

FERNANDA LANG SCHUMACHER

Assistant Professor
Division of Biostatistics, College of Public Health
The Ohio State University
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(updated April 10, 2025)

EDUCATION

- 2018 - 2021** **Ph.D. degree in Statistics**
State University of Campinas, UNICAMP, Campinas – SP, Brazil
Advisor: Larissa Avila Matos and Victor Hugo Lachos Davila
- 2015 - 2016** **M.Sc. degree in Statistics**
State University of Campinas, UNICAMP, Campinas – SP, Brazil
Advisor: Victor Hugo Lachos Davila and Filidor Vilca Labra
- 2011 - 2014** **B.S. degree in Statistics**
State University of Maringa, UEM, Maringa – PR, Brazil
Graduated with honors

PROFESSIONAL EXPERIENCE

- 04/2022 - present** Assistant professor: Division of Biostatistics
College of Public Health, The Ohio State University
Columbus, OH, USA
- 11/2016 - 02/2018** Statistician: Technologist in geographic and statistical information
Brazilian Institute of Geography and Statistics, IBGE
Rio de Janeiro – RJ, Brazil
- 08/2017 - 12/2017** Instructor: Department of Statistics
National School of Statistical Sciences, ENCE
Rio de Janeiro – RJ, Brazil
- 08/2013 - 07/2014** Project director and founding member
Estats Consultoria (Junior company of statistical consulting), UEM
Maringa – PR, Brazil

AWARDS

1. Winner of the competition for students of statistics in association with the Conference in Honour of Fred Smith and Chris Skinner – 2021.
2. 2nd place in the Best Master's Thesis contest in 23rd SINAPE – 2018.
3. Bachelor's degree obtained with honor (*Láurea acadêmica de graduação*) – 2015.

RESEARCH INTERESTS

- Censored regression models
- DNA methylation patterns
- Linear and nonlinear mixed-effects models
- Longitudinal models
- Missing data analysis
- Multiple sclerosis disease
- Robust models
- Skew-elliptical/elliptical distributions
- Variable selection for mixed models

GRANTS AND CONTRACTS

Active

- NMSS BI-2306-41591 (PI: Schumacher) 07/2024 - 06/2027
Epigenetics in MS: An evaluation of biological aging and disease severity
Role: Principal Investigator (30% support)
- NIH/NICHD R01HD091274-01A1 (PI: Maria Gallo) 08/2018 - 05/2025
Postpartum Family Planning
Role: Co-Investigator (10% support)
- NIH/NIA R03AG078946 (PI: Yinan Zhang) 09/2022 - 05/2025
Markers of Biological Aging in Multiple Sclerosis
Role: Biostatistician (5-10% support)

PUBLICATIONS

Statistical Methodology *Student advisee

1. Castro, K. T.*, Matos, L. A., **Schumacher, F. L.** (2025) Diagnostic analysis in scale mixture of skew-normal linear mixed models. *Statistica Neerlandica*, 79(1), e70002.
2. Zhong, K., **Schumacher, F. L.**, Castro, L. M., Lachos, V. H. (2025). Bayesian analysis of censored linear mixed-effects models for heavy-tailed irregularly observed repeated measures. *Statistics in Medicine*, 44: e10295.
3. Loo Valeriano, K. A., **Schumacher, F. L.**, Galarza, C. E., Matos, L. A. (2024). Censored autoregressive regression models with Student-t innovations. *Canadian Journal of Statistics*, 52: 804-828.
4. **Schumacher, F. L.**, Matos, L. A., Lachos, V. H., Abanto-Valle, C., Castro, L. M. C. A Censored Time Series Analysis for Responses on the Unit Interval: An Application to Acid Rain Modeling. *Sankhya A*, 86, 637-660.
5. **Schumacher, F. L.**, Lachos, V. H., Matos, L. A. (2021). Scale mixture of skew-normal linear mixed models with within-subject serial dependence. *Statistics in Medicine*, 40(7), 1790-1810.

6. **Schumacher, F. L.**, Dey, D. K., Lachos, V. H. (2021). Approximate inferences for nonlinear mixed effects models with scale mixtures of skew-normal distributions. *Journal of Statistical Theory and Practice*, 15(3), 1-26.
7. **Schumacher, F. L.**, Ferreira, C. S., Prates, M. O., Lachos, A., Lachos, V. H. (2021). A robust nonlinear mixed-effects model for COVID-19 death data. *Statistics and Its Interface*, 14, 49-57.
8. **Schumacher, F. L.**, Lachos, V. H., Vilca-Labra, F. E. (2018). Influence diagnostics for censored regression models with autoregressive errors. *Australian & New Zealand Journal of Statistics*, 60(2), 209-229.
9. **Schumacher, F. L.**, Lachos, V. H., Dey, D. K. (2017). Censored regression models with autoregressive errors: A likelihood-based perspective. *Canadian Journal of Statistics*, 45, 375-392.
10. Souza, E. M., Alves, D. B. M., **Schumacher, F. L.** (2015). Harmonic Analysis of Multipath Index Time Series in GPS Stations. *Tendencias em Matemática Aplicada e Computacional (TEMA)*, 16, 71.
11. **Schumacher, F. L.**, Souza, E. M., Gimenes, E., Uchimura, T. T., Masukawa, M. L. T. (2014). Modelos estruturais em series temporais com aplicação em dados de internação por bronquiólite. *Revista da Estatística da Universidade Federal de Ouro Preto*, III, 188-199.
12. Philippsen, A. S., Peralta, D., Gazola, S., **Schumacher, F. L.**, Kung, J. (2014). O jornalismo impresso na comunidade universitária. *Extensio (Florianópolis)*, 11, 16-25.

Statistical Applications

1. Gallo, M. F., **Schumacher, F. L.**, Lawley, M., Keim, S. A., Dupper, A. C., Keder, L. (2024). Potential effect of immediate postpartum use of injectable contraception on lactogenesis. *Contraception*, 110726.
2. Nassani, L. M., Bencharit, S., **Schumacher, F.**, Lu, W. E., Fernandes, G. V. O. (2024) The Impact of Technology Teaching in the Dental Predoctoral Curriculum on Students' Perception of Digital. *Dentistry Journal*, 12(3), p.75.
3. Park, G., Meirelles, L., Gouveia, D., Lee, D., Lu, W.E., **Schumacher, F.L.**, Leblebicioglu, B. (2024). Accuracy of dental implant placement with CAD-CAM 3D printed and conventional thermoplastic surgical pilot guides: A clinical comparative trial. *The Journal of Prosthetic Dentistry*, S0022-3913(24)00715-7. Advance online publication.
4. Stanwick, M., Fenesha, F., Hamid, A., Kang, K., Kanniard, D., Kim, I., Mandarano, N., **Schumacher, F.L.**, Peters, S.B. (2024). Impaired Tertiary Dentin Secretion After Shallow Injury in Tgfb β 2-Deficient Dental Pulp Cells Is Rescued by Extended CGRP Signaling. *International Journal of Molecular Sciences*, 25(13), p.6847.

5. Stetzel, L., Foucher, F., Jang, S. J., Wu, T.-H., Fields, H., **Schumacher, F.**, Richmond, S., Ko, C.-C. (2024). Artificial Intelligence for Predicting the Aesthetic Component of the Index of Orthodontic Treatment Need. *Bioengineering*, 11(9), 861.
6. Wu, Y.C., **Schumacher, F.L.**, Tatakis, D.N. (2024). Participant Experience of Taking Part in Periodontal Experimental Studies. *International Journal of Dentistry*, 2024(1), p.8888815.
7. Zaiger J., Leblebicioglu B., Meirelles L., Lu W.-E., **Schumacher F.L.**, Tatakis D.N. (2024). Effects of extraoral storage time on autologous gingival graft early healing: A split-mouth randomized study. *Journal of Periodontal Research*, 59: 1143-1152.
8. Conley, K. H., Jatana, C., **Schumacher, F. L.**, Lu, W. E. and Moffitt, A. (2023). Exploring the Attitudes of Women Dental Students Regarding Becoming Oral and Maxillofacial Surgeons. *Journal of Oral and Maxillofacial Surgery*, 81(9).
9. Donmez, M. B., Çakmak, G., Dede, D. Ö., Küçükekenci, A. S., Lu, W. E., **Schumacher, F. L.**, Revilla-León, M., Yilmaz, B. (2023). Effect of scan powder and scanning technology on measured deviations of complete-arch implant supported frameworks digitized with industrial and intraoral scanners. *Journal of Dentistry*, 138.
10. Lima, S. G., **Schumacher, F. L.**, Cazarin, C. B. B. (2023). Front-of-package label in Brazil: Comparison of guideline daily amounts, traffic-light and warning systems. *Food and Humanity*, 1, 199-209.
11. Yilmaz B., Dede D. Ö., Donmez M. B., Küçükekenci A. S., Lu W. E., **Schumacher F. L.**, Çakmak G. (2023). Comparison of intraoral and laboratory scanners to an industrial-grade scanner while analyzing the fabrication trueness of polymer and titanium complete-arch implant-supported frameworks. *Journal of Dentistry*, 138.

PAPERS SUBMITTED OR UNDER REVISION

1. **Schumacher, F. L.**, Matos, L. A., Cabral, C. R. B. Canonical fundamental skew-t linear mixed models.
2. **Schumacher, F. L.**, Matos, L. A., Lachos, V. H. skewlmm: An R Package for Fitting Skewed and Heavy-Tailed Linear Mixed Models.
3. Mani, S.K.*, Rempala, G.A., Kenah, E., **Schumacher, F.L.** Short-Term Bayesian Influenza Forecasting in a Hospital Environment Using a Linear Kalman Filter.
4. Allen, M. D., Thompson, A., Clark, B. C., **Schumacher, F. L.**, Zhang, Y. Multiple sclerosis and sarcopenia: analysis of population-level prevalence and key risk factors from the UK Biobank.
5. Oliveira, D. C., **Schumacher, F. L.**, Lachos, V. H. The use of the EM algorithm for regularization problems in high-dimensional linear mixed-effects models.

GRADUATE STUDENT TRAINED

PhD Dissertation Committee Member

- Danielle Tyson (2023-2024). Epidemiology.
- Yi Tang Chen (2025-). Biostatistics.

PhD Candidacy Committee Member

- Amy Dupper (2023-2024). Epidemiology.
- Micaela Richter (2023-2024). Biostatistics.
- Yi Tang Chen (2023-2023). Biostatistics.
- Meredith McCormack-Mager (2022-2024). Biostatistics.
- Danielle Tyson (2022-2023). Epidemiology.

Master thesis advisor

- Dimitra Herbei, 2024 M.S., Biostatistics, The Ohio State University. *Exploring the association of multiple sclerosis and sarcopenia under missing data: A comparative exploration based on the UK Biobank*
- Keyliane Travassos Almeida da Silva, 2023 M.S., Statistics, University of Campinas. Co-supervision with Dr. Larissa A. Matos. *Diagnostic analysis in scale mixture of skew-normal linear mixed models.*

Master thesis committee member

- Shankar Mani (2023-2024). Biostatistics.
- Jacob Falter (2022-2023). Orthodontics.
- Leah N. Stetzel (2022-2023). Orthodontics.

Master examination committee member

- Akua Amponsah, Epidemiology (MPHPEP, 2024 AU)
- Madison Theodore, Epidemiology (MPHP, 2024 SP)

UNDERGRADUATE STUDENT SUPERVISION

1. Syed Rafey Abbas, Ohio Five Summer Undergraduate Research Experience program (2024 SU).
2. Yiting Lu, Research Internship (2023 SU+AU), Hangzhou Dianzi University, China.
3. Anthony Thompson. The Ohio State University. Undergraduate Capstone Research in Public Health (SP2023).

COURSES TAUGHT

The Ohio State University College of Public Health

Spring 2025	PUBHBIO 7230	Applied Longitudinal Data Analysis
Fall 2023	PUBHBIO 6260	Ethics in Biostatistics
Spring 2024	PUBHBIO 7230	Applied Longitudinal Data Analysis

Fall 2023	PUBHBIO 6260	Ethics in Biostatistics
Spring 2023	PUBHBIO 7230	Applied Longitudinal Data Analysis

National School of Statistical Sciences (ENCE-IBGE)

Fall 2017	EST065	Survey methodology (Planejamento de Pesquisas)
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PROFESSIONAL PRESENTATIONS

Conferences

1. EMLMLasso: An EM Algorithm Implementation for Regularization in High-Dimensional Linear Mixed Models. **Poster presentation**. ENAR 2025, New Orleans, LA, USA.
2. What Are We Measuring with Epigenetic Clocks in People with MS? **Poster presentation**. ACTRIMS Forum 2025, West Palm Beach, FL, USA.
3. Assessment of biological aging in people with multiple sclerosis based on epigenetic clocks. **Poster presentation**. 10th Tykeson Fellows Conference, 2024. National Multiple Sclerosis Society. Denver, CO, USA.
4. Challenges in assessing biological aging in people with multiple sclerosis based on epigenetic clocks. **Invited session**. 37th New England Statistics Symposium, 2024. University of Connecticut. Storrs, CT, USA.
5. Bayesian scale mixture of normal censored linear mixed models with within-subject serial dependence. **Invited session**. CMStatistics 2023. Berlin, Germany.
6. Variable selection in high-dimensional linear mixed-effects models. **Contribución Científica**. Vigésimas Jornadas en Estadística, 2023, Guayaquil, Ecuador.
7. Panel on How to Join/Explore Pharma. **Panelist**. Statistics in Pharmaceuticals, 2023, Storrs, CT, USA.
8. Robust mixed models for longitudinal data: model fitting and evaluation. **Speed presentation**. ASA Joint Statistical Meetings, 2023, Toronto, Canada.
9. EM algorithm for regularization problems in high-dimensional LMMs. **Flash talk**. IMS 23rd Meeting of New Researchers in Statistics and Probability, 2023, Toronto, Canada.
10. Bayesian Estimation in Scale Mixture of Skew-Normal linear mixed models using Hamiltonian Monte Carlo. **Oral presentation**. ISI 64th World Statistics Congress, 2023, Ottawa, Canada.
11. Censored autoregressive regression modeling using the R package ARCensReg. **Oral presentation**. 24th International Conference on Computational Statistics, 2022, Bologna, Italy.
12. Modeling Longitudinal Data using Robust Mixed Models in R. **Tutorial**. 24^o Simpósio Nacional de Probabilidade e Estatística (SINAPE), 2022, Gramado, RS, Brazil.
13. Censored autoregressive regression models with Student-t innovations. **Oral**

presentation. ICSA 2022 Applied Statistics Symposium, 2022, Gainesville, FL, USA.

14. Canonical Fundamental Skew-t Linear Mixed Models. **Oral presentation.** III Jornadas Ecuatorianas en Matemáticas, 2021, Ecuador (virtual conference).
15. Scale mixture of skew-normal linear mixed models with within-subject serial dependence. **Poster presentation.** 34th New England Statistics Symposium, 2021, Providence, RI, USA.
16. skewlmm: An R package for robust estimation of linear mixed models based on scale mixture of skew-normal distributions. **Poster presentation.** ISI World Statistics Congress 2021.
17. Canonical fundamental skew-t linear mixed models. **Oral presentation** (Student Prize Session). Conference in Honour of Fred Smith and Chris Skinner (virtual satellite meeting of the ISI World Statistics Congress 2021).
18. Scale mixture of skew-normal linear mixed models with within-subject serial dependence. **Oral presentation** (Organized Invited Session). 4th International Conference on Econometrics and Statistics, 2021, Hong Kong (virtual conference).
19. Robust estimation in linear mixed models using the R package skewlmm. **Oral presentation.** XV Encontro Científico de Pós-Graduandos do IMECC, November 2020, Campinas – SP, Brazil (virtual conference).
20. Autoregressive scale mixture of skew-normal linear mixed models. **Poster presentation.** VI Workshop em Análise de Sobrevida e Aplicações (WASA), November 2019, Piracicaba – SP, Brazil.
21. Influence Diagnostics for Censored Regression Models with Autoregressive Errors. **Oral presentation.** XVI Escola de Modelos de Regressão (EMR), March 2019, Pirenópolis – GO, Brazil.
22. Censored regression models with autoregressive errors. **Oral presentation.** 23^o Simpósio Nacional de Probabilidade e Estatística (SINAPE), September 2018, São Pedro – SP, Brazil.
23. *Imputação de Dados Faltantes em séries temporais.* **Poster presentation.** XIV EMR, March 2015, Campinas – SP, Brazil.
24. *Modelos estruturais em séries temporais com aplicação em dados de internação por bronquiólite.* **Oral presentation.** 59^a RBras, May 2014, Ouro Preto – MG, Brazil.

Guest Lectures

1. Guest speaker discussing difference in difference models, VETPREV 8725: Quantitative Methods Capstone, The Ohio State University, February 20, 2025.

Other Invited Presentations

1. Challenges in Longitudinal Data Analysis: Complex Made Simple with the R Package skewlmm. **Seminar.** 2024 Fall Speaker and Annual Banquet, Columbus ASA Chapter.

Columbus, OH, USA, September 16, 2024.

2. Lessons from an Ethics in Biostatistics Course. **Seminar**. Department of Statistics, University of Campinas. Campinas, SP, Brazil, July 12, 2024.
3. Scale Mixture of Skew-Normal Linear Mixed Models: a Bayesian approach using Hamiltonian Monte Carlo. **Seminar**. Department of Bioinformatics and Biostatistics, University of Louisville. Louisville, KY, USA, January 26, 2024.
4. Penalized Estimation of Scale Mixture of Skew-Normal Linear Mixed Models using Hamiltonian Monte Carlo. **Seminar**. Division of Biostatistics and Bioinformatics, University of Cincinnati, October 27, 2023.
5. Penalized Estimation of Scale Mixture of Skew-Normal Linear Mixed Models using Hamiltonian Monte Carlo. **Seminar**. Department of Statistics, The Ohio State University, October 19, 2023.
6. Penalized Estimation of Scale Mixture of Skew-Normal Linear Mixed Models using Hamiltonian Monte Carlo. **Colloquium**. Department of Statistics, Federal University of Minas Gerais, September 22, 2023.
7. A trajetória acadêmica e uma introdução a modelos mistos para dados longitudinais. **Invited lecture**. Department of Statistics, State University of Maringa, March 23, 2022.
8. Robust Mixed-Effects Models for Longitudinal Data. **Colloquium**. Department of Statistics, University of Connecticut, November 17, 2021.

SOFTWARES

1. **Schumacher, F. L.**, Matos, L. A., Lachos, V. H. (2020). skewlmm: Scale Mixture of Skew-Normal Linear Mixed Models. <https://cran.r-project.org/package=skewlmm>
2. **Schumacher, F. L.**, Lachos, V. H. and Galarza, C.E. (2016). ARCensReg: Fitting Univariate Censored Linear Regression Model with Autoregressive Errors. <https://cran.r-project.org/package=ARCensReg>

OTHER PROFESSIONAL SERVICES AND INFORMATION

- **Organizing conferences or workshops**

1. Statistics in Pharmaceuticals 2023. University of Connecticut, Storrs, CT, USA. Member of the Organizing Committee.
2. XIII Encontro Científico dos Pos-Graduandos do IMECC. 2018. Campinas, SP, Brazil. Member of the Organizing Committee.

- **Referee Services**

1. Brazilian Journal of Probability and Statistics

2. Communications for Statistical Applications and Methods
3. Infectious Disease Modelling
4. JAMA Neurology
5. Journal of Multivariate Analysis
6. Journal of Scientific Research and Reports
7. Journal of the Korean Statistical Society
8. R Journal
9. Sankhya B
10. Statistics in Medicine

- **Associate Editor Services**

1. Sankhya B

- **Professional affiliations:**

1. Brazilian Statistical Association (Associação Brasileira de Estatística, ABE) – member
2. Caucus for Women in Statistics – member
3. International Statistical Institute – member

- **Google Scholar Citation:** <https://scholar.google.com.br/citations?user=WNtJVuUAAAAJ>

- **ORCID ID:** <https://orcid.org/0000-0002-5724-8918>

- **OSU bio page:** <https://cph.osu.edu/people/fschumacher>

- **Personal page:** <https://sites.google.com/view/fernandalschumacher/>