Joshua Carpenter

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Education

2020 – 2025 **Ph.D.** Civil Engineering - Geomatics, Purdue University, IN
Specializing in Computational Science and Engineering
Academic advisor: Dr. Jinha Jung
Thesis Title: Deriving Hardwood Species and Functional Traits from 3D Point Clouds

2018 – 2020 **M.S.** in Geomatics, Civil Engineering, Purdue University, IN

2009 – 2013 **B.S.** in Surveying and Mapping, University of Akron, OH

Appointments

2024 – Present **Assistant Professor**, Department of Civil Engineering, The University of Akron

2020 – 2024 **Research Assistant**, Geospatial Digital Science Lab, Purdue University

- Served as lead UAV pilot for the Geospatial Data Science Lab (GDSL)
- Managed large-scale ground and aerial data collection campaigns over research forests
- Developed algorithms for building digital twins
- Aided in the development of projects and proposals

2023 – 2024 **Team Member,** Welcome to the Jungle, XPrize Rainforest Competition Finalists

- Lead UAV pilot for rainforest data collection during the semifinals in Singapore
- Implemented fast-turnover data processing and analysis during the semifinals
- Designing our team's mapping and analysis elements for the upcoming finals

Teaching Experience

2024 – Present **Assistant Professor**, Department of Civil Engineering, The University of Akron

SURV 100 Introduction to Geomatics – An introduction to the field of geomatics focusing on its history, current applications, and professional participation. (in person)

SURV 101 Basic Surveying – An introduction to elementary planar surveying calculations and field procedure. (in-person)

SURV 102 Topographic Surveying – Field methods and data processing for topographic mapping. (in-person)

SURV 310 Computations and Adjustments – Basic statistics, error propagation, and linear least squares in the context of surveying measurement adjustment. (online)

SURV 330 Photogrammetry – An overview of classic photogrammetric mathematics and introductory image processing with applications in structure from motion processing. (hybrid)

SURV 431 Senior Seminar – A review for the Fundamentals of Surveying Exam. (in person)

SURV 450 Special Topics in Professional Development – An investigation of recent and ongoing changes in the surveying profession. (in person)

SURV 489 LiDAR Data Processing – Basic point cloud manipulation and analysis using Python programming. (in person)

SURV 489 Geodesy – An introduction to the shape of the earth, projections, and coordinate systems. (in-person)

2022 **Instructor**, CE 299 Developing Tomorrow's Infrastructure: An Intro. to Civil Engineering, Purdue University
- Developed interactive curriculum to introduce geomatics and the surveying profession
- Team-taught the week-long course to expose 30 high schoolers to civil engineering

2020 – 2021 **Assistant Instructor**, Summer College for Highschool Students, Purdue University
- Aided in designing and implementing day-long activities to introduce geomatics
- Presented short lectures on surveying and UAV data collection

2018 – 2021 **Teaching Assistant**, CE 203 Principles and Practice of Geomatics, Purdue University
- Taught lab sessions covering, surveying, photogrammetry, GIS, and remote sensing
- Developed online instructional material for lectures and lab assignments
- Aided in preparing packages for ABET accreditation

Work Experience

2014 – 2018 **Professional Surveyor** (S-8733), KS Associates, Elyria, OH
Highlighted Projects:
- NEORSD Collection System Asset Renewal – field surveying and confined space scanning
- NEORSD Green Infrastructure Design – utility mapping and records research
- CLE International Airport Layout Plan – FAA field surveying and drafting
- GCRTA Redline Greenway – boundary retracement and field railway surveying
- Mariner's Point Sand Monitoring – hydrographic surveying, land surveying, and mapping
- Eaton Center in Beachwood OH – construction layout

2014 **Manager Trainee**, Hoist and Crane, Jefferson, LA
Highlighted Skills:
- Overhead hoist and crane inspection in chemical and steel manufacturing facilities
- Electrical, mechanical, and hydraulic inspection and minor repair
- High tolerance alignment and survey of overhead crane rails

Outreach

2023 **Technical Expert**, Delegation to Honduras for training InfoAgro on the operation of unmanned aerial vehicle data collection and processing procedures, facilitated by the USDA-Foreign Agricultural Service, Purdue University, and Texas A&M AgriLife Research

2022 **Presentation Judge**, Spring Undergraduate Research Conference, Purdue University

2021 **Geomatics Undergraduate Concentration Rep.**, Concentration Fair, Purdue University

2019 **Invited Speaker,** Indiana Society of Professional Surveyors - Student Chapter, "Cave Mapping – Surveying as a Hobby," Purdue University

2011 – 2012 **Conversation Partner**, English Language Institute, University of Akron

Scholarships and Awards

2023 **Doctoral Talk Award**, Computational Interdisciplinary Graduate Program, Purdue University

2023 **Fareed and Rosemarie Nader Persistence Educator Award**, Purdue University

2022 **Gill Endowment Travel Fund**, Purdue University

2022 **Professor Edward M. Mikhail Endowment**, Purdue University

2022 **Indiana View Scholarship**, Indiana View

2021	**Roland S. Corning II Memorial Fund**, Purdue University
2020	**Nellie Munson Teaching Assistant Award**, Purdue University
2013	**Professional Land Surveyors of Ohio Academic Scholarship**, PLSO
2012	**Graduating Associate Degree Outstanding Scholastic Achievement**, University of Akron
2011	**Charly Salem Award for Academic Excellence**, University of Akron

Proposed Projects

2025	**Principal Investigator**, Innovative Approach to Identify ODOT Owned Right of Way (Ohio Department of Transportation RFP 2006-10STAR-B) – Not Awarded
2025	**Co-Investigator**, Center for Urban and Rural Water Resilience and Adaptation for Northeast Ohio Communities (DOE, Biological and Environmental Research, Resilience Centers) – Not Awarded
2024	**Principal Investigator**, Building 3D Structural Models of Forest Plots for Improved Species Mapping (2025 Faculty Research Committee Research Fellowship) – **$10,000**
2023	**Contributor**, Revolutionizing Root Phenotyping – Integrating Close Range Photogrammetry and CT Scanning for Hight Throughput 3D Analysis in Plant Science (Ag-Eng Purdue College of Agriculture/College of Engineering) – Not Awarded
2022	**Contributor**, Automated Pavement Core Sample Analysis (Indiana Department of Transportation/Joint Transportation Research Program FY22) – Not Awarded
2021	**Contributor**, Developing Methodologies for Generating Forest Inventory and High-quality 3D Building Maps (The National Center for Airborne Laser Mapping) – Not Awarded
2020	**Contributor**, Photogrammetry-based Asphalt Core 3D Scanning System (Purdue Research Foundation) – **$50,000**

Refereed Journal Publications

J. Carpenter, M. Jung, A. Goel, S. Fei, J. Jung, "Modality-Specific Feature Design for Species Classification in Forest Inventories Using TLS and UAS LiDAR" *Frontiers in Forests and Global Change*, 2025.

J. Carpenter, J. Jung, J. Lee, "Photogrammetric 3D Scanning of Asphalt Cores for Automatic Layer Detection and Gradation Classification," *Korean Journal of Civil Engineering*, 2023.

J. Carpenter, D. Rentauskas, N. Makkar, J. Jung, S. Fei, "Improving Deciduous Forest Inventory Plot Center Measurement Using Unoccupied Aerial Systems Imagery," *Journal of Forestry*, 2023.

J. Carpenter, J. Jung, S. Oh, B. Hardiman, S. Fei, "An Unsupervised Canopy-to-Root Pathing (UCRP) Tree Segmentation Algorithm for Automatic Forest Mapping" *Remote Sensing,* 2022.

M. Jung, J. Choi, **J. Carpenter**, S. Fei, J. Jung, "Individual Tree Biomass Estimation using Single-Scan Terrestrial Laser Scanner with Efficient Projection-Based Deep Learning," *Journal of Forestry*, 2025.

S. Bogati, **J. Carpenter**, J. Jung, et al., Divergence of root system traits in soybean between breeding and diversity lines, May 2025.

Y. Huang, B. Yang, **J. Carpenter**, J. Jung, and S. Fei, "Temperate forest tree species classification with winter UAV images," Remote Sensing Applications: Society and Environment, vol. 37, p. 101 422, Jan. 2025.

J. Shao, Y. Lin, C. Wingren, S. Shin, W. Fei, **J. Carpenter**, A. Habib, S. Fei, "Large-scale inventory in natural forests with mobile LiDAR point clouds," Science of Remote Sensing, vol. 10, p. 100168, 2024.

J. Shan, Z. Li, D. Lercel, K. Tissue, J. Hupy, **J. Carpenter**, "Democratizing Photogrammetry: An Accuracy Perspective" *Geospatial Information Science*, 2023, 1-14.

S. Oh, D. Lee, C. Gongora, A. Ashapure, **J. Carpenter**, A. Cruz, M. Fernandez-Campos, B. Lane, D. Telenko, J. Jung, C. Cruz, "Tar Spot Disease Quantification Using Unmanned Aircraft Systems (UAS) Data" *Remote Sensing*, 2021, 13 (13).

Manuscripts

J. Carpenter, S. Bogati, D. Wang, J. Jung, "A 3D Modeling Framework for Quantifying Variation in Soybean Root Structure Architecture," BioRxiv, 2025.05. 06.652473, 2025.

Conference Proceedings

H. Song, **J. Carpenter**, J. Froehlich, J. Jung, "Accessible Area Mapper for Inclusive and Sustainable Urban Mobility: A Preliminary Investigation of Airborne Point Clouds for Pathway Analysis," *1st ACM SIGSPATIAL Workshop on Sustainable Mobility*, Hamburg, Germany, November 13, 2023.

J. Salinas, M. Broberg, D. Wagner, **J. Carpenter**, "Evaluation of a High School Engineering Short Course Integrating the Engineering Design Process, Creativity, and Innovation," *2023 ASEE Annual Conference and Exposition*, Baltimore, MD, June 25, 2023.

Presentations

J. Carpenter, "BoundaryTracer," *Fresno State Annual Geomatics Conference*, Fresno CA, January 21, 2026.

J. Carpenter, J. Jung, "Deriving Functional Traits from Incomplete Lidar Data," *AGU*, New Orleans, LA, December 16, 2025.

J. Carpenter, "A Virtual Sandbox for Boundary Surveying Education," *ISPLS Annual Conference*, Evansville, IN, January 15, 2025.

J. Carpenter, A. Goel, M. Jung, S. Fei, J. Jung, "Species Classification in Northern Hardwood Forests," *AGU*, Washington DC, December 2024.

J. Carpenter, S. Bogati, J. Jung, D. Wang, "Close-Range Photo Scanning for Soybean RSA," *International Plant Phenotyping Symposium*, Lincoln, NE, November 2024.

J. Carpenter, "Web-based Boundary Retracement Simulation," *PLSO Annual Conference*, Columbus, OH, February 21, 2024.

J. Carpenter, S. Bogati, J. Jung, D. Wang, "Root Structure Modeling," *Purdue GIS Day*, West Lafayette, IN, November 11, 2023.

J. Carpenter, J. Jung, "Wall-to-wall Forest Inventories Using UAS Aerial Mapping," *International Symposium on Remote Sensing*, Jeju, South Korea, April 19-21, 2023.

J. Carpenter, J. Jung, "Tree Stem Mapping and Feature Extraction from High-Density Point Clouds," *28th Environmental Engineering and Science Annual Symposium*, Urbana-Champaign, IL, April 14, 2023.

J. Carpenter, N. Makkar, J. Jung, R. Costello, M. Yeager, "The Use of Imaging and Low-Cost LiDAR Sensors for Mapping Urban and Natural Features," *UESI Surveying and Geomatics*, Lawrenceburg, IN, October 2-4, 2022.

J. Carpenter, J. Jung, S. Fei, "GIS to Organize Forest Plot Locations and Segmentation Results," *Indiana Geographic Information Council*, Muncie, IN, May 23-25, 2022.

J. Carpenter, J. Jung, J. Landivar, "High Throughput Phenotyping Using Spaceborne Lidar Systems," *ASA, CSSA, and SSSA International Annual Meeting*, Virtual, November 9-13, 2020.

J. Carpenter, J. Jung, J. Lee, "Photogrammetry Based 3D Scanning of Asphalt Pavement Samples," *2010 Sigma XI Graduate Students Poster Competition*, Lafayette, IN, February 2020.

J. Carpenter, W. Zhang, "A Brief Description of the Phonetics of Whispering," *2012 Research Symposium University of Akron*, Akron, OH, April 2012.

Intellectual Property

J. Carpenter, S. Fei, J. Jung, "Forestry management system and method," *WO2023147138A1*, August 3, 2023.

Licensure

2020	**FAA Remote Pilot**, #4391602
2017	**Professional Surveyor**, Ohio, S-8733