Doctoral Thesis Title: Modeling of the probability of ignition of forest fires using variables obtained with remote sensing techniques in the province of Loja-Ecuador

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Abstract:

Modeling of the probability of ignition of forest fires using variables obtained with remote sensing techniques in the province of Loja-Ecuador

Loja is a province located in the south of Ecuador, which has surroundings a mega diversity of unique flora and fauna (Aguirre Mendoza, Aguirre Mendoza, & Muñoz Ch, 2017). However, forest fires caused by human actions are the five most common causes of habitat fragmentation and ecosystem loss (Blondel & Fernandez, 2012). The increase in these is related to human activities (99%); in addition to other factors such as: vegetation cover (acts as fuel), climate, topography or wind speed (Silva et. al, 2010). This project proposes the generation of susceptibility maps to forest fires for each canton of the province of Loja from automated learning models based on open information VIIRS, Modis, Sentinel 2, as well as the prioritization of areas for permanent monitoring, which serve as a decision-making support tool for the National Risk Management Service and the Municipal Government of the 16 cantons of the province of Loja.

For the identification of variables for the generation of the forest fire susceptibility model and the vulnerability and fuel type maps, a bibliographical review of similar studies in other cities or countries will be based on and this information will be complemented with interviews with personnel involved with the theme. The required information will be download from Landsat 8, Sentinel 2B or MODIS satellite images (Costa-Saura et al., 2021).

Subsequently, the applicability of data mining techniques will be evaluated (Bergado et al. 2021), and one of the techniques will be selected to generate the propagation model on 80% of the data collected. Simultaneously, the predictive capacity of the model will be evaluated with the remaining 20% of the data. Once the model is approved, it will be applied to the province of Loja to determine the areas with the highest probability of forest fire propagation. Additionally, the generated maps will be validated in a participatory manner through the elaboration of talking maps with the support of farmers, PASF project technicians and the municipalities involved.

Forest fire susceptibility maps are expected to be generated for use in monitoring and early warning, easily accessible to the community and especially to the institutions involved in fire management. They will make it possible to identify the areas that need rapid intervention in prevention and combat, which leads to a reduction in the impact that these events have on the territory.

Available Means: For the fulfillment of the doctoral thesis the following means will be used:

- Download satellite data with Google Earth Engine for free on the online platform.
- Use of R-Studio + R free software.
- Software SAGA free environment.
- Use of software and Qgis associated with Python for modeling.

References

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