FABIANA FERRACINA

Contact	E-mail: fabiana@tohoku.ac.jp Website: fabstat.github.io		
Research	Applications of topological data analysis and graph-based learning methods to problems in academic fields, such as material science and biology. Exploration of intrinsic and extrinsic uses of persistent homology to artificial neural networks. Interest in combining methods in topological data analysis, artificial neural networks and knot theory to gain novel perspective on various datasets.		
Education	Washington State University, Vancouver Vancouver, WA Ph.D. in Statistical Science, June, 2024 Thesis title: "Trials, Turbulations, and Inferences of ML on Complex data: Potato Varieties, Simulated Clouds, and More" Overall GPA of 3.92		
	University of Washington	University of Rochester	
	Seattle, WA M.S. in Mathematics, June, 2012 Optimization Specialization Overall GPA of 3.63	Rochester, NY B.S. in Mathematics, May, 2006 General Liberal Arts Education Overall GPA of 3.86	
Academic and Professional Experience	Math Center for Co-creative Society (MCCS) at Tohoku University, Sendai, Japan		
	Postdoctoral Research Fellow	October, 2024 - September, 2026	
	• Serves as Program Coordinator (PC) for G-RIPS Sendai, a Summer internship pro- gram where scholars from both Japan and U.S. work together on industry research projects.		
	• In the capacity of PC, works with the G-RIPS Sendai program director and adminis- tration on planning, coordinating and scheduling its activities; supports students and academic mentors; and develops curriculum for presentation and design skills course.		
	• Researches the development of novel frameworks and tools using topology and machine learning.		
	• Works on various applied projects such as analysis of amorphous metals' atomic structure and image classification of anomalous lung tissue.		
	• Maintains working relationships with international scholars to aid advancement of previously developed software tools.		
	Tohoku University through IPAM UCLA, Sendai, Japan		
	Academic Mentor	June, 2024 - August, 2024	
	• Provides project guidance and academic mentorship to group of graduate students		
	• Works with program director, industry mentors and other academic mentors to ensure students have the proper resources to succeed in their project		
	• Assists with interactions between grounds	students and mentors of diverse cultural back-	

Pacific Northwest National Laboratory, Richland, WA

PhD Intern - Data Sciences & Machine Intelligence

January, 2023 - May, 2024

- Worked remotely with the data science team and domain experts at PNNL on applications of graph neural networks
- Investigated reduced models of aerosol particle-size distributions, as well as developed machine learning models of aerosol particle dynamics
- Investigated the addition of topological descriptors to graph network simulators in order to improve efficiency and performance

Tohoku University through IPAM UCLA, Sendai, Japan

Graduate Student Intern in Summer Program

June, 2022 - August, 2022

- Selected to participate in UCLA IPAM's Graduate-level Research in Industrial Projects for Students (G-RIPS) at Tohoku University in Sendai
- Worked with F-MIRAI research center at University of Tsukuba and Toyota on mathematical approaches for mobility services in suburban areas
- Worked full time with three peers on developing and implementing a queue based model to study traffic congestion and gas emissions due to congestion

Washington State University, Vancouver, WA

Graduate Student and Teaching Assistant

August, 2018 - December, 2022

- Taught and developed materials for Calculus and Statistics courses at WSU Vancouver, as well as participated in interdisciplinary research involving mathematics, statistics, biology and computer science topics
- Worked closely with faculty from various departments to forward knowledge and research in science and mathematics
- Researched time-series data analysis, topological data analysis, state space models, hidden Markov models and Bayesian statistics

University of Washington, Bothell, WA

Math and CS Lecturer

June, 2013 - December, 2016

- Taught and developed materials for Computer Science courses at the University of Washington, Bothell, such as Java programming and functional programming in Scala
- Developed novel Scientific Computing class, as well as developed new teaching and testing materials for existing programming and mathematics classes
- Worked closely with faculty and program directors on improving the quality and accessibility of technical education to a diverse population of students

University of Washington, Seattle, WA

Graduate Student and Teaching Assistant

August, 2010 - June, 2012

- Focused major on Optimization and Numerical Analysis with a curriculum involving classes from both the Mathematics and the Applied Mathematics departments; participated on Combinatorial Optimization research
- Held two weekly Calculus sessions every quarter, ranging from Basic to Advanced

• Assisted students in person and email; graded exams and homework consistently and promptly

Google Inc, Mountain View, CA

Finance Operations Analyst

March, 2007 - July, 2009

- Managed several projects pertaining to the automation of data collection/reporting
- Performed data analysis and created reporting for executive management using Excel and Python
- Worked with engineers in adding new features and enhancing internal tools pertaining to travel and expenses

Teaching Experience

I have many years of experience teaching mathematics, statistics and computer science. Besides lectures and lab guidance, I have worked on developing teaching and testing materials for each subject. I have experience teaching both in class and remotely online:

- WSU MATH 106: College Algebra (class)
- WSU MATH 140: [QUAN] Calculus for Life Scientists (both class and labs)
- WSU MATH 171: [QUAN] Calculus I (both class and labs)
- WSU STAT 212: [QUAN] Introduction to Statistical Methods (class)
- WSU STAT 360: Probability and Statistics (class)
 - Original material (reveal.js slides)
- WSU STAT 380: [M] Decision Making and Statistics (grading)
- WSU Quantitative Skills Center Math, Stats and R Tutoring
- WSU Applied Statistics review sessions for graduate students preparing to take the graduate qualifying exam
- UW Bothell BCUSP 122/123: Functions, Models, and Quantitative Reasoning
- UW Bothell BCUSP 124/125: Calculus I and II
- UW Bothell BCUSP 127: Learning Strategies in Mathematics
- UW Bothell CSS 161/SKL 161: Fundamentals of Computing (class and lab)
 - Wrote high quality lab and testing materials using Java
- UW Bothell CSS 162: Programming Methodology
- UW Bothell CSS 490 Electives: Introduction to Functional Programming; and Elements of Scientific Computing (designed and taught)
- Publications Ferracina, F., Krishnamoorthy, B., Halappanavar, M., Hu, S. and Sathuvalli, V., 2025. Predictive analytics of selections of russet potatoes. Crop Science, 65(1), p.e21432. (https://doi.org/10.1002/csc2.21432)

Nakamura, A., Ferracina, F., Sakata, N., Noguchi, T. and Ando, H., 2025. Reducing Total Trip Time and Vehicle Emission through Park-and-Ride-methods and case-study. Journal of Cleaner Production, p.144860. (https://doi.org/10.1016/j.jclepro.2025.144860)

Ferracina, F., Beeler, P., Halappanavar, M., Krishnamoorthy, B., Minutoli, M. and Fierce, L., 2024. Learning to Simulate Aerosol Dynamics with Graph Neural Networks. arXiv preprint arXiv:2409.13861. *To appear in the ACS ES&T Air Journal.*

Talks and Conferences	Learning to Simulate Aerosol Microphysics with Graph Neural Networks. Tohoku U versity MCCS Departmental Seminar. December, 2024. Sendai, Japan.	
	Simulating Aerosol Chemistry with Graph Neural Networks. Cascade RAIN Mathematics Meeting. April, 2024. Portland, OR. (slides)	
	Persistent Homology for Assessing Facility Placement. AMS-MRC Conference week on Complex Social Systems. June, 2023. Java Center, NY.	
	Topological Data Analysis (TDA) and Bayesian Classification of Brain States. WSU Statistics Departmental Seminar. Fall, 2021. Pullman, WA.	
	State-space modelling of the flight behaviour of Raptors. WSU Statistics Departmental Seminar. Spring, 2021. Pullman, WA.	
Academic Service	Provided internal review for USGS of Bergen, S., Huso, M. M., Duerr, A. E., Braham, M. A., Katzner, T. E., Schmuecker, S., & Miller, T. A. (2022). Classifying behavior from short-interval biologging data: An example with GPS tracking of birds. Ecology and Evolution, 12(2), e08395.	
	Served in the Council for Equity, Diversity and Inclusion (CEDI) from January, 2021 to May, 2022.	
	Participated in a discussion group during the International Statitical Ecology Conference (ISEC) 2020 which led to publication: Popovic, G., Mason, T.J., Drobniak, S.M., Marques, T.A., Potts, J., Joo, R., Altwegg, R., Burns, C.C.I., McCarthy, M.A., Johnston, A. and Nakagawa, S., 2024. Four principles for improved statistical ecology. Methods in Ecology and Evolution, 15(2), pp.266-281.	
	Reviewed chapter on Convex Optimization which appeared in Blekherman, Grigoriy, Pablo A. Parrilo, and Rekha R. Thomas, eds. Semidefinite optimization and convex algebraic geometry. Society for Industrial and Applied Mathematics, 2012.	
Course Projects	• The Ontogeny of Bald Eagle Behavior. Fall, 2020	
Ŭ	• Modeling Presence-Only Data: a Hierarchical Exploration of the Oceanic Whitetip Shark Distribution. Fall, 2020.	
	• A Hidden Markov Connection: Quantifying Neuronal Spikes and Forest Fires (with Jacob Pennington), Spring, 2020.	
	• Modeling Changes in Symbiotic Nitrogen Fixing and Ecosystem Function due to Human Activity. Spring, 2020.	
	• On Bayesian Species Occurrence Modeling Research: a Reproducibility and Adapt- ability Review (with Christopher Custer and Roxanne Lindgren). Fall, 2019.	
	• SparkulAkka: a Simple and Extensible Distributed Simulation System built on Spark and Akka. Spring, 2019.	
Awards	CISER Mike Jacroux Book Award for Best Among PhD Students in Statistics. April, 2022.	
Skills	Proficient in Python, HTML and I ^A T _E X. Familiar with CSS, Javascript, Java, MatLab, R and SAS. Comfortable with Linux CLI and git. Fluent in English and Portuguese.	