María A. Valdez Cabrera

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Personal Profile

I am a mathematical statistician developing rigorous and computationally efficient methods for complex data structures in the health and biological sciences, with a focus on phylogenetic analysis. My recent work introduces a new mathematical framework for weighted tree-graphs with non-identical tip-nodes, enabling intuitive distances and informative summaries for tree collections. My broader goal is to integrate statistical methodology with applied mathematics to improve the analysis of object-oriented data.

Currently a postdoctoral fellow in the Department of Biostatistics at the University of Washington, I am seeking a faculty position in a department that values research at the interface of statistics, mathematics, and biology. My research interests include statistical methods for non-Euclidean data and topological data analysis; probability theory and semiparametric modeling; computational statistics and optimization methods; evolution modeling, microbial ecology and infectious diseases.

Education

University of Washington — *Seattle, Washington, USA*

PhD in Biostatistics — *September 2018 – August 2024*

- Advisor: Amy Willis, Ph. D.
- Dissertation: Statistical methods for phylogenetic trees with non-identical leaf sets

Universidad de Guanajuato — *Guanajuato, México*

Bachelor in Mathematics — *August 2013 – June 2018*

- Advisor: Eloísa Díaz-Francés, Ph. D.
- Thesis project: Proposal for the efficient estimation of a Binomial success rate and its extension to the comparison of two binomial distributions

Awards and Scholarships

University of Washington — *Washington, USA*

School of Public Health Outstanding PhD Award in Biostatistics — *April, 2024*

Yearly award granted by faculty in recognition of excellence in four areas: Coursework & Exam Performance, Dissertation & Publications, Written & Oral Skills, and Leadership.

XV Escuela de Probabilidad y Estadística — *Guanajuato, México*

Poster Contest — *March 2017*

Won the first place in the poster Contest of the XV Summer School of Probability and Statistics of CIMAT.

CIMAT (Center for Research in Mathematics) — *Guanajuato, México*

CIMAT scholarship — *August 2013 - June 2018*

Scholarship for students who achieve and maintain a high GPA throughout their studies.

Publications

Refereed research articles

1. **Valdez Cabrera, M. A.**, & Willis, A. D. (2025). *Distances Between Extension Spaces of Phylogenetic Trees*. IEEE Transactions on Computational Biology and Bioinformatics, 22(2), 614–627.

2. Mirembe, B. G., **Valdez Cabrera, M.**, van der Straten, A., Nakalega, R., Cobbing, M., Mgodi, N. M., Palanee-Phillips, T., Mayo, A. J., Dadabhai, S., Mansoor, L. E., Siva, S., Nair, G., Chinula, L., Akello, C. A., Nakabiito, C., Soto-Torres, L. E., Baeten, J. M., & Brown, E. R. (2022). *Correlates of Dapivirine Vaginal Ring Acceptance among Women Participating in an Open Label Extension Trial*. AIDS and Behavior. https://doi.org/10.1007/s10461-022-03841-z

3. Urquídez, O., & **Valdez, M.** (2019). *Diseño de grafos pesados con n-ciclos persistentes*. Morfismos, Vol. 23 No.1

Preprint Manuscripts

1. **Valdez Cabrera, M. A.**, Willis, A. D., & Taeb, A. (2025). *Consensus Tree Estimation with False Discovery Rate Control via Partially Ordered Sets.* https://doi.org/10.48550/arXiv.2511.23433
2. **Valdez Cabrera, M. A.**, & Willis, A. D. (2025). *Geometry of the space of phylogenetic trees with non-identical leaves.* https://doi.org/10.48550/arxiv.2508.06747

Other refereed scholarly publications

1. **Valdez Cabrera, M. A**. (2024). Statistical Methods for Phylogenetic Trees With Non-Identical Leaf Sets. ProQuest Dissertations & Theses.
2. **Maria Alejandra Valdez Cabrera.** Propuesta de Estimación Eficiente de una Proporción de Éxito Binomial y su extensión a la comparación de dos Distribuciones Binomiales. June 2018 (Undergrad Thesis, University of Guanajuato)

Conferences and Workshops

Invited presentations

1. **Valdez Cabrera, M.** Towering BHV spaces to analyse trees with non-identical leaves. Presented at: JSM 2025; August 2025; Nashville, TN, USA.
2. **Valdez Cabrera, M.** & Willis, A. Developing statistical methods to compare Phylogenetic Trees with non-identical leaf sets. Presented at: WNAR 2023 Annual Meeting; June 2023; Anchorage, AK, USA.
3. **Valdez Cabrera, M.** & Willis, A. Statistical methods to analyze phylogenetic trees with non-identical leaf sets. Presented at: 6th International Conference on Econometrics and Statistics; July 2023; Tokyo, Japan.
4. **Valdez Cabrera, M.** Esqueleto de Homología Persistente como descriptor del borde de objetos en una imagen (Homologically Persisten Skeleton for describing the border of objects in an Image). Presented at: Noveno Verano de Probabilidad y Estadística en el CIMAT; June 2016; Guanjuato, México.

Poster Presentations

1. **Valdez Cabrera, M.** Towering Tree Space: a metric between trees with differing leaf sets. Poster presented at: Contemporary Challenges in Large-Scale Sequence Alignments and Phylogenies, Bridging Theory and Practice; August 2025; Chicago, IL, USA.
2. Gati Mirembe, B., **Valdez Cabrera, M.**, Cobbing, M., ..., Brown, E. Correlates of Dapivirine vaginal ring uptake among women participating in an open label extension trial-MTN-025/HOPE. Poster presented at: HIV R4P; January 2021; Virtual.
3. **Valdez Cabrera, M.** & Díaz-Francés, E. Propuesta de estimación de una proporción Binomial con intervalos de verosímilitud de nivel adecuado (Proposal for the estimation of a Binomial proportion with appropriate level likelihood intervals). Poster presented at: XV Escuela de Probabilidad y Estadística en el CIMAT; March 2017; Guanajuato, México.

Workshops and Conference Participation

1. Object Oriented Data Analysis in Health Sciences Workshop; July 2023; Chicago, IL, USA.
2. 2019 Women in Statistics and Data Science (WSDS) Conference; October 2019; Bellevue, WA, USA.
3. III School of Topological Data Analysis and Stochastic Topology; January 2017; Toluca, Mexico.

Research Experience

University of Washington - Biostatistics Department *Seattle, Washington, USA*

Postdoctoral Fellow *October 2024 – current*

- **Supervisor:** Amy Willis, Ph.D.
- Development of statistical methods and algorithms for Phylogenetic Analysis.

University of Washington - Statistical Diversity Lab *Seattle, Washington, USA*

Research Assistant *June 2022 – August 2024*

- **Supervisor:** Amy Willis, Ph.D.
- Development of statistical methods and software for Phylogenetics. This includes the public software:
  - **ExtensionSpacesDistance:** A Java source for computing distances between Extension Spaces in BHV tree space.
- Maintenance and improvement of software from the Statistical Diversity Lab such as the R packages:
  - **Breakaway:** R package to estimate and to model species richness and microbial diversity.
  - **Corncob:** R package that provides models for microbial abundances and tests for the effect of covariates on it.
  - **DivNet:** R package to estimate diversity in networked communities.
  - **Tinyvamp:** R package for estimation and removal of measurement error in high-throughput sequencing data.

Fred Hutchinson Cancer Research Center *Seattle, Washington, USA*

Research Assistant *April 2019 – June 2022*

- **Supervisor:** Elizabeth Brown, Ph.D.
- Development of statistical plan for studies on STI incidence rate.
- Analysis on the usage of novel HIV prevention methods in an open label HIV prevention trial under Microbicide Trials Network (MTN).

CIMAT (Center for Research in Mathematics) *Guanajuato, México*

Research Assistant *January 2018 – May 2018*

- **Supervisor:** Víctor Pérez-Abreu, Ph.D.
- Explored the application of Topological Data Analysis into graph theory.

CIMAT (Center for Research in Mathematics) *Guanajuato, México*

Research Assistant *August 2015 – December 2016*

- **Supervisor:** Eloísa Díaz-Francés, Ph.D.
- Improvement of the use of binomial likelihoods in proportions estimation on clinical trials.
- Review on the most common methods of binomial estimation.

Teaching Experience

Teaching Assistant *European Institute for Marine Sciences, Brest University*

EBAME: Emerging Bioinformatics Approaches for Microbial Ecogenomics *October 2025*
- Lecture on Statistics Foundations and Data management.
- Statistical methods for microbial communities: Functional Enrichment and Differential Abundance.

Teaching Assistant *Marine Biological Laboratory, University of Chicago*

STAMPS: Strategies and Techniques for Analyzing Microbial Population Structures *July 2025, July 2024*
- Lecture on Statistics Foundations and Introduction to R tools.
- Statistical methods for microbial communities: Differential Abundance and Phylogenomics.

Teaching Assistant *University of Washington*

BIOST 571: Advanced Regression Methods for Dependent Data *January 2023 – March 2023*
- Longitudinal Data Models, Generalized Linear and Non-linear Mixed Models.
- Generalized Estimating Equations, Likelihood-based and Bayesian Inference

BIOST 537: Survival Data Analysis In Epidemiology *January 2022 – March 2022*
- Methods for analyzing Right-censored Survival Data.
- Kaplan–Meier Estimation, Proportional Hazards and Accelerated Failure Time Models.

BIOST 513: Medical Biometry III *March 2021 – June 2021*
- Categorical Data Analysis, Logistic regression, Survival Analysis.

BIOST 512: Medical Biometry II — *January 2021 – March 2021; January 2019 – March 2019*

- Simple and multiple Linear Regression

BIOST 536: Categorical Data Analysis in Epidemiology — *September 2020 – December 2020*

- Univariate and Multivariate Categorical Data Analysis using Multiplicative Models.

BIOST 523: Statistical Inference For Biometry II — *January 2020 – March 2020*

- Theory of statistical inference and basic concepts of probability
- Parametric Models, Maximum Likelihood and Bayesian Inference and Theory of Hypothesis Testing.

BIOST 511: Medical Biometry I — *September 2018 - December 2018*

- Data description methods and fundamentals on Parametric and Non-parametric Statistics

Teaching Assistant — *Universidad de Guanajuato*

M24101: Statistical Methods — *January 2016 – June 2016*

- Introduction to Statistics Inference and Parametric Models.

Extracurricular Activities

Biostatistics Student Seminar Organizer — *September 2019 – December 2022*

Activities included the planning of useful sessions for students and the recruitment of presenters each quarter, keeping assistance for enrolled students for proper accreditation and making public announcements for each session.

Organizational Committee of National Elementary and Middle School Mathematical Olympiads program (ONMAPS) — *January 2015 – June 2018*

Member of the Organizational Committee of National Elementary and Middle School Mathematical Olympiads program (ONMAPS) for the state of Guanajuato. Activities included designing, applying and grading selection tests, training the selected students and giving workshops to teachers of different schools.

Mathematics Educational Extension department — *January 2014 – December 2014*

Volunteer at the Mathematics Educational Extension department of CIMAT (Matemorfosis). As part of this team I gave workshops of interactive mathematics to kids along the state of Guanajuato.

Technical skills

Programming	R, C/C++, Python, JavaScript
R packages	devtools, dplyr, ggplot2, lme4, msm, shiny, tidyverse
Miscellaneous	Shell (Bash), LaTeX(Overleaf/R Markdown), Git, SQL

References available upon request.