Wolfgang Betz

Engineering Risk Analysis Group – Technische Universität München

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Education & Employment History

since 01/2017 Senior Engineer for Risk Assessment and Uncertainty Quantification, *Eracons GmbH*, München.

2012–2017 Research associate (PhD student) at the Engineering Risk Analysis Group, *Technische Universität München*, **expected to finish end of 2017**.

- 2014 Visiting Researcher, visiting *Prof. James L. Beck* (2.5 months), California Institute of Technology, Caltech, Pasadena, USA
- 2015 Visiting Researcher, visiting *Prof. Jasper Vrugt* (1 month), University of California, Irvine, USA

2013–2017 CEO, *Betz Risk Assessment GmbH & Co. KG*

2009–2012 **M.Sc. (Hons)** in Computational Mechanics, *Technische Universität München*.

- 2011 Visiting Student Researcher, University of California, Berkeley (5 months)
- 2010–2012 Student of the Honors Program of the Bavarian Graduate School of Computational Engineering (BGCE)
- 2009–2010 Student researcher, methods in reliability analysis (5 months) Chair for Computation in Engineering

2005–2009 **Dipl.-Ing. (FH)** in Civil Engineering, *Georg–Simon–Ohm University of Applied Sciences*, Nürnberg.

- 2008–2009 Student researcher, setting up a Beowulf linux cluster (12 months) Faculty of Civil Engineering
- 2008–2009 Student assistant, support department of *SOFiSTiK* (14 months)
- 2007–2008 Internship at the department of hydraulic structures (3 months), Federal Waterways Engineering and Research Institute, Karlsruhe, Germany
- 2007 Internship at the department of project management (3 months), Max Bögl Group, Germany

Honors & Awards

2013 *SOFiSTiK prize* for the best thesis of the faculty regarding numerical methods, Department of Civil, Geo and Environmental Engineering, Technische Universität München.

2008 *1st price*: ultimate load carrying competition (dome made of spaghetti), Faculty of Civil Engineering, Georg–Simon–Ohm University of Applied Sciences, Nürnberg.

2008 *2nd price*: design competition for joint work of civil and architectural students, teamwork, 3 members, worked on engineering design,
AIV-Förderpreis, Architekten und Ingenieurverein Nürnberg e.V.

2007 *1st price*: ultimate load carrying competition (bridge made of spaghetti), teamwork, 2 members, worked on design & construction,
Faculty of Civil Engineering,
Georg–Simon–Ohm University of Applied Sciences, Nürnberg.

2007 *1st price*: 11th German Concrete Canoe Regatta, price for best constructed boat, teamwork, 16 members, worked on FEM-design optimization & construction,
Deutsche Zement- und Betonindustrie.

Academic Services

since 2017 Board member of the International Graduate School of Science and Engineering (IGSSE) of Technische Universität München.

Research Interests

- Bayesian updating and Bayesian model class selection
- Probabilistic modeling and Uncertainty Quantification
- Reliability analysis in high dimensional spaces
- Discretization/simulation of random fields

Software Development

Fesslix	*main developer* [*C++*]. Fesslix is a Free Software program for stochastic analysis, reliability analysis and Bayesian updating. (since 2009)
Rely	*main developer* [*Fortran*]. Rely is a module of SOFiSTiK (a commercial finite element software package) that performs finite element reliability analysis. (since 2013)
Strurel	*implementation of reliability methods and external interfaces* [*Fortran*]. Sturel is a commercial program for reliability analysis. (since 2013)

Publications

Submitted

Betz, W., I., Beck, J.L., Papaioannou, and Straub, D. Bayesian inference with reliability methods without knowing the maximum of the likelihood function. *Probabilistic Engineering Mechanics*, submitted for review.

Journals

Betz, W., Papaioannou, I., Beck, J. L., and Straub, D. Bayesian inference with Subset Simulation: Strategies and improvements. *Computer Methods in Applied Mechanics and Engineering*, 331:72–93 (2018).

Betz, W., Papaioannou, I., and Straub, D. Closure to "Transitional Markov Chain Monte Carlo: Observations and Improvements" by Wolfgang Betz, Iason Papaioannou, and Daniel Straub. *Journal of Engineering Mechanics*, 143(9) (2017).

Betz, W., Papaioannou, I., and Straub, D. Transitional Markov Chain Monte Carlo: Observations and Improvements. *Journal of Engineering Mechanics*, 142(5) (2016).

Straub, D., Papaioannou, I., and Betz, W. Bayesian analysis of rare events. *Journal of Computational Physics*, 314:538–556 (2016).

Papaioannou, I., Betz, W., Zwirglmaier, K., and Straub, D. MCMC algorithms for Subset Simulation. *Probabilistic Engineering Mechanics*, 41:89–103 (2015).

Betz, W., Papaioannou, I., and Straub, D. Numerical methods for the discretization of random fields by means of the Karhunen–Loève expansion. *Computer Methods in Applied Mechanics and Engineering*, 271:109–129 (2014).

Conference papers

Straub, D., Betz, W., Papaioannou, I., and Teichgräber, M. Was tun, wenn die Norm keine Antwort bereit hält? Chancen und Herausforderungen der probabilistischen Bemessung. *21th Münchner Massivbau Seminar, Munich, Germany* (2017).

Uribe, F., Papaioannou, I., Betz, W., and Straub, D. Random fields in Bayesian inference: effects of the random field discretization. *12th International Conference on Structural Safety and Reliability (ICOSSAR 2017), Vienna, Austria* (2017).

Straub, D., Papaioannou, I., and Betz, W. Reliability updating in the presence of spatial variability. In P. Gardoni, editor, *Risk and Reliability Analysis: Theory and Applications*, pages 365–383. Springer (2017).

Betz, W., Eckl, M., Papaioannou, I., Heidkamp, H., and Straub, D. Reliability Analysis of a Tunnel Design with RELY. *SOFiSTiK Seminar 2016, München, Germany* (2016).

Betz, W., Papaioannou, I., and Straub, D. Adaptive variant of the BUS approach to Bayesian updating. *9th International Conference on Structural Dynamics (EURODYN), Porto, Portugal* (2014).

Betz, W., Mok, C. M., Papaioannou, I., and Straub, D. Bayesian model calibration using structural reliability methods: application to the hydrological abc model. *2nd International Conference on Vulnerability and Risk Analysis and Management (ICVRAM), Liverpool, UK* (2014).

Papaioannou, I., Betz, W., and Straub, D. Bayesian model updating of a tunnel in soft soil with settlement measurements. In *Proc. 4th International Symposium on Geotechnical Safety and Risk, Hong Kong* (2013).

Ranjan, R., Betz, W., Papaioannou, I., and Straub, D. A two-step approach for reliability assessment of a tunnel in soft soil. In *Proc. 3rd International Conference on Computational Methods in Tunnelling and Subsurface Engineering EUROTUN* (2013).

Betz, W., Papaioannou, I., and Straub, D. Assessment of methods for the numerical solution of the Fredholm integral eigenvalue problem. *11th International Conference on Structural Safety & Risk (ICOSSAR), New York, USA* (2013).

Betz, W., Papaioannou, I., and Straub, D. A finite cell approach for discretization of random fields. *10th International Probabilistic Workshop, Stuttgart, Germany* (2012).

Betz, W. Ein Dom aus Nudeln – Traglastwettbewerb an der Hochschule Nürnberg. *SOFiSTiK Seminar 2010, Nürnberg, Germany* (2010).

Teaching and Supervision

Teaching

2013–2016 Teaching Assistant for the course *Zuverlässigkeit und Lastannahmen* attended by Undergraduate Civil Engineering students at the Technische Universität München.

Summer 2012 Teaching Assistant for the course *Risk Analysis 1* attended by Master's students of Civil and Environmental Engineering at the Technische Universität München.

Winter 2010 Student Teaching Assistant for the course *Fluid Mechanics* attended by graduate students of Computational Mechanics at the Technische Universität München.

Summer 2010 Student Teaching Assistant for the course *Advanced Computational Methods II* attended by graduate students of Computational Mechanics at the Technische Universität München.

Summer 2010 Student Teaching Assistant for the course *Introduction to C++* attended by graduate students of Computational Mechanics at the Technische Universität München.

2007–2008 Student Teaching Assistant for the course *Computational Fluid Mechanics* attended by students of Civil and Environmental Engineering at the Georg–Simon–Ohm University of Applied Sciences, Nürnberg.

Summer 2007 Student Teaching Assistant for the course *Structural Analysis II* attended by students of Civil and Environmental Engineering at the Georg–Simon–Ohm University of Applied Sciences, Nürnberg.

Supervision of Master's theses

Winter 2016 Schäfer, Steve: *Markov Chain Monte Carlo in Subset Simulation: Optimimizing the Expected Squared Jumping Distance by means of an Importance Sampling strategy*, Technische Universität München.

Winter 2014 Senft, Florian: *Bayesian updating of numerical models: Comparison of the BUSS and DREAM algorithm*, Technische Universität München.

Summer 2013 Neuefeind, Sebastian: *Bayesian updating in hydrological modeling – A comparison of GLUE and formal Bayesian approaches*, Technische Universität München.

Winter 2013 Taherzadeh, Niousha: *Bayesian updating in model prediction*, Technische Universität München.

Winter 2013 Ranjan, Rohit: *A two-step approach for reliability assessment of a tunnel in soft soil*, Technische Universität München.

Supervision of Study projects

Summer 2016 Schäfer, Steve: *Investigation of Nested Sampling*, Technische Universität München.

Summer 2014 Senft, Florian: *Statistical Analysis of RAMMS::Rockfall simulation results*, Technische Universität München.

Summer 2013 Taherzadeh, Niousha: *Prediction of catchment discharge based on past rainfall and discharge measurements using Bayesian Networks*, Technische Universität München.

Supervision of Bachelor's theses

Summer 2017 Kaplan, Peter: *Development of an Artificial Neural Network interface for simulation methods in structural reliability and Bayesian inference*, Technische Universität München.

Winter 2016 Vogt, Denise: *Location based statistical evaluation of wind data*, Technische Universität München.

Attended Conferences and Workshops

06/2017 2nd International Conference on Uncertainty Quantification in Computational Sciences and Engineering (UNCECOMP), 2017, Rhodes Island, Greece.

04/2016 25th SOFiSTiK Seminar, 2016, München, Germany.

04/2016 SIAM Conference on Uncertainty Quantification, 2016, EPFL Campus, Lausanne, Switzerland.

05/2015 1st International Conference on Uncertainty Quantification in Computational Sciences and Engineering (UNCECOMP), 2015, Crete Island, Greece.

07/2014 2nd International Conference on Vulnerability and Risk Analysis and Management (ICVRAM), 2014, Liverpool, UK.

07/2014 9th International Conference on Structural Dynamics (EURODYN), 2014, Porto, Portugal.

06/2013 11th International Conference on Structural Safety & Reliability (ICOSSAR), 2013, New York, USA.

11/2012 10th International Probabilistic Workshop (IPW), 2012, Stuttgart, Germany.

10/2012 TUM Institute of Advanced Study workshop on *Structural Reliability, Risk Assessment and Decision-Making: Past, Present, Future*, Engineering Risk Analysis Group, Technische Universität München, Germany

06/2012 Workshop on *Model Identification & Learning from Data*, Karlsruhe Institute of Technology (KIT), Institute for Water and River Basin Management, Karlsruhe, Germany.

04/2010 22nd SOFiSTiK Seminar, 2010, Nürnberg, Germany.

Reviewer

Journals
Applied Mathematical Modelling
Computer Methods in Applied Mechanics and Engineering
Engineering Structures

Industrial projects (consulting, software development and expert reviews)

Omitting the proof pressure test of cylinder stages of the booster of the Ariane 5 rocket. Client: MT Aerospace, 2017.

Reliability analysis of pile foundations of power poles conducted on two exemplary case studies. Client: KINA Ingenieurgesellschaft mbH, 2017.
Reliability analysis of a concept design for the Sulafjorden submerged floating tube bridge. Client: Dr. techn. Olav Olsen AS, Norway, 2017.
Review of a procedure for a reliability analysis of power poles; in collaboration with Prof. Daniel Straub. Client: KINA Ingenieurgesellschaft mbH, 2015.

References

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February 10, 2018 (Wolfgang Betz)