

Lidar Remote Sensing For Forestry Applications

Course Code: FOR 6934 Topics | Spring 2025
Instructor: Dr. Carlos Alberto Silva



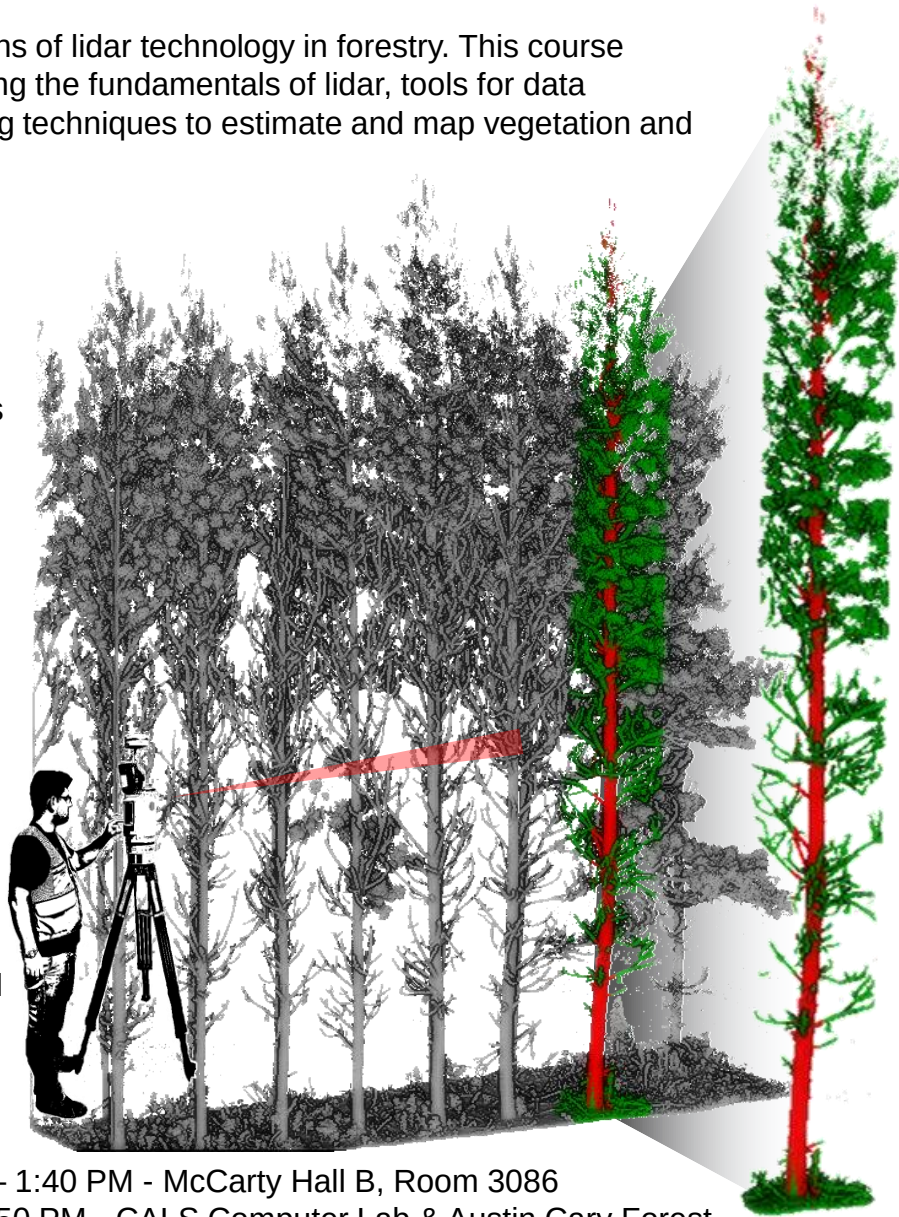
Course Overview

Explore the cutting-edge applications of lidar technology in forestry. This course provides hands-on learning, covering the fundamentals of lidar, tools for data processing, and advanced modeling techniques to estimate and map vegetation and forest structures.

Learning Objectives

Upon completing the course, students will:

- Gain a comprehensive understanding of lidar technology and its applications in forestry;
- Process raw lidar data (las/laz format) to create digital terrain and canopy height models;
- Extract key lidar-derived metrics to assess vegetation structure.
- Develop statistical models for estimating and mapping vegetation attributes;
- Analyze and evaluate their own lidar datasets using advanced methodologies;
- v) Accurately measure physical attributes of individual trees and forest stands, including timber volume.



Class Schedule

•**Lectures:** Mondays, 11:45 AM – 1:40 PM - McCarty Hall B, Room 3086

•**Labs:** Tuesdays, 12:50 PM – 3:50 PM - CALS Computer Lab & Austin Cary Forest

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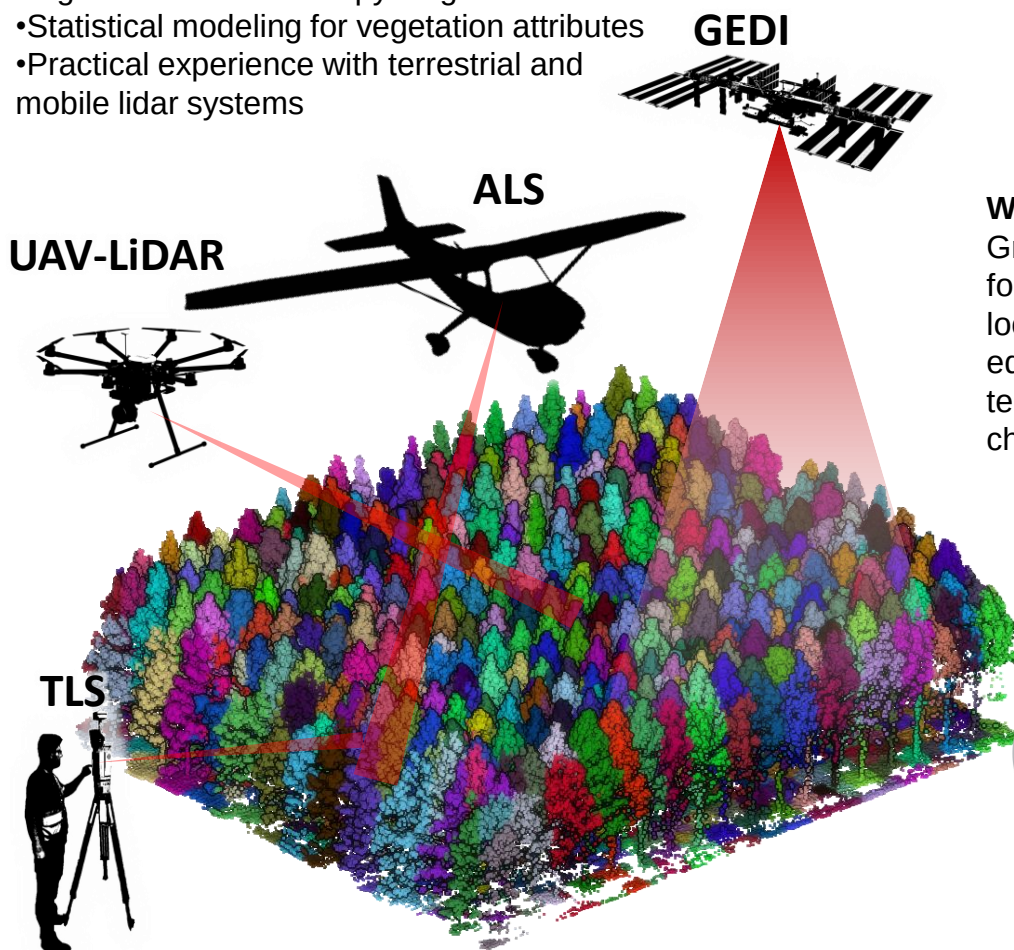


Key Topics Covered

- Principles and applications of lidar technology in forestry
- Platforms and systems for data collection
- Open-source tools for lidar processing (R, FUSION/LDV)
- Digital terrain and canopy height models
- Statistical modeling for vegetation attributes
- Practical experience with terrestrial and mobile lidar systems

Hands-On Learning

Labs feature lidar processing tools and fieldwork at locations like the Austin Cary Forest. Develop your own lidar-based project tailored to your research interests, guided by expert faculty and real-world datasets.



Who Should Enroll?

Graduate students in forestry and related fields looking to apply cutting-edge remote sensing techniques to real-world challenges.



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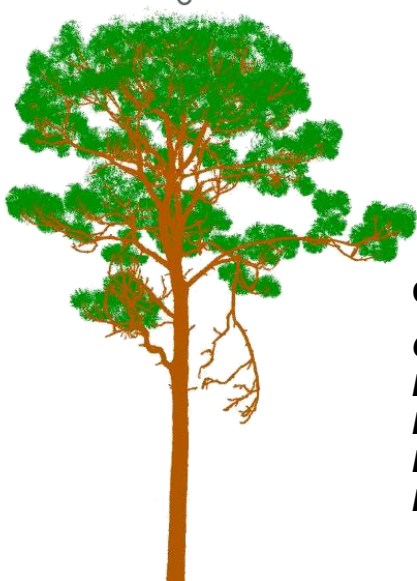


Course Essential Questions

- What is lidar and how this technology can be applied in forestry?
- What are the lidar platforms and systems?
- What are the state-of-the-art open-source tools for lidar data processing?

Cornerstone Tasks

- **Laboratory Assignments:** Submit written reports summarizing lab activities and the synthesis of collected field data. These assignments will also reinforce your skills in R programming.
- **Quizzes:** Complete online assessments to evaluate your knowledge. Quizzes will be accessible through the course website (e-Learning at UF).
- **Lecture Notes:** Prepare concise, one-page notes to capture key concepts and insights from lectures.
- **Reading Assignments:** Write summaries and analyses of assigned research articles to deepen your understanding of relevant topics.
- **Final Project:** Collaborate with your team to design, develop, and present a comprehensive lidar application project as a capstone experience.



Grading

Quizzes (10 @ 10 pts each):	100 pts
Lecture Notes (10 @ 5 pts each):	50 pts
Readings (10 @ 5 pts each):	50 pts
Lab Assignments (10 @ 15 pts each):	150 pts
Final Project (written 200 pts + presentation 150 pts)	350 pts
Total: 700 pts	

Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Course Score	638 - 700	580 - <638	522 - <580	464 - <522	406 - <464	348 - <406	290 - <348	232 - <290	174 - <232	116 - <174	58 - <116	0-<58
Grade Points	4	3.67	3.33	3	2.67	2.33	2	1.67	1.33	1	0.67	0

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About the instructor



Dr. **Carlos Alberto Silva** is an Assistant Professor of Quantitative Forest Science at the School of Forest, Fisheries, and Geomatics Sciences (SFFGS) at the University of Florida (UF). He directs the Forest Biometrics, Remote Sensing, and Artificial Intelligence (AI) Lab (SilvaLab). His research advances the understanding of forest ecosystem dynamics through cutting-edge remote sensing technologies, AI, and quantitative analysis. Dr. Silva addresses critical ecological and management challenges by developing innovative statistical models and open-source tools that leverage LiDAR data from terrestrial (TLS), airborne (ALS), and satellite platforms (e.g., GEDI, ICESat-2), alongside optical and radar (SAR) imagery.

His work quantifies forest structure, monitors aboveground biomass, and assesses the impacts of natural and human-induced disturbances—such as fire and hurricanes—on ecosystems at various spatial scales. By integrating these advanced technologies, he provides actionable insights for sustainable forest management, carbon monitoring, and biodiversity conservation. At the SilvaLab, Dr. Silva bridges the gap between remote sensing and forest science, creating tools such as rGEDI, TreeTop, rLiDAR, ForestGapR, leafR, and ICESat2VegR. These tools empower scientists, land managers, and policymakers to monitor forests more accurately and efficiently. Previously, Dr. Silva worked as a research scientist at the University of Maryland, NASA's Jet Propulsion Laboratory, and NASA Goddard Space Flight Center. He has authored 120 research articles and is currently involved in 11 projects, serving as Principal Investigator (PI) on seven projects funded by NASA, NSF, the USDA Forest Service, and the Joint Fire Science Program. Since joining UF in 2021, he has secured over \$9 million in research funding. Dr. Silva is also a member of NASA's Carbon Monitoring System (CMS) and the ICESat-2 Science Teams.

<https://carlos-alberto-silva.github.io/silvalab/lab.html>

