NEURAL INFORMATION PROCESSING SYSTEMS

Climate Change AI

Scene-to-Patch Earth Observation: *Multiple Instance Learning for Land Cover Classification*

Joseph Early*, Ying-Jung Deweese†, Christine Evers*, Sarvapali Ramchurn*

* University of Southampton, *UK*
† Georgia Institute of Technology, *USA*

J.A.Early@soton.ac.uk
@JosephAEarly

Tackling Climate Change with Machine Learning
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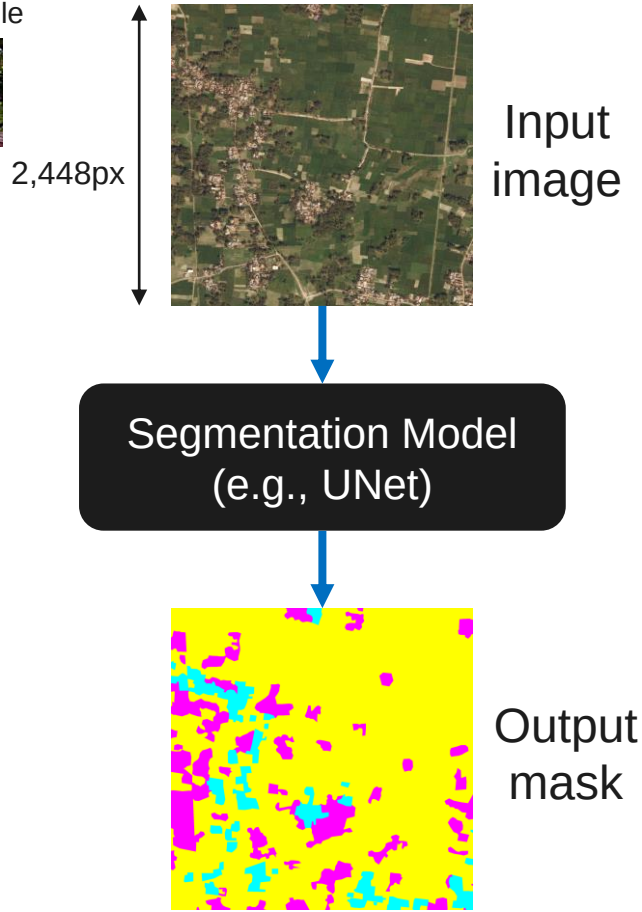
Land Cover Classification (LCC)

- Land cover change is a **major contributor to the rise of atmospheric carbon dioxide.**
- It's estimated that a **reduction of a third** of emissions could come from **better land management.**
- Machine learning for LCC aims to **classify/segment satellite imagery** into different land use cases.

Existing Approaches

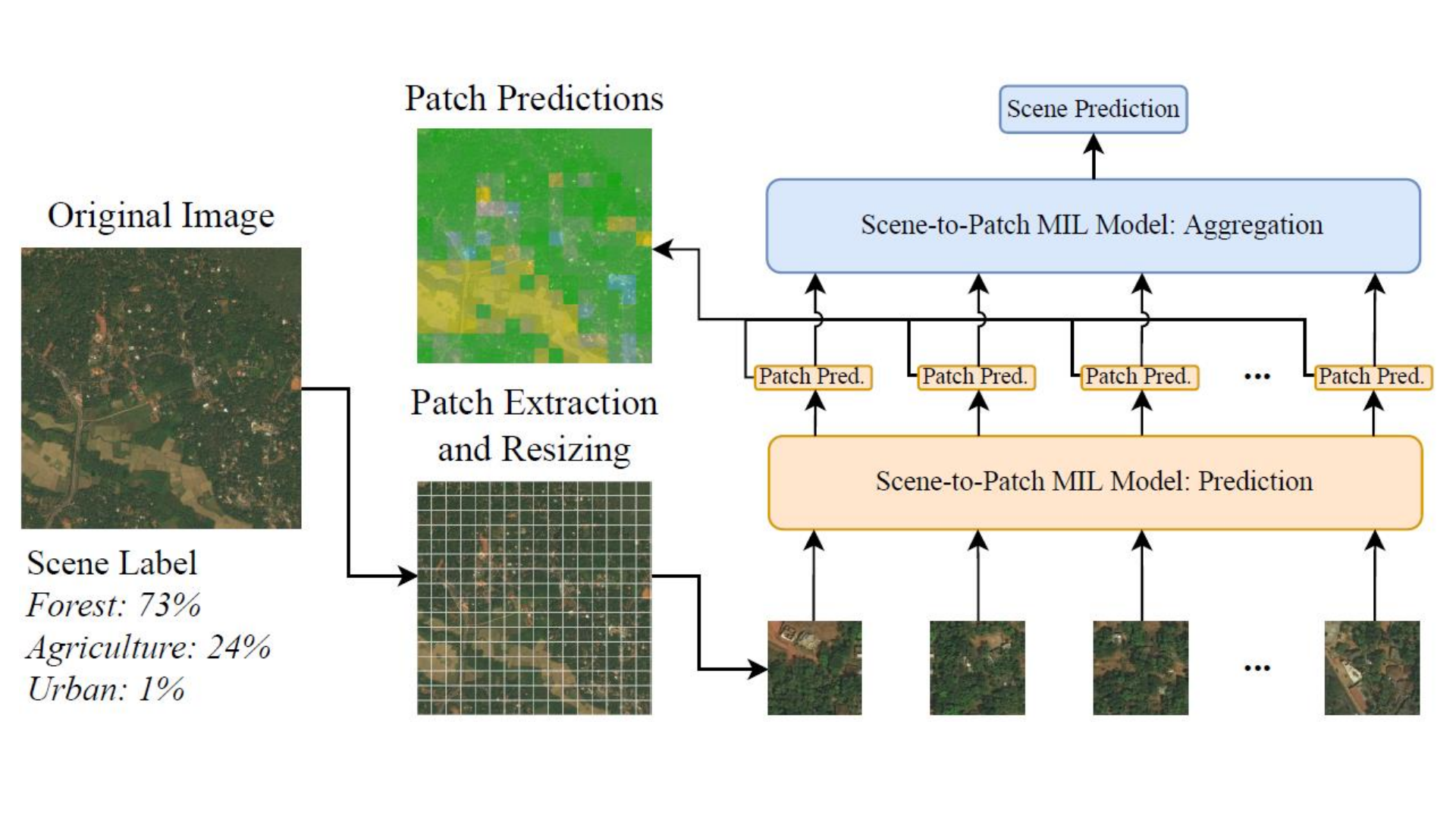


- A popular existing solution is segmentation, which **requires manually segmented data** for training.
- Downsides:
  1) Creating segmented masks is **expensive.**
  2) The input images have to be **downsampled.**

Our Approach – Scene-to-Patch Multiple Instance Learning

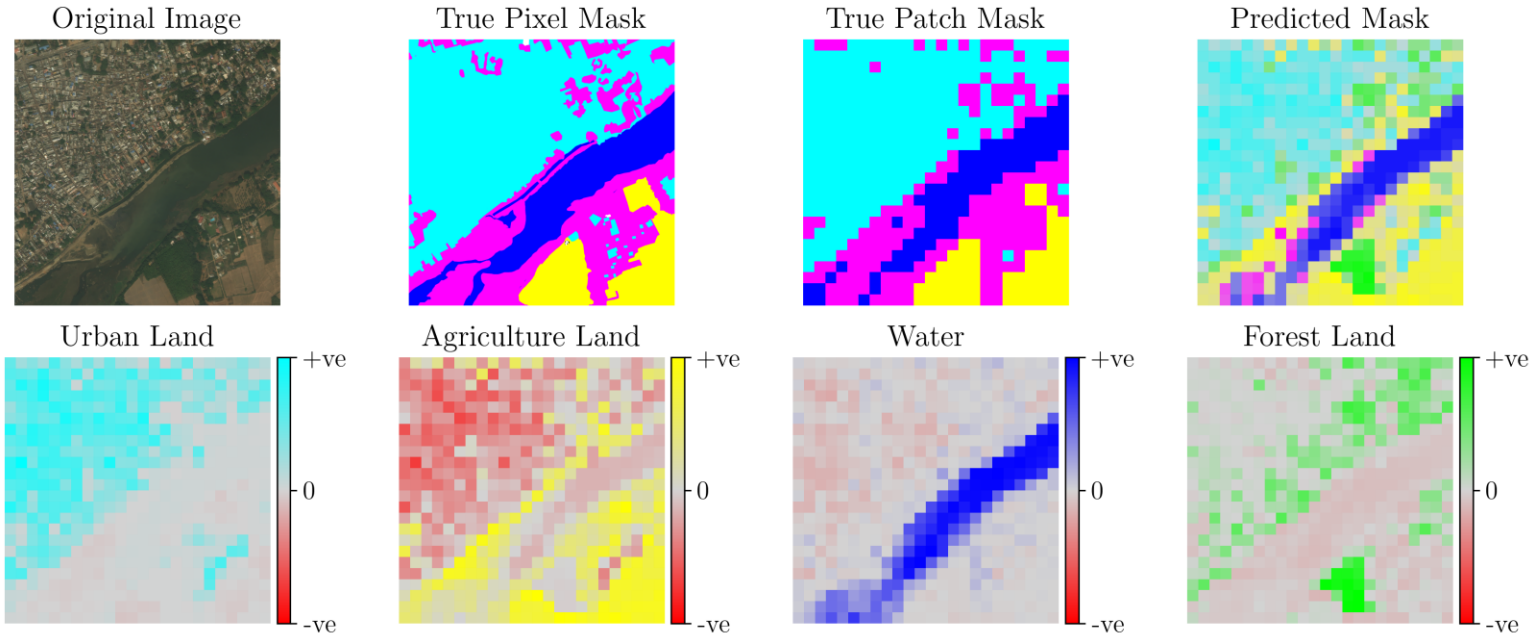
- We propose to use **Multiple Instance Learning (MIL):** patches are extracted from each image, forming a bag of instances.

- Advantages:
  1) Labelling is cheaper – **only require land cover percentages**, rather than complete segmentation.
  2) **Maintains the input resolution**, i.e., no downsampling.


Patch Predictions
Scene Prediction
Original Image
Scene-to-Patch MIL Model: Aggregation
Patch Pred.
Patch Pred.
Patch Pred.
...
Patch Pred.
Patch Extraction
and Resizing
Scene-to-Patch MIL Model: Prediction
Scene Label
Forest: 73%
Agriculture: 24%
Urban: 1%
...

Key Results

– Our Scene-to-Patch models outperform ResNet and UNet baselines at **both scene- and pixel-level prediction.**



Conclusion

J.A.Early@soton.ac.uk
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- Our Scene-to-Patch models **transform low-resolution labels into high-resolution predictions.**

- Removing the need for segmentation labels **reduces the burden of labelling** and will accelerate future applications of LCC in climate change mitigation and adaptation.

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