ELIZABETH G. CAMPOLONGO, PH.D.

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EDUCATION

The Ohio State University, Columbus, OH
Doctor of Philosophy: Mathematics   August 2022
- Thesis: Lattice Point Counting through Fractal Geometry and Stationary Phase for Surfaces with Vanishing Curvature
- Advisor: Krystal Taylor

Master of Science: Mathematics   May 2017

New York University Gallatin School of Individualized Study, New York, NY   May 2014
Bachelor of Arts, Cum Laude in "The Language of Mathematics," Minor: Middle Eastern Studies

PROFESSIONAL EXPERIENCE

The Ohio State University:
 Imageomics Institute
  Senior Data Scientist   November 2024 - Present
  Research Data Manager and Technology Coordinator   March 2023 - November 2024
 AI and Biodiversity Change (ABC) Global Center
  Senior Data Scientist   November 2024 - Present
  Research Data Manager and Technology Coordinator   June 2024 - November 2024

Erdős Institute *Mentor*   Fall 2022, Spring and May 2024
- Advised participants in project groups on the data science lifecycle for their projects.
- Acted as a sounding-board for their ideas and general resource to help them succeed.
- All seven project groups I advised finished, and two of four placed in the Top 5 in Fall 2022.

Mined XAI *Intern continuing Topological Data Analysis Applied to Football Project*   December 2021 - January 2022
- Extended project to other two play-types, engineering predictive features for punts to cluster into different strategies with UMAP and HDBSCAN. Clustered on the 1-skeleton of alpha complexes for initial kickoff positions.
  - We expanded the SciPy Voronoi class to include points at infinity and compute Voronoi distance, then further extended this to an alpha complex class which constructs the 1-skeleton of an alpha complex.

Autonomy Technology Research Center, Wright State University *Graduate Researcher*   May - August 2018
- Collaborated with Dr. T. Bihl (AFRL) on an applied math problem: Detecting and Analyzing Anomalies with TDA.
- Improved community understanding of how topological data analysis (TDA) could be used for detecting and analyzing anomalies in large data sets—specifically those describing visual data.
- Compared the efficacy of analyzing the MNIST dataset through TDA to an analysis with diffusion maps by running topological models through the Ayasdi platform and applying diffusion maps in MATLAB.
- Enhanced community knowledge of hash functions, password security, and authentication practices.

SELECTED PROJECTS

Imageomics Guide for FAIR and Reproducible Collaborative Science, *Project Lead*
BioCLIP, *Data Lead*
FAIR Data Access and Validation:
 ***Cautious-Robot**, Project Lead*
 ***Sum-Buddy**, Project Co-Lead*
 ***Distributed-Downloader**, Project Co-Advisor*

Asymmetric Cloning to Eavesdrop on BB84 Protocol:
 ***Independent Researcher**, Mentor Alex Khan*   August 2022 - March 2023
 ***QuForce Innovation Fellow**, 1st Place Demo, Mentor Alex Khan*   April - August 2022

Lattice Points Close to the Heisenberg Norm, OSU, Columbus, OH   September 2017 - May 2022
 Ph.D. Thesis Project, Advisor Prof. K. Taylor

The Erdős Institute Boot Camp:
 ***Topological Data Analysis Applied to Football** A Fall 2021 Top Project*   September - December 2021
 Predicting COVID Spread   September - December 2020

Elm Encryption/Decryption Program, *Cryptology Coding Project*   January - May 2018
- Using the Elm programming language, developed a program to encrypt and decrypt messages in the ADFGVX cipher used by the Germans in World War I.
- Extended this program to implement the alterations to the cipher I developed in my undergraduate thesis.
- Inspired to use Elm and guided in learning to implement Elm code by Dr. Jim Carlson.

Linguistics and Mathematics in Cryptology, *Undergraduate Thesis Project*   January - April 2014

RESEARCH AND PERFORMANCE AWARDS

Papers and Projects
- Best Student Paper Award for BioCLIP at IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR) 2024
- 1st Place: QuForce Demo Day (2022)
- Top Project: Erdős Institute Fall Boot Camp (2021)

Awards & Honors
- Nominated by OSU for the 2024 Council of Graduate Schools (CGS)/ProQuest Distinguished Dissertation Award in Mathematics, Physical Sciences and Engineering (Summer 2024)
- SIAM-NSF Early Career Travel Award (July 2024)

The Ohio State University
- Graduate Associate Performance Award (2021)
- Rhodus Graduate Fellowship (Autumn 2018 and 2019)
- Math Department Fellowship (2016)
- University Fellowship (2015)

New York University Gallatin
- Honors on Senior Thesis Project: Linguistics and Mathematics in Cryptology
- Founder's Day Award
- Dean's List
- National Merit Scholarship

PUBLICATIONS
- **Elizabeth G. Campolongo,** Yuan-Tang Chou, Ekaterina Govorkova, Wahid Bhimji, Wei-Lun Chao, Chris Harris, Shih-Chieh Hsu, Hilmar Lapp, Mark S. Neubauer, Josephine Namayanja, Aneesh Subramanian, Philip Harris, Advaith Anand, David E. Carlyn, Subhankar Ghosh, Christopher Lawrence, Eric Moreno, Ryan Raikman, Jiaman Wu, et al. *Building Machine Learning Challenges for Anomaly Detection in Science*. (arXiv, March 2025).
- Maksim Kholiavchenko, Jenna Kline, Maksim Kukushkin, Otto Brookes, Sam Stevens, Isla Duporge, Alec Sheets, Reshma R. Babu, Namrata Banerji, **Elizabeth Campolongo**, Matthew Thompson, Nina Van Tiel, Jackson Miliko, Eduardo Bessa, Majid Mirmehdi, Thomas Schmid, Tanya Berger-Wolf, Daniel I. Rubenstein, Tilo Burghardt, Charles V. Stewart. Deep dive into KABR: a dataset for understanding ungulate behavior from in-situ drone video. *Multimedia Tools and Applications* (2024). https://doi.org/10.1007/s11042-024-20512-4.
- Brian Pigott, **Elizabeth Campolongo**, Hardik Routray, Alex Khan. *Eavesdropping on the BB84 Protocol using Phase-Covariant Cloning: Experimental Results.* (under review, arXiv, September 2024).
- *Be open to unexpected opportunities. Work-life balance requires creativity, but it is worth the effort.* Notices of the American Mathematical Society, Early Career Series (August 2024).
- *Lattice Points Close to the Heisenberg Spheres*, (with K. Taylor), La Mathematica, 2 (2023), no. 1, 156–196. https://doi.org/10.1007/s44007-022-00040-z.
- *Lattice Point Counting through Fractal Geometry and Stationary Phase for Surfaces with Vanishing Curvature* (Dissertation for Ph.D. in Mathematics, 2022).

Refereed Conference and Workshop Papers
- Zhenyang Feng, Zihe Wang, Saul Ibaven Bueno, Tomasz Frelek, Advikaa Ramesh, Jingyan Bai, Lemeng Wang, Zanming Huang, Jianyang Gu, Jinsu Yoo, Tai-Yu Pan, Arpita Chowdhury, Michelle Ramirez, **Elizabeth G Campolongo**, Matthew J Thompson, Christopher G. Lawrence, Sydne Record, Neil Rosser, Anuj Karpatne, Daniel Rubenstein, Hilmar Lapp, Charles V. Stewart, Tanya Berger-Wolf, Yu Su, Wei-Lun Chao. "Static Segmentation by Tracking: A Frustratingly Label-Efficient Approach to Fine-Grained Segmentation" (arXiv Jan. 2025).
- Arpita Chowdhury, Dipanjyoti Paul, Zheda Mai, Jianyang Gu, Ziheng Zhang, Kazi Sajeed Mehrab, **Elizabeth G. Campolongo**, Daniel Rubenstein, Charles V. Stewart, Anuj Karpatne, Tanya Berger-Wolf, Yu Su, Wei-Lun Chao. "PROMPT-CAM: A Simpler Interpretable Transformer for Fine-Grained Analysis" (arXiv Jan. 2025, CVPR 2025).

- Kazi Sajeed Mehrab, M. Maruf, Arka Daw, Harish Babu Manogaran, Abhilash Neog, Mridul Khurana, Bahadir Altintas, Yasin Bakis, **Elizabeth G Campolongo**, Matthew J Thompson, Xiaojun Wang, Hilmar Lapp, Wei-Lun Chao, Paula M. Mabee, Henry L. Bart Jr., Wasila Dahdul, Anuj Karpatne. "Fish-Vista: A Multi-Purpose Dataset for Understanding & Identification of Traits from Images" ([arXiv](), July 2024, CVPR 2025).
- Harish Babu Manogaran, M. Maruf, Arka Daw, Kazi Sajeed Mehrab, Caleb Patrick Charpentier, Josef C. Uyeda, Wasila Dahdul, Matthew J Thompson, **Elizabeth G Campolongo**, Kaiya L Provost, Paula M. Mabee, Hilmar Lapp, Anuj Karpatne. "What Do You See in Common? Learning Hierarchical Prototypes over Tree-of-Life to Discover Evolutionary Traits" ([arXiv](), September 2024, ICLR 2025).
- M. Maruf, Arka Daw, Kazi Sajeed Mehrab, Harish Babu Manogaran, Abhilash Neog, Medha Sawhney, Mridul Khurana, James P. Balhoff, Yasin Bakis, Bahadir Altintas, Matthew J. Thompson, **Elizabeth G. Campolongo**, Josef C. Uyeda, Hilmar Lapp, Henry L. Bart, Paula M. Mabee, Yu Su, Wei-Lun Chao, Charles Stewart, Tanya Berger-Wolf, Wasila Dahdul, Anuj Karpatne. "VLM4Bio: A Benchmark Dataset to Evaluate Pretrained Vision-Language Models for Trait Discovery from Biological Images", *2024 Advances in Neural Information Processing Systems 37 (NeurIPS 2024) Datasets and Benchmarks Track*, Vancouver, BC, Canada, Dec. 2024, pp.131035–131071.
- Samuel Stevens*, Jiaman Wu*, Matthew J. Thompson, **Elizabeth G. Campolongo**, Chan Hee Song, David Edward Carlyn, Li Dong, Wasila M. Dahdul, Charles Stewart, Tanya Berger-Wolf, Wei-Lun Chao, and Yu Su. "BioCLIP: A Vision Foundation Model for the Tree of Life", *2024 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR'24 Oral)*, Seattle, WA, June 2024, pp. 19412-19424. (*: Equal Contribution).
- M. Kholiavchenko, J. Kline, M. Ramirez, S. Stevens, A. Sheets, R. Ramesh Babu, N. Banerji, **E. Campolongo**, M. Thompson, N. Van Tiel, J. Miliko, E. Bessa, I. Duporge, T. Y. Berger-Wolf, D. Rubenstein, C. Stewart, "KABR: In-Situ Dataset for Kenyan Animal Behavior Recognition From Drone Videos", *2024 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) Workshops*, Waikoloa, Hawaii, Jan. 2024, pp. 31–40.
- J. Kline, C. Stewart, T. Y. Berger-Wolf, M. Ramirez, S. Stevens, R. Ramesh Babu, N. Banerji, A. Sheets, S. Balasubramaniam, **E. Campolongo**, M. Thompson, C. V. Stewart, M. Kholiavchenko, D. I. Rubenstein, N. Van Tiel, J. Miliko , "A Framework for Autonomic Computing for In Situ Imageomics", *2023 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS)*, Toronto, ON, Canada, 2023, pp. 11–16, doi: 10.1109/ACSOS58161.2023.00018.

COMPETITION AND WORKSHOP ORGANIZATION

- Beetles as Sentinel Taxa: Predicting drought conditions from NEON specimen imagery (Imageomics Challenge Lead), November 2024 - Present.
    - Part of larger HDR Institutes Scientific Modeling out of distribution (Scientific-Mood) ML Challenge: nsfhdr.org/mlchallenge-y2 (Lead Organizer).
- Anomaly Detection in Scientific Domains AAAI Workshop (Co-organizer, nsfhdr.org/AAAI-workshop), March 2025.
- Butterfly Hybrid Detection ML Challenge (Imageomics Challenge Lead), November 2023 - March 2024.
    - Part of larger HDR Institutes ML Anomaly Detection Challenge: nsfhdr.org/mlchallenge.
- Image Datapalooza, August 2023 (Co-organizer, site: imageomics.osu.edu/image-datapalooza-2023).

CONFERENCES AND WORKSHOPS

- OSU LoveDataWeek (February 2025).
    - Lightning Presentation: *Imageomics Datasets*.
    - Poster: *Imageomics: FAIR ML Products for Biological Knowledge Discovery*.
- FARR Conference Invited Speaker and AI Reproducibility Panelist (October 2024):
    - Contributed Talk: *FAIR and Reproducible Data, Models, and Workflows in Imageomics*.
- HDR Ecosystem Conference (September 2024):
    - Contributed Talk: *Anomaly Detection: Hybrid Butterflies*.
    - Poster Presentation: *Imageomics: FAIR ML Products for Biological Knowledge Discovery*.
- BeetlePalooza Workshop *Data Curator* and *Participant* (August 2024).
- ID4 Integration of Data Fluency into 6th-12th Grade Education Workshop (July 2024).
- SIAM ED24 CP3 Session Chair, Contributed Talk: *Andromeda 2.0: FAIR Exploration of High-Dimensional Data* (July 2024).
- Imageomics All Hands Collaborator Day Poster Presentations and Demos (April 2024):
    - *Imageomics: ML for Biological Knowledge Discovery*.
    - *Data Dashboard: Facilitating Data Exploration*.
- NSF Research Infrastructure Workshop Poster Presentation: *Imageomics: ML for Biological Knowledge Discovery*. (March 2024).
- OSU LoveDataWeek Lightning Presentation and Poster: *Imageomics Datasets* (February 2024).

- HDR Ecosystem Conference (presented by co-authors in October 2023):
    - Contributed Talk: *FAIR and Reproducible Data, Models, and Workflows in Imageomics.*
    - Poster Presentation: *Data Dashboard: Facilitating Data Exploration.*
- APS March Meeting Contributed Talk: *Asymmetric Cloning to Eavesdrop on BB84 Protocol* (March 2023).
- miniMAGNTS Poster Presentation: *Lattice Point Counting: From Gauss Circle Problem to Heisenberg Norms* (August 2021).
- SIAM Annual Meeting, AWM Workshop Poster Presentation: *Lattice Point Counting: From Gauss Circle Problem to Heisenberg Norms* (July 2021).
- 3M RISE Symposium (June 2021).
- Hausdorff Trimester Program at The Hausdorff Center for Mathematics, Universität Bonn (2021):
    - Seminar Series: Harmonic Analysis From the Edge & Arithmetic Applications of Fourier Analysis (May-August).
    - The Polynomial Method, Summer School (June 2021).
    - The Circle Method: Entering its Second Century, Summer School (June 2020--Postponed to May 2021).
- IEEE NAECON Presentation: *A Tutorial on Topological Data Analysis for Big Data Analytics* (July 2019).
- First Midwest Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning Poster Presentation: *Performing Topological Data Analysis through the Ayasdi Platform* (June 2019).
- INFORMS Symposium Presentation: *Big Data Analysis with Topological Data Analysis* (presented by co-author in October 2018).

TEACHING EXPERIENCE

Experiential Introduction to AI and Ecology *Co-Lead Instructor*	Academic Year 2024 - 2025
Data Training Workshop *Lead Instructor*	April 2024
Git Training *Co-Instructor*	September 2023, August 2024, February 2024 & 2025
The Erdős Institute Boot Camp *Teaching Assistant*	May, September - December 2022
BAMM: Beyond the Classroom Summer Camp, OSU *Teaching Associate*	June 2021
Recitation Instructor, Tutor, and Grader, OSU *Graduate Teaching Associate*	August 2016 - May 2022
HCSSiM, Hampshire College *Junior Faculty*	June - August 2012

SKILLS

- **Data Analytics and Machine Learning:** Python (Pandas, Polars, NumPy, scikit-learn, matplotlib, Plotly), Topological Data Analysis (UMAP, HDBSCAN), Qiskit.
- **Computer Languages:** Python, LaTeX, Git, Java, basic HTML, Elm, and bash/zsh programming.
- **Tools/Platforms:** Jupyter Notebook, GitHub, Microsoft Office Suite, iWork, Zoom, Linux, Macs, and PCs.
- **Foreign Languages:** Functionally proficient in Spanish and Italian. Arabic (beginner), French (reading).
- **Public Speaking:** Twelve years of theatre performance and training, including Off-Broadway.

MEMBERSHIPS

- Society for Industrial and Applied Mathematics (SIAM).
- Association for Women in Mathematics (AWM).
- American Association for the Advancement of Science (AAAS).