Deshpande, Prasad Jayant
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RESEARCH INTERESTS-

Remote sensing, Citizen science, and AI-ML applications in Hydro-meteorology and Agro-hydrology

RESEARCH EXPERIENCE-

Ongoing Postdoctoral Research at Kansas State University (USA): Advisor: Dr. Gaurav Jha

- **Evaluation of OpenET Estimates Against In-Situ Evapotranspiration (ET) Measurements in Central Plains USA: Kansas State University (USA):** Advisor: Dr. Gaurav Jha
  - Validated satellite-based ET estimates by OpenET NASA with in-situ measurements.
  - Analyzed ET dynamics for corn and soybean under multiple irrigation systems in an on-farm trial.
  - Identified spatial and temporal patterns in OpenET accuracy for water management.

- **Comparison of Emerging Precision Irrigation Systems in On-farm Trials:**
  - Autonomous Pivot and Rain360 are emerging precision irrigation systems.
  - Optical imagery, Radar, and AI-based irrigation are carried out in an on-farm trial.
  - Comparison of emerging methods with conventional subsurface in terms of water deficit index.
  - Using UAV and satellite imagery, along with ET estimates, to find irrigation efficiencies.

Master's and Doctoral Research at the Indian Institute of Technology Kanpur (India):

Advisor: Dr. Shivam Tripathi

- **Fog in Indo-Gangetic Plains: Climatology, Detection, and Forecasting using Data-Driven Methods: *Doctoral Thesis at* Indian Institute of Technology:** Advisor: Dr. Shivam Tripathi
  - Studied fog climatology to understand nature and patterns of fog using 11 airport visibility sensors.
  - Developed a real-time fog detection model using INSAT-3D satellite data by ISRO (Indian Space Research Organization). This model shows a four-fold improvement over ISRO's operational product using uncertainty-aware Bayesian Neural Networks.
  - Developed a probabilistic fog forecasting model using Google's GraphCast outputs. The forecasting model extends the fog forecasting lead time up to 5 times (i.e., 10 days) that of the existing models without significant deterioration in performance. Link for real-time results: https://fog.iitk.ac.in/

- **Historical Land Cover Classification from CORONA Imagery:**
  - CORONA imagery, collected during 1960s, has potential for pre-Landsat land cover reconstruction.
  - Developed classification methods using convolutional neural networks and geometric moments.
  - Demonstrated >90% classification accuracy at study sites in Uttar Pradesh and Bihar, India.

EDUCATIONAL DEGREES

Degree	Institute	Graduation Year
MTech - PhD (Civil Engineering) in *Hydraulics & Water Resources Engineering*	Indian Institute of Technology, Kanpur, India	2025
BTech (Civil Engineering) with Minor in *Computer Science & Engineering*	Walchand College of Engineering, Sangli**,** India	2016

PROFESSIONAL EXPERIENCE

Position	Affiliation	Year
Postdoctoral Researcher in Precision Irrigation	Kansas State University, USA	Jan 2025-present
GET: Graduate Engineer Trainee (Civil-Structural)	Petrofac Engineering India	July 2016- Aug 2017

SOFTWARE/TOOLS

Python, QGIS, Google Earth Engine, SWAT, HEC-RAS, High Performance and Cloud Computing.

RESEARCH GRANTS AND PROJECTS

1. **PI** – **Deshpande, P.J.,** Banbariya, R., Patil, Y. P., Bajaj, K.: *Enhancing Disaster Resilience through Innovative Fog Monitoring and Forecasting* by Coalition for Disaster Resilient Infrastructure with mentors Prof. Shivam Tripathi, Prof. Arnab Bhattacharya (IIT Kanpur), and Prof. Jan Cermak (KIT Karlsruhe, Germany). Grant amount: 15000 USD, Duration: August 2024 to December 2025.
2. **Co-PI** – Jha, G., Metzger, S., Rudnick, D., **Deshpande, P.J.**: *On-Farm Water Stewardship by Satellite and AI-Driven Precision Irrigation Technologies* by Kansas Water Office, USA. Grant amount: 21643 USD, Duration: May 2025 to April 2026.
3. **Unlisted collaborator** (as a PhD student): Bhattacharya, A., Tripathi, S., Verma, M.K.: *Short and Long-term Fog Predictions using Data* by Scheme for Transformational and Advanced Research in Sciences by Ministry of Education, Govt. of India (MoE-STARS). Duration: June 2020 to June 2024.
4. **PI** – **Deshpande, P.J.,** Jha, G., Metzger, S.: *Evaluation of Precision Irrigation Methods Using Satellite-based Metrics* by Corteva-Agriscience. Duration: 2 years. (Shortlisted for second round).
5. **Co-PI** – Jha, G., **Deshpande, P.J.,** Metzger, S., Tiwari, A.[a], Datta, S.[b], Calil, Y.[a], Das, B., Bhandari, M.[a],: *Regional Forecasting of Evapotranspiration and Crop Water Demand Using OpenET, GraphCast Weather Predictions, and NISAR Soil Moisture Observations* by NASA ROSES Proposal. Duration: 3 years (Shortlisted for second round). *Texas A&M AgriLife Research[a], Oklahoma State University[b]*

BOOK CHAPTERS

1. **Deshpande, P.J.**, Datta, W., Jha, G.*: *Trustworthy Artificial Intelligence for Digital Agriculture (2025),* Precision Technologies for Digital Agriculture by Elsevier (Revision submitted).
2. Jha, G.*, Dey, S., **Deshpande, P.J.**: *Operational and Analytical Frameworks of Unoccupied Aerial Vehicles (UAV) for Precision Agriculture Applications (2025),* Advances in Agronomy by Elsevier (Volume 196, In-press).
3. **Deshpande, P.J.***, Sure, A., Dikshit, O., Tripathi, S.: *Study of Temporal Behaviour of Homogeneity Maps for Estimating Representative Area of a Ground Sample Using Remote Sensing (2021)* In: Bhuiyan, C., Flügel, WA., Jain, S.K. (eds) Water Security and Sustainability: Lecture Notes in Civil Engineering by Springer, vol 115. Springer, Singapore. (DOI: 10.1007/978-981-15-9805-0_9).

RESEARCH PAPERS

1. **Deshpande, P. J.***, Tripathi, S., and Bhattacharya, A.: *Quantification of Epistemic and Aleatoric Uncertainty in Satellite Fog Detection using Bayesian Neural Networks (2024)*, **Remote Sensing in Earth Systems Sciences** by Springer**,** 8, 232–250. (DOI:10.1007/s41976-024-00155-7). [**Q2**, Impact Factor: 1.9]
2. **Deshpande, P. J.***, Meena, D., Tripathi, S., Bhattacharya, A., and Verma, M.K.: *Event-based Fog Climatology and Typology for Cities in Indo-Gangetic Plains (2023),* **Urban Climate** by Elsevier, *51*, 101642. (DOI:10.1016/j.uclim.2023.101642). [**Q1**, Impact Factor: 6.9]
3. **Deshpande, P. J.***, Belwalkar, A., Dikshit, O., and Tripathi, S.: *Historical Land Cover Classification from CORONA Imagery using Convolutional Neural Networks and Geometric Moments (2021)*, **International Journal of Remote Sensing** by Taylor & Francis, 42:13, 5148-5175. (DOI: 10.1080/01431161.2021.1910365). [**Q1**, Impact Factor: 2.9]
4. **Deshpande P. J.***, Tripathi, S. and Bhattacharya, A.: *Data-Driven Fog Forecasting for North India (2025)*, **Current Science**, 129, 6. (DOI:10.18520/cs/v129/i6/502-512). [**Q2**, Impact Factor: 1.1]
5. **Deshpande P. J.***, Agarwal S., Bansal, K., Tripathi, S., and Bhattacharya, A.: *FogCast:Probabilistic Medium Range Fog Forecasting using Global Machine Learning Weather Prediction Model*, **Quarterly Journal of Royal Meteorological Society** by Wiley (Revision submitted). [**Q1**, Impact Factor: 2.9]
6. Debangshi, U., **Deshpande, P. J.,** Ciampitti, I., Metzger, S., … & Jha, G.*: *Precision Irrigation with AI-Integrated Ground Penetrating Radar Reduces Water Stress in Kansas Corn (2025),* **Agricultural & Environmental Letters** by Wiley (Revision submitted). [**Q1**, Impact Factor: 3.6]
7. Dey, S.; Nazrul, F., Kim, J., **Deshpande, P.J.**, Xu, X, …, Jha, G.*: *Feature Selection and Explainable Machine Learning to Identify Climatic Drivers of Alfalfa Yield in the Ogallala Region (USA)*, **Field Crops** by Elsevier (Reviewed and under revision).

CONFERENCE PROCEEDINGS / PRESENTATIONS

1. **Deshpande, P. J.***, Bhattacharya, A., and Tripathi, S. (2025): *Disentangling Aleatoric and Epistemic Uncertainty using Bayesian Neural Networks for Fog Detection and Forecasting.* Abstract accepted for AGU25 by the American Geophysical Union, 15-19 Dec 2025 at New Orleans, USA.
2. **Deshpande, P.J.**, Debangshi, U., Ciampitti, I., Metzger, S., and Jha, G. (2025): *Evaluation of OpenET Estimates Against in-Situ Evapotranspiration Measurements in Central Kansas*. *CANVAS 2025*.
3. **Deshpande, P.J.,** Dey, S., Widanagamage, N., and Jha, G. (2025): *Assessment of GraphCast Forecast Accuracy for the Central Plains of the USA*. American Society of Agronomy *CANVAS 2025*.
4. Debangshi, U., **Deshpande, P.J.,** Sharda, V., Prasad, P.V.V., Adee, E.A., Dooley, S., and Jha, G.* (2025): *Multimodal Data Sources to Predict Soybean Yield and Quality Under Variable Planting Dates*. American Society of Agronomy *CANVAS 2025*.
5. Dey, S., Shimim, F.N.N., Kim, J., **Deshpande, P.J.,** Xu, X., Whitaker, B., Bhandari, M., and Jha, G.* (2025): *Explainable Machine Learning Identifies Climatic Factors Affecting Alfalfa Yield in the Ogallala Aquifer Region*. American Society of Agronomy *CANVAS 2025*.
6. Debangshi, U., **Deshpande, P.J.,** Ciampitti, I., Metzger, S., Sharda, V., and Jha, G.* (2025): *AI-Radar Irrigation Improves Crop Water Use and Water Challenges in Central Kansas*. American Society of Agronomy, *CANVAS 2025*.
7. **Deshpande, P. J.***, Agarwal S., Tripathi S., and Bhattacharya A. (2024): *Post-processing of GraphCast Outputs for Fog Forecasting at Airports.* AGU 24 by American Geophysical Union, 9-13 Dec 2024 at Washington D.C., USA.

8. Bajaj. K., Mannam U., **Deshpande, P. J.**, Patil Y., Bhattacharya A.*****, and Tripathi S. (2024): *Forecasting of Fog Index and Prediction Interval using Bayesian Methods.* Paper presented at 8th CODS-COMAD by the Association for Computing Machinery, December 18-21, 2024, Jodhpur, India. (DOI:10.1145/3703323.3703738)
9. Sharma S., Bajaj. K., **Deshpande, P. J.**, Bhattacharya A*****, and Tripathi S. (2024): *Short-Term Fog Forecasting using Meteorological Observations at Airports in North India*. Paper presented at 7th CODS-COMAD by the Association for Computing Machinery, January 4-7, 2024, Bengaluru, India. (DOI: 10.1145/3632410.3632449)
10. **Deshpande, P. J.***, Tripathi, S., and Bhattacharya, A. (2023): *Estimating Uncertainty for Fog Detection and Visibility Estimation using Satellite Observation,* International Fog, Dew, and Dew Collection Conference 2023, Colorado State University, Fort Collins, USA, July 23-28, 2023.
11. **Deshpande, P. J.***, Tripathi, S., and Bhattacharya, A. (2023): *Bayesian Neural Network-based Satellite Fog Detection*, EGU General Assembly 2023, Vienna, Austria, April 24-28, 2023. (DOI: 10.5194/egusphere-egu23-613).
12. **Deshpande, P. J.***, Tripathi, S., and Bhattacharya, A. (2022): *Comparison of In-situ Fog Observations with INSAT-3D Fog Observations for North Indian cities*. Paper presented at the IEEE International Geoscience and Remote Sensing Symposium IGARSS 2022, Kuala Lumpur, Malaysia. (DOI: 10.1109/IGARSS46834.2022.9883759).
13. **Deshpande, P. J.***, Tripathi, S., and Bhattacharya, A. (2022): *Satellite-based Fog Detection for North India using LSTMs*. Paper presented at Hydro 2019 International Conference, Chandigarh, India, December 2022.
14. **Deshpande, P. J.***, Tripathi S., and Bhattacharya A. (2021): *Comparison of In-situ Fog Observations with INSAT-3D Fog Observations for North Indian Cities,* Asia Oceania Geosciences Society AOGS 2021 VIRTUAL Conference, August 1-6, 2021.
15. **Deshpande, P. J.***, Belwalkar, A., Dikshit, O., and Tripathi, S. (2019): *Land Use and Land Cover Classification using CORONA Imagery Through Machine Learning Algorithms*, Hydro 2019 International Conference, Hyderabad, India, December 18-20, 2019.
16. **Deshpande, P. J.***, Sure, A., Dikshit, O., and Tripathi, S. (2019): *Study of Temporal Behaviour of Heterogeneity Maps for Estimating Representative Area of a Ground Sample Using Remote Sensing*, Down To Earth- 2019, International Conference on Water Security & Sustainability, SMIT Sikkim. December 13-14, 2019
17. **Deshpande, P. J.***, Sure, A., Dikshit, O., and Tripathi, S. (2019): *A Framework for Estimating Representative Area of a Ground Sample Using Remote Sensing,* Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., 2019. (DOI :10.5194/isprs-archives-XLII-2-W13-687-2019) Poster presented at ISPRS Geospatial Week 2019 at Uni. Twente, Enschede, The Netherlands. June 9 – 14, 2019.

* refers to corresponding author

INVITED WORKSHOPS/COURSES/TALKS

1. **Interpretable and Uncertainty-aware Neural Networks** - Workshop Instructor, University of Campinas (UNICAMP), Brazil, 6th August 2025.
2. **Uncertainty-aware Bayesian Neural Networks** - Tutorial Instructor, XXV ISPRS (International Society for Photogrammetry and Remote Sensing) Congress 2026 to be held in Toronto, Canada.
3. **Introduction to GraphCast –** Webinar Presenter, Indian Institute of Technology (BHU), Varanasi, India, scheduled soon.

TEACHING/TUTORSHIP RESPONSIBILITIES

1. **Agronomic Data Analytics** (Advanced Topics in Agronomy), Co-instructor with Dr. Gaurav Jha, Kansas State University. August to December 2025.
2. **Engineering Drawing**, Tutor, Institute-level UG course, IIT Kanpur. 2nd Semester, 2022.
3. **Engineering Hydrology**, Tutor, Civil Engineering, IIT Kanpur.
4. **Computational Methods in Hydraulics and Hydrology**, Tutor, Civil Engineering, IIT Kanpur.
5. **Statistical Analysis for Civil Engineers**, Tutor, Civil Engineering, IIT Kanpur.

AWARDS/FELLOWSHIPS

- National Agricultural Producers Data Cooperative (NAPDC) Travel Support for attending the CANVAS conference by the **American Society of Agronomy**.
- TIF Travel Grant by **ISPRS** (International Society for Photogrammetry and Remote Sensing) for poster presentation in GSW 2019 conference at the University of Twente, the Netherlands. (Link for Report)
- **IEEE** Geoscience and Remote Sensing Society (GRSS) Travel Support for paper presentation in IGARSS conference, Kuala Lumpur, Malaysia.
- **NSF** Travel Grant (by National Science Foundation, USA) for poster presentation in 9th International Conference on Fog, Fog Collection, and Dew at Colorado State University, Fort Collins, USA.
- Institute Fellowship for doctoral research by the Ministry of Education, Government of India.
- Finalist in **Smart India Hackathon** 2020 for *Detecting clouds and predicting their movement from INSAT imagery.*
- Alternate (waitlisted) candidate for **Fulbright-Nehru Doctoral Research Fellowship**

WORKSHOPS ATTENDED (CO-CURRICULAR)

Name	Description	Date
Hybrid Physics-AI Systems (SPARC Workshop)	Centre for Excellence in AI at IIT Kharagpur	Jun 2024
AI/ML Techniques for the Weather and Climate Application	Workshop by IIT Kanpur, IISc Bangalore, IITM Pune.	12-14th Mar2022
Spatial Modelling and Analysis of Environmental Systems using Open Source Tools	GIAN course, Indian Institute of Technology Madras.	11-22nd Jun 2018
MODIS to VIIRS Transition for Air Quality Applications	NASA's Applied Remote Sensing Training Program (online)	22nd Oct 2020
Geospatial Modelling for Watershed Management	Indian Institute of Remote Sensing (online)	May 2018
India Water Impact Summit - IWIS 2017	National Mission for Clean Ganga (Attended and Volunteered)	4-7th Dec 2017
Digital Land Surveying & Mapping	NPTEL Online Course by IIT Roorkee	Apr 2017
Hydrological Modelling using QSWAT	Workshop on Open Source QGIS tools	Jun 2015

TRANSLATION INTO THE INDIAN LANGUAGE

Translated part of NPTEL course 'Geology and Soil Physics' into Marathi language.

ACADEMIC PEER REVIEW SERVICE

- International Journal of Climatology by Wiley.
- Aerosol and Air Quality Research by Springer.
- Geoscience and Remote Sensing Letters by IEEE.
- Agronomy Journal by Wiley.
- Scientific Reports by Springer.

OUTREACH/MENTORING ACTIVITIES

- Volunteered as Overall Coordinator for the *IITK Diamond Jubilee Open House* event (January 2020). 5000+ school students visited different labs and places at IITK to learn about cutting-edge research and facilities at IITK.
- Volunteered in *H_2O and Climate 2025 Conference* organized by the Dept. of Civil Engineering, IITK. (October 2025) and the India Water Impact Summit 2017 by the National Clean Ganga Mission (December 2017).
- Mentored 15+ UG students for winter and summer projects as a part of IITK Fog Prediction project.
- Mentored UG students for summer and winter projects as a part of SoCE (Society of Civil Engineers) IITK.

REFERENCES

- **Dr. Shivam Tripathi** (PhD Thesis supervisor), Professor at Department of Civil Engineering, Indian Institute of Technology Kanpur, India.
  (Email - shiva@iitk.ac.in, Phone no. – 0512 259 6709)
- **Dr. Onkar Dikshit** (MTech Thesis collaborator, course instructor), Professor at Department of Civil Engineering, Indian Institute of Technology Kanpur, India.
  (Email - onkar@iitk.ac.in, Phone no. – 0512 259 7937)
- **Dr. Arnab Bhattacharya** (PhD Thesis collaborator), Professor at Department of Computer Science and Engineering, Indian Institute of Technology Kanpur, India.
  (Email - arnabb@iitk.ac.in, Phone no. – 0512 259 7650)
- **Dr. Gaurav Jha** (Postdoc supervisor), Assistant Professor at the Department of Agronomy, Kansas State University, USA (Email- gjha@ksu.edu)

LINKS

- Homepage: https://hydroinfo-prasad.github.io/
- ResearchGate: http://researchgate.net/profile/Prasad-Deshpande-8/
- LinkedIn: https://www.linkedin.com/in/prasad-deshpande-iitkanpur
- Google Scholar: https://scholar.google.com/citations?user=oUwxlK0AAAAJ&hl=en