Hand Detection

MODEL DETAILS

This model is designed to detect human hands in images by identifying bounding boxes and assigning confidence scores, optimized for indoor environments and short-range detection
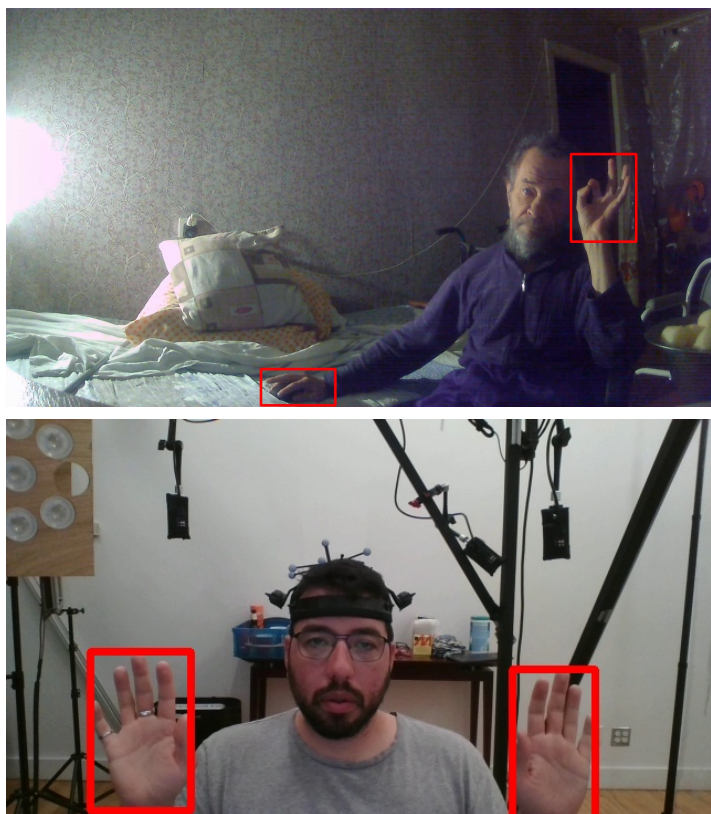

Figure 1: Hand Detection Model Output.

MODEL SPECIFICATIONS

Inputs

- 256×144×1 grayscale image

Outputs

- Hand bounding boxes
- Confidence score

Architecture

- YOLO-like architecture

Parameters

- 302,696 (298,656 trainable, 4,040 non-trainable)

AUTHORS	Lattice Semiconductor	**SOURCE CODE**	Training Source Code
VERSION	hd-nx33-8.2.0	**TOOLCHAIN**	LATTE
RELEASE	2025-12-18		LSCQuant

PERFORMANCE EVALUATION

Live Evaluation

Evaluations were performed on Lattice CLNX-33 FPGA and IMX219 camera, 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.

- **Detection Range:** The model has been evaluated across distances from 40 cm to 2 m, maintaining optimal stability up to 1 m.
- **Illumination:** Performance was tested under lighting conditions ranging from 10 lux to 1000 lux. Noticeable degradation occurs in low-light environments beyond 1 m.

Offline Evaluation

The KPIs for the evaluation data are reported in Table 1. Categorical metadata for quantitative analysis were generated using Gender Classifier, Age Classifier, and Deep Face. Figure 2 illustrates the false negative rate by age, ethnicity and gender categories.

Table 1: Hand Detection Metrics Across Datasets.

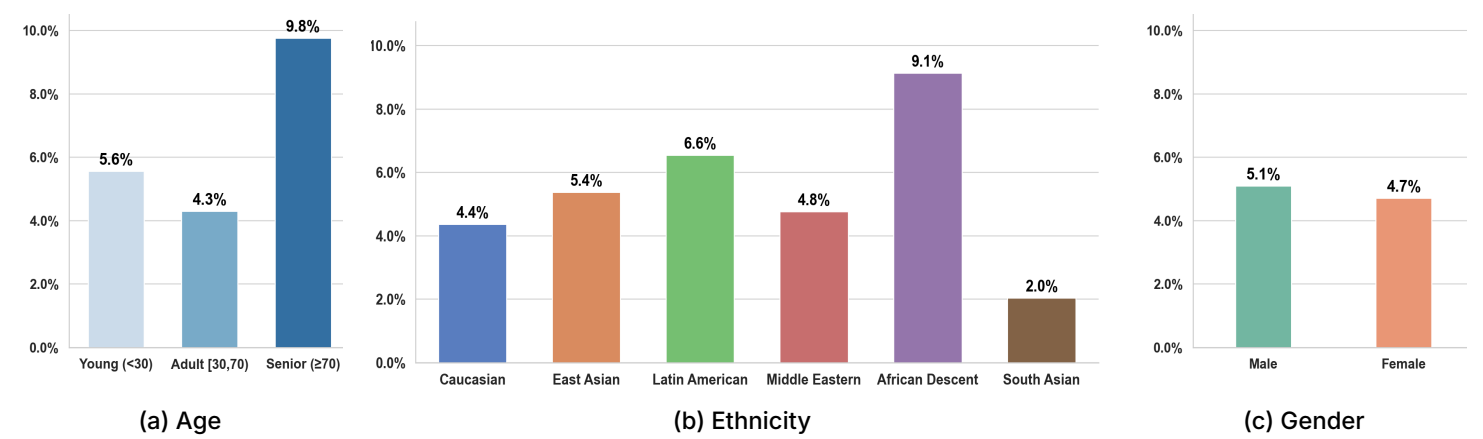| Dataset	Metric	Value	Comments
HaGrid, IPN, Internal	Precision	94%	Threshold = 0.5
	Recall	95%	Threshold = 0.5
	F1 Score	94%	Threshold = 0.5

(a) Age

(b) Ethnicity

(c) Gender

Figure 2: False Negative Rate by age, ethnicity, and gender categories.