A UNet-based solution for detecting deforestation and reduction of reservoirs and glaciers

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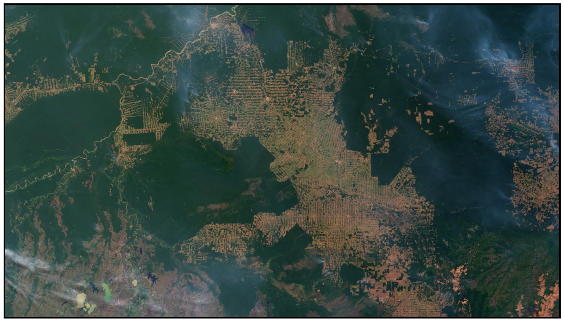
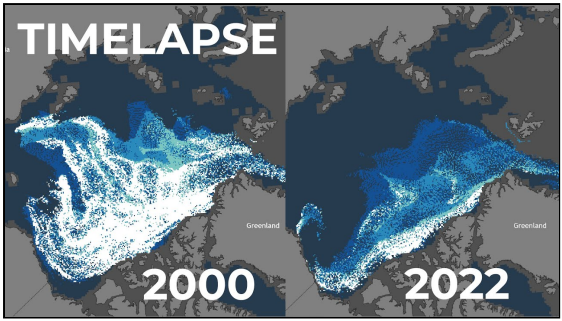
Scenario

Addressed problem

Climate change is recognized as an issue that has **negative effects** on the ecosystem and it is mainly caused by **wild** and **uncontrolled deforestation** of the main world forests. Another important negative effect of climate change is the **melting glaciers** of North Pole.





Modelling approach (1/2)

We used the LandCover.ai[1] data set for training and quantitatively evaluating the model. The data set provides a mapping of the areas represented in the images in five categories: *forest*, *reservoirs*, *roads*, *buildings* and *other*.

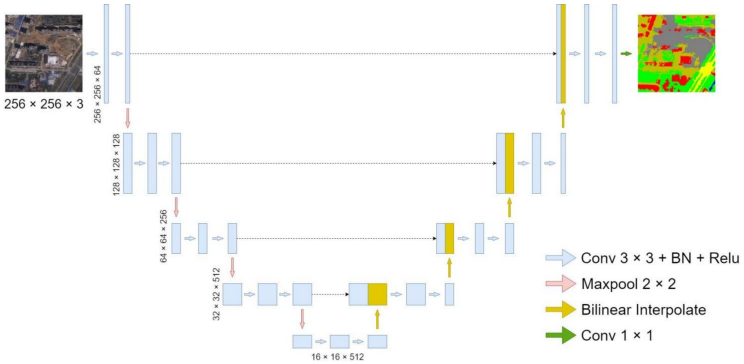
The distribution of the classes is as follows:

Class	**Percentage**
Reservoirs	6.00 %
Forest	33.30 %
Roads	1.60 %
Buildings	0.85 %
Other	58.25 %

[1] https://landcover.ai.linuxpolska.com

Modelling approach (2/2)

We decided to use a UNet-based network, a segmentation-based approach, which has been proved to be very effective for this kind of tasks.



Results (1/2)

A quantitative evaluation of the trained model has been conducted on the LandCover.ai data set by computing the following metrics:

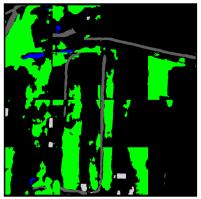
$$IoU = \frac{P_{bbox} \cap GT_{bbox}}{P_{bbox} \cup GT_{bbox}}$$

$$F1\text{-}score = \frac{2 * TP}{2 * TP + FP + FN}$$

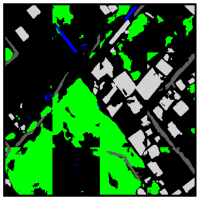
On the LandCover.ai data set, we obtained a **IoU score** of **0.654** and a **F1-score** of **0.7433**.

Results (2/2)

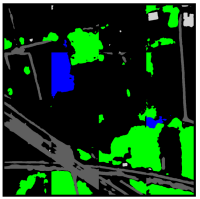
A qualitative evaluation on the Campania data set has been carried out. The images show how vegetation reduced in two years.



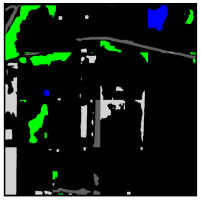
(a) Area # 1 (2018)



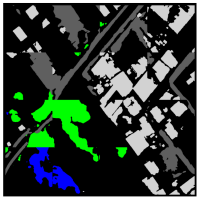
(b) Area # 2 (2018)



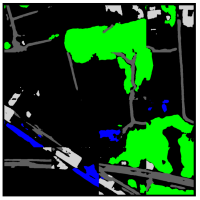
(c) Area # 3 (2018)



(d) Area # 1 (2020)



(e) Area # 2 (2020)



(f) Area # 3 (2020)

Conclusions

The aim of the proposed solution was to **provide a framework** for mapping the territory based on specific characteristics through the use of satellite images for detecting deforestation, reduction of reservoirs and glaciers.

A future work will be on testing the approach on a data set having also glaciers.

Thank you for your attention.