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Towards a multi-Modal, multi-Temporal and multi-Phenomena dataset for natural phenomena observation through deep learning

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La Région
Auvergne-Rhône-Alpes



1. Key points

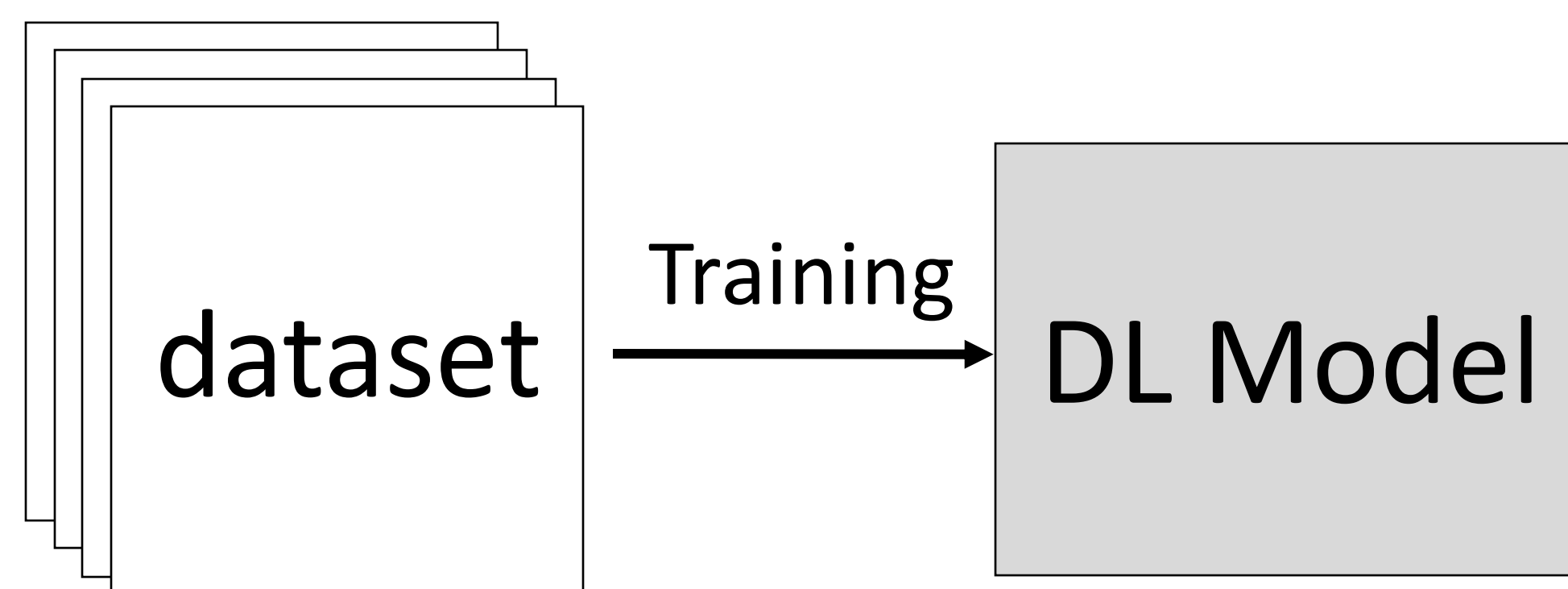
- **A common dataset** of standard products for fair comparisons
- **Multi-modal dataset** for early warning systems
- **Multi-temporal dataset** for ground motion monitoring
- **Multi-phenomena dataset** for cascaded event prevention

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2. Problem statement

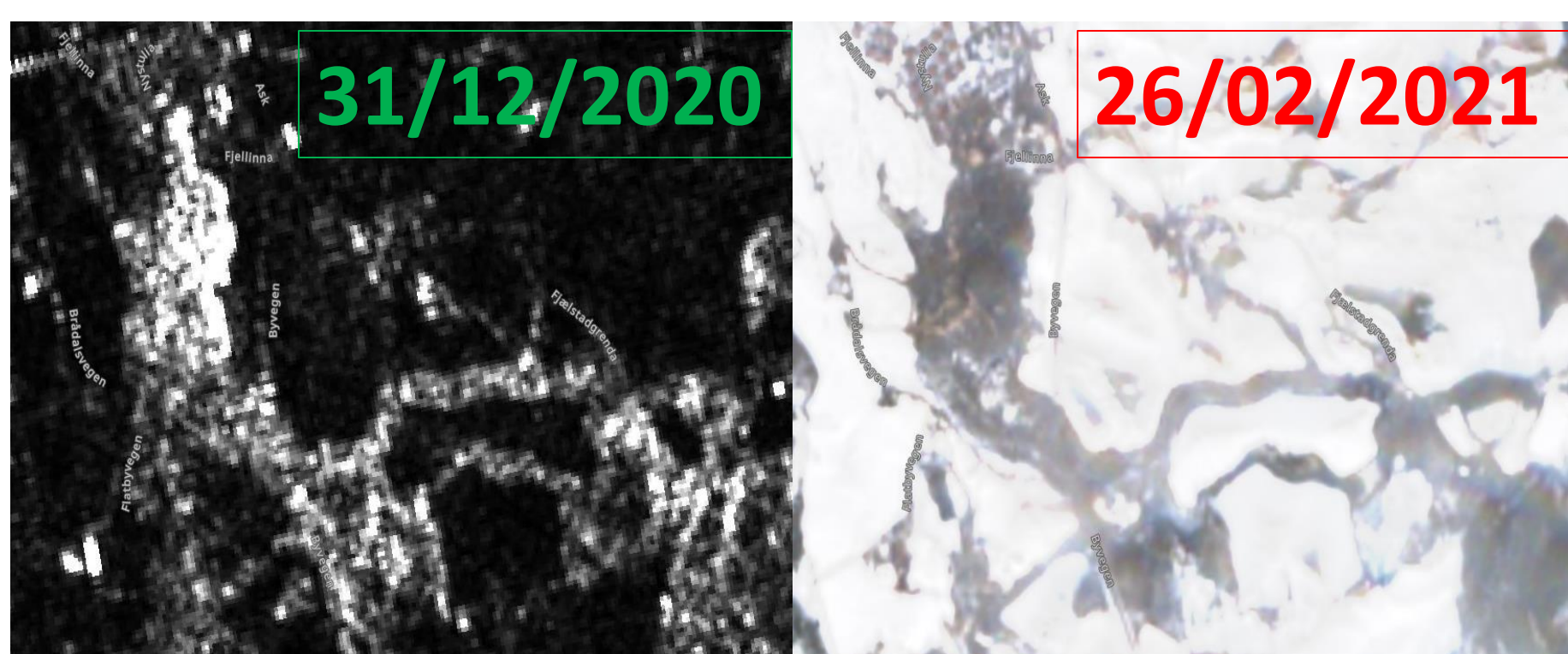
Problem specific
Region specific
Small
No standard products
No free access



~~Generalizability
Reproducibility
Fair comparison
Improvements~~

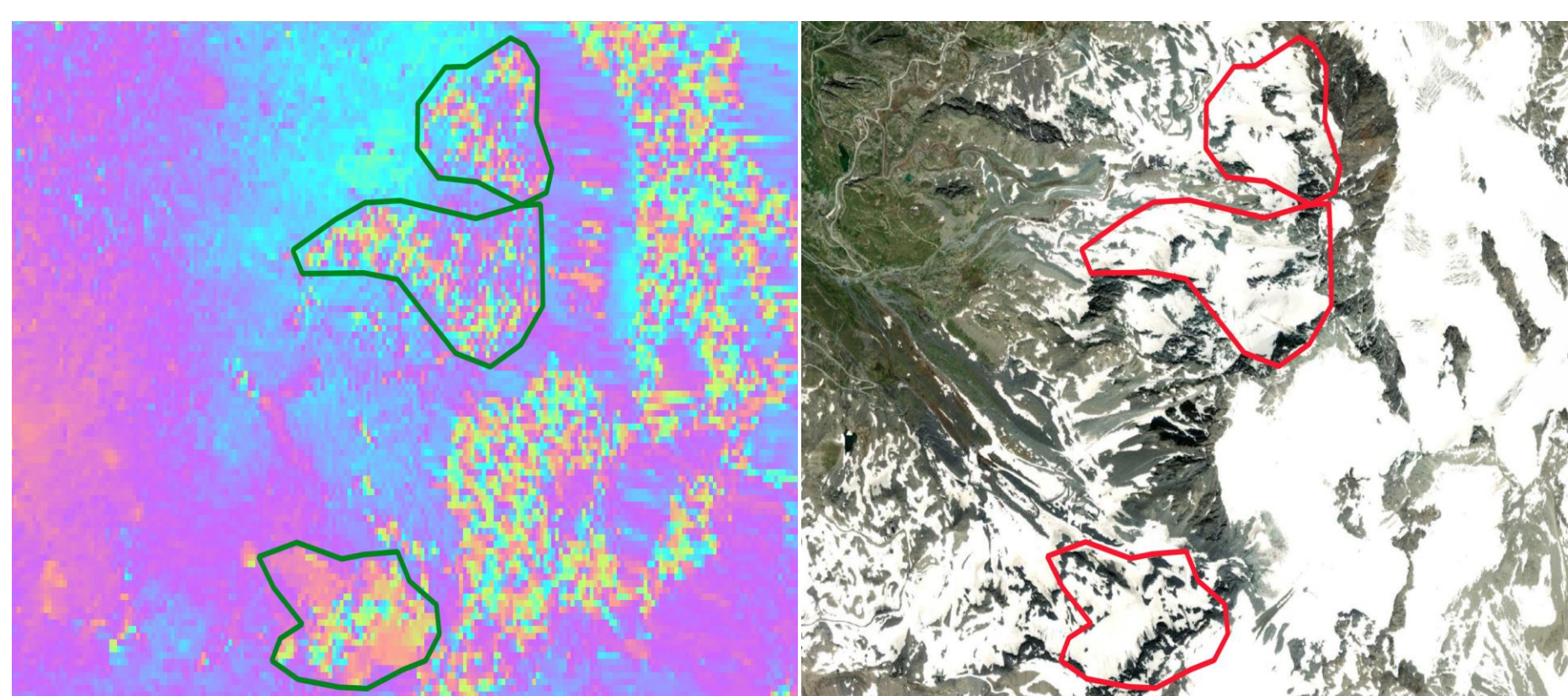
3. Multi-modal dataset

- **Complementarity**
 - Significant improvements due to modality specific features [1]
- **The earlier the better !**
 - First available modality used for emergency [2]



31/12/2020 Gjerdrüm Landslide.
First post-event SAR image (left) and cloud-free optical image (right)

4. Multi-temporal dataset

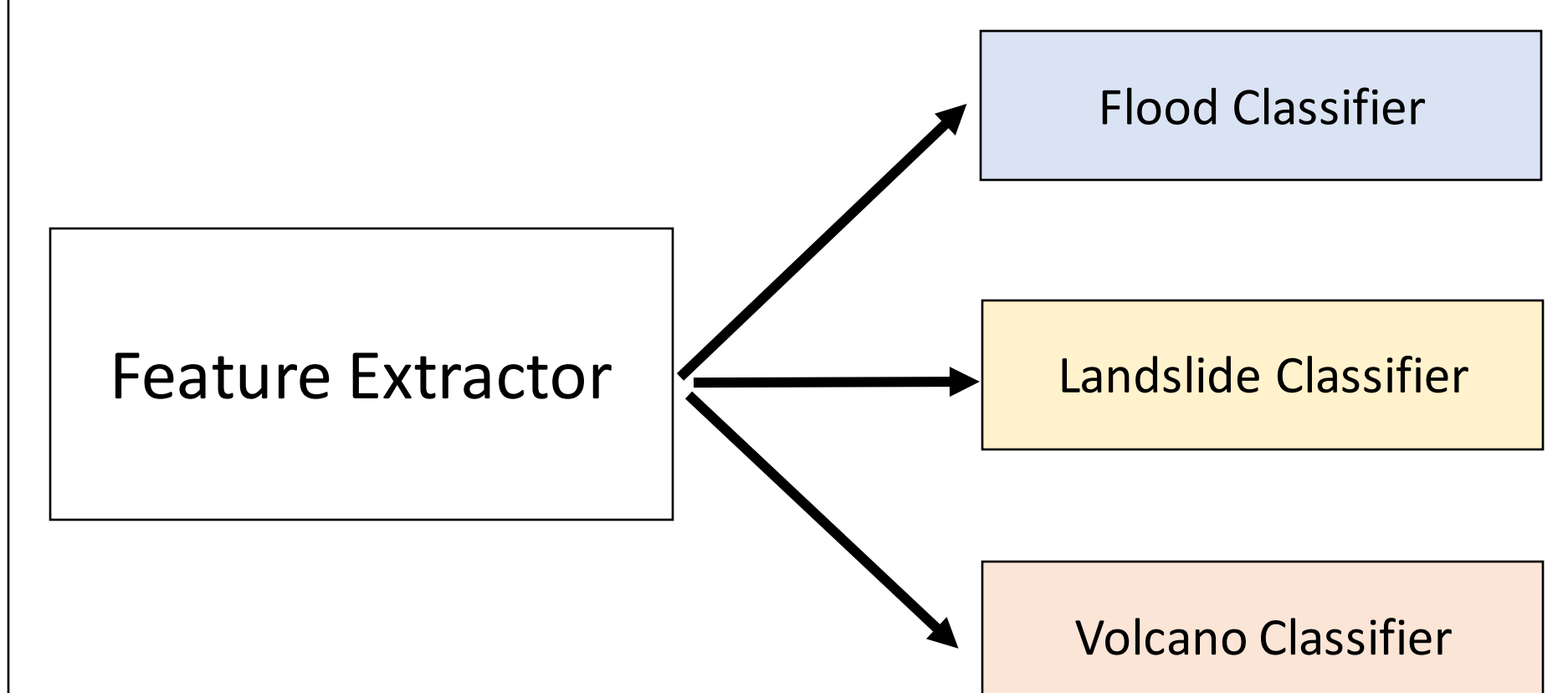


Interferogram generated (left) and its corresponding optical view (right). Green and red lines are suspicions of moving areas based on the interferogram.

- **Slow ground motions**
 - Monitoring of rock glaciers [3], slow moving landslides [4] and volcanoes [5]
- **Change detection**
 - Multitemporal images improve detections [6]

5. Multi-phenomena dataset

- **To leverage similarities**
 - Multi-task learning to strengthen tasks independently [7]



- **To detect triggered events**
 - Cascaded phenomena preventions

6. Common efforts

- Events **occurrence dates and locations** listing
- **Standard products** collection (Sentinel-1 / 2)
- Phenomena annotations with **expert knowledge**
- **Free release** of the dataset for community use

7. Conclusion

Need a common effort for a multi-MTP dataset for even more relevant deep learning researches and overcome specific dataset issues



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- [7] Nagendra, Savinay, et al. "Constructing a large-scale landslide database across heterogeneous environments using task-specific model updates." *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 15 (2022): 4349-4370.