EMAIL: azn@allisonznliu.com | GITHUB: aznliu | WEBSITE: www.allisonznliu.com

ALLISON LIU

Geospatial Data Scientist with federal transportation experience and a strong foundation in spatial analytics and machine learning. Passionate about advancing sustainability through transforming complex datasets into actionable insights.

PROFESSIONAL EXPERIENCE

APRIL 2024 – SEPTEMBER 2025

Bureau of Transportation Statistics, U.S. Department of Transportation
Office of Spatial Analysis and Visualization
Data Scientist

- Produced a nationally consistent dataset providing insights into transportations assets exposed to natural hazards by sourcing, integrating, and analyzing multi-agency hazard data using Python (geopandas, GDAL), QGIS, and ArcGIS.
  - Built an interactive web map using JavaScript/React and MapLibre GL JS to visualize infrastructure exposure and support data-driving resilience planning.
- Facilitated a 50+ member collaboration of state DOTs, local governments, researchers, and industry partners to define a national bicycle, pedestrian, and accessibility infrastructure data standard.
- Designed a data processing pipeline for analysis of the National Transportation Noise Map, improving efficiency and reproducibility of geospatial workflows.

MAY 2022 – MAY 2023

University of Colorado Boulder
Graduate Research Assistant – Applied Mathematics

- Conducted master's thesis research analyzing spatial and temporal solar image data to identify precursors to major solar flare events using singular value decompositions.
  - Processed, cleaned, and transformed seven years of NASA AIA satellite data.
- Applied machine learning and anomaly detection techniques to uncover predictive patterns in remote sensing imagery.

FEBRUARY 2021 – DECEMBER 2022

Laboratory for Atmospheric and Space Physics (LASP)
Student Data Scientist

- Trained and optimized a generative adversarial network (GAN) to combine historic and current satellite data to create a machine learning ready dataset for solar flare prediction.
  - Processed and cleaned 17 years of magnetogram data from multiple NASA datasets.
  - Evaluated and tuned GAN architectures, performing feature engineering, data preprocessing, and statistical performance analysis to optimize model accuracy.

JUNE 2017 – AUGUST 2020

Kapteyn-Murnane Group, JILA, University of Colorado Boulder
Student Research Assistant

- Designed and built a diagnostic instrument to measure laser beam quality for my lab group.
  - Programmed a GUI in MATLAB for real-time data acquisition and analysis.
  - Implemented a modified phase-retrieval algorithm to characterize laser beam profiles.
- Interfaced a novel laser system with an existing chemical engineering experiment, enabling new research capabilities.

SEPTEMBER 2020 – AUGUST 2022

Climbing Gym Route Setter at University of Colorado Boulder

- Collaborated with a five-person team to design and set innovative and technically challenging climbing routes for recreational and competition events.
- Coordinated event logistics, managed safety systems, and contributed to a culture of constructive feedback and teamwork.

EDUCATION

MAY 2022 – MAY 2023

University of Colorado Boulder
M.S. Applied Mathematics, GPA 3.86/4.00

- Coursework: Numerical Methods, Statistical Learning, Machine Learning Applications

AUGUST 2018 – MAY 2022

University of Colorado Boulder
B.S. Applied Mathematics, GPA 3.72/4.00 – Cum Laude with Honors
Minor in Computer Science

- Coursework: Data Structures, Algorithm Design, Linear Algebra, Database Systems
- Awards/Honors: **College of Engineering Outstanding Graduate for Research (2022)**, Pres. Horace M. Hale Award, Engineering Honors Program, Dean's List

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SKILLS

TECHNICAL LANGUAGES & TOOLS	Python (pandas, scikit-learn, numpy), R, HTML/CSS/JavaScript Git, Jupyter, Docker, Linux, LaTeX
DATA SCIENCE	Machine Learning (pytorch, tensorflow), Visualization (seaborn, matplotlib, MapLibre, Leaflet, Plotly), Image Analysis
GEOSPATIAL TOOLS	geopandas, QGIS, ArcGIS, GDAL
LANGUAGES	English – Native proficiency, Chinese (Mandarin) – Proficient

VOLUNTEERING & OUTREACH

APRIL 2025 – JUNE 2025
Bright Block – Data Analyst
- Analyzed air pollution exposure data collected from prototype smart bike lights to evaluate differences between protected and unprotected bike lanes. Contributed to findings to support advocacy for safer cycling infrastructure.

MAY 2022 – JUNE 2022
Boulder Solar Alliance Research Experience for Undergraduates (REU)
Undergraduate Research Program Mentor
- Developed and led interactive Python programming tutorials for undergraduate research students.

MAY 2021 – JULY 2021
Machine Learning STEM Camp Instructor
- Developed curriculum and taught machine learning and data science fundamentals to high school students, building interests computational and applied research.

FEBRUARY 2020 – MAY 2020
Partnerships for Informal Education in the Community (PISEC)
STEM Mentor – Elementary Outreach
- Volunteered weekly as a STEM mentor for students in low-income communities, leading hands-on lab activities to foster scientific curiosity.

PUBLICATIONS & PRESENTATIONS

- Data Augmentation of Magnetograms for Solar Flare Prediction using Generative Adversarial Networks.
  A. Liu, W. Carande. *Poster Presented at the American Geophysical Union Conference: New Orleans, LA (2021)*.
  DOI: 10.1002/essoar.10510080.1
- Generation of extreme-ultraviolet beams with time-varying orbital angular momentum.
  L. Rego, K. Dorney, N. Brooks, Q. Nguyen, C. T. Liao, J. San Román, D. Couch, **A. Liu**, E. Pisanty, M. Lewenstein, L. Plaja, H. C. Kapteyn, M. M. Murnane, & C. Hernández-García. *Science 364*, 6447 (2019).
  DOI: 10.1126/science.aaw9486
- Detection of the Keto-Enol Tautomerization in Acetaldehyde, Acetone, Cyclohexanone, and Methyl Vinyl Ketone with a Novel VUV Light Source.
  D. Couch, Q. Nguyen, **A. Liu**, D. Hickstein, H. Kapteyn, M. Murnane, & N. Labbe. *Proc. Combust. Inst. 38* (2021).
  DOI: 10.1010/j.proci.2020.06.139