Patrick Sicurello

3100 Fallscliff Road, Baltimore, MD, 21211

patsicurello@gmail.com | Tel: (510) 305-8493 | GitHub: github.com/patjsic

EDUCATION

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

- Scientific Machine Learning (SciML), Geometric Deep Learning
- Variational Autoencoders (VAEs), Bayesian Optimization
- Physics-Informed Neural Networks (PINNs)
- Remote Sensing, Geospatial AI, and Uncertainty Quantification
- Out-of-Distribution (OOD) Detection in Multivariate Time Series

PROFESSIONAL EXPERIENCE

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.

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Machine Learning Engineer at Hedgehog AI

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

Conference Presentations & Posters

Sicurello, P. Physics-Informed Machine Learning for Characterization of Arctic Sea Ice.
- Presented at AGU Fall Meeting 2023
- DOI: 10.22541/essopenarchive.1264263.v1

Technical Documentation

- Climate TRACE Wastewater Treatment Plant Emissions Estimation Methodology
  - GitHub: climatetracecoalition/methodology-documents
- Climate TRACE Global Road Transportation Emissions Methodology
  - GitHub: climatetracecoalition/methodology-documents

TECHNICAL SKILLS

- 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

- Variational Autoencoder (VAE) for Out-of-Distribution Detection
  - Developed a beta-VAE model to detect anomalous time-series data and performed statistical tests.
- Geospatial Deep Learning for Environmental Monitoring

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- Applied GeoFM models to identify wastewater treatment ponds using geospatial embeddings.

- Best-Subset Selection for Regression Analysis
  - Implemented best-subset selection, AIC, BIC, and cross-validation to analyze data.

AWARDS & GRANTS

- NASA Cryosphere Research Grant (Co-PI, 2024)
- NOAA Research Funding for Geospatial AI Applications (2023)
- JHU Applied Physics Lab IRAD Award (2023)

PROFESSIONAL MEMBERSHIPS

- American Geophysical Union (AGU)
- American Meteorological Society (AMS)
- Society for Industrial and Applied Mathematics (SIAM)