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**CSE102L Computer Programming Lab**

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“On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Submitted to:

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**Paper 1:- Forest aboveground biomass estimation using Landsat 8 and Sentinel-1A data with machine learning algorithms**

**Summery: -**

Forest aboveground biomass (Agb) had searched in the researched paper given to me. In this paper researcher point out the estimate of AGB by remote sensing which an effective method to calculate and determine the regional scale of AGB. In this study remote sensing (Landsat 8 Operational Land Imager and Sentinel-1A) with three algorithms (linear regression (LR), random forest (RF), or the extreme gradient boosting) is used at different region of china. Thrice algorithms could use but the extreme gradient boosting is an effective method to estimate ABG. The forest ecosystem is the wide and the most important natural ecosystem in the terrestrial ecosystem.it fulfill the oxygen and carbon cycle in the environment and keep balance at global level. Correct estimation of forest biomass in large areas is essential. For a small forest stand, the AGB calculation is more accurate when based on actual field measurements. However, the use of field measurements to calculate forest AGB is not feasible at the regional scale, as it is too costly, labor intensive, and time consuming. The remote sensing can effectively measure biomass at the regional scale therefore, various types of remote sensors, that use both passive and active sensors, have been used to estimate AGB. As an active type of remote sensing, radar has the ability to penetrate the canopy and interact with the main biomass components e.g (the tree trunks and branches).

For this analysis an exhaust statistical regression model can be built using the sample data and remote sensing parameters. Due to this, the classical statistical regression method can not relationship b\w forest AGB and remote sensing data. For this search, the AGB of a subtropical forest has been estimated using remote sensing and the LR and two machine learning algorithms RF advanced GB system, is widely used by data scientists and provided state-of-the-art results for many problems. Despite the excellent performance of XGBoost, XGBoost has many parameters that need to be tuned. To date, few researchers have used XGBoost to estimate forest aboveground biomass based on remote-sensing data. Li *et al*. used data from two sources, China’s National Forest Continuous Inventory and Landsat 8, in combination with three separate algorithms, LR, RF, and XGBoost, to establish biomass estimation models.The ended study indicated that the XGBoost models significantly improved the estimation accuracy compared with the LR models, and reduced the problems to a possible limit.

The main specific objectives of this study were as follows:

(1) to face the process and effect of tuning parameters for the RF and XGBoost.

(2) To re capable the capability of the RF and XGBoost for estimating AGB

(3) To compare the accuracy of the LR, RF, and XGBoost models using different datasets

(4) To collect the data and draw the AGB map for the study area.

**Paper 2:-Estimating Aboveground Biomass on Private Forest Using** **Sentinel-2 Imagery**

**Summery:-**

The Indonesian tropical forest is home to myriad flora and fauna, including charismatic species such as orangutans (*Pongo pygmaeus*), Sumatran tigers (*Panthera tigris sumatrae*), and rhinos (*Rhinocerossondaicus*). Unfortunately, the Indonesian tropical forest is under threats due to degradation and deforestation. In a time span of a decade from 2000 to 2010, 14.7 Mha of Indonesian tropical forests has disappeared. Deforestation in Indonesia is eventually becoming a global concern. This phenomenon has not only driven Indonesia to lose forest areas but also increased the greenhouse gas (GHG) emission, which in turn can lead to the accumulation of GHG in the atmosphere. Considering the important role of the forest monitoring system, understanding the spatial distribution of aboveground biomass (AGB) is crucial. AGB represents a majority of biomass values on the terrestrial ecosystem and is a useful parameter to measure the velocity of forest succession. Furthermore, AGB also provides valuable information for forestry strategic planning. AGB accumulation in the earth can be increased through expanding plantation areas such as private forests. Private forests have a potential to store AGB reaching a capacity of up to 300 tons/ha. The number of private forests in Indonesia is likely to increase annually in accordance with the ambition of the government to expand social forestry areas at 12.7 million ha by 2019. The capabilities of remote sensing for assessing AGB have been tried in some types of forest in Indonesia like tropical forest and mangrove. However, information and methods for estimating AGB in private forests through remote sensing have not been treated in much detail.

Remote sensing based on vegetation indices has been widely used for estimating AGB. The vegetation index is enhanced by strong reflectance of near infrared (NIR) due to leaf internal scattering and high chlorophyll absorption by the red region of wavelength. One of the vegetation indices used to estimate biomass is the normalised difference vegetation index (NDVI). However, there are certain problems associated with the use of NDVI. One of these is that NDVI has a saturation problem particularly for dense vegetation which tends to have a high level of biomass. Utilisation of vegetation indices based on wavelengths located in the red edge is then a method that is proposed to overcome that problem.

Sentinel-2 is a new generation of multispectral satellite imagery that has been launched on 23 June 2015 by the European Space Agency (ESA). Sentinel-2 is a continuing image data from Landsat and SPOT, offering 13 spectral bands with 3 spatial resolutions (10 m, 20 m, and 60 m), a wide swath of 290 km, a radiometric resolution of 12 bits, and 5 days of revisit times by two satellites.

**Comparison:-**

Both papers point out and explain an exhaustive figures and statement for estimation of ABG. But the first paper has searched data to large extent, all the measurement and the quick figure diagram is included in paper. On the other side paper 2 explain correct and many symptom’s and precaution as well such as deforestation and pollution due to different reasons. But Papers 1 is over searched paper on paper 2.