Resource-Efficient Cloud Removal Methods for Supporting Zero Hunger in Developing Tropical Areas
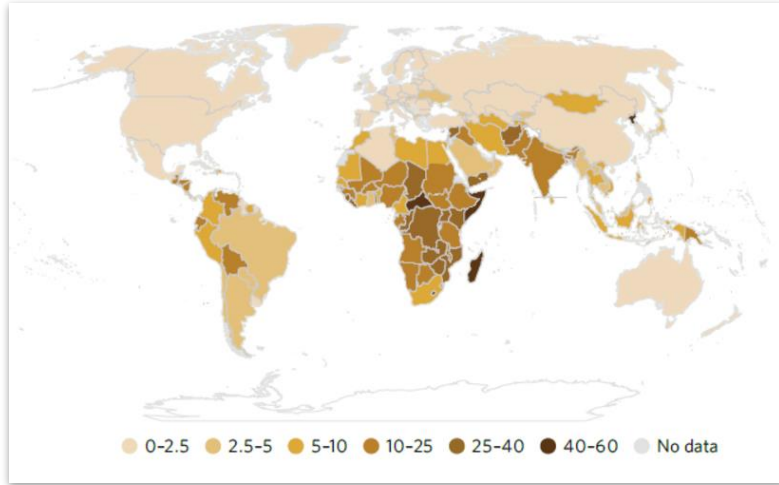
Chenxi Duan

AGILE★ Association of Geographic Information Laboratories in Europe

UNIVERSITY OF TWENTE. | ITC

Problem

Prevalence of undernourishment, 2020–2022 average (percentage)

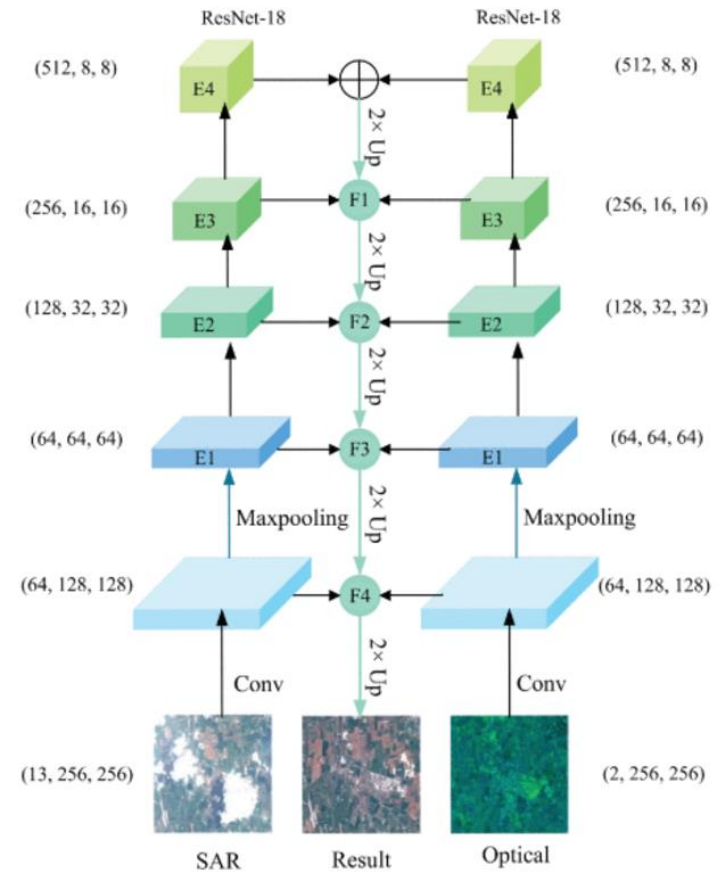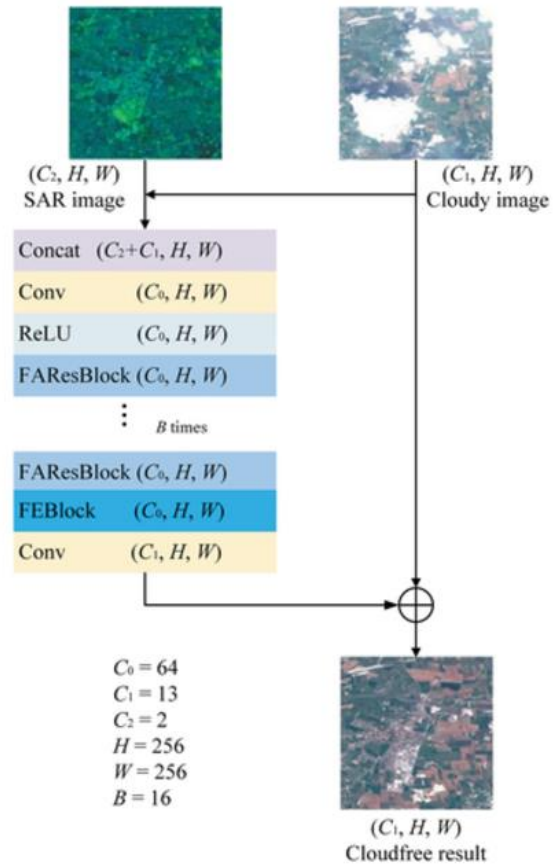Farmland in agriculturally developing regions

Farmland in agriculturally advanced regions

Cloud covered farmland

Method

1. Proposing efficient cloud removal methods by fusing Sentinel-2 optical data and Sentinel-1 SAR data.
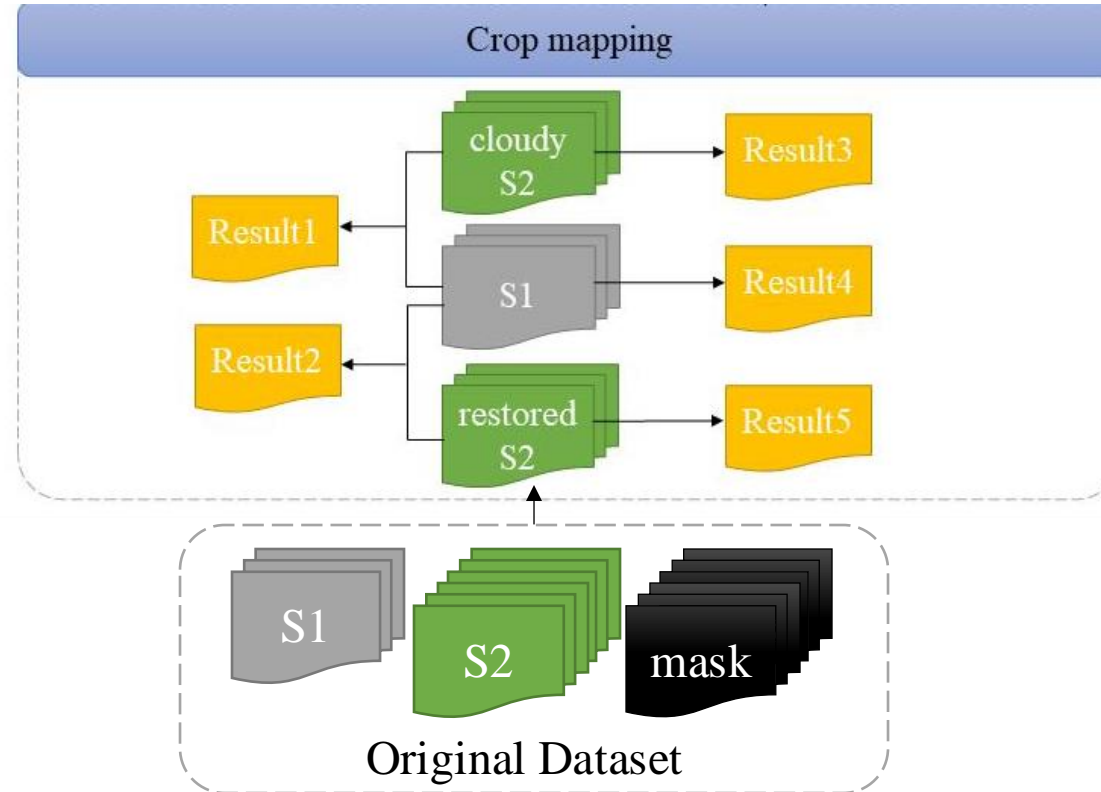

Proposed FENet and FPNet

Method

2. State-of-the-art deep learning models for cloud removal are systematically evaluated within the context of crop mapping.

This study focuses on the regions of Ghana and South Sudan, comparing the obtained five sets of results using metrics such as accuracy, confidence, feature importance, and complexity.

Preliminary results

Accuracies of FPNet and the comparison methods

Method	PSNR	SSIM	MAE(ρ_{TOA})	RMSE(ρ_{TOA})
DSen2-CR	28.13	0.8651	2.92	4.09
GLF-CR	26.89	0.8463	3.68	4.93
FENet	28.51	0.8764	2.87	3.97

Efficiency of FPNet and the comparison methods

Method	Parameters(M)	Complexity(GMac)	Training time(h/epoch)	Speed(ms)
DSen2-CR	18.94	1241.48	10.047	206
GLF-CR	-	-	18.145	99
FENet	1.91	125.21	7.835	51

FENet saves more than one week on training on the experimental dataset

Preliminary results

Accuracies of FPNet and the comparison methods

Method	PSNR↑	SSIM↑	MAE↓	RMSE↓
DSen2-CR	28.13	0.8651	2.92	4.09
GLF-CR	26.89	0.8463	3.68	4.93
FPNet-18	27.78	0.8753	2.76	3.88
FPNet-34	**29.12**	**0.8837**	**2.65**	**3.69**

Efficiency of FPNet and the comparison methods

Method	Speed(FPS)↑	Training time (h/epoch)↓
DSen2-CR	7.002	10.047
GLF-CR	10.054	18.145
FPNet-18	**129.493**	**2.752**
FPNet-34	96.042	3.533

FPNet reduces the training time to up to 1/5 while achieving inference speeds 9.6 to 18 times faster than the comparison methods

Thank you for your attention!