

Prof. Tommaso Gastaldi

Associate Professor of Statistics

Department of Statistics

Sapienza University of Rome

Rome, Italy

CONTACT

tommaso.gastaldi@uniroma1.it

tommaso.gastaldi@gmail.com

ORCID

0009-0001-3790-7496

ResearchGate

Tommaso Gastaldi

RESEARCH, METHODOLOGY & COMPUTATIONAL DOMAINS

STATISTICS

Mathematical Statistics
Statistical Inference
Nonparametric Methods
Multivariate Statistics

COMPUTATIONAL

Computational Statistics
Statistical Computing
Numerical Algorithms
High-Dimensional Data

DATA SCIENCE

Statistical Learning
Classification
Clustering
Data Mining

MODELLING

Statistical Modelling
Censored Data
Reliability
Fuzzy Data

ALGORITHMS

Algorithm Development
Computational Research
Decision Processes
Statistical Software

QUANTITATIVE FINANCE

Quantitative Finance
Algorithmic Trading
Data-Driven Modelling
Computational Finance

Research Profile

Professor of Statistics at Sapienza University of Rome with an academic career spanning statistical methodology, computational statistics, statistical inference, statistical computing and computer science. My research trajectory combines theoretical and applied statistics with algorithmic and computational research. Earlier work focused on distribution-free inference, censored data, reliability theory, multivariate statistics, nonparametric procedures and statistical decision problems. Subsequent research extended toward fuzzy data, classification, data mining, computational statistics and statistical software.

More recently, my independent research has expanded toward algorithm development, quantitative finance, algorithmic trading and computational research. This work includes the development of operational computational systems as well as theoretical work on statistical mechanisms underlying algorithmic decision processes.

A distinctive feature of my research activity is the interaction between statistical reasoning, computational implementation and concrete algorithmic experimentation.

I have also maintained a longstanding interest in computer science and computational education, including university teaching in computer science, statistical computing, data analysis, data mining and cybersecurity-related programmes.

Academic Appointment

Sapienza University of Rome, Italy

- Professor / Associate Professor in Statistics, Department of Statistics, SECS-S/01.
- Teaching and academic activities extending also to the Department of Computer Science.

- Academic career in the statistical sciences since 1990.

Education

Laurea in Scienze Statistiche e Demografiche

- Degree awarded with **summa cum laude**.

International Research Experience

- **University of North Carolina at Chapel Hill**, Department of Statistics.
CNR-supported postdoctoral research activity and subsequent visiting research activity. Research under Prof. Norman L. Johnson, with additional collaboration involving Prof. Stamatis Cambanis.
- **Purdue University**, Department of Statistics / Center for Statistical Decision Sciences.
CNR-supported research and subsequent visiting research activity. Research with Prof. Shanti S. Gupta and collaborators, including work on nonparametric selection procedures, reliability and multinomial probability problems.
- **University of Nebraska–Lincoln**.
Visiting research activity under Prof. J. J. Ren.

Research Interests

- | | | |
|---|---------------------------------|--|
| • Mathematical Statistics | • Statistical Modelling | • High-Dimensional and Structured Data |
| • Statistical Inference | • Censored and Incomplete Data | • Algorithm Development |
| • Computational Statistics | • Reliability Statistics | • Computational Research |
| • Statistical Computing | • Clustering and Classification | • Quantitative Finance |
| • Statistical Learning | • Fuzzy Data Analysis | • Algorithmic Trading |
| • Nonparametric and Distribution-Free Methods | • Data Mining | • Statistical Decision Processes |
| • Multivariate Statistics | | • Data-Driven Modelling |

Selected Research Contributions

Distribution-Free Inference and Censored Data

A substantial part of my early research concerned nonparametric statistical inference in the presence of censoring, truncation and incomplete observations.

This work included generalized Kolmogorov–Smirnov procedures, reconstruction of censored samples, estimation under random censorship, sequential inference and exact conditional distributions.

Reliability and Incomplete Information

Research in reliability statistics addressed life-testing procedures, multi-component systems, masked failure causes, incomplete information and statistical inspection strategies.

Multivariate Statistics and Statistical Decision Theory

Research with collaborators at Purdue University included nonparametric selection procedures, minimax-type procedures and the study of multinomial probability structures.

A particularly substantial contribution is the work on the Gupta–Nagel conjecture and the minimization of multinomial tails.

Fuzzy Data and Statistical Modelling

Research with Pierpaolo D’Urso developed statistical regression methods for fuzzy data, including adaptive fuzzy regression models, polynomial regression procedures and approaches accounting for the relationship between centres and spreads.

Computational Statistics and Data Mining

My academic activity has also included statistical algorithms, computational statistics, data mining, classification, statistical software and computationally intensive data analysis.

Algorithmic and Quantitative Research

More recent independent research has extended the statistical and computational programme toward algorithm development and quantitative finance.

This includes the G-BOT / USE research programme and the development of proprietary computational algorithms.

Books and Monographs

1. **Gastaldi, T. (1998).** *Algoritmi Statistici e di Calcolo Numerico*. McGraw-Hill Italia, Milano.
Monograph devoted to statistical algorithms, computational statistics and numerical computation.
2. **Gastaldi, T. (1999).** *Statistica*. Interscience Press.
Didactic volume covering descriptive and inferential statistics, including theoretical material and exercises.

Scientific Journal Articles

1. **Gastaldi, T. (1988).** Sulle misure dell’omogeneità. *Statistica*, 48(1–2), 59–79.
2. **Gastaldi, T. (1988).** La formalizzazione dell’intuizione operata dagli indici statistici. *Statistica*, 48(3–4), 243–258.
3. **Gastaldi, T. (1988).** L’asimmetria intrinseca. *Metron*, 46(1–4), 431–444.
4. **Gastaldi, T. (1989).** On the mean and variance of certain oscillation indices and inferential considerations on time series. *Metron*, 47(1–4), 221–240.
5. **Gastaldi, T. (1990).** Mutability analysis: analysis of “variance” for qualitative data. *Metron*, 48(1–4), 297–308.
6. **Gastaldi, T. (1990).** Sulla interpretazione di alcune disuguaglianze nell’ambito della correlazione. *Metron*, 48(1–4), 441–446.
7. **Gastaldi, T. (1991).** Generalized Two Sample Kolmogorov–Smirnov Test Involving a Possibly Censored Sample. *Communications in Statistics – Simulation and Computation*, 20(1), 365–373.

8. **Gastaldi, T. (1992).** Testing a censoring hypothesis through an identity test. *Communications in Statistics – Theory and Methods*, 21(5), 1267–1272.
9. **Gastaldi, T. (1992).** Optimal reconstruction of a generally censored sample. *Statistics & Probability Letters*, 14(5), 393–399.
10. **Gastaldi, T. (1993).** Interpolating missing values in a censored sample. *Journal of Statistical Planning and Inference*, 35(2), 189–199.
11. **Gastaldi, T. (1993).** A Kolmogorov–Smirnov test procedure involving a possibly censored or truncated sample. *Communications in Statistics – Theory and Methods*, 22(1), 31–39.
12. **Gastaldi, T. (1994).** Improved maximum likelihood estimation for component reliabilities with Miyakawa–Usher–Hodgson–Guess’ estimators under censored search for the cause of failure. *Statistics & Probability Letters*, 19(1), 5–18.
13. **Gastaldi, T., & Gupta, S. S. (1994).** Minimax type procedures for nonparametric selection of the “best” population with partially classified data. *Communications in Statistics – Theory and Methods*, 23(9), 2503–2532.
14. **Gastaldi, T. (1995).** Interval estimation from a life-test through a sequential Kolmogorov–Smirnov type procedure. *IEEE Transactions on Reliability*, 44(3), 470–476.
15. **Gupta, S. S., & Gastaldi, T. (1996).** Life testing for multi-component systems with incomplete information on the cause of failure: a study on some inspection strategies. *Computational Statistics & Data Analysis*, 22(4), 373–393.
16. **Gastaldi, T. (1996).** Exact conditional distribution of the two-sample Kolmogorov–Smirnov goodness-of-fit test statistic under a finite censoring scheme. *Sankhya, Series B*, 58(2), 170–183.
17. **Gastaldi, T. (1996).** Note on closed-form MLEs of failure rates in a fully parametric random censorship model with incomplete data. *Statistics & Probability Letters*, 26(4), 309–314.
18. **D’Urso, P., & Gastaldi, T. (2000).** A least-squares approach to fuzzy linear regression analysis. *Computational Statistics & Data Analysis*, 34(4), 427–440.
19. **D’Urso, P., & Gastaldi, T. (2002).** An “orderwise” polynomial regression procedure for fuzzy data. *Fuzzy Sets and Systems*, 130(1), 1–19.
20. **D’Urso, P., & Gastaldi, T. (2003).** A life test procedure with right censored data based on the Wald–Wolfowitz run test. *Communications in Statistics – Simulation and Computation*, 32(1), 95–102.
21. **Gastaldi, T. (2005).** On the minimization of multinomial tails and the Gupta–Nagel conjecture. *Journal of Multivariate Analysis*, 94(1), 70–108.
22. **Gastaldi, T. (2024).** On a fundamental statistical edge principle. arXiv:2404.14252.

Book Chapters and Contributions to Edited Volumes

1. **Gastaldi, T. (1997).** Reconstructive estimation in a parametric random censorship model with incomplete data. In *Advances in Statistical Decision Theory and Applications*, Birkhäuser, Boston, pp. 387–404.
2. **Gastaldi, T., & Vicari, D. (1998).** A constrained clusterwise procedure for segmentation. In *Advances in Data Science and Classification*, Springer, Berlin, pp. 145–151.
3. **D’Urso, P., & Gastaldi, T. (2000).** Linear fuzzy regression analysis with asymmetric spreads. In *Advances in Classification and Data Analysis*, Springer, Berlin, pp. 257–264.
4. **Gastaldi et al. (2008).** Inflazione: falsi e realtà. In *Tra Scienza e Società*, ed. Cosimo Loré, Giuffrè, Milano.

Recent Independent Research

Statistical Edge and Quantitative Finance

Gastaldi, T. (2024). *On a fundamental statistical edge principle.* arXiv:2404.14252.

The work investigates the role of self-generated historical trading information in the statistical structure of algorithmic trading processes.

A related non-technical exposition appeared in *Business Reporter* under the title *The true nature of the trading edge in quantitative finance*.

G-BOT / USE Research Programme

G-BOT – Algorithmic Trading Research and Development

Independent research and technology-development programme combining statistical reasoning, algorithmic decision processes, computational implementation and quantitative finance.

The programme includes the development of an operational algorithmic trading platform and the investigation of the **Universal Statistical Edge (USE)** framework.

The research focuses on path-dependent information, Historical Trading Information (HTI), dynamic exposure management and computational decision processes.

G-BOT is presented separately from the peer-reviewed publication record as an independent research and technology-development activity.

Fast Approximate Linear Convolution

FALC – Fast Approximate Linear Convolution.

Independent computational research on a state-propagation approach to approximate linear convolution.

The proposed computational architecture is designed around single-pass processing with linear-time execution and constant auxiliary memory.

The project is maintained separately from the conventional academic publication record because of its proprietary research status.

Technical material is available through the author's research portal.

Forthcoming Independent Research

Independent computational research project – forthcoming.

A further independent computational research project is currently under development and is scheduled for public release in September 2026.

Detailed technical information is intentionally withheld prior to public release.

Research Projects

1. **1999.** Statistical multivariate analysis for vague/fuzzy data. Faculty research project, Università degli Studi di Roma "La Sapienza".
2. **2002.** Computational-intensive analysis of longitudinal data concerning the evolution of acute lymphomas.
3. **2000.** New classification methodologies for data mining and symbolic data analysis.
4. **2004–2006.** New classification and dimensionality-reduction methods for customer satisfaction (PRIN).
5. **2004–2006.** Multivariate methodologies for statistical analysis of gene-expression profiles (University Project).
6. **2006–2007.** New methodologies for the analysis of customer-satisfaction data (Faculty Project).

Industrial, Institutional and Applied Research

Documented methodological and computational activities include:

- Kuwait Petroleum – methodological proposal.
- Sogei – analysis of tax litigation, simulation model and dashboard.
- Banca d'Italia – methodological proposal for rating procedures under Basel II.
- Ericsson / EDA – enterprise reporting and dashboard methodology.
- Poste Italiane – KPI systems and project-monitoring dashboards.
- BPS – CRM methodological proposal.
- Regione Campania – tax analysis, methodology and software proposal.
- SCS – data-mining software architecture.
- DataTime – ROLAP engine design and architecture for reporting, dashboards, ETL, integration and data warehousing.
- ENEL – data-warehouse restructuring methodology.
- SEAT – supplier-selection methodology.
- Ministero dell'Interno – dashboard system methodology.
- BPV – methodological proposal for an asynchronous trading strategy and automated trading software.
- Honda Italia – reporting system supporting the design of new motorcycle models.
- RAI Cinema – enterprise reporting and software proposal.

Teaching

I have extensive university teaching experience in statistics, computational statistics, computer science, data analysis, data mining and statistical software.

Documented teaching activities include:

- | | |
|------------------------------------|---|
| • Statistical Computing II | • Statistical Software for Information Management |
| • Fundamentals of Computer Science | • Psychometric Statistics |
| • Data Analysis and Data Mining | • Mathematical Analysis I |

Teaching activity spans Bachelor's and Master's education and includes activities connected with computer science and cybersecurity.

Theory – Computation – Data – Validation – Interpretation

Particular emphasis is placed on understanding statistical assumptions, implementing selected methods from first principles, computational experimentation, reproducibility and critical interpretation of results.

Computational and Interdisciplinary Education

My academic activity includes teaching and supervision involving the intersection of statistics and computer science.

Topics have included statistical computing, programming, data analysis, data mining, statistical software and cybersecurity-related quantitative methods.

The teaching approach combines formal statistical reasoning with hands-on computational work and real or simulated datasets.

International Academic Appointments and Fellowships

1. **1990.** CNR Fellowship for foreign research. Department of Statistics, University of North Carolina at Chapel Hill.
2. **1990.** Visiting Professor / research activity, Department of Statistics, University of North Carolina at Chapel Hill.
3. **1992.** CNR Fellowship for foreign research, Department of Statistics, Purdue University.
4. **1993.** Visiting Professor, University of Nebraska–Lincoln.
5. **1994.** Visiting Professor, Center for Statistical Decision Sciences and Department of Statistics, Purdue University.

Editorial and Scientific Service

- **1999–2003.** Editor-in-Chief / Responsible Director, *Scienza & Business*.
- Official referee for *Mathematical Reviews*.
- Referee for international journals including *Communications in Statistics* and *Statistics & Probability Letters*.
- Scientific referee and conference service including COMPSTAT 2006.
- Participation in scientific and organising activities associated with international statistical conferences.

Mathematical Reviews

Documented reviews include:

- MR2189186
- MR2340124
- MR2340125
- MR2406075

Other Scientific Contributions

1. **Gastaldi, T., & Leti, G. (1989).** Cinquanta anni di storia della S.I.S. In *Statistica e Società*, Riunione Scientifica SIS, Pisa.
2. **Gastaldi, T. (2002).** Data Mining: Alberi Decisionali e Regole Induttive per la profilazione del Cliente. *Scienza & Business*.
3. **Gastaldi, T. (2003).** “Dominance Scoring”: La misura del valore del cliente. *Scienza & Business*.

Working Papers, Technical Reports and Research Documents

The following materials are presented separately from peer-reviewed journal publications.

1. **Gastaldi, T.** Generalized Two Sample Kolmogorov–Smirnov Test Involving a Possibly Censored Sample. Mimeo Series, Department of Statistics, University of North Carolina at Chapel Hill.
2. **Gupta, S. S., & Gastaldi, T.** An Asymptotic Minimax Type Procedure for Nonparametric Selection of the “Best” Population with Partially Classified Data. Technical Paper, Purdue University.
3. **Gupta, S. S., & Gastaldi, T.** Minimax Type Procedures for Nonparametric Selection of the “Best” Population with Partially Classified Data. Technical Paper, Purdue University.
4. **Gupta, S. S., & Gastaldi, T.** On Some Search Strategies in Reliability Estimation Under Random Censorship. Technical Paper, Purdue University.
5. **Gastaldi, T.** Sulla stratificazione Sociale ed Economica della popolazione. DSPSA, Università degli Studi di Roma “La Sapienza”.
6. **Gastaldi, T.** A short review on latent class models and a new LC stochastic model proposal.
7. **Gastaldi, T.** A ML method for estimation within latent class models.
8. **Gastaldi, T.** “Best Sorter” method for latent parameter estimation, based on a reconstructive approach.
9. **Gastaldi, T.** Simulation study and performance assessment for LC models by using the reconstructive approach and the “Best Sorter” method.
10. **Gastaldi, T.** Conditional Pattern ML Estimation in LC Stochastic Models.
11. **Gastaldi, T.** Beyond ML: A Short Note on a New Computational Technique for LC Estimation.
12. **Gastaldi, T.** A New Automated Strategy for Exchange Traded Funds (ETF) and Stocks Based on Geometric Brownian Motion and Simultaneous Symmetric Trading on Multiple Accounts.
13. **Gastaldi, T.** Latent Estimation in Stochastic Latent Class Models Through “Reconstruction” of Latent Behaviours.

Creative and Other Achievements

Piano Performance and Improvisation

Award – Permanent International Competition “De la Creatividad al Piano”.

International recognition for creativity in piano performance and improvisation.

An awarded performance is publicly available online.

Awarded Piano Performance

Additional information concerning the award and the competition is available through the competition’s public archive.

Selected Publications

For external applications, the following publications provide a compact representation of the applicant’s research trajectory.

1. **Gastaldi, T. (2005).** *On the minimization of multinomial tails and the Gupta–Nagel conjecture.* Journal of Multivariate Analysis, 94(1), 70–108.
2. **D’Urso, P., & Gastaldi, T. (2000).** *A least-squares approach to fuzzy linear regression analysis.* Computational Statistics & Data Analysis, 34(4), 427–440.
3. **D’Urso, P., & Gastaldi, T. (2002).** *An “orderwise” polynomial regression procedure for fuzzy data.* Fuzzy Sets and Systems, 130(1), 1–19.
4. **Gastaldi, T. (1996).** *Exact conditional distribution of the two-sample Kolmogorov–Smirnov goodness-of-fit test statistic under a finite censoring scheme.* Sankhya, Series B, 58(2), 170–183.

5. **Gastaldi, T. (2024).** *On a fundamental statistical edge principle.* arXiv:2404.14252.

Research and Academic Links

- **Sapienza University of Rome:** Institutional profile
- **ORCID:** ORCID profile
- **ResearchGate:** Research profile
- **Computational research portal:** DataTime research portal
- **G-BOT:** Algorithmic research and development project