

Moritz N. Lang

Post-Doctoral Research Assistant

I am currently working as a post-doc at the Department of Statistics at the University of Innsbruck, from which I graduated in 2020. My PhD thesis, under the supervision of Georg J. Mayr and Achim Zeileis, was on advanced statistical methods for probabilistic forecasting within the domain of atmospheric science. The statistical models employed range from parametric to non-parametric machine learning approaches.

My research stands at the intersection between computational statistics and environmental science with a focus on probabilistic forecasting. In this framework, I am a (co-)developer of several R-packages for estimating distributional random forests and graphically evaluating probabilistic models.



Contact Information

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🏠 <https://moritzlang.org>

🐦 [MoritzNLang](#)

Research Interests

- Probabilistic Forecasting
- Computational Statistics
- Machine Learning
- Environmental Science
- Data Visualization

Technical Skills

- Data Analysis and Modeling with R
- Programming in R and Python
- Data Management
- Web (App) Development
- R Package Development
- High-Performance Computing
- Source Control

Professional Experience

- 2020 - **Post-Doctoral University Assistant**
Department of Statistics, Faculty of Economics and Statistics, University of Innsbruck, Austria
 - R-package development for estimating distributional random forests and graphically evaluating probabilistic models
 - Teaching and supervision of master students within the programs Atmospheric Sciences, Economics and Data Science
 - Consulting of industry partners within Tiroler Data Science Bootcamp
- 2017 - **Pre-Doctoral Research Assistant**
Department of Statistics, Faculty of Economics and Statistics, University of Innsbruck, Austria
 - Development of advanced statistical methods for probabilistic wind forecasting as part of an industry collaboration with the Austrian air navigation service provider
 - FFG Project: 'Profcast - Probabilistic nowcasting of wind profiles'
- 2015 - **Research Assistant**
Section Model Applications - Division Data, Methods and Models, Zentralanstalt für Meteorologie und Geodynamik, Vienna, Austria
 - Statistical post-processing of gridded weather forecasts
 - Contribution to the development of an operational probabilistic prediction system
- 2014 - **Student Assistant**
Atmospheric Sciences, Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria
 - Data analysis and visualization with MATLAB and Python
 - FWF-Project: 'Quantifying exchange processes over mountainous terrain'
- 2012 - **Student Tutor**
Medical University of Innsbruck, Austria
 - Computational support for students



Educational Background

2020

● **Doctor of Philosophy**

Atmospheric Sciences, Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria

- Completion of various applied statistics courses at PhD and Master's level such as microeconometrics, time series analysis, and advanced regression methods
- Thesis: 'Probabilistic Wind Forecasting in the Framework of Distributional Modeling'
- Supervisor: Ao. Univ.-Prof. Dr. Georg J. Mayr, Univ.-Prof. Dr. Achim Zeileis
- Reviewer: Prof. Dr. Christophe Ley, Dr. Michael Scheuerer

2015

● **Master of Science**

Atmospheric Sciences, Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria

- Thesis: 'The impact of embedded valleys on daytime pollution transport over a mountain range - Idealised large-eddy simulations'

2011

● **Bachelor of Science**

Atmospheric Sciences, Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria

- Completion of various optional courses in mathematics and physics at the Institute for Theoretical Physics
- Thesis: 'Feinskalige Struktur von Kaltfronten im Inn- und Wipptal während MAP'

2006

● **Allgemeine Hochschulreife**

Ignaz-Günther-Gymnasium, Rosenheim, Germany

2003

● **Academic Year Abroad**

Hugh-Christie-Technology College, Tunbridge Wells, England



Teaching Experience

2021 -

● **Tiroler Data Science Bootcamp**

Consulting of industry partners funded by 'Leuchtturmprojekte im Bereich Digitalisierung', University of Innsbruck, Austria

2020 -

● **Statistical Data Analysis**

Courses for Bachelor's Programme Management and Economic, University of Innsbruck, Austria

2020 -

● **Data Science in Practice**

Supervision of master's theses within continuing education program Data Science, University of Innsbruck, Austria



R Package Development



topmodels: Infrastructure for Inference and Forecasting in Probabilistic Models

Senior Developer

- Unified infrastructure for probabilistic models and distributional regressions: Computation of probabilities, densities, scores, and Hessians
- Diagnostic graphics such as rootograms, PIT histograms, reliagrams, quantile residual Q-Q plots, and worm plots



disttree: Trees and Forests for Distributional Regression

Senior Developer

- Infrastructure for fitting distributional regression trees and forests based on maximum-likelihood estimation

- **cirtree: Regression Trees and Forests for Circular Responses**
Senior Developer
• Infrastructure for fitting distributional trees and forests based on maximum-likelihood estimation of parameters for a circular response



Awards

- 2022 ● **Best PhD Thesis**
Award for the best PhD thesis in Applied Statistics 2021 by the Austrian Statistical Society (ÖSG)
- 2022 ● **Best PhD Thesis**
Award for the best PhD thesis of the Faculty of Geo- and Atmospheric Sciences in the academic year 2021/22
- 2012 ● **Scholarship for Excellence**
Master of Science, Atmospheric Sciences, Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria



Selected Publications and Conferences

- **Full publication list available at:**
<https://moritzlang.org/publication>
- 2021 ● **Probability distribution forecasts: Learning with random forests and graphical assessment**
Moritz N. Lang, Reto Stauffer, Lisa Schlosser, Achim Zeileis

Talk at useR! 2021, Zürich, Switzerland (virtual)
- 2020 ● **Circular regression trees and forests with an application to probabilistic wind direction forecasting**
Moritz N. Lang, Lisa Schlosser, Torsten Hothorn, Georg J. Mayr, Reto Stauffer, Achim Zeileis

Journal of the Royal Statistical Society: Series C (Applied Statistics), 69, 1357–1374, <https://doi.org/10.1111/rssc.12437>
- 2020 ● **Remember the past: A comparison of time-adaptive training schemes for non-homogeneous regression**
Moritz N. Lang, Sebastian Lerch, Georg J. Mayr, Thorsten Simon, Reto Stauffer, Achim Zeileis

Nonlinear Processes in Geophysics, 27, 23–34, <https://doi.org/10.5194/npg-27-23-2020>
- 2019 ● **Bivariate Gaussian models for wind vectors in a distributional regression framework**
Moritz N. Lang, Georg J. Mayr, Reto Stauffer, Achim Zeileis

Advances in Statistical Climatology, Meteorology and Oceanography, 5, 115–132, <https://doi.org/10.5194/ascmo-5-115-2019>, 2019.