Martin Singull (formerly Ohlson)

Curriculum Vitae

CONTACT INFORMATION

Department of Mathematics
Mathematical Statistics
Linköping University
581 83 LINKÖPING

Phone: +46–(0)13–281447
E-mail: martin.singull@liu.se
web: liu.se/en/employee/maroh70

BORN

January 29, 1977

CITIZENSHIP

Sweden

RESEARCH INTERESTS

Professor Singulls research focus on the problem of estimating and testing the parameters for multivariate normal distribution, in moderate and high dimensions, where the mean and covariance matrix may have various structures. The mean can be a parametric model, such as linear, bilinear (aka the Growth Curve model) or even higher dimensions as trilinear regression models. In these models the covariance matrix has a Kronecker product structure, whereas some matrices may follow a linearly structure, e.g., banded, intraclass, Toeplitz, circular Toeplitz, special structure with zeros or some mix.

The Growth Curve model can be applied when measuring one or several response variables repeatedly over time. Professor Singulls recent research in supervised learning focus on the ideas that both the *spatial and temporal information* hidden in the high dimensional growth curves should be considered to develop inventive classifiers for repeated measurements and their expected misclassification probabilities.

ACADEMIC DEGREES

Linköping University, Linköping, Sweden

– Docent in Mathematical Statistics, March 2016.
  - Seminar title (in Swedish): *Klassiska tillväxtkurvor, mönstrade kovariansmatriser och högdimensionell statistik*

– Doctor of Philosophy PhD (Teknologie doktor), Mathematical Statistics, 2009.
  - PhD thesis: *Studies in Estimation of Patterned Covariance Matrices*
– Licentiate of Engineering (Teknologie licentiat), Mathematical Statistics, 2007.
  - Licentiate thesis: *Testing Spatial Independence using a Separable Covariance Matrix*
– Master of Science in Applied Physics and Electrical Engineering, 2003.

Academic Experience

– *Head of Division* - Applied Mathematics, Department of Mathematics, Linköping University *January 2021 to present*

– *Professor* in Mathematical Statistics, Department of Mathematics, Linköping University *December 2020 to present*

– *Head of Division* - Mathematical Statistics, Department of Mathematics, Linköping University *January 2016 to December 2020*

– *Associate Professor (biträdande professor)* in Mathematical Statistics, Department of Mathematics, Linköping University *April 2018 to November 2020*

– *Associate Professor (docent)*, Department of Mathematics, Mathematical Statistics, Linköping University *March 2016 to March 2018*

– *Assistant Professor* in Mathematical Statistics, Department of Mathematics, Linköping University *April 2012 to March 2016*

– *Research Associate*, Mathematical Statistics, Department of Mathematics, Linköping University *July 2009 to April 2012*

Research Visits

– Department of Statistics, P. J. Safarik University, Kosice, Slovakia. *June 2011*
– Department of Statistics, University of Toronto, Canada. *April 2014*
March 2013, August 2013
May 2011
October 2009
May 2008 to October 2008
– Department of Biometry and Informatics, Otto-von-Guericke-Universität, Magdeburg, Germany. *December 2005*

Bibliography *Thesis*

- Ohlson, M. (2009). Studies in Estimation of Patterned Covariance Matrices. Doctor of Philosophy PhD (Teknologie doktor), Mathematical Statistics, Linköping University, Linköping, Sweden.
- Ohlson, M. (2007). Testing Spatial Independence using a Separable Covariance Matrix. Licentiate of Engineering (Teknologie licentiat), Mathematical Statistics, Linköping University, Linköping, Sweden.

Article in journal (Refereed)

42. Byukusenge, B., von Rosen, D. and Singull, M. (2022). On Residual Analysis in the GMANOVA-MANOVA Model. Accepted for publication in Trends in Mathematical, Information and Data Sciences: a Tribute to Leandro Pardo, Springer Series Studies in Systems, Decision and Control.
41. Söderbäck, P., Blomvall, J. and Singull, M. (2022). Improved Dividend Estimation from Intraday Quotes. Entropy 24(1):95.
40. Byukusenge, B., von Rosen, D. and Singull, M. (2022). On an Important Residual in the GMANOVA-MANOVA Model. Journal of Statistical Theory and Practice 16, 2.
39. Byukusenge, B., von Rosen, D. and Singull, M. (2021). On the Identification of Extreme Elements in a Residual for the GMANOVA-MANOVA Model. Accepted for publication in Innovations in multivariate statistical modelling: navigating theoretical and multidisciplinary domains, Springer Emerging Topics in Statistics and Biostatistics.
38. Singull, M., Uwamariya, D. and Yang, X. (2021). Large deviation asymptotics of condition numbers of random matrices. Journal of Applied Probability 58(4), 1114-1130.
37. Nampala, H., Jablonska-Sabukaand, M. and Singull, M. (2021). Mathematical Analysis of the Role of HIV/HBV Latency in Hepatocytes. Journal of Applied Mathematics.
36. Wamono, F., von Rosen, D. and Singull, M. (2021). Residuals in the Growth Curve Model with Rank Restrictions on Parameters. Journal of the Korean Statistical Society.
35. Ngailo, E., von Rosen, D. and Singull, M. (2021). Approximation of misclassification probabilities in linear discriminant analysis with repeated measurements. Acta et Commentationes Universitatis Tartuensis de Mathematica (ACUTM) 25(1):67-85.
34. Cengiz, C., von Rosen, D. and Singull, M. (2021). Profile Analysis in High Dimensions. Journal of Statistical Theory and Practice 15:15.
33. Fonseca, M. and Singull, M. (2020). Growth Curve Model with Orthogonal Covariance Structure. In Recent Developments in Multivariate and Random Matrix Analysis (pp. 67-81). Springer, Cham.
32. Coelho, C. A. and Singull, M. (2020). Testing for double complete symmetry. In Recent Developments in Multivariate and Random Matrix Analysis (pp. 17-39). Springer, Cham.
31. Holgersson, T. and Singull, M. (2020). Risk and Bias in Portfolio Optimization. In Recent Developments in Multivariate and Random Matrix Analysis (pp. 163-173). Springer, Cham.
30. Börjesson, L. and Singull, M. (2020). Forecasting Financial Time Series through Causal and Dilated Convolutional Neural Networks. Entropy 22(10), 1094.
29. Nannyonga, B. K. and Singull, M. (2020). Modelling allocation of resources in prevention and control of obstetric fistula in Ugandan women. Accepted for publication in PLOS ONE.
28. Nannyonga, B. K. and Singull, M. (2020). Impact of Health Education on Knowledge and Behaviors toward Obstetric Fistula among Women of Reproductive Age in Uganda. Applied Mathematics and Computation 372:124997.

27. Ngaruye, I., von Rosen, D. and Singull, M. (2019). Mean-Squared errors of small area estimators under a multivariate linear model for repeated measures data. Communications in Statistics - Theory and Methods 48(8):2060-2073.
26. John, M. A., Larsson, T., Singull, M. and Mushi, A. (2018). Asset liability management for Tanzania pension funds by stochastic programming. Afrika Statistika 13(3):1733-1758.
25. Pielaszkiewicz, J., von Rosen, D. and Singull, M. (2018). On n/p-asymptotic distribution of vector of weighted traces of powers of Wishart matrices. Electronic Journal of Linear Algebra 33:24-40.
24. Ngaruye, I., von Rosen, D. and Singull, M. (2018). Small area estimation with missing data using a multivariate linear random effects model. Japanese Journal of Statistics and Data Science 1(1):23-37.
23. Evarest, E., Berntsson, F., Singull, M. and Yang, X. (2018). Weather Derivatives Pricing Using Regime Switching Model. Monte Carlo Methods and Applications 24(1):13-27.
22. John, M. A., Larsson, T., Singull, M. and Mushi, A. (2017). Projecting Tanzania Pension Fund System. African Journal of Applied Statistics 4(1):193-218.
21. Evarest, E., Berntsson, F., Singull, M. and Charles, W. (2017). Regime switching models on temperature dynamics. International Journal of Applied Mathematics and Statistics 56(2):19-36.
20. Pielaszkiewicz J., von Rosen D., and Singull M. (2017). Testing Independence via Spectral Moments. In: Bebiano N. (eds) Applied and Computational Matrix Analysis. MAT-TRIAD 2015. Springer Proceedings in Mathematics & Statistics, vol 192. Springer, Cham.
19. Habyarimana, C., Singull, M. and Nzabanita, J. (2017). Estimation of Parameters in the Growth Curve Model with a Linearly Structured Covariance Matrix - A Simulation Study. International Journal of Scientific Engineering and Technology 6(1):45-49.
18. Pielaszkiewicz, J. and von Rosen, D. and Singull, M. (2017). On $E\big[\prod_{i=0}^{k} tr\{W^{m_i}\}\big]$, where $W \sim \mathcal{W}_p(I, n)$. Communications in Statistics - Theory and Methods 46(6):2990-3005.
17. Srivastava, M. S. and Singull, M. (2017). Test for the mean matrix in a Growth Curve model for high dimensions. Communications in Statistics - Theory and Methods 46(13):6668-6683.
16. Srivastava, M. S. and Singull, M. (2017). Testing sphericity and intraclass covariance structures under a Growth Curve model in high dimension. Communications in Statistics - Simulation and Computation 46(7):5740-5751.
15. Ngaruye, I., von Rosen, D. and Singull, M. (2016). Crop yield estimation at district level for agricultural seasons 2014 in Rwanda. African Journal of Applied Statistics 3(1):69-90.
14. Ngaruye, I., Nzabanita, J., von Rosen, D. and Singull, M. (2016). Small Area Estimation under a multivariate linear model for repeated measures Data. Communications in Statistics - Theory and Methods 46(21):10835-10850.
13. Nzabanita, J., von Rosen, D. and Singull, M. (2015). Bilinear regression model with Kronecker and linear structures for the covariance matrix. Afrika Statistika 10(2):827-837.
12. Nzabanita, J. and von Rosen, D. and Singull, M. (2015). Extended GMANOVA model with a linearly structured covariance matrix. Mathematical Methods of Statistics 24(4):280-291.
11. Karlsson, E. and Singull, M. (2015). More on explicit estimators for a banded covariance matrix. Acta et Commentationes Universitatis Tartuensis de Mathematica 19(1):49-62.
10. Pielaszkiewicz, J., von Rosen, D. and Singull, M. (2014). Cumulant-moment relation in free probability theory. Acta et Commentationes Universitatis Tartuensis

de Mathematica 18(2):265-278.

9. Ohlson, M., Ahmad, M. R. and von Rosen, D. (2013). The multilinear normal distribution: introduction and some basic properties. Journal of Multivariate Analysis 113:37-47.
8. Ahmad, M. R. and von Rosen, D. and Singull, M. (2013). A note on mean testing for high dimensional multivariate data under non-normality. Statistica Neerlandica 67(1):81-99.
7. Srivastava, M. S. and Singull, M. (2012). Profile analysis with random-effects covariance structure. Journal of the Japan Statistical Society 42(2):145-164.
6. Nzabanita, J., von Rosen, D. and Singull, M. (2012). Estimation of parameters in the extended Growth Curve model with linearly structured covariance matrix. Acta et Commentationes Universitatis Tartuensis de Mathematica 16(1):13 - 32.
5. Singull, M. and Koski, T. (2012). On the distribution of matrix quadratic forms. Communications in Statistics - Theory and Methods 41(18):3403 - 3415.
4. Singull, M., Ahmad, M. R. and von Rosen, D. (2012). More on the Kronecker structured covariance matrix. Communications in Statistics - Theory and Methods 41(13-14):2512 - 2523.
3. Ohlson, M., Andrushchenko, Z. and von Rosen, D. (2011). Explicit estimators under m-dependence for a multivariate normal distribution. Annals of the Institute of Statistical Mathematics 63(1):29-42.
2. Ohlson, M. and Srivastava, M. S. (2010). Profile analysis for a Growth Curve model. Journal of the Japan Statistical Society 40(1):1-21.
1. Ohlson, M. and von Rosen, D. (2010). Explicit Estimators of Parameters in the Growth Curve model with linearly structured covariance matrices. Journal of Multivariate Analysis 101(5):1284-1295.

Conferences and Lectures

Conferences as invited speaker

7. IWMS 2019, June 6-9 2019, Shanghai, China. Invited speaker in *Special Session on Decompositions of Tensor Spaces with Applications to Multilinear Models*. Title: Estimation, testing and residual analysis in the GMANOVA-MANOVA model.
6. International Conference on Linear Algebra and its Applications (ICLAA2017), December 11-15, 2017, Manipal University, Manipal, India – Invited Speaker with title: *The use of antieigenvalues in statistics*.
5. 2017 Annual Southern Africa Mathematical Sciences Association (SAMSA) conference, November 20-23, 2017, Arusha, Tanzania – Invited Speaker with title: *History of multivariate normal distribution - from bivariate to high dimensional analysis*.
4. IWMS 2015, May 25-28 2015, Haikou, China – Invited speaker in *Mini-symposium on Linear and Mixed Models*. Title: *Testing sphericity and intraclass covariance structures under a growth curve model in high dimension*.
3. AISC 2014, October 10-12 2014, University of North Carolina at Greensboro, USA – Invited Speaker in *Special session on Recent advances in multivariate theory and its application*. Title: *Test for the mean in a Growth Curve model for high dimensions*.
2. JSM 2014, August 2-7 2014, Boston, Massachusetts, USA – Invited Speaker in *Topic-Contributed Session on Analysis with Kronecker product structured covariance matrices*. Title: *Expectation-maximization algorithm for the multilinear normal distribution*.
1. IWMS 2013, August 12-15 2013, Toronto, Cananda – Invited speaker in *Special Session on Perspectives on High Dimensional Data Analysis*. Title: *Test for the mean in a Growth Curve model in high dimension*.

International collaborations

Among others *Muni Srivastava*, University of Toronto, Canada, *Miguel Fonseca*, Universidade Nova de Lisboa, *Carlos A. Coelho*, Universidade Nova de Lisboa, *Daniel Klein*, P. J. Safarik University, Slovakia, *Ivan Zezula*, P. J. Safarik University, Slovakia, *Katarzyna Filipiak*, Poznan University of Life Sciences, Poland.

Referee assignments for journals

Among others Journal of Multivariate Analysis, Linear Algebra and its Applications, Communications in Statistics - Theory and Methods, Journal of Statistical Planning, Computational Statistics and Data Analysis, Metrika.

Supervision

Graduated PhD-students (6)

Main supervisor:

- Edward Kanuti Ngailo
  - PhD thesis (June 2020): *Contributions to linear discriminant analysis with applications to growth curves* (Mathematical Statistics, Linköping University)
- Emanuel Evarest
  - PhD thesis (March 2018): *Modelling and Pricing of Weather Derivatives: a Regime Switching Approach* (Mathematics, University of Dar es Salaam)
  - Licentiate thesis (August 2017): *Modelling Weather Dynamics for Weather Derivatives Pricing* (Mathematical Statistics, Linköping University)
- Innocent Ngaruye
  - PhD thesis (June 2017): *Contributions to Small Area Estimation: Using Random Effects Growth Curve Model* (Mathematical Statistics, Linköping University)
  - Licentiate thesis (December 2014): *Small Area Estimation for Multivariate Repeated Measures Data* (Mathematical Statistics, Linköping University)

Co-supervisor:

- John Andongwisye
  - PhD thesis (August 2018): *Asset liability management for Tanzania pension funds* (Mathematics, University of Dar es Salaam)
  - Licentiate thesis (June 2018): *Asset Liability Management for Tanzania Pension Funds* (Optimization, Linköping University)
- Jolanta Pielaszkiewicz
  - PhD thesis (December 2015): *Contributions to High-Dimensional Analysis under Kolmogorov Condition* (Mathematical Statistics, Linköping University)
  - Licentiate thesis (June 2013): *On the asymptotic spectral distribution of random matrices – Closed form solutions using free independence* (Mathematical Statistics, Linköping University)
- Joseph Nzabanita
  - PhD thesis (June 2015): *Bilinear and Trilinear Regression Models with Structured Covariance Matrices* (Mathematical Statistics, Linköping University)
    Awarded the *Cramér Prize 2016*, i.e., best thesis in Statistics and Mathematical Statistics 2015 in Sweden.
  - Licentiate thesis (May 2012): *Estimation in Multivariate Linear Models with Linearly Structured Covariance Matrices* (Mathematical Statistics, Linköping University)

Ongoing PhD-projects (8)

Main supervisor:

- Beatrice Byukusenge (started 2015, LiU). Project title: *Residual analysis in the Extended Growth Curve Model.*
- Cigdem Cengiz (admitted November 2020), Project title: *Profile analysis in high dimensions.*
  - Licentiate thesis (September 2020): *A New Approach in Profile Analysis with High-Dimensional Data Using Scores* (Department of Energy and Technology, Division of Biometry and Systems Analysis, Swedish University of Agricultural Sciences, Uppsala, Sweden)
- Emelyne Gasana (started 2018, LiU). Project title: *Moments for the linear classification function in large and high dimensions.*
  - Licentiate thesis (June 2021): *Misclassification Probabilities through Edgeworth-type Expansion for the Distribution of the Maximum Likelihood based Discriminant Function.*
- Elias Erdtman (started 2019, LiU). Project title: *High-dimensional covariance estimation with applications to massive MIMO.*

Co-supervisor:

- Pontus Söderbäck (started 2015, LiU). Preliminary project title: *Comparison and calibration of option pricing models.*
- Felix Wamono (started 2016, Department of Mathematics, Makerere University, Uganda). Preliminary project title: *Residuals in the Growth Curve Model with rank restrictions on parameters with application to small area estimation.*
- Denise Uwamariya (started 2018, LiU). Preliminary project title: *Large deviation, the normalized empirical spectral density and antieigenvalues.*
  - Licentiate thesis (June 2021): *Large deviations of condition numbers of random matrices.*
- Mainza Mbokoma (started 2019, LiU). Preliminary project title: *Longest run and related topics.*

Advisor and/or examinator of more than 20 undergraduate master theses.

Pedagogical Skills

Pedagogical Courses:

- Teaching in Higher Education, Step 1. Learning, Instructing and Knowledge, 6hp, Linköping University, Linköping, Sweden.
- Teaching in Higher Education, Step 2. Designing, Evaluating and Organizing Learning, 6hp, Linköping University, Linköping, Sweden.
- Teaching in Higher Education, Step 3. Research Supervision, Linköping University, Linköping, Sweden.

Teaching Experience:

- Mathematical Statistics (Statistical Inference)
- Multivariate Statistics
- Generalized Linear Models
- Design and Analysis of Experiments

- Stochastic Processes
- Probability Theory
- Foundation Course in Mathematics
- Calculus
- Financial Mathematics

Commissions of Trust

Chair of the board of Cramérsällskapet (part of the Swedish Statistical Society). *March 2022 to present*

Team Leader for the sub-programme 'Capacity Building in Mathematics and its Applications' to build capacity for postgraduate training and research in mathematics and statistics at the Department of Mathematics, Makerere University, Uganda. *July 2021 to present*

Team Leader for the sub-programme 'Capacity Building in Mathematics, Statistics and its Applications' to build capacity for postgraduate training and research in mathematics and statistics at the Department of Mathematics, Eduardo Mondlane University, Mozambique. *July 2021 to present*

Team Leader for the sub-programme 'Capacity Building of Mathematics in Higher Education Institutions in Tanzania' to build capacity for postgraduate training and research in mathematics and statistics at the Department of Mathematics, University of Dar es Salaam, Tanzania. *July 2021 to present*

Member of ISP (International Science Programme) Mathematics Reference Group. Participate in evaluation of applications submitted to ISP at their annual meetings. *April 2021 to present*

Member of the board of Cramérsällskapet (part of the Swedish Statistical Society). *March 2021 to March 2022*

Team Leader for the sub-programme 'Capacity Building in Mathematics, Statistics and its Applications' to build capacity for postgraduate training and research in mathematics and statistics at the Department of Mathematics, Royal University of Phnom Penh (RUPP), Cambodia. *January 2020 to present*

Team Leader for the sub-programme 'Strengthening Research Capacity in Mathematics, Statistics and Their Applications' part of University of Rwanda – Sweden Programme for Research, Higher Education and Institutional Advancement. *June 2019 to present*

Chair of the scientific committee for the *5th Network Meeting for Research Groups in Mathematics in Sub-Saharan Africa* (postponed due to the pandemic outbreak of covid-19). *August 2020*

Chair of the scientific committee for the *4th EAUMP conference* (postponed due to the pandemic outbreak of covid-19). *August 2020*

Chair of the scientific committee for the *4th Network Meeting for Sida- and ISP funded PhD students and Postdocs in Mathematics.* *August 2019*

Member of the international scientific committee for the conference serie *International Workshop on Matrices and Statistics* (IWMS). *June 2019 to present*

Member of the Advisory Board Linkura AB. *March 2018 to present*

Member of the committee for evaluation of the Eastern Africa Universities Mathematics Programme (EAUMP) for the years 2002-2015. *January 2016 to March 2017*

Assistant director for the *Research School in Interdisciplinary Mathematics* at Linköping University. *April 2016 to present*

Deputy Team Leader for the sub-programme Applied Mathematics and Statistics part of University of Rwanda – Sweden Research, Higher Education and Institutional Advancement Cooperation Programme. *January 2015 to June 2019*

Member of the board of Department of Mathematics, Linköping University. *January 2015 to present*

Member of the board of Cramérsällskapet (part of the Swedish Statistical Society). *March 2014 to March 2016*

Member of the board of Studies for Industrial Engineering and Logistics, Linköping University. *January 2012 to December 2017*

Chair of organizing committee for the *International Conference on Trends and Perspectives in Linear Statistical Inference* (LinStat2014) hold 24-28 August, 2014 at Linköping University, Sweden. *August 2014*