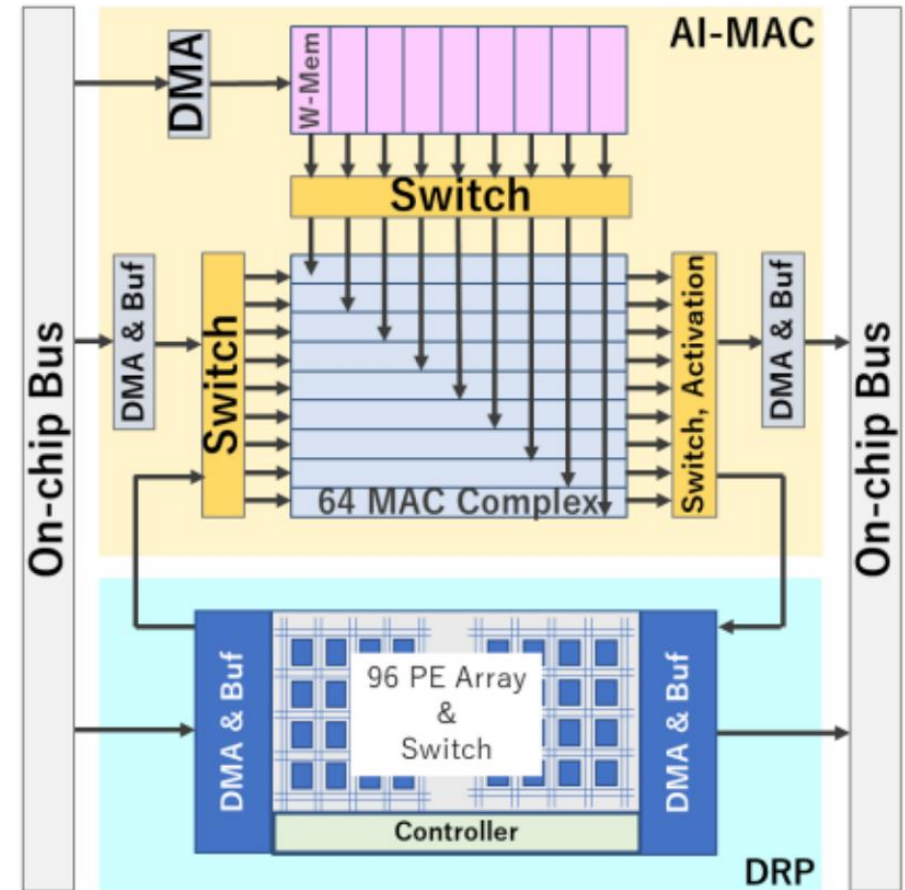


- **DRP** (Dynamically Reconfigurable Processor): Programmable hardware
- **AI-MAC** (multiply-and-accumulate): Hardware dedicated for MAC computing
- **DMAC** (Direct Memory Access Controller)

DRP-AI Translator:

- Tool to generate DRP-AI optimized executables from trained ONNX model
- Optimize the graph structure

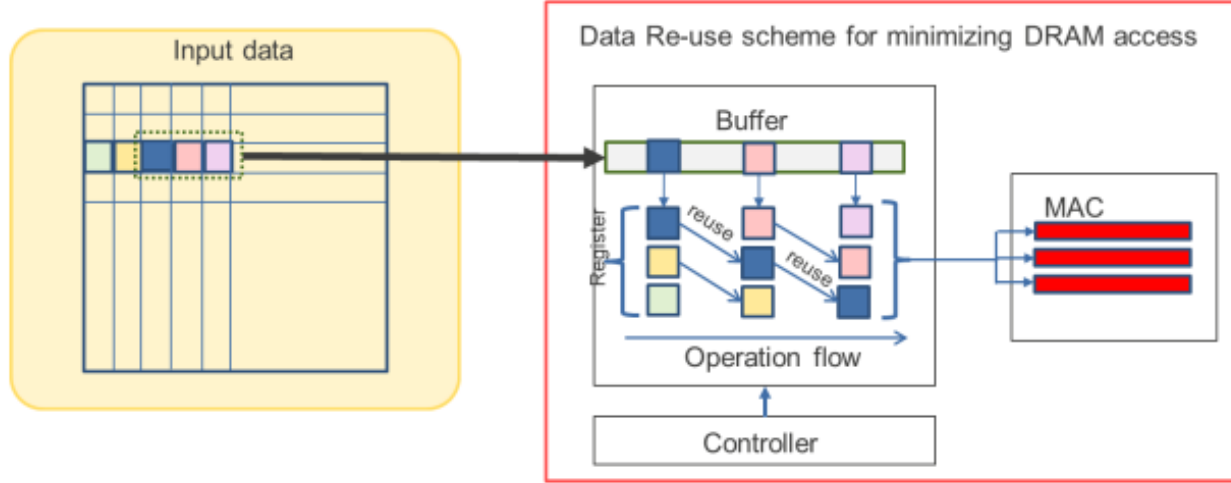
Develop and run applications on Yocto Linux



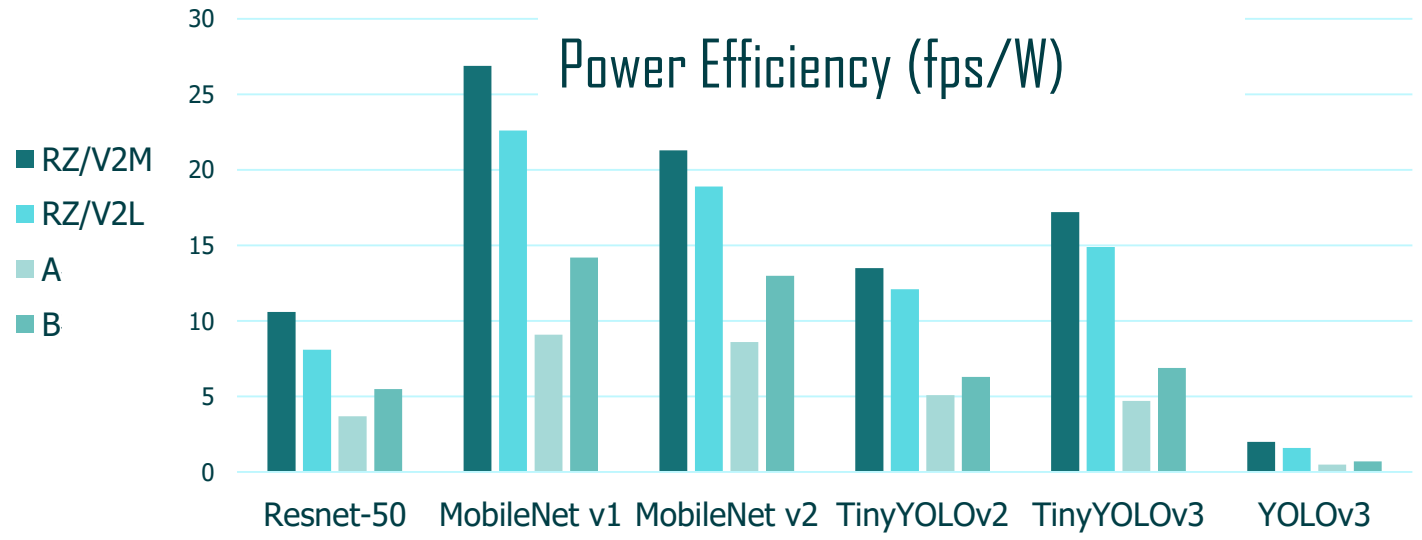
Renesas RZ/V2L Power Saving Features



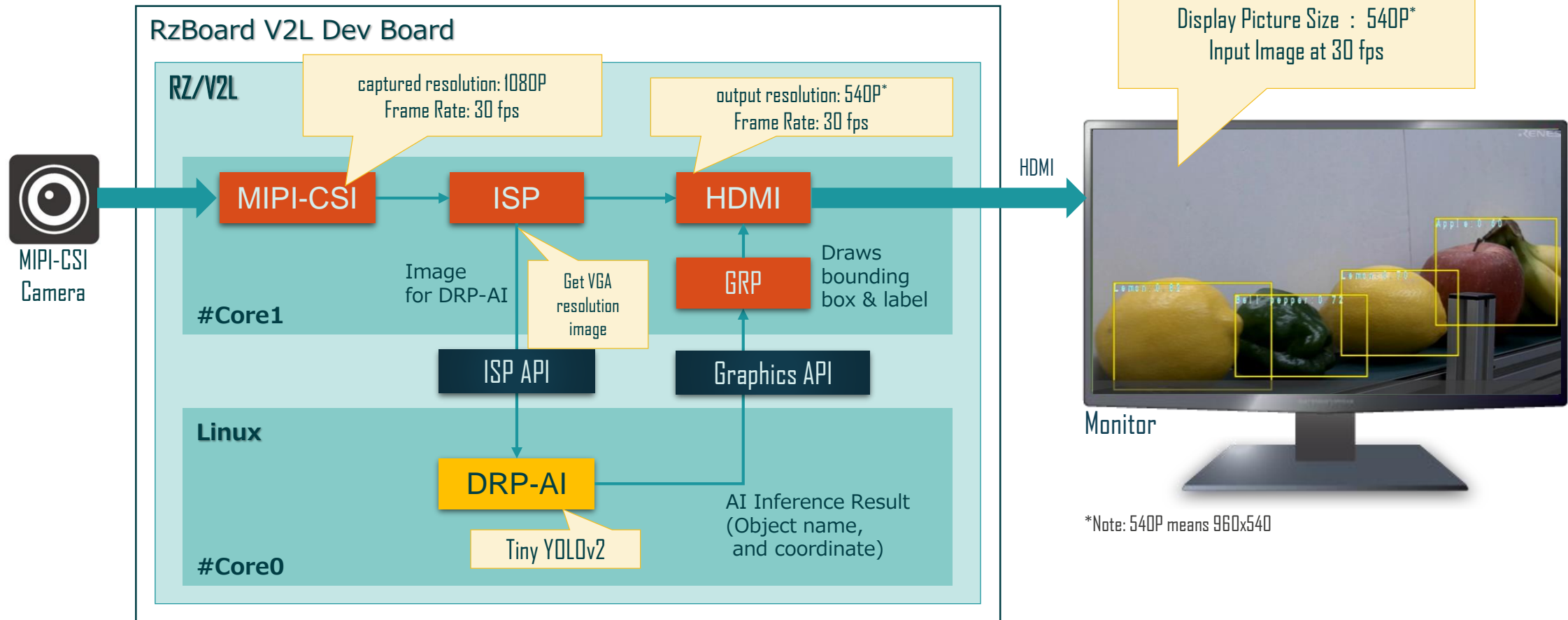
1. Detect zeros to prevent unnecessary operations
2. Reuse data for matrix operations



No heat sink needed!



Smart Retail — Object Detection Demo



Other reference designs available at: avnet.me/RzBoard-V2L

Lightning-fast Stereo Vision on the Edge AI Kit

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What is the i.MX 8M Plus Edge AI Kit?

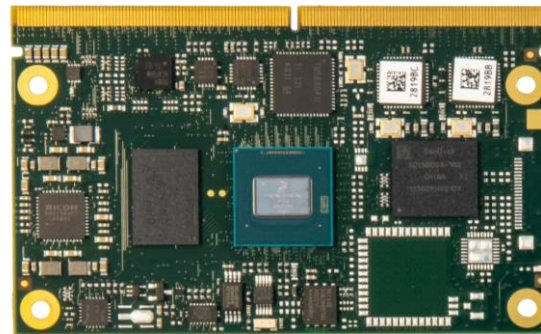
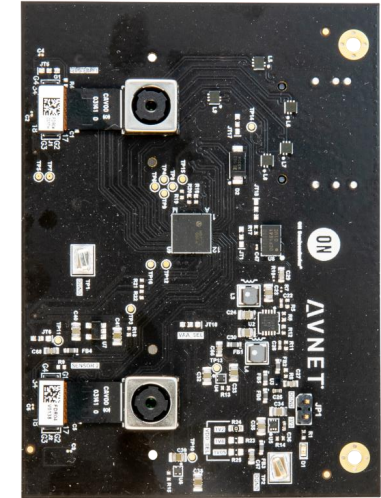
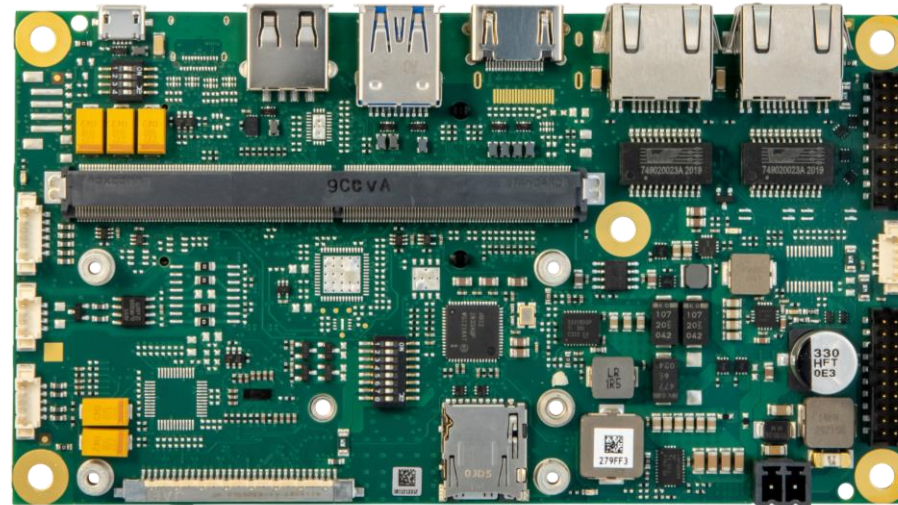


SMARC Carrier and SoM

- NPU (2.3 TOPS)
- Image Signal Processor 12 MP @ 30 fps
- Quad Core Arm Cortex-A53 ARM Applications Processor
- Dual image signal processors (ISP) and two camera inputs

Applications

- Stereo Vision
- Object detection
- Facial recognition
- Image segmentation



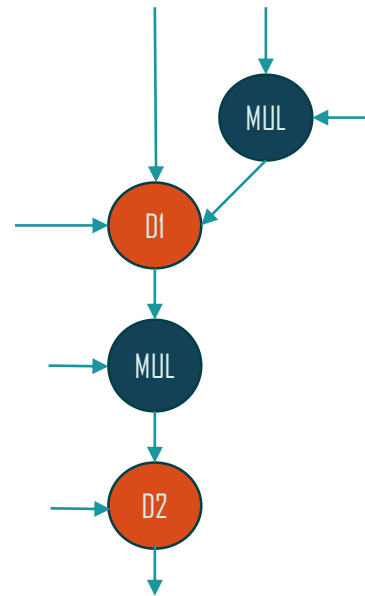
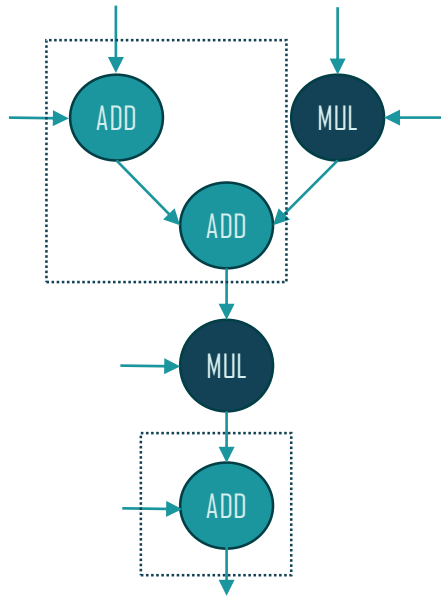
Dual camera adapter

- Two onsemi AR1335 IAS Camera Modules
- onsemi AP1302 ISP

i.MX 8M Plus Edge Kit — eIQ + NPU



- **eIQ** is NXP's ML software stack for i.MX (included as Yocto layer)
- Delegates choose which operations to accelerate



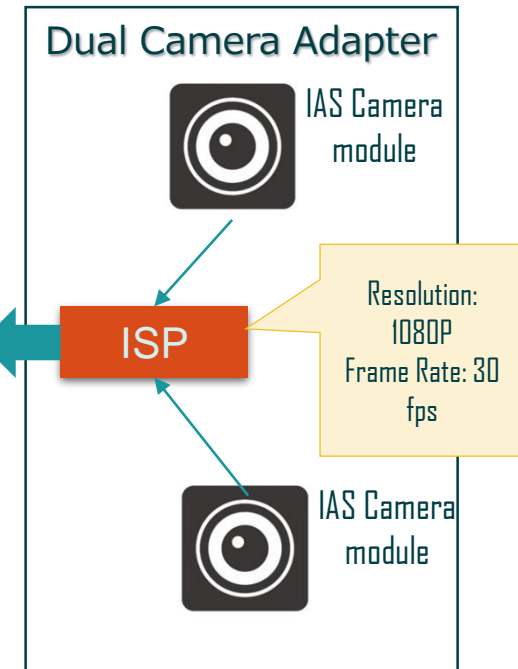
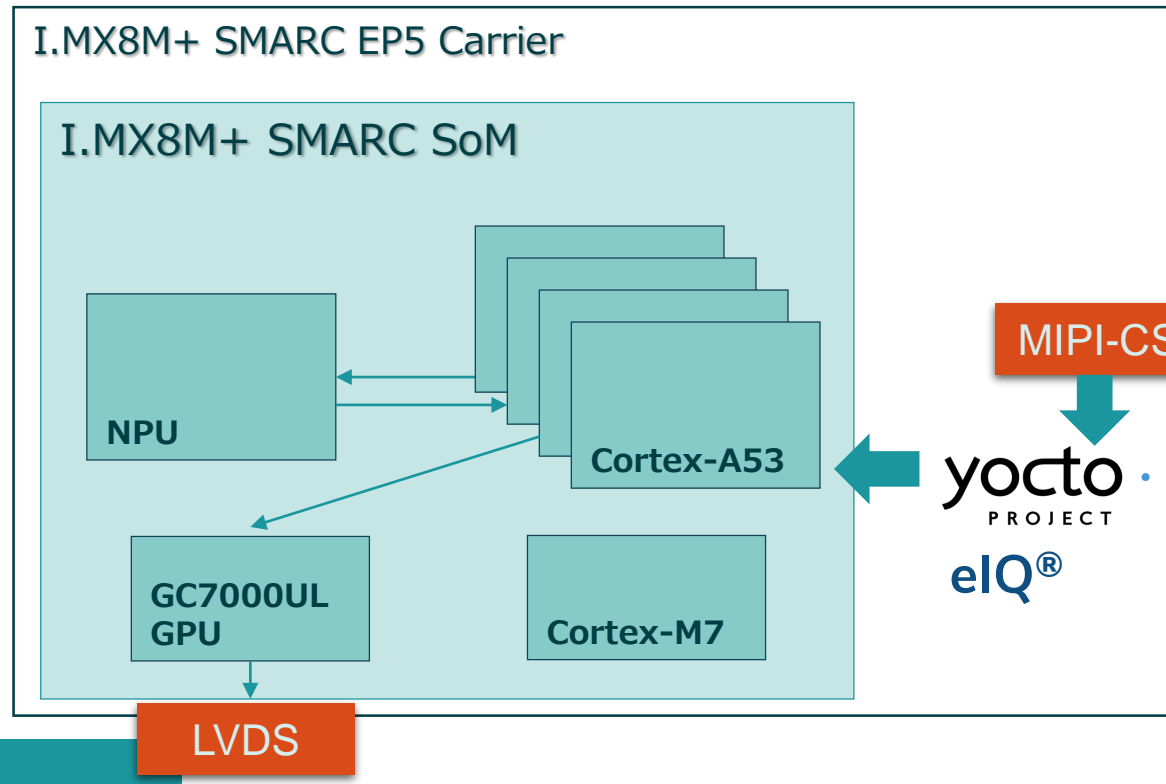
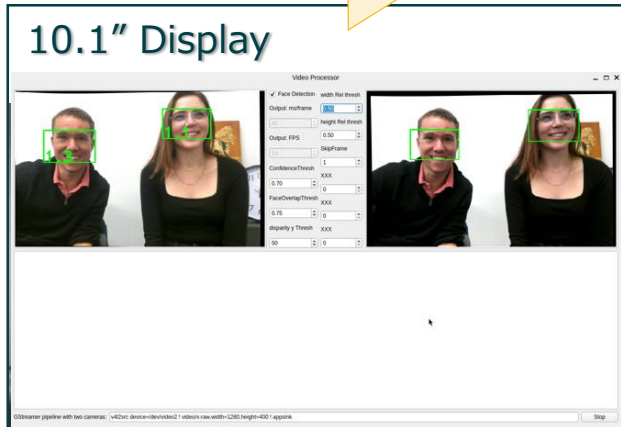
Support for:

- ArmNN
- TensorFlow Lite
- ONNX Runtime
- PyTorch
- OpenCV

i.MX 8M Plus Edge AI Kit — Stereo Vision Demo



Display Picture Size : 1280 x 800px
Input Image at 30 fps



Low-cost, High-performance Machine Vision with the ZUBoard 1CG

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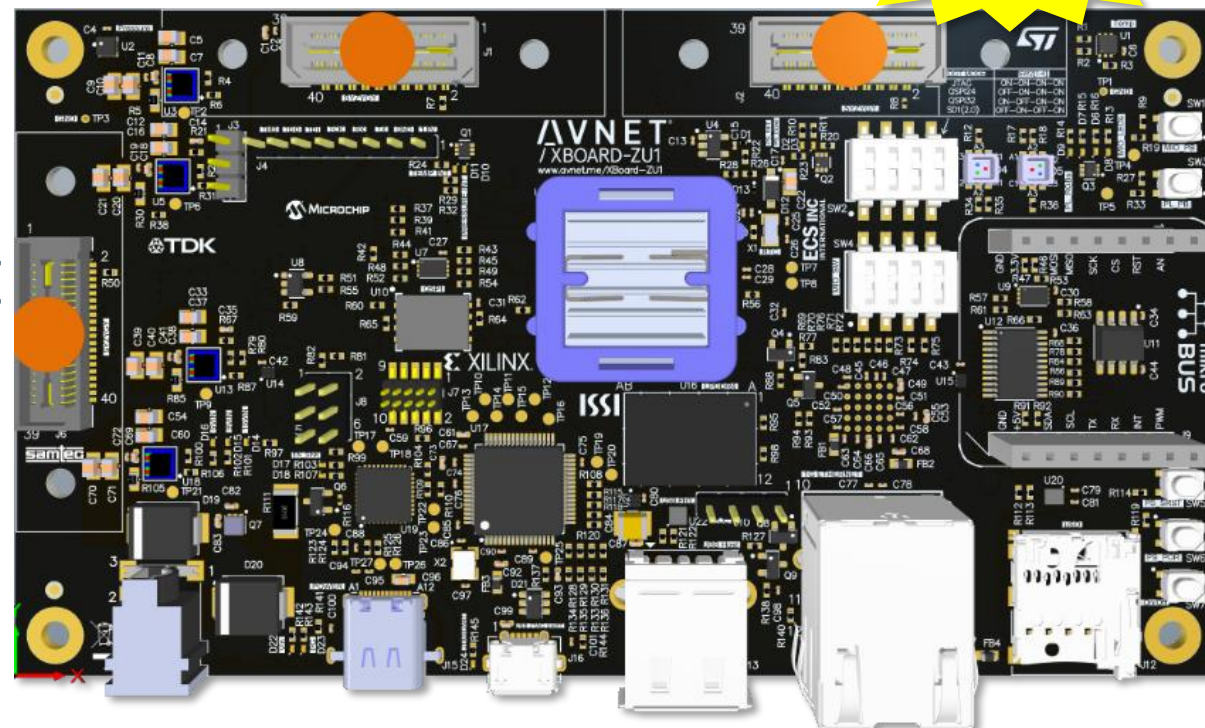
What is ZUBoard 1CG?

- Versatile sub-\$150 development board based on (AMD) Xilinx ZU1 Zynq UltraScale+ MPSoC
 - Dual arm A53 APU and arm R5 RPU
 - 256 KB on-chip RAM
 - 81.9 K FPGA Logic Cells
- Similar to Avnet's Zynq-7000 MiniZed
- Dozens of ML models available via Vitis-AI
- Sensors: Temperature & Pressure
- Expansion Interfaces: 3 Syzygy, 1 Click

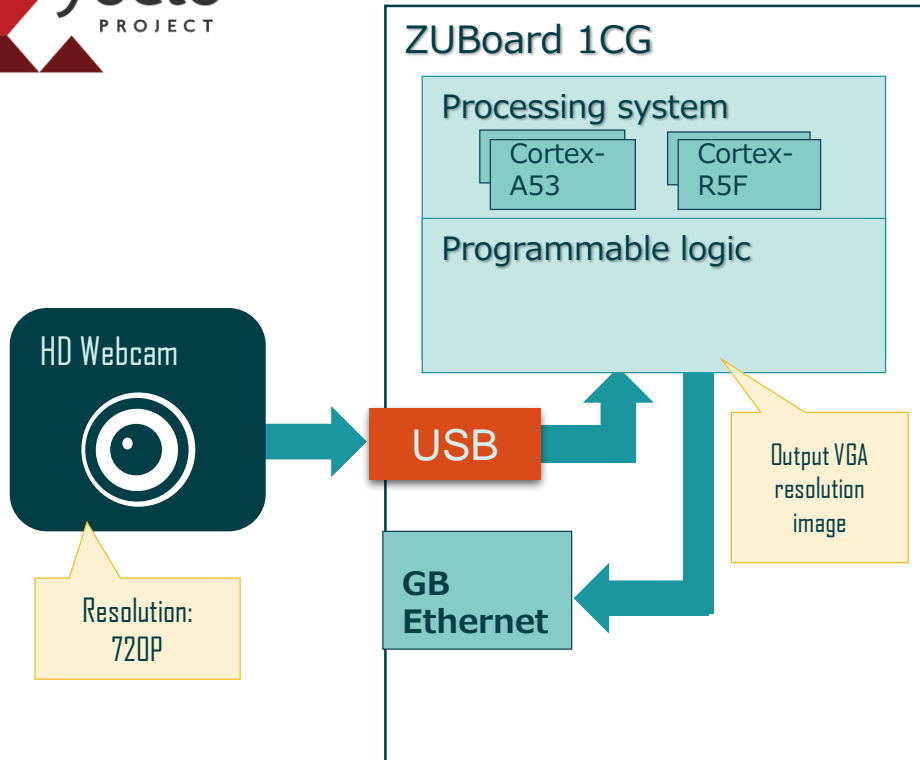
Applications

- Object detection
- Facial recognition
- Machine vision
- Stereo vision

Available 3Q22



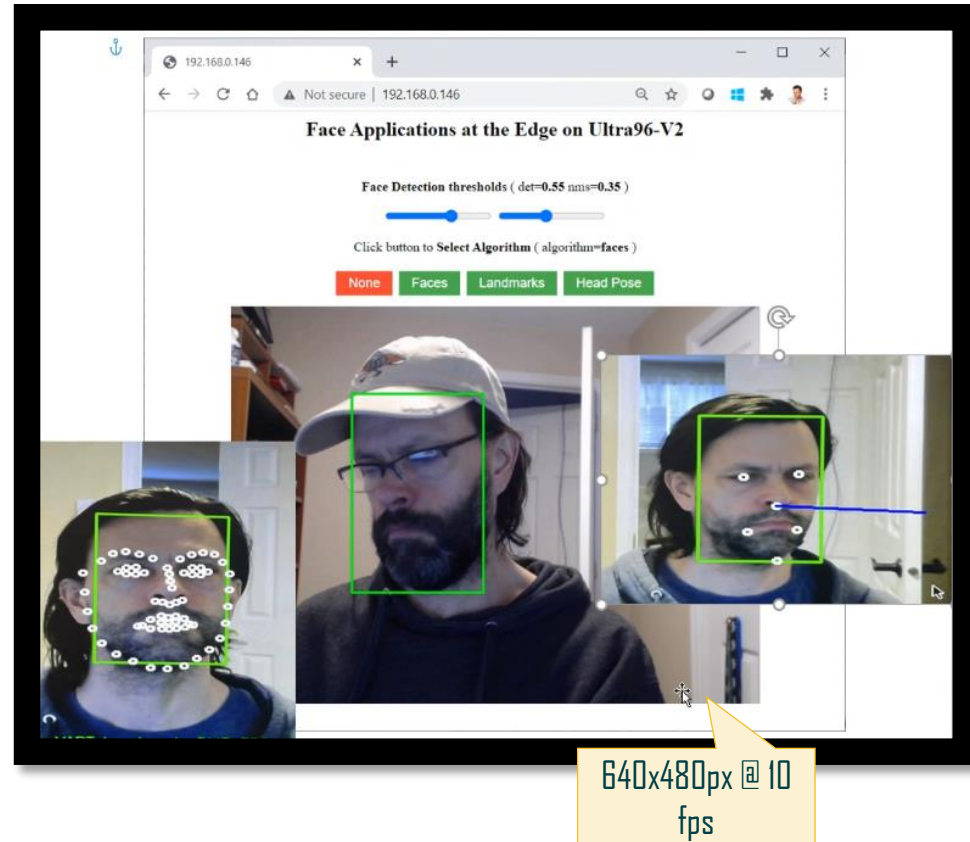
Face Detection with the ZUBoard 1CG



Resolution: 720P

Output VGA resolution image

Web interface



640x480px @ 10 fps

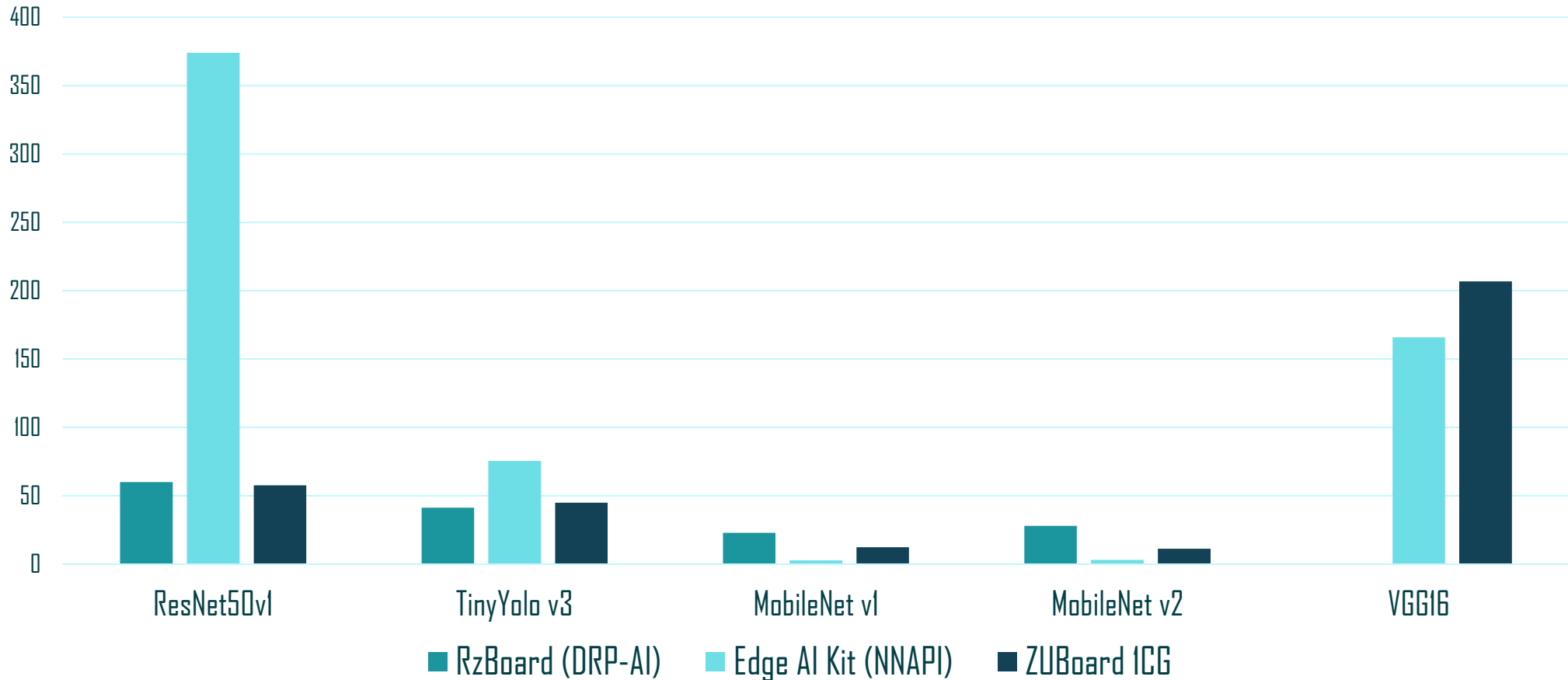
Other reference designs available at: avnet.me/ZUBoard_1CG

Benchmarking Results

Benchmarking Results — Performance



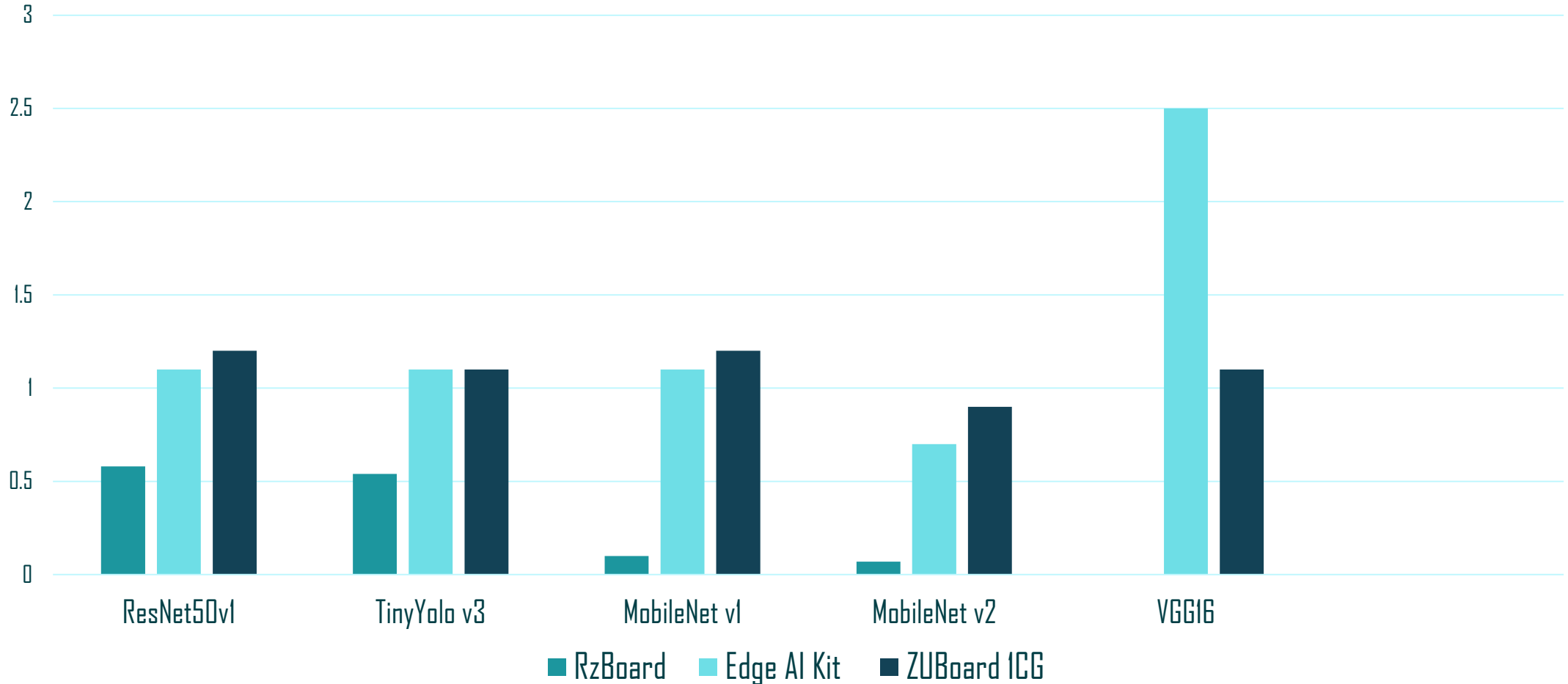
Inference Time (milliseconds)



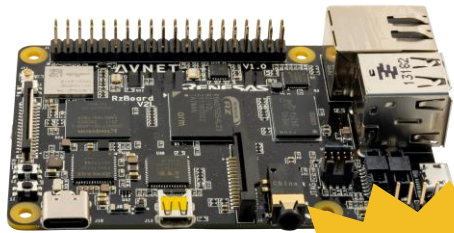
Benchmarking Results — Power



Peak Power Consumption (Watts)



RzBoard V2L



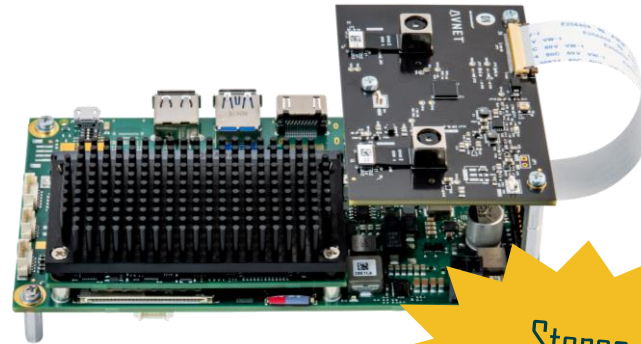
*Low
power!*

Applications

- Barcode scanning
- Object detection
- Pose detection
- SLAM

avnet.me/imx8mplus-edgeai

8M Plus Edge AI Kit



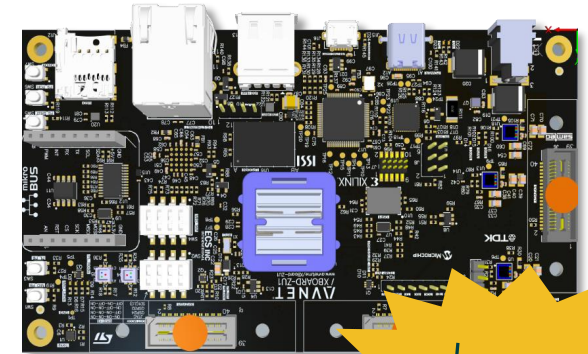
*Stereo
vision!*

Applications

- Stereo vision
- Object detection
- Facial recognition
- Image segmentation

avnet.me/RzBoard-V2L

ZUboard 1CG



*Low-cost
FPGA!*

Applications

- Object detection
- Facial recognition
- Machine vision
- Stereo vision

avnet.me/ZUBoard_1CG



Board Info:

Edge AI Kit:

<http://avnet.me/imx8mplus-edgeai>

RzBoard:

<http://avnet.me/RzBoard-V2L>

ZUboard 1CG:

http://avnet.me/ZUBoard_1CG

Reference Designs:

Edge AI Kit:

<http://avnet.me/imx8mplus-edgeai>

RzBoard:

<http://avnet.me/RzBoard-V2L>











ZUboard 1CG:

http://avnet.me/ZUBoard_1CG

Backup Slides

Embedded Vision Summit

Avnet Booth Demos

#	Avnet SBC Board	Featured Camera Solution	Camera Spec	Supplier Focus	Demo Description
1	XBoard ZU1	SYZGY dual IAS camera pod with AR0144 IAS camera modules (2) AP1302 ISP co-processor	1 MP (2x)	  	Machine Vision / Stereo face-detection (Social-distancing health-safety application?)
2	8M Plus Edge AI Kit	Dual IAS camera adapter with AR1335 IAS camera modules (2) AP1302 ISP co-processor	13 MP (2x)	 	Facial recognition
3	RzBoard V2L	Pi IAS camera adapter AS0260 IAS camera module	2 MP	 	DRP-AI based object detection + comparison vs non DRP-AI (Smart Retail application?)
4	IAS Camera Modules	AR0144 IAS camera module AR1335 IAS camera module AS0260 IAS camera module	1 MP 13 MP 2 MP	  	Static demo with PowerPoint IAS overview

Benchmarking Results — Latency (msec)



Model	RzBoard	Edge AI Kit	ZUBoard ICG
Inception V4	N/A	101.41	194.64
VGG-16	N/A	82.50	206.83
ResNet-50	60.2	36.52	57.76
Mobilenet-V1	23.4	7.78	12.35
Mobilenet-V2	28.5	9.09	11.25
Tiny Yolo V3	41.2	21.07	44.97
SSD Mobilenet-V1	N/A	20.02	28.81
SSD Mobilenet-V2	N/A	36.32	49.50