MACHINE LEARNING FOR GLOBAL SCALE CLASSIFICATION OF REMOTELY SENSED IMAGERY

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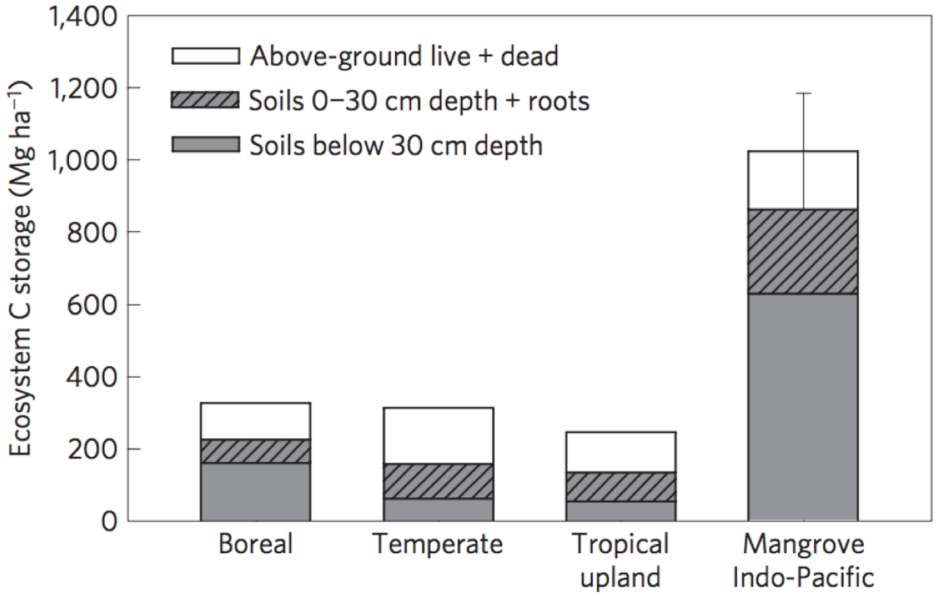
MAPPING GLOBAL MANGROVE FOREST EXTENT

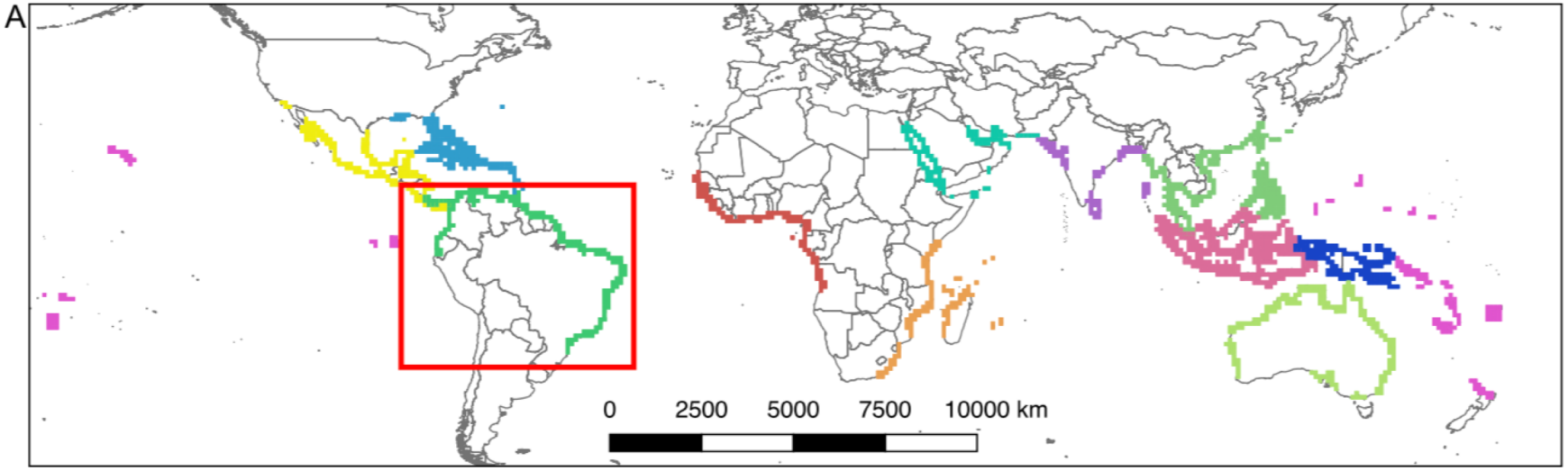
- Tropical coastal wetland forest
- Provide important ecosystem services
  - Materials (timber)
  - Biodiversity
  - Carbon
- Lost up to 30% over the last century
- Human impact
- Global maps required
  - Outdated baselines

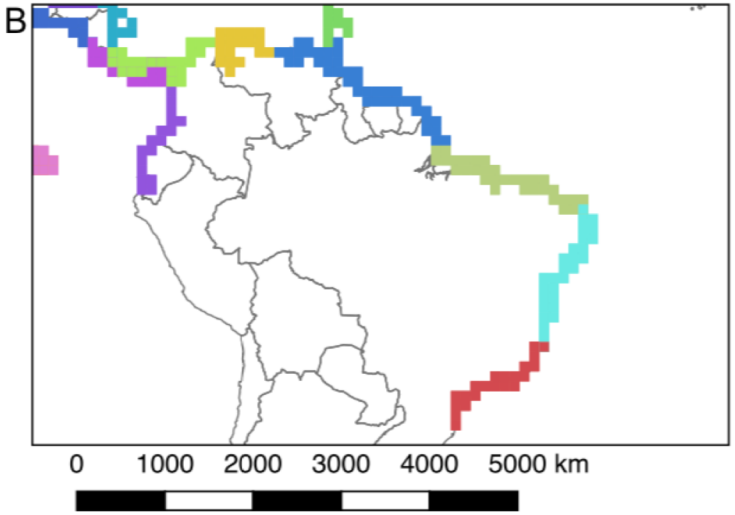


DATASETS AND SOFTWARE

- Radar
  - ALOS PALSAR (HH and HV) satellite imagery
  - 1500 ALOS PALSAR images
  - 21 million pixels per band
- Optical
  - Landsat 5 (TM)/Landsat 7 (ETM) satellite imagery
  - 15,346 Landsat images (1800 scenes)
  - 55 million pixels per band
- Python
  - SK-Learn
  - Remote Sensing and GIS Library (rsgislib.org)
- HPC
  - 100 cores

128 PROJECTS





METHOD

Coastal Mask → Mangrove 'Habitat' → Generate Training → Mangrove Baseline (A) → Mangrove Baseline (B) → Validation

Training

- 100,000 random samples per region
- 12.8 million training samples total

Mangrove Baseline A

- Extremely randomized trees classifier (sklearn)
- 100 trees (grid search sensitivity analysis)
- Radar HH, HV & HH/HV ratio
- Pixel latitude and longitude
- Mangrove Probability

Mangrove Baseline B

- Extremely randomized trees classifier (sklearn)
- Landsat bands
  - Blue, Green, RED, NIR, SWIR1, SWIR2

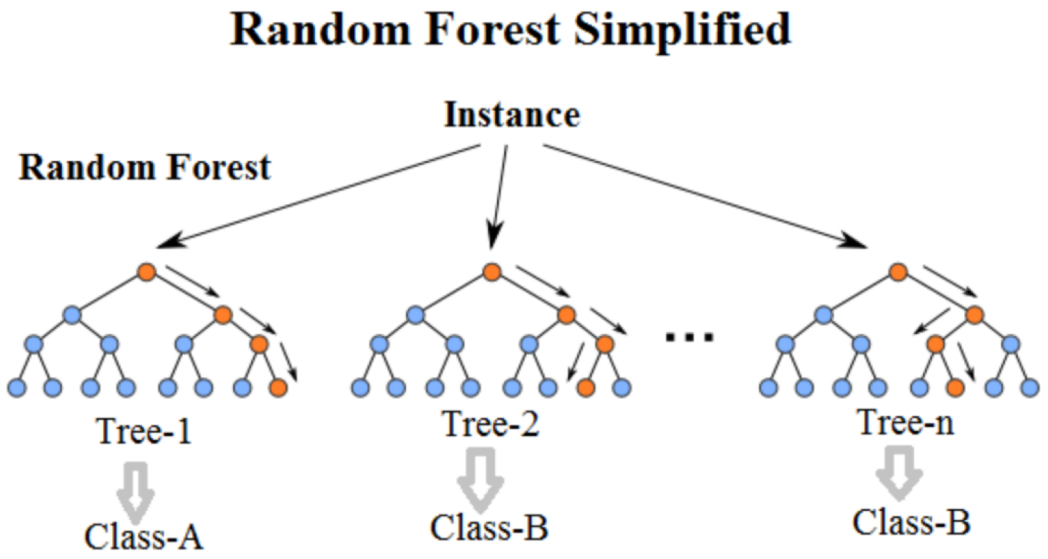


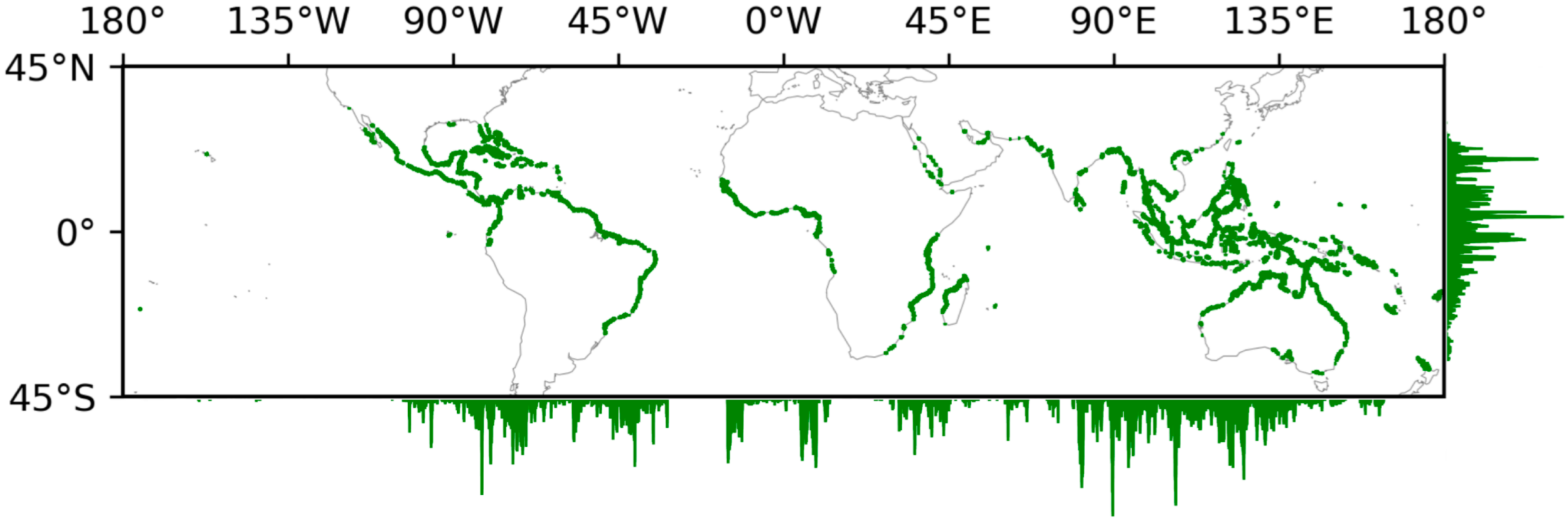
Image:Sefiks.com

A New Mangrove baseline

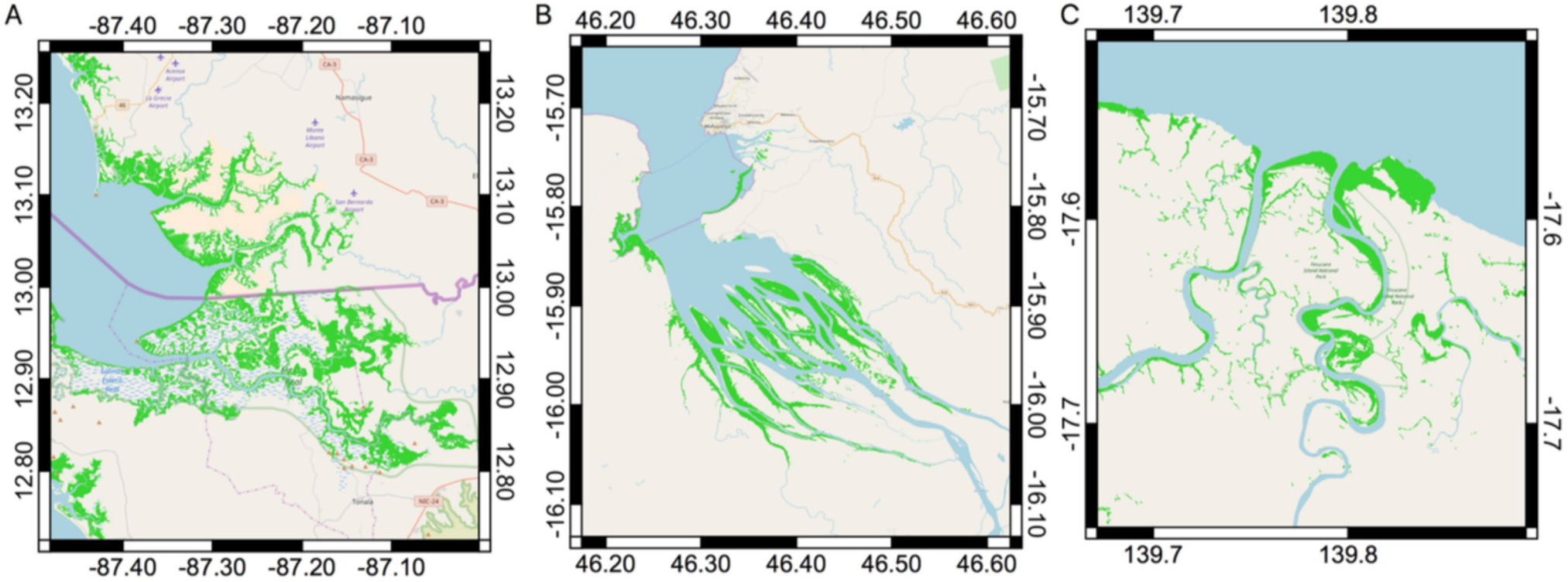
137,600 km²

(2.26E+08 mangrove pixels)

Accuracy: 95.0-95.5 % (55,878 points)



Bunting et al. 2018. The Global Mangrove Watch - A New 2010 Global Baseline of Mangrove Extent, *Remote Sensing*



Region	GMW v2.0 (km^2)	Global %
Africa	27,465	20.0
Asia	55,278	38.7
Europe	1,026	0.7
South America/Caribbean	27,939	20.3
North America	11,563	8.4
Oceania	16,329	11.9
Total	137,600	

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- SuperComputing Wales