BED: A Real-Time Object Detection System for Edge Devices

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BED

- What's the advantage of BED?
- Pipeline of BED.
- Object detection using the GUI.
- Real-time object detection.

What is BED?
What's the advantage of BED?

BED is an **integrated** system for **real-time** object detection on edge devices

- Lightens DNN training with lower bit-width

- Faster on-chip DNN inference with lower memory consumption

- Supports customized or camera-capturing input images
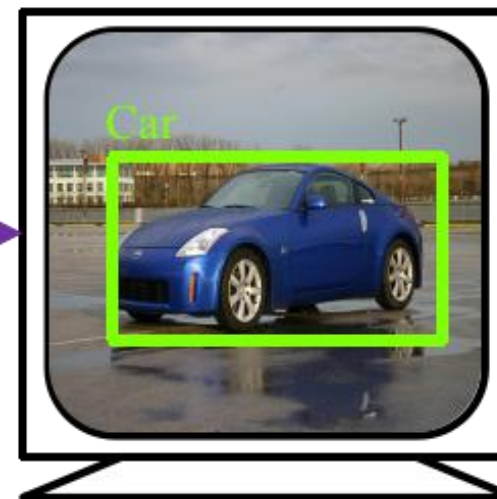
Pipeline of BED

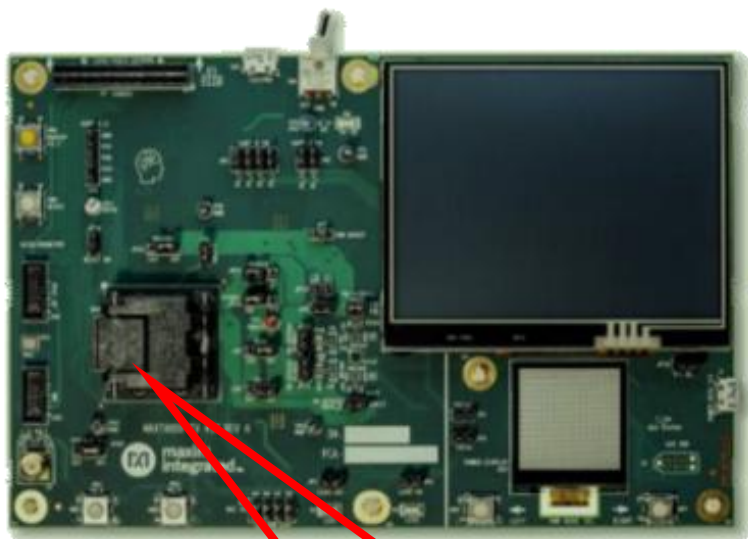An efficient DNN accelerator

Input: Camera

MAX78000

Output: Screen

Car

BE

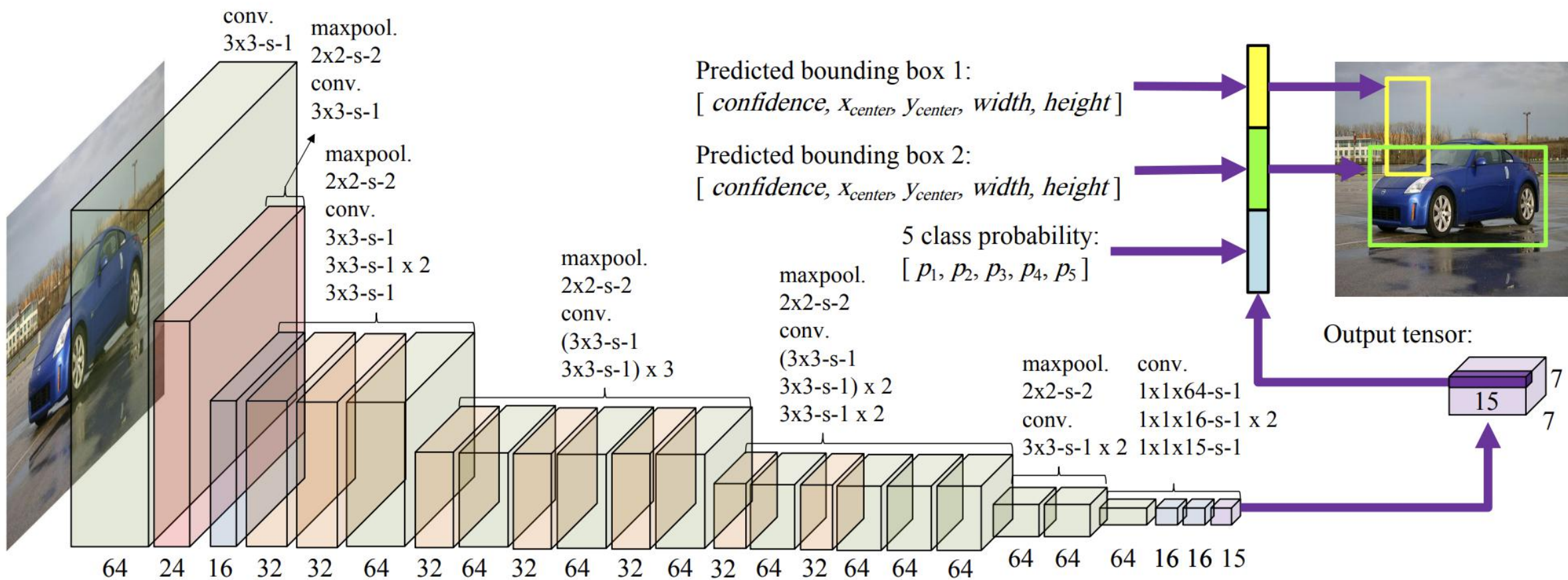**Input: Camera** **MAX78000** **Output: Screen**

Car

Deploy a well-trained
DNN model

DNN architecture

conv.
3x3-s-1

maxpool.
2x2-s-2
conv.
3x3-s-1

maxpool.
2x2-s-2
conv.
3x3-s-1
3x3-s-1 x 2
3x3-s-1

maxpool.
2x2-s-2
conv.
(3x3-s-1
3x3-s-1) x 3

maxpool.
2x2-s-2
conv.
(3x3-s-1
3x3-s-1) x 2
3x3-s-1 x 2

maxpool.   conv.
2x2-s-2   1x1x64-s-1
conv.   1x1x16-s-1 x 2
3x3-s-1 x 2   1x1x15-s-1

Predicted bounding box 1:
[$confidence$, x_{center}, y_{center}, $width$, $height$]

Predicted bounding box 2:
[$confidence$, x_{center}, y_{center}, $width$, $height$]

5 class probability:
[p_1, p_2, p_3, p_4, p_5]

Output tensor:

64 24 16 32 32 64 32 64 32 64 32 64 32 64 32 64 64 64 64 64 64 16 16 15

Latency of BED

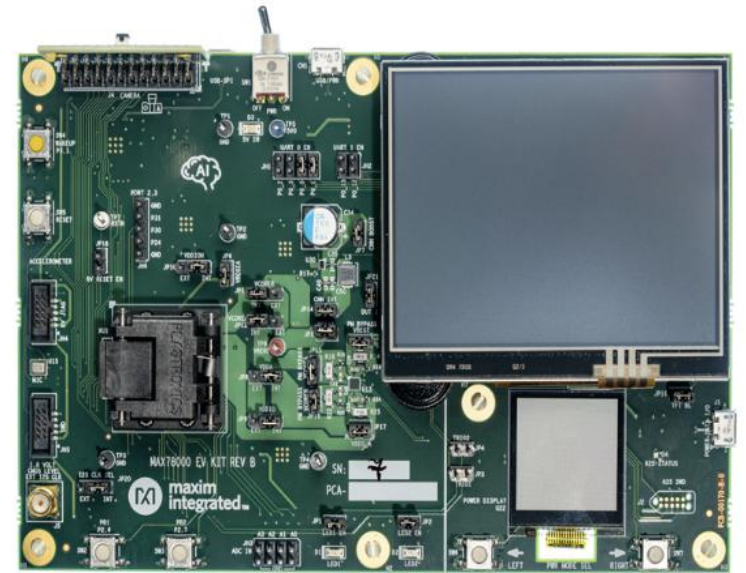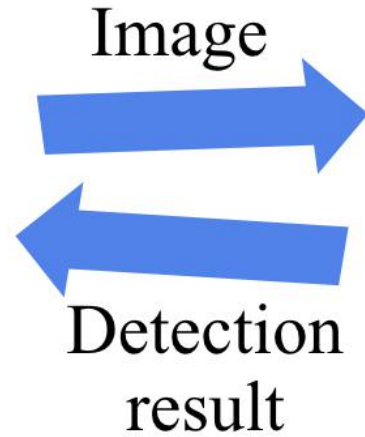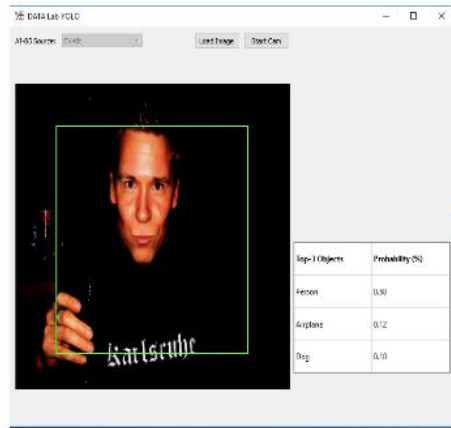| Processing	Memory	Power	Inference time	Energy
Image load and DNN inference	299.52KB	20.08mW	91.9ms	1.845mJ

GoogleNet: 50MB

167 ×

How to use BED for object detection?

Use BED GUI for object detection

Image

Detection result
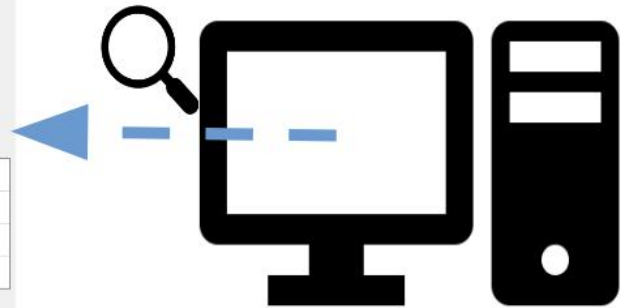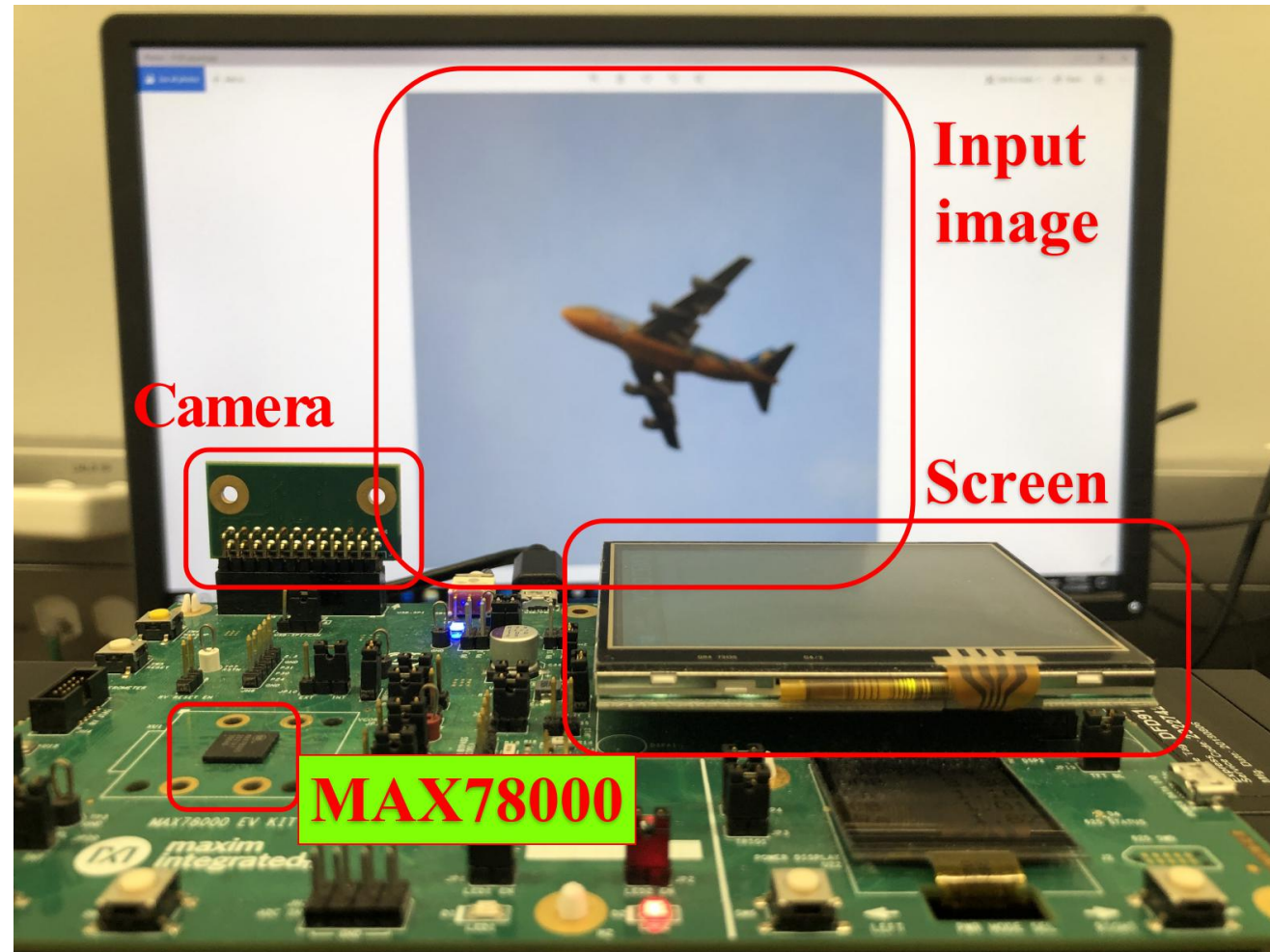
Video

Demonstration of BED for real-time object detection

Pipeline of real-time object detection

Video

Other Resurce

- Github Repo: https://github.com/datamllab/BED_main

- Demo Paper: https://arxiv.org/pdf/2202.07503.pdf

- Youtube:
  https://www.youtube.com/watch?v=0tY31_cECCA&feature=youtu.be

Thank You