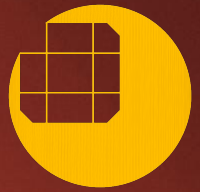

HyperionSolarNet

Solar Panel Detection from Aerial Images

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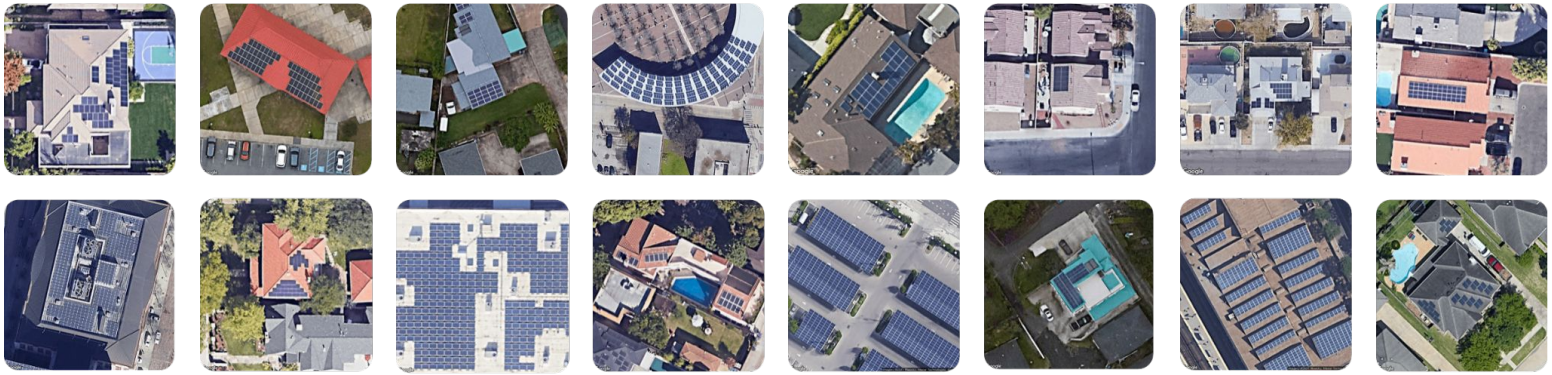
Alberto Todeschini, Hossein Vahabi

University of California, Berkeley

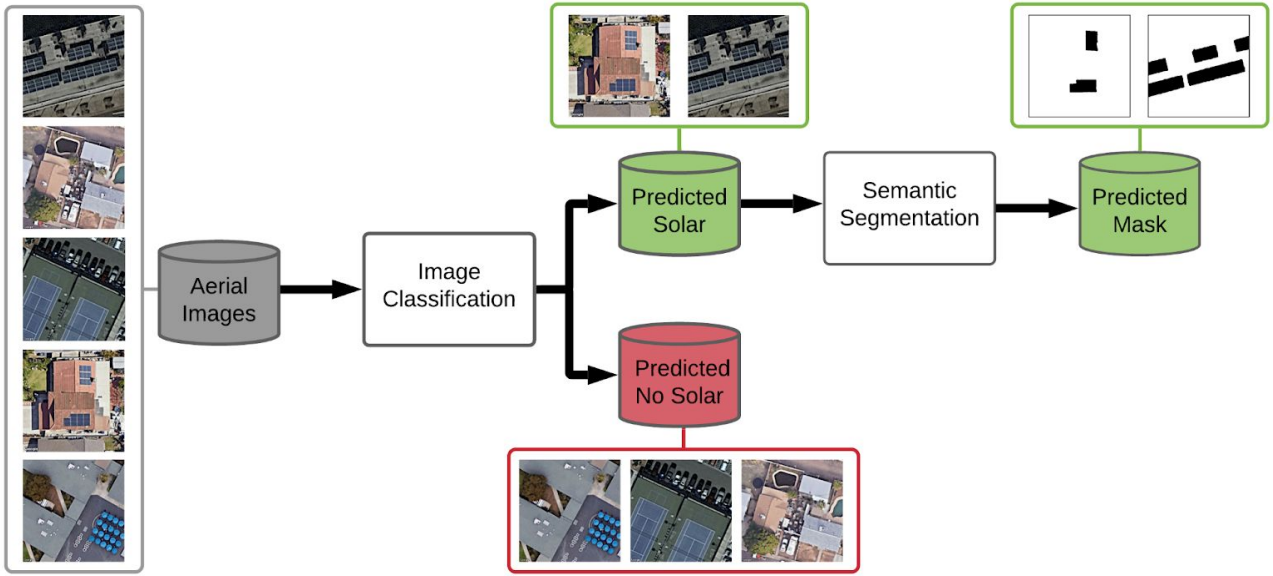
Motivation

- Fight climate change by expanding solar energy
- HyperionSolarNet uses deep learning methods and satellite imagery to identify solar panel locations and estimate their total surface area
- Target users include solar panel companies, market analysts, policy makers, and environmental agencies



HyperionSolarNet

- Start with input data of satellite images from Google Maps
- Binary image classification model separating into solar and no-solar classes
- Segmentation model performs the task of classifying each pixel to its specific class
- Predicted masks are further processed to determine the area and number of solar panels



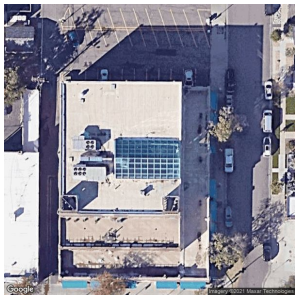
Data

- Images from Arizona, California, Colorado, Florida, Hawaii, Idaho, Louisiana, Massachusetts, Nevada, New Jersey, New York, Oregon, Texas, Washington
- Zoom 20 and 21
- Sizes 416x416 and 600x600
- Residential and Commercial
- For no-solar images, focus on objects that could be misclassified as solar panels, for example:

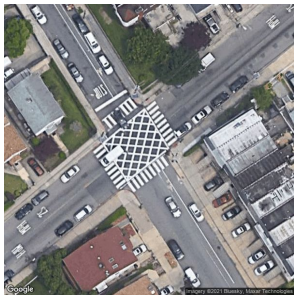
Classification Dataset			
	Solar	No-Solar	Total
Training	668	1295	1963
Validation	168	324	492
Berkeley Testset	321	1922	2243

Segmentation Dataset	
Training	668
Validation	168
Berkeley Testset	321

Skylights



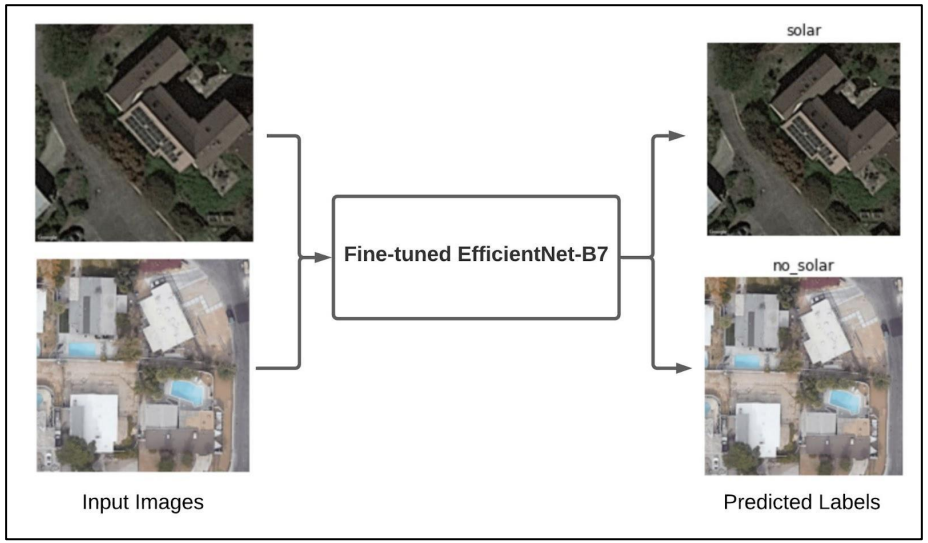
Crosswalks



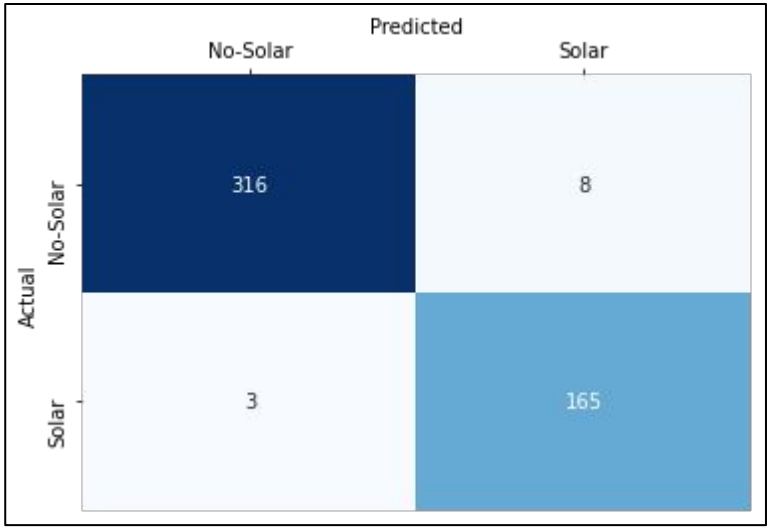
Side of tall buildings

Classification Model

- Transfer Learning
- Fine-tuned EfficientNet-B7 for solar panel images

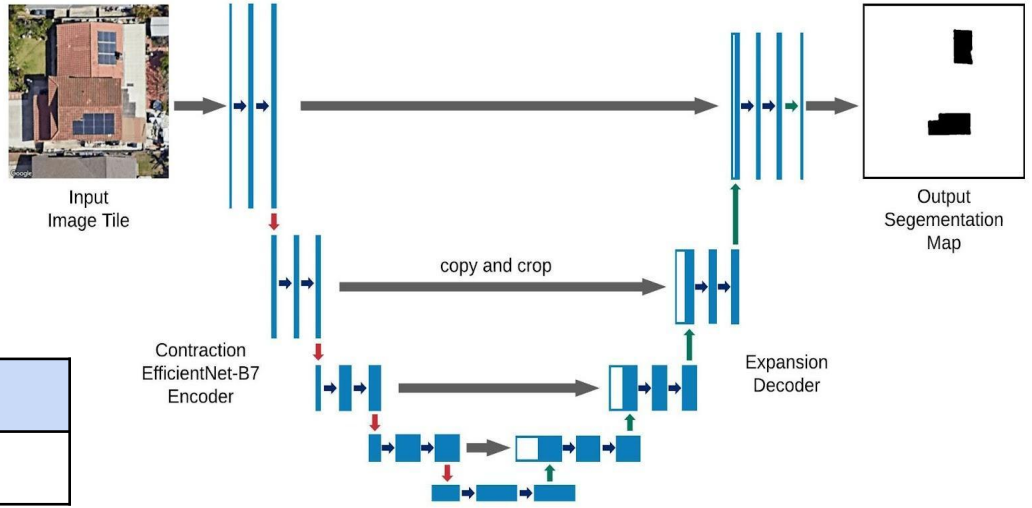


Model	Accuracy	Precision	Recall	F1 Score
Classification	0.98	0.95	0.98	0.97



Semantic Segmentation Model

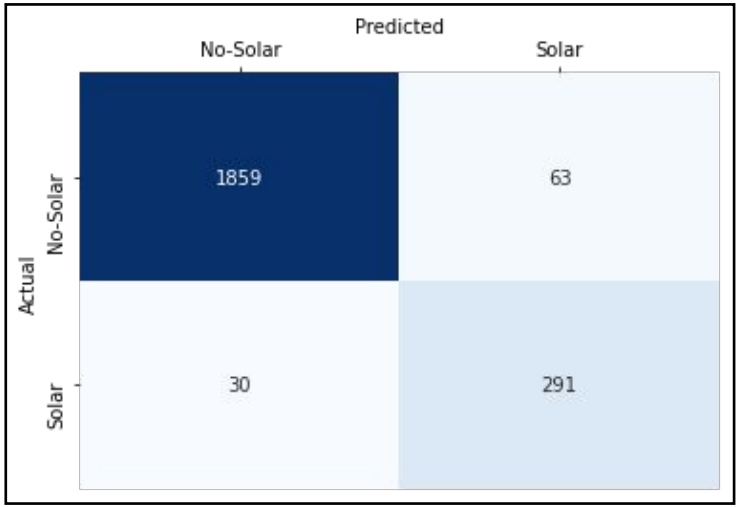
- U-Net is one of the most popular deep learning based semantic segmentation method
- U-Net architecture with EfficientNet-B7 backbone
- Images augmentation using Albumentations library
- Model training using Segmentation Models library



Model	IoU Score	F1 Score
Semantic Segmentation	0.86	0.92

Berkeley Testset

Classification	Precision	Recall	F1	Support
no_solar	0.98	0.97	0.98	1922
solar	0.82	0.91	0.86	321



Segmentation	IoU	F1
Berkeley Testset Evaluation	0.82	0.89

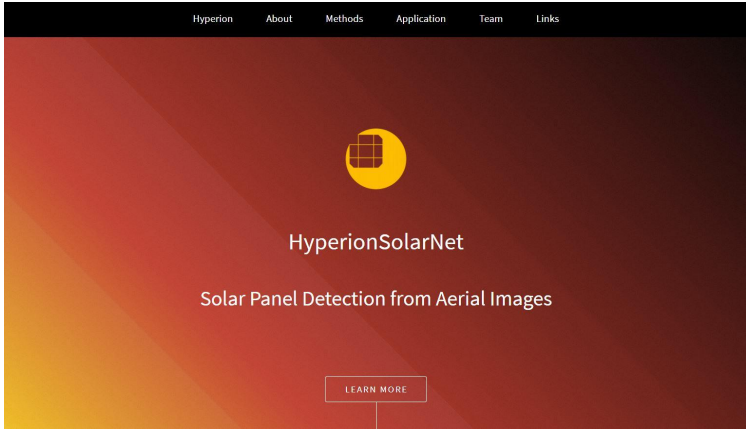
Area and Number of Solar Panels	Area (sq. ft.)	Number of Solar Panels
Actual	101,765.48	5,787
Predicted	102,609.72	5,828

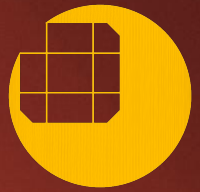
Conclusion

- HyperionSolarNet leverages deep learning methods to identify solar panel locations and sizes
- The use of our two-branch model results in improved performance while using a relatively small training dataset
- For additional information, please see:

WEBSITE

https://groups.ischool.berkeley.edu/HyperionSolarNet





Thank you!

Acknowledgements

- Colorado Reed
- Professor Paolo D’Odorico, Chair of the Department of Environmental Science at UC Berkeley
- UC Berkeley Master of Information and Data Science Program