Santosh Pant

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RESEARCH INTERESTS

Machine learning for Earth observation where ground truth is scarce. I work on evaluation when labels are weak, calibrated uncertainty, and transfer across regions and sensors, mainly for smallholder agriculture.

EDUCATION

Knox College, Galesburg, Illinois — September 2023 to June 2027 (expected)

Bachelor of Science in Computer Science and Data Science (double major). GPA 3.73, Dean's List.

Courses: Machine Learning, Linear Algebra, Calculus, Statistics and Probability, Differential Equations (winter 2027)

PUBLICATIONS

Peer-Reviewed

[1] **Santosh Pant**. *Auditing GeoFM Evaluation for Field-Extent Segmentation: Label Proxies, Baselines, and When Frozen Features Match Fine-tuning*. Transactions on Machine Learning Research (TMLR), 2026. [paper] [code]

[2] **Santosh Pant**. *Calibrated District-Level Prediction Intervals for 2025 Paddy Yield Departure in Nepal's Madhesh Province*. Proceedings of the 34th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (SIGSPATIAL 2026), Applications track, short paper. [paper] [code]

Manuscript

[3] **Santosh Pant**, Adithya Vaithinathan Asokan, Haoyun Feng, Matthew R. Dennis, Keenan Gibbons, Verrah Akinyi Otiende, and Geoffrey Siwo. *Auditing Split Proximity and Radiometric Scale in RGB-to-Thermal Evaluation*. Manuscript, 2026.

PRESENTATIONS

- Poster, ACM SIGSPATIAL 2026, Riverside, California [2] — November 2026
- Poster, Midstates Undergraduate Research Symposium, Washington University in St. Louis [1] — November 2026

RESEARCH EXPERIENCE

Data Science Intern — December 2026 to February 2027

Smithsonian's National Zoo and Conservation Biology Institute, supervised by Dr. James Hassell — *Remote, part-time*

- Project: classifying watersheds and ecosystem types with geospatial foundation models, starting in Kenya.

NISAR L-band Radar for Monsoon Rice Mapping, Nepal Terai — September 2026 to present

Data Science senior project at Knox College, supervised by Prof. Andrew Leahy — *Galesburg, Illinois*

- Rebuilt the Sentinel-1 rice rule that ICIMOD and Nepal's agriculture ministry use, for 21 Terai districts (2021 to 2023). Against an independent map, it finds a median 32 percent of staple cropland and fails in the far west.
- Trained a temporal attention model only on California crop-map labels and applied it to NISAR's 2026 images of Nepal. Inside the ministry's agricultural zone, it separates staple cropland from non-crop land better than the rule (AUROC 0.895 vs 0.746 in Bara, 0.878 vs 0.656 in Chitwan).
- On field points from a 2023 Asian Development Bank survey in Pakistan, the model separates rice from non-crop land (AUROC 0.81 to 0.96) but not reliably from other summer crops, mostly sorghum (0.64 to 0.82).

Research Collaborator, RGB-to-Thermal Urban Heat Mapping — March to August 2026

University of Michigan Center for Global Health Equity, mentored by Prof. Geoffrey H. Siwo — *Remote*

- Continued a second-place UMich hackathon project with its organizer, Prof. Siwo. Found two hidden data errors (thermal targets read from color-mapped JPEGs, misaligned RGB-thermal frames) and rebuilt the pipeline.
- Built two training-free checks. A Proximity Audit found that in the CART dataset's mixed split, 97.8 to 100 percent of test frames share a flight with a training frame. An Affine Probe showed that per-frame normalization erases the temperature scale [3].

Geospatial Foundation-Model Evaluation Audit 2025 to 2026

Independent research at Knox College, no faculty supervisor *Galesburg, Illinois*

- Found that label and baseline choices change foundation-model rankings on Fields of The World. Swapping field polygons for ESA WorldCover labels raises random-forest AUROC by up to 0.34, and a U-Net trained from scratch beats a frozen Prithvi probe in five of six regions [1].
- Showed that frozen backbones match full fine-tuning (within 0.02 AUROC) in 9 of 12 region and model pairs (Prithvi-EO-2.0, TerraMind). The frozen Prithvi version has about 110 times fewer trainable parameters [1].

Conformal Prediction Intervals for District Paddy-Yield Loss 2026

Independent research at Knox College, no faculty supervisor *Galesburg, Illinois*

- Built district-level prediction intervals for paddy yield loss in Nepal's 2025 Madhesh drought, using a LightGBM ensemble, conformal calibration, and a Bihar transfer check. All 8 districts were inconclusive [2].

Structured Random Graphs for HPC Interconnects 2025

Knox College, advised by Prof. David Bunde *Galesburg, Illinois*

- Studied random-graph topologies for HPC networks with Dipesh Adhikari. Presented at Knox Horizons.

SOFTWARE

CropScan (cropscan.tech): a crop-disease diagnosis app that answers only when its two models agree. Accuracy is 75.6 percent on field photos and 99.7 percent on lab images. Built the ML pipeline and backend (three-person team).

HONORS AND AWARDS

- CRA Outstanding Undergraduate Researcher Award, departmental nominee, Knox College 2026
- ACM SIGSPATIAL 2026 Student Travel Award (NSF-funded) 2026
- Break Through Tech AI Fellow, Cornell Tech 2026 to present
- HackIllinois, Best Use of Actian VectorAI DB (sponsor track), 1st place 2026
- University of Michigan AI for Urban Heat Resilience Hackathon, 2nd place 2026
- ASA DataFest (Central Illinois), Best Insights Award 2026
- Richter Research Scholar, Knox College: four funded terms 2024 to 2026
- Next Genius Scholarship, Knox College: full-tuition award, one recipient per year 2023
- EducationUSA Opportunity Funds Program, USEF-Nepal: one of 16 students selected nationally 2022

TEACHING AND LEADERSHIP

- Teaching Assistant: Programming Languages (fall 2026), Data Structures and Algorithms (two terms)
- Resident Assistant, Knox College 2024 to present
- Computer Science Tutor, Knox College 2024 to 2026
- Computer Science Club Lead, Knox College 2025 to 2026

TECHNICAL SKILLS

Remote sensing: Google Earth Engine, Rasterio, Sentinel-1/2, NISAR, ALOS-2, drone RGB and thermal
Machine learning: PyTorch, scikit-learn, LightGBM, U-Net, Prithvi-EO-2.0 and TerraMind
Methods: split and weighted conformal prediction, TOST equivalence, block bootstrap, leakage-aware evaluation
Programming: Python, R, SQL, Go, TypeScript, FastAPI, React, Docker, Git