

ImClass: A user-tailored Image CLASSification service for land surface mapping

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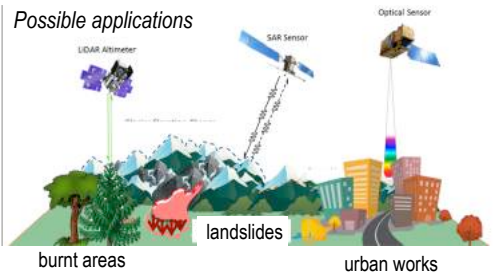


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CONTEXT



ImClass is a user-driven change detection service based on machine learning (Random Forest classifier and active learning) tailored for mapping a variety of land surface processes over large areas. The service currently integrates MR and VHR multispectral images, and will be further developed for SAR imagery.



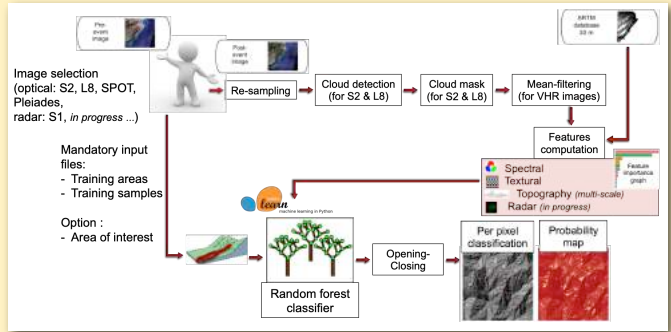
Hypotheses:

- use of medium & high resolution imagery (e.g. S1, S2, L8 & SPOT, Pleiades datasets),
- use of a mono-class approach with ill-posed problem (class imbalance) as use cases,
- optimized for big data processing with an implementation on the use of the A²S processing infrastructure of University of Strasbourg,
- involvement of operational users (ONF-RTM, EMS) at all steps of the service development.

FIRST RESULTS

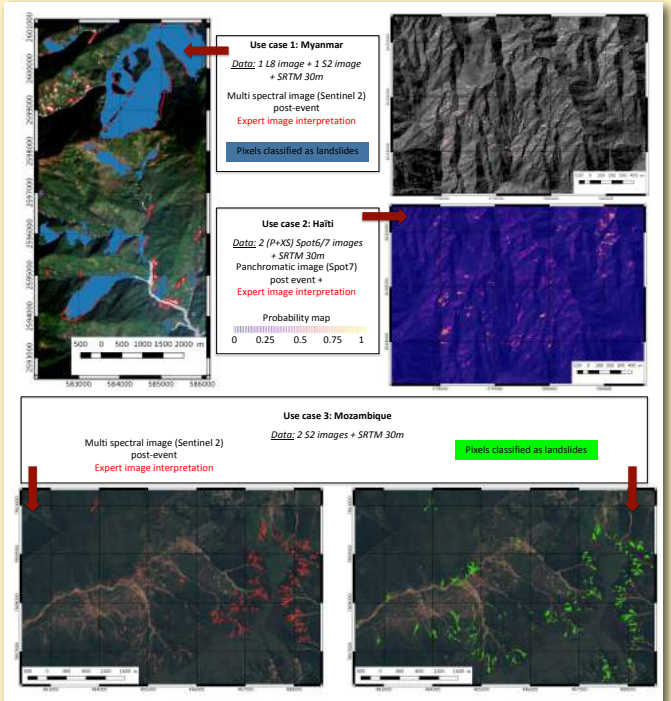


Dockerization and optimization of HPC calculation



Trial experiments for landslide detection

Applications using several image sources (Sentinel-2, Landsat-8, SPOT6-7) were performed for the automatic detection of landslides over large regions. Examples of landslides triggered by the cyclon Komen (2015, Myanmar), the hurricane Matthew (2016, Haiti) and the cyclone Idai (2019, Mozambique) are presented.

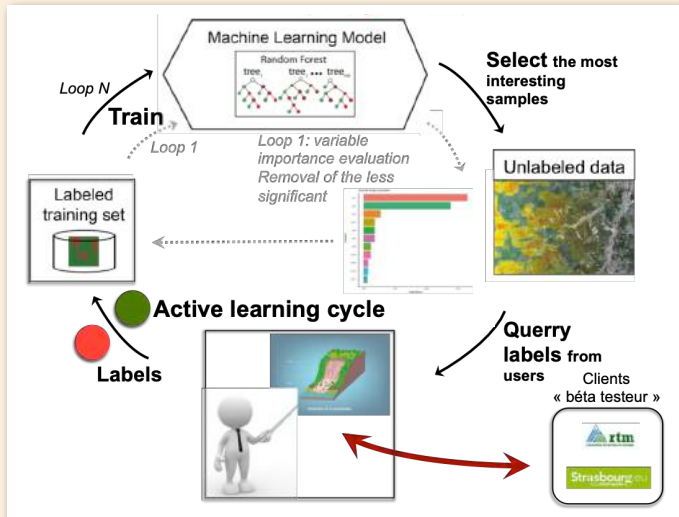


PROCESSING SERVICE



ImCLASS service is a development of the ALADIM supervised classifier currently available on the ESA GEP environment. imCLASS integrates active learning to optimize the selection of the most relevant training samples and thus increase the accuracy of the classification. The service workflow consists in the following steps:

- (1) the system starts with a dataset of unlabelled images at two dates,
- (2) a small sample of data is classified by an expert and this sample is used to train a machine learning model,
- (3) the initial model results and the structure of the data are automatically exploited to select the most interesting samples for the next learning cycle.



The approach is innovative as:

- a large number of features derived from the images are computed,
- several data type are combined (multispectral, SAR, topography),
- several combination of sensor models can be combined for the pre- and images,
- a per-pixel and a object-based classification are produced,
- uncertainly maps and performance statistics are calculated,
- a WPS on-line processing system will be developed.

FUTURE APPLICATIONS

To enable user interaction, a service for online-image classification will be developed using graphical user interfaces; the interface will be open to users for labelling the objects of interest, launch the calculation using a few sets of parameters, and download the products.

Starting Fall 2019, several beta-clients (ONF-RTM, EMS) will test the system for their operational applications.

