

# Thordis L. Thorarinsdottir

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## Research Interests

Bayesian methods, forecast verification, point processes, probabilistic forecasting, spatial statistics

## Education

Ph.D. Mathematical Statistics, Aarhus University, 2006.

*Dissertation:* Spatio-temporal modelling of fMRI data.

*Supervisor:* Eva B. Vedel Jensen

Academic Visitor, University of Oxford, 2005.

Diplom Mathematics, University of Cologne, 2003.

*Thesis:* Asymptotic minimax estimation in nonparametric autoregression.

*Supervisor:* Michael H. Neumann

B.S. Mathematics, University of Iceland, 2000.

## Employment

Chief Research Scientist, Norwegian Computing Center, 2016– present.

Senior Research Scientist, Norwegian Computing Center, 2013-2016.

Research Scientist, Norwegian Computing Center, 2012-2013.

Research Assistant Professor, Institute of Applied Mathematics, Heidelberg University, 2009-2012.

Postdoctoral Fellow and Visiting Lecturer, Department of Statistics, University of Washington, 2008-2009.

Postdoctoral Fellow, Department of Mathematical Sciences, Aarhus University, 2006-2007.

Ph.D. Fellow, Department of Mathematical Sciences, Aarhus University, 2003-2006.

Research Assistant in Statistics, Aarhus University, 2002-2003.

Research Assistant in Mathematics, University of Cologne, 2000-2002.

Research Assistant in Statistics, Marine Research Institute, Iceland, 1999-2000.

## Grants & Awards

*Model Selection and Model Verification for Point Processes*, 6,155,000 NOK. Sole principal investigator, The Research Council of Norway (FRIPRO Young Research Talent Award), 2015-2018.

*High-dimensional Statistical Modeling of Changes in Wave Climate and Implications for Maritime Infrastructure*, 6,814,000 NOK. Principal investigator with P. Guttorp, H. Rognebakke, C. Stefanakos and E. Vanem, The Research Council of Norway (KLIMAFORSK), 2015-2019.

*Statistical Analysis of Climate Projections*, 4,000,000 NOK. Principal investigator with C. Fox Maule, P. Guttorp and P. Uotila, NordForsk (NeGI), 2015-2018.

*Physical and Statistical Analysis of Climate Extremes in Large Datasets*, 6,790,000 NOK. Co-principal investigator with J. Sillmann and K. de Bruin, The Research Council of Norway (KLIMAFORSK), 2015-2018.

*A Robust Flood Estimation Framework for Norway*, 16,134,000 NOK. Principal investigator for research with T. Mo Willig, K. Alfredsen, H. Hisdal and O. E. Tveito, The Research Council of Norway (ENERGIX) and the Norwegian Hydropower Industry, 2014-2017.

Extension of *Mesoscale Weather Extremes: Theory, Spatial Modeling and Prediction*, € 659,200. Co-principal investigator with P. Friederichs, T. Gneiting, A. Hense and M. Schlather, The Volkswagen Foundation, 2014-2017.

*Mesoscale Weather Extremes: Theory, Spatial Modeling and Prediction*, € 650,000. Co-principal investigator with P. Friederichs, T. Gneiting, A. Hense and M. Schlather, The Volkswagen Foundation, 2011-2014.

*Spatial/Temporal Probabilistic Graphical Models and Applications in Image Analysis*, € 2,500,000. Co-principal investigator with C. Schnörr, H. G. Bock, R. Dahlhaus, T. Gneiting, F. A. Hamprecht, D. W. Heermann, W. Jähne, B. Ommer and G. Reinelt, German National Science Foundation, 2010-2014.

Pacific Institute for the Mathematical Sciences Postdoctoral Fellowship, 2008.

Helga Jónsdóttir and Sigurliði Kristjánsson Award for Excellent Academic Achievement, 2003.

German Academic Exchange Service Scholarship, 2001.

## Professional Activities

Associate Editor of *Environmetrics* 2012–2015 and *Annals of Applied Statistics* 2014–present.

Regional representative for Europe on the board of the International Environmetrics Society, 2015–present.

Member of Ph.D. defense committee of Pierre-Julien Trombe at the Technical University of Denmark in 2013, Xianping Hu at the Norwegian University of Science and Technology in 2013, Óli Páll Geirsson at the University of Iceland in 2015, and Robin M. Williams at the University of Exeter in 2016.

Co-organizer of *Workshop linking practitioners and researchers: Uncertainty quantification and visualization tools for climate change adaptation* 2016, *FlomQ - Workshop on flood estimation* 2016, *Workshop on understanding, modeling and predicting weather and climate extremes* 2015, *Stats + Climate* 2013, *Workshop on Probabilistic Forecasting of High-impact Weather Events* 2012, *RTG 1653 Annual Workshop* 2011 and *Baltic Way Mathematical Olympiad* 1999.

Reviewed papers for *Advances in Science and Research*, *Annals of Applied Statistics*, *Annals of Statistics*, *Communications in Statistics – Theory and Methods*, *Computational Statistics and Data Analysis*, *Computers and Geosciences*, *Energies*, *Environmental and Ecological Statistics*, *Journal of Applied Meteorology and Climatology*, *Journal of Climate*, *Journal of Climatology*, *Journal of Geophysical Research*, *Journals of the Royal Statistical Society*, *Methodology & Computing in Applied Probability*, *Monthly Weather Review*, *Quarterly Journal of the Royal Meteorological Society*, *Statistics and Computing*, *Stochastic Environmental Research and Risk Assessment*, *Studies in Nonlinear Dynamics & Econometrics*, *Tellus*, *TEST*, *Weather and Forecasting*, *Wind Energy*.

Reviewed grant proposals for *Canadian Statistical Science Institute*, *National Science Foundation*, *The Netherlands Organisation for Scientific Research*.

Member of the Icelandic Mathematical Association, and the International Environmetrics Society.

## Publications

### Refereed Journal Articles

S. Lerch, T. L. Thorarinsdottir, F. Ravazzolo and T. Gneiting. **Forecaster's dilemma: extreme events and forecast evaluation.** *Statistical Science*, to appear, 2016.

G. H. Steinbakk, T. L. Thorarinsdottir, T. Reitan, L. Schlichting, S. Hølleland and K. Engeland. **Propagation of rating curve uncertainty in design flood estimation.** *Water Resources Research*, in press, 2016.

T. L. Thorarinsdottir, M. Scheuerer and C. Heinz. **Assessing the calibration of high-dimensional ensemble forecasts using rank histograms.** *Journal of Computational and Graphical Statistics*, 25(1): 105-122, 2016.

E.-M. Didden, T. L. Thorarinsdottir, A. Lenkoski and C. Schnörr. **Shape from texture using locally scaled point processes.** *Image Analysis & Stereology*, 34: 161-170, 2015.

- F. Bachl, A. Lenkoski, T. L. Thorarinsdottir and C. Garbe. **Bayesian motion detection for dust aerosols.** *Annals of Applied Statistics*, 9(3): 1298-1327, 2015.
- L. V. Hansen, T. L. Thorarinsdottir, E. Ovcharov, T. Gneiting, and D. Richards. **Lévy particles: Modelling and simulating star-shaped random sets.** *Advances in Applied Probability*, 47(2): 307-327, 2015.
- A. V. Dyrddal, A. Lenkoski, T. L. Thorarinsdottir and F. Stordal. **Bayesian hierarchical modeling of extreme hourly precipitation in Norway.** *Environmetrics*, 26(2): 89-106, 2015.
- K. Feldmann, M. Scheuerer and T. L. Thorarinsdottir. **Spatial postprocessing of ensemble forecasts for temperature using nonhomogeneous Gaussian regression.** *Monthly Weather Review*, 143(3): 955-971, 2015.
- K. Willett, C. Williams, I. Jolliffe, R. Lund, L. Alexander, S. Br unniman, L. A. Vincent, S. Easterbrook, V. Venema, D. Berry, R. Warren, G. Lopardo, R. Auchmann, E. Aguilar, M. Menne, C. Gallagher, Z. Hausfather, T. Thorarinsdottir and P. W. Thorne. **Concepts for benchmarking of homogenisation algorithm performance on the global scale.** *Geoscientific Instrumentation, Methods and Data Systems Discussions*, 4(1): 235-270, 2014.
- L. V. Hansen and T. L. Thorarinsdottir. **A note on moving average models for Gaussian random fields.** *Statistics & Probability Letters*, 83(3):850-855, 2013.
- S. Lerch and T. L. Thorarinsdottir. **Comparing nonhomogeneous regression models for probabilistic wind speed forecasting.** *Tellus A*, 65:21206, 2013.
- A. M ller, A. Lenkoski, and T. L. Thorarinsdottir. **Multivariate probabilistic forecasting using Bayesian model averaging and copulas.** *Quarterly Journal of the Royal Meteorological Society*, 139(673):982-991, 2013.
- R. Schefzik, T. L. Thorarinsdottir, and T. Gneiting. **Uncertainty quantification in complex simulation models using ensemble copula coupling.** *Statistical Science*, 28(4):616-640, 2013.
- T. L. Thorarinsdottir. **Calibration diagnostics for point process models via the probability integral transform.** *Stat*, 2(1):150-158, 2013.
- T. L. Thorarinsdottir, T. Gneiting, and N. Gissibl. **Using proper divergence functions to evaluate climate models.** *SIAM/ASA Journal on Uncertainty Quantification*, 1(1): 522-534, 2013.
- P. Friederichs and T. L. Thorarinsdottir. **Forecast verification for extreme value distributions with an application to probabilistic peak wind prediction.** *Environmetrics*, 23(7):579-594, 2012.
- P. Guttorp and T. L. Thorarinsdottir. **What happened to discrete chaos, the Quenouille process, and the sharp Markov property? Some history of stochastic point processes.** *International Statistical Review*, 80(2):253-268, 2012.
- N. Schuhen, T. L. Thorarinsdottir, and T. Gneiting. **Ensemble model output statistics for wind vectors.** *Monthly Weather Review*, 140(10):3204-3219, 2012.
- T. L. Thorarinsdottir and M. S. Johnson. **Probabilistic wind gust forecasting using non-homogeneous Gaussian regression.** *Monthly Weather Review*, 140(3):889-897, 2012.
- T. L. Thorarinsdottir, M. Scheuerer, and K. Feldmann. **Statistical post-processing of ensemble forecasts.** *Promet*, 37(3/4):43-52, 2012 (in German, invited paper).
- T. L. Thorarinsdottir and T. Gneiting. **Probabilistic forecasts of wind speed: Ensemble model output statistics by using heteroskedastic censored regression.** *Journal of the Royal Statistical Society Series A: Statistics in Society*, 173(2): 371-388, 2010.
- E. B. V. Jensen and T. L. Thorarinsdottir. **A spatio-temporal model for functional magnetic resonance imaging data - with a view to resting state networks.** *Scandinavian Journal of Statistics*, 34(3):587-614, 2007.
- M. H. Neumann and T. L. Thorarinsdottir. **Asymptotic minimax estimation in nonparametric autoregression.** *Mathematical Methods of Statistics*, 15(4): 374-397, 2007.
- T. L. Thorarinsdottir. **Bayesian image restoration, using configurations.** *Image Analysis & Stereology*, 25:129-143, 2006.

### Book Chapters

P. Guttorp and T. L. Thorarinsdottir. **Bayesian inference for non-Markovian point processes**. In E. Porcu, J.M. Montero, and M. Schlather (Eds.), *Advances and Challenges in Space-time Modelling of Natural Events*, Springer: Berlin Heidelberg, Lecture Notes in Statistics, Volume 207, pp. 79-102, 2012.

### Proceedings

T. L. Thorarinsdottir and E. B. V. Jensen. **Modelling resting state networks in the human brain**. In R. Lechnerová, I. Saxl, and V. Benes, editors, *Proceedings S4G: International Conference on Stereology, Spatial Statistics and Stochastic Geometry*, pp. 137-147, 2006.

### Comments and Meeting Reports

T. L. Thorarinsdottir and K. de Bruin. **Challenges of climate change adaptation**. *EOS Transactions*, to appear, 2016.

A. Lenkoski and T. L. Thorarinsdottir, **Comments on: Of quantiles and expectiles: consistent scoring functions, Choquet representations and forecast rankings** by W. Ehm, T. Gneiting, A. Jordan and F. Krüger. *Journal of the Royal Statistical Society, Series B*, 78(3): 548, 2016.

T. L. Thorarinsdottir and A. Løland. **Comments on: Space-time wind speed forecasting for improved power system dispatch**. *TEST*, 23(1):32-33, 2014.

T. L. Thorarinsdottir, J. Sillmann and R. Benestad. **Studying statistical methodology in climate research**. *EOS Transactions*, 95(15):129, 2014.

## Teaching

### University of Oslo

Lecturer in Applied Bayesian Analysis and Numerical Methods, Fall 2014.

### Heidelberg University

Instructor in Statistical Seminar, Winter 2009/2010 - Summer 2012.

Lecturer in Bayesian Inference, Summer 2011.

Teaching Assistant in Mathematical Statistics and Decision Theory and Forecasting, Winter 2009/2010 - Summer 2010.

### University of Washington

Lecturer in Statistics 220, Fall 2008 - Spring 2009.

### Aarhus University

Lecturer in Bayesian Inference, Fall 2007.

Teaching Assistant in Statistical Models II, Statistical Inference, Nanostatistics, Simulation, Statistics 1, and Statistics  $\alpha$ , Fall 2003 - Spring 2007.

### University of Iceland

Recitation Instructor in Calculus and Linear Algebra, Fall 1999.

## Advising

### Ph.D. Students

Sebastian Lerch, *Forecast verification*, Karlsruhe Institute of Technology, 2013 – 2016. (Joint with Tilmann Gneiting)

Roman Schefzik, *Physically coherent probabilistic weather forecasts using multivariate discrete copula-based ensemble postprocessing methods*, Heidelberg University, 2011 – 2014. (Joint with Tilmann Gneiting)

Eva-Maria Didden, *Modelling of locally scaled spatial point processes, and applications in image analysis*, Heidelberg University, 2011–2014. (Joint with Alex Lenkoski and Christoph Schnörr)

Annette Möller, *Multivariate predictive distributions of weather quantities using graphical models*, Heidelberg University, 2010–2014. (Joint with Tilmann Gneiting and Alex Lenkoski)

### Master/Diploma Students

Natalia Hernández Vargas, *Bayesian point process modelling of earthquake occurrences*, Heidelberg University, 2012.

Nadine Gissibl, *Proper divergence measures for comparing and combining climate model outputs for extreme temperature indices*, Heidelberg University, 2012.

Christian Rohrbeck, *Isotonic recursive partitioning for combining predictive distributions*, Heidelberg University, 2012. (Joint with Tilmann Gneiting)

Kira Feldmann, *Statistical post-processing of ensemble forecasts for temperature: The importance of spatial modeling*, Heidelberg University, 2012. (Joint with Michael Scheuerer)

Corinna Frei, *Probabilistic forecasts of precipitation using quantiles*, Heidelberg University, 2012. (Joint with Tilmann Gneiting)

Sebastian Lerch, *Verification of probabilistic forecasts for rare and extreme events*, Heidelberg University, 2012.

Dina Richter, *Bayesian ensemble model output statistics*, Heidelberg University, 2012. (Joint with Alex Lenkoski)

Sam Dörken, *Probabilistic forecasting of US Treasury Bills*, Heidelberg University, 2011. (Joint with Tilmann Gneiting)

Anna Rigazio, *Comparing Bayesian model averaging and Bayesian hierarchical modelling for probabilistic forecasts of precipitation over Italy*, University of Bologna, 2011. (Joint with Francesca Bruno, Daniela Cocchi, and Tilmann Gneiting)

Roman Schefzik, *Ensemble copula coupling*, Heidelberg University, 2011. (Joint with Tilmann Gneiting)

Nina Schuhen, *Ensemble model output statistics for wind vectors*, Heidelberg University, 2011. (Joint with Tilmann Gneiting)

### Invited Talks

*Regional flood frequency analysis for Norway*. Workshop on spatial and space-time statistics, Smögen, Sweden, August 2016.

*Paths and pitfalls in model evaluation: The importance of being proper*. TIES 2016, Edinburgh, United Kingdom, July 2016.

*Regional flood frequency analysis for Norway*. Karlsruhe Institute of Technology, Stochastics Seminar, May 2016.

*Regional flood frequency analysis for Norway*. University of Exeter, Statistics Seminar, May 2016.

*Assessing the calibration of high-dimensional ensemble forecasts using rank histograms*. RSS 2015, Exeter, United Kingdom, September 2015.

*Predicting temporal trajectories of regional wind and solar power production*. Workshop on new challenges in spatial and spatio-temporal modeling, Karlsruhe, Germany, October, 2014.

*FlomQ - A robust flood estimation framework for Norway*. High North Seminar, Oslo, Norway, October 2014.

*Joint probabilistic forecasting of temporal trajectories of regional wind and solar power prediction*. Spatial Copula Workshop, Münster, Germany, September 2014.

*Using proper divergence functions to evaluate climate models*. Workshop on uncertainty in climate variability and projections of climate change: Towards a process-based understanding, Chicheley Hall, United Kingdom, September 2014.

*FlomQ - flomberegningsprosjekt*. Regional meeting in Vassdragsteknisk forum, Rosendal, Norway, September 2014.

*Joint probabilistic forecasting of temporal trajectories of regional wind and solar power prediction*. Workshop on spatial and space-time statistics, Smögen, Sweden, August 2014.

*Evaluating probabilistic forecasts*. Summer school on “Modelling and prediction of weather extremes”, Anweiler am Trifels, Germany, June 2014.

*Recovering the multivariate dependencies of statistically post-processed ensemble forecasts*. The Climate Corporation, San Francisco, United States, February 2014.

*Assessing multivariate calibration via band depth rank histograms*. Miniworkshop on “Evaluating probabilistic forecasts of multivariate quantities”, Heidelberg, Germany, October 2013.

*Geometric analysis of textured 3D scenes via locally scaled point processes*. Joint Statistical Meeting, Montréal, Canada, August 2013 (topic contributed session).

*Efficient framework for Bayesian inference in locally scaled point processes and Using proper divergence functions to evaluate climate models*. 11th European Congress of Stereology and Image Analysis, Kaiserslautern, Germany, Juli 2013 (2 talks in minisymposia).

*Using proper divergence functions to evaluate climate models*. 12th International Meeting on Statistical Climatology, Jeju, Korea, June 2013.

*Detecting the differences: Bayesian model selection framework for point process models*. 2nd French Workshop on Stochastic Geometry, Grenoble, France, April 2013.

*Assessing the calibration of high-dimensional forecasts via rank histograms*. Norwegian University of Science and Technology, Department of Mathematical Sciences, March 2013.

*Bayesian model selection for point process cluster models*. University of Reading, Statistics Seminar, February 2013.

*Recovering the multivariate dependencies of statistically post-processed ensemble forecasts*. University of Reading, Department of Meteorology, February 2013.

*Paths and pitfalls in prediction verification*. Norges Bank, Lunch Seminar, January 2013.

*Proper scoring rules and divergences to evaluate weather and climate models*. University of Oslo, Statistics Seminar, October 2012.

*Bayesian model selection for point process cluster models*. The Trondheim Symposium in Statistics, Trondheim, Norway, October 2012.

*Proper scoring rules and divergences for weather and climate predictions*. COST VALUE - Data and Validation Workshop, Trieste, Italy, September 2012.

*Lévy particles: modelling and simulating star-shaped random sets and Bayesian model selection for point process models*. S<sup>4</sup>G: 7th International Conference of Stereology, Spatial Statistics and Stochastic Geometry, Prague, Czech Republic, June 2012 (2 talks in minisymposia).

*Model selection and model validation for point process models*. Nordstat 2012, Umeå, Sweden, June 2012.

*Lévy particles: modelling and simulating star-shaped random sets*. Karlsruhe Institute of Technology, Stochastic Geometry Working Group, February 2012.

*The importance of high performance computing for post-processing*. Swiss Meteorological Institute, Zürich, Switzerland, November 2011.

*Model selection for point process models*. CSGB Minisymposium on Bayesian Inference in Spatial Statistics, Aarhus, Denmark, February 2011.

*Probabilistic weather forecasting – an overview*. Charles University Prague, Applied Statistics Seminar, October 2010.

*Model selection for point process models*. Charles University Prague, Mathematical Statistics Seminar, October 2010.

*Does Bayes beat squinting? Model selection for point process models*. University of Zurich/ETH Zurich, Applied Statistics Seminar, September 2010.

*Ensemble post-processing using heteroskedastic censored regression.* European Centre for Medium-Range Weather Forecasts, Reading, UK, May 2010.

*Bayesian inference and model selection for point processes.* University of Bristol, Department of Mathematics, April 2010.

*Space-time point processes.* Spring School “Advances and Challenges in Space-Time Modelling of Natural Events”, Toledo, Spain, March 2010 (2 talks).

*Obtaining a probabilistic forecast from an ensemble of point forecasts.* Oberwolfach Workshop “Statistical Issues in Prediction”, January 2010.

*Probabilistic wind speed forecasting.* Bonn University, Meteorological Institute, January 2010.

*Bayesian inference for point processes.* Aarhus University, The T.N. Thiele Centre, August 2009.

*Probabilistic forecasts of wind speed: ensemble model output statistics using heteroskedastic censored regression.* University of Washington, Center for Statistics and the Social Sciences, March 2009.

*Probabilistic forecasts of wind speed: ensemble model output statistics using heteroskedastic censored regression.* University of Washington, Department of Statistics, February 2009.

*Probabilistic forecasting using heterogeneous regression and ensembles.* PIMS Summer School, Vancouver, Canada, July 2008.

*Statistical post-processing of forecasts using ensemble model output statistics.* Aarhus University, The T.N. Thiele Centre, June 2008.

*A spatio-temporal point process model for fMRI data.* University of Washington, Department of Statistics, January 2008.

*Spatio-temporal model for fMRI data – with a view to resting state networks.* University of Warwick, Department of Statistics, November 2005.

*Spatio-temporal model for fMRI data – with a view to resting state networks.* University of Oxford, Department of Statistics, October 2005.

## Other

Fluent in English, German, Danish, and Icelandic.

Avid mountaineer and rock climber.

Enthusiastic cook.

Last updated: October 16, 2016