Suraj A. Yadav

Ph.D.

Mississippi State University
Department of Agricultural and biological Engineering
MS-39762, USA.
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Github *Linkedin* *Google Scholar*

Education

2017 - 2022 **Doctor of Philosophy (PhD), Physics: Remote Sening**, *Indian Institute of Technology*, BHU, Varanasi: 221005, India, CPI: 8.13/10.00.
Thesis Title: Scattering model for land bio-geophysical parameter retrieval and validation using multi-frequency bistatic scatterometer measurements.

2012 - 2014 **Master of Science (MSc), Physics**, *University of Mumbai*, Mumbai: 400032, India, CGPA: 6.21/7.00.

2009 - 2012 **Bachelor of Science (BSc), Physics**, *University of Mumbai*, Mumbai: 400032, India, Percentage: 75%.

2007–2009 **Higher Secondary Certificate (HSC), Science**, *Maharashtra state board of Pune*, Maharashtra, India, Percentage: 68.83%.

2006–2007 **Secondary School Certificate (SSC)**, *Maharashtra state board of Pune*, Maharashtra, India, Percentage: 81.38%.

Research Experience

Postdoctoral Researcher - Department of Agricultural and Biological Engineering, Mississippi State University, MS-39762, USA.

02/2024 - present ***Advanced autonomy, precision, and artificial intelligence for dynamic, robust, and resilient cropping systems from UAVs equipped with onboard multispectral, hyperspectral, and LIDAR sensor***.

- Conducting research on advanced autonomy, precision agriculture, and AI-driven sensor analytics using UAV-based multispectral, hyperspectral, and LiDAR systems.
- Led optimization, calibration, and validation of imaging spectroscopy platforms across crop types and land surface conditions to ensure robust canopy trait retrieval.
- Developing physics-informed deep learning and computer vision frameworks for UAV applications, enabling automated crop monitoring, nitrogen estimation, and yield prediction.

Advisors: **Dr. Xin Zhang**, *Assistant Professor, Department of Agricultural and Biological Engineering*, Mississippi State University. (*Personal Webpage*)
Dr. Nuwan K. Wijewardane, *Assistant Professor, Department of Agricultural & Biological Engineering*, Mississippi State University (*Personal Webpage*)

Postdoctoral Researcher - High Performance Computing Collaboratory (Geosystem Research Institute) and Department of Electrical and Computer Engineering, Mississippi State University, MS-39762, USA.

12/2022 - 01/2024 ***Computational simulations to expand the Global navigation satellite system (GNSS)-Transmittivity scattering models for radio realistic forest architecture***.

- Developed virtual radio realistic tree model to simulate their EM signatures using EM/SCoBi solvers and integrated the realistic forest simulations into MSU's current EM scattering models.
- Gained hands-on expertise in robotic system design and hardware-in-the-loop development, contributing to UAV/UGV platform integration for microwave sensing applications.

Advisor: **Dr. Mehmet Kurum**, *Associate Professor, Department of Electrical and Computer Engineering*, University of Georgia (*Personal Webpage*)

Visiting Research Associate - Center of Studies in Resources Engineering (CSRE), Indian Institute of Technology (IIT) Bombay, Mumbai-400076, India.

10/2022 - 11/2022 ***Modeling scattering amplitudes from dielectric scatterers with varying electromagnetic properties for applications in microwave remote sensing of vegetation***.

- Analysed a physics-based model to simulate microwave scattering amplitudes from dielectric materials with varying electromagnetic properties.

Advisor: **Dr. Gulab Singh**, *Professor, Centre of Studies in Resources Engineering*, IIT Bombay (*Personal Webpage*)

Doctoral Researcher - Department of Physics, Indian Institute of Technology (IIT) BHU, Varanasi: 221005, India.

2017 - 2022 ***Optimization, calibration, and validation of the indigenously-designed ground-based multi-frequency bistatic scatterometer system in forward scattering alignment***.

- Designed, optimized, and calibrated an indigenously developed ground-based multi-frequency bistatic scatterometer system in forward-scattering alignment for vegetation and soil monitoring.
- Conducted controlled measurements at X-, C-, and L-band frequencies over vegetated land surfaces, enabling systematic evaluation of radar scattering under varying soil moisture and crop conditions.
- Integrated radiative transfer modeling and machine learning frameworks to interpret bistatic scattering from vegetated rough soils, improving the retrieval of crop traits and soil parameters.
- Developed strong theoretical and practical expertise in applied electromagnetics, polarimetric radar measurements, and microwave remote sensing, laying the foundation for subsequent UAV/UGV-based sensor fusion and precision agriculture research.

Advisor: **Dr. Rajendra Prasad**, *Professor, Department of Physics*, IIT BHU (*Personal Webpage*)

Technical Skills

System Design	Sensor design, calibration and validation, embedded systems, data acquisition, sensor UAV/UGV integration, circuit design, and signal processing,
Algorithm	Model (Empirical, semi-empirical, physical) development, optimization, implementation, and validation, Deep learning regression models, and physics-informed machine learning models.
Simulating	Matlab, Python (Pytorch, Keras, Cuda, Tensorflow and Scikit-Learn), and R.
Documenting	LaTeX, Spreadsheets, Word processing, PowerPoint, and Data visualization.
Software	SNAP, QGIS, ArcMap, ArcGIS, ENVI, ENVI liDAR, CloudCompare, Google Earth Engine, Fire Dynamics Simulator (FDS), DSSAT, and Smokeview.
Professional	Teaching and Mentoring Graduate students, Grant/Project Proposal writing, Collaborating capabilities, Work independently or in a team environment.

Research Expertise

- Monostatic/bistatic radar, Signals of opportunity, ubiquitous remote sensing of vegetation, land, and forest.
- Software-defined forward and inverse radar scattering model for vegetated land parameters retrieval.
- Geospatial Anlysis and Digital Image processing using QGIS, ArcGIS pro, ENVI, and Python.
- Multispectral/hyperspectral/LiDAR (Terristial/Airborne) based drone remote sensing for agriculture monitoring, mapping, and traits retrieval/prediction.
- Machine and deep learning techniques for classification and retrieval (CNN, uNET, GANS, conditional Autoencoders, RNN and LSTM).
- Forest fire simulation using FDS and Smokeview.

Teaching Experience and Professional Lectures/Talks

04/2025 ***Guest Lecture: UAV Measurements and Control in Biological Systems***.
Mississippi State University, MS-39762, USA.

04/2025 ***AI/ML Talk: "Context-Aware Deep Learning Model for Crop Yield Prediction Using Time-Series UAS Multispectral Data. Agriculture."***.
Center for Advanced Vehicular Systems (CAVS), Mississippi State University, MS-39762, USA.

02/2025 ***Guest Talk at Data Science Academic Insight Event: Deep Learning Model for Crop Yield Prediction via Time-Series Adaptive Semantic Segmentation on UAS-based Spatio-Spectral Fusion Data***.
Mississippi State University, MS-39762, USA.

11/2024 ***Guest Lecture: "Introduction to Imaging in Biological Systems: Special emphasis on UAV imaging for precision Agriculture."***.
Mississippi State University, MS-39762, USA.

10/2024 ***Association for Computing Machinery Invited Research Talk: "UAV: Exploring Imaging Systems that Fly."***.
Mississippi State University, MS-39762, USA.

12/2023 ***Alumini Invited Talk: " How Microwave Sensors see the Earth from Sky: SAR Remote Sensing (Theory and Application)"***.
Department of Physics, Bhavans College, Mumbai: 400058, India.

2017 - 2022 ***Teaching Assistant - Graduate and Post-graduate student, Department of Physcis, Indian Institute of Technology (IIT) BHU, Varanasi: 221005, India***.
- Led laboratory sessions and tutorials for Remote Sensing, Antennas and Propogation, Electromagnetism, and Electronics.

2014 - 2015 ***Assistant Professor (Applied Physics), Sardar Patel College of Engineering, Andheri (West), Mumbai: 400058, India.***.
- Taught applied physics subjects (Electromagnetism, optics, and solid state physics) to three mainstream branches (i.e., Civil/Mechanical/Electrical Engineering) students.
- Designed lessons and assignments, facilitated discussion sections, and assessed papers and exams.

Publications

Communicated and In-progress Journal Article

2025 **Suraj A. Yadav, Yanbo Huang, Kenny Zhu, Rayyan Haque, Wyatt Young, Lorin Harvey, Mark Hall, Xin Zhang, Nuwan Wijewardane, Ruijin Qin, Max Feldman, Haibo Yao, and John Brooks**, Deep Transfer Learning for Cross-Crop Yield Prediction, In **(to be submitted (100% work done))**.

2025 **Suraj A. Yadav, Nuwan K. Wijewardane, Xin Zhang, and Daniel McCraine**, Voxelized LiDAR Point Cloud Rasterization for Automated LAI Estimation and Crop Characterization, In **(under review in IEEE TGRS)**.

2025 **Suraj A. Yadav, Mehmet Kurum, Rajendra Prasad and Shubham k. Singh**, Analytically Modified First-order Radiative Transfer Model Calibration via X, C, and L Band Bistatic Radar Measurements over Vegetation, In **IEEE Transactions on Geoscience and Remote Sensing (second minor revision submitted)**.

Journal Articles

2025 **Suraj A. Yadav**, Xin Zhang, Nuwan K Wijewardane, Max Feldman, Ruijun Qin, Yanbo Huang, Sathishkumar Samiappan, Wyatt Young, and Francisco G Tapia. Context-aware deep learning model for yield prediction in potato using time-series UAS multispectral data. ***IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing***, volume 18, pages 6096–6115. IEEE, 2025, **(Impact Factor:4.7)**.

2025 Jyoti Sharma, Rajendra Prasad, Prashant K. Srivastava, Shubham K. Singh, **Suraj A. Yadav**, and Dharmendra K. Pandey. Improved radar vegetation water content integration for smap soil moisture retrieval. *Remote Sensing Applications: Society and Environment*, volume 37, page 101443. Elsevier, 2025, **(Impact Factor:4.5)**.

2024 Shubham K. Singh, Rajendra Prasad, **Suraj A. Yadav**, Prashant K Srivastava, Gulab Singh, and Hari Shankar Srivastava. Fusion of optical and SAR data using three approaches for the estimation of LAI with modified integral equation model. ***IEEE Geoscience and Remote Sensing Letters***, volume 21, pages 1–5. IEEE, 2024, **(Impact Factor:4.0)**.

2024 Jyoti Sharma, Rajendra Prasad, Prashant K Srivastava, **Suraj A. Yadav**, Shubham K. Singh, and Bhagyashree Verma. Development of a new vegetation modulated soil moisture index for the spatial disaggregation of SMAP soil moisture data product. ***Physics and Chemistry of the Earth, Parts A/B/C***, volume 135, page 103594. Elsevier, 2024, **(Impact Factor:3.0)**.

2023 Shubham K. Singh, Rajendra Prasad, Prashant K Srivastava, Vijay P Yadav, **Suraj A. Yadav**, and Jyoti Sharma. Incorporation of first-order backscattered power in water cloud model for improving the leaf area index and soil moisture retrieval using dual-polarized sentinel-1 SAR data. ***Remote Sensing of Environment***, volume 296, page 113756. Elsevier, 2023, **(Impact Factor:11.1)**.

2022 Bhagyashree Verma, Rajendra Prasad, Prashant K Srivastava, **Suraj A. Yadav**, Prachi Singh, and RK Singh. Investigation of optimal vegetation indices for retrieval of leaf chlorophyll and leaf area index using enhanced learning algorithms. ***Computers and electronics in agriculture***, volume 192, page 106581. Elsevier, 2022, **(Impact Factor:7.7)**.

2022 **Suraj A. Yadav**, Rajendra Prasad, Vijay P Yadav, Bhagyashree Verma, Shubham K. Singh, Jyoti Sharma, and Prashant K Srivastava. Far-field bistatic scattering simulation for rice crop biophysical parameters retrieval using modified radiative transfer model at X-and C-band. ***Remote Sensing of Environment***, volume 272, page 112959. Elsevier, 2022, **(Impact Factor:11.1)**.

2022 **Suraj A. Yadav**, Rajendra Prasad, Prashant K Srivastava, Shubham K. Singh, Jyoti Sharma, and Sumana Khamrai. Time-series polarimetric bistatic scattering decomposition using comprehensive modified first-order radiative transfer model at C-band for vegetative terrain and validation. ***International Journal of Remote Sensing***, volume 43, pages 7161–7180. Taylor & Francis, 2022, **(Impact Factor:3.0)**.

2022 Shubham K. Singh, Rajendra Prasad, Vijay Pratap Yadav, **Suraj A. Yadav**, Jyoti Sharma, and Prashant K Srivastava. Synergy of dual–polarimetric radar vegetation descriptor and gaussian processes regression algorithm for estimation of leaf area index. ***International Journal of Remote Sensing***, volume 43, pages 6921–6935. Taylor & Francis, 2022, **(Impact Factor:3.0)**.

2022 Jyoti Sharma, Rajendra Prasad, Prashant K Srivastava, **Suraj A. Yadav**, and Vijay P Yadav. Improving spatial representation of soil moisture through the incorporation of single-channel algorithm with different downscaling approaches. ***IEEE Transactions on Geoscience and Remote Sensing***, volume 60, pages 1–10. IEEE, 2022, **(Impact Factor:7.5)**.

2021 Jyoti Sharma, Rajendra Prasad, Prashant K Srivastava, Shubham K. Singh, **Suraj A. Yadav**, and Vijay Pratap Yadav. Roughness characterization and disaggregation of coarse resolution SMAP soil moisture using single-channel algorithm. ***Journal of Applied Remote Sensing***, volume 15, pages 014514–014514. Society of Photo-Optical Instrumentation Engineers, 2021, **(Impact Factor:1.4)**.

2020 **Suraj A. Yadav**, Rajendra Prasad, Ajeet Kumar Vishwakarma, Jyoti Sharma, Bhagyashree Verma, and Prashant K Srivastava. Optimization of dual-polarized bistatic specular scatterometer for studying microwave scattering response and vegetation growth parameters retrieval of paddy crop using a machine learning algorithm. ***Computers and Electronics in Agriculture***, volume 175, page 105592. Elsevier, 2020, **(Impact Factor:7.7)**.

In Conference Proceedings and Abstracts

2025 **Suraj A. Yadav**, *Nuwan K. Wijewardane, Xin Zhang, and Daniel McCraine*, "Radiometric and Modified RossThick-LiSparse BRDF Correction for Low-Altitude UAV Data at Varying Solar-Sensor Geometries for Time-Series Analysis", In **SPIE Defense + Commercial Sensing (SPIE 25)**, 13-17 April 2025, Orlando, Florida, USA. [Peer reviewed paper].

2025 **Suraj A. Yadav**, *Xin Zhang, Nuwan K. Wijewardane, , Max feldman, Ruijin Qin, Yanbo Huang, Sathishkumar Samiappan, Wyatt Young, and Daniel O.Wall*, "Conv1D-BiLSTM-Attention Model: Crop Yield Prediction via Time-Series Adaptive Semantic Segmentation on UAS-based Spatio-Spectral Fusion Data", In **American Society of Agricultural and Biological Engineers Annual Meeting (ASABE 24)**, 28-31 July 2024, Anaheim, California, USA. [Abstract].

2024 Dylan Boyd, *Mehmet Kurum,* ***Suraj A. Yadav****, Ehsanul Hoque, Abesh Ghosh, Mehedi Farhad, Ines Fenni, E. Macorps, and B. Osmanoglu*, "Exploring the Impact of Tree Structure on Forest Transmissivity Modeling", In **IEEE International Geosciences and Remote Sensing Symposium (IGARSS'24)**, 2024, 7–12 July 2024, Athens, Greece. [Peer reviewed paper].

2023 Abesh Ghosh, *Mehedi Farhad, Dylan Boyd,* ***Suraj A. Yadav****, Andrias Colliander, Micheal H. Cosh, M.H., and Mehmet Kurum*, 'Forest Vegetation Optical Depth Mapping Using GNSS Signals at SMAPVEX'22", In **IEEE International Geosciences and Remote Sensing Symposium (IGARSS'23)**, 2023, 16–21 July 2023, Pasadena, CA (USA). [Peer reviewed paper].

2023 **Suraj A. Yadav**, *Abesh Ghosh, Dylan Boyd, and Mehmet Kurum*, "A Realistic Framework of GNSS-T for Simulating Scattering and Propagation of GNSS Signals under a Forest Canopy", In **PhotonIcs and Electromagnetics Research Symposium (PIERS'23)**, 2023, 3–6 July 2023, Prague, Czech Republic. [Abstract].

2019 **Suraj A. Yadav**, *and Rajendra Prasad*, "Optimization of dual-polarized bistatic scatterometer for studying microwave response of rice crop growth variable at X-band", In **National Symposium on Innovations in Geospatial Technology for Sustainable Development with special emphasis on NER**, Shillong, 2019, November 20-22, 2019, Shillong, India. [Extended Abstract].

2019 Vijay P. Yadav, *Rajendra Prasad, Ruchi Bala, Ajit K. Vishwakarma,* ***Suraj Yadav****, and Shubham K. Singh*, "A comparison of machine-learning regression algorithms for the estimation of LAI using LANDSAT - 8 satellite data", In **International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences**, XLII-4/W16, 679–683, 6th International Conference on Geomatics and Geospatial Technology (GGT 2019), 1–3 October 2019, Kuala Lumpur, Malaysia, 2019. [Peer reviewed paper].

2019 Ajit K. Vishwakarma, *Rajendra Prasad, Vijay P. Yadav, and* ***Suraj A. Yadav***, "Multi-temporal multi-angular bistatic specular scattering measurement of corn crop field using scatterometer at multi-frequency (L, C, and X bands) co-polarizations (HH and VV)", In **2019 URSI Asia-Pacific Radio Science Conference (AP-RASC)**, (AP-RASC) (pp. 1-1). IEEE, 9-15 March 2019, New Delhi, India. [Abstract].

2019 **Suraj A. Yadav**, *Rajendra Prasad, Ajit K. Vishwakarma and Vijay P. Yadav*, "Random forest regression for the estimation of leaf area index of okra crop using ground-based bistatic scatterometer", In **ISPRS International Archives of the Photogrammetry**, Remote Sensing and Spatial Information Sciences, Volume XLII-5, 2018, pp.719-725, ISPRS TC V Mid-term Symposium "Geospatial Technology – Pixel to People," 20–23 November 2018, Dehradun, India. [Peer reviewed paper].

2018 Vijay P. Yadav, *Rajendra Prasad, Ruchi Bala, Ajit K. Vishwakarma, and* ***Suraj A. Yadav***, "Estimation of biophysical parameters of wheat crop through modified water cloud model using satellite data", In **ISPRS International Archives of the Photogrammetry**, Remote Sensing and Spatial Information Sciences, Volume XLII-5, 2018, pp.719-725, ISPRS TC V Mid-term Symposium "Geospatial Technology – Pixel to People", 20–23 November 2018, Dehradun, India. [Peer reviewed paper].

Book Chapters

2022 **Suraj A. Yadav**, *Dileep K. Gupta, Rajendra Prasad, Jyoti Sharma, and Prashant K. Srivastava*, "Theory of monostatic and bistatic radar systems", In **Radar Remote Sensing**, (pp. 49-63). Elsevier.

2022 Prashant K. Srivastava, *Rajendra Prasad, Sumit Chaudhary,* ***Suraj A. Yadav****, Jyoti Sharma, Swati Suman, Varsha Pandey, Rishabh Singh, and Dileep K. Gupta*, "Challenges in Radar remote sensing", In **Radar Remote Sensing**, (pp. 377-385). Elsevier.

Grants Writing Experience

07/2024 **Bayor crop sciences proposal**, *Statuts - Not Funded*.
Suraj A. Yadav, Nuwan K. Wijewardane, Xin Zhang. Automated solutions for open-field plot grid creation (Hi-Res UAV imagery), July 2024.
Budget: $100,000

04/2023 **SBIR pitch**, *Statuts - Not Funded*.
BS Krishnan, **Suraj A. Yadav**, Sathish Samiappan, Robert Moorehead, and Gurubuz Ali. UAV Swarm Detection with Polarimetric SWIR Array and Machine learning, Apr 2023.
Budget: $80,000

Professional Fellowships, Awards, and Services

10/2024 **Evaluator for the Fall 2024 Graduate Research Symposium**.
At Mississippi State University, MS-39762, USA.

03/2023 **Evaluator for the Summer 2023 Undergraduate Research Showcase**.
At Mississippi State University, MS-39762, USA.

11/2019 **First Best Oral Presentation Award Letter in Student Category**.
At National Symposium on Innovations in Geospatial Technology for Sustainable Development with special emphasis on NER.

7/2019 **The Council of Scientific and Industrial Research- University Grants Commission (CSIR-UGC) Award letter**.
For Graduate research fellowship and Lecturership award letter in Physics, All India Rank: 105.

6/2018 **The Council of Scientific and Industrial Research- University Grants Commission (CSIR-UGC) Award letter**.
Lecturership award letter in Physics, All India Rank: 123.

3/2017 **Graduate Aptitude test in Engineering (GATE) award letter**, *From Ministry of Human Resources Development, India.*.
Physics, All India Rank: 298.

Referee Services: Reviewer of the Journals

- Remote sensing of Environment
- IEEE Transactions on Geoscience and Remote Sensing, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Transactions on AgriFood Electronics
- Journal of Hydrology
- International Journal of Applied Earth Observation and Geoinformation
- Advances in Space Research
- Scientific Reports
- Computers and Electronics in Agriculture
- MDPI Remote Sensing, Applied Sciences, Electronics, Forest, Agronomy
- International Journal of Digital Earth
- Journal of Soil Science and Plant Nutrition
- Artificial Intelligence Review
- Journal of Agriculture and Food Research

Referees

Dr. Mehmet Kurum
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Dr. Xin Zhang
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