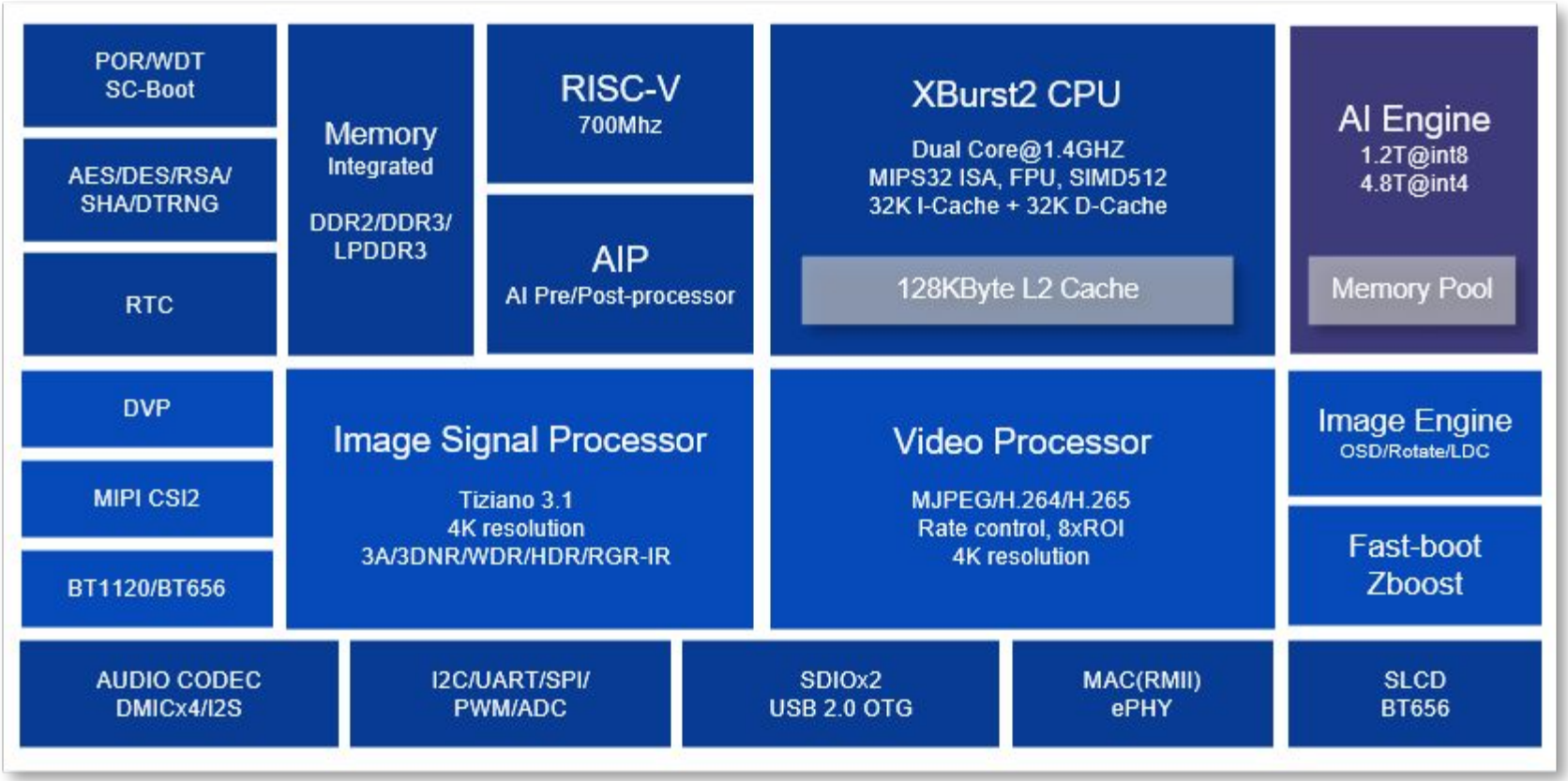
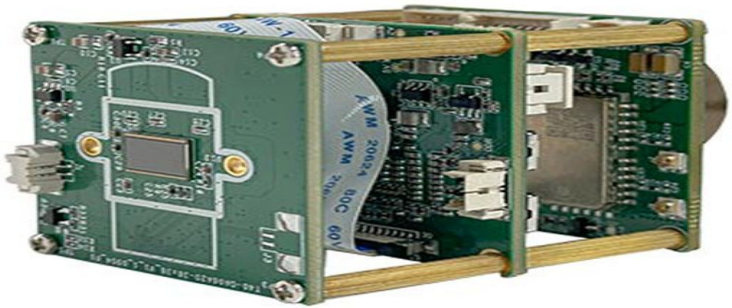
Case study of Image processing with Ingenic T31 and T41 chipset with Magik tool kit

https://github.com/wispytrace/magik-toolkit/blob/main/README_en.md

T31/T41


POR/WDT
SC-Boot
AES/DES/RSA/
SHA/DTRNG
RTC
Memory
Integrated
DDR2/DDR3/
LPDDR3
RISC-V
700Mhz
AIP
AI Pre/Post-processor
XBurst2 CPU
Dual Core@1.4GHZ
MIPS32 ISA, FPU, SIMD512
32K I-Cache + 32K D-Cache
128KByte L2 Cache
AI Engine
1.2T@int8
4.8T@int4
Memory Pool
DVP
MIPI CSI2
BT1120/BT656
Image Signal Processor
Tiziano 3.1
4K resolution
3A/3DNR/WDR/HDR/RGR-IR
Video Processor
MJPEG/H.264/H.265
Rate control, 8xROI
4K resolution
Image Engine
OSD/Rotate/LDC
Fast-boot
Zboost
AUDIO CODEC
DMICx4/I2S
I2C/UART/SPI/
PWM/ADC
SDIOx2
USB 2.0 OTG
MAC(RMII)
ePHY
SLCD
BT656

T41 Rs 900



Case Study

Magic AI on T41 has been successfully applied in various real-world scenarios, demonstrating its effectiveness for object detection in diverse environments.

One notable application is in low-light environments where T41, leveraging IR cameras, achieved real-time detection of various objects like pedestrians, vehicles, and bicycles with minimal loss. Another example is vessel detection using T41 and SHA-256, showing improved precision and data security. Additionally, T41 has been used for tomato quality inspection, achieving high accuracy in detecting and classifying defective and non-defective tomatoes. Furthermore, T41 has been employed for small-target detection in tea insect infestation, demonstrating improved accuracy.

It is capable of detecting 5 people in a single frame, all at 45 fps!

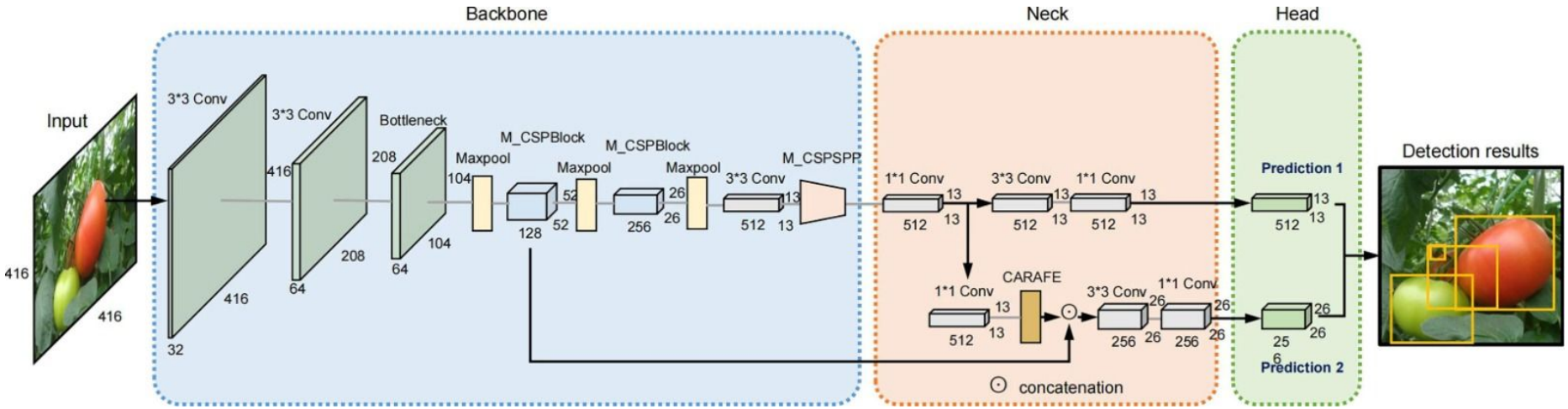
some more case studies:

Low-Light Object Detection:
The model successfully detected various objects, including pedestrians, cars, and bikes, demonstrating its ability to perform real-time detection with minimal loss.

Vessel Detection:
A study by IndiaAI integrated T41 with advanced architectures and a class-balanced dataset to detect vessels. The results showed a significant improvement in precision compared to T31 and ensured data security through the use of SHA-256.
Tomato Quality Inspection:

T41 was utilized in a case study to inspect the quality of tomatoes.

Yolo (45 frames per second)



Advantages

Chip Capabilities

The T41 functions as a powerful NPU, capable of running operating systems like Linux or RTOS.

Multimedia Processing

It supports H.264/H.265 coding and decoding for efficient multimedia handling.

Robust Connectivity

Equipped with Gigabit Ethernet interfaces for reliable network connections.

Edge AI Optimization

Tailored for edge AI solutions with its Mips32 architecture, on-chip memory, and low power consumption.

Combined with Ingenic's MAGIK tools, provide a strong foundation for developing advanced embedded AI applications.

MAGIK: Deep Learning Development Kit

1

Model Quantization & Training

MAGIK offers pre-developed models or a Model Zoo with popular models, which can be trained with customer data to produce 4-8 bit quantized models. It also supports training with TensorFlow, mxnet, PyTorch, or yolo.

2

Model Transforming

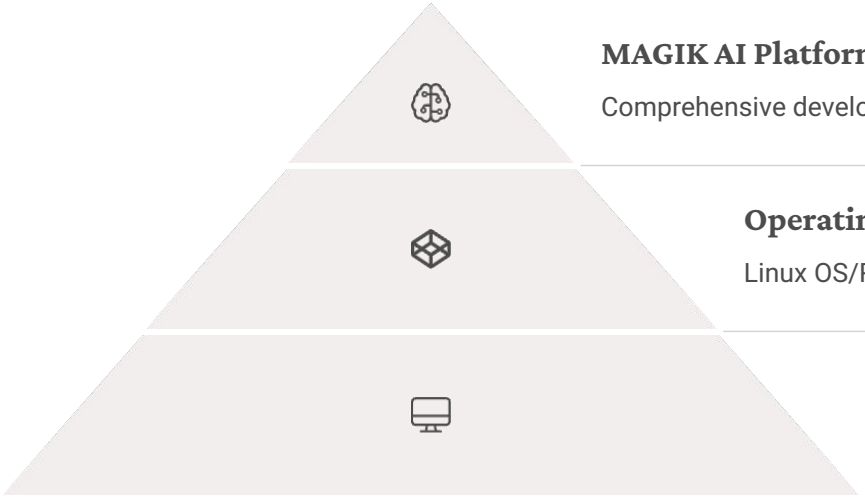
This involves model checking for hardware suitability, converting models from different platforms into MAGIK models, and optimizing them to best utilize the T41 features.

3

System Deploying

II can be deployed on GPU, TPU and NPUs

T41 with Magik AI



MAGIK AI Platform

Comprehensive development kit for deep learning.

Operating Systems & Kits

Linux OS/RTOS.

Computing Resources

XBurst CPU with MIPS ISA and advanced memory management.

The T41 chip's AI capacity, combining image processing, video coding/decoding, and connectivity, enables its deployment as a standalone edge AI agent.

Detector	Backbone	AP@0.5	FPS
Faster R-CNN [1]	VGG-16	0.6213	10.7
Faster R-CNN [1]	ResNet50_FPN	0.6321	-
Cascade R-CNN [4]	ResNet50_FPN	0.6534	-
SSD [16]	VGG-16	0.4857	21.8
YOLOv3 [8]	Darknet53	0.5764	49.3
YOLOv4 [9]	CSP-Darknet53	0.6590	52.3

Conclusion/Findings

1. T41/T31 with Rs 900 we can have 45 FPS object , person and texture detections.
2. Family of 5 person in a home can be trained and detected
3. Door open/close, baby crying detection and theft alarm
4. Person count

https://github.com/akumrao/MagicAI/tree/AIPeopleCount