

## Iason Papaioannou, Ph.D. (Dr.-Ing.)

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### EDUCATION

Technische Universität München (TUM)

**PhD (Dr.-Ing.) in Civil Engineering, 2012**

Dissertation: "Non-intrusive finite element reliability analysis"

Honors: "summa cum laude"

(Advisors: Prof. Ernst Rank and Prof. Daniel Straub)

Technische Universität München (TUM)

**MSc with Honors in Computational Mechanics, 2007**

Thesis: "Fluid-structure interaction with high-order finite element methods"

(Advisor: Prof. Ernst Rank)

National Technical University of Athens (NTUA)

**Diploma (MSc equivalent) in Civil Engineering, 2005**

Thesis: "Advanced methods for inelastic analysis of framed structures"

(Advisor: Prof. Manolis Papadrakakis)

### WORK EXPERIENCE

Eracons GmbH, Munich ([www.eracons.com](http://www.eracons.com))

**Co-Founder and partner, since 2013**

Consulting and software development in engineering reliability and risk assessment, uncertainty quantification and machine learning.

Engineering Risk Analysis Group, TU München

**Senior lecturer and deputy group leader, since 2011 (tenured since 2021)**

- Research on reliability assessment, Bayesian updating and probabilistic modeling of engineering structures
- Supervision of Ph.D. and M.Sc. students
- Lecturer in graduate and undergraduate level

SOFiSTiK AG, Oberschleissheim

**Visiting researcher, 2007**

Implementation of a software prototype for coupling reliability analysis with finite elements.

Chair of Computation in Engineering, TU München

**Research assistant, 2005-2007**

Research on numerical methods in solid and fluid mechanics.

## AWARDS

IASSAR Early Achievement Research Award 2022

Supervisory award 2021 of the Department of Civil, Geo and Environmental Engineering of the TU München

ASCE Outstanding Reviewer 2017 for ASCE-ASME Journal of Risk and Uncertainty Analysis

GEOSNet Young Researcher Award 2015

Bauer prize 2012 for the best PhD thesis of the Department of Civil, Geo and Environmental Engineering of the TU München

## RESEARCH INTERESTS

Uncertainty quantification of numerical models of engineering systems

Reliability analysis/updating and reliability-based optimization of engineering systems

Bayesian updating of engineering models with data

Uncertainty-based sensitivity analysis

Probabilistic modeling and machine learning

Discretization/simulation of random fields

Uncertainty analysis and reliability assessment of high-dimensional systems

Geotechnical reliability assessment

## LANGUAGES

Greek (native language)

English (fluent)

German (fluent)

French (good)

## UNIVERSITY COURSES

TU München

**Prognostics and Health Management (M.Sc. level, 2hrs/week, since 2022)**

Developed syllabus and overall course structure.

TU München

**Elements of Machine Learning (M.Sc. level, 2hrs/week, with Dr. Kanjilal, since 2020)**

Collaborated on course development (50%).

TU München

**Estimation of Rare Events and Failure Probabilities (M.Sc. level, 2hrs/week, since 2018)**

Developed syllabus and overall course structure.

TU München

**Advanced Stochastic Finite Element Methods (M.Sc. level, 3hrs/week, 2015-2018)**

Developed syllabus and overall course structure.

TU München

**Structural Reliability Methods (M.Sc. level, 2hrs/week, with Prof. Straub, since 2014)**

Collaborated on course development (50%).

Last evaluation: 1.2 (evaluations are made at a scale of 1 to 5, where 1 is best)

TU München

**Stochastic Finite Element Methods (M.Sc. level, 3hrs/week, 2011-2017; merged with ASFEM, 5hrs/week, since 2018)**

Developed syllabus and overall course structure.

Average evaluation: 1.7 (evaluations are made at a scale of 1 to 5, where 1 is best)

TU München

**Engineering Data Analysis with Matlab (B.Sc. level, 2hrs/week, 2012-2014)**

Developed syllabus and overall course structure.

Last evaluation: 1.5 (evaluations are made at a scale of 1 to 5, where 1 is best)

TU München

**Risk Analysis 2: Decisions, optimization and management (M.Sc. level, 3hrs/week, 2011)**

Teaching assistant.

TU München

**Introduction to Programming in C/C++ (M.Sc. level, 1.5hrs/week, 2009)**

Collaborated on course development based on material from previous years (50%).

## OTHER COURSES

Structural Reliability Analysis. Kielce University of Technology, Poland (4-day course, October 2021)

## COURSES FOR INDUSTRY

Uncertainty and Reliability in Engineering. Munich, Germany, (2-day course, with Dr. Wolfgang Betz and Prof. Daniel Straub, December/March 2019)

## LECTURES AT SUMMER SCHOOLS

Subset Simulation/Bayesian Updating. French-German Summer School on Modeling and Numerical Methods for Uncertainty Quantification, Porquerolles, France, 2019.

## TEACHING CERTIFICATION

Teaching Skills, ProLehre, TUM. 40 TU course covering presentation skills, didactics and teaching methodology.

## SUPERVISION OF PH.D. PROJECTS

Orestis Zinas: A hierarchical probabilistic ground modelling approach for offshore wind farms (since 2022, with Ronald Schneider and Pablo Cuéllar, Federal Institute for Materials Research and Testing)

Jianpeng Chan: Reliability analysis of network systems (since 2019, with Prof. Daniel Straub)

Felix Schneider: Uncertainty quantification of structural dynamics systems (since 2018, with Prof. Gerhard Müller, TUM Chair of Structural Mechanics)

Fabian Wagner: On efficient methods and error bounds for rare event estimation (2018-2021, with Prof. Elisabeth Ullmann, TUM Chair of Numerical Mathematics)

Barbara Carrera: Simulation-based methods for estimation of groundwater flow parameters (since 2017, with Dr. Chin Man Mok, GSI Environmental)

Max Ehre: Towards a separation of epistemic and aleatory uncertainties in reliability and Bayesian inference (2017-2022, with Prof. Daniel Straub)

Sebastian Geyer: Reliability assessment of spatially variable properties with monitoring data (since 2016, with Prof. Daniel Straub)

Felipe Uribe: Bayesian updating of engineering models with spatially variable properties (2016-2020, with Prof. Daniel Straub)

Wolfgang Betz: Bayesian updating of finite element models (2012-2017, with Prof. Daniel Straub)

Ji Yuan: Time dependent probabilistic assessment of rainfall induced slope failure (2012-2016, with Prof. Daniel Straub)

#### EXTERNAL REFEREE OF PH.D. PROJECTS

Mark van der Krogt: Reliability analysis of dikes (2022, TU Delft, advisors: Matthijs Kok and Timo Schweckendiek)

Chenxiao Song: Monte Carlo variance reduction methods with applications to structural reliability analysis (2022, University of Sydney, advisor: Ray Kawai)

#### INTERNATIONAL EXPERIENCE

University of Thessaly (Prof. Costas Papadimitriou)

**Visiting researcher, October 2013**

Research on efficient reliability analysis in high dimensions

National University of Singapore (NUS) (Prof. CM Wang)

**Visiting researcher, April 2011**

Research on stochastic analysis of very large floating structures

University of California, Berkeley (Prof. Armen Der Kiureghian)

**Visiting researcher, January-April 2010**

Research on discretization of random fields and reliability-based design of geotechnical structures

## EDITORIAL BOARD MEMBER

Georisk, Taylor & Francis (since 2021)

Structural Safety, Elsevier (since 2021)

## REVIEW ACTIVITIES

Reviewed journal articles for:

Advances in Water Resources, Applied Mathematical Modelling, ASCE-ASME Journal of Risk and Uncertainty Analysis, ASCE Journal of Engineering Mechanics, ASCE Journal of Geotechnical and Geoenvironmental Engineering, ASCE Journal of Structural Engineering, Canadian Geotechnical Journal, Computers and Geotechnics, Computers and Mathematics with Applications, Computer Methods in Applied Mechanics and Engineering, Engineering Geology, Engineering Structures, Engineering with Computers, Georisk, Geotechnical and Geological Engineering, Géotechnique, IAEG Bulletin of Engineering Geology and the Environment, International Journal for Numerical Methods in Engineering, International Journal for Uncertainty Quantification, International Journal of Computational Methods, Inverse Problems in Science & Engineering, ISSMGE International Journal of Geoenvironmental Case Histories, Journal of Computational Physics, Mechanical Systems and Signal Processing, Probabilistic Engineering Mechanics, Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, Reliability Engineering and System Safety, Simulation Modeling Practice and Theory, SIAM/ASA Journal of Uncertainty Quantification, SIAM Journal on Scientific Computing, Soils and Foundations, Stochastic Environmental Research and Risk Assessment, Structural and Multidisciplinary Optimization, Structure and Infrastructure Engineering, Structural Safety, Tunneling and Underground Space Technology.

Reviewed research proposals for:

German Science Foundation (DFG)

Dutch Research Council (NWO)

Alexander von Humboldt Foundation

Reviewed book proposals for:

IOPscience

## MEMBERSHIPS

DGGT WG2.15 on Geotechnical Reliability Methods (since 2022)

German Geotechnical Society (DGGT) (since 2018)

ISSMGE TC304 on Engineering Practice of Risk Assessment and Management (since 2018)

Geotechnical Safety Network (Secretary 2011-2017, Executive Board Member 2017-2022)

GAMM activity group on Uncertainty Quantification (since 2012)

IFIP WG7.5 on Reliability and Optimization of Structural Systems (since 2012)

TUM International Graduate School of Science and Engineering (IGSSE) (2007-2012 and since 2016)

Elite Network of Bavaria (2005-2007)

Technical Chamber of Greece (since 2005)

## ORGANIZED CONFERENCES/EVENTS

Geo-Risk 2023, Specialty Conference of the Geo-Institute of ASCE, Arlington, Virginia, 2023, Member of the Program Committee.

SIAM Conference on Uncertainty Quantification, Munich, 2020. Member of the local conference organizers – Conference cancelled due to Covid19.

Workshop on Data Analytics in Geotechnical Engineering, TU München, 2019. Main organizer with D. Straub and KK Phoon.

Frontiers of Uncertainty Quantification in Engineering, Munich, 2017. Workshop under the support of the GAMM Activity Group on UQ. Main organizer together with E. Ullmann.

## ORGANIZED CONFERENCE SESSIONS

Special Session on Bayesian Analysis of Geotechnical Data. 8th International Symposium on Geotechnical Safety and Risk, Newcastle, Australia, 2022. Co-organizer with Z. Cao and D. Straub.

Mini Symposium on Decision Making under Uncertainty. 13th International Conference on Structural Safety and Reliability, Shanghai, China, 2022. (online) Co-organizer with D. Straub, K. Papakonstantinou and M. Pozzi.

Mini Symposium on Bayesian Analysis of Structural and Geotechnical Models. 13th International Conference on Structural Safety and Reliability, Shanghai, China, 2022. (online) Co-organizer with C. Papadimitriou, D. Straub and J. Zhang.

Mini Symposium on Reliability Analysis and Rare Event Simulation. ECCOMAS Congress 2022 – 8th International Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, 2022. Co-organizer with M. Ehre, E. Patelli, B. Sudret and D. Straub.

Mini Symposium on Bayesian Inference of Engineering Models: Advances in Theory and Applications. ECCOMAS Congress 2022 – 8th International Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, 2022. Co-organizer with O. Kanjilal, C. Papadimitriou, G. Lombaert and D. Straub.

Mini Symposium on Theory and Estimation of Failure Probabilities and Rare Events. SIAM Conference on Uncertainty Quantification, Atlanta, Georgia, 2022. Co-organizer with M. Ehre and E. Ullmann.

Mini Symposium on Bayesian Updating, Filtering and Inversion for Dynamic Systems. 11th International Conference on Structural Dynamics, EUROLYN 2020, Athens, Greece, 2020. Co-organizer with J. Beck and A. Taflanidis.

Special Session on Bayesian Updating: Formalizing the Observational Method. 7th International Symposium on Geotechnical Safety and Risk, Taipei, Taiwan, 2019. Co-organizer with J. Spross and D. Straub.

Mini Symposium on Bayesian Analysis of Numerical Models. 3rd International Conference on Uncertainty Quantification in Computational Sciences and Engineering, Crete, Greece, 2019. Co-organizer with D. Straub and C. Papadimitriou.

Mini Symposium on Bayesian Analysis of Numerical Models. 13th International Conference on Applications of Statistics and Probability in Civil Engineering, Seoul, South Korea, 2019. Co-organizer with D. Straub and C. Papadimitriou.

Mini Symposium on Theory and Estimation of Failure Probabilities and Rare Events. SIAM Conference on Uncertainty Quantification, Garden Grove, California, 2018. Co-organizer with E. Ullmann and M. Shields.

Mini Symposium on Bayesian Analysis of Numerical Models. 2nd International Conference on Uncertainty Quantification in Computational Sciences and Engineering, Rhodes, Greece, 2017. Co-organizer with D. Straub and C. Papadimitriou.

Session on Uncertainty Relating to Geotechnical Properties, Models and Testing Methods. 6th International Symposium on Geotechnical Safety and Risk/Geo-Risk 2017, Denver, Colorado, 2017. Main organizer.

Mini Symposium on Theory and Estimation of Failure Probabilities and Rare Events. SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, 2016. Co-organizer with E. Ullmann.

Mini Symposium on Bayesian Analysis of Numerical Models. 1st International Conference on Uncertainty Quantification in Computational Sciences and Engineering, Crete, Greece, 2015. Co-organizer with D. Straub and C. Papadimitriou.

Special Session on Reliability- and Risk-Based Monitoring and Site Investigation. 4th International Symposium on Geotechnical Safety and Risk, Hong Kong, 2013. Co-organizer with T. Schweckendiek and D. Straub.

Mini Symposium on Treatment of Spatial Variability in Reliability and Probabilistic Assessment. 11th International Conference on Structural Safety and Reliability, New York, United States, 2013. Co-organizer with K.K. Phoon.

## SELECTED INVITED TALKS

“Recent trends in structural reliability analysis.” Keynote lecture, Selected Issues in Building Structural Design, Kielce, Poland, July 14, 2022.

“Reliability sensitivity analysis with dependent inputs.” Invited lecture, MASCOT-NUM, Clermont Ferrand, France, June 8, 2022.

“Reliability sensitivity analysis with FORM.” Invited lecture, UQSay Seminar Series, Paris Saclay, July 1, 2021.

“Revisiting the generic multivariate distribution model for probabilistic prediction of soil properties.” TC304 spotlight lecture, TC304 Engineering Practice of Risk Assessment and Management, online meeting, February 24, 2021.

“Sequential sampling methods for rare event estimation.” Invited lecture, Aerospace Computational Design Laboratory, Massachusetts Institute of Technology, November 1, 2018.

“Sequential sampling approaches for reliability assessment.” Invited lecture, Workshop on Computational Challenges in the Reliability Assessment of Engineering Structures, Delft, January 24, 2018.

“Sequential methods for rare event estimation and Bayesian learning.” Keynote lecture, ECOMMAS Thematic Conference on Computational Modeling of Multi-Uncertainty and Multi-Scale Problems, Porto, September 13, 2017.

“Sequential sampling approaches for structural reliability.” Invited lecture, Institute of Structural Engineering, ETH Zurich, December 8, 2016.

“Learning soil parameters and updating geotechnical reliability under spatial variability.” Invited lecture, Department of Civil and Environmental Engineering, Carnegie Mellon University, April 25, 2016.

“Improved reliability assessment of geotechnical constructions by combining models with observations.” Invited lecture, 7. Stuttgarter Geotechnik-Symposium, September 29, 2011.

#### SELECTED INDUSTRIAL PROJECTS

Predictive maintenance of gas networks. Client: NetzeBW, Germany, 2020.

Predictive machine learning modeling of ship performance degradation. Client: Jotun, Norway, 2019-2020.

Reliability analysis of a concept design for the Sulafjorden submerged floating tube bridge. Client: Olav Olsen, Norway, 2016-2017.

Review of approach for reliability updating of slope stability of dikes. Client: Rijkswaterstaat, The Netherlands, 2016.

Development of a software tool for optimization of pipelaying process for the Amazon vessel. Client: Ceona Offshore, UK, 2015.

Assessment of distributions of geotechnical parameters for reliability analysis of transmission tower foundations. Client: Kina Engineering, Germany, 2013-2017.

Development of a software tool (Extreme) for extreme value analysis of data from fluid-structure interaction simulations. Client: SL Rasch, Germany, 2012.

#### RESEARCH PROJECTS AS PRINCIPAL INVESTIGATOR

Uncertainty quantification and global reliability evaluation of complex concrete structures. Co-PI (with Prof. Daniel Straub and Prof. Jianbing Chen). Chinese-German Mobility Grant. Funded by the Sino-German Center for Research Promotion. 2022-2025.



RELERT – Reliability analysis of quick clay landslide integrating innovative geophysical site investigation. Funding for access to the NGI test site facilities. Group leader of User Group. Funded by the GEOLAB Project as part of the EU H2020 Program. 2022.

Bayesian multilevel uncertainty quantification for enhanced reliability assessment and decision support. Co-PI (with Prof. Daniel Straub). Funded by the German Science Foundation (DFG). 2020-2023.

Integration of reliability and sensitivity assessment with data assimilation for improved decision support. Co-PI (with Prof. Daniel Straub). Funded by the German Science Foundation (DFG) as part of SPP 1866. 2016-2019.

BAYES – Bayesian updating of engineering models with spatially variable properties. Co-PI (with Prof. Daniel Straub and Prof. Elisabeth Ullmann). Funded by the TUM International Graduate School of Science and Engineering. 2016-2019.

## RESEARCH PROJECTS AS CONTRIBUTOR

A hierarchical probabilistic ground modelling approach for offshore wind farms. Contributed as co-project manager. Funded by the German Federal Institute for Materials Research and Testing. 2022-2025.

Value of information in structural health monitoring. Contributed as advisor. Funded by the TUM Institute of Advanced Studies. 2019-2022

Dynamic reliability updating and sensitivity analysis of structures using Monte Carlo simulation methods. Contributed in the proposal and as co-project manager. Funded by the Alexander von Humboldt Foundation. 2019-2021.

Hydraulic tomography with simulation-based methods. Project management. Funded by GSI Environmental. 2017-2020.

Reliability of hydraulic structures considering spatial variability. Co-Project Manager (with Prof. Daniel Straub). Funded by BAW – Federal Waterways Engineering and Research Institute. 2017-2020.

Reliability sensitivity analysis of dynamic models. Contributed in the proposal and as co-project manager. Funded by the Alexander von Humboldt Foundation. 2017-2018.

Material characterization of additively manufactured metal porous parts. Contributed as advisor in the stochastic modeling. Funded by Siemens AG, Corporate Technology. 2016-2019.

Smart watershed operation and risk management using Bayesian methods. Co-Project Management. Funded by the TUM Institute of Advanced Studies. 2012-2015.

## SUMMARY OF SCIENTIFIC OUTPUT

61 refereed journal papers; 2 book chapters; 56 refereed conference papers  
h-index 24; i10-index 43; [Full list of publications](#); [Google scholar profile](#)