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# Analysis of Remote Sensing Satellite Image for Deforestation in Amravati District, Maharashtra, India

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**ABSTRACT:** In the field of remote sensing images, satellite image processing allows various services like evaluation of vegetation, deforestation, weather change, land use land cover classification, temperature variations etc. where features required to be distinguished. Satellite remote sensing allows a fundamental data for observation and for calculating deforestation effect. The data from the Moderate Resolution Imaging Spectroradiometer (MODIS), locally accessible National Aeronautics and Space Administration (NASA) Earth Observing System (EOS) satellite offers the ability to create deforestation discovery because of its data availability on daily basis. In this work, analysis of deforestation of Amravati district of Maharashtra will be carried out for last 2 decades using various spectral indices and supervised classification algorithms.

**KEYWORDS:** MATLAB, GIS Tool

## I. INTRODUCTION

Remote sensing is the procedure of detecting and monitoring the physical characteristics of an object, area or feature without physically coming in contact to it through measuring its reflected and emitted radiation at a distance generally from satellite or aircraft. Humans apply remote sensing of their every day life, through vision, hearing and sense of smell. The data collected can be of many forms, variations in acoustic wave distributions (e.g., sonar), variations in force distributions (e.g., gravity meter), variations in electromagnetic energy distributions (e.g., eye) etc. These remotely collected data through various sensors may be analyzed to obtain information about the objects or features under investigation. Thus, remote sensing is the process of inferring surface parameters from measurements of the electromagnetic radiation (EMR) from the Earth's surface. This EMR can either be reflected or emitted from the Earth's surface. In other words, remote sensing is detecting and measuring electromagnetic (EM) energy emanating or reflected from distant objects made of various materials, so that we can identify and categorize these objects by class or type. Remote sensing provides a means of observing large areas at finer spatial and temporal frequencies. It finds extensive applications in watershed studies, hydrological states and fluxes simulation, hydrological modeling, disaster management services such as flood and drought warning and monitoring, damage assessment in case of natural calamities, environmental monitoring, urban planning, deforestation etc. In remote sensing terminology, electromagnetic energy is usually expressed in terms of wavelength,  $\lambda$ . All matters reflect, emit or radiate a range of electromagnetic energy, depending upon the material characteristics. In remote sensing, it is the measurement of electromagnetic radiation reflected or emitted from an object, is the used to become aware of the goal and to infer its properties.

### Deforestation

Remote sensing is the most essential technique used for the forest ecology, to manage several applications like monitoring species, land cover changes like fragmentation of habitat and various other properties of forests. Multi-spectral remote sensing images are most efficient way to obtain information of the environment. It generally acquires information and extracts the features based on some objects, area such as vegetation, land cover, water etc. it has many applications in areas including forest classification, land cover classification, snow mapping etc. Loss of forests results in deforestation. These losses are in the form of human activities like road construction, mining, shifting cultivation etc.



As per 2019 forest report, India's total forest cover is 712,249 sq.km. i.e. around 21.67% of its total geographical area. This per cent is not exactly one fourth of the total forest cover however India has to reach the target of 33 % of forest and tree cover to have proper resources. If we look at the situation Maharashtra has lost about 6,346 hectares i.e. 63 sq.km. of forest cover for various other urbanization purposes between the years from 2014 to 2017, revealed the data from higher union environment authority. In the field of remote sensing images, satellite image processing allows various services for analysis and deforestation, climate change, ecosystem and land surface temperature are some of the major research areas, where features required to be distinguished. In scene arranging and asset administration, the checking land adjusts are critical movement. Satellite remote sensing allows a fundamental data for observation and for calculating deforestation effect. To speak to high-determination woods mapping will utilize novel remote-detecting advancements, for distinguishing and mapping the deforestation territory, the application is as yet constrained as it were. The lack of systematic availability, cost of acquisition, challenging processing requirements and complex interactions with forest structure that are band dependent limitations contributing to poor performance of distribution-free methods from small sample sizes and imbalanced data, these are the limitations for the radar. In context, field measures applied were limited to a very small sampling intensity and there are challenges which would limit the effectiveness of high resolution pixel analyses. Utilizing hybrid algorithm and I suggested a satellite image for detection of deforestation.

## II. RELATED WORK

The decrease of farmland area is significant. The main reason for farmland reduction is that substantial proportion of the original farmland has now been converted into other agricultural lands. The absolute quantity of land use change has been great, with the internal conversion among agricultural land use dominating. The rapid socio-economic development of Guangzhou is the main driving force for land use change. Due to the readjustment of the agricultural structure and other reasons, a large area of farmland has been converted into other types of agricultural lands. Meanwhile, the rapid urban expansion has also caused the significant change of agricultural into constructional land. One is a supervised method, treating land use map generation as pattern classification problem assuming few labeled pixels are available from different land use regions. The other is an unsupervised technique, considering land use map generation as clustering based image segmentation problem. The proposed supervised APC algorithm is compared with two other popular classification algorithms. In summary, from the experimental observation it is seen that both the supervised and unsupervised APC algorithms are useful for automatic land use map generation from multispectral remotely sensed images. In future we can plan to test the proposed algorithm on various kinds of remotely sensed data as well as compare the results with other existing techniques. This reduction was caused by diminishing reserves in the area and a decline in the required production. The forest area also decreased by 172 ha between 2004 and 2008. It was concluded that the classification accuracies for both images are close to each other, but the IKONOS image classification accuracy, 97.70%, is higher than the Quick Bird image classification accuracy, 93.86%. This difference can be explained by the difference in their spectral bands. The results show that the methodology can be utilised effectively in monitoring changes in land use in surface coal mining areas. It also provides essential input for planning mine reclamation and closure activities. Common land use categories namely built-up area, water bodies, vegetation, grassland and open land are considered for classification for all eight selected years of satellite images. Initially, an Isodata based unsupervised classification with the maximum of six iteration is conducted to classify the IRS images with bands 2 (green), 3 (red), and 4 (near infrared) using ENVI 4.3 image processing software. The accuracy of the classification is verified using Google Earth map. The original classification of land use of 25–30 categories are aggregated to five land uses using combined classes procedure as (i) urban or built up area, (ii) water bodies, (iii) vegetation (iv) grass land and (v) open space. The area of each land uses is obtained using class statistics option available in the software. The urban part of study area includes high density built up area, low density built up area, infrastructure, roads and highways, industrial land use and also covers a very small part of monuments and temples within the city limit. Open space includes barren land, open area (ie. play ground), unpaved area along the bitumen and concrete roads, dry river bed and dry cultivable land. Water bodies include water in the temple tanks, flowing water in the river, rainwater standing in the agricultural field and residential layout and standing irrigation water in the agricultural field. Vegetation refers to the ground cover provided by the wide variety of plants. It includes cultivated garden, lawn, road side weed patches and trees. The grass land includes area covered by grass and scrub. The processed image is verified with field data and also using Google image of the study area. Comparing products with others that have had their accuracy assessed is an alternative approach as previously. We can extend this approach by comparing the results with a synthesis of multiple products. Song et al. (2011) used a regression tree model to integrate forest cover from GLC 2000, MODIS VCF, GLCC, GlobCover, and the standard MODIS classification to create a 5-km product.

### III. METHODOLOGY

In this study, multispectral satellite data of planet scope 3 meter resolution provided by M.R.S.A.C. Amravati district from October 2019 to February 2020 is being processed and then analysis is done for the forest cover change. The algorithms are generated using matlab and statistics are generated using temporal data for the duration of five months. To get the efficient use of data some image processing techniques like pre-processing, enhancement segmentation and classification are applied on remote sensing data to find the forest areas. The main aim is to observe the forest cover change and analyse the image on basis of NDVI classification including various classes of forest. The main aim of image enhancement is used to have an easy interpretation and bring out the fine details of the image. It is a method of contrast adjustment by stretching out the intensity values with improved contrasts. In histogram equalization the global contrast intensities are increased. The main aim of image enhancement is used to have an easy interpretation and bring out the fine details of the image. It is a method of contrast adjustment by stretching out the intensity values with improved contrasts. In histogram equalization the global contrast intensities are increased by forming histogram of an image as it allows the region of low local contrast to gain higher contrast. And the histogram formation takes place by spreading the most frequent intensity values. For this study enhancement process is performed by histogram equalization method with the help of matlab. The first step of this process is conversion of original images to grey scale images. After conversion of images to gray-scale the formation of histogram is done by using the formula for discrete values as the probability of occurrence  $Pr(r_k)$  of gray level  $r_k$  in an image is given.

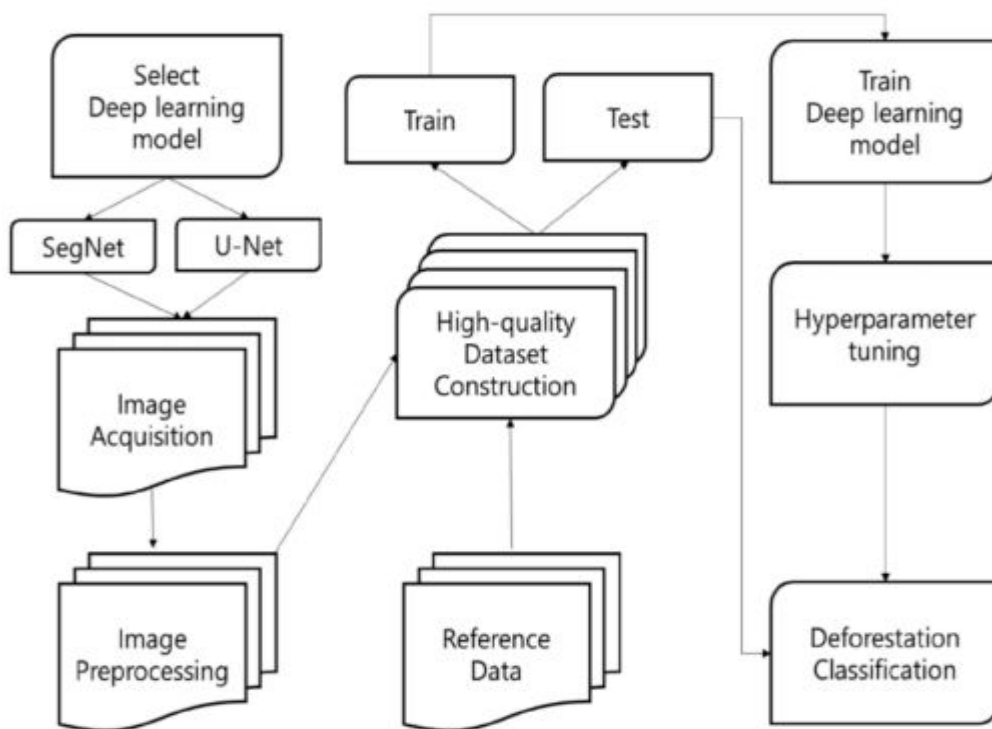


Fig 1. Flow Chart

#### SegNet

We present a novel and practical deep fully convolutional neural network architecture for semantic pixel-wise segmentation termed SegNet. This core trainable segmentation engine consists of an encoder network, a corresponding decoder network followed by a pixel-wise classification layer. SegNet is effective in terms of learning speed and accuracy. The architecture of SegNet consists of encoder and decoder processes.



The architecture of the encoder network is topologically identical to the 13 convolutional layers in the VGG16 network. The role of the decoder network is to map the low resolution encoder feature maps to full input resolution feature maps for pixel-wise classification.

The novelty of SegNet lies in the manner in which the decoder upsamples its lower resolution input feature map(s). Specifically, the decoder uses pooling indices computed in the max-pooling step of the corresponding encoder to perform non-linear upsampling. This eliminates the need for learning to upsample. The upsampled maps are sparse and are then convolved with trainable filters to produce dense feature maps. We compare our proposed architecture with the widely adopted FCN and also with the well known DeepLab-LargeFOV, DeconvNet architectures. This comparison reveals the memory versus accuracy trade-off involved in achieving good segmentation performance.

### U-Net

UNet is convolution neural network architecture that expanded with few changes in the CNN architecture. It was invented to deal with biomedical images where the target is not only to classify whether there is an infection or not but also to identify the area infection. Analysis Of Remote Sensing Satellite Image For Deforestation. The U-Net is a convolutional neural network architecture that is designed for fast and precise segmentation of images. It has performed extremely well in several challenges and to this day, it is one of the most popular end-to-end architectures in the field of semantic segmentation

### Future Scope

These system can able to connect with cloud computing server like AWS and store all the field value on could for whole country. These concept can we motorized with deforestation and serve it regularly. These methodology will easily connect with Digital marketing so whenever we buy something related to wood. System will show us deforestation rate of that place.

## IV. CONCLUSION

Using these literature review and following block diagram I will try to make my dissertation work on such parameter with given data sets. Satellite images were classified using the FCN-based U-Net and SegNet deep-learning algorithms.

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