

## M2 paid internship position: global scaling of MassBalanceMachine

### Context:

MassBalanceMachine (MBM) [1] is a statistical learning model based on neural networks, designed to predict the surface mass balance of glaciers (accumulation - melt) from topographical and climate data. It is trained using in situ mass balance measurements, currently available for glaciers in the Alps, Norway and Iceland. This model has already demonstrated very good performance [2] and can be used to extrapolate mass balance for glaciers for which no measurements are available.

The team is currently working on extending MBM to a global scale by integrating geodetic remote sensing datasets (volume variation over several years). This scaling up raises computational and methodological challenges that need to be addressed.

The aim of the internship is to contribute to the development of the MBM code in order to make it more efficient and scalable on a global scale, in particular by managing aspects related to GPU use and multiprocessing.

### Tasks:

- Refactor the package architecture to make it easier to maintain and evolve in an open source context with many collaborators.
- Optimize the code to make it faster, more modular and scalable so that it can process data on a global scale.
- Automate the pre-processing and preparation of datasets.
- Set up unit tests and continuous integration tools.
- Document the model, its architecture and API.

### Profile:

- Master level in computer science.
- Good level in Python (PyTorch, pandas) and comfortable working in a Linux environment.
- Accustomed to contributing to open source projects and designing complex code architectures.
- A background in big data management would be a plus.

### Supervision and working environment:

The intern will work closely with members of the *MassBalanceMachine* team, based at the Institute of Environmental Geosciences (IGE) in Grenoble, ETH Zurich (Switzerland) and HVL (Norway). The internship offers a unique opportunity to participate in an international project with a strong scientific and environmental impact, in a collaborative and open source environment.

**Salary:** ~650-700€ net/month

### How to apply:

Send your resume and GitHub profile or equivalent to Alban Gossard ([alban.gossard@univ-grenoble-alpes.fr](mailto:alban.gossard@univ-grenoble-alpes.fr)) and Jordi Bolibar ([jordi.bolibar@univ-grenoble-alpes.fr](mailto:jordi.bolibar@univ-grenoble-alpes.fr)).

### References:

- [1] <https://github.com/ODINN-SciML/MassBalanceMachine>
- [2] Sjursen, K. H., Bolibar, J., van der Meer, M., Andreassen, L. M., Biesheuvel, J. P., Dunse, T., Huss, M., Maussion, F., Rounce, D. R., and Tober, B.: Machine learning improves seasonal mass balance prediction for unmonitored glaciers, EGUsphere [preprint], <https://doi.org/10.5194/egusphere-2025-1206>, 2025.