Landslide Susceptibility Mapping via binomial Generalized Additive Model

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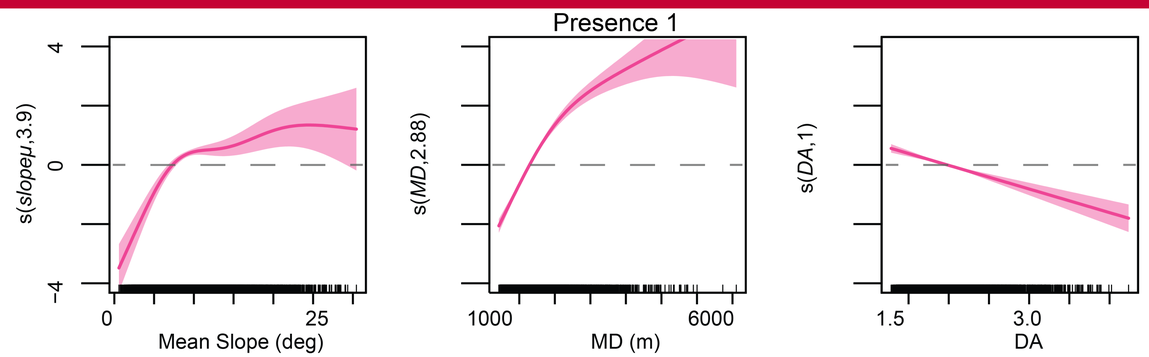
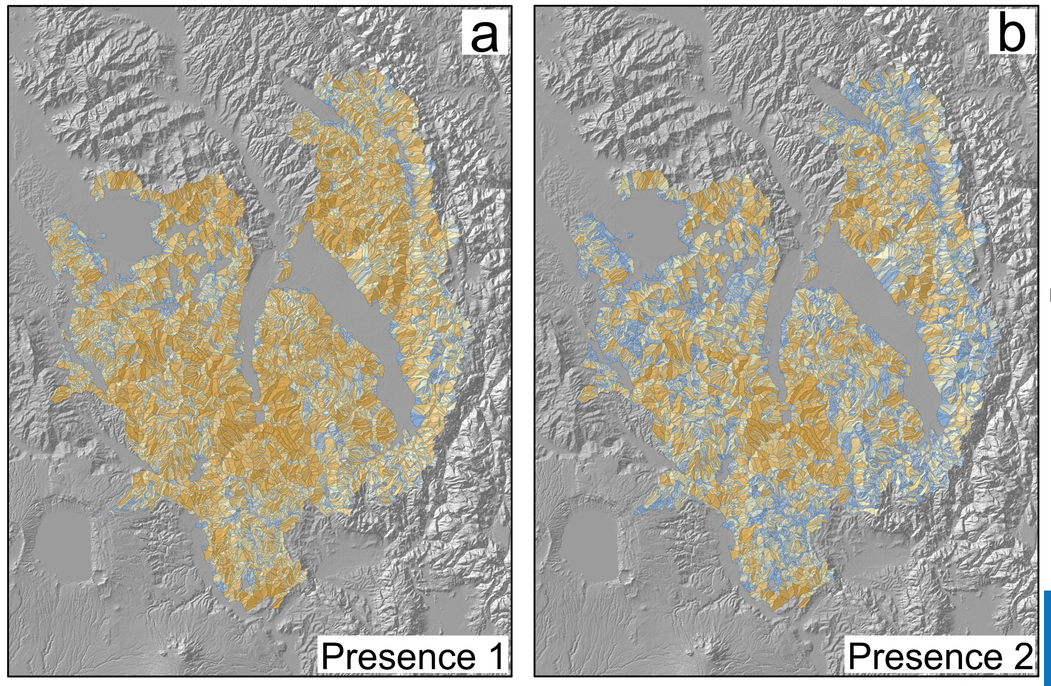
Introduction & Motivation

Developments of geostatistical models in landslide susceptibility mapping often do not consider interpretability, although this element has a reasonably fundamental importance on risk assessment. Last trends in machine learning demonstrate that enhancement of performances influences the interpretability of mechanical processes in geostatistical models, in which geomorphic causation is suddenly lost. We took the benchmark dataset in central Italy as our study case, for which a complete inventory of landslides is available. We built two landslide susceptibility models using a Generalized Additive Model (GAM) with a slope-unit partitioning of the area (~4,100 km^2, comprising 7,360 slope units), and a set of 26 independent variables, with the aim of classifying the presence/absence of landslides.

Results





Sample susceptibility maps, obtained as a simple fit (no calibration/validation, no multiple random selections) of the "presence 1" (a) and "presence 2" (b) landslide presence flags, using a GAM model.

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Sharing is encouraged

Conclusions

We tested the capability of a binomial GAM through nonparametric smoothing functions to evaluate the interpretability of the covariates. Furthermore, we obtained satisfactory results in terms of performance with a reasonable compromise in the interpretability.

GAMs are very popular classifiers in landslides susceptibility and even though other methods yield better performance, we suggest that interpretability in geostatistical analyses should proceed in tandem with improving the models' performances.