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

ALLISON LIU

Data Scientist specializing in spatial analysis with six years of research experience. Passionate about applying statistical techniques and machine learning to uncover patterns in geospatial data and develop solutions for improving sustainability.

EDUCATION

MAY 2022 – MAY 2023

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

- **Thesis: Event Detection in Spatiotemporal Data Using Singular Value Decompositions.**
  - Analyzed spatial and temporal aspects of solar image data to understand solar flares.
  - Data Engineering – explored transformations of satellite data to identify patterns during time periods leading up to large solar flare events.
  - Processed and cleaned seven years of remote sensing data collected by NASA's Atmospheric Imaging Assembly (AIA).
- Anomaly detection – worked with various machine learning algorithms to identify flaring events.
- Coursework focused on numerical methods, statistical learning, statistical analysis, applications of machine-learning techniques.

AUGUST 2018 – MAY 2022

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

- Mathematics coursework focused on numerical analysis, linear algebra.
- Computer science coursework in machine learning, regressions, data analysis, algorithm design/optimization, deep neural networks, data structures, database systems.
- Awards/Honors: Engineering Honors Program, BOLD Scholar, Dean's List, Pres. Horace M. Hale Award, College of Engineering 2022 Outstanding Graduate for Research
- Clubs/Organizations: Society of Women Engineers, CU Women's Ultimate Frisbee

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. Project involved sourcing existing hazard data, spatial joining with transportation asset data, and conducting exposure analysis.
  - Used Python GeoPandas, GDAL, QGIS, and ArcGIS.
  - Created custom interactive web map visualization using JavaScript/React and MapLibre GL JS.
- Facilitated a collaboration of 50+ participants to develop a national bicycle, pedestrian, and accessibility infrastructure data standard. The collaboration is composed of representatives from state DOTs, local governments, academic researchers, and industry professionals.
- Designed a data processing pipeline for analysis of the National Transportation Noise Map released by BTS. Used Python GeoPandas, GDAL, and QGIS.

FEBRUARY 2021 – DECEMBER 2022

Laboratory for Atmospheric and Space Physics (LASP) - University of Colorado Boulder
Student Data Scientist

- Trained and optimized a generative adversarial network to combine historic and current satellite data to create a machine learning ready dataset for solar flare prediction.
  - Downloaded and cleaned solar magnetogram data from two datasets spanning 17 years.
  - Investigated and tuned various GAN machine learning architectures to optimize performance.
  - Data pre-processing and exploration, feature engineering, and statistical analysis of results.

JUNE 2017 – AUGUST 2020

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

- Designed and built a commercial-quality diagnostic instrument to measure laser beam quality. Interfaced photonics components and programmed a graphical user interface to collect and analyze data in MATLAB.
- Implemented a modified phase-retrieval algorithm to fully characterize a laser beam.
- Interfaced a novel laser system with an existing chemical engineering experiment.

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SEPTEMBER 2020 – AUGUST 2022

Climbing Gym Route Setter at University of Colorado Boulder

- Collaborated with a team to create unique and complex rock climbs at the CU Climbing Gym.
  - Organized competition logistics, worked with roped systems, frequently gave and received effective feedback.

VOLUNTEERING & OUTREACH

APRIL 2025 – JUNE 2025

Bright Block

- Conducted data analysis for Bright Block, a project to build a smart bike light to map pollution exposure and advocate for safer infrastructure.

MAY 2022 – JUNE 2022

Boulder Solar Alliance Research Experience for Undergraduates (REU)

- Developed and led Python programming tutorials for undergraduate research students.

MAY 2021 – JULY 2021

Machine Learning STEM Camp

- Developed curriculum and taught machine learning techniques to high school students for a STEM summer program.

FEBRUARY 2020 – MAY 2020

Partnerships for Informal Education in the Community (PISEC)

- Volunteered weekly as a STEM mentor for primary school students in low-income communities.

SKILLS

TECHNICAL LANGUAGES	Python (PyTorch, TensorFlow, sklearn, numpy, pandas), MATLAB, R, HTML/CSS/JavaScript
	Geospatial Tools – Python GeoPandas, GDAL, QGIS, ArcGIS
	Limited – SQL, C++
TOOLS/TECHNOLOGIES	Unix/Linux, Git, Latex, Bash Shell, Mathematica, Jupyter
MANUFACTURING	Woodworking, laser-cutting, soldering, machining
LANGUAGES	English – Native proficiency, Chinese (Mandarin) – Proficient

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