Yolov8

Team SentinelX2.0

EcoInnovators Ideathon 2026
AI Powered Rooftop PV Detection

Overview

1.Purpose of the Model

Our model is built to automatically detect solar panels on building rooftops using satellite and aerial imagery. The purpose is to provide a fast, reliable, and scalable way to measure how communities are adopting renewable energy. Instead of relying on manual surveys, the model delivers accurate insights in seconds.

2.Intend Use

Urban Planning

- Planners understand renewable energy distribution, design and smarter infrastructure.

Renewable Energy Assesment

- Allowing goverenment,NGOs, and researchers to track solar adoption rates and progress towards sustainability goals.

Community Insights

- Highlighting neighborhoods with high solar potential, guiding investment and awareness campaigns

3.Not Intend Use

Surveillance of private property

- It should not be used to monitor individual households or invade personal privacy

Commercial exploitation of personal data

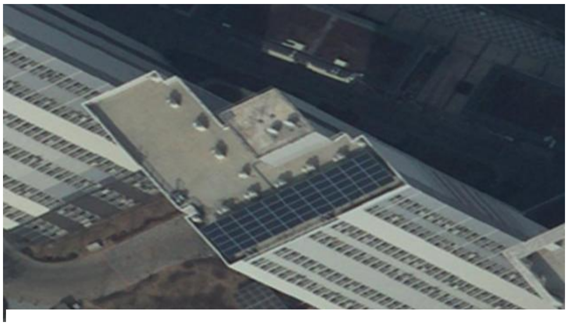
- It is not designed to target or profile residents

Unrelated applications

- The focus is strictly on solar adoption, not other non-renewable contexts

Data

1. Source of Training Data



2. Preprocessing Step

Image Resizing	Orientation Correction	Dataset Organization
• All images were resized to 640*640 resolution to match YOLOv8 input requirements	• Images that were flipped or rotated were corrected to maintain consistent orientation	• After preprocessing all images and label files were uploaded to Google drive, and the YOLOv8 training pipeline accessed them directly from there.

3. Limitations

Rooftop images varied in brightness, angle, and clarity, which may reduce precision in tricky cases.

Some datasets had inconsistent labeling quality, especially where solar panels were small or partially occuluded

The dataset was merged manually, so class balancing or duplicate handling may not be perfect

Model Details

1.Architecture

For our prototype, we selected YOLOv8(Nano)-
The smallest and fastest YOLOv8 model

- Very fast training and inference
- Good accuracy for satellite imagery works
  Well on Google Collab's GPU

2. Training Setup

	Setting	Value
Model	Yolov8n	120+70
Epochs	120(640)	(640*640)
Batch Size	16	16
Optimizer	Yolov8 Default	SGD
Hardware	Google collab free T4 GPU	SGD
Time	1.8hr	

3. Dataset Spit

Train : 70%

Validation : 20%

Test : 10%

4. Assumptions

Clear, unobstructed

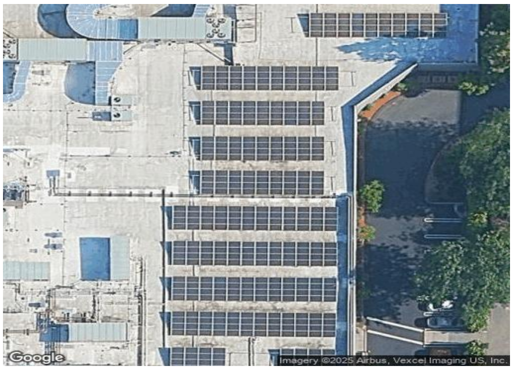
Overlap & Bounding Box Check

Solar Status Decision

Representative dataset

Results & Visuals

Input

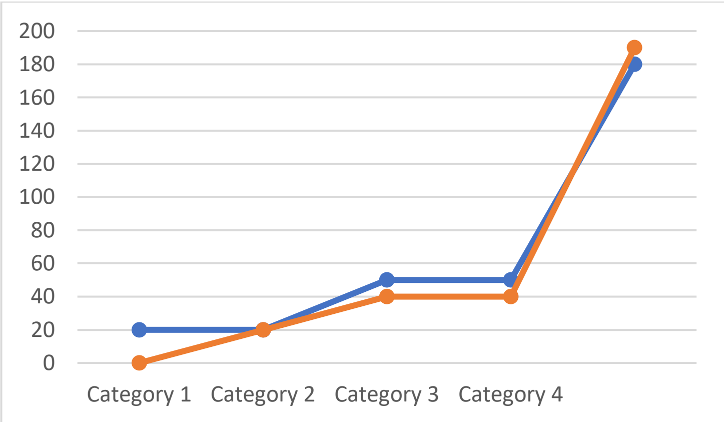


Output

Performance Metrices Table

Metric	Value
Precision	0.914
Recall	0.847
mAP@0.5	0.83
mAP@0.5:0.95	0.68

QC Logic & Buffer Radius



- Above 0.5 confidence threshold are counted, below is ignored
- Detection corresponds to rooftop regions only, removes noise overlapping outside the main boundary
- If at least one high confidence solar panel is detected ->> “VERIFIABLE” Otherwise ->> “NOT VERIFIABLE”

A buffer radius of 10 meters ensures that solar panels positioned near rooftop edges are still detected, Compensating for minor coordinate inaccuracies in satellite Imagery.

Retraining Instructions

When: Every 3-6 months or when mAP drops below 80%
Why: To prevent Data Drift and correct specific failure modes (e.g., shaded roofs)
How: Collect new data and perform Fine-Tuning using the previous model’s weights.