FERNANDA LANG SCHUMACHER

Assistant Professor
Division of Biostatistics, College of Public Health
The Ohio State University
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(updated August 15, 2024)

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 honor

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
- Linear and nonlinear mixed-effects models
- Longitudinal data
- 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
Schumacher (PI)
7/1/24-6/30/27
Epigenetics in MS: An evaluation of biological aging and disease severity

R03AG078946
Zhang (PI), Role: biostatistician
09/2022 - 05/2025
Markers of Biological Aging in Multiple Sclerosis

R01 HD091274-01A1 (Maria Gallo, PI)
Gallo (PI), Role: co-investigator
08/2018 - 05/2025
Postpartum Family Planning

PUBLICATIONS

1. **Schumacher, F. L.**, Matos, L. A., Lachos, V. H., Abanto-Valle, C. A., & Castro, L. M. (2024). A Censored Time Series Analysis for Responses on the Unit Interval: An Application to Acid Rain Modeling. *Sankhya A*, 86(1), 637-660.

2. Valeriano, K. A. L., **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.

3. 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*.

4. Nassani, L. M., Bencharit, S., **Schumacher, F. L.**, Lu, W. E., Resende, R., & Fernandes, G. V. O. (2024). The Impact of Technology Teaching in the Dental Predoctoral Curriculum on Students' Perception of Digital Dentistry. *Dentistry Journal*, 12(3), 75.

5. 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 Tgfbr2-Deficient Dental Pulp Cells Is Rescued by Extended CGRP Signaling. *International Journal of Molecular Sciences*, *25*(13), 6847.

6. 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. F*ood and Humanity, 1*, 199-209.

7. 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.

8. 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.

9. Conley, K. H., Jatana, C., **Schumacher, F. L.**, Lu, W. E., & Moffitt, A. (2023). Exploring the Attitudes of Women Dental Students Regarding Becoming Oral and Maxillofacial Surgeons. *Journal of Oral and Maxillofacial Surgery*, 81(9).

10. **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.

11. **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.

12. **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.

13. **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.

14. **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.

15. 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.

16. **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 bronquiolite. Revista da Estatística da Universidade Federal de Ouro Preto, *III*, 188-199.

17. Philippsen, A. S., Peralta, D., Gazola, S., **Schumacher, F. L.**, & Kung, J. (2014). O jornalismo impresso na comunidade universitária. Extensio (Florianópolis), *11*, 16-25.

PAPERS SUBMITTED OR UNDER REVISION

1. 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.

2. **Schumacher, F. L.**, Matos, L. A., & Cabral, C. R. B. Canonical fundamental skew-t linear mixed models.

3. **Schumacher, F. L.**, Matos, L. A., & Lachos, V. H. skewlmm: An R Package for Fitting Skewed and Heavy-Tailed Linear Mixed Models.

4. Castro, K. T., Matos, L. A., & **Schumacher, F. L.** Diagnostic analysis in scale mixture of skew-normal linear mixed models.

5. Mani, S. K., Rempala, G. A., Kenah, E., & **Schumacher, F. L.** Short-Term Influenza Forecasting in the Hospital Environment Using a Bayesian Kalman Filter.

6. Zhong, K., **Schumacher, F. L.**, Castro, L. M., & Lachos, V. H. Bayesian analysis of censored linear mixed-effects models for heavy-tailed irregularly observed repeated measures.

GRADUATE STUDENT TRAINED

Thesis advisor
1. Dimitra Herbei, M.S. 2024 Biostatistics. The Ohio State University. *Exploring the association of multiple sclerosis and sarcopenia under missing data: A comparative exploration based on the UK Biobank*

2. Keyliane Travassos Almeida da Silva, M.S. 2023 Statistics, University of Campinas. Co-supervision with Dr. Larissa A. Matos. *Diagnostic analysis in scale mixture of skew-normal linear mixed models*

Candidacy Committee Member
1. Amy Dupper (2024). Epidemiology.
2. Micaela Richter (2023-2024). Biostatistics.
3. Yi Tang Chen (2023). Biostatistics.
4. Danielle Tyson (2022-2023). Epidemiology.
5. Meredith McCormack-Mager (2022-2024) Biostatistics.

Dissertation Committee Member
1. Danielle Pleshette Tyson, Ph.D. 2024 Epidemiology. *You Are Where You Eat: An Analysis of the Effects of Social Determinants of Health and Social Needs on Human*

Milk Feeding Behaviors

MPH Culminating Projects/Integrated Learning Experience

1. 2nd Reader, 2024. Madison Theodore. *Sex Association with Emergency Room Costs for Heart Attacks*

UNDERGRADUATE STUDENT SUPERVISION

1. Syed Abbas. Kenyon University. Ohio-5 SURE (SU2024).

2. Yiting Lu. Hangzhou Dianzi University. Summer internship (SU2023).

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 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)

PROFESSIONAL PRESENTATIONS

Conferences

1. Handling missing data and partially observed data in longitudinal analysis. **Short course**. 25º Simpósio Nacional de Probabilidade e Estatística (SINAPE), 2024, Fortaleza, CE, Brazil.

2. Challenges in assessing biological aging in people with multiple sclerosis based on epigenetic clocks. **Oral presentation**. 37th New England Statistics Symposium, 2024, Storrs, CT, USA.

3. Bayesian scale mixture of normal censored linear mixed models with within-subject serial dependence. **Oral presentation**. 16th International Conference of the ERCIM WG on Computational and Methodological Statistics and 17th International Conference on Computational and Financial Econometrics, 2023, Berlin, Germany.

4. Variable selection in high-dimensional linear mixed-effects models. **Contribución Científica**. Vigésimas Jornadas en Estadística, 2023, Guayaquil, Ecuador.

5. Panel on How to Join/Explore Pharma. **Panelist**. Statistics in Pharmaceuticals, 2023, Storrs, CT, USA.

6. Robust mixed models for longitudinal data: model fitting and evaluation. **Speed presentation**. ASA Joint Statistical Meetings, 2023, Toronto, Canada.

7. EM algorithm for regularization problems in high-dimensional LMMs. **Flash talk**. IMS 23rd Meeting of New Researchers in Statistics and Probability, 2023, Toronto, Canada.

8. 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.

9. Censored autoregressive regression modeling using the R package ARCensReg. **Oral presentation**. 24th International Conference on Computational Statistics, 2022, Bologna, Italy.

10. Modeling Longitudinal Data using Robust Mixed Models in R. **Tutorial**. 24º Simpósio Nacional de Probabilidade e Estatística (SINAPE), 2022, Gramado, RS, Brazil.

11. Censored autoregressive regression models with Student-t innovations. **Oral presentation**. ICSA 2022 Applied Statistics Symposium, 2022, Gainesville, FL, USA.

12. Canonical Fundamental Skew-t Linear Mixed Models. **Oral presentation**. III Jornadas Ecuatorianas en Matemáticas, 2021, Ecuador (virtual conference).

13. Scale mixture of skew-normal linear mixed models with within-subject serial dependence. **Poster presentation**. 34th New England Statistics Symposium, 2021, Providence, RI, USA.

14. 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.

15. 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).

16. 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).

17. 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).

18. Autoregressive scale mixture of skew-normal linear mixed models. **Poster presentation**. VI Workshop em Análise de Sobrevivência e Aplicações (WASA), November 2019, Piracicaba – SP, Brazil.

19. Influence Diagnostics for Censored Regression Models with Autoregressive Errors. **Oral presentation**. XVI Escola de Modelos de Regressão (EMR), March 2019, Pirenópolis – GO, Brazil.

20. Censored regression models with autoregressive errors. **Oral presentation**. 23º Simpósio Nacional de Probabilidade e Estatística (SINAPE), September 2018, São Pedro – SP, Brazil.

21. *Imputação de Dados Faltantes em séries temporais*. **Poster presentation**. XIV EMR, March 2015, Campinas – SP, Brazil.

22. *Modelos estruturais em séries temporais com aplicação em dados de internação por bronquiolite*. **Oral presentation**. 59ª RBras, May 2014, Ouro Preto – MG, Brazil.

Other invited presentations

1. Lessons from an Ethics in Biostatistics Course. **Seminar**. Department of Statistics, University of Campinas, July 12, 2024.

2. Scale Mixture of Skew-Normal Linear Mixed Models: a Bayesian approach using Hamiltonian Monte Carlo. **Seminar**. Department of Bioinformatics and Biostatistics, University of Louisville, January 26, 2024.

3. 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.

4. 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.

5. 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.

6. A trajetória acadêmica e uma introdução a modelos mistos para dados longitudinais. **Invited lecture**. Department of Statistics, State University of Maringa, March 23, 2022.

7. 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

- **Conferences or workshops**

1. I Encontro do Laboratório de Modelos de Regressão. 2024. University of Campinas, Brazil. Member of the Organizing Committee.

2. 37th New England Statistics Symposium. 2024. University of Connecticut, Storrs, CT, USA. Member of the Program Committee.

3. Statistics in Pharmaceuticals 2023. University of Connecticut, Storrs, CT, USA. Member of the Organizing Committee.

4. 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. Journal of Multivariate Analysis
  5. Journal of Scientific Research and Reports
  6. Journal of the Korean Statistical Society
  7. R Journal
  8. Sankhya B
  9. Statistics in Medicine

- **Associate Editor Services**
  1. Sankhya B

- **Professional affiliations:**
  1. American Statistical Association – member
  2. Brazilian Statistical Association (Associação Brasileira de Estatística, ABE) – member
  3. Caucus For Women in Statistics – member
  4. International Statistical Institute – member
  5. Statistics Without Borders – Delivery and Quality Assurance Analyst

- **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