MODEL CARD
EcoInnovators — Rooftop PV Detection Models
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1. Model Overview

This project uses a three-model architecture:
- Model A — Rooftop segmentation (roof_seg): binary semantic segmentation that outputs roof masks.
- Model B — Solar detector (solar_det): detection+segmentation model producing candidate panels (masks, boxes, confidences).
- Model C — Look-alike classifier (lookalike_clf): small CNN to classify candidate crops as SOLAR vs NOT-SOLAR.

During inference, Model A provides roof polygons to constrain/search area for Model B; Model B proposes candidates; Model C filters false positives.

2. Training Data Sources

- Public datasets (Roboflow aggregated PV datasets — list dataset names & versions)
- Team-curated rooftop images (annotated)
- Synthetic augmentation: rendered panel overlays with shadows/tilt/occlusion
- Negative sample sources: metal roofs, water tanks, skylights (collected from region-specific repositories)

(Include dataset names, counts, and license info.)

3. Intended Use

Primary: Automated detection and area estimation of rooftop photovoltaic installations for government programs and subsidy verification.
Not intended for: individual household risk assessment, law enforcement, or uses requiring sub-meter legal precision without further validation.

4. Limitations

- Accuracy depends on imagery resolution and recency. Degraded when capture_date is old (> 2 years).
- Failure modes for heavily occluded roofs (dense trees), very low-res imagery, or strong shading.
- Model trained on datasets that may underrepresent certain roof types and regions.

5. Known Failure Cases

- Corrugated metal roofs mis-detected as panels.
- Small clustered panels below detection threshold — underestimation of pv_area.
- Heavy cloud/shadow leading to NOT_VERIFIABLE QC.

6. Bias & Mitigation

Potential biases:
- Urban / high-income housing may be over-represented.

Mitigations:
- Synthetic augmentation, targeted data collection in underrepresented regions, and periodic retraining.

7. Evaluation Metrics

Primary metrics:
- F1-score on has_solar (binary)
- RMSE on PV area (sqm)
- Per-region performance breakdown (urban/rural)
- Confusion matrix and PR curve

8. Recommendations for Retraining

- Add regionally diverse labeled data (target 20% samples from underrepresented states).
- Retrain every 6–12 months or after major provider/imagery changes.
- Collect field-verified ground-truth for continued validation.

Appendix: attach data provenance, model checkpoints, hyperparameters, and training configs.