

GUNJAN BARUA

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EDUCATION

Virginia Tech <i>PhD, Geospatial and Environmental Analysis</i>	Anticipated Spring 2026
Virginia Tech <i>Master's, Geography</i>	January 2021 - May 2023
Virginia Tech <i>Certification, Geospatial Information Technology</i>	December 2022
Khulna University of Engineering & Technology <i>Bachelor's, Urban and Regional Planning</i>	August 2016

PROFESSIONAL EXPERIENCE

Department of Forest Resources & Environmental Conservation, Virginia Tech <i>Graduate Research Assistant</i>	Blacksburg, VA, USA <i>August 2023 - Present</i>
<ul style="list-style-type: none">Conduct research using AI, LiDAR, and remote sensing to enhance yield predictions for pine plantations.Develop and validate AI models (machine learning and recurrent neural network) for forest yield forecasting, supporting sustainable management.	
CarboBon Inc. <i>Technical Advisor</i>	Remote <i>May 2023 - Present</i>
<ul style="list-style-type: none">Developed an MRV system using AI and remote sensing for real-time forest surveillance, enabling accurate carbon accounting.Enhanced MRV capabilities to support ESG reporting and compliance with sustainability standards.Leading research on new technologies to improve emission reduction consulting and environmental impact analysis.	
GFR Forestry Consultants PLLC <i>GIS Developer Intern</i>	Remote <i>May 2023 - August 2023</i>
<ul style="list-style-type: none">Responsible for the revision and update of the company's forest operation and business operation dashboard, optimizing it on ArcOnline for improved efficiency and usabilityLed the automation of work processes by effectively integrating Survey 123, Microsoft Power Automate, and ArcOnline mapsThis integration enhanced productivity and streamlined tasksImproved the structure and performance of the hosted layers' database in ArcOnline, utilizing the capabilities of ArcGIS API for Python	
Department of Forest Resources & Environmental Conservation, Virginia Tech <i>Research Assistant</i>	Blacksburg, VA, USA <i>January 2023 - July 2023</i>
<ul style="list-style-type: none">Explore and analyze airborne LiDAR data and satellite imagery to understand complex forest structuresApply geospatial analysis and machine learning methods to analyze forest productivity	
Near Earth Imaging Lab, Dept. of Geography, Virginia Tech <i>Research Assistant</i>	Blacksburg, VA, USA <i>January 2021 - February 2023</i>
<ul style="list-style-type: none">Developed high-resolution thermal models using UAV data with shading and colormap techniques.Conducted a user study comparing UAV & satellite thermal maps, optimized for readability & performance.Introduced novel thermal visualization methods to enhance urban heat analysis and decision-making.	
Department of Forest Resources & Environmental Conservation, Virginia Tech <i>Summer Research Assistant</i>	Blacksburg, VA, USA <i>May 2022 - August 2022</i>
<ul style="list-style-type: none">Determined forest productivity with respect to bedding orientation using LiDAR data & Google Earth EngineProduced a scalable product including Python and JavaScript codes with a detailed protocol	
School of Public and International Affairs, Virginia Tech <i>Summer Research Assistant</i>	Blacksburg, VA, USA <i>May 2021 - August 2021</i>
<ul style="list-style-type: none">Collected and processed thermal UAV data at multiple locations in Blacksburg and Roanoke, VABuilt high-resolution thermal models to understand communities' heating experience at a small scale	
Practical Action & Municipal Association of Bangladesh <i>Policy Advocacy Specialist</i>	Dhaka, Bangladesh <i>September 2016 - November 2020</i>
<ul style="list-style-type: none">Managed \$850,000 in portfolios, executing advocacy agendas, campaigns, and project reports, and conducting policy research and business development	

- Collaborated with government and stakeholders to draft a national WASH action plan and a 10-year sanitation strategy.

PROJECTS & OUTSIDE EXPERIENCE

Yield prediction of Loblolly pine plantations using UAV LiDAR-derived metrics with machine learning

LiDAR / Random Forest / Support Vector Regression / Python / RStudio / Scikit-Learn

- Predicting yield of Loblolly pine plantations using UAV LiDAR-derived individual tree crown metrics and distance-dependent competition indices with random forest regression and support vector regression

Tree row segmentation of Loblolly pine stands with deep learning & clustering algorithms from LiDAR data

LiDAR / Google Earth Engine / Python / GeoPandas / DBSCAN / Scikit-Learn / TensorFlow

- Using a density-based scan (DBSCAN) clustering algorithm, and deep learning techniques, identifying tree rows in Loblolly pine plantation stands.

Assessing spatial and spatiotemporal clusters of wildfire occurrences across the contiguous USA

GIS / Spatial Clustering / Spatiotemporal Clustering / SatScan / Python

- Comparison of spatial and spatiotemporal clusters of wildfire occurrences across the contiguous USA using SatScan software to provide a better decision support tool for wildfire management
- The research adopts the Poisson probability model for cluster assessment

Predicting yield of Loblolly pine plantations with neural networks & machine learning using optical and synthetic aperture radar (SAR) satellite data

Google Earth Engine / Python / Random Forest / Support Vector Regression / GBM / LightGBM / XGBoost / LSTM / GRU / Scikit-Learn / TensorFlow

- Performance assessment of yield prediction models of Loblolly pine using optical remote sensing indices (Landsat and Sentinel 2) and synthetic aperture radar (SAR) data (Sentinel 1) in neural network and machine learning models
- The algorithms that are being tested are - long short-term memory (LSTM), gated recurrent unit (GRU), random forest, SVR, GBM, XGBoost, and LightGBM,

Assessing the transferability of ML-based yield prediction models from LiDAR-derived metrics for Loblolly pine plantations

LiDAR / Random Forest / Support Vector Regression / Python / RStudio / Scikit-Learn

- Transferability assessment of machine learning-based yield prediction models for Loblolly pine plantations using LiDAR-derived metrics to dataset from other regions that were not used in training the models
- Model calibration may require adjusting the model uncertainty

SKILLS

Skills: Python, Adobe After Effects, Pandas, NumPy, Scikit-learn, Tensorflow, PowerPoint/Keynote/Slides, Excel/Numbers/Sheets, Machine Learning, Neural Networks, GIS, Remote Sensing, LiDAR, ArcGIS Pro, Google Earth Engine, Pix4D, JMP, Cloud Compare, ArcGIS Online

SELECTED PUBLICATIONS

- Barua et al. (2025). *Advancing Growth and Yield Predictions for Pinus taeda (L.) Plantations: Integrating LiDAR-Derived Metrics and Machine Learning Models Across Diverse Sites*. ASPRS Annual Conference at Geo Week 2025
- Barua et al. (2023). *Urban Thermal Map Design Considerations: Color, Shading, and Resolution*. DOI: 10.1080/15230406.2023.2267418
- Barua et al. (2023). *Bedding Orientation Impact Analysis and Tree Row Detection in Pine Plantations: Insights from Lidar, Remote Sensing, and Machine Learning*. FPC Annual Meeting 2023. (Poster)

SELECTED AWARDS

- Best Student Presentation Award. 2025 APSAF Annual Conference, Wilmington, NC
- APSAF Student Scholarship, 2025. Appalachian Society of American Foresters (APSAF)
- ICA Scholarship 2022. International Cartographic Association (ICA)
- Sigma Xi Research Award 2022. Sigma Xi - The Scientific Research Honor Society, Virginia Tech Chapter
- Georgia Pacific Fellowship Award 2021. Department of Geography, Virginia Tech

SELECTED CERTIFICATIONS

- Part 107: Remote Pilot Certification, Federal Aviation Administration (FAA)
- CITI Program course on Social and Behavioral Research. Collaborative Institutional Training Initiative (CITI).