

Gunjan Barua

Ph.D. Candidate

Geospatial and Environmental Analysis Program

Virginia Polytechnic Institute and State University

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EDUCATION

- **Ph.D. in Geospatial and Environmental Analysis (anticipated Spring 2026)**

Virginia Tech

Dissertation: Advancing Yield Predictions in *Pinus taeda* (L.): An Artificial Intelligence (AI) Approach Leveraging LiDAR-derived Individual Tree Crown (ITC) Metrics, Competition Indices (CI), and Multispectral Remote Sensing Indices

Major Advisors: Dr. David Carter & Dr. Valerie Thomas

Research interest: precision forestry, forest biometry, geospatial data science, remote sensing, lidar, AI application in forestry

- **Master of Science in Geography (2023).**

Virginia Tech

Major Advisor: Dr. Thomas Pingel

Thesis: Understanding the Perception of Different Urban Thermal Model Visualizations

- **Graduate Certificate in Geospatial Information Technology (2022).**

Virginia Tech

- **Bachelor of Urban & Regional Planning (2016).**

Khulna University of Engineering & Technology (KUET), Khulna, Bangladesh

Major Advisor: Dr. Salahuddin Pavel

Thesis: Land use characterization in peri-urban areas of Khulna - Towards an eco-sustainable metropolitan region

RESEARCH EXPERIENCE

Graduate Research Assistant, August 2023 – Present. *Dept. of Forest Resources & Environmental Conservation, Virginia Tech*

- Incorporate active and passive remote sensing (optical and SAR satellite data, and LiDAR) in AI to predict the yield of Loblolly Pine in the Southeast US
- Assess the generalizability and transferability of the developed models

Summer Research Assistant, May 2025 – August 2025. Forest Productivity Cooperative (FPC) & Michigan State University

- Developed an automated workflow that transforms handwritten forestry field sheets into structured digital spreadsheets, eliminating manual data entry
- Built a financial assistant that automatically extracts and tags key receipt details, streamlining the accounting process

Research Assistant, January 2023 – July 2023. *Dept. of Forest Resources & Environmental Conservation, Virginia Tech*

- Explored and analyzed airborne lidar data and satellite imagery to understand complex forest structures
- Applied geospatial analysis and machine learning methods to analyze forest productivity

Graduate Research, January 2021 – February 2023. *Near Earth Imaging Lab, Department of Geography, Virginia Tech*

- Collected thermal data with UAVs and used photogrammetry to create high-resolution thermal models
- Used optical satellite imagery & LiDAR data to create shaded thermal images (new thermal visualization method)
- Conducted a perception study using PsychoPy and analyzed data using Python and JMP

Summer Research Assistant, May 2022 – August 2022. *Department of Forest Resources & Environmental Conservation, Virginia Tech*

- Determined forest productivity to bedding orientation using Lidar data and Google Earth Engine
- Produced a scalable product including Python and JavaScript codes with a detailed protocol

Summer Research Assistant, May 2021 – August 2021. *School of Public and International Affairs, Virginia Tech*

- Collected & processed thermal drone data at multiple locations in Blacksburg & Roanoke, VA
- Built high-resolution thermal models to understand communities' heating experience at a small scale

TEACHING EXPERIENCE

Graduate Teaching Assistant, January 2021 – December 2022. *Department of Geography, Virginia Tech*

- Advanced Remote Sensing (Instructor)
Fall 2022 – Enrolment: 88
Spring 2022 – Enrolment: 85
Fall 2021 – Enrolment: 59
- Advanced Geovisualization (Teaching Assistant)
Spring 2022 – Enrolment: 22
- Advanced Analysis in GIS (Teaching Assistant)
Fall 2022 – Enrolment: 31
- Geography of Wine (Teaching Assistant)
Spring 2021 – Enrolment: 675

PROFESSIONAL EXPERIENCE

Technical Advisor, May 2023 – Present. *CarboBon – Measuring Forest Protection*

- Developed machine learning and remote sensing-based innovative Monitoring, Reporting, and Verification (MRV) system for real-time forest surveillance.

- The role involves transforming climate action into a quantifiable science and contributing to the creation of Bangladesh's first-ever carbon credit marketplace
- Developing an API for calculating scope 1 and scope 2 emission of corporate companies
- Leading the research on new technologies and methodologies in machine learning and remote sensing to improve the MRV system

GIS Developer Intern, May 2023 – August 2023. *GFR Forestry Consultants PLLC*

- Responsible for the revision and update of the company's forest operation and business operation dashboard, optimizing it on ArcOnline for improved efficiency and usability.
- Pioneered the automation of work processes by effectively integrating Survey 123, Microsoft Power Automate, and ArcOnline maps. This integration enhanced productivity and streamlined tasks.
- Improved the structure and performance of the hosted layers' database in ArcOnline, utilizing the capabilities of the ArcGIS API for Python. This optimization enhanced data accessibility and functionality.

Policy Advocacy Specialist, June 2018 – November 2020. *Municipal Association of Bangladesh*

- Managed a portfolio of \$350,000 and oversaw field implementation of project activities
- Facilitated capacity building of 5 municipality staff
- Maintained liaison with the Local Government Engineering Department and respective stakeholders to draft a national action plan on WASH, and prepare a sanitation strategy for 10 years for 5 municipalities

Documentation Officer, September 2016 – June 2018. *Practical Action, Bangladesh*

- Managed a communications portfolio of \$500,000
- Pitched advocacy agenda and prepared communications and campaign plans
- Coordinated social mobilization and BCC campaign, project report writing, policy briefs, and summary reports
- Provided visualization of project data, Conducted research for policy analysis & business development

Freelance GIS Analyst, May 2015 – June 2016. *Elance-Odesk*

- Prepared maps based on spatial analysis and geospatial data
- Conducted topological, hydrological, and transportation modeling
- Prepared maps and conducted spatial analysis for utilities, health services, real estate, and transportation industries, authored research, and project reports

Intern, May 2015 – June 2015. *Asian Disaster Preparedness Center*

- Conducted spatial analysis for large geo-database
- Prepared research report on the social vulnerability index
- Drafted a report for an earthquake research project on Dhaka city

PUBLICATIONS

Referred Publications

- **Barua, G.**, Carter, D., Thomas, V., Green, P.C., Radtke, P., Pingel, T.J., Cook, R.L., Albaugh, T., Rubilar, R., Campoe, O., Sumnall, M. (2025). *Predicting yield of Pinus taeda (L.) using LiDAR data in random forest and support vector machine models*. Forest Ecology and Management. DOI: 10.1016/j.foreco.2025.122977
- **Barua, G.**, Pingel, T.J., Lim, T.C. (2023). *Urban Thermal Map Design Considerations: Color, Shading, and Resolution*. Cartography and Geographic Information Science. DOI: 10.1080/15230406.2023.2267418
- Ekram, K. M., **Barua, G.**, & Uddin, M. (2018). Land Use Characterization in Peri-Urban Areas of Khulna towards an Eco-Sustainable Metropolitan Region. Journal of Engineering Science, 09(2), 127-137.
- **Barua, G.**, & Ekram, K. M. (2014). A Conceptual Model of Reusing the Paper Wastes Generated from the Universities. International Journal of Applied Engineering Research. 9, pp. 53-58. Delhi: Research India Publications.

Book Chapter

- Roy, T.K., Ekram, K.M.M., **Barua, G.**, Hossain, S.T., Akter, F. (2019). Solid Waste Management Scenario in Public University Campuses of Bangladesh: A Comparative Study between KUET and Khulna University. In Ghosh S. (eds) Waste Management and Resource Efficiency. Springer, Singapore. DOI: 10.1007/978-981-10-7290-1_83

PUBLICATIONS IN-PREP

- Platt, E., Carter, D., Albaugh, T.J., Cook, R.L., Campoe, O., Rubilar, R., **Barua, G.**, Sumnall, M.J. *Precision Forestry: Using Artificial Intelligence and LiDAR to inform thinning in Pinus taeda plantations – a case study*. Submitted to the **Journal of Forestry**
- **Barua, G.**, Pires, M., Kim, J. In prep. *Static Maps, Dynamic Threats: Re-evaluating U.S. Wildfire Risk with Spatiotemporal Clustering*. For submission to **Fire Ecology**. Anticipated by September 2025. Preprint: <https://dx.doi.org/10.2139/ssrn.5366489>
- Islam, K.M.A., **Barua, G.** *Mapping the Mangrove Region of Bangladesh: Integrating National Forest Inventory Data with AlphaEarth Satellite Embedding V1 Dataset using Neural Networks*. For submission to **Remote Sensing of Environment**. Anticipated by October 2025
- **Barua, G.**, Carter, D., Thomas, V., Green, P.C., Radtke, P., Pingel, T.J., Cook, R.L., Albaugh, T., Rubilar, R., Campoe, O., Sumnall, M. *Predicting Yields of Pinus taeda (L.) with Open-Source Time-Series Sentinel 1 and 2 Data with Machine Learning and Neural Networks*. For submission to the **Journal of Forestry Research**. Anticipated by October 2025.
- **Barua, G.**, Carter, D., Thomas, V., Green, P.C., Radtke, P., Pingel, T.J., Cook, R.L., Albaugh, T., Rubilar, R., Campoe, O., Sumnall, M. *Crowns, Competition, and Continuity: A Machine Learning Approach for Annual Yield Prediction of Pinus taeda (L.) Using UAV-LiDAR Data*. For submission to the **ISPRS Journal of Photogrammetry and Remote Sensing**. Anticipated by December 2025.

PRESENTATIONS

Conference

- **Barua, G.** 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, Denver, CO, United States.
- Pires, M., **Barua, G.**, Kim, J. Comparison and Analysis of Spatial and Spatiotemporal Clustering of Wildfires in the United States of America. 2025 Young Scholar Symposium on Spatiotemporal Data Science, Spatial Data Lab.
- **Barua, G.** 4-Year Timber Yield Forecasts in *Pinus taeda* (L.) Using LiDAR-Derived Metrics and Advanced Machine Learning Models. 2025 APSAF Annual Conference, Wilmington, NC, United States.
- Sauda, S.S., **Barua, G.** (2023). Predicting Urban Heat Island Effect in Phoenix, Arizona for 2026. ESRI Federal GIS Conference, Washington D.C., United States.
- **Barua, G.**, Pingel, T.J., Lim, T.C. (2022). Understanding perception of different urban thermal model visualizations. AutoCarto 2022, Redlands, CA, United States.
- Roy, T. K., **Barua, G.**, & Ekram, K. M. M. (2015). Role of Stakeholders in Managing School Solid Wastes of Khulna City. Proceedings of the WasteSafe 2015 – 4th International Conference on Solid Waste Management in the Developing Countries. Khulna.

Poster Presentations

- **Barua, G.**, Carter, D., Thomas, V., Green, P.C., Radtke, P., Pingel, T.J., Cook, R.L., Albaugh, T., Rubilar, R., Campoe, O., Sumnall, M. *Predicting Yields of Pinus taeda (L.) with Open-Source Time-Series Sentinel 1 and 2 Data with Machine Learning and Neural Networks*. Scheduled to present at the **Forest Productivity Cooperative Annual Meeting, 2025**, Chapel Hill, North Carolina (September 2025)
- **Barua, G.**, Carter, D., Thomas, V., Green, P.C., Radtke, P., Pingel, T.J., Cook, R.L., Albaugh, T., Rubilar, R., Campoe, O., Sumnall, M. *Crowns, Competition, and Continuity: A Machine Learning Approach for Annual Yield Prediction of Pinus taeda (L.) Using UAV-LiDAR Data*. Scheduled to present at **AGU 2025**, New Orleans, Louisiana (December 2025)
- **Barua, G.**, Carter, D., Thomas, V. (2025). *Evaluating Machine Learning and Neural Networks for Yield Prediction in Pinus taeda (L.) Plantations Using Time-series Sentinel-1 and 2 Data*. **OGIS Symposium 2025**, Blacksburg, Virginia Tech.
- **Barua, G.**, Carter, D. (2023). *Bedding Orientation Impact Analysis and Tree Row Detection in Pine Plantations: Insights from Lidar, Remote Sensing, and Machine Learning*. **Forest Productivity Cooperative Annual Meeting 2023**, Blacksburg, Virginia Tech.
- **Barua, G.**, Pingel, T. J., Lim, T. C., Rijal, S., Zick, S. (2022). *Construction and Geovisualization of 3D Thermal Models of Urban Areas*. **OGIS Symposium 2022**, Blacksburg, Virginia Tech.
- Jahan, H., Ganguly, P., Farah, M., **Barua, G.** & Rahman, A. (2017). *The Treasure Hunt: An organized movement with society to turn waste into wealth*. Poster presented at the 4th FSM Conference. Chennai, India.

Invited Talks, Lectures, and Panel Sessions

- **Invited Speaker.** 2025. *Predicting yield of Pinus taeda (L.) using LiDAR data in random forest and support vector machine models.* Weyerhaeuser Virtual Seminar.
- **Invited Speaker.** 2025. *Remote Sensing in AI: Predicting yield of Pinus taeda (L.) plantations with LiDAR and Satellite Data.* Blue Ridge SAF Chapter Meeting. Blacksburg, VA.
- **Presenter.** 2025. *Remote Sensing Meets AI: Predicting Yield in Pinus taeda (L.) Plantations with Open-Source Time-Series Satellite Data.* FREC Spring Seminar. Blacksburg, VA
- **Presenter.** 2025. *Advancing Yield Predictions for Pinus taeda (L.) Plantations: Integrating Lidar-Derived Metrics and Machine Learning Models Across Diverse Sites.* Seminar in Remote Sensing and GIS. Virginia Tech.
- **Guest lecture.** 2023. Advanced Geovisualization class. Department of Geography, Virginia Tech
- **Session Moderator.** 2023. *Past, present, and future of endangered languages.* Virginia Tech
- **Panelist.** 2022. *Interested in attending Graduate School? Graduate School Panel Discussion.* College of Natural Resources and Environment (CNRE), Virginia Tech
- **Session Moderator.** 2020. *Paving the enabling environment towards urban sanitation solutions: The journey of local government associations from South Asia.* 5th South Asian Cities Summit. Goa, India

AWARDS AND FELLOWSHIPS

- **Best Student Presentation Award.** 2025 APSAF Annual Conference, Wilmington, NC
- **APSAF Student Scholarship, 2025.** Appalachian Society of American Foresters (APSAF)
- **KP Funderburke Education Endowment, 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
- **1st prize for graduate poster presentation at OGIS Symposium 2022.** Organization of Geographic Information Systems and Remote Sensing Research (OGIS)
- **Georgia Pacific Fellowship Award 2021.** Department of Geography, Virginia Tech
- **Technical Merit Scholarship, 2013 - 2016.** Khulna University of Engineering & Technology.

GRANTS RECEIVED

- **CNRE Graduate Student Travel Grant, Fall 2025.** USD 600. Virginia Tech
- **Graduate and Professional Student Senate Travel Award, Fall 2025.** USD 500. Virginia Tech
- **Department of Geography Grad Fund for Conference, Spring 2025.** USD 350. Virginia Tech
- **Graduate and Professional Student Senate Travel Award, Winter 2025.** USD 500. Virginia Tech
- **Sidman P. Poole Endowment 2022.** USD 1,150. Department of Geography, Virginia Tech
- **Graduate and Professional Student Senate Travel Award, Fall 2022.** USD 300. Virginia Tech
- **CNRE Graduate Student Travel Grant, Fall 2022.** USD 600. Virginia Tech
- **Department of Geography Grad Fund for Conference, Fall 2022.** USD 350. Virginia Tech

GRANTS/AWARDS APPLICATION SUBMITTED

- Grant A. Harris Fellowship (2024)
- Cartography and Geographic Information Science (CaGIS) Scholarship (2024)
- Geo Empower Event Scholarship (2024)
- AGU Student Travel Grant (2024)

REVIEWER

Journals

- Remote Sensing Applications: Society and Environment
- Cartography and Geographic Information Science
- International Journal of Geomatics

Grants

- Graduate and Professional Student Senate Travel Award, Spring 2025, Virginia Tech

PROFESSIONAL AFFILIATION

- **Associate Member**, Sigma Xi – The Scientific Research Honor Society
- **Student Member**, ASPRS – The Imaging & Geospatial Information Society
- **Student Member**, Society of American Foresters (SAF)
- **Student Member**, American Geophysical Union (AGU)
- **Student Member**, Cartography and Geographic Information Society

SERVICE EXPERIENCE

- **Academic Chair**, Geography Graduate Student Alliance at Virginia Tech. September 2022 – February 2023
- **Student Senator**, Graduate and Professional Student Senate, Virginia Tech. September 2021 – September 2022
- **President (Debate & Administration)**, KUET Debating Society. July 2015 - July 2016
- **Campus Coordinator**, Engineering Students' Association, Bangladesh - KUET Chapter. March 2015 – July 2016
- **General Secretary**, URP Association, KUET. September 2014 - August 2015
- **General Secretary**, Notre Dame Debating Club. September 2010 – August 2011

CERTIFICATIONS

- **Part 107: Remote Pilot Certification**, Federal Aviation Administration (FAA)
- **CITI Program course on Social and Behavioural Research**. Collaborative Institutional Training Initiative (CITI). Record ID: 45876021. November 2021
- **Initiating And Planning Projects**, University of California, Irvine on Coursera. Verify: <https://goo.gl/ehTCDk>
- **Managing Project Risks and Challenges**, University of California, Irvine on Coursera. Verify: <https://goo.gl/oNH1V2>

- **Budgeting And Scheduling Projects**, University of California, Irvine on Coursera. Verify: <https://goo.gl/gVcc4l>
- **Data Science Orientation**, IBM on Coursera. Verify: <https://bit.ly/2lATGnf>
- **Open Sources Tools for Data Science**, IBM on Coursera. Verify: <https://bit.ly/2lEHOQS>

TECHNICAL SKILLS

Geospatial Software: **ArcGIS Pro**, **Erdas Imagine**, **ENVI**, *CartoDB* and *Mapbox*, *Google Earth Engine*

Photogrammetry & Lidar: **Pix4D**, **DroneDeploy** and *Cloud Compare*

Programming Language and Statistical software: *Python*, *R* and *JMP*

Graphic Software: **Adobe Illustrator**, *Adobe Photoshop*, *Adobe Lightroom*, and *Final Cut Pro*

CAD Software: **Google Sketchup** and *AutoCAD*

Office Application: **Word**, **PowerPoint**, *Project*, **Excel**, and *Access*

*skills in **bold** characters means advanced level and *italic* means the intermediate level

NON-ACADEMIC ACHIEVEMENTS

- Champion: Case Study Analysis Competition in Cenovation, 2015. Islamic University of Technology
- Third place: Undergraduate Planning Student's Competition on "Engaging young minds to understand and communicate urban problems-2014". Department of Urban and Regional Planning, BUET
- Runner-Up & Debater of the Final: Debate competition of Inter-University Cultural Fiesta-2014. Khulna University of Engineering & Technology (KUET)
- Champion: Independence Day Debate Competition-2013. Khulna University
- Debater of the Tournament: Debate Competition on Young Planners' Day, 2012, Bangladesh Institute of Planners