Matthew Rilloraza

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Education

Aug 2020 – May 2024

B.S. Engineering Physics
University of Illinois Urbana-Champaign
GPA: 4.00

Research Experience

Jan 2025 – Jun 2025

Research Assistant (Incoming)
National Center for Supercomputing Applications
Supervisor: Aiman Soliman, Ph.D.

- Will develop machine learning techniques alongside industry partner for detecting methane pipeline leakage points using satellite imagery

Feb 2024 – Present

Research Assistant
Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign
Supervisors: Aiman Soliman, Ph.D.; Jennifer Fraterrigo, Ph.D.

- Leading technical development study on digital soil phosphorus mapping and geostatistical machine learning methodologies
- Determining the efficacy and interpretability of using non-spatial regression models (XGBoost, Random Forest, etc.) in conjunction with geospatial interpolation methods (Ordinary Kriging, Regression Kriging, etc.)
- Designing and constructing project data pipeline, from initial data preprocessing to integration into interpolation models
- Leveraging science-standard geospatial and machine learning Python libraries for manipulating geospatial raster data (e.g. Rasterio, pyproj) and developing models (e.g. Scikit-learn, XGBoost)

June 2024 – Aug 2024

International Research Assistant
Department of Atmospheric Science, Nanjing University
Global Research Experience for Young Scientists (GripS)
Supervisors: Huiling Yuan, Ph.D.; Sandro Veiga, Ph.D.

- Spearheaded research project analyzing the link between the Madden-Julian Oscillation (MJO) and precipitation in Southern China
- Utilized a Neural Additive Model (NAM) architecture in Python (PyTorch) to emphasize model interpretability while maintaining robust expressivity in predicting Southern China precipitation state
- Worked with simulated climate data derived from the Coupled Model Intercomparison Project, Phase 6 (CMIP6)
- Received Distinction Award for end-of-program research poster contest; subsequently delivered presentation on personal contributions at closing awards ceremony
- Continuing collaboration abroad to evaluate architecture behavior on additional weather phenomena with well-represented teleconnections

May 2024 – Aug 2023 **Summer Undergraduate Research Fellow (SURF)**
National Institute of Standards and Technology (Boulder site)
Supervisor: Ryan Cole, Ph.D.

- Operated a frequency comb-calibrated laser heterodyne radiometry system for the purpose of ultra-high-precision greenhouse gas (GHG) measurement
- Developed a Python framework for fitting atmospheric absorption spectra via spectrum lookup tables, improving fitting times by a factor of 60
- Extensively used Python libraries for spectrum data creation and manipulation (e.g. HAPI)
- Delivered an end-of-program presentation on the theory behind laser heterodyne radiometry, its application to measuring GHG enhancement, and personal contributions towards its practical deployment

Jun 2022 – Aug 2022 **Research Assistant**
Department of Climate, Meteorology, and Atmospheric Sciences, University of Illinois Urbana-Champaign
Supervisor: Larry di Girolamo, Ph.D.

- Performed exploratory data analysis NASA's Clouds, Aerosol, and Monsoon Processes-Philippines Experiment (CAMP²Ex)
- Developed data visualization schemes in Python for use in academic works
- Worked extensively with standard scientific Python libraries for geographic data manipulation (e.g. GeoPandas) and for visualization (e.g. Matplotlib, Cartopy)

Teaching Experience

Jan 2022 – May 2024 **Undergraduate Engineering Tutor; Tutoring Team Lead**
Center for Academic Resources in Engineering, University of Illinois Urbana-Champaign

- Created the first iteration of a weekly undergraduate peer-led study group for the introductory quantum physics and thermodynamics sequence, personally developing original curriculum materials (e.g. worksheets, presentations)
- Led 6-member exam review team for organizing and conducting exam review sessions, providing review material and tutoring support to large groups (20-40 students)
- Delivered personalized tutoring for undergraduates in a variety of subjects (e.g. physics, calculus, statistics) in multiple formats, such as walk-ins, private sessions, and group study
- Exceptionally rated for approachability, communication skills, and overall teaching effectiveness by tutees through end-of-semester evaluations

Relevant Skills and Coursework

Programming Languages: Python (proficient), R (intermediate), Java (intermediate)
Data Analysis and Scientific Computing: NumPy, Pandas, SciPy, Scikit-learn, PyTorch, OpenCV, HAPI
Geospatial Analysis:, GeoPandas, Rasterio, GDAL, ENVI software
Typesetting: LaTeX, Markdown
Version Control: Git

Undergraduate Coursework:

- Machine Learning for Physics, Spring 2024
- Thermal and Statistical Physics, Spring 2024
- Statistical Learning, Fall 2023

- Time Series Analysis, Fall 2023
- Digital Signal Processing, Fall 2023
- Remote Sensing, Fall 2023
- Introduction to Computational Physics, Spring 2023

Selected Coursework Projects:

- *Quantum Peek-a-Boo* – for "Where Art Meets Physics" course, Spring 2024.
  Designed and developed interactive art installation using webcam-based face-tracking capabilities (pyglet, OpenCV, Dlib) in Python, bringing the concept of "quantum observation" to a macroscopic scale.
- *Analysis of Landscape Change in Hawaii after 2023 Wildfir*e – for "Remote Sensing" course, Fall 2024.
  Utilized features derived from DEM and remote sensing data sources with logistic regression to assess wildfire risk on the island of Maui in the aftermath of the 2023 wildfires.

Publications

Miller, R. M., Rauber, R. M., Di Girolamo, L., **Rilloraza, M.**, Fu, D., McFarquhar, G. M., Nesbitt, S. W., Ziemba, L. D., Woods, S., and Thornhill, K. L. (2023): Influence of natural and anthropogenic aerosols on cloud base droplet size distributions in clouds over the South China Sea and West Pacific, Atmos. Chem. Phys., 23, 8959–8977.

Presentations

Rilloraza, M., Yuan, H., Veiga, S., Fan, Y. (2024): Exploring the Effect of Madden-Julian Oscillation on South China Precipitation with Interpretable Neural Networks.
Poster presented internally at the Global Research Experience for Young Scientists (GripS) Closing Ceremony, Nanjing, China.

Rilloraza, M., Cole, R., Fredrick, C. (2023): Frequency Comb-Calibrated Laser Heterodyne Radiometry for Precision GHG Measurement.
Presented internally at the Summer Undergraduate Research Fellowship (SURF Program Closing Ceremony, Boulder, CO.

Honors & Awards

Aug 2024	Poster Distinction Award (top 6 out of 84 selected) *Global Research Immersion Program for Young Scientists*
May 2024	Bronze Tablet Distinction (top 3% of graduating class) *University of Illinois Urbana-Champaign*
Aug 2020 – May 2024	Dean's List *University of Illinois Urbana-Champaign*

Professional Affiliations

Tau Beta Pi, The Engineering Honor Society – inducted 2024
Phi Beta Kappa – inducted 2023