

22. Identification of the best suited spectral Indices, difference/weighted fusion model for burn scar discrimination and automation of burn scar extraction using AI/ML model.

Aim

Comparative analysis of various Burn area Spectral Indices (BSI), features weighted fusion of various BSI with CVA towards their utility on Burn Scar mapping for an accurate discrimination.

Development of methodology for Automatic Burn Scar Extraction using AI/ML.

One of the most complex problem facing in deciduous forests of India is the recurrent incidence of fire. It is well known that fire caused extensive damage in the forest ecosystem by quantitatively and qualitatively. It impacts forest ecology, atmospheric systems, as well as having detrimental effects on living environment. A large variation exists between exact area burnt and area reported by ocular method by the forest staff. Most of times the area reported are less than reality or sometimes they are highly exaggerated. Error is introduced from primary stages as burnt area estimation technique is ocular without surveying in detail.

Scope

To reduce occurrences of forest fire, management of fire is highly important which entails mapping of forest fire frequency, severity, risk zones and identification of suitable area for watchtowers. Watchtowers at crucial points which give good overview of large parts of the area. Effective communication network, and mobility to reach affected areas swiftly are all important factors for effective fire protection. As per National working plan code-2014 (for sustainable management of forest & biodiversity in India) fire frequency assessment using satellite imageries has become mandatory for working plan preparation. This information can be used for identification of fire closure and regeneration areas as well as designing fire lines in working plan preparation. The Output of this study like mapping of forest Burn Scar, fire frequency, and risk zones assessment can support forestry services to process efficient vegetation recovery and post-fire management and in identification of suitable area for Watchtowers, as Watchtowers at crucial points are very essential to give good overview of large parts of the forest area for efficient management.

In this study, burn scar detection and discrimination capabilities of 8 widely used spectral indices in multi-temporal domain are envisaged to examine. The scope of the project includes utilization of satellite images for Burn scar detection and its discrimination followed by its frequency and intensity assessment. The present study using 8 Spectral Indices (SI)

like Burn Area Index (BAI), Burned Area Index Modified-ISWIR (BAIML), Burned Area Index Modified-sSWIR (BAIMS), Normalized Burn Ratio (NBR), Normalized Difference Vegetation Index(NDVI), Normalized Difference Moisture Index(NDMI), Mid Infrared Burn Index (MIRBI), Modified Soil-Adjusted Vegetation Index (MSAVI). Comparative analysis of various Burn area Spectral Indices (BSI), features weighted fusion of various BSI with CVA towards their utility on Burn Scar mapping for an accurate discrimination will be carried out. For automatizing the Burn Scar extraction image segmentation and various AI/ML model will be attempted and based on the accuracy, the final model will be selected.

Current constraints / Challenges

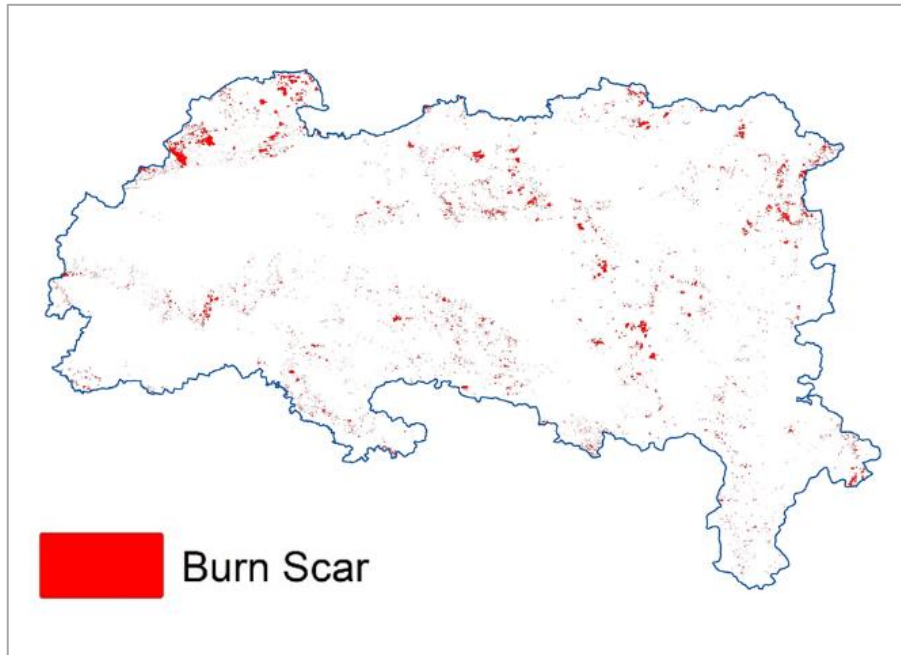
Currently, most of the fire information available online on Indian region are point location information on active fire. Also, the information on forest burnt area and fire frequency using satellite remote sensing data is not available. Today, many techniques have been developed to derive burn scar information from satellite remote sensing data, but these methodologies have been commonly applied to specific fire events. Also, the major estimation is based on coarse resolution sensors and is likely to be a conservative estimate of total burned area. None of spectral indices for burn scar delineation is providing required accuracy. This study with medium resolution sensors will attempt to provide of Burn Area in Indian forests with a better accuracy. The proposed method can overcome the disadvantages of traditional methods with selecting fixed thresholds and considering localized fire events.

Expected outcome

- Best suited SI-difference/weighted Fusion method for Burn Scar discrimination
- An automatic Burn Scar Extraction Model.
- Upscaling the model to different Forest ranges of the country

Timeframe

2022 – 2024



Forest Burn Scar extracted using Fusion of BAI, MSAVI, NBR & BAIMs in Vidarbha region of Maharashtra