

Michael Isaiah Edidem

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EDUCATION

PhD: Geographic Information Systems and Environmental Modeling Expected 2027

Southern Illinois University Carbondale

Master of Science: Geography and Environmental Resources. (Spec: Geospatial AI) 2024

Southern Illinois University Carbondale

GPA: 3.97/4

Bachelor of Science: Geoinformatics and Surveying 2018

University of Uyo, Nigeria

RESEARCH INTEREST

Geospatial AI, spatiotemporal deep learning, physics-guided machine learning, hydrologic modeling, remote sensing, LiDAR/DEM analysis, GeoAI decision-support systems.

TECHNICAL SKILLS

Python, PyTorch, TensorFlow, deep learning model optimization, automated ML workflows, GeoPandas, Rasterio, GDAL, ArcGIS Pro, ERDAS Imagine, Google Earth Engine, PostGIS, MODFLOW, LiDAR/DEM, Computer Vision (U-Net, YOLOv5, Faster R-CNN), Git, Large-scale geospatial data pipelines, TPU/HPC computing, Cloud Platforms (AWS, GCP)

WORK EXPERIENCE/RELEVANT EXPERIENCE

Research Assistant/Teaching Assistant

08/22 – Present

Southern Illinois University Carbondale

- Developing large-scale geospatial ML pipelines for mapping and environmental modeling using Python, MODFLOW, and GIS tools.
- Built Theory-Guided Neural Network (TgNN) surrogate models for scalable spatial simulation, reducing computational cost while preserving physical consistency.
- Utilized geospatial libraries and APIs (GDAL, Rasterio, GeoPandas, Shapely) and Esri tools to automate spatial workflows and streamline data conversion.
- Implemented deep learning architectures (U-Net, CM-UNet, Faster R-CNN, YOLOv5, Transformer-based models) for elevation-derived hydrographic feature extraction and classification.
- Optimized deep learning models for high-performance and distributed computing environments.
- Conducted TauDEM-based topographic and stream network analysis for hydrologic connectivity studies in agricultural watersheds.
- Teaching introduction to GIS (GEOG 401/502) and mentored over 500 students in geospatial analysis, research methods, and capstone project development.
- Developed modular, version-controlled GeoAI workflows in Python with Git for reproducible experimentation and collaboration.

GIS Specialist Intern

05/25 – 08/25

CDM Smith, Chicago, IL

- Evaluated and optimized AI-based wetland delineation model to improve scalability and accuracy.
- Evaluated multiple hydrology kernel configurations to improve wetland delineation accuracy.
- Implemented and evaluated a peer-reviewed spectral diversity method for biodiversity monitoring and presented findings to stakeholders.
- Expanded a Bayesian model to correct additive bias in PFAS concentration estimates and automated extractable organofluorine soil data processing for reproducible analysis.
- Co-led a GitHub training session for engineering teams to enhance version control and collaborative workflows.

Geographic Information Systems Officer

06/21 – 07/22

Ikeja Electricity Distribution PLC, Lagos

- Developed and managed customer enumeration application featuring real-time tracking capabilities, improved customer data accuracy by 30%, resulting in enhanced service delivery and reduced operational costs.
- Coordinated the deployment of UAVs for powerline inspection, feeder fault detection and processing of imagery, reduced inspection time by 40%.

- Updated enterprise geospatial databases and developed analytical maps to support data-driven decision-making.

Project Control|GIS Analyst

08/20 – 07/21

Subsea100 Global, Port Harcourt

- Oversaw GIS project planning and spatial data workflows, ensuring timely delivery and preparing technical reports and bid documents for engineering stakeholders.

Early Geospatial & Surveying Experience

2017 – 2020

Conducted cadastral, engineering, and maritime surveys using GNSS and total stations; produced CAD-based maps and managed spatial datasets for infrastructure and land-use projects.

RESEARCH EXPERIENCE

Research Fellow: Optimizing Deep Learning Models for Geospatial Applications

(University of North Texas)

05/24 – 08/24

- Designed and optimized DL models for drought forecasting and drainage detection, improving computational efficiency through TPU optimization.
- Developed automated pipelines for processing large-scale geospatial datasets, reducing data preparation time by 50%.
- Integrated domain knowledge into deep learning models for geospatial prediction tasks.

Research Fellow: I-GUIDE Summer School: Convergence Science in Action

(Boulder, Colorado)

08/23

Problem set category: Improving the 3D Representation of Rivers in Digital Elevation Models (DEM)

- Deployed deep learning models for improving river delineation.
- Applied machine learning techniques, including Random Forest, regression for max river depth Estimation.

PUBLICATIONS (including conference proceedings)

Edidem, M., B. Xu, R. Li, D. Wu, B. Rekabdar, G. Wang. Identification of Drainage Crossings on High-Resolution Digital Elevation Models Using Explanatory Deep Learning Approaches. *Frontiers in Artificial Intelligence*. doi: 10.3389/frai.2025.1561281

Edidem, M., R. Li, D. Wu, B. Rekabdar, G. Wang. 2025. GeoAI-based Drainage Crossing Detection for Elevation-derived Hydrographic Mapping. *Environmental Modelling and Software*. doi.org/10.1016/j.envsoft.2025.106338

Nazeri, A., D.W. Godwin, A.M. Panteleaki, I. Anagnostopoulos, **M. Edidem**, R. Li, T. Shu. 2025. Exploration of TPU Architectures for the Optimized Transformer in Drainage Crossing Detection. Proceedings of 2024 *IEEE International Conference on Big Data*. [10.1109/BigData62323.2024.10826077](https://doi.org/10.1109/BigData62323.2024.10826077)

Wu, D., R. Li, **M. Edidem** and G. Wang. 2024. “Enhancing Hydrologic LiDAR Digital Elevation Models: Bridging Hydrographic Gaps at Fine Scales.” *JAWRA Journal of the American Water Resources Association* 00(0): 1–17. doi.org/10.1111/1752-1688.13239.

Wu, D., R. Li, C. Talbert, **M. Edidem**, B. Rekabdar, G. Wang. 2023. Classification of Drainage Crossings on High-resolution Digital Elevation Models: A Deep Learning Approach. *GIScience & Remote Sensing*. 60:1. doi.org/10.1080/15481603.2023.2230706

Udoh, I.B, **Edidem, M.I.**, and Eyofen, I.E. Networking Public Health Emergency Facilities with Incidence of Road Accident in Uyo. (2018)

CONFERENCES PRESENTATIONS

Edidem, M., R. Li, P. Kharazi. Accuracy Is Not Enough: Evaluating Physical Consistency in Deep Learning-Based Groundwater Model Surrogates. *AWRA Geospatial Water Technology Conference, May 18-20, 2026, Niagara Falls, NY*

Edidem M, Li R, Wang G, Rekabdar B. Towards a Comprehensive Culvert Detection and Classification Dataset for Enhanced Infrastructure Monitoring. *AAG Annual Meeting*. Mar. 24-28, 2025, Detroit, Michigan.

Nazeri, A., D.W. Godwin, A.M. Panteleaki, I. Anagnostopoulos, **M. Edidem**, R. Li, T. Shu. 2025. Exploration of TPU Architectures for the Optimized Transformer in Drainage Crossing Detection. *IEEE International Conference on Big Data*. Dec. 15 – 18, 2024, Washington, DC.

Edidem M, Li R, Wang G, Rekabdar B, Xu B. Classification of drainage crossings based on advanced deep learning models and high-resolution digital elevation models. *AGU Fall Meeting*. Dec. 9-13, 2024, Washington, D.C.

Edidem, M. R. Li, D. Wu, G. Wang. Geospatial AI Solutions for Locating Drainage Barriers in Elevation-derived Hydrographic Mapping. *AAG Annual Meeting*. Apr. 16-20, 2024, Honolulu, HI.

HONORS AND AWARDS

- SIUC Outstanding Thesis Award (University-wide) 2025-2026
- SIUC Student Creative Activities and Research Award 2025
- SIUC David G. Arey Memorial Award (Best MSc Thesis, Department) 2025
- 2024 NSF Summer School Award for Deep Learning Systems in Advanced GPU Cyberinfrastructure
- 2024 NSF Travel Award for AAG Geospatial Cyberinfrastructure Workshop
- 2023 NSF I-GUIDE Summer School Award

VOLUNTEERING

GIS Analyst

Geohazards Risk Mapping Initiative - Nigeria 08/20 – 08/22

- Developed GIS flood risk model integrating socio-economic data with hazard maps to assess vulnerability, estimate risk, damage and loss of life.
- Created high-resolution flood hazard inundation maps tailored for applications in land use planning, flood risk mitigation design, public awareness campaigns, and emergency planning.

Geospatial Data Scientist

Omdena - Improving Food Security and Agriculture in Senegal 11/20 – 2/21

- Developed software that combines data from satellite imagery, meteorology crop characteristics, and disease to improve food security and agriculture in Senegal

PROFESSIONAL AFFILIATIONS

- **President**, MANRRS (Minorities in Agriculture, Natural Resources and Related Sciences) SIUC Chapter 2026 – Present
- American Water Resources Association 2025 – Present
- American Association of Geographers 2023 – Present
- American Geophysical Union 2023 – Present