

**Post-doctorate ISTerre :
Artificial intelligence applied to the detection of landslide zones in high
mountains using SAR imagery.**

Job identification:

Fonctions 1-year contract researcher (post-doctorate)

Assignment : Institute of Earth Sciences (ISTerre)

Dates : Start between September and December 2023

Scientific context

In the mountains, slope movements such as landslides, Deep-seated Gravitational Slope Deformation (DGSD) or rock glaciers, manifest themselves through surface velocities ranging from a few mm/year to a few m/year, and can accelerate to catastrophic failure. During their slow-moving phase, they can be detected in SAR interferograms (INSAR) acquired by the Sentinel-1 open-source global satellites. However, this detection is not automatic, despite the societal importance of such detection. However, Sentinel-1 InSAR data are now mass-processed at regional scales, by SNO ISDeform, making it possible to automate this detection. Based on promising initial work and an initial manual inventory of the Alps currently under construction at ISTerre, this project aims to build a detection and classification algorithm for gravity instabilities in mountains, using a machine-learning algorithm for image segmentation (of the U-net convolutional neural network type).

Role of the post-doctoral fellow

As the inventory is already being built up by Diego Cusicanqui, the person recruited will work in tandem with him to develop learning algorithms capable of detecting and characterizing slow landslides. The first part of the post-doc will be dedicated to getting to grips with the subject, the data and the literature. The main task will then be to develop a specific algorithm taking into account the particular aspects of INSAR data (acquisition in radar geometry, complex image values, different durations between acquisitions) in order to make the most of the information contained in these data. Depending on the skills and progress of the person recruited, a number of perspectives may be considered: coupling with optical data, analysis on different time scales, applications to other regions (South America). The person recruited will also be involved in the creation of an open source signal database that can be fed collaboratively.

Profile required

- Skills and know-how

The profile sought is clearly linked to data sciences (particularly remote sensing) and techniques developed in artificial intelligence, with experience in methodological developments applied to geosciences. Experience in Python, cluster computing and remote sensing is required. Support in remote sensing and earth sciences, as well as in machine learning, will be available within the research team.

- Know-how

A strong interest in the applicative aspects of methodological developments in AI and curiosity about important processes in the earth sciences will be appreciated. As the working environment is interdisciplinary, communication and leadership skills will be required. A strong link must be forged with the Gricad computing center. Partial supervision of internships/theses on related subjects may be offered.

Context and working environment

Description of the structure

Earth Sciences Research Laboratory

Team description :

The team associated with the project consists mainly of 2 permanent researchers: Sophie Giffard-Roisin (CR IRD), Pascal Lacroix (CR IRD) belonging respectively to the "Cycles and transient deformations" and "Risk and environmental geophysics" teams, and a non-permanent researcher, Diego Cusicanqui (CNES post-doc). The project team is larger, comprising 2 other ISTerre researchers and 1 researcher from the EDYTEM laboratory - with complementary skills.

General information

To apply: send an e-mail asap to sophie.giffard@univ-grenoble-alpes.fr and pascal.lacroix@univ-grenoble-alpes.fr with your CV and a brief explanation of why you are applying.