

Justin Guthrie

Portland, ME, United States | j.guthrie@northeastern.edu | [LinkedIn](#) | [GitHub](#) | [Portfolio](#)

RESEARCH INTERESTS

GeoAI; humanitarian mapping and OpenStreetMap-derived geospatial data; multimodal and satellite embedding interpretability; AI for critical infrastructure resilience; interdependent cascading failure modeling; human mobility and network science.

EDUCATION

Northeastern University, Boston, MA

Sept 2021 – May 2025

Bachelor of Science in Data Science and Business Administration

Concentration: Marketing Analytics | GPA: 3.76/4.00 | Dean's List

Coursework: Machine Learning & Data Mining I–II (Linear Algebra, Bayesian Modeling, Neural Networks);

Calculus I–II for Science & Engineering; Advanced Programming for Data Science.

PUBLICATIONS & SOFTWARE

Benavides-Martínez, I.F., **Guthrie, J.**, Arias, J.E., et al. "What on Earth is Google AlphaEarth? Hierarchical Structure and Functional Interpretability for Global Land Cover." Preprint available on arXiv: arXiv:2603.16911, 2026.

Guthrie, J. (2025). What on Earth is Google AlphaEarth? Interactive Dashboard [Software]. Zenodo.

<https://doi.org/10.5281/zenodo.17728053>. ([App](#), [Source](#))

RESEARCH EXPERIENCE

George Mason University | Research Assistant

Apr 2026 – Present

Advisor: Dr. Edward Oughton

- Leading Infra-Bench, a global benchmark paper of 18,756 tiles across seven continents and 13 infrastructure classes evaluating Earth observation foundation models (AlphaEarth Foundations, Prithvi-EO-2.0, CROMA, SatlasPretrain S1/S2) on facility-scale critical infrastructure mapping (substations, water works, airports, data centers).
- Curated global tile set from Sentinel-1 SAR and Sentinel-2 multispectral imagery with weak labels derived from OpenStreetMap; implemented a controlled linear-probe protocol for cross-model comparison.

Sustainability Data Science Lab at Northeastern University | Research Assistant

Jan 2025 – Present

PI: Dr. Auroop R. Ganguly

- Investigating interpretability of Google DeepMind AlphaEarth embeddings by identifying which of the 64 latent dimensions are most predictive for ESA WorldCover classification tasks.
- Built a full-stack visualization system in React/TypeScript and Python/Polars for 130K+ classification experiments, including server-side caching.
- Contributing to rail network resilience research: modeling betweenness-centrality on Amtrak as subgraph of U.S. freight rail network to optimize service extensions under budget constraints while maximizing population served and resilience to weather extremes.

Defense Industrial Base Institute at Northeastern University | Research Associate

May 2025 – Present

- Producing StoryMap-based community readiness assessments for U.S. coastal communities considering incoming shipyard investment; synthesizing stakeholder interview notes with online research into geospatial narratives for economic-development audiences.
- Prior maritime-investment StoryMap work reached Florida's Secretary of Commerce; methodology expanding to additional states.
- Developed geodatabase of 300+ U.S. shipyards and repair facilities with 10+ analytical attributes per site; visualized in a private ArcGIS Dashboard with user-interactive filtering.

Global Resilience Institute at Northeastern University | Research Assistant

Jan 2025 – May 2025

- Collected baseline resilience indicators (transportation, public safety, urbanism) for three communities in St. Thomas, USVI using the I-RES methodology.

INDUSTRY EXPERIENCE

Enodia Inc. | Co-Founder & GIS Lead

May 2025 – Present

- Simulating cascading failures across interdependent critical infrastructure systems to support municipal emergency-management decision-making; visualizing disaster impacts as "systems of systems" for policy and consulting stakeholders.
- Built an internal FastMCP-based AI assistant for querying and synthesizing information from Enodia's Maine Community Action Grants database ([Source](#)).
- Developed a prototype multi-agent orchestration system using RAG and local LLMs to simulate role-based employee collaboration and escalation for internal question-answering workflows.
- Built front-end interface for data product MVP; integrated backend data pipelines and authentication.
- Completed the NSF Regional I-Corps Spark Program on behalf of Enodia.

Keolis Commuter Services | Digital Solutions Co-op

Jul 2023 – Dec 2023

- Enhanced real-time Python data pipeline in Azure for track change handling across MBTA Commuter Rail network, cross-referencing Amtrak and MBTA schedules.
- Improved scheduling accuracy for 81K+ daily passengers via XML transformations across 135 stations.
- Implemented NetworkX graph model using Dijkstra's algorithm; established framework for South Coast Rail service integration.

SELECTED PROJECTS

FastMCP Community Awards Assistant

FastMCP-based internal AI assistant for querying and synthesizing town-level information from Enodia's Maine Community Action Grants / resilience planning spreadsheet using Google Sheets integration and fuzzy lookup.

Agentic AI EdTech Chatbot

RAG-based agentic system using open-source LLMs to answer queries from course materials; full-stack deployment.

MBTA Transit Delay Predictor

Bayesian and MLP models predicting transit delays from weather data; visualization in web application.

Google AlphaEarth Foundation Model Visualization

Full-stack research dashboard for exploring 130K+ AlphaEarth land-cover classification experiments and interpreting relationships between foundation-model embedding dimensions and downstream land-cover performance.

TECHNICAL SKILLS

AI/ML: PyTorch, scikit-learn, Bayesian modeling, neural networks/MLP/CNN, foundation models (linear probing), NLP, retrieval-augmented generation

Programming: Python, SQL, R, TypeScript/JavaScript

Geospatial/Data: ArcGIS Pro/Online, GeoPandas, Earth Engine, Planetary Computer STAC, Sentinel-1/2, OpenStreetMap, QGIS, NetworkX, Polars/Pandas

Development: React, Next.js, Flask, Node.js, Git, Vercel/Netlify

PRESENTATIONS

Guthrie, J. (2026, June 4). "What on Earth is Google AlphaEarth? Hierarchical Structure and Functional Interpretability for Global Land Cover." GeoAI 2026 — First International Conference on GeoAI, Ghent, Belgium.

Guthrie, J. (2025, November 19). "What on Earth is Google AlphaEarth?" GIS Day 2025, Northeastern University, Boston, MA. Featured in NULab coverage.