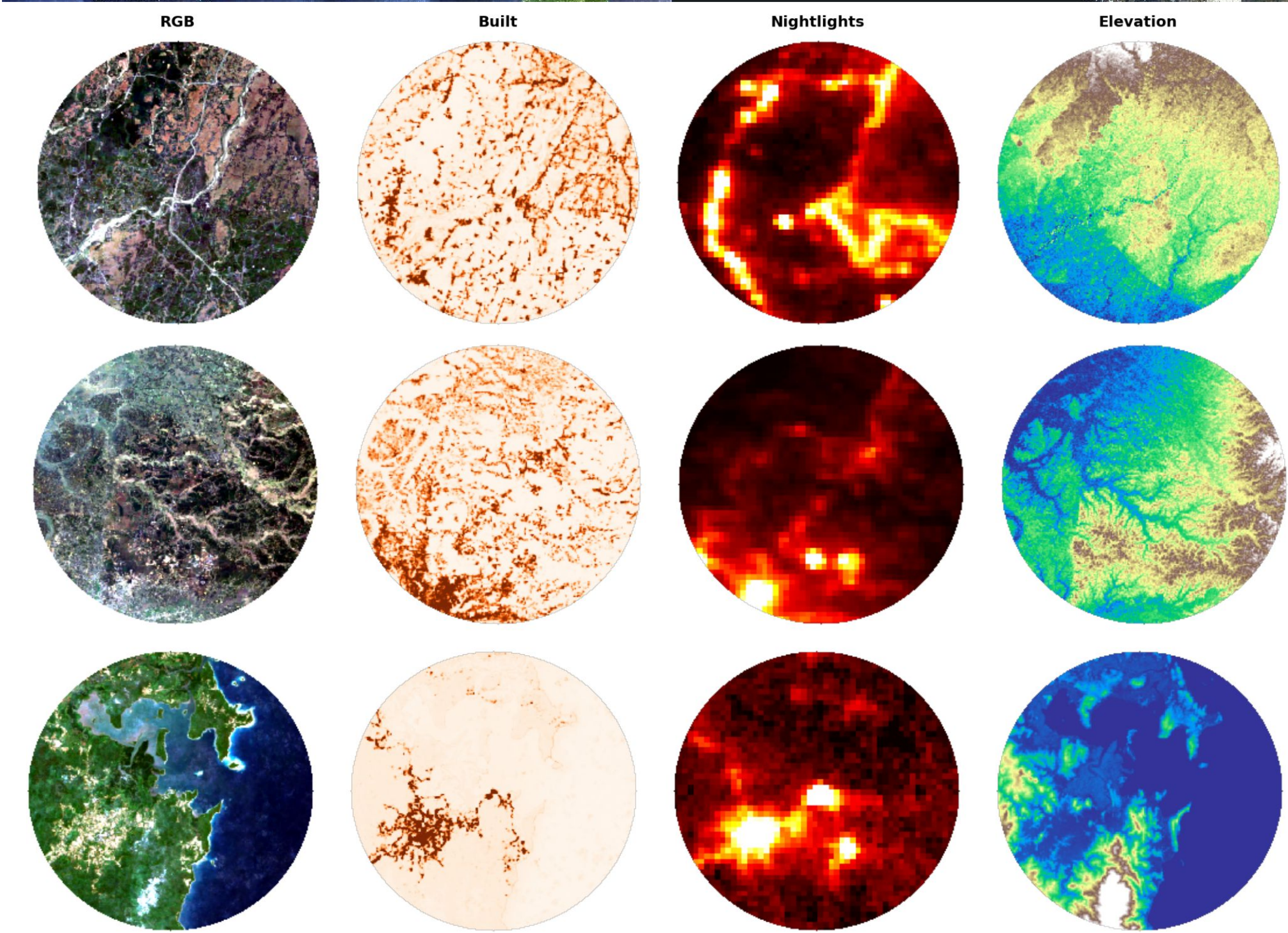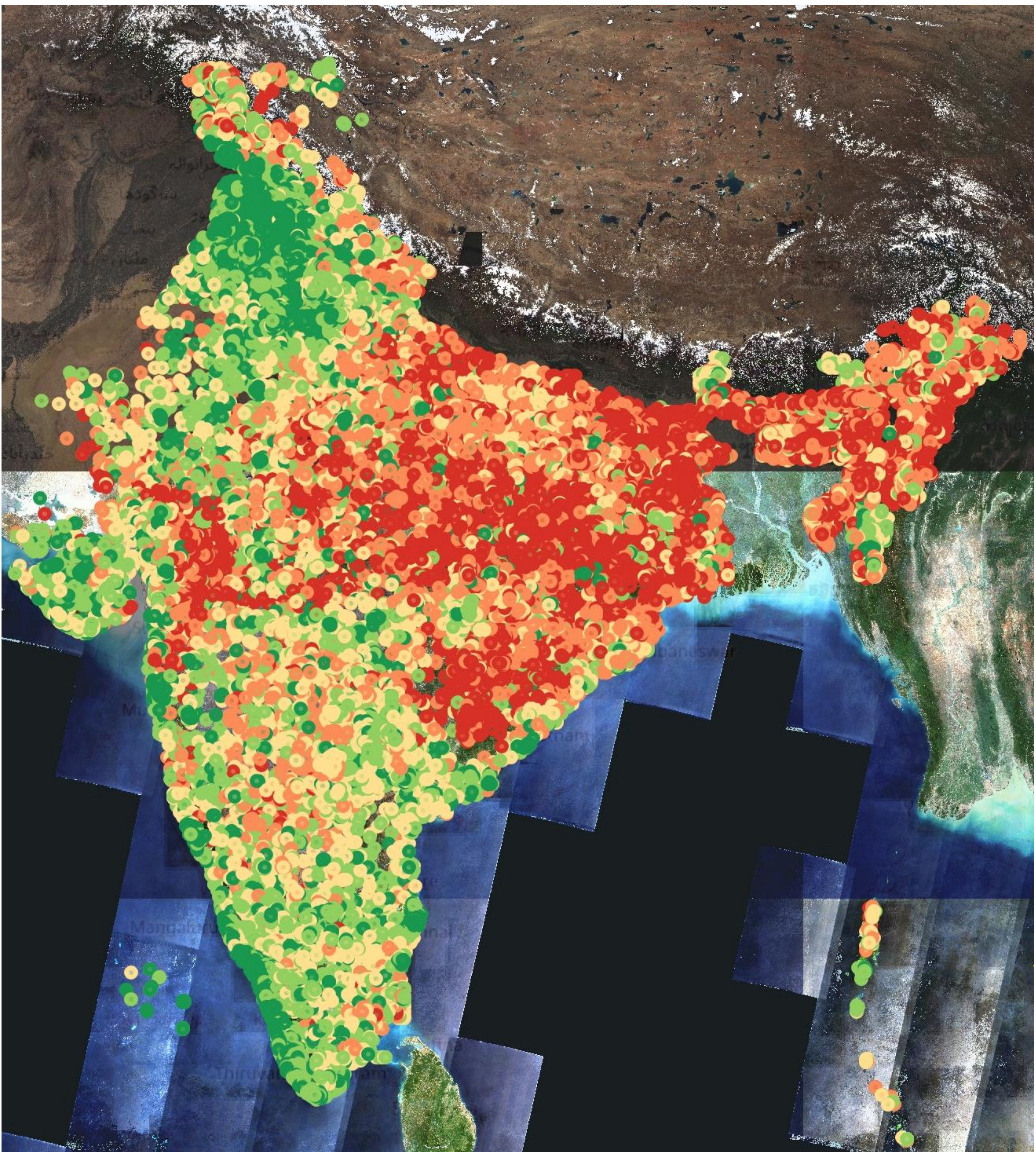# Learning from Nightlights: Predicting Poverty via Satellite Transfer Learning
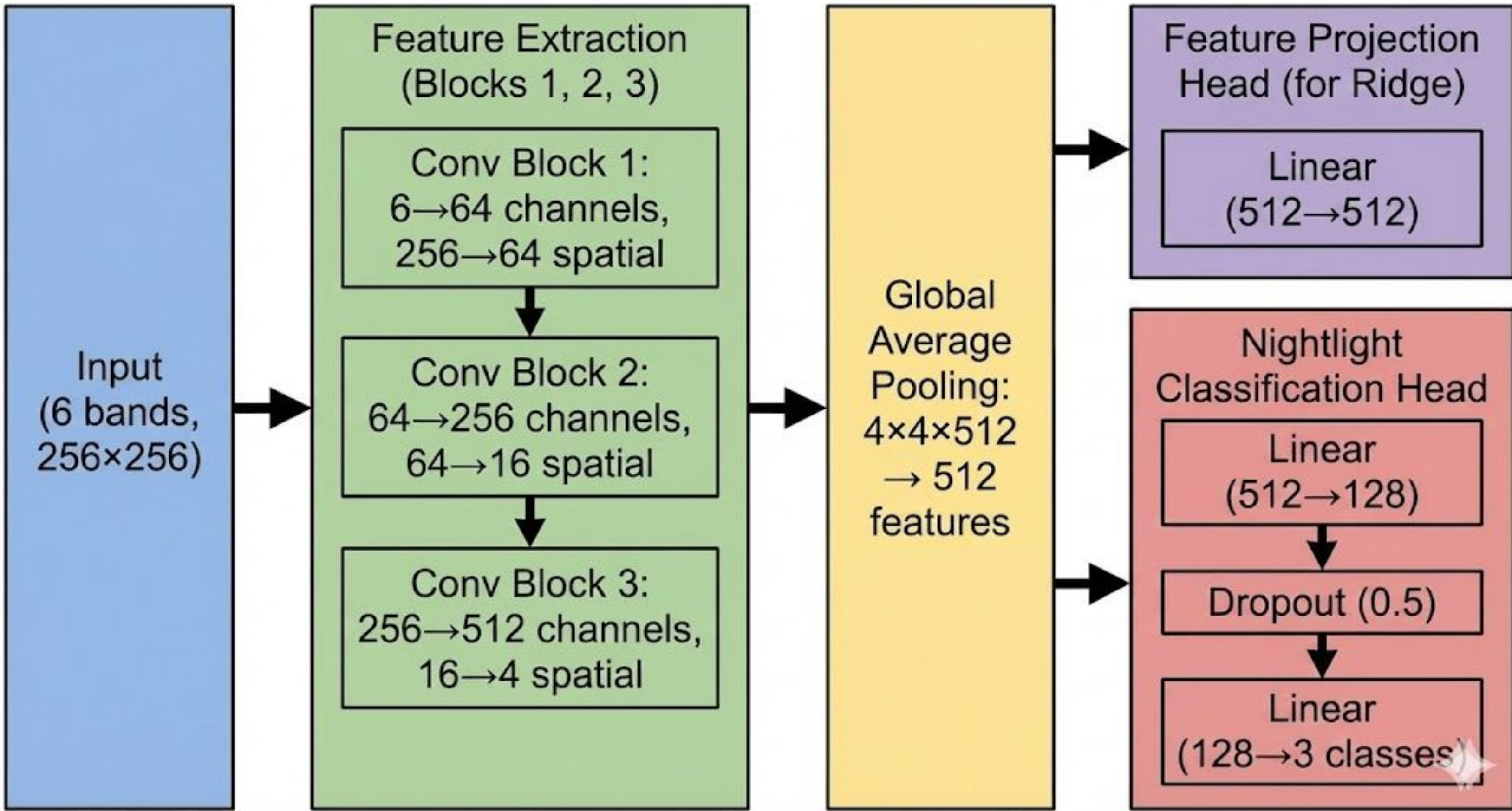
Replication and Adaptation of Jean et al. (2016) for COMP0173: AI for Sustainable Development

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Replication of Jean et al. (2016) for India using 6-band satellite imagery. CNN trained on nightlight classification, then used as feature extractor for wealth prediction via Ridge regression.

LightCNN256

Input	3 bands (RGB)	6 bands	Richer multi-spectral data from GEE
Model	VGG-F (ImageNet)	LightCNN256	7-band input prevents ImageNet transfer
Data	500k random images	29k DHS clusters	DHS-only approach is more targeted
Context	5 African countries	India only	Country - specific validation

Top-left: 30,052 DHS clusters colored by wealth (red=poor, green=rich).
Top-right: VIIRS nightlights showing economic activity patterns.
Center: LightCNN256 architecture trained on nightlight classification, then used for wealth prediction via Ridge regression. The **bottom-left** shows sample clusters from each wealth quintile across multiple spectral bands (RGB, built area, nightlights, elevation), revealing visible differences between poor and wealthy regions (Poor to Rich). Finally, the **results table** confirms our model achieves R²=0.48, within 5% of Jean et al., while improving 30.7x over simple nightlight regression. The different SDGs that project addresses are highlighted in the **bottom right corner.**
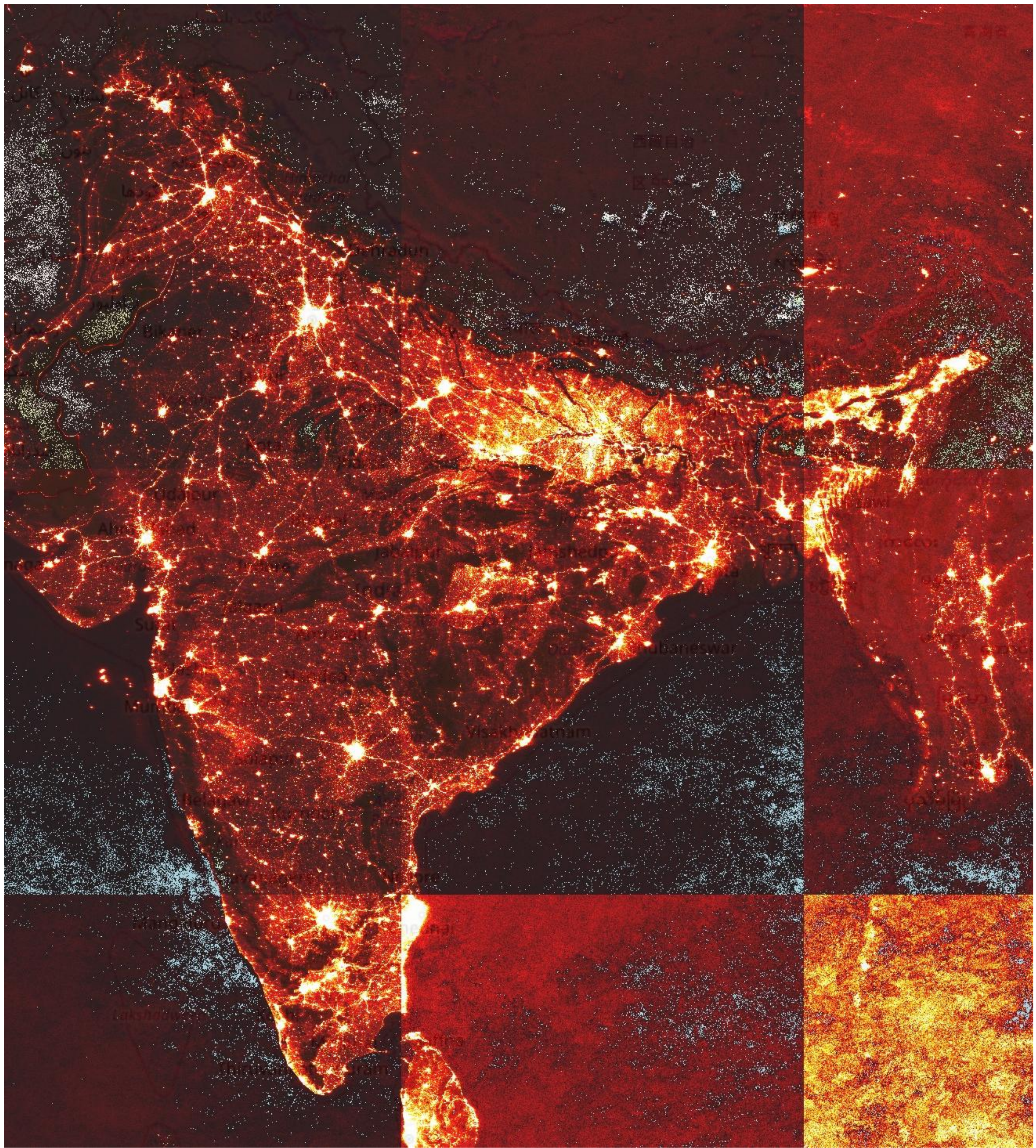
Metric	Jean et al.	Ours
Nightlight Classification Accuracy	~75%	90.7%
Wealth R²	0.50-0.55	0.48
Nightlight-only Baseline R²	~0.04	0.016
Improvement over Baseline	12x	30.7x

1 NO POVERTY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES