

DETECTION OF HOUSING AND AGRICULTURE AREAS ON DRY-RIVERBEDS FOR THE EVALUATION OF RISK BY LANDSLIDES USING LOW-RESOLUTION SATELLITE IMAGERY BASED ON DEEP LEARNING.

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Motivation

El Niño



Img s/c: <http://www.minedu.gob.pe/fenomeno-el-nino/>,

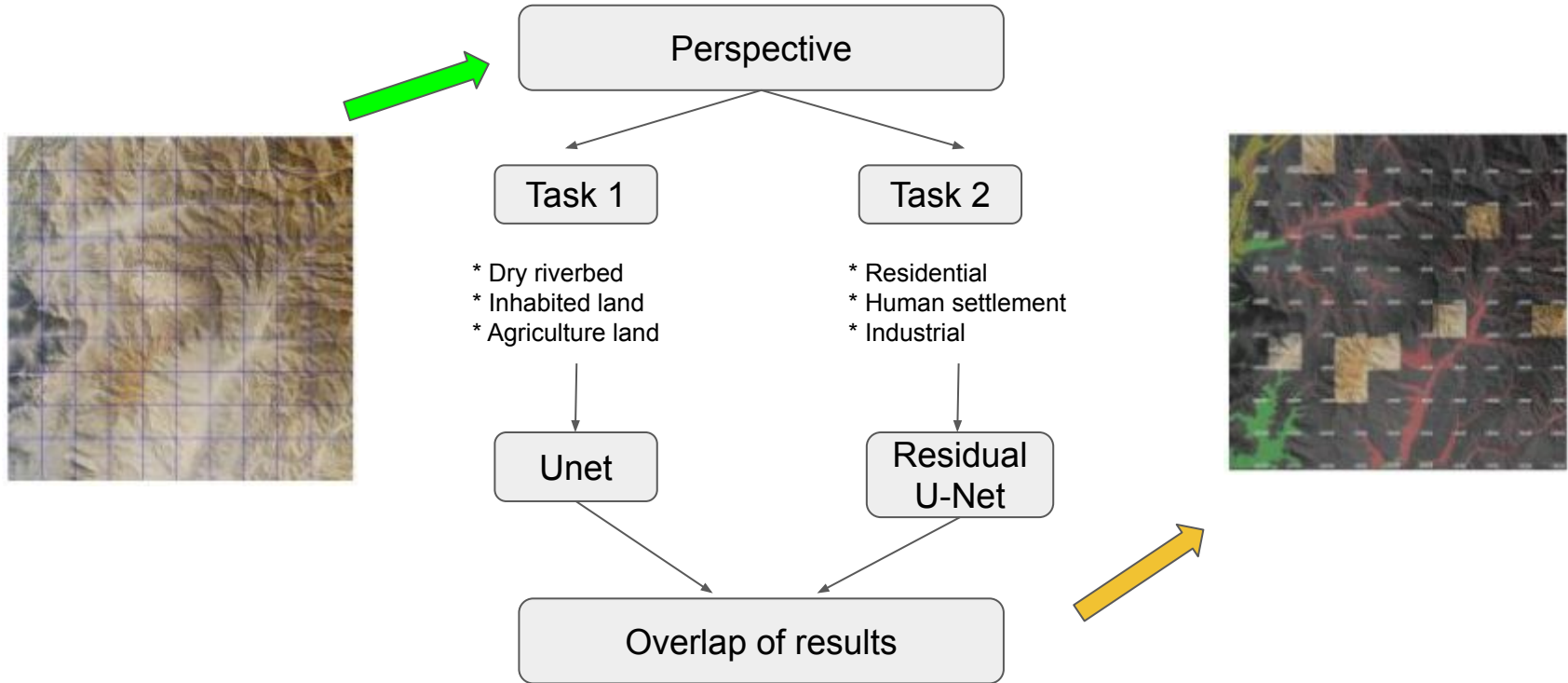
<https://www.bbc.com/mundo/noticiahttps://www.bbc.com/mundo/noticias-america-latina-39259721s-america-latina-39259721>

Urban planning and Land Use



Image from Villacorta Chambi et al. Peligros geológicos en el área de Lima Metropolitana y la región Callao N° 59 (Lima: Instituto Geológico, Minero y Metalúrgico, 2015),
<http://verdenoticias.org/index.php/blog-noticias-cambio-climatico/1937-peru-entre-huaicos-y-sequias>

Workflow

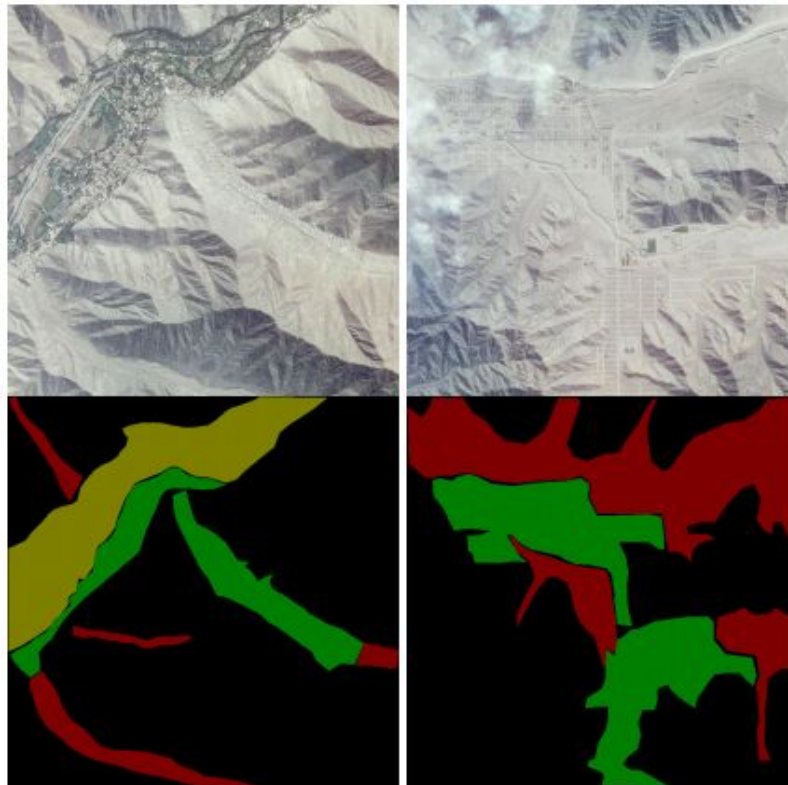


Dataset

- RGB Images of 5000x5000 pixels taken by RapidEye satellite (Planet Labs)
- Each image has been sliced in 100 chips with overlapping

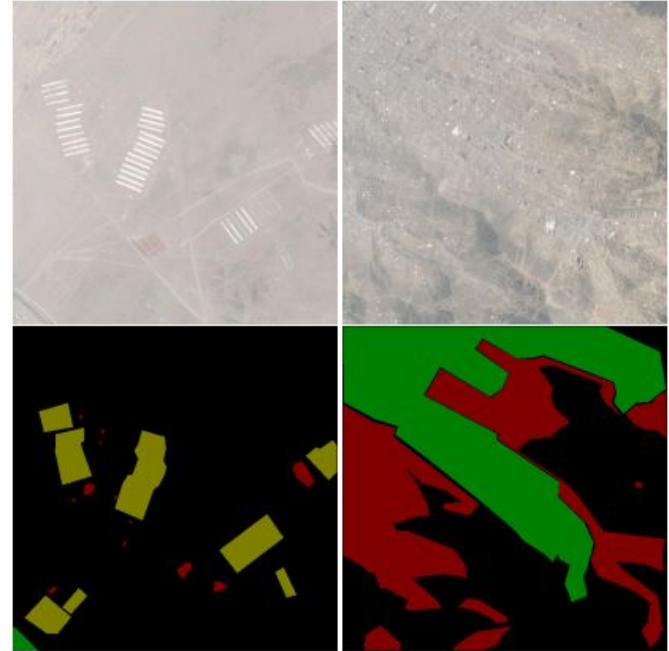
Task 1:

Value	Class	RGB	Description
1	Dry riverbed	(1,0,0)	channel where used to flow a river
2	Inhabited land	(0,1,0)	any kind of building
3	Agriculture land	(1,1,0)	croplands, farms
0	Background	(0,0,0)	others



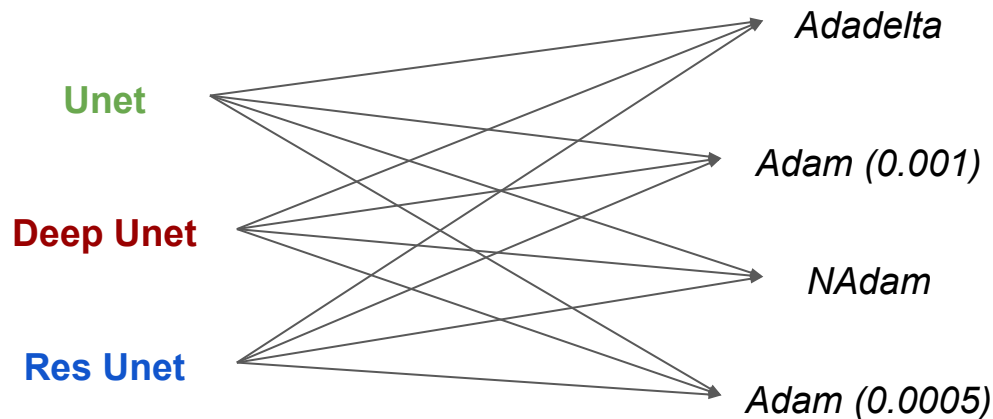
Task 2:

Value	Class	RGB	Description
1	Residential	(0,1,0)	area where housing predominates
2	Human settlement	(1,0,0)	areas in initial process of colonization
3	Industrial	(1,1,0)	industrial plant, farm, warehouse
0	Background	(0,0,0)	others



Training and Results

$$\text{Dice - Coefficient} = \frac{1}{n} \sum_{i=1}^{c=n} S, S = \frac{2TP_c}{2TP_c + FP_c + FN_c}$$



Model	F1 Score					
	0	1	2	3	Avg	Avg (w/o background)
Unet + Adam	0.95	0.56	0.722	0.905	0.784	0.729
Unet + Adadelta	0.957	0.641	0.722	0.918	0.809	0.760
Unet + Adam($l_r=0.0005$)	0.953	0.593	0.72	0.913	0.795	0.742

Experimental results for Task 1

Model	F1 Score					
	0	1	2	3	Avg	Avg (w/o background)
Residual Unet + Adadelta	0.961	0.531	0.77	0.319	0.645	0.54
Residual Unet + Adam	0.963	0.551	0.803	0.232	0.637	0.529
Residual Unet + NAdam	0.965	0.608	0.829	0.096	0.603	0.509
Residual Unet + Adam($l_r=0.0005$)	0.961	0.547	0.785	0.269	0.641	0.534

Experimental results for Task 2

Conclusions and future work

Housing areas lying on dry riverbeds with significant potential risk are shown as low susceptibility areas by the official susceptibility map

Apply post processing techniques such as Jaccard Index.

Explore other architectures :

- Mask R-CNN
- Yolact

