LEAF WOOD SEPARATION OF TLS POINT CLOUD OF MANGROVES

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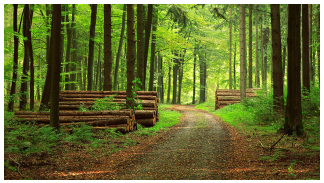
Background

Mangroves grow in hostile environments – marshy and saline.

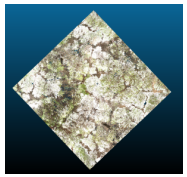
Terrestrial Laser Scanner (TLS) captures 3D details of forests actively and accurately.

Retrieval of biophysical parameters like tree height, AGB, canopy cover, etc. requires separation of point clouds into wood and leaves.

Traditional foliage filtering methods produce erroneous results when applied to TLS point clouds of mangroves.



Materials

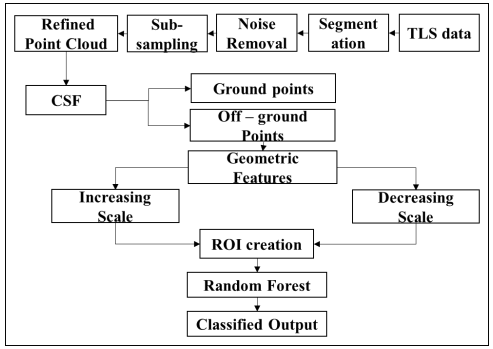


Faro Focus S 350 TLS at 1550nm wavelength was used to collect point cloud data from a 33m x 33m plot (72.81897 19.23719) in Gorai, Maharashtra, India.

Research Goals

(i) To find a method to separate the leaves from wood of raw point cloud data, (ii) to find features substantial to the process, and (iii) to find the spatial scales at which the inter-class separability is maximum.

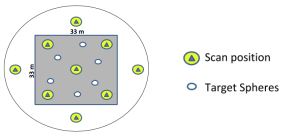
Methodology



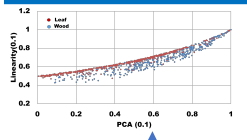
CSF – Cloth Simulation Filter , Increasing scale - 0.1m, 0.25m, and 0.5m & decreasing scale - 0.1m, 0.075m, and 0.05m

Features extracted at both sets of scales (19*3)

1st eigenvalue, 2nd eigenvalue, 3rd eigenvalue, verticality, sphericity, surface variation, linearity, planarity, anisotropy, roughness, eigenentropy, omnivariance, sum of eigenvalues, normal change rate, gaussian curvature, mean curvature, first-order moment and the first two principal components.



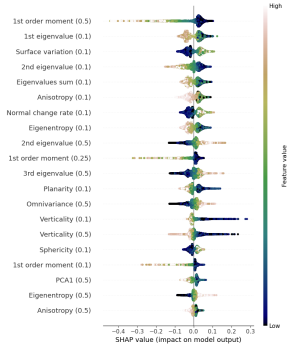
Results

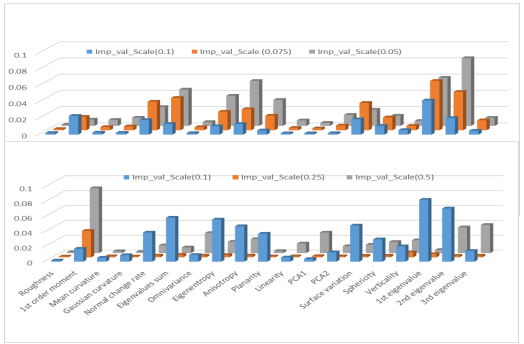


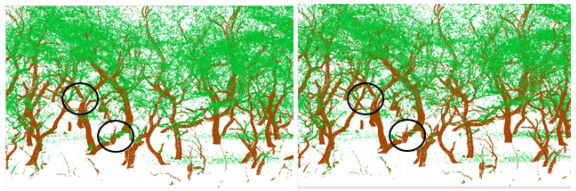
Scatterplot showing separability between classes.

Features' impact on model output at increasing scale

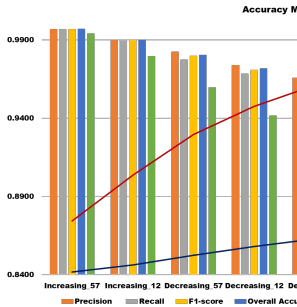
Feature Importance values







Classified output (left) decreasing scale, (right) increasing scale.



Discus

- Features at increasing sca components better than featu
- Features having most imp moment, 1st and 2nd eig eigenvalues sum, anisotropy,

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References –

- *Feliciano, E. A., Wdowinski, S., mangrove above-ground biomass scanning: A case study in the Ev 34, 955-968.*
- *Adimoolam, Y. K., Pillai, N. D., Kumar, V. (2022). Estimation of Al Forests from Terrestrial LiDAR Learning Algorithms.*
- *Vicari, M. B., Disney, M., Wilk Woodgate, W. (2019). Leaf and terrestrial LiDAR point clouds. M 10(5), 680-694.*