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SIGALE: An online early warning system for gravitational hazard (Savoie, France)

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The *SIGALE* (System of Information Geographic for grAvitational hazard vigiLancE assessment) project aims at developing an experimental early-warning system of gravitational hazard (landslides and rockfalls) over the road infrastructure network of Savoie (France). This network is about 3 300 km long.

We propose a new approach based on machine learning to predict a vigilance degree. The vigilance degree is a combination of susceptibility model and trigger model.

The landslide susceptibility model is based on topographical data, landcover and lithology. The rockfall susceptibility model is based on statistical results of propagation using Flow-R.

The trigger models have been trained on an event database of 863 landslides and 481 rockfalls events from 2008 to 2020. The database covers 13 years, so about 4 745 days, over about 6 000 sectors. The thousand events are spread over 28 millions of spatio-temporal sectors. The dataset is thus highly unbalanced and specific machine learning has been deployed. The trigger models features are based on rainfalls and temperatures.

Our results show that, in spite of the high class imbalance issues of such database, the trigger models provide recall values of about 75%, with about 60% of precision.

Our prototype is a web-service showing vigilance degree model for both landslide and rockfall with different zooming information for decision support.