

DR. ENG. ROBERTO ROCCHETTA

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OVERVIEW

Dr Eng. Roberto Rocchetta is a post-doctoral researcher involved in collaborative research effort between Philips research centre and the technical university of Eindhoven. Roberto holds a master of science in *energy engineering* from the university of Bologna (IT), a master of research in *decision-making under risk and uncertainty*, and a PhD in *resilience of networked engineering systems* and data science from the University of Liverpool (UK). His research primarily focuses on the development of mathematical frameworks for: i) the quantification of uncertainty arising from lack of data and imprecision, ii) the reliability/resilience assessment and optimization of engineering system designs, iii) predictive maintenance and maintenance decision-making and iv) high-fidelity digital twins modelling by combining machine learning models, theoretically guaranteed generalization bounds and physics-based modelling. Before joining TU/e, Roberto worked in the USA as a Research Scholar (postdoc) involved in a collaborative project with the National Institute of Aerospace (NIA) and NASA Langley. During his PhD Roberto focused on smart, resilient and sustainable power grids and developed new methods to model, analyse and optimize complex systems and critical infrastructures. Please refer to the publication listed and the personal web pages for more details.

WORK EXPERIENCE, VISITING AND INTERSHIPS

Postdoc , TU/e and Philips Electronics, Eindhoven, NL	15-01-2019	Present
Research Scholar , NIA and NASA Langley, Hampton, VA, USA	15-01-2019	15-10-2019
Internship , ARAMIS srl, Milan, IT	2017	6 months
Visiting student , Energy Science Center ETH, Zurich, SW	2017	3 months
Visiting student , Lasar group at Milano Polytechnic, Milan, IT	2016	3 months
Master thesis , Ecole Centrale de Paris, Paris, FR	2013	6 months

EDUCATION

Ph.D. at Institute for Risk and Uncertainty, University of Liverpool, UK	2015-2018
Master of Research Decision-Making Under Risk and Uncertainty, Liverpool, UK	2014-2015
Bachelor and Master , Energy Engineering University of Bologna, IT	2008-2014

PERSONAL WEB PAGES

<https://research.tue.nl/en/persons/roberto-rocchetta>
<https://roberock.github.io/>
<https://scholar.google.com/citations?user=qMIqumgAAAAJ&hl=en>

HONOURS, AWARDS AND GRANTS

Best Score: ESREL 2020 innovation challenge on PHM in changing environments
First Prize: Mathematical Competitive Game (2017) *'From the Earth to the Moon'*
Scholarships: For a master of research and PhD supported by EPSRC and ESRC (2015-2016)
Second Prize: Mathematical Competitive Game (2016) *'Uncertainties in GPS Positioning'*
Top 3 Prize: for the best Image of Risk Competition, ESREL conference 2017, Portorz, Slovenia
Leonardo da Vinci Scholarship for Mater Thesis Abroad (2013) at Ecole Centrale de Paris
Best paper award: NAFEMS world congress 2015

PEER-REVIEWED JOURNAL PUBLICATIONS

1. R. Rocchetta, E. Patelli, "A Post-Contingency Power Flow Emulator for Generalized Probabilistic Risks Assessment of Power Grids", Reliability Engineering & System Safety, Volume 197, May 2020, 106817, <https://doi.org/10.1016/j.ress.2020.106817>
2. Roberto Rocchetta, Luis G. Crespo, Sean P. Kenny, "A scenario optimization approach to reliability-based design", Reliability Engineering & System Safety, Volume 196, 2020, <https://doi.org/10.1016/j.ress.2019.106755>
3. R. Rocchetta, M. Compare, L. Bellani, E. Patelli, E. Zio, "A Reinforcement Learning Framework for Optimal Operation and Maintenance of Power Grids", Applied Energy, Volume 241, Pp 291-301, 2019, <https://doi.org/10.1016/j.apenergy.2019.03.027>
4. R. Rocchetta, E. Patelli, E. Zio, "A Power-Flow Emulator Approach for Resilience Assessment of Repairable Power Grids subject to Weather-Induced Failures and Data Deficiency", Applied Energy, Volume 210, 15, pp 339-350, 2018, <https://doi.org/10.1016/j.apenergy.2017.10.126>
5. R. Rocchetta, E. Patelli, "Assessment of Power Grid Vulnerabilities Accounting for Stochastic Loads and Model Imprecision", International Journal for Electrical Power & Energy Systems, Volume 98, pp 219-232, 2018, <https://doi.org/10.1016/j.ijepes.2017.11.047>
6. R. Rocchetta, E. Patelli, M. Broggi, Q. Huchet, "On-Line Bayesian Model Updating for Structural Health Monitoring", Mechanical Systems and Signal Processing, Volume 103, 174 - 195, 2018, <https://doi.org/10.1016/j.ymsp.2017.10.015>.
7. R. Rocchetta, E. Patelli, M. Broggi, "Do we have enough data? Robust reliability via uncertainty quantification", Applied Mathematical Modelling, Vol-54, pp 710-721, 2018, <https://doi.org/10.1016/j.apm.2017.10.020>.
8. R. Rocchetta and Y.F. Li and E. Zio, "Risk Assessment and Risk-Cost Optimization of Distributed Generation Systems Considering Extreme Weather Conditions", Reliability Engineering and System Safety, Volume 136, pp 47 - 61, 2015, <https://doi.org/10.1016/j.ress.2014.11.013>.

PEER-REVIEWED CONFERENCE PUBLICATIONS

1. A. Gray, A. Wimbush, R. Rocchetta, M. DeAngelis, P. O. Hristov, E. Miralles-Dolz, D. Calleja, "Bayesian calibration and probability bounds analysis: solution to the Nasa 2020 UQ challenge on optimization under uncertainty", Proceedings of the 30th ESREL and the 15th PSAM Conferences, 2020. <https://www.rpsonline.com.sg/proceedings/esrel2020/pdf/5520.pdf>
2. R. Rocchetta, L. G. Crespo, "An empirical approach to reliability-based design using scenario optimization", Proceedings of the 30th ESREL and the 15th PSAM Conferences, 2020 <https://www.rpsonline.com.sg/proceedings/esrel2020/pdf/4775.pdf>
3. R. Rocchetta, M. Compare, E. Patelli, L. Bellani, E. Zio, "A reinforcement learning framework for optimisation of power grid operations and maintenance", 8th international workshop on reliable engineering computing, REC 2018, Liverpool, UK, July, 2018.
4. R. Rocchetta, E. Patelli, "Stochastic Analysis and Reliability-Cost Optimization of Distributed Generators and Air Source Heat Pumps", to be presented at the 2nd International Conference on System Reliability and Safety, ICSRS, 2017, [10.1109/ICSRS.2017.8272792](https://doi.org/10.1109/ICSRS.2017.8272792)
5. R. Rocchetta, E. Patelli, "An Efficient Framework for Reliability Assessment of Power Networks Installing Renewable Generators and Subject to Parametric P-box Uncertainty", Proceedings of the 27th ESREL conference, <https://www.taylorfrancis.com/books/9781315210469>
6. R. Rocchetta, E. Patelli, "Power Grid Robustness to Severe Failures: Topological and Flow Based Metrics Comparison", European Congress on Computational Methods in Applied Sciences and Engineering, ECCOMAS, Crete 2016, pp. 6121-6135.
7. R. Rocchetta, E. Patelli, M. Broggi, Q. Huchet, "On Bayesian Approaches for Real-Time Crack Detection", ESREL conference proceedings, Zurich 2015, pp 1929-1936.
8. R. Rocchetta, E. Patelli, "Imprecise Probabilistic Framework for Power Grids Risk Assessment and Sensitivity Analysis", European Safety and Reliability Conference, ESREL, Glasgow 2016.
9. R. Rocchetta, E. Patelli, M. Broggi, "Efficient Epistemic-Aleatory Uncertainty Quantification: Application to the NAFEMS Challenge Problem", NAFEMS World Congress, San Diego, California, USA 21-24 June 2015.

10. R. Rocchetta, E. Patelli, "A Simulation-Based Probabilistic Risk Assessment of Electric Vehicles Control Strategies Accounting Renewable Energy Sources", International Probabilistic Workshop, IPW Liverpool, UK, 4-6 November 2015, pp. 183-198.

PAPERS UNDER REVIEW OR UNDER DEVELOPMENT (TENTATIVE TITLES)

1. R. Rocchetta, Qi Gao, Milan Petkovic, "Soft-constrained interval predictor models and epistemic reliability intervals: a new tool for uncertainty quantification with limited experimental data", (MSSP re-submitted 2021)
2. R. Rocchetta, Luis G. Crespo, "Reliability-Based Design via Soft-Constrained Scenario Optimization", (RESS re-submitted 2021)
3. Ozcel Cangul; Roberto Rocchetta,; Murat Fahrioglu, "Optimal allocation and sizing of distributed solar PV generators: Unit financial impact indicator", (to be submitted)
4. R. Rocchetta, et al. "Generalization Error Bounds for Support Vector Machines: A Comparative Study", (work in progress)
5. R. Rocchetta, et al. "Scenario theoretic bounds for Extreme Learning Machines: application to reliability-based sequential decision-making", (work in progress)
6. R. Rocchetta, et al. "Generalization Error Bounds for Soft-constrained Convex Optimization Programs: application to Interval Predictor Models", (ICCOSAR 2022 submitted)
7. R. Rocchetta, et al. "An extended solution to the NASA 2020 UQ challenge: design optimization and uncertainty calibration under mixed sources of aleatory and epistemic uncertainty", (MSSP submitted to the NASA UQ special issue 2021)

LANGUAGE

Italian	Mother tongue
English (IELTS & Cambridge Certificates)	Working proficiency
Dutch	Just started (A0)
Spanish	Basic conversational skills (A2-B1)
French	Basic conversational skills (A2-B1)

SOFTWARE KNOWLEDGE

- **Data analysis, simulation and modelling:** MATLAB Python, Julia, R studio.
- **Data based and storage:** Vertica, SQL.
- **Energy systems and multi-physics simulation:** MatPower, COMSOL Multiphysics.
- **Writing, Visualization, Editing:** LaTeX, JabRef, Mendely, Office, Slack, Inkscape.

KEY WORDS AND RESEARCH INTERESTS

Design optimization under lack of data, Grids Reliability, Resilience, Vulnerability and Risk, Probability theory, Complex systems and Networks, Stochastic Optimization, Machine Learning, Generalization error bounds; Uncertainty Quantification; Energy Systems.

ACADEMIC NETWORK AND REFEREES

1. **Prof. Edoardo Patelli**, Strathclyde university, former Ph.D, supervisor edoardo.patelli@strath.ac.uk
2. **Dr. Luis G. Crespo**, former advisor at NASA Langley Research Center, luis.g.crespo@nasa.gov
3. **Prof. Milan Petkovic**, project coordinator at TU/e and Philips, m.petkovic@tue.nl
4. **Prof. Enrico Zio**, Polytechnic Milan and Mines ParisTech, enrico.zio@polimi.it
5. **Prof. Giovanni Sansavini**, ETH Zurich, sansavini@ethz.ch
6. **Prof. Michael Beer**, Leibniz University Hannover, beer@bauinf.uni-hannover.de