An Accessible, Low Cost Tool for Citizen Scientists: Using Remote Sensing Techniques to Predict Fire Damage Propensity

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Over the last few years, devastating fires in California have destroyed habitats, released toxic fumes, and caused extreme heat. The megafires of 2020 burned 4.5 million acres, straining fire agencies and local communities, which could be alleviated through preemptive measures. The goal of this project is to (1) establish a correlation between land conditions prior to fire, using satellite indices, and the extent of fire damage and (2) build a tool for preemptive work. Wildfire statistics, such as latitude, longitude, and acres burned were obtained from CalFire's annual red books. In order to analyze land conditions, twelve parameters were identified and obtained from NASA & USGS Earth Data. Python code was written to process CSV files and classify the indices into bands for a machine learning model (ML). ML was first trained on data from 100 California wildfires of varying intensities over the last 19 years. ML was then used to predict fire intensities for 227 locations selected across California, based on satellite indices in August 2020. The ML model has a precision of 95.3% and area under Curve at a statistically significant value of 99.3%. Heat maps of high intensity fires were generated. The ML model identified a probability of >90% for 27 locations with >100,000 acres impacted 14 locations with >150,000 acres impacted This easily-accessible and high-precision model offers a prediction window to citizen scientists and ecological nonprofits for preventative measures. Some measures include removal of invasive species and the restoration of native plants.

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