MODEL CARD

Automotive Multi-Object Detection

MODEL DETAILS

The model is designed to detect eight object categories: person, bicycle, car, motorcycle, bus, truck, traffic light, and stop sign. In addition to classifying these objects, it generates bounding boxes for localization. The architecture is optimized for efficient performance on embedded systems.

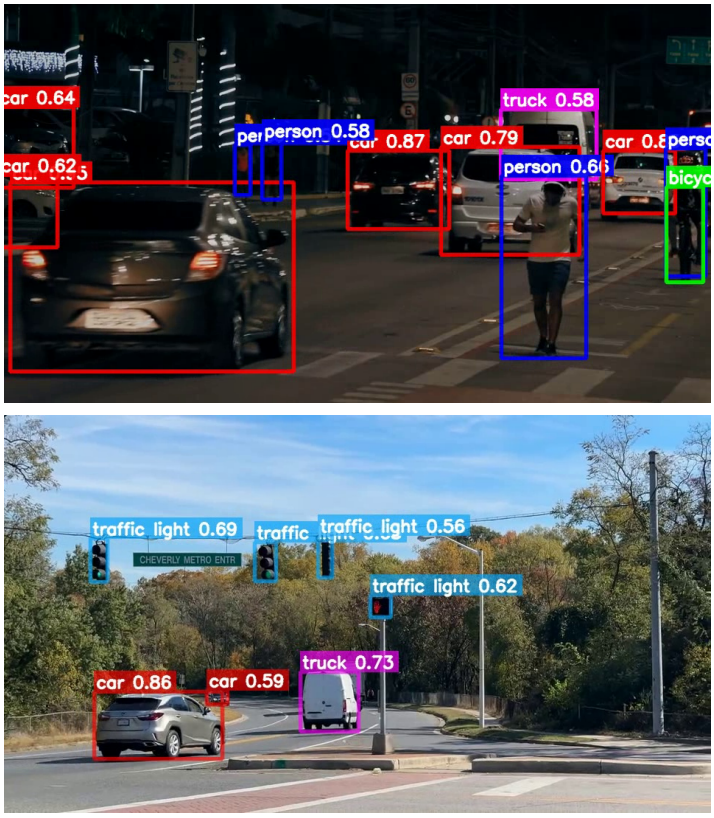

Figure 1: Model output under both nighttime and daytime conditions.

MODEL SPECIFICATIONS

Inputs

- 384×288×3 RGB image

Outputs

- Object bounding boxes
- Predicted classes

Architecture

- The model uses a YOLO-like anchor-free architecture
- There are three detection scales
- Classes and bounding boxes are separated in the outputs

Parameters

- 2,745,776 (2,734,992 trainable, 10,784 non-trainable)

AUTHORS	Lattice Semiconductor	**SOURCE CODE**	Training Source Code
VERSION	amod-cpnx-8.2.0	**TOOLCHAIN**	LATTE
RELEASE	2025-12-18		LSCQuant

PERFORMANCE EVALUATION

Live Evaluation

Evaluations were performed on Lattice CPNX-100 hardware under a controlled, standardized environment to ensure consistency and reproducibility of results. While these conditions shaped the reported metrics, the model architecture is designed for flexibility, supporting potential deployment across a wide range of platforms, including non-FPGA environments. Tests covered the following scenarios:

Software Testing

- **Indoor Testing:** Conducted under controlled conditions to validate detection and classification accuracy across all object classes.
- **Outdoor Testing (Sunny Day):** Verified proper detection and bounding box quality for all classes. Distance performance was assessed for selected objects: car (reliable up to 30 m), traffic lights (reliable up to 10 m), and stop signs (reliable up to 10 m).

Hardware Testing

- **Indoor Testing (Lattice CPNX-100):** Evaluated on multiple automotive videos with the camera facing a screen display. Detection was consistent across eight classes, except for occasional misclassification of trucks.

Offline Evaluation

The KPIs for the evaluation data are reported in Table 1 and Figure 2. The following datasets were used to evaluate the model in the offline evaluations:

- COCO-8px: Objects smaller than 8×8 pixels were excluded from COCO validation dataset (model absolute minimum detectable size).
- COCO-20px: Objects smaller than 20×20 pixels were excluded from COCO validation dataset (model reasonable minimum detectable size).

Table 1: Model performance across datasets.

Dataset	Metric	Value	Notes
COCO-8px	mAP@0.5	0.608	2,290 images and 7,514 bounding boxes
COCO-20px	mAP@0.5	0.708	1,690 images and 3,639 bounding boxes

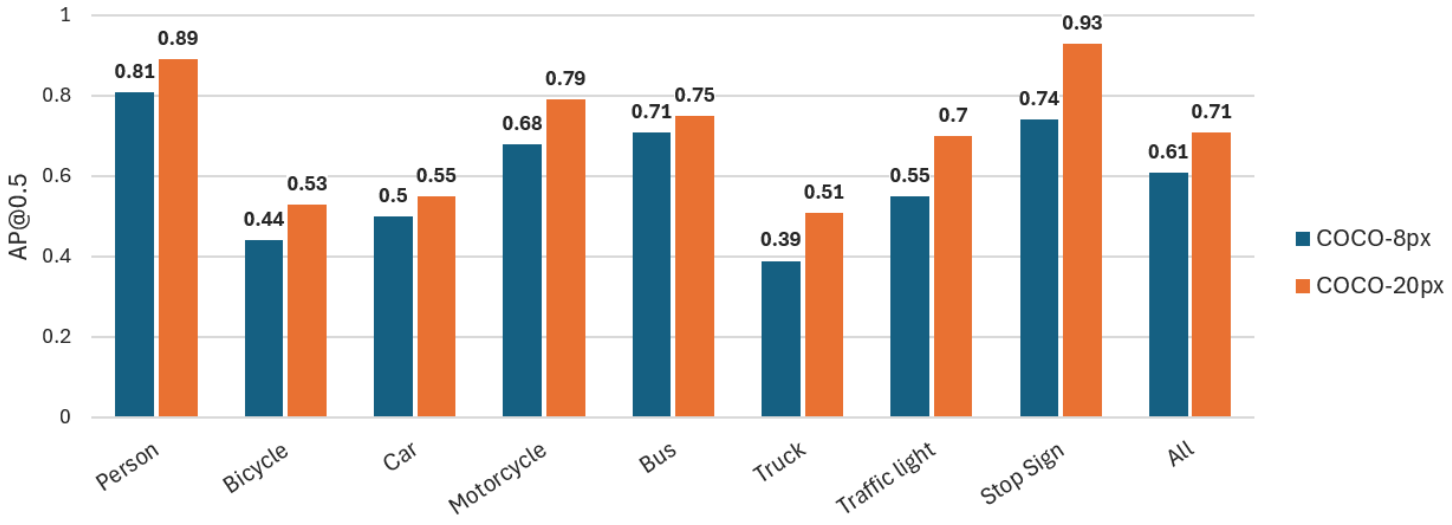

Figure 2: Class-wise mAP@0.5 for COCO-8px versus COCO-20px.