Roberto Molinari

Academic Positions

Assistant Professor, Auburn University, Auburn, USA,
2020 - present

Lindsay Assistant Professor, Penn State University, State College, USA,
2018 - 2020

Visiting Assistant Professor, University of California, Santa Barbara, USA,
2016 - 2017

Education

PhD in Statistics, University of Geneva, Switzerland, 2012 - July 2016

- Thesis: "*Robust Inference for Random Fields and Latent Models*". Advisors: Prof. Maria-Pia Victoria-Feser & Prof. Stéphane Guerrier. Committee Members: Prof. Fabio Trojani, Prof. Roger Koenker & Prof. Steven Portnoy.
- Visiting scholar at the Department of Statistics of the University of Illinois at Urbana-Champaign

MSc in Statistics, University of Geneva, Switzerland, 2010 - 2012

- MSc Thesis: *"Robust Estimation of the Wavelet Variance"* · Advisor: Prof. Maria-Pia Victoria-Feser · Grade: 5.4/6 (ECTS: A)

BSc and MSc in Political Sciences and International Affairs, LUISS Guido Carli, Rome, Italy, 2001 - 2006

- MSc Thesis: *"Sustainable Development and Energy Security: the potential of the EU-Russia Energy Dialogue"* · Advisor: Prof. Paolo Garonna · Grade: 110/110 with honours

Publications

Overturf, K., Steinhauer, N., **Molinari, R.**, Wilson, M., Watt, A., Cross, R., VanEngelsdorp, D., Williams, G., & Rogers, S.,"*Winter weather best predicts honey bee colony loss at the national scale*", Ecological Indicators, 2022.

Zhang, Y., Cucci, D., **Molinari, R.** & Guerrier, S., "*Scale-wise Variance Minimization for Optimal Virtual Gyroscopes*", IEEE Transactions on Signal Processing, 2022.

Kumar, H., Srivastava, P., Lamba, J., Ortiz, B.V., Way, T.R., Sangha, L., Takhellambam, B.S., Morata, G. & **Molinari, R.**, "*Within-field variability in nutrients for site-specific agricultural management in irrigated cropland*", Journal of the American Society of Agricultural and Biological Engineers, 2022.

Miglioli, C., Bakalli, G., Orso, S., Karemera, M., **Molinari, R.**, Guerrier, S. & Mili, N., "*Evidence of antagonistic predictive effects of miRNAs in breast cancer cohorts through data-driven networks*", Scientific Reports, 2022.

Slavkovic, A. & **Molinari, R.**, "*Perturbed M-Estimation: A Further Investigation of Robust Statistics for Differential Privacy*", Statistics in the Public Interest (Springer Series in the Data Sciences), 2022.

Parisi, N., Janier-Dubry, A., Ponzetto, E., Pavlopoulos, C., Bakalli, G., **Molinari, R.**, Guerrier, S. & Mili, N. "*Non applicability of a validated predictive model for intensive care admission and death of COVID-19 patients in a secondary care hospital in Belgium*", Journal of Emergency and Critical Care Medicine, 2021.

Heerah, S., **Molinari, R**, Guerrier, S. & Marshall-Colon, A., "*Granger-Causal Testing for Irregularly Sampled Time Series with Application to Nitrogen Signaling in Arabidopsis*", Bioinformatics, 2021.

Graveleau, J., Reserva, M.E., Keita, A., **Molinari, R.** & Constantin de Magny, G., "*Influence of Community-Led Total Sanitation and water coverages in the control of cholera in Madarounfa, Niger (2018)*", Frontiers in Public Health, 2021.

Guerrier, S., **Molinari, R.**, Victoria-Feser, M.-P. & Xu, H., "*Robust Two-Step Wavelet-Based Inference for Time Series Models*", Journal of the American Statistical Association, 2021.

Nixon Pistner, M., Nixon, S. & **Molinari, R.**, "*Data of the Defense and the Defense of Data*", CHANCE Journal, 2020.

Guerrier, S., Jurado, J., Khaghani, M., Bakalli, G., Karemera, M., **Molinari, R.**, Orso, S., Raquet, J., Schubert Kabban, C.M., Skaloud, J & Zhang, Y., "*Wavelet-Based Moment-Matching Techniques for Inertial Sensor Calibration*", IEEE Transcations on Instrumentation and Measurement, 2020.

Xu, H., Guerrier, S., **Molinari, R.** & Karemera, M., "*Multivariate Signal Modelling with Applications to Inertial Sensor Calibration*", IEEE Transactions on Signal Processing, 2019.

Radi, A., Bakalli, G., Guerrier, S., El-Sheimy, N., Sesay, A. & **Molinari, R.**, "*A Multi-Signal Wavelet Variance-based Framework for Inertial Sensor Stochastic Error Modeling*", IEEE Transactions on Instrumentation and Measurement, 2019.

Duncan, I., Nhan, H., **Molinari, R.** & Duncan, J., "*Using Survival Analysis to Predict Workers' Compensation Termination*", Variance Journal, 2018.

Clausen, P., Skaloud, J., **Molinari, R.**, Lee, J. & Guerrier, S., "*Use of a New Online Calibration Platform with Applications to Inertial Sensors*", IEEE Aerospace and Electronic Systems Magazine, 2018.

Branca, M., Orso, S., **Molinari, R.**, Guerrier, S. & Mili, N., "*Is Metastatic Melanoma Predictable through Genomic Biomarkers?*", Melanoma Research, 2018.

Balamuta, J., Guerrier, S., **Molinari, R.** & Yang, W., "*A Computationally Efficient Framework for Automatic Inertial Sensor Calibration*", IEEE Sensors Journal, 2018.

Xu, H., Guerrier, S., **Molinari, R.** & Zhang, Y., "*A Study of the Allan Variance for Constant-Mean Non-Stationary Processes*", IEEE Signal Processing Letters, 2017.

Guerrier, S., **Molinari, R.** & Balamuta, J., "*Discussion on Maximum Likelihood-based Methods for Inertial Sensor Calibration*", IEEE Sensors Journal, 2016.

Guerrier, S., **Molinari, R.** & Stebler, Y., "*Wavelet-based Improvements for Inertial Sensor Error Modelling*", IEEE Transactions on Instrumentation and Measurement, 2016.

Guerrier, S., Mili, N., **Molinari, R.**, Orso S., Avella-Medina, M. & Ma, Y., "*A Paradigmatic Regression Algorithm for Gene Selection Problems*". Frontiers in Genetics, Statistical Genetics and Methodology, 2016.

Guerrier, S., **Molinari, R.** & Stebler, Y., "*Theoretical Limitations of Allan Variance-based Regression for Time Series Model Estimation*", IEEE Signal Processing Letters, 2016.

Guerrier, S., **Molinari, R.** & Skaloud, J., "*Automatic Identification and Calibration of Stochastic Parameters in Inertial Sensors*", Journal of the Institute of Navigation, 2015.

Guerrier, S., **Molinari, R.** & Victoria-Feser, M.-P., "*Estimation of Time Series Models via Robust Wavelet Variance*", Austrian Journal of Statistics, 2014.

ARTICLES SUBMITTED

Insolia, L., **Molinari, R.**, Rogers, S., Williams, G., Chiaromonte, F. & Calovi, M., "*Honey Bee Loss Linked to Parasites, Pesticides and Extreme Weather Across the United States*" (Scientific Reports).

Bakalli, G., Cucci, D., Radi, A., El-Sheimy, N., **Molinari, R.**, Scaillet, O., Victoria-Feser, M.-P. & Guerrier, S., "*Multi-Signal Wavelet-Based Approaches for Repeated Sampling Schemes*" (IEEE Transactions on Signal Processing).

CONFERENCE PROCEEDINGS

Zhang, Y., Xu, H., Radi, A., **Molinari, R.**, Guerrier, S., Karemera, M., El-Sheimy, N., "*An Optimal Virtual Inertial Sensor Framework using Wavelet Cross-Covariance*", in Proceedings of Position, Location and Navigation Symposium (PLANS), IEEE/ION, 2018.

Bakalli, G., Radi, A., Nassar, S., Guerrier, S., Zhang, Y., **Molinari, R.**, "*A Two-Step Computationally Efficient Procedure for IMU Classification and Calibration*", in Proceedings of Position, Location and Navigation Symposium (PLANS), IEEE/ION, 2018.

Radi, A., Nassar, S., Khedr, M., El-Sheimy, N., **Molinari, R.**, S Guerrier, "*Improved Stochastic Modelling of Low-Cost GNSS Receivers Positioning Errors*", in Proceedings of Position, Location and Navigation Symposium (PLANS), IEEE/ION, 2018.

Clausen, P., Skaloud, J., **Molinari, R.**, Balamuta, J., Guerrier, S., "*An Overview of a New Sensor Calibration Platform*", in Proceedings of IEEE International Workshop on Metrology for AeroSpace (MetroAeroSpace), 2017.

Radi, A., Bakalli, G., El-Sheimy, N., Guerrier, S., **Molinari, R.**,"*An Automatic Calibration Approach for the Stochastic Parameters of Inertial Sensors*", in Proceedings of 30th International Technical Meeting of the Satellite Division of the Institute of Navigation, ION GNSS, 2017.

Bakalli, G., Radi, A., El-Sheimy, N., **Molinari, R.**, Guerrier, S., "*A Computational Multivariate-based Technique for Inertial Sensor Calibration*", in Proceedings of 30th International Technical Meeting of the Satellite Division of the Institute of Navigation, ION GNSS, 2017.

Mili, N., **Molinari, R.**, Ma, Y. & Guerrier, S., "*Differentiating Inflammatory Bowel Diseases by using Genomic Data: Dimension of the Problem and Network Organization*", Human Genomics, 2016.

Molinari, R., Balamuta, J., Guerrier, S. & Skaloud, J., "*An Inertial Sensor Calibration Platform to Estimate and Select Error Models*", in Proceedings of the International Association of Institutes of Navigation, Prague, Czech Republic, 2015.

Balamuta, J., **Molinari, R.**, Guerrier, S. & Skaloud, J., "*A Computationally Efficient Platform for Inertial Sensor Calibration*", in Proceedings of the ION GNSS 2015, Tampa, FL, USA, 2015.

Molinari, R., Balamuta, J., Guerrier, S. & Skaloud, J., "*Automatic and Computationally Efficient Method For Model Selection In Inertial Sensor Calibration*", in Proceedings of the ION GNSS 2015, Tampa, FL, USA, 2015.

Stebler, Y., Guerrier, S., Skaloud, J., **Molinari, R.** & Victoria-Feser, M.-P., "*Study of MEMS-based Inertial Sensors Operating in Dynamic Conditions*", in Proceedings of IEEE/ION PLANS 2014, Monterey, CA, USA, 2014.

Guerrier, S., **Molinari R.**, Skaloud, J. & Victoria-Feser, M.-P., "*An Algorithm for Automatic Inertial Sensors Calibration*", in Proceedings of the ION GNSS 2013, Nashville, TN, USA, 2013.

Work in Progress

Molinari, R., "*The Harmonic Bootstrap*"

Molinari, R., Bakalli, G., Guerrier, S., Mignoli, C., Orso, S. & Scaillet, O., "*SWAG: A Wrapper Method for Sparse Learning*"

Smith, M. & **Molinari, R.**, "*Statistical Inference for Image Similarity: a Study on Bee Nest Symmetry*"

Cucci, D., Voirol, L., M., Chu, W., **Molinari, R.** & Guerrier, S. "*Accounting for Vibration Noise in Composite Stochastic Processes*"

Awan, J., **Molinari, R.**, Guerrier, S. & Karemera, M., "*A General Statistical Inference Framework for Differentially Private Mechanisms*".

Orso, S., Clausen, P., **Molinari, R.**, Guerrier, S. & Skaloud, J., "*Inertial Sensor Stochastic Calibration under Varying External Conditions*".

Grants

NSF Grant # 2150615: "*Simulation-Based Inference for Differential Privacy*". Amount: $450,000.00; Period: 2022-2025; Role: co-PI (PI Dr. Awan, Purdue University)

Statistical Software

"irg" - R package: implementation of the Granger-Causal testing framework for irregularly sampled gene signals. Joint work with Guerrier, S. More information: https://github.com/SMAC-Group/irg.

"swag" - R package: implementation of the Sparse Wrapper Algorithm (SWAG). Joint work with Orso, S., Miglioli, C. & Bakalli, G. More information: https://github.com/SMAC-Group/SWAG-R-Package (downloadable from CRAN).

"simts" - R package: collection of tools to represent and study time series. Joint work with Guerrier, S. & Zhang, Y. More information: https://github.com/SMAC-Group/simts (downloadable from CRAN).

"avar" - R package: computationally efficient and flexible tools to compute and perform Allan variance analysis of time series. Joint work with Guerrier, S. & Zhang, Y. More information: https://github.com/SMAC-Group/avar (downloadable from CRAN).

"wv" - R package: computationally efficient and flexible tools to compute and perform wavelet variance analysis of time series and random fields. Joint work with Guerrier, S. & Zhang, Y. More information: https://github.com/SMAC-Group/wv (downloadable from CRAN).

"gmwm" - R package: computationally efficient implementation of the classical, robust GMWM estimator. Joint work with Balamuta, J., Guerrier, S. & Yang, W. More information: https://github.com/SMAC-Group/gmwm.

"imudata" - R package: Joint work with Balamuta, J. & Guerrier, S. More information: https://github.com/SMAC-Group/imudata.

"panning" - R package: implementation of the paradigmatic regression algorithm for gene selection problems. Joint work with Orso S. & Guerrier, S. More information: https://github.com/SMAC-Group/panning.

Talks

"*Robust and Scalable Inference for Stochastic Processes*", Purdue University, USA, 2022.

"*SWAG: A Sparse Wrapper Algorithm with Applications in Genomics*", York University, Canada, 2022.

"*Perturbed M-Estimation: Ideas from Robust Statistics for Differential Privacy*", University of Illinois at Chicago, USA, 2022.

"*Wavelet-Based Stochastic Calibration of Inertial Sensors*", Applied Research Laboratory at Penn State University, USA, 2019.

"*Robust Statistics: Ideas for Differential Privacy and Utility*", EURO2019, Ireland, 2019.

"*Robust Statistics and Bias Correction: Ideas for Differential Privacy and Utility*", Workshop on Data Privacy: Foundations and Applications, UC Berkeley, USA, 2019.

"*Live Demonstration: Advancement of an Online Platform for Inertial Sensor Calibration*", IEEE International Workshop on Metrology for AeroSpace, Rome, Italy, 2018.

"*Modelling Vapor Pressure with Multivariate Latent Processes for Mosquito Abundance*", ISRA, Dakar, Senegal, 2018.

"*Robust Estimation for Random Fields*", Penn State University, State College, USA, 2018.

"*A Prediction-Based Algorithm for Variable Selection with Applications in Genomics*", ERCIM, London, United Kingdom, 2017.

"*Automatic and Computationally Efficient Method For Model Selection In Inertial Sensor Calibration*", IEEE/ION GNSS+ 2015, Tampa, FL, USA, 2015.

"*Robust Generalized Method of Wavelet Moments*", Statistics Seminar, Oregon State University, USA, 2015.

"*Robust Generalized Method of Wavelet Moments*", Statistics Seminar, University of Illinois at Urbana-Champaign, USA, 2015.

"*Robust Generalized Method of Wavelet Moments*", International Conference on Robust Statistics, Calcutta, India, 2015.

"*Bounded-Influence Robust Estimation of Copulas*", ERCIM, Pisa, Italy, 2014.

"*Study of MEMS-based Inertial Sensors Operating in Dynamic Conditions*", IEEE/ION PLANS 2014, Monterey, CA, USA, 2014.

"*Robust Generalized Method of Wavelet Moments for the Estimation of Composite Stochastic Processes*", ERCIM, London, United Kingdom, 2013.

"*Robust Wavelet Variance Estimation*", International Conference on Robust Statistics, Saint Petersburg, Russia, 2013.

Awards

- University of Geneva, *Best Teaching Assistant for the Geneva School of Economics and Management (GSEM)*, 2015.
- University of Geneva, *Best Overall Average for the MSc in Statistics*, 2012.

Research Interests

- Time Series
- Robust Statistics
- Machine Learning
- Differential Privacy
- Model/Feature Selection
- Spatial Statistics
- Statistical applications in Engineering, Economics, Actuarial Sciences, Epidemiology, Biology and Medicine

Teaching Experience

Auburn University, Auburn, USA

"Linear Models (STAT 7800)" Spring 2022
Instructor for a graduate level course in linear models.

"Data Epistemology (STAT 1010)" Fall 2021
Instructor for a undergraduate level course in data literacy.

"Applied Time Series Analysis (STAT 7860)" Spring 2021
Instructor for a graduate level course in time series analysis.

"R Programming for Data Science (STAT 6210)" Fall 2020 & Fall 2021
Instructor for a graduate level course in programming tools in R for data analytics.

Penn State University, State College, USA

"Applied Time Series Analysis (STAT 463)" Fall 2018 & 2019
Instructor for an undergraduate level course in time series analysis.

"Applied Nonparametric Statistics (STAT 464)" Fall 2018
Instructor for an undergraduate level course in nonparametric statistics.

British Business College, Dakar, Senegal

"Statistics for Management" Fall 2017
Instructor for an undergraduate level course in statistical tools for corporate management.

University of California, Santa Barbara, USA

"Statistics (PSTAT 5A)" Fall 2016
Instructor for an undergraduate level course in Probability and Statistics.

"Statistics (PSTAT 296A and 296B)" Fall 2016 & Winter 2017
Supervisor for student projects in Actuarial Sciences.

University of Geneva, Switzerland

"Supervision of Bachelor and Master Theses" 2013 - 2015
Partial supervision of a Bachelor thesis and a Master thesis.

"Mixed Linear Models" (Master in Statistics) 2013 - 2015
Teaching Assistant with shared responsibility for exams, assignments, and grades.

"Statistical Methods" (Bachelor in Business Administration) 2012 - 2014
Teaching Assistant with shared responsibility for exams, assignments, and grades.

"Statistics 1" (Bachelor in Economics and Management) 2014 - 2015
Teaching Assistant with shared responsibility for exams, assignments, and grades.

Teaching Interests

- Dependent Data Analysis (Time Series)
- Robust Statistics
- Statistical Programming
- Machine Learning
- Model Selection
- Applied Statistics

Professional Experience

Statistical Consulting 2011 - 2018

Global Research and Advocacy Group, Dakar, Senegal, 2017 - 2018: training on statistical software R, design of data collection procedures and data analysis on the topics of child abuse and female genital mutilation in West Africa in partnership with UNDP, WHO and UNICEF.

Life Store SA, Geneva, Switzerland, 2012 - 2016: Developing and maintenance of an automatic platform for optimal stock allocation and financial risk estimation.

Beeone Communications SA, Geneva, Switzerland, 2011 - 2012: Creation of a statistical model for predicting profit margins for international calling cards given the pricing parameters and other variables

Professional positions 2001 - 2009

Ernst Young Financial Business Advisors S.p.A., Rome, Italy, 2007 - 2009: European, national and local policy evaluation concerning economic, legal and social issues and relative impact and costs assessments for the European Commission

Global Metro City - The Glocal Forum, Rome, Italy, 2007: Researching and preparing fund, tender, loan or grant proposals: proposing innovative development projects and laying out prospected budgets

Hi-Tech Travel S.r.l., Rome, Italy, 2003 - 2007: Responsible for check-in procedures for charter flights and ticket re-booking at the airport, act as a focus point in ad-hoc situations for Costa Cruises, C.T.S. and I.N.P.D.A.P.

Hilton Hotel, Rome Airport, Italy, 2001 - 2002: Client account management as Front Desk Operator

Tutoring 2001 - 2016

English and Math courses for high-school and university students.

Professional internships 2006 - 2012

Life Store SA, Geneva, Switzerland, 2012: Study of stock allocation and set-up of an R interface for statistical forecasting of monthly demand

Beeone Communications SA, Geneva, Switzerland, 2011: Creation of a statistical model for predicting profit margins for international calling cards given the pricing parameters and other variables

International Trade Center, Geneva, Switzerland, 2011: Gravity model building and testing for report on Sri Lanka survey: modelling the impacts of non-tariff measures on Sri Lankan exports

Italian Permanent Mission to the OECD, Paris, France, 2007: Providing basic consultancy services on energy and environmental issues at stake in IEA activities

Global Metro City - The Glocal Forum, Rome, Italy, 2007: Managing relations with funds and partners such as The World Bank, Inter-American Development Bank, European Union, Microsoft, Oracle and many others

UNECE (United Nations Economic Commission for Europe), Geneva, Switzerland, 2006: Part of a Task Force studying the political economy of South-

Eastern Europe together with the Executive Secretary, the Deputy Executive Secretary and heads of division (Political Economy Team)

Computer Skills

- Extensive programming experience with R and Matlab
- Programming experience with Python, C++, SQL and VBA

Languages

- English: Fluent (mother tongue)
- Italian: Fluent (mother tongue)
- French: Fluent
- Spanish: Proficient
- Chinese: Learner