Using Computer Vision Techniques to Identify and Assess the Quality of Green and Blue Spaces from Satellite Imagery

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Green and Blue spaces

- **Green** and **Blue** spaces are known to provide numerous health benefits: reducing premature mortality; improving mental health; lowering cardiovascular disease risk

- We are interested in identifying **high-quality, publicly accessible green and blue spaces**: parks, rivers, beaches etc.

Problems with existing methods

- Normalized Difference Vegetation Index (**NDVI**): only indicates greenness, **no indication of land usage or quality**, e.g., hard to distinguish farm-land from parks using NDVI alone; lower resolution
- Existing scene classification: inaccurate & very noisy

Our Idea

- **Machine learning** + **open GIS data** to learn semantics of land usage from satellite/aerial imagery, to identify high-quality green and blue spaces, relevant to health outcomes
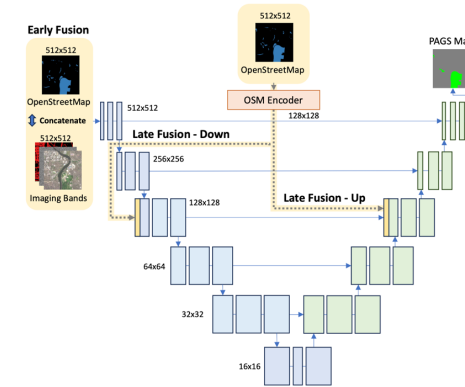
Proposed new NI-LMPS dataset

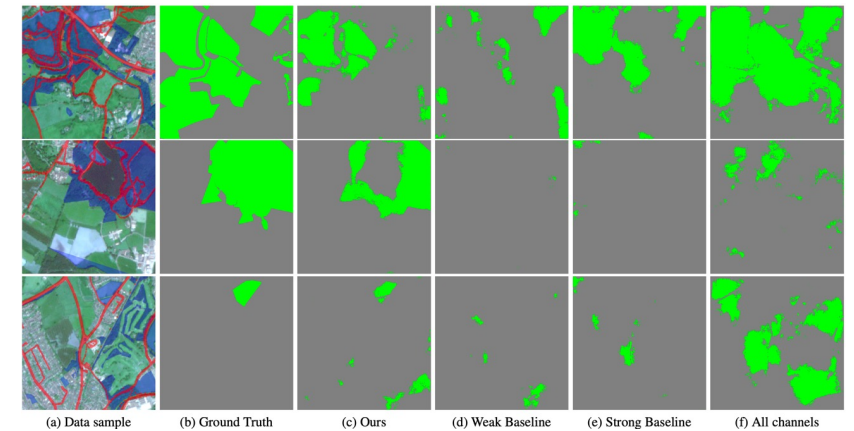## Proposed automated and generalized machine learning pipeline

NI-LMPS Dataset
Greenness & Accessibility

Semantic Segmentation of **Publicly Accessible Green Spaces**

Publicly Accessible Green Spaces Map
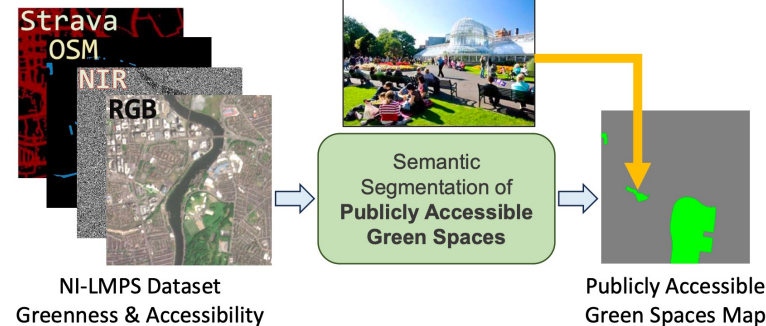
Proposed neural network model

Imaging and semantic channel selection

								Pixel Accuracy			
R	G	B	NIR	NDVI	OSM	Strava	F1	Jaccard	FG	All
Baselines											
✓	✓	✓					0.114	0.060	7.28	94.49
✓	✓	✓		✓			0.189	0.104	13.60	94.24
Imaging channels only											
✓	✓	✓		✓			0.001	0.001	0.07	94.45
✓	✓	✓	✓	✓			0.129	0.069	11.83	92.45
				✓			0.192	0.106	44.10	80.76
Imaging & semantic channels											
✓						✓	0.009	0.004	0.99	94.11
✓					✓	✓	0.157	0.085	13.54	93.02
✓					✓	✓	0.171	0.093	12.15	94.43
✓	✓	✓	✓		✓	✓	0.240	0.136	39.13	87.42
✓	✓	✓			✓		0.281	0.163	22.43	94.14
✓	✓	✓				✓	0.327	0.196	26.66	94.06
✓				✓		✓	0.342	0.206	35.36	93.04
✓	✓	✓				✓	0.354	0.215	25.90	95.21
✓	✓	✓			✓		0.365	0.223	49.57	91.06
						✓	**0.438**	**0.281**	42.03	94.60

Qualitative results

(a) Data sample (b) Ground Truth (c) Ours (d) Weak Baseline (e) Strong Baseline (f) All channels