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Abstract

A Machine Learning Algorithm Approach to Map Wildfire Probability Based on Static Parameters †

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Abstract: Wildfires are occurring throughout the world, causing more damage to plant and animal species, humans, and the environment. Fire danger indices are useful for forecasting fire danger, and these indices involve the integration of both static and dynamic indices. The static indicators, such as vegetation, topographic characteristics, etc., are constant over the study area and are variables that promote the ignition of fires and, therefore, are useful for understanding fire patterns and distribution in the study area. In this study, the Static Fire Danger Index (SFDI) is generated using the MODIS Land cover type (MCD12Q1), the Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM), and the Open Street Map datasets by applying a Random Forest (RF) algorithm. Random Forest (RF) is a machine learning algorithm that can automatically select important variables and flexibly evaluate the complex interactions between variables. The MODIS, TERRA, and AQUA active fire points (MCD14) during 2011–2017 have been used to train the RF algorithm, and fire probability maps are generated for the years 2018 and 2019. The fire probability maps are categorized into five fire danger classes, i.e., very low, low, medium, high, and very high, on the basis of the RF prediction probability values. The active fire points (MCD14) have been used to validate the SFDI, and accuracy is found to be 85.74% and 87.91% for the years 2018 and 2019, respectively. Thus, the machine learning algorithm is successfully applied for generating the wildfire susceptibility maps.

Keywords: wildfires; RF; MODIS; SFDI; machine learning

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