

MUCYO KAREMERA

CONTACT INFORMATION

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EDUCATION

PhD in Mathematics, University of Geneva, Switzerland, 2016

Thesis: “*Quantum Invariants of 3-Manifolds from a Quantum Group related to $U_q(\mathfrak{sl}_3)$* ”, advisor: Prof. [Rinat Kashaev](#), full text: [here](#).

MSc & BSc in Mathematics, University of Geneva, Switzerland, 2009

ACADEMIC POSITIONS

Research Associate, School of Pharmaceutical Sciences, University of Geneva, Switzerland, June 2025 - present.

Research Associate, Geneva School of Economics and Management, University of Geneva, Switzerland, July 2022 - May 2025.

Postdoctoral Scholar in Mathematics & Statistics, Department of Mathematics & Statistics, Auburn University, AL, USA, October 2021 - June 2022.

Lecturer in Mathematics, Geneva School of Economics and Management, University of Geneva, Switzerland, August 2020 - August 2021.

Postdoctoral Scholar in Statistics, Research Center for Statistics & Faculty of Medicine, University of Geneva, Switzerland, August 2019 - September 2021.

Postdoctoral Scholar in Statistics, Department of Statistics, Pennsylvania State University, PA, USA, August 2018 - July 2019.

PUBLICATIONS

9. Balbinot, F., Voirol, L., Guerrier, S., **Karemera, M.**, Feser, R., Baroffio, A. & Gerbase, M.W., “*Unveiling empathy across borders: a comparative analysis of medical students from two geo-sociocultural backgrounds*”, BMC Medical Education, 25(1), p.554, 2025
8. **Karemera, M.**, Voirol, L., Cucci D.A., Chu W., Molinari, R. & Guerrier, S., “*Accounting for vibration noise in stochastic measurement errors of inertial sensors*”, IEEE Transactions on Signal Processing, 72(1), p.2117-2129, 2024.
7. Pfarrwaller, E., Voirol, L., **Karemera, M.**, Guerrier, S. & Baroffio, A., “*Dynamics of career intentions in a medical student cohort: a four-year longitudinal study*”, BMC Medical Education, 23(1), p.131, 2023.
6. Miglioli, C., Bakalli, G., Guerrier, S., Orso, S., Molinari, R., **Karemera, M.** & Mili, N., “*Evidence of antagonistic predictive effects of miRNAs in breast cancer cohorts through data-driven networks*”, Scientific Reports, 12(1), p.5166-5181, 2022.
5. Pfarrwaller, E., Voirol, L., Piumatti, G., **Karemera, M.**, Sommer, J., Gerbase, M.W., Guerrier, S. & Baroffio, A., “*Students intentions to practice primary care are associated with their motives to become doctors: a longitudinal study*”, BMC Medical Education, 22(1), p.30, 2022.

4. Guerrier, S., Jurado, J., Khaghani, M., Bakalli, G., **Karemera, M.**, Molinari, R., Orso, S., Raquet, J., Schubert Kabban, C., Skaloud, J. Xu, H. & Zhang, Y., “*Wavelet-based moment-matching techniques for inertial sensor calibration*”, IEEE Transactions on Instrumentation & Measurement, 69(10), p.7542-7551, 2020.
 3. Xu, H., Guerrier, S., Molinari, R. & **Karemera, M.**, “*Multivariate signal modelling with applications to inertial sensor calibration*”, IEEE Transactions on Signal Processing, 67(19), p.5143-5152, 2019.
- CONFERENCE PROCEEDINGS
2. Voirol, L., Guerrier, S., Zhang Y., **Karemera, M.** & Radi A., “*Optimally weighted wavelet variance-based estimation for inertial sensor stochastic calibration*”, 12th International Conference on Electrical Engineering, Cairo, Egypt, p.482-486, 2020.
 1. Zhang, Y., Xu, H., Radi, A., Molinari, R., Guerrier, S., El-Sheimy, N., & **Karemera, M.**, “*An optimal virtual inertial sensor framework using wavelet cross covariance*”, 2018 IEEE/ION PLANS, Monterey, CA, USA, p.1342-1350, 2018.
- ARTICLES SUBMITTED
5. **Karemera, M.**, “ *$s\mathfrak{l}_3$ matrix dilogarithm as a $6j$ -symbol*”, full text: <https://arxiv.org/abs/2010.14633>.
 4. Orso, S., **Karemera, M.**, Victoria-Feser, M.-P. & Guerrier, S., “*An accurate percentile method for parametric inference based on asymptotically biased estimators*”, full text: <https://arxiv.org/abs/2405.05403>.
 3. Zhang, Y., Ma, Y., Orso, S., **Karemera, M.**, Victoria-Feser, M.-P. & Guerrier, S., “*Just identified indirect inference estimator: accurate inference through bias correction*”, full text: <https://arxiv.org/abs/2204.07907>.
 2. Molinari, R., Bakalli, G., Guerrier, S., Miglioli, C., Orso, S., **Karemera, M.**, Scaillet, O., “*SWAG: a wrapper method for sparse learning*”, full text: <https://arxiv.org/abs/2006.12837>.
- WORKING PAPERS
9. Orso, S., **Karemera, M.**, Victoria-Feser, M.-P., Xie, M. & Guerrier, S., “*The Implicit Bootstrap: Accurate Parametric Inference Beyond Consistency*”.
 8. Guerrier, S., Hurlin, C., **Karemera, M.**, Perignon, C. & Saurin, S. “*Equivalence Testing for Algorithmic Fairness*”.
 7. **Karemera, M.**, Orso, S. & Xu, H., “*A relaxed inference framework for high-dimensional logistic regression models*”.
 6. **Karemera, M.**, Voirol, L. & Guerrier, S., “*A moment-based framework for stochastic estimation in geodetic applications*”.
 5. **Karemera, M.**, Insolia, L. & Guerrier, S., “*Optimal adjustment for bioequivalence assessment in heteroskedastic scenarios*”.
 4. **Karemera, M.** & Kashaev, R., “*A new family of quantum hyperbolic link invariants*”.
 3. Couturier, D.-L., Insolia, L., **Karemera, M.**, Orso, S., Victoria-Feser, M.-P. & Guerrier, S., “*Modelling censoring thresholds for accurate sample size calculations with growth-curves mixed models in cancer research*”.
 2. Molinari, R., Bakalli, G., Miglioli, C., Orso, S., Scaillet, O., Mili, N., **Karemera, M.**, Guerrier, S., “*More of less: a Rashomon algorithm for sparse model sets*”.
 1. Awan, J., Guerrier, S., **Karemera, M.** & Molinari, R., “*A general statistical inference framework for differentially private mechanisms*”.

RESEARCH INTERESTS

- Simulation-based Inference
- Equivalence Testing
- Small Area Estimation
- High-dimensional Data Analysis
- Signal Processing
- Quantum Topology
- Representation Theory
- Topological Data Analysis
- Applied statistical research in Biology and Medicine

GRANTS

- Principal Investigator, [University of Geneva](#), Rectorate award for the MOOC project: “*Voir clair en mathématiques : intuition, approximation et optimisation*”, 2025 - 2026, 50'000 CHF.
Project partners: Prof. S. Guerrier & Prof. H. Duminil-Copin.
- Project Coordinator & Co-author, SNSF SPIRIT Grant: *Inference for Small Area Estimation through Generative Methods: A Focus on Gender Disparities*, 2025 - 2028, 453'270 CHF.
PIs: Prof. Guerrier , Prof. Ngaruye & Prof. Nzabanita.
- Grants for attending conferences, between 2019 & 2024, 3'700 CHF.
- Grants for organizing the Data Analytics Lab Workshops, 2023, 2024 & 2025, 11'500 CHF.

TEACHING

TEACHING MATERIALS

Karemera, M., Guerrier, S. & Duminil-Copin, H., “*Voir clair en mathématiques : intuition, approximation et optimisation*”, MOOC, University of Geneva, Coursera (in preparation, expected spring 2027).

Guerrier, S., **Karemera, M.**, Orso, S. & Voirol, L. “*Introduction à la Statistique*”, Course material accessible: <https://intro-statistique.netlify.app/>.

Karemera, M. & Guerrier, S., “*Introduction to Mathematics for Undergraduates in Economics and Management*”, all material is in French and an English version is under development. Youtube videos: [here](#).

Course material accessible: <https://mkaremera-math1.netlify.app>.

Guerrier, S., Bakalli, G. & **Karemera, M.**, “*Introduction to Statistical Thinking*”, Course material accessible: <https://github.com/gaetanbakalli/StatThinking>.

COURSE DETAILS

University of Geneva, Switzerland

“*Projet interdisciplinaire*”

Spring 2025 - 2026

Instructor for an interdisciplinary graduate level course in Pharmaceutical Sciences (in French).

Class size: $\approx$ 180 students.

“*Introduction à la Statistique*”

Spring 2025 - 2026

Instructor for an undergraduate level course on Statistics (in French).

Class size: $\approx$ 350 students.

“Statistique et Méthodologie Pharmaceutique” Fall 2024

Instructor for an undergraduate level course on Statistics (in French).

Class size: ≈ 350 students.

Aivancity, Paris, France

“Constrained Optimization” Fall 2023

Instructor for an undergraduate level course on Calculus and Constrained Optimization (in French). Class size: ≈ 30 students.

Auburn University, Alabama, USA

“Calculus II” Spring 2022

Instructor for an undergraduate level course on Calculus. Class size: ≈ 200 students.

University of Geneva, Switzerland

“Mathematics I” Fall 2020 - Spring 2021

Instructor for an undergraduate level course on Calculus (in French).

Class size: ≈ 600 students.

“Introduction to Statistical Thinking” Fall 2020

Contributor to the development of support material for an undergraduate level course introducing non-scientist students to statistical thinking.

“Teaching Assistant” 2009 - 2015

Teaching Assistant with shared responsibility for exams, assignments, and grades for the following courses:

- *“Graph Theory”* (MSc in Mathematics) - Fall 2014.
- *“Calculus I”* (BSc in Mathematics) - Fall 2013, 2012; Spring 2012.
- *“Algebra I”* (BSc in Mathematics) - Fall 2012; Spring 2010.
- *“Algebraic Topology”* (MSc in Mathematics) - Spring 2011.
- *“Introduction to Programming”* (BSc in Mathematics) - Spring 2011.
- *“Non-linear Systems of Equations”* (MSc in Mathematics) - Spring 2009.

CFP Arts, Switzerland

“High School Teacher” 2016 - 2018

High School Teacher within the “CFP Arts” School of Arts where I taught various Mathematics courses (including students prone to math phobia).

TEACHING INTERESTS

- Asymptotic Statistics
- Introduction to Statistics
- Introduction Calculus and Algebra
- Quantum Topology
- Graph Theory

STATISTICAL SOFTWARE

“wv” - R package: implements various methods related to the wavelet variance including the approaches proposed in [3] and [5] to perform multivariate analysis. Available on CRAN, downloads $\approx 6K$ /year.

More information: <https://smac-group.github.io/wv/>.

“ib” - R package: implements the iterative bootstrap approach proposed in [9].

More information: <https://cran.r-project.org/web/packages/ib/index.html>.

ORGANISATION
OF CONFERENCES

- Co-organiser of the [Data Analytics Lab Workshops](#) (2023, 2024 & 2025)
- Organiser of the Data Analytics Lab Seminar series (2019 - 2021)
- Co-organiser of the [Workshops Racialisation/Résistance & \(S'\)exposer en postcolonialité](#) of the research group PostCit, (March & May 2018)

TALKS

“Percentile second-order correct interval estimation”, International Conference on Frontiers of Data Science, Hangzhou, China, 2026.

“Percentile second-order correct interval estimation”, Data Analytics Lab Workshop in Ovronnaz, Valais, Switzerland, 2025.

“Percentile second-order correct interval estimation for parametric models”, IMS International Conference on Statistics and Data Science, Nice, France, 2024.

“A fast and accurate inferential method for complex parametric models: the implicit bootstrap”, Data Analytics Lab Workshop in Ovronnaz, Valais, Switzerland, 2024.

“A flexible bias correction method based on inconsistent estimators”, International Conference on Computational Statistics, London, UK, 2023.

“Percentile second-order correct interval estimation for parametric models”, Joint Statistical Meetings in Toronto, Ontario, Canada, 2023.

“A flexible bias correction method for parametric models in high dimensional settings”, Data Analytics Lab Workshop in Ovronnaz, Valais, Switzerland, 2023.

“Quantum invariants of knots and 6j-symbols”, Topology Seminar, Department of Mathematics and Statistics, Auburn University, USA, 2022.

“A general approach for simulation-based bias correction in high dimensional settings”, Research Center for Statistics Seminar, Geneva School of Economics and Management, University of Geneva, Switzerland, 2021.

“A general approach for simulation-based bias correction in high dimensional settings”, Statistics and Data Science Seminar, Department of Mathematics and Statistics, Auburn University, USA, 2021.

“Finite sample unbiased estimation in high dimensional settings”, International Conference on Computational and Methodological Statistics, Senate House University of London, UK, 2019.

“A simple recipe for making accurate parametric inference in finite sample”, Joint Statistical Meetings in Denver, Colorado, USA, 2019.

“On the properties of simulation-based estimators in high dimensions”, International Conference on Computational and Financial Econometrics, University of Pisa, Italy, 2018.

“On the finite sample and asymptotic bias correction properties of simulation-based estimators”, SMAC Talk, Department of Statistics, Pennsylvania State University, USA, 2018.

“Charged 6j-symbols and 3-manifolds invariants”, Conference des jeunes chercheurs, Section of Mathematics, University of Geneva, Switzerland, 2013.

“Triangulation idéal de noeuds et géométrisation”, Geometry and Topology Seminar, Section of Mathematics, University of Geneva, Switzerland, 2009.

SERVICE TO THE
PROFESSION

- Representative of the Participatory Council, GSEM, UNIGE, 2022 - 2024.

ADDITIONAL
EXPERIENCE

Swiss Civilian Service of 13 months including 7 months in a retirement home, 4 months within Swiss AIDS prevention group and 2 months in a center for refugees.

LANGUAGES

- French: Fluent (mother tongue)
- Kinyarwanda: Fluent (mother tongue)
- English: Fluent
- German: Elementary