Sayantan 'Monty' Majumdar, Ph.D.

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About Me

I am currently an Assistant Research Professor of Hydrologic Sciences and Remote Sensing at the Desert Research Institute, Reno, Nevada, United States. My research interests include hydrology, remote sensing, machine learning, geospatial data science, and scientific software development.

Research/Work Experience

- **Desert Research Institute** — **Reno, NV, USA**
  Assistant Research Professor — *Jun 2023–Present*

  Working as an Assistant Research Professor of Hydrologic Sciences and Remote Sensing. I am also serving as an Adjunct Faculty as part of the University of Nevada Reno (UNR) and DRI Graduate Program of Hydrologic Sciences.

- **Colorado State University** — **Fort Collins, CO, USA**
  Postdoctoral Fellow — *Sep 2022–Jun 2023*

  Worked with the U.S. Geological Survey (USGS) and Dr. Ryan Smith on hydrologic remote sensing and machine learning techniques to estimate agricultural water use in the Mississippi Alluvial Plain.

- **Meta Platforms, Inc.** — **Menlo Park, CA, USA**
  Research Scientist Intern — *May 2022–Aug 2022*

  Worked with the Physical Modeling Team on their sustainability efforts related to nature-based carbon credits. Integrated high-resolution satellite imagery, LiDAR data sets, and deep learning for developing global reforestation monitoring products.

- **Missouri University of Science and Technology** — **Rolla, MO, USA**
  Graduate Research Assistant — *Fall 2021-Spring 2022*

  Worked on hydrologic remote sensing involving large-scale geospatial data analysis and machine learning at the Remote Sensing Hydrology Lab, under the supervision of Dr. Ryan Smith. Also collaborated with the USGS to develop the Aquaculture and Irrigation Water-Use Model (AIWUM) version 2.0.

- **Planet Labs** — **Remote, USA**
  Analytics Modeling Intern — *Jun 2021–Aug 2021*

  My primary focus area was on computer vision modeling using advanced remote sensing and machine learning (deep) techniques for high-resolution global inland surface water mapping. Developed an automated pipeline on the Google Cloud Platform which uses PlanetScope scenes and deep learning to monitor surface water bodies.

- **Missouri University of Science and Technology** — **Rolla, MO, USA**
  Graduate Research Assistant — *Spring 2021*
  Graduate Teaching Assistant (Lab Instructor, GIS Class, GE 3148/GEOL 3811) — *Fall 2020*
  Student Research Assistant (Full-Time) — *Summer 2020*
  Graduate Teaching Assistant (Lab Instructor, Remote Sensing Class, GE 5144) — *Spring 2020*
  Graduate Research Assistant — *Fall 2019*

- **Indian Institute of Remote Sensing (IIRS), ISRO** — **Dehradun, India**
  Officer Trainee — *Sep 2017–Mar 2019*

  IIRS is an ISRO training center for capacity building and promoting space education. During this time, I was enrolled as an MSc student in the Geoinformatics department under the IIRS-ITC Joint Education Program.

Education & Research

Academic Qualifications

- **Missouri University of Science and Technology** — **USA**
  Ph.D. Geological Engineering, CGPA: 3.75/4 — *Aug 2019–Dec 2022*
- **Faculty ITC, University of Twente** — **Netherlands**
  M.Sc. Geoinformatics, Graduated Cum Laude, CGPA: 8.9/10 — *Sep 2017–Mar 2019*
- **St. Xavier's College (Autonomous) Kolkata** — **India**
  M.Sc. Computer Science, Graduated First Class, CGPA: 8.43/10 — *Jul 2015–Jun 2017*
  B.Sc. Computer Science (Hons.), Graduated First Class, CGPA: 7.08/10 — *Jul 2012–Jun 2015*

List of Funded Projects

- ***Operationalizing Satellite-Based Irrigation Water Use for Improved Water Accounting and Management in the Southwest U.S.***

  Major Goals: This work will directly address the critical need for accurate, timely, and actionable data on irrigation water use (IWU) in the Southwest U.S., with detailed research to operations applications in Arizona, Nevada, and New Mexico. The proposal addresses priority areas of "Drought Resilience and Water Scarcity Management" and "Sustainable and Efficient Water Use Across Sectors (Irrigation)." Irrigated agriculture consumes the largest fraction of water in the Southwest U.S., but IWU records developed and maintained by state water agencies are often self-reported or based on water right duty, potential crop water use, or other estimation methods due to lack of in situ measurements, and can exhibit significant bias, propagating to management decisions. Moreover, IWU information is often fragmented and inconsistent in time and space and require manual updating by water agencies. To fill this gap, we propose to develop and deploy an operational system that combines satellite, weather, irrigation status, and water right geospatial information with physically based modeling and machine learning to quantify monthly IWU from 1986-2028. OpenET data will serve as a core input for quantifying evapotranspiration. The primary output is the automated generation of field-scale IWU information for water agency administrative hydrographic areas- the official spatial units used for water rights administration by our end-user partners. The proposed system will also partition and summarize IWU into surface water and groundwater sources based on water right place of use and permit geospatial data, enabling more explicit and accurate water accounting and hydrologic modeling.
  PI: Dr. Sayantan Majumdar (DRI), **Co-Is**: Dr. Justin Huntington (DRI), Peter ReVelle (DRI), Christopher Pearson (DRI), Thomas Ott (DRI), Dr. Yeonuk Kim (DRI), Dr. Ryan Smith (CSU), Dr. James J. Butler, Jr. (Kansas Geological Survey), Dr. Brad Wolaver (NMOSE), Kip Allander (NDWR), Collin Wogenstahl (ADWR)
  Source of Support: NASA and New Mexico Office of the State Engineer
  Project/Proposal Start and End Date: 08/2026 – 07/2029
  Total Award Amount (including Indirect Costs): $999,998 (NASA: $899,998; NMOSE: $100,000)

- ***Crop Evapotranspiration, Consumptive Use, and Open Water Evaporation Inventories for New Mexico***

  Major Goals: Developing state-wide agricultural consumptive water use and open water evaporation inventories, geospatial databases and web applications, and comparing new inventory information to meteorological, pumping, and water use data were available for model development and validation, drought mitigation and regional planning
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty and co-lead
  Source of Support: New Mexico Office of the State Engineer
  Project/Proposal Start and End Date: 09/2025 – 06/2028
  Total Award Amount (including Indirect Costs): $2,000,000

- ***Towards Intelligent River Basin Management: A Digital Twin and Water Cycle Atlas for the Ganga Basin using Hydrological Modeling, AI, and Satellite Remote Sensing***

  Major Goals: The project aims to develop an advanced Digital Twin and Water Cycle Atlas for the Ganga River Basin by leveraging AI, satellite remote sensing, and hydrological modeling for real-time, data-driven river basin management.
  PI: Dr. Manabendra Saharia (IIT Delhi), **Co-PIs**: Dr. Gaurav Talukdar (IIT Delhi), Dr. Sandeep Kumar

(IIT Delhi), Dr. Sayantan Majumdar (DRI; no-cost), Dr. Sujay V. Kumar (NASA GSFC; no-cost), Dr. Niko Wanders (Utrecht University; no-cost), Dr. Ram Avtar (Hokkaido University; no-cost)
Source of Support: National Mission for Clean Ganga/Ministry of Jal Shakti, India
Project/Proposal Start and End Date: 01/2026 – 12/2028
Total Award Amount (including Indirect Costs): $370,000 (approx.)

- ***Irrigation Status Mapping in the Western U.S. using Satellite Embeddings***

  Major Goals: As part of this project, we will develop annual irrigation status maps for the western United States, from 2017 to 2024 at 30 m spatial resolution. The primary objective will be to evaluate how the integration of the Satellite Embeddings will improve upon the established IrrMapper machine learning framework. We anticipate that the model, augmented with this advanced data, will produce a significantly more accurate dataset than existing products. The project will be designed to resolve known limitations in previous maps, such as the systematic misclassification of non-irrigated areas at the corners of center-pivot systems. The resulting maps will serve as a more reliable data source for water resource managers and policymakers in the water-stressed Western U.S., enabling improved water budgeting and policy formulation. Ultimately, the project's findings will provide a clear case for the adoption of foundational satellite embeddings in widely-used geospatial workflows, demonstrating a new paradigm for creating superior scientific data products.
  PI: Dr. Sayantan Majumdar (DRI), **Co-I**: Dr. Samapriya Roy (DRI)
  Source of Support: Google
  Project/Proposal Start and End Date: 11/2025 – 11/2026
  Total Award Amount (including Indirect Costs): $5,000

- ***Improving remote sensing and machine learning-driven groundwater withdrawal estimation in Arizona: Insights into surface water deliveries, irrigation efficiency, and long-term forecasts***

  Major Goals: To enhance our existing machine learning and remote sensing-based model estimates in Arizona. The existing model will be improved to provide actionable withdrawal estimates in light of ongoing and future reductions in the Colorado River and other surface water bodies.
  PI: Dr. Ryan Smith (CSU), **Co-I**: Dr. Sayantan Majumdar (DRI)
  Source of Support: NASA
  Project/Proposal Start and End Date: 01/2024 – 12/2025
  Total Award Amount (including Indirect Costs): $121,821, **Majumdar share**: $105,343

- ***Improved Characterization of Groundwater Resources in Transboundary Watersheds using Satellite Data and Integrated Models***

  Major Goals: This proposal is aimed at characterizing groundwater resources in eight international and transboundary watersheds through an integrated use of satellite remote sensing, hydroclimate, land surface, and other in-situ and modeled data. One of the key datasets is satellite-based evapotranspiration (ET). Desert Research Institute's (DRI) team of experts in satellite-based ET modeling and data processing will support Colorado State University (CSU) researcher partners in characterizing groundwater resources for this project. DRI researchers will provide support and guidance on selection of ET models that are most appropriate, support implementation of ET data processing workflows, and support quality assurance and quality control of ET data. DRI researchers will rely on existing cloud-based software and data sets that are operationally used (e.g. geeSEBAL, SSEBop, OpenET, WaPOR) and support ingesting new data and updates to codebases as required. Additionally, we will assist with writing and reviewing scientific documents as needed by CSU.
  PI: Dr. Ryan Smith (CSU), **Co-PIs**: Dr. Ryan Bailey (CSU), Dr. Justin Huntington (DRI), Dr. Sayantan Majumdar (DRI), Mr. Peter ReVelle (DRI)
  Source of Support: DOD-Army-ERDC
  Project/Proposal Start and End Date: 05/2025 – 4/2027
  Total Award Amount to DRI (including Indirect Costs): $115,068

- ***Drinking Water Arsenic, Blood Pressure, and Ischemic Stroke in the REGARDS Study***

  Major Goals: To develop an R package based on previous epidemiological studies and estimate a range of arsenic exposure outcomes based on an existing model of arsenic concentrations in groundwater. The R package will enable easier implementation of the arsenic exposure model by other epidemiologists.
  PI: Dr. Matthew Gribble (UCSF), **Co-Is**: Dr. Sayantan Majumdar (DRI), Dr. Ryan Smith (CSU)
  Source of Support: NIH

Project/Proposal Start and End Date: 08/2022 – 07/2025
Total Award Amount (including Indirect Costs): $222,750, **Majumdar share**: $43,686

- ***OpenET Planning***

  Major Goals: The goal of the project is to enhance and work toward operationalizing the use of OpenET.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: DOI – USGS
  Project/Proposal Start and End Date: 10/2022 – 02/2024
  Total Award Amount (including Indirect Costs): $494,464

- ***OpenET Planning - OpenET Software System Data, Application Programming Interface, and Precision and Accuracy Reporting Development, Integration, and Enhancements***

  Major Goals: The goal of the project is to enhance and work toward operationalizing the use of OpenET, a satellite-based ET-based cloud computing and data services platform co-led by the Desert Research Institute (DRI), and integrate OpenET data into a national scale hydrologic model to support the goals of the National Water Census and Water Availability and Use Science Program. The OpenET web application and data services provide equal access to information by all parties, helping stakeholders feel comfortable with the data while promoting better understanding of inherent uncertainties with respect to water use and supply planning.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: DOI – USGS
  Project/Proposal Start and End Date: 10/2023 – 09/2025
  Total Award Amount (including Indirect Costs): $875,000

- ***Development and Enhancement of OpenET Software Tools, Datasets, and Planning - Phase III***

  Major Goals: Developing software, tools, and datasets for OpenET and planning different applications.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: DOI – USGS
  Project/Proposal Start and End Date: 1/2025 – 01/2027
  Total Award Amount (including Indirect Costs): $1,299,999

- ***Nevada Water Resources Initiative***

  Major Goals: The primary goals will be to estimate water use across the state associated with agriculture and natural groundwater discharge areas, and perform data collection and monitoring that will be used for water use model development and validation. These estimates will be foundational for updating groundwater withdrawals, consumptive use, water budgets, and future hydrologic modeling activities across the state. Additional activities in collaboration with Nevada Division of Water Resources (NDWR) and USGS will focus on providing water use, and GIS data and analyses to support groundwater recharge, water availability, and water demand assessments across the state, and water budget assessments in priority basins.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: State of Nevada / U.S. Dept. of the Treasury
  Project/Proposal Start and End Date: 01/2023 – 12/2026
  Total Award Amount (including Indirect Costs): $3,128,748

- ***CESU: Development and Application of Climate and Remote Sensing Tools and Applications for Climate, Water, and Ecological Vulnerability Assessments for National Park Service Lands and Resources***

  Major Goals: Collaborate with NPS and academic partners to assess vulnerabilities of groundwater dependent ecosystems, develop adaptation strategies, and participate in outreach and training activities.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: National Park Service
  Project/Proposal Start and End Date: 01/2024 – 12/2026
  Total Award Amount (including Indirect Costs): $861,741

- ***Development of Water Use Projections to Support Nevada State Water Plan Updates***

  Major Goals: Developing historical and future consumptive use projections in Nevada.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: State of Nevada - Department of Conservation and Natural Resources
  Project/Proposal Start and End Date: 11/2024 – 09/2026

Total Award Amount (including Indirect Costs): $250,000

- ***Anchoring Commercialization Ecosystem for Environmental Technologies and Know-How***

  Major Goals: Estimating land deformation in Nevada using InSAR and machine learning.
  PI: Dr. Vicken Etyemezian (DRI), **Majumdar role**: Faculty
  Source of Support: State of Nevada - Governor's Office of Economic Development
  Project/Proposal Start and End Date: 07/2024 – 06/2025
  Total Award Amount (including Indirect Costs): $2,168,532, **Majumdar share**: $32,500

- ***CalSim Hydro - ET Demands Development***

  Major Goals: ASCE-PM standardized reference ET is the gold standard for crop ET estimates and planning throughout the United States and the World. ASCE-PM provides a consistent approach for estimating reference ET using the best available inputs and data processing allowing for reproducible ET estimation in variable environments and scenarios. Adoption of a dual crop coefficient approach based on ASCE-PM reference ET will bring CalSim in line with other crop ET estimation practices throughout Reclamation. Furthermore, application of finer scale gridded weather and land use datasets will establish a consistent framework for future updates and incorporation of future vulnerability modeling.
  PI: Christopher Pearson (DRI), **Majumdar role**: Faculty
  Source of Support: U.S. Bureau of Reclamation
  Project/Proposal Start and End Date: 09/2023 – 09/2025
  Total Award Amount (including Indirect Costs): $111,024

- ***NSF Futures Engine in the Southwest***

  Major Goals: Mentored four community college students from the Truckee Meadows Community College as part of the DRI Research Immersion Internship program. The project, titled "Understanding Nevada's Groundwater- Geospatial Data and Machine Learning", trained these students on modern computational research using Python tools and geospatial data science techniques for assessing groundwater levels in Nevada.
  DRI PI: Dr. Sean McKenna, **Majumdar role**: Faculty
  Source of Support: NSF
  Project/Proposal Start and End Date: 03/2024 – 02/2026
  Total Parent Award Amount (including Indirect Costs): $15,000,000
  Details: https://www.nsf.gov/funding/initiatives/regional-innovation-engines/portfolio/futures-engine-southwest

- ***Advancement of Climate and Remote Sensing Applications for Rangeland Condition Monitoring and Communication***

  Major Goals: The strategic goals for this project include: 1. Assist the BLM in identifying the types of products and analysis techniques that would be most helpful for identifying impacts to public lands List of tool requirements identified by stakeholders within the first 6 months of project initiation 2. Develop tools that can be easily accessible to both the BLM and the public for running the specific analyses Develop software code and documentation within the 1st year 3. Use existing BLM operated real-time network sensors of NDVI and Rangeland Analysis Platform (RAPs) functional vegetation groups web application to calibrate the tools and correlate NDVI data to species compositions Develop trend mapping within the first 2 years of the project; add in additional datasets (soil moisture, snow) to the software within the first 3 years 4. Run analyses on different habitat types, such as groundwater dependent ecosystems, sagebrush and terrestrial range habitats to identify changes over time - Finalize software updates and summarize baseline assessments by the end of the 5th year. 5. Develop training manuals and provide workshops on use of the tools Conduct at least 15 trainings for a range of stakeholders on use of the tool throughout the life of the project.
  PI: Dr. Justin Huntington (DRI), **Majumdar role**: Faculty
  Source of Support: DOI – Bureau of Land Management
  Project/Proposal Start and End Date: 09/2020 – 09/2023
  Total Award Amount (including Indirect Costs): $450,000

- ***Estimating Groundwater Withdrawals using Satellite Data in the Mississippi Alluvial Plain***

  Major Goals: Improving crop-specific groundwater use estimation methods using remote sensing and machine learning in the Mississippi Alluvial Plain.
  PI: Dr. Ryan Smith (CSU), **Majumdar role**: Ph.D. Student (Missouri S&T), Postdoc (CSU)

Source of Support: USGS, Gulf Coast Water Science Center
Project/Proposal Start and End Date: 04/2021 – 06/2023
Total Award Amount (including Indirect Costs): $150,000

- ***High-Resolution Estimation of Groundwater Withdrawals using Machine Learning Integration of Satellite Datasets***

  Major Goals: Developing methods for groundwater withdrawal estimation across different regions in the U.S.
  PI: Dr. Ryan Smith (CSU), **Majumdar role**: Ph.D. Student (Missouri S&T), Postdoc (CSU)
  Source of Support: NASA
  Project/Proposal Start and End Date: 01/2021 – 09/2025
  Total Award Amount (including Indirect Costs): $487,934

- ***New Investigator Proposal: Global Monitoring of Groundwater Extraction Using Automated Assessment of Land Subsidence***

  Major Goals: Developing methods for groundwater pumping-induced land subsidence mapping across the world.
  PI: Dr. Ryan Smith (CSU), **Majumdar role**: Ph.D. Student (Missouri S&T), Postdoc (CSU)
  Source of Support: National Geospatial Intelligence Agency
  Project/Proposal Start and End Date: 10/2020 – 10/2022
  Total Award Amount (including Indirect Costs): $193,243

- ***Groundwater Withdrawal Prediction Using Integrated Multitemporal Remote Sensing Data Sets and Machine Learning***

  Major Goals: Developing methods for groundwater withdrawal estimation in Kansas using remote sensing and machine learning techniques.
  PI: Dr. James J. Butler, Jr. (Kansas Geological Survey), **Majumdar role**: Ph.D. Student (Missouri S&T)
  Source of Support: USDA-NIFA/NSF INFEWS
  Details: https://doi.org/10.1029/2020WR028059

Technical Skills

- **Programming Languages:** Proficient: Python, R, Java, C++. Familiar: Linux, MATLAB, SQL, Git, LaTeX.
- **Tools/IDEs:** Google Cloud, Kubeflow, Docker, Google Earth Engine, JIRA, ENVI, ERDAS IMAGINE, QGIS, ArcGIS, GMTSAR, ISCE2, SNAP, PyCharm, Jupyter Notebook, Google Colab, IntelliJ IDEA, VS Code, Android Studio.

Journal Publications

[1] **S. Majumdar**, R. G. Smith, P. ReVelle, M. F. Hasan, and C. Wogenstahl, "Where Arizona's water goes: Declining agricultural dominance and rising urban demand drive a two-century shift in withdrawal patterns (1896–2099)," *In prep. for AGU Earth's Future*, 2026.

[2] **S. Majumdar**, R. G. Smith, P. ReVelle, M. F. Hasan, and C. Wogenstahl, "Historical and projected groundwater/surface-water withdrawals, irrigation consumptive use, and pumping-induced surface water capture for Arizona, 1896–2099," *In prep. for Nature Scientific Data*, 2026.

[3] **S. Majumdar**, S. M. Bartell, M. A. Lombard, R. G. Smith, and M. O. Gribble, "geoExposeR: An R package for modeling health effects of environmental exposures," *Under review in Journal of Open Source Software*, 2026.

[4] M. F. Hasan, R. G. Smith, F. V. Davenport, and **S. Majumdar**, "Groundwater pumping and irrigation in the Western United States estimated at high resolution with machine learning and satellite products," *Under review in Journal of Hydrology: Regional Studies*, 2026.

[5] D. W. Asfaw, R. G. Smith, M. J. Ronayne, **S. Majumdar**, S. A. Abbas, and R. T. Bailey, "Explainable AI as a diagnostic tool for analyzing spatiotemporal variability in simulated groundwater recharge: Application to a semi-arid river basin," *Under review in Environmental Modelling & Software*, 2026.

[6] J. W. Muturi, **S. Majumdar**, C. E. Ndehedehe, N. O. Agutu, and M. J. Kennard, "An integrated satellite remote sensing approach for mapping field-scale irrigation dynamics to support water management in highly regulated semi-arid catchments," *Under review in Agricultural Water Management*, 2026.

[7] Y. Kim, J. L. Huntington, B. C. de Andrade, M. S. Johnson, J. M. Volk, **S. Majumdar**, C. Morton, and P. ReVelle, "Thermodynamically constrained surface energy balance using medium-resolution remote sensing for efficient evapotranspiration mapping," *Under review in Remote Sensing of Environment*, 2026. Preprint: https://doi.org/10.31223/X51B4P.

[8] J. M. Volk, C. Dunkerly, **S. Majumdar**, J. L. Huntington, B. A. Minor, Y. Kim, C. G. Morton, P. ReVelle, A. Kilic, F. Melton, R. G. Allen, C. Pearson, A. J. Purdy, and T. G. Caldwell, "Assessing and correcting bias in gridded reference evapotranspiration over agricultural lands across the Contiguous United States," *Under review in Agricultural Water Management*, 2026. Preprint: https://doi.org/10.31223/X54F38.

[9] C. Dunkerly, J. M. Volk, **S. Majumdar**, J. L. Huntington, R. G. Allen, C. Pearson, Y. Kim, C. G. Morton, B. A. Minor, P. ReVelle, A. Kilic, F. Melton, A. J. Purdy, and T. G. Caldwell, "A benchmark dataset of agricultural weather stations over the Contiguous United States for evapotranspiration applications," *Under review in Nature Scientific Data*, 2026. Preprint: https://doi.org/10.31223/X56T9Z.

[10] M. Chahal, I. Kalu, O. E. Adeyeri, **S. Majumdar**, F. Helfer, and C. Ndehedehe, "Machine learning downscaling of GRACE satellite data for local-scale water storage assessment in South-East Queensland, Australia," *Geomatica*, vol. 78, p. 100094, 7 2026. 10.1016/j.geomat.2026.100094.

[11] S. Banerjee*, **S. Majumdar***, J. Saha, M. S. Kukal, P. K. Thakur, V. S. Rathore, P. R. Kaushik, G. Talukdar, D. Misra, and C. Ndehedehe, "Groundwater potential mapping in India: A review of approaches and pathways for sustainable management," *Cambridge Prisms: Drylands*, vol. 2, pp. e12, 1–47, 2025. https://doi.org/10.1017/dry.2025.10008, [*Equal contribution].

[12] P. Parasar, P. Moral, A. Srivastava, A. P. Krishna, **S. Majumdar**, R. Bhattacharjee, A. P. Mishra, D. Mustafi, V. S. Rathore, R. Sharma, and A. Mustafi, "Integrating genetic algorithms and machine learning for spatiotemporal groundwater potential zoning in fractured aquifers," *Journal of Hydrology: Regional Studies*, vol. 62, p. 102800, 2025. https://doi.org/10.1016/j.ejrh.2025.102800.

[13] M. F. Hasan, R. G. Smith, **S. Majumdar**, J. L. Huntington, A. A. M. Neto, and B. A. Minor, "Satellite data and physics-constrained machine learning for estimating effective precipitation in the Western United States and application for monitoring groundwater irrigation," *Agricultural Water Management*, vol. 319, p. 109821, 2025. https://doi.org/10.1016/j.agwat.2025.109821.

[14] D. Asfaw, R. G. Smith, **S. Majumdar**, K. Grote, B. Fang, B. Wilson, V. Lakshmi, and J. Butler, "Predicting groundwater withdrawals using machine learning with limited metering data: Assessment of training data requirements," *Agricultural Water Management*, vol. 318, p. 109691, 2025. https://doi.org/10.1016/j.agwat.2025.109691.

[15] R. T. Bailey, S. Abbas, N. Čerkasova, J. G. Arnold, M. J. White, **S. Majumdar**, and R. Smith, "Quantifying agricultural groundwater abstraction using an integrated watershed modeling approach, Mississippi Delta, USA," *Hydrogeology Journal*, vol. 33, pp. 1429–1447, 2025. https://doi.org/10.1007/s10040-025-02922-2.

[16] T. J. Ott*, **S. Majumdar***, J. L. Huntington, C. Pearson, M. Bromley, B. Minor, P. ReVelle, C. G. Morton, S. Sueki, J. P. Beamer, and R. L. Jasoni, "Toward field-scale groundwater pumping and improved groundwater management using remote sensing and climate data," *Agricultural Water Management*, vol. 302, p. 109000, 2024. https://doi.org/10.1016/j.agwat.2024.109000 [*Equal contribution].

[17] **S. Majumdar**, R. G. Smith, M. F. Hasan, J. L. Wilson, V. E. White, E. Bristow, J. R. Rigby, W. Kress, and J. A. Painter, "Improving crop-specific groundwater use estimation in the Mississippi Alluvial Plain: Implications for integrated remote sensing and machine learning approaches in data-scarce regions," *Journal of Hydrology: Regional Studies*, vol. 52, p. 101674, 2024. https://doi.org/10.1016/j.ejrh.2024.101674.

[18] J. Tolan, H.-I. Yang, ..., **S. Majumdar**, *et al.*, "Very high resolution canopy height maps from RGB imagery using self-supervised vision transformer and convolutional decoder trained on aerial lidar," *Remote Sensing of Environment*, vol. 300, p. 113888, 2024. https://doi.org/10.1016/j.rse.2023.113888.

[19] M. F. Hasan, R. Smith, S. Vajedian, R. Pommerenke, and **S. Majumdar**, "Global land subsidence mapping reveals widespread loss of aquifer storage capacity," *Nature Communications*, vol. 14, p. 6180, 2023. https://doi.org/10.1038/s41467-023-41933-z.

[20] **S. Majumdar**, R. Smith, B. D. Conway, and V. Lakshmi, "Advancing remote sensing and machine learning-driven frameworks for groundwater withdrawal estimation in Arizona: Linking land subsidence to groundwater withdrawals," *Hydrological Processes*, vol. 36, no. 11, 2022. https://doi.org/10.1002/hyp.14757.

[21] **S. Majumdar**, R. Smith, J. J. Butler Jr, and V. Lakshmi, "Groundwater withdrawal prediction using integrated multitemporal remote sensing data sets and machine learning," *Water Resources Research*, vol. 56, 2020. https://doi.org/10.1029/2020WR028059.

[22] R. Smith and S. Majumdar, "Groundwater storage loss associated with land subsidence in western united states mapped using machine learning," *Water Resources Research*, vol. 56, p. e2019WR026621, 2020. https://doi.org/10.1029/2019WR026621.

Data & Software Publications

[1] **S. Majumdar**, R. G. Smith, P. ReVelle, M. F. Hasan, and W. Collin, "AZ-Hydro — Historical and projected Arizona annual water use: Software, input data, models, raster and well package predictions, and validation at 2 km resolution (1896–2099)," 2026. *Zenodo*. https://doi.org/10.5281/zenodo.19057935.

[2] **S. Majumdar**, S. M. Bartell, M. A. Lombard, R. G. Smith, and M. O. Gribble, "geoExposeR: An R package for modeling health effects of environmental exposures," 2026. *U.S. Geological Survey software release*. https://doi.org/10.5066/P1JGUKMD.

[3] **S. Majumdar**, J. L. Huntington, P. ReVelle, S. Nozari, R. G. Smith, M. F. Hasan, M. Bromley, J. Atkin, J. Rapp, E. R. Jensen, D. Ketchum, and S. Roy, "Agribound: Unified agricultural field boundary delineation from satellite imagery using geospatial foundation models, pre-trained segmentation, and embeddings," 2026. *Zenodo*. https://doi.org/10.5281/zenodo.19420961.

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[13] J. Tolan, H.-I. Yang, ..., **S. Majumdar**, *et al.*, "High Resolution Canopy Height Maps by WRI and Meta," 2023. *Meta and World Resources Institute (WRI) - 2023. High Resolution Canopy Height Maps (CHM). Source imagery for CHM © 2016 Maxar*. Data: https://registry.opendata.aws/dataforgood-fb-forests/, Code: https://github.com/facebookresearch/HighResCanopyHeight.

Conference Publications

[1] **S. Majumdar**, R. G. Smith, and M. F. Hasan, "A high-resolution data-driven monthly aquaculture and irrigation water use model in the Mississippi Alluvial Plain," in *IGARSS 2025 - 2025 IEEE International Geoscience and Remote Sensing Symposium*, (Brisbane, Australia), pp. 2686–2691, 2025. https://doi.org/10.1109/IGARSS55030.2025.11243173 [Poster presentation: S. Majumdar].

[2] **S. Majumdar**, J. L. Huntington, R. G. Smith, P. ReVelle, T. J. Ott, S. A. McKenna, V. Etyemezian, and S. N. Bacon, "Satellite remote sensing and groundwater records reveal land subsidence in Diamond Valley, Nevada," in *IGARSS 2025 - 2025 IEEE International Geoscience and Remote Sensing Symposium*, (Brisbane, Australia), pp. 448–453, 2025. https://doi.org/10.1109/IGARSS55030.2025.11242748 [Oral presentation: S. Majumdar].

[3] **S. Majumdar**, R. Smith, B. D. Conway, J. J. Butler, V. Lakshmi, and C. H. Dagli, "Estimating local-scale groundwater withdrawals using integrated remote sensing products and deep learning," in *IGARSS 2021 - 2021 IEEE International Geoscience and Remote Sensing Symposium*, (Online), pp. 4304–4307, 2021. https://doi.org/10.1109/IGARSS47720.2021.9554784 [Oral presentation: S. Majumdar].

[4] **S. Majumdar**, P. K. Thakur, L. Chang, and S. Kumar, "X-band polarimetric SAR copolar phase difference for fresh snow depth estimation in the northwestern Himalayan watershed," in *IGARSS 2019 - 2019 IEEE International Geoscience and Remote Sensing Symposium*, (Yokohama, Japan), pp. 4102–4105, 2019. https://doi.org/10.1109/IGARSS.2019.8898884 [Poster presentation: S. Majumdar].

[5] R. Ghosh, P. K. Gupta, V. Tolpekin, S. K. Srivastav, and **S. Majumdar**, "The potential of channel specific reflectance in Landsat 8 OLI sensor for retrieving coal fire affected pixels," in *IGARSS 2019 - 2019 IEEE International Geoscience and Remote Sensing Symposium*, (Yokohama, Japan), pp. 9968–9971, 2019. https://doi.org/10.1109/IGARSS.2019.8900618 [Poster presentation: S. Majumdar].

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[7] **S. Majumdar**, S. Shukla, and A. Maiti, "Open agent based runoff and erosion simulation (OARES): A generic cross platform tool for spatio-temporal watershed monitoring using climate forecast system reanalysis weather data," in *ISPRS Ann. Photogramm. Remote Sens. Spat. Inf. Sci.*, vol. IV-4, (Delft, Netherlands), pp. 125–132, 2018. https://doi.org/10.5194/isprs-annals-IV-4-125-2018 [Oral presentation: S. Majumdar].

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[9] S. Gupta, C. Shah, D. Shah, P. Deore, **S. Majumdar**, A. Maiti, S. Shukla, J. Mehta, and M. Shah, "A grass root oriented urban planning approach to uplift the socio-economic facet of a city using 2D and 3D GIS: Case study on Mehmedabad City, India," in *ISPRS Ann. Photogramm. Remote Sens. Spat. Inf. Sci.*, vol. IV-4, (Delft, Netherlands), pp. 73–80, 2018. https://doi.org/10.5194/isprs-annals-IV-4-73-2018.

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Conference Abstracts

[1] J. Muturi, **S. Majumdar**, C. Ndehedehe, and M. Kennard, "Detecting irrigation at catchment scale over recent years (2019-2025)," in *EGU General Assembly 2026*, (Vienna, Austria), 2026. https://doi.org/10.5194/egusphere-egu26-6080 [Poster presentation: J. Muturi].

[2] **S. Majumdar**, J. Payne, B. Padilla, I. de la Garza-Gibson, E. Muir, R. Putnam, and M. Collins, "Understanding Nevada's groundwater using geospatial data and machine learning: Developing student pathways into Earth Science research," in *AGU Fall Meeting 2025*, (New Orleans, Louisiana), 2025. [Poster presentation: S. Majumdar].

[3] M. F. Hasan, R. G. Smith, F. Davenport, and **S. Majumdar**, "A data-driven approach for estimating groundwater irrigation for major agricultural basins of the Western United States," in *AGU Fall Meeting 2025*, (New Orleans, Louisiana), 2025. [Oral presentation: M. F. Hasan].

[4] E. Manu, **S. Majumdar**, M. D. Lucia, E. Obuobie, A. Lutz, and M. Kühn, "Groundwater level prediction in the Pra Basin, Ghana: Evaluating the temporal generalization of ensemble and deep learning models," in *AGU Fall Meeting 2025*, (New Orleans, Louisiana), 2025. [Poster presentation: S. Majumdar].

[5] **S. Majumdar**, J. L. Huntington, R. G. Smith, T. J. Ott, P. ReVelle, M. Bromley, M. F. Hasan, C. Pearson, B. A. Minor, C. G. Morton, and C. Dunkerly, "Developing long-term groundwater withdrawal and consumptive use inventories for irrigated agriculture in the Western U.S. using satellite remote sensing," in *2025 U.S. Committee on Irrigation and Drainage Conference*, (Reno, NV), 2025. [Oral presentation: S. Majumdar].

[6] J. L. Huntington, T. J. Ott, P. ReVelle, **S. Majumdar**, M. Bromley, B. Minor, C. Pearson, and K. Allander, "Water right buy backs: Quantifying how much wet water is actually conserved," in *2025 U.S. Committee on Irrigation and Drainage Conference*, (Reno, NV), 2025. [Oral presentation: J. L. Huntington].

[7] P. R. Kaushik, A. Lenczuk, **S. Majumdar**, and P. K. Thakur, "Assessing hydrological dynamics in the Ganges Basin, India using satellite remote sensing and machine learning," in *2025 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (Brisbane, Australia), 2025. https://tinyurl.com/4aeuevas [Poster presentation: S. Majumdar].

[8] **S. Majumdar**, T. J. Ott, J. L. Huntington, R. G. Smith, P. ReVelle, M. Bromley, M. F. Hasan, C. Pearson, B. A. Minor, C. G. Morton, and R. Pommerenke, "Using Landsat evapotranspiration and climate data for estimating high-resolution gridded and field-scale irrigation water use and groundwater withdrawals in the Western U.S.," in *ESA Living Planet Symposium 2025*, (Vienna, Austria), 2025. https://tinyurl.com/f6nv3ffe [Poster presentation: R. Pommerenke].

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[10] **S. Majumdar**, "Assessing groundwater pumping, consumptive use, and irrigation efficiencies in the Western U.S.: Insights from high-resolution satellite remote sensing and climate data," in *45th Annual AGU Hydrology Days*, (Fort Collins, CO), 2025. https://doi.org/10.25675/10217/240629 [Oral presentation: S. Majumdar].

[11] **S. Majumdar**, "Integrating satellite remote sensing and groundwater data for assessing land subsidence in Diamond Valley, Nevada," in *45th Annual AGU Hydrology Days*, (Fort Collins, CO), 2025. https://doi.org/10.25675/10217/240629 [Oral presentation: S. Majumdar].

[12] T. J. Ott, M. Bromley, **S. Majumdar**, P. ReVelle, B. Minor, J. Atkin, C. McCartin, L. Bartels, N. Goehring, C. Pearson, C. G. Morton, S. Sueki, E. Billings, and J. L. Huntington, "Developing an agricultural water use

and pumping inventory for Nevada," in *NWRA Annual Conference*, (Reno, NV), 2025. https://tinyurl.com/nhhzd2f9 [Oral presentation: T.J. Ott].

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[14] P. Gardner, J. L. Huntington, J. Volk, C. Garner, M. Gardner, **S. Majumdar**, A. Pitman, C. J. Mayers, and K. Allander, "Nevada Water Initiative: Evaluating methods for estimating recharge to Basin and Range Aquifer systems in Nevada," in *NWRA Annual Conference*, (Reno, NV), 2025. https://tinyurl.com/nhhzd2f9 [Oral presentation: P. Gardner].

[15] **S. Majumdar**, R. G. Smith, B. D. Conway, and C. Wogenstahl, "A multi-decadal analysis of groundwater withdrawals in Arizona using remote sensing and machine learning," in *AGU Fall Meeting 2024*, (Washington, D.C.), 2024. https://ui.adsabs.harvard.edu/abs/2024AGUFMH22D...02M/abstract [Oral presentation: S. Majumdar].

[16] M. F. Hasan, R. G. Smith, **S. Majumdar**, and J. L. Huntington, "Satellite data and machine learning-based effective precipitation modeling for the Western United States," in *AGU Fall Meeting 2024*, (Washington, D.C.), 2024. https://ui.adsabs.harvard.edu/abs/2024AGUFMH21D...07H/abstract [Oral presentation: M. F. Hasan].

[17] T. Doane, **S. Majumdar**, and G. Yu, "Testing the utility of SAR for mapping surface flow events in post-fire settings," in *AGU Fall Meeting 2024*, (Washington, D.C.), 2024. https://ui.adsabs.harvard.edu/abs/2024AGUFMNH33A2183D/abstract [Poster presentation: T. Doane].

[18] **S. Majumdar**, T. J. Ott, J. L. Huntington, R. G. Smith, C. Pearson, M. Bromley, B. Minor, C. G. Morton, P. ReVelle, M. F. Hasan, J. P. Beamer, and B. D. Conway, "Tracking groundwater pumping, consumptive use, and irrigation efficiencies in the Western U.S. through OpenET," in *AGU WaterSciCon24*, (St. Paul, MN), 2024. https://ui.adsabs.harvard.edu/abs/2024wsc..conf20202M/abstract [Oral presentation: S. Majumdar].

[19] P. ReVelle, B. Minor, M. Bromley, C. Pearson, **S. Majumdar**, C. G. Morton, and J. L. Huntington, "Enhancing hydrographic basin water resource management with OpenET: Quantifying consumptive use volumes and evaluating variability across models and irrigation status datasets," in *AGU WaterSciCon24*, (St. Paul, MN), 2024. https://ui.adsabs.harvard.edu/abs/2024wsc..conf26285R/abstract [Poster presentation: P. ReVelle, S. Majumdar].

[20] **S. Majumdar**, "Regional and field scale estimates of groundwater withdrawals using remote sensing and climate data," in *OpenET Applications Conference*, (Albuquerque, NM), 2024. https://www.youtube.com/watch?v=VZ201guaVuI [Oral presentation].

[21] **S. Majumdar**[*], T. J. Ott[*], J. L. Huntington, C. Pearson, M. Bromley, B. Minor, C. G. Morton, S. Sueki, J. P. Beamer, and R. Jasoni, "Assessing statistical and machine learning approaches to estimate field-scale groundwater pumping using Landsat-based evapotranspiration, irrigation, and climate data," in *AGU Chapman Conference: Remote Sensing of the Water Cycle*, (Honolulu, HI), 2024. https://agu.confex.com/agu/24chapman1/meetingapp.cgi/Paper/1493323 [*Equal contribution, Poster presentation: S. Majumdar].

[22] T. J. Ott, J. L. Huntington, M. Bromley, C. G. Morton, S. Sueki, and **S. Majumdar**, "Estimating field-scale groundwater pumping using Landsat evapotranspiration and climate data: Insights into Diamond Valley, Nevada," in *NWRA Annual Conference*, (Las Vegas, NV), 2024. [Oral presentation: T.J. Ott].

[23] **S. Majumdar**[*], T. J. Ott[*], J. L. Huntington, R. Smith, B. Fang, and V. Lakshmi, "Toward field scale groundwater withdrawals in the Western U.S. using remote sensing and climate data," in *AGU Fall Meeting*, (San Francisco, CA), 2023. https://doi.org/10.22541/essoar.170688858.81127989/v1 [*Equal contribution, Poster presentation: S. Majumdar, T.J. Ott].

[24] D. Asfaw, R. Smith, **S. Majumdar**, B. Lakshmi, V. Fang, K. Grote, J. J. Butler, and B. B. Wilson, "Capturing the spatio -temporal variability of groundwater pumping using remote sensing products and machine learning techniques: An assessment of training data quality and quantity implications on model performance," in *AGU Fall Meeting*, (San Francisco, CA), 2023. [Poster presentation: D. Asfaw].

[25] V. E. White and **S. Majumdar**, "To collect or not to collect: Where, when, and why to collect irrigation and aquaculture well water use data for understanding and modeling," in *ASCE EWRI World Environmental and Water Resources Congress*, (Henderson, NV), 2023. https://tinyurl.com/4mnsum8h [Oral presentation: V.E. White].

[26] **S. Majumdar** and R. Smith, "Integrating remote sensing and machine learning for high-resolution groundwater use estimation," in *43rd Annual AGU Hydrology Days*, (Fort Collins, CO), 2023. http://dx.doi.org/10.25675/10217/236401 [Oral presentation: S. Majumdar].

[27] **S. Majumdar**, R. Smith, M. F. Hasan, V. E. White, E. Bristow, W. Kress, and J. R. Rigby, "High-resolution groundwater use estimation at annual and monthly scales in the Mississippi Alluvial Plain using remote sensing and machine learning," in *AGU Fall Meeting*, (Chicago, IL), 2022. https://ui.adsabs.harvard.edu/abs/2022AGUFM.H25T1359M/abstract [Poster presentation: S. Majumdar].

[28] M. F. Hasan, R. Smith, S. Vajedian, R. Pommerenke, and **S. Majumdar**, "Linking subsidence and groundwater storage loss: Investigating drivers and trends using big data," in *AGU Fall Meeting*, (Chicago, IL), 2022. https://ui.adsabs.harvard.edu/abs/2022AGUFMNS23A..08H/abstract [Oral presentation: M.F. Hasan].

[29] D. Asfaw, R. Smith, **S. Majumdar**, V. Lakshmi, K. Grote, and J. J. Butler, "Towards generalizable groundwater withdrawal predictions: How much data do we need?," in *AGU Fall Meeting*, (Chicago, IL), 2022. https://ui.adsabs.harvard.edu/abs/2022AGUFM.H25T1364A/abstract [Poster presentation: D. Asfaw].

[30] **S. Majumdar**, R. Nair, A. Kapadia, J. M. Manso, C. Bronstein, B. Neuberg, S. Roy, B. Goldenberg, J. Davis, K. Jordahl, and R. Smith, "High-resolution global inland surface water monitoring using PlanetScope data and supervised learning with bootstrapped noisy labels," in *AGU Fall Meeting*, (New Orleans, LA), 2021. https://doi.org/10.1002/essoar.10508281.1 [Poster presentation: S. Majumdar].

[31] **S. Majumdar**, R. Smith, M. F. Hasan, J. L. Wilson, E. Bristow, L. Oyler, and J. R. Rigby, "Using remote sensing and machine learning to estimate groundwater use in the Mississippi Alluvial Plain," in *AGU Fall Meeting*, (New Orleans, LA), 2021. https://doi.org/10.1002/essoar.10508282.1 [Poster presentation: S. Majumdar].

[32] R. Smith, **S. Majumdar**, L. Oyler, R. Pommerenke, J. Li, M. F. Hasan, J. J. Butler, V. Lakshmi, B. D. Conway, J. R. Rigby, R. Knight, and M. Goebel, "Modeling hydrogeologic fluxes and their impact on natural and human systems," in *AGU Fall Meeting*, (New Orleans, LA), 2021. https://ui.adsabs.harvard.edu/abs/2021AGUFMNS43A..02S [Oral presentation: R. Smith].

[33] M. F. Hasan, R. Smith, R. Pommerenke, and **S. Majumdar**, "Mapping global land subsidence using remote sensing and machine learning," in *AGU Fall Meeting 2021*, (New Orleans, LA), 2021. https://ui.adsabs.harvard.edu/abs/2021AGUFMNS25B0425H [Poster presentation: M.F. Hasan].

[34] R. Smith, **S. Majumdar**, M. F. Hasan, J. J. Butler, V. Lakshmi, B. D. Conway, and J. R. Rigby, "Mapping groundwater use with satellite sensor fusion and machine learning," in *GSA Connects*, (Portand, OR), 2021. https://doi.org/10.1130/abs/2021AM-369568 [Oral presentation: R. Smith].

[35] **S. Majumdar**, R. Smith, B. D. Conway, J. J. Butler, and V. Lakshmi, "Integrating remote sensing and machine learning for groundwater withdrawal estimation in Arizona," in *AGU Fall Meeting*, (Online), 2020. https://ui.adsabs.harvard.edu/abs/2020AGUFMH030.0018M [Poster presentation: S. Majumdar].

[36] **S. Majumdar**, R. Smith, B. D. Conway, J. J. Butler, and V. Lakshmi, "Estimating groundwater withdrawals using multi-temporal remote sensing products and machine learning," in *USGIF GeoConnect Series*, (Online), 2020. https://doi.org/10.13140/RG.2.2.32065.92009 [Oral presentation: S. Majumdar].

[37] R. Smith, **S. Majumdar**, L. Oyler, J. J. Butler, and V. Lakshmi, "A machine learning approach for estimating groundwater use with satellite data," in *AGU Chapman Conf.*, (Valencia, Spain), 2019. https://agu.confex.com/agu/19chapman5/meetingapp.cgi/Paper/488318 [Poster presentation: S. Majumdar].

[38] R. Smith, **S. Majumdar**, L. Oyler, J. J. Butler, and V. Lakshmi, "Estimating groundwater extraction with integrated satellite datasets and machine learning," in *GSA Annual Meeting*, (Phoenix, AZ), 2019. https://doi.org/10.1130/abs/2019AM-340862 [Oral presentation: R. Smith].

[39] **S. Majumdar**, P. K. Thakur, L. Chang, S. Kumar, and R. Smith, "Spaceborne polarimetric SAR interferometry for snow depth retrieval in the northwestern Himalayan watershed," in *GSA Annual Meeting*, (Phoenix, AZ), 2019. https://doi.org/10.1130/abs/2019AM-338916 [Oral presentation: S. Majumdar].

Invited Talks/Guest Lectures

[1] **S. Majumdar**, "The role of Google Earth Engine in satellite-based agricultural water use monitoring," in *Google Geo For Good 2025, Singapore*, September 2025.

[2] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use at field to regional scales," in *Griffith University, Nathan, Queensland, Australia*, August 2025.

[3] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use at field to regional scales," in *IAH - The International Association of Hydrogeologists, Brisbane, Queensland, Australia*, August 2025.

[4] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use at field to regional scales," in *Webinar, Ghana Institution of Geoscientists*, May 2025.

[5] **S. Majumdar**, "Tracking groundwater pumping, consumptive use, and irrigation efficiencies in the Western U.S. using OpenET," in *Webinar, IAHS - International Association of Hydrological Sciences Working Group on Irrigation Quantification & Management & its Effect on the Water Cycle*, May 2025.

[6] **S. Majumdar** and S. Roy, "Some field boundary developments, applications of satellite-based irrigation water use, and future directions," in *Taylor Geospatial Engine (TGE) Fields of The World (FTW) Phase II Workshop, St Louis, Missouri, USA*, March 2025.

[7] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use," in *Indian Institute of Technology Delhi, New Delhi, India*, February 2025.

[8] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use," in *Indian Institute of Remote Sensing (IIRS), Indian Space Research Organisation (ISRO), Dehradun, India*, October 2024.

[9] **S. Majumdar**, "Integrating satellite remote sensing, climate data, and machine learning to quantify irrigation water use," in *Birla Institute of Technology, Mesra, India*, September 2024.

Dissertation and Thesis

[1] **S. Majumdar**, *Groundwater Withdrawal Estimation using Integrated Remote Sensing Products and Machine Learning*. Ph.D. Dissertation, Missouri University of Science and Technology, Rolla, MO, 2022. Available at https://scholarsmine.mst.edu/doctoral_dissertations/3230/.

[2] **S. Majumdar**, "Snow depth and SWE estimation using Spaceborne Polarimetric and Interferometric Synthetic Aperture Radar," M.Sc. Thesis, ITC, University of Twente, Enschede, Netherlands, 2019. Available at https://essay.utwente.nl/83533/1/majumdar.pdf.

Professional Service and Volunteering Activities

- **Internship Advisor**: Internship advisor for four students (from University of Nevada, Reno and Truckee Meadows Community College) as part of the DRI Research Immersion Internship program (Jun 2025-Aug 2025).
- **Editorial Board Member**: Editorial Board Member for Springer Nature Scientific Reports (Feb 2025-present).
- **NSF Panelist**: Panelist for NSF Division of Research, Innovation, Synergies and Education (GEO/RISE) 2025.
- **NASA Panelist**: Panel Reviewer for the NASA Early Career Investigator Program in Earth Science (ECIP-ES) (Oct-Nov 2023) and NASA ROSES 2023 (Aug 2024).
- **Scientific Advisor**: Scientific advisor to two startups- Thazhal Geospatial Analytics (Aug 2023-present) and Mizu Risk Lab (Mar 2024-Mar 2025), and the Oregon Water Resources Department (OWRD, Apr

2025-present) as part of the OWRD Technical Advisory Group (TAG) on the Water Availability Reporting System..

- **Journal Reviewer**: Reviewed manuscripts for Nature Communications, Nature Scientific Data, AGU Water Resources Research, Elsevier Remote Sensing of Environment, Journal of Hydrology, Agricultural Water Management, Journal of Hydrology: Regional Studies, Science of The Total Environment (STOTEN), Environmental Modelling & Software, Advances in Space Research, Springer Hydrogeology Journal, ASCE Journal of Hydrologic Engineering, EGU Hydrology and Earth System Sciences (HESS), IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS), IEEE Transactions on Geoscience and Remote Sensing (TGRS), Nature npj Clean Water, AGU Earth's Future, Taylor & Francis Imaging Science, and others.
- **DRI STEM Educator & Student Partnership PD Workshop**, Nov 18, 2023: Volunteered as one of the three DRI faculty members selected for this workshop. I interacted with twenty University of Nevada Reno (UNR) undergraduate and graduate students and shared my research experience, answered their questions, and listened to their interesting project ideas and presentations.
- **Colorado State University**, Nov 16, 2022: Volunteered as a judge at the Fall Graduate Student Showcase.
- **The Nature Conservancy**, Dec 2021- Jul 2023: Participated as a Conservation Champion.
- **IEEE IGARSS 2021**, Jul 12-16, 2021: Co-chaired the conference session WE2.MM-10: Parameter Retrieval with SAR, LiDAR and New Systems.
- **Frontier Development Lab (FDL)**, Jun 2021-Aug 2021: Participated as an external reviewer (on behalf of Planet Labs) on the FDL 2021 ML Payload for PhiSat2 and Beyond challenge.
- **American Society for Photogrammetry and Remote Sensing (ASPRS)**, Heartland Region, Sep 2020-May 2022: Volunteered as the Secretary in the ASPRS Heartland Region. Primary activities included briefing the board on monthly meetings and taking notes in such meetings.
- **American Geophysical Union (AGU) Fall Meeting**, Dec 1-17, 2020: Student volunteering responsibilities included attending three specific sessions on remote sensing and hydrology, taking notes, and engaging in Q&A.
- **Semi-Automatic Classification Plugin for QGIS**, Apr 2020: Fixed a bug in this popular QGIS plugin used for remote sensing image classification.
- **National Service Scheme (NSS)**, Jul 2012-June 2015: Involved in the NSS program at St. Xavier's College (Autonomous) Kolkata. Primarily taught basic English and Mathematics to underprivileged children from different villages in southern West Bengal, India.

Scientific, Technical, and Management Experience

My primary contribution to the field of hydrology lies in developing open-source tools for high-resolution groundwater use estimation integrating remote sensing and machine learning. The approach I developed during my Ph.D. is the first work on estimating groundwater withdrawals at local scales using data-driven methodologies. Moreover, I compared modeled groundwater withdrawals and InSAR-derived subsidence data in Arizona, which is the first study to explore the relationship between withdrawals and subsidence across a vast geographical area. I also improved an existing USGS-developed groundwater use model in the Mississippi Alluvial Plain and developed the first field-scale groundwater use estimation model integrating remote sensing and hydroclimate data in a machine learning workflow.

As an early career faculty member at the Desert Research Institute, my goal is to build a Geospatial Analytics research group with students and postdoctoral researchers working on problems at the intersection of remote sensing, machine learning, and geospatial data science focusing on hydrology, as well as other related Earth science domains. Currently, I am the director of the Planetary Water Dynamics Lab. Over the years, I have collaborated with the USGS, Kansas Geological Survey (KGS), Arizona Department of Water Resources (ADWR), Nevada Division of Water Resources (NDWR), New Mexico Office of the State Engineer (NMOSE), and Oregon Water Resources Department (OWRD). I have also successfully led and co-authored multiple publications, including conference presentations with these agencies and other university faculties and industries (Meta, Planet Labs), showcasing my efficient research project management skills.

Academic Achievements

2026	Research proposal selected as part of the NASA ROSES 2025 Water Resources Applications program
2025	Selected to participate in Google Geo for Good 2025, Singapore
2025	Selected as a panelist for NSF GEO/RISE 2025
2024	Selected as a panelist for NASA ROSES 2023
2024	Selected as a member of the International Advisory Committee for ASCE CISSC 2025, Chandigarh, India
2024	AGU Chapman Conference Early Career Travel Grant, Honolulu, Hawaii, USA
2023	Selected as a panelist for the NASA Early Career Investigator Program in Earth Science (ECIP-ES)
2023	Research proposal selected as part of the NASA ROSES 2022 Applications-Oriented Augmentations for Research and Analysis solicitation
2023	Feature story in the Department of Civil and Environmental Engineering (CIVE), Colorado State University news
2023	Feature story in the Desert Research Institute news and announcements
2020	4^{th} prize, Poster Competition, Council of Graduate Students, Missouri S&T
2020	Winner of 2020 GGF/G-RES Poster Competition, USGIF
2020	AGU Fall Meeting Virtual Student Travel Grant
2020	Research work showcased in popular science news platform, phys.org
2020	Research work highlighted in Missouri S&T News and Events
2020	Research article showcased in AGU Editors' Highlights
2020	Geological Society of America (GSA) CARES Grant, USA
2019	AGU/NSF Student Travel Grant, AGU Chapman Conference, USA/Spain
2019	GSA North-Central Section Student Travel Grant, GSA Annual Meeting, USA
2019	IGARSS 2019 Student Travel Grant, IEEE/GRSS, USA/Japan
2018-19	Golden Jubilee Fellowship, IIRS, ISRO, India (1^{st} position in Blocks I-IV)
2016	Summer Research Fellowship, Indian Academy of Sciences, IIT Madras