ForestSAT 2026

Association for Forest Spatial Analysis Technologies

May 4-8, 2026 | Gainesville, Florida, USA

Title: TLS Point Cloud Processing and Leaf–Wood Segmentation Using Open-Source Methods

Instructors/Affiliation: Jinyi Xia (jinyixia@ufl.edu).

School of Forest, Fisheries, and Geomatics Sciences, University of Florida, Gainesville, FL, 32611, USA

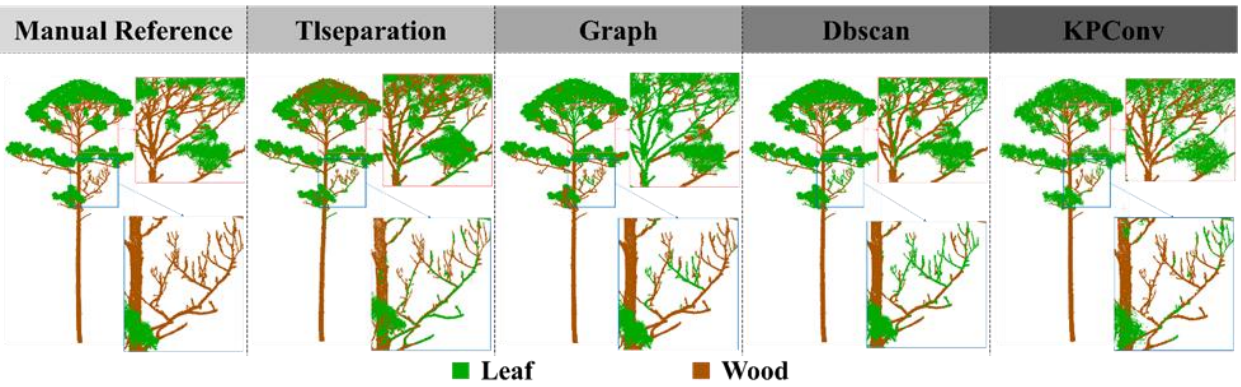
Description: Accurate segmentation of leaf and wood components is a critical step for tree structure analysis using Terrestrial Laser Scanning (TLS) data. This workshop introduces participants to open-source tools and workflows for preprocessing TLS point clouds and performing leaf–wood classification using both rule-based and machine learning approaches. Participants will gain hands-on experience with the following methods: i) TLSeparation – a heuristic algorithm based on geometric features; ii) DBSCAN – a density-based clustering algorithm; iii) Graph – identifies wood points by generating graph structure; iv) KPConv – a deep learning algorithm based on kernel points.

The workflow includes point cloud normalization, filtering, segmentation, visualization, and evaluation using reference data. Comparative performance of the methods will be discussed in terms of accuracy and transferability across species.

Requirements: Computer with R and Python (or Anaconda) environments installed. Instructions for installing specific packages will be provided in the workshop.

Schedule: January 15, 9:00 AM – 2:00 PM (EST)

Duration: 4 hours.



Learning Objectives: By the end of the workshop, participants will:

- Understand the importance of accurate leaf–wood segmentation in TLS-based tree structure analysis
- Learn to preprocess TLS point clouds (normalization, filtering, visualization)
- Gain practical experience with segmentation methods: TLSeparation, DBSCAN, and Graph.
- Evaluate and compare segmentation results using reference data

Target audience: Graduate students, researchers, and professionals in forestry, ecology, remote sensing, or geospatial analysis who work with TLS data and are interested in tree structure modeling and point cloud classification.

Format & Activities: This is a hands-on workshop that includes short presentations followed by practical sessions using real TLS point cloud datasets. Participants will install and use open-source tools in R and Python to perform data preprocessing and apply multiple leaf–wood segmentation methods. Comparative analysis will also be discussed.

Expected outcomes: Participants will:

- Gain practical skills in preprocessing and segmenting TLS point clouds
- Learn to apply and compare different leaf–wood classification techniques
- Understand strengths and limitations of rule-based vs. machine learning approaches
- Be able to apply these workflows to their own TLS datasets

Language: English

Instructor Biography:

Aug.2022 - present: Jinyi Xia is a Ph.D. candidate in the School of Forest, Fisheries, and Geomatics Sciences at the University of Florida. Her research focuses on applying terrestrial and mobile laser scanning (TLS/MLS) to quantify three-dimensional structural attributes of Southern pine forests, with particular emphasis on stem and branch morphology, crown

architecture, and their responses to silvicultural treatments. She integrates advanced point cloud processing techniques, semantic segmentation algorithms, and quantitative structure modeling (QSM) to improve the accuracy of tree metric estimation and to enhance the applicability of LiDAR technologies for forest monitoring and management.

Agenda

Eastern Time (ET)	**Topic**	**Instructor**
09:00 – 10:00	Introduction to TLS and data preprocessing	Jinyi
10:00 – 10:30	Introduction to TLSeparation	Jinyi
10:30 – 11:00	Introduction to DBSCAN	Jinyi
11:00 – 11:30	Introduction to Graph	Jinyi
11:30 – 12:00	Introduction to KPConv	–
12:00 – 13:00	Lunch break	Jinyi
13:00 – 14:00	Introduction to leaf and wood separation evaluation	Jinyi