

BAILEY WALLACE

wallacebailey32@gmail.com • linkedin.com/in/baileywallace

Portfolio: baileywallace.ai • Company: lightspacelabs.com • Charlotte, NC • open to relocation

SUMMARY

Production photogrammetrist and geospatial engineer. My core work is stereo feature compilation in DAT/EM Summit Evolution with Civil 3D, and classifying county-scale LiDAR through a staged pipeline of TerraScan ground macros followed by an AI model I train and run. On top of that I build the internal software my team runs on, including a Python ArcGIS toolbox and a web dashboard now in daily use. Duke M.S. thesis training and validating deep-learning models on satellite imagery ($F1 = 0.933$, 95.9% pixel accuracy). Trained first as an environmental scientist, which shows up as care about validation, transferability, and stating plainly what an analysis does not support.

EXPERIENCE

ESP Associates, Photogrammetrist / GIS & AI Lead

Dec 2025 – Present • North Carolina

- Compile planimetric and topographic features in stereo from aerial imagery using DAT/EM Summit Evolution with Civil 3D. This is the department's core production work.
- Serve as the department's go-to GIS resource and AI subject-matter expert across production aerial-survey and LiDAR projects, setting how the team adopts machine learning in its geospatial pipelines.
- Produce and QC county-wide LiDAR and mapping deliverables in ArcGIS Pro, taking raw point clouds and Civil 3D / AutoCAD data through geoprocessing, classification, and QA/QC to deliverable-ready vector and raster outputs, including CAD-to-GIS conversion.
- Classify county-scale LiDAR point clouds through a staged production pipeline: Terrasolid TerraScan macros for the initial ground classification, then an AI model I train and run on that output, then manual editing and QC through to deliverable-ready data.
- Designed and shipped the internal web dashboard the team now uses daily to track editing progress across the production tile scheme: Python and Flask, SQLite, and a Leaflet map front end, with state-plane to WGS84 reprojection, progress rolled up by stage, person, and county, map annotation and flagging for review findings, GIS export, and a projected completion date computed from recent pace. Read-only against production data with audit logging.
- Built a Python ArcGIS toolbox that automates impervious-surface calculations for stormwater compliance, applying right-of-way logic across lot polygons and outputting a clean per-lot CSV; teammates run it independently, cutting hours per project and standardizing the deliverable.
- Translate technical geospatial output into guidance non-technical stakeholders can act on, including a department head who needs visibility without learning new software.

Duke University, Jim Zhang Lab, Graduate Researcher (M.S. Thesis)

2024 – 2026 • Durham, NC

- Built a two-stage deep-learning pipeline in Python and PyTorch on PlanetScope satellite imagery (3 m/pixel): a ConvNeXt Large classifier for detection and a DeepLabV3+ model with a ResNet-101 encoder for pixel-level segmentation.
- Constructed the ground-truth dataset directly, hand-annotating and spatially QC'ing 109 scenes; achieved $F1 = 0.933$ with perfect recall (1.000) on classification and 95.9% pixel accuracy on segmentation. Authored and defended the full thesis (March 18, 2026).
- Ran cross-location evaluation to quantify how accuracy transfers to a new geography without fine-tuning (IoU 0.448 to 0.319), publishing the degradation as a reusable template for model transferability rather than reporting validation-set wins alone.
- Ran the study as an international collaboration, coordinating with a research team at Mongolia National University alongside a Duke-based mentor, exchanging data and findings across a twelve-hour time difference.
- Modeled PM2.5 exposure following the Palisades wildfire, integrating satellite remote sensing, ground monitoring networks, and meteorological data into predictive surfaces of population exposure.

- Built and operate an AI-powered competitive-intelligence SaaS on the Anthropic Claude API, owning the full stack from data pipeline to customer-facing product.
- Built a multi-LLM evaluation loop that validates outputs for accuracy and consistency before they reach customers, plus the data and reporting layer that turns raw model output into decisions users act on.
- Manage all infrastructure (Vercel, Cloudflare Workers and D1, Railway, Postgres), tenant configuration, cost, and incident response.
- Designed and built the company website, and own marketing and positioning for the product.

SELECTED PROJECTS

Terra (*in build*). A three-agent satellite-imagery pipeline replacing the \$800 to \$2,000 site visit a lender pays for before releasing each construction draw. Ingestion fuses Sentinel-1 radar, Sentinel-2 optical, and Landsat over a bounding box into a GeoParquet of H3 hex cells carrying 20-dimensional Clay embeddings; classification assigns one of 25 material classes per cell with calibrated confidence and recovers object height from shadow geometry at the moment of overpass. The reporting agent is the current build.

Lightsky (*live, lightsky.ai*). A team of AI assistants that runs the back office of a small business: nine specialist agents under an orchestrator covering inbox triage, lead capture, review response, SEO, marketing, site monitoring, and weekly reporting. Every agent drafts in the background and holds anything customer-facing until the owner approves, with per-agent permission scopes and auto-send unlocked task by task as trust builds. Next.js, Claude API, Railway, Postgres. Pivoted from an agent-observability SDK I built and ran, whose guardrail layer became the permission system.

SkySchool (*prototype*). Mobile-first PWA that teaches aerial photogrammetry and GIS from first principles, with hands-on demos for every concept. Vite, React, TypeScript.

EDUCATION

Duke University, M.S., Global Health

2026

Thesis: deep-learning detection and segmentation on PlanetScope satellite imagery. Coursework: GIS & Environmental Health, Predictive Modeling & Spatial Analysis.

UCLA, B.S., Marine Biology

2024

GPA: 3.7 / 4.0. Coursework: Geography / Environmental Studies, Global Health. NCAA Division I rowing.

TECHNICAL SKILLS

- **GIS & geospatial:** ArcGIS Pro, ArcGIS Online, ArcPy, ArcGIS ModelBuilder, QGIS, Global Mapper, MicroStation, Terrasolid TerraScan, DAT/EM Summit Evolution and DAT/EM production tools, geodatabase design and management, geoprocessing, spatial QA/QC, web maps and dashboards, cartography, coordinate systems and reprojection, CAD-to-GIS conversion, Civil 3D, AutoCAD, spatial databases.
- **Remote sensing:** PlanetScope multispectral imagery, LiDAR point clouds (LAS/LAZ), photogrammetry, raster and vector analysis, ground-truth annotation, accuracy assessment (F1, IoU, recall), domain-shift and cross-location evaluation, H3 hex grids, GeoParquet.
- **Machine learning:** PyTorch, ConvNeXt, DeepLabV3+, ResNet-101, image classification and semantic segmentation, training-set design, model validation and transferability analysis, random forests, regression, spatiotemporal and predictive modeling.
- **AI / LLM engineering:** Anthropic Claude API, AI-agent development, prompt engineering, AI vision, multi-LLM evaluation, guardrails and output validation, cost and usage monitoring.
- **Languages & data:** Python (GeoPandas, rasterio, Shapely, NumPy, Pandas, laspy), SQL, JavaScript / TypeScript, R, Jupyter, Postgres, SQLite, git and GitHub, command-line workflows.
- **Engineering & deployment:** Flask, Leaflet, React, Docker, Vercel, Cloudflare Workers and D1, Railway, Prisma, REST and JSON APIs, monitoring and incident response.