Development of a Regional-Scale Early Warning System for Landslide Prediction Using Physics-Informed Deep Learning
(Proposer: Dr. Ascanio Rosi)

Landslide is a well-known natural hazard, posing threat to human lives, infrastructure, and economic stability worldwide. The increasing frequency of extreme weather events due to climate change has exacerbated the risk linked to rainfall induced landslides, hence the need for effective early warning systems is increased. Traditional approaches for landslide prediction usually relies on physical models or statistical methods, while recent advancements in artificial intelligence seems to offer new opportunities to improve the accuracy of landslide forecasts.

However, purely data-driven approaches may lack with physical consistency and interpretability. These limitations can be overcome by integrating physical knowledge into deep learning architectures, to set up more robust and reliable prediction systems.

In this research project, the student will explore the potentiality of physics-informed learning models for rainfall-induced landslide forecasting, to develop highly effective landslide early warning systems.

Starting from a comprehensive literature research, the student shall build a landslide inventory, as well as a geodatabase of the geotechnical parameters involved in slope stability analysis. This data will be then used to train and test a learning model, along with rainfall data, to identify and successively predict the conditions associated with landslide initiation, considering different terrain aggregation units (e.g. slope units, watersheds, etc.).

The candidate shall have basic knowledge of engineering geology, with a focus on slope stability analysis, and of GIS and programming skills. The student must be motivated, well-organized and shall be prepared to collaborate in an international working group, but also possess independent working skills and problem-solving abilities. The student will have access to High Performance Computing facilities for model training and system deployment.

Available Funds:
- DOR
- BIRD2023 - Progetti SID
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