

# Patrick Sicurello

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## EDUCATION

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### **Johns Hopkins University**

Baltimore, MD | 08/2023 - Present

M.A. in Applied Mathematics

### **University of California, Berkeley**

Berkeley, CA | 08/2016 - 12/2020

B.A. in Physics and Applied Mathematics

### **University of California, San Diego**

Remote | 09/2021 - 03/2022

Certificate in Machine Learning

## RESEARCH INTERESTS

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- Scientific Machine Learning (SciML), specifically utilizing PINNs or FNOs on geospatial data
- Geometric Deep Learning
- Remote Sensing, Geospatial AI, Uncertainty Quantification
- Data Science for Climate, Additive Manufacturing

## PROFESSIONAL EXPERIENCE

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### **Machine Learning Researcher at Johns Hopkins University Applied Physics Laboratory**

Laurel, MD | 07/2022 - Present

- Develop deep learning models for global GHG emissions estimation using GIS and OSM data as part of Climate TRACE.
- Implement Physics-Informed Neural Networks (PINNs) to predict sea ice drift vectors in dynamic environments.
- Fine-tune geospatial foundation models (GeoFM) for GIS image segmentation and classification.
- Perform uncertainty quantification for calibration of additive manufacturing processes.
- Research novel methods for detecting out-of-distribution (OOD) data in multivariate time series.
- Routinely write grant proposals and pitch research ideas (NASA Cryosphere, NOAA, U.S. Navy).
- Work presented at American Meteorological Society Conference, AGU, and COP29.

### **Machine Learning Engineer at Hedgehog AI**

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*Palo Alto, CA | 10/2021 - 07/2022*

- Trained and deployed NLP models for named-entity recognition on pet insurance claims.
- Supported client teams in model implementation and troubleshooting deployment issues.
- Served as primary client liaison to ensure smooth model integration and adoption.

## **Freelance Developer**

*Berkeley, CA | 10/2020 - 11/2021*

- Developed Jupyter Notebook plugins to improve data science workflows for remote clients.
- Designed and implemented autograders for the University of Maryland Global Campus Data Science coursework.
- Optimized data pipelines for downstream analytics and automation.

## **PUBLICATIONS & TECHNICAL DOCUMENTATION**

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### **Conference Presentations & Posters**

Sicurello, P. Physics-Informed Machine Learning for Characterization of Arctic Sea Ice.

- Presented at AGU Fall Meeting 2024
- DOI: 10.22541/essopenarchive.1264263.v1

### **Technical Documentation**

- Climate TRACE Wastewater Treatment Plant Emissions Estimation Methodology  
- <https://github.com/climatetracecoalition/methodology-documents/blob/main/2024/Waste/Waste%20sector-Emissions%20from%20Wastewater%20Treatment%20Plants.docx.pdf> GitHub:  
<https://github.com/climatetracecoalition/methodology-documents/blob/main/2024/Waste/Waste%20sector-Emissions%20from%20Wastewater%20Treatment%20Plants.docx.pdf>
- Climate TRACE Global Road Transportation Emissions Methodology  
- <https://github.com/climatetracecoalition/methodology-documents/blob/main/2024/Transportation/Transportation%20sector-Global%20Road%20Emissions.pdf> GitHub:  
<https://github.com/climatetracecoalition/methodology-documents/blob/main/2024/Transportation/Transportation%20sector-Global%20Road%20Emissions.pdf>

## **TECHNICAL SKILLS**

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- Programming: Python (PyTorch, TensorFlow, Scikit-learn), Java, PySpark, SQL, R, MATLAB
- Machine Learning: Deep Learning, Bayesian Optimization, Probabilistic Graphical Models
- Geospatial AI: QGIS, OpenStreetMap (OSM), GeoPandas, Raster Data Processing
- MLOps & Deployment: Docker, Kubernetes, AWS, Azure, MLFlow, Weights & Biases (wandb)
- Data Science & Visualization: NumPy, Pandas, Matplotlib, Seaborn

## **SELECTED PROJECTS**

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- Variational Autoencoder (VAE) for Out-of-Distribution Detection

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- Developed a beta-VAE model to detect anomalous time-series data and performed statistical tests.
- Geospatial Deep Learning for Environmental Monitoring
  - Applied GeoFM models to identify wastewater treatment ponds using geospatial embeddings.
- Reframing PINNs in a Multitask Learning Framework
  - Explore noticeable performance boost when implementing hard parameter sharing between additive loss terms when training PINN.

## AWARDS & GRANTS

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- NOAA Research Funding for Geospatial AI Applications (2023)
- JHU Applied Physics Lab IRAD Award (2022, 2023, 2024)
- JHU Applied Physics Lab Bravo Award (2024)

## PROFESSIONAL MEMBERSHIPS

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- American Geophysical Union (AGU)
- American Meteorological Society (AMS)