

GeoImageNet: A Collaborative Platform for Deep Learning Application on Very High Resolution Images

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GeoImageNet

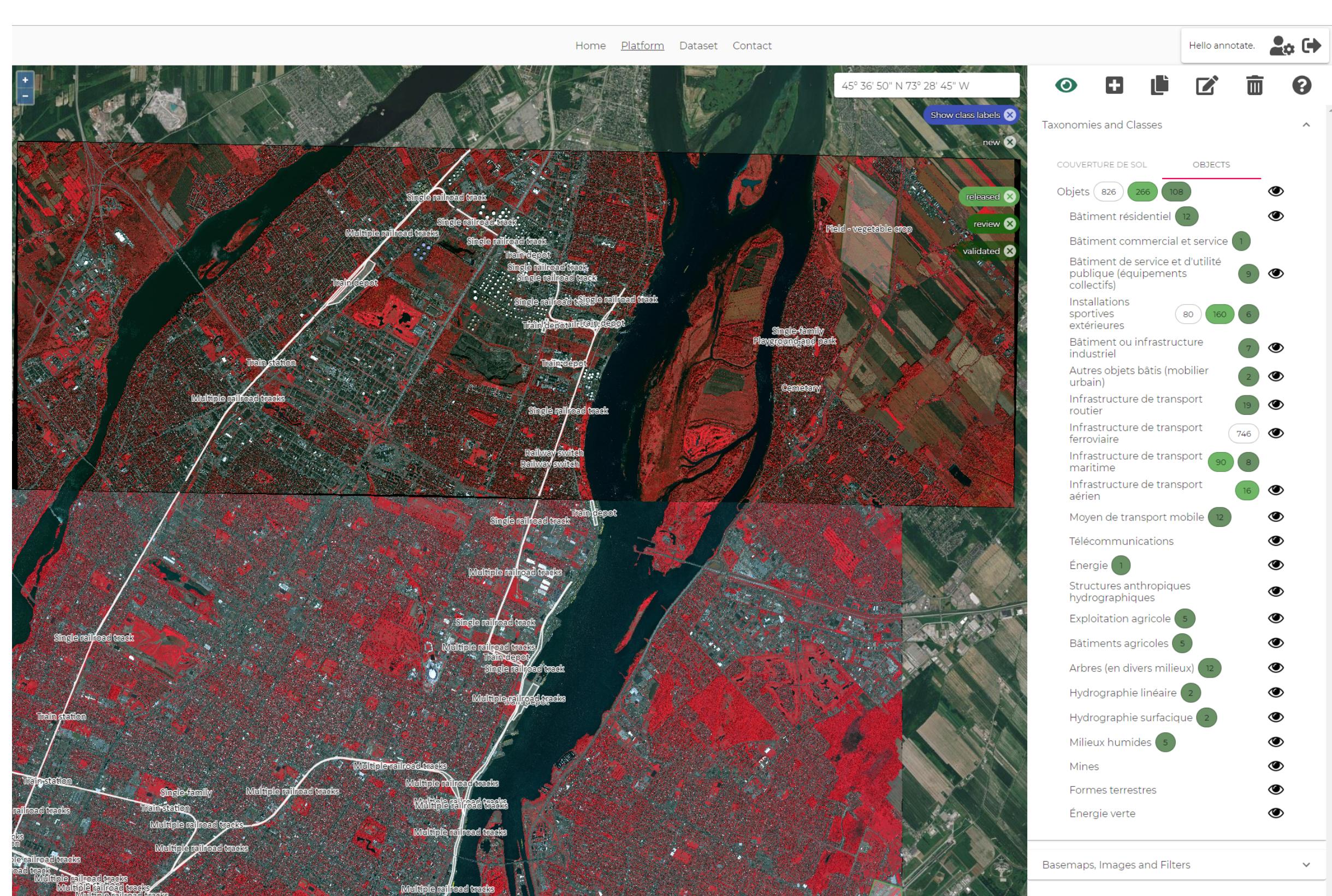
- A collaborative initiative between **remote sensing** researchers, web platform developers, artificial intelligence experts and satellite imagery providers.
- Implement a **web platform** that allows users to make annotations on VHR images (e.g.: Pleiades 50 cm; WorldView-2 40 cm; WorldView-3 30 cm).
- Create **large datasets** of annotations and related patches.
- Download resulting datasets to **train deep learning models** on VHR images.
- Uploaded models can then be tested and results can be published into a **benchmark**.

Context

- Recent work on the application of Deep Learning to VHR satellite imagery has shown much higher success rates than other advanced approaches [2].
- The specificity of satellite data requires more research on transfer learning techniques or the adaptation of existing CNN architectures [3].
- There is a lack of large annotated training sets.
- Our dataset contains 10,000 km² of Pleiades images and approximately 3,000 km² of WorldView-2 and -3 images acquired over Canada's major cities.

Annotation and Taxonomy

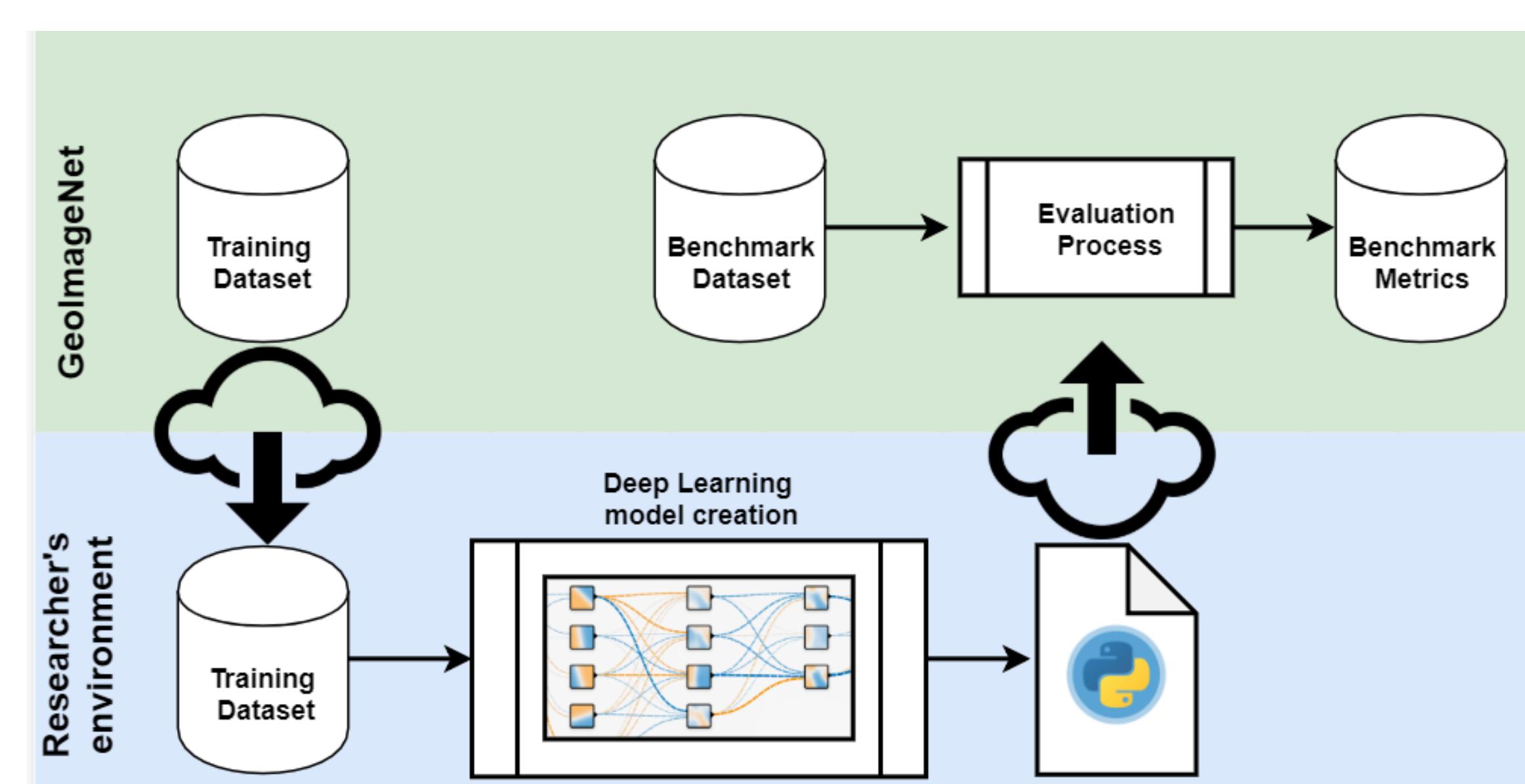
- Taxonomy: **Land covers**: 48 classes, **Objects**: 178 classes
- Different **access rights** for different users: Annotator, Validator, Expert, Researcher, Admin
- Full **traceability** of annotation, taxonomy and dataset creation.



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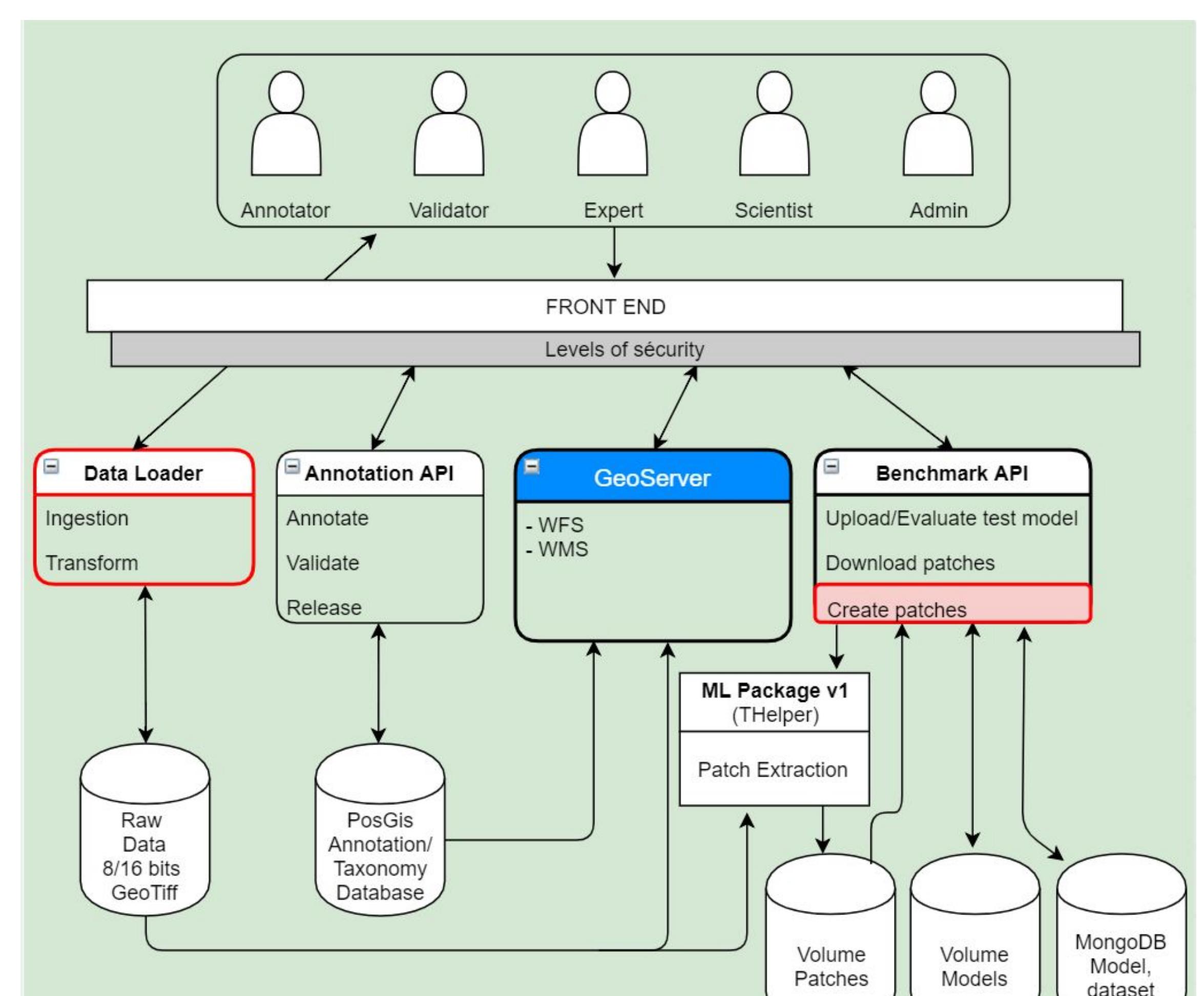
Deep Learning Benchmark

- Download 90% of patches for training.
- **PyTorch Model** created in researchers' environment.
- Upload and evaluate of models with 10% of patches.
- Offer benchmarking service with an evaluation server to obtain performance metrics.



Platform Architecture

- OpenSource Platform in **Python/JavaScript**.
- Support **OGC standards** (WMS, WFS, WPS)
- **GeoServer** to share, process and edit geospatial data
- **Birdhouse**: Web Processing Services [1].



References

- [1] Birdhouse, GitHub Web Processing Services. <https://birdhouse.readthedocs.io/en/latest/overview.html>, 2019.
- [2] A. Van Etten. You Only Look Twice: RapidMulti-Scale Object Detection in Satellite Imagery. In <https://arxiv.org/pdf/1805.09512.pdf>, 2018.
- [3] X. Zhu, D. Tuia, L. Mou, G. Xia, L. Zang, F. Xu, and F. Frau. Deep Learning in Remote Sensing: A Comprehensive Review and List of Resources. *IEEE Geoscience and Remote Sensing Magazine*, 5(4), 2017.