Automatic Multi-Class Mask Generation Based on Sentinel-1/2 Derived Indices and Deep Learning Neural Network

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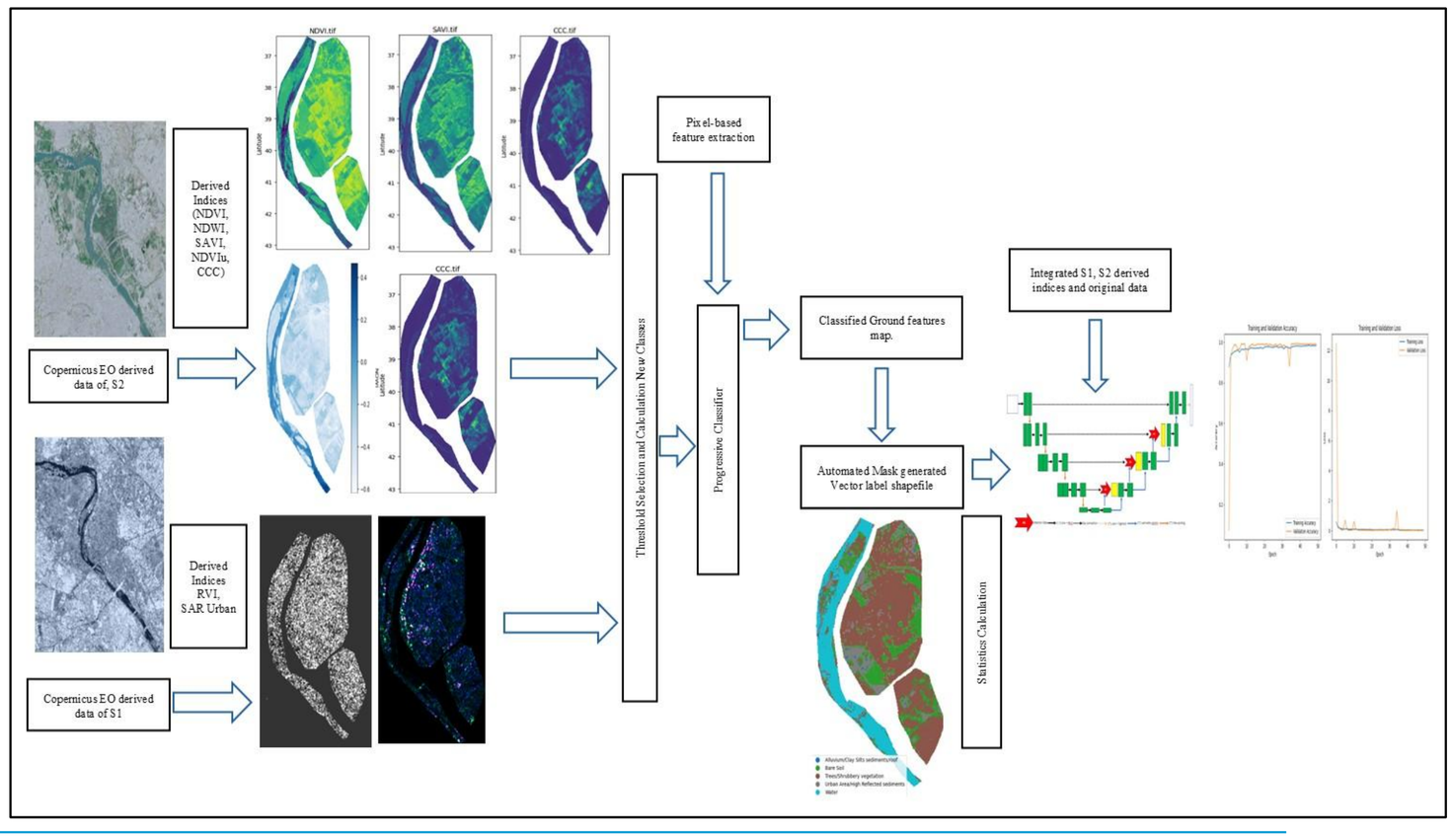
TL;DR:

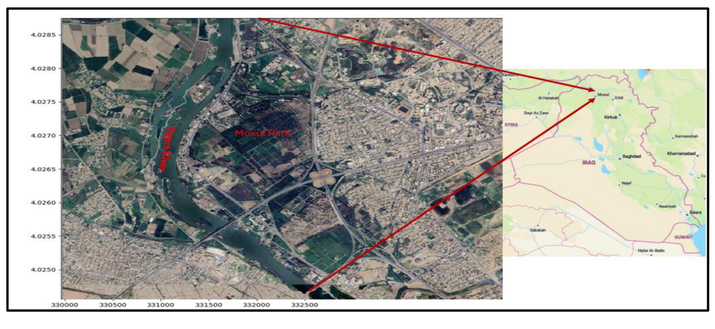
This research presents an automated approach for land cover classification using Sentinel-1/2 data and deep learning. The method combines spectral indices to identify land cover types, generating training datasets for deep learning models. Utilizing an Attention U-Net model, it enhances segmentation accuracy for large-scale environmental analysis.

KEYWORDS: Classifier, Semi-supervised Classifier, Deep Learning, Spectral Index, Land Cover Classes



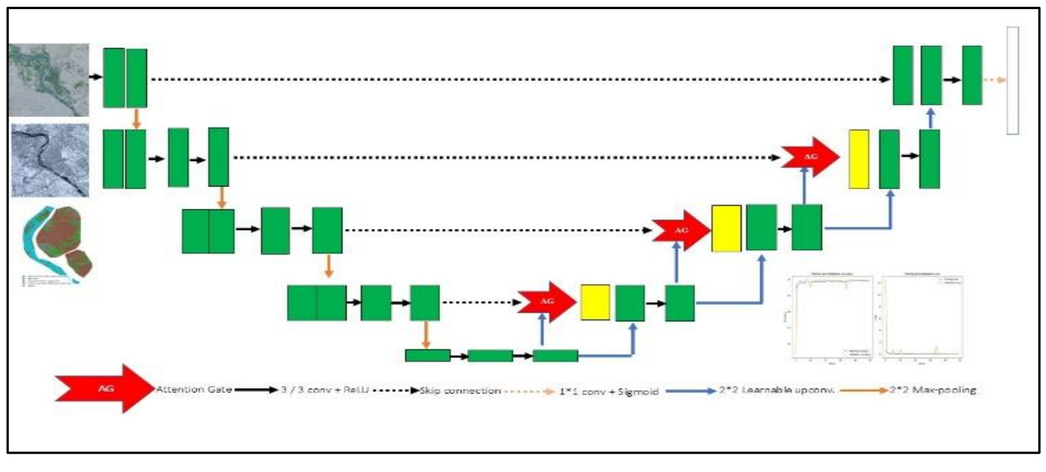
Introduction

The Progressive Classifier (PC) combines spectral indices for long-term change detection in Mosul Park, Iraq, generating multi-class vector datasets for AI-based segmentation models. It achieves high accuracy with training and validation scores of 0.9846 and 0.9892.



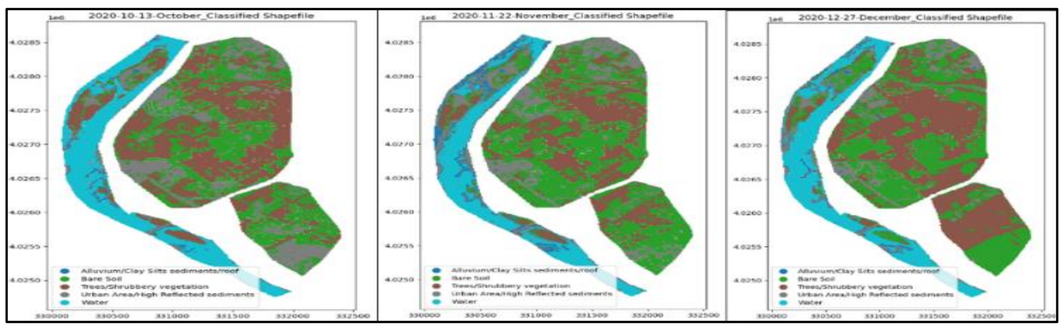
How Does the Classifier Work?

The classifier defines objectives, selects index combinations, and generates vector label masks to track seasonal changes across five classes within the AOI.



Classifier Design

The classifier defines objectives, selects index combinations, and generates vector label masks to track seasonal changes across five classes within the AOI.



Class ID	Class Name	Area (sq km)
4	Urban Area/High Reflected sediments	0.71
5	Alluvium/Clay Silts sediments/roof	0.08
2	Bare Soil	1.65
3	Trees/Shrubbery vegetation	1.80
1	Water	0.61

Conclusion

This study presents a methodology for **monitoring biodiversity** in Mosul Park using the **Progressive Classifier** and a **classification-based change detection technique**. The dynamically changing environment allowed for rigorous testing and refinement of the classifier, which effectively distinguished complex **land cover classes**, particularly **between bare soil and vegetation**. The integration of **S1/S2 datasets** significantly enhanced mapping accuracy, though challenges remained in defining **reliable threshold values for radar-based indices** like RVI. **Segmentation masks** generated were used for further modelling tasks. The upcoming release of PC will incorporate a **Neural Network architecture** to **improve automated land cover discrimination**. Additionally, promising results from classified features of Narrabeen Beach, Sydney, suggest its suitability as an external validation site.

https://github.com/falahfakhri-Iraq/Semi-supervised-classification-algorithm-Progressive-Classifier-PC-

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