Model Card: Rooftop Solar Panel Detection (YOLOv8)

Model Overview
This model detects rooftop-mounted photovoltaic (PV) solar panels from high-resolution satellite imagery. It was developed for the EcoInnovators Ideathon (2026) as an offline AI pipeline for solar adoption assessment.

Model Architecture
YOLOv8 Object Detection Model (Ultralytics). Trained using transfer learning with a custom-aggregated dataset.

Datasets Used & Licensing
1. **solar-panels-detection-master**
Source: GitHub (Dong Bao)
License: MIT License
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2. **PVP Dataset (PVNet)**
Wang et al., 2023 — International Journal of Applied Earth Observation and Geoinformation
DOI: https://doi.org/10.1016/j.jag.2023.103309
Usage: Academic & research purposes

3. **LSGI547 Dataset**
Source: Roboflow Universe
License: Creative Commons Attribution 4.0 (CC BY 4.0)

4. **Custom Workflow Object Detection Dataset**
Source: Roboflow Universe
License: CC BY 4.0

5. **Solar Panels v1 (YOLOv8)**
Source: Roboflow Universe
License: CC BY 4.0

6. **roofData Dataset**
Source: Roboflow / Open Satellite Annotations
License: CC BY 4.0

Assumptions
• Rooftop solar panels are visible from overhead imagery
• Imagery resolution ≥ 30 cm/pixel
• Panels follow common rectangular layouts

Known Limitations & Bias
• Reduced accuracy under heavy shadows or dense clutter
• Limited performance on extremely small or damaged panels
• Dataset bias toward urban and semi-urban rooftops

Failure Modes
• Missed detections on highly reflective rooftops
• False positives on skylights or rooftop structures

Evaluation & Validation
Validation performed using real-world latitude/longitude inputs and Google Static Maps imagery. Outputs include bounding-box overlays and structured JSON predictions.

Intended Use

Research, academic evaluation, and non-commercial demonstration only.

Retraining Guidance
• Add region-specific datasets
• Increase small-object annotations
• Fine-tune confidence thresholds and augmentation strategies

Ethical & Legal Notice
This model does not include private data and respects original dataset licenses.