DR. -ING. ROBERTO ROCCHETTA

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OVERVIEW

Dr. Roberto Rocchetta currently works at University of Applied Sciences and Arts of Southern Switzerland within the Intelligent energy systems group (SUPSI-DACD-ISAAC). Before joining SUPSI, he worked at TU/Eindhoven in the department of mathematics and computer science, industrial statistics, and statistics and operational research cluster and at the National Institute of Aerospace (NIA) in collaboration with the NASA Langley Research Centre. Rocchetta received his **Ph.D. reliability engineering** and **Master of Research in Decision-making Under Risk and Uncertainty** from the University of Liverpool and a **Master in Energy engineering** awarded by the University of Bologna. Rocchetta's research lay in the intersection between reliability theory, statistics, machine learning, and energy engineering. He joined serval collaborative projects with international recognized industrial and academic groups such as Philips, ETH Zurich, Signify, ARAMIS Srl, Politecnico di Milano. Rocchetta is the author of more than **30 peer-reviewed** dissemination documents, of which 13 are high-impact publications in prestigious international journals. His research generated a notable impact within the research community reliability engineering and uncertainty quantification and analysis community and gathered **more than 600 citations** with an **h-index of 11 and steadily growing**. Rocchetta is a recognized expert in **the simulation of interconnected systems and networks,** vulnerability risk and resilience assessments, survival analysis, and reliability theory. He also has a deep knowledge of **probability and statistical learning theory, stochastic optimization, and machine learning**. Recently, he focused on new statistical models for microelectronics components degradation paths, damage identification, and classification for multi-physics systems. More in general, he is interested in theoretical/foundational studies and algorithmic/methodological developments for a variety of topics, such as decision-making under risk and uncertainty, prognostics & health management with robust/explainable AI models, statistical models for survival analysis and stochastic methods for the optimization of engineering components, systems, and networks. Please refer to the publications and personal web pages for additional details. **The research and expertise of Dr. Rocchetta are highly multidisciplinary**, and this greatly **facilitates the cross-fertilization of ideas**, it generates interesting synergies within the department and supports knowledge transfer between partners.

WORK EXPERIENCES, VISITING, AND INTERNSHIPS

Researcher, SUPSI-DACD, CH. Intelligent energy systems group. *Focus on stochastic optimization and Reinforcement learning for electric mobility & distributed energy resources.*	1-10-2022	Present
Postdoc, TU/Eindhoven & Signify, Department for mathematics and computer science, Statistics, NL. *Focus on LEDs reliability, survival analysis, and design of experiments.*	1-09-2021	1-10-2022
Postdoc, TU/Eindhoven & Philips, Security, NL. *AI and ML for MRI maintenance optimization.*	15-10-2019	1-09-2021
Research Scholar, NIA, and NASA Langley, VA, USA. D*ata-driven reliability optimization.*	15-01-2019	15-10-2019
Internship, ARAMIS srl, Milan, IT. O*n Reinforcement Learning for maintenance optimization.*	2017/2018	6 months
Visiting Ph.D. Energy Science Center ETH, Zurich, CH.	2017	2 months
Visiting Ph.D. Laboratory of signal and risk analysis, Milan Polytechnic, IT	2016/17	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	2015-2018/19
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 GRANTS AND RESEARCH PROJECTS

- **PROPER-GRIDs,** Value: 300 [kCHF], (2023-2024) under review at the SFOE.
- **Personal fellowship grant Alexander von Humboldt**, (2022) Value: 60 [k€].
- **Collaborative grant for the** Eureka AI call (2022-2025), DAIsy project Value 4 [M€].
- **Postdoctoral grant,** within the project Daytime ITEA-3 (2019-2022), grant 17030, Project Value: 11 [M€]
- **Scholarship grant** Master of research and Ph.D. (2015-2019), Liverpool, EPSRC and ESRC Centre for Doctoral Grant No. (EP/L015927/1) Project Value 4,156 [k£]
- **Scholarship:** Mater Thesis Abroad (2012/2013), at Ecole Centrale de Paris, Project Value: 3.1 [k€]

PEER-REVIEWED JOURNAL PUBLICATIONS

[1] **Roberto Rocchetta**, Qi Gao, Dimitrios Mavroeidis, Milan Petkovic, *"A robust model selection framework for fault detection and system health monitoring with limited failure examples: Heterogeneous data fusion and formal sensitivity bounds"*, Engineering Applications of Artificial Intelligence, Vol 114, 2022, 105140, https://doi.org/10.1016/j.engappai.2022.105140 **IF: 7.80, Citations: 3**

[2] **Roberto Rocchetta**, *"Enhancing the resilience of critical infrastructures: a statistical analysis on spectral clustering and vulnerability metrics for power networks"*, RSER, Vol 159, 2022, https://doi.org/10.1016/j.rser.2022.112185 **IF: 16.79, Citations: 8**

[3] W. Zhao, C. Dang, **R. Rocchetta**, M. Valdebenito, D. Moens, *"Enriching stochastic model updating: An eff10cient Bayesian approach using the Bray-Curtis distance and an adaptive binning algorithm"*, MSSP, 2022, https://doi.org/10.1016/j.ymssp.2022.108889, **IF: 8.93, Citations: 1**

[4] A. Gray, A. Wimbush, M. De Angelis, P. O. Hristov, E. Miralles-Dolz, D. Calleja, **R. Rocchetta**, *"From inference to design: A comprehensive framework for uncertainty quantification in engineering with limited information"*, MSSP, Vol 165, 2022, 108210, https://doi.org/10.1016/j.ymssp.2021.108210 **IF: 8.93, Citations: 23**

[5] **R. Rocchetta**, *Luis G. Crespo, "A scenario optimization approach to reliability-based and risk-based design: soft-constrained modulation of failure probability bounds"*, RESS, 2021, https://doi.org/10.1016/j.ress.2021.107900 **IF: 7.24, Citations: 20**

[6] **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, Vol 161, 2021, https://doi.org/10.1016/j.ymssp.2021.107973 **IF: 8.93, Citations: 6**

[7] **R. Rocchetta**, E. Patelli, *"A Post-Contingency Power Flow Emulator for Generalized Probabilistic Risks Assessment of Power Grids"*, RESS, Vol 197, May 2020, 106817, https://doi.org/10.1016/j.ress.2020.106817 **IF: 7.24, Citations: 14**

[8] **R. Rocchetta**, Luis G. Crespo, Sean P. Kenny, *"A scenario optimization approach to reliability-based design"*, RESS, Vol 196, 2020, https://doi.org/10.1016/j.ress.2019.106755 **IF: 7.24, Citations: 18**

[9] **R. Rocchetta**, et al., *"A Reinforcement Learning Framework for Optimal Operation and Maintenance of Power Grids"*, Applied Energy, Vol 241, Pp 291-301, 2019, https://doi.org/10.1016/j.apenergy.2019.03.027 **IF: 11.44, Citations: 150**

[10] **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, Vol 210, pp 339-350, 2018, https://doi.org/10.1016/j.apenergy.2017.10.126 **IF: 11.44, Citations: 75**

[11] **R. Rocchetta**, E. Patelli, *"Assessment of Power Grid Vulnerabilities Accounting for Stochastic Loads and Model Imprecision"*, IJEPES, Vol 98, pp 219-232, 2018, https://doi.org/10.1016/j.ijepes.2017.11.047 **IF: 5.65, Citations: 48**

[12] **R. Rocchetta**, E. Patelli, M. Broggi, Q. Huchet, *"On-Line Bayesian Model Updating for Structural Health Monitoring"*, MSSP, Vol 103, 174 - 195, 2018, https://doi.org/10.1016/j.ymssp.2017.10.015 **IF: 8.93, Citations: 95**

[13] **R. Rocchetta**, E. Patelli, M. Broggi, *"Do we have enough data? Robust reliability via uncertainty quantification"*, Applied Mathematical Modelling, Volume 54, pp 710-721, 2018, https://doi.org/10.1016/j.apm.2017.10.020 **IF: 5.33, Citations: 33**

[14] **R. Rocchetta**, Y.F. Li and E. Zio, *"Risk Assessment and Risk-Cost Optimization of Distributed Generation Systems Considering Extreme Weather Conditions"*, RESS, Vol 136, pp 47 - 61, 2015, https://doi.org/10.1016/j.ress.2014.11.013 **IF: 7.24, Citations: 102**

PEER-REVIEWED CONFERENCE PUBLICATIONS

[1] **R. Rocchetta**, Z. Zhao, A. Di Bucchianico, *"Prediction of the Luminous Flux Degradation of Light Emitting Diodes with an Interval Regressions Model "*, ESREL 2022 *link*

[2] Wang, Chenxing, Lechang Yang, **R. Rocchetta**, *"Bayesian Information Fusion for Imprecise Probabilistic Models with Different Types of Information."* 3rd International Conference on System Reliability and Safety Engineering (SRSE). IEEE, 2021.

[3] **R. Rocchetta**, *"New probabilistic guarantees on the accuracy of Extreme Learning Machines: an application to decision-making in a reliability context"*, ESREL conference, September 2021 link

[4] M. De Angelis, **R. Rocchetta**, A. Gray, S. Ferson, *"Constructing consonant predictive beliefs from data with scenario theory"*, International Symposium on Imprecise Probabilities ISIPTA: Theories and Applications, *July 2021 link*

[5] A. Gray, A. Wimbush, **R. Rocchetta**, M. De Angelis, 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"*, ESREL-PSAM Conferences, 2020 link

[6] **R. Rocchetta**, M. Petkovic, Q. Gao, *"Scenario-based Generalization bound for Anomaly Detection Support Vector Machine Ensembles"*, Proceedings of the 30th ESREL and the 15th PSAM Conferences, 2020 link

[7] **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 link

[8] **R. Rocchetta**, L. G. Crespo, S. P Kenny *"Solution of the benchmark control problem by scenario optimization"* ASME 2019 Dynamic Systems and Control Conference, DSCC , link

[9] E. Patelli, S. Tolo, H. George-Williams, J. Sadeghi, **R. Rocchetta**, M. de Angelis, M. Broggi *"OpenCossan 2.0: an efficient computational toolbox for risk, reliability and resilience analysis"*, Proceedings of the joint ICVRAM ISUMA UNCERTAINTIES conference, 2018. link

[10] **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, Jully, 2018. link

[11] **R. Rocchetta**, E. Patelli, *"Stochastic Analysis and Reliability-Cost Optimization of Distributed Generators and Air Source Heat Pumps"*, International Conference on System Reliability and Safety, ICSRS, 2017, link

[12] **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, link

[13] **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. link

[14] **R. Rocchetta**, E. Patelli, M. Broggi, Q. Huchet, *"On Bayesian Approaches for Real-Time Crack Detection"*, ESREL conference proceedings, Zurich 2015, pp 1929-1936. link

[15] **R. Rocchetta**, E. Patelli, *"Imprecise Probabilistic Framework for Power Grids Risk Assessment and Sensitivity Analysis"*, European Safety and Reliability Conference, ESREL, Glasgow 2016.

[16] **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. link

[17] **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.

WORKING PAPERS

[1] P. Dersin and R. Rocchetta, "*Confidence interval for RUL: a new approach based on time transformation and reliability theory*", extended abstract submitted to ESREL 2023

[2] R. Rocchetta, S. Basso, L. Nespoli, M. Derboni, V. Medici, M. Salani, "*Rule-based deep reinforcement learning for optimal control of electrical batteries in an energy community*", full paper submitted to ESREL 2023

[3] O. Cangul; R. Rocchetta, E. Patelli, M. Fahrioglu, "*A novel metric for the optimal allocation and sizing of decentralized solar PV2generators: unit financial impact indicator*", submitted to journal.

[4] O. Cangul; R. Rocchetta, E. Patelli, M. Fahrioglu, "*Assessing the sustainability and safety integration of photovoltaic generators and energy storage systems in electric power grids*", submitted to journal.

[5] Roberto Rocchetta, Zhouzhao Zhana, Willem Dirk van Drielb, Alessandro Di Bucchianico, "*Uncertainty analysis and interval prediction of LEDs lumen maintenance*" Under review RESS

[6] E. Congeduti, R. Rocchetta, F. A. Oliehoek, "Influence Learning in Complex Systems". Under review as submission to TMLR journal.

[7] R. Rocchetta, E. Perrone, A. Di Bucchianico, P. Dersin, "*A survey on optimal accelerated testing for LED reliability assessment*", in preparation

[8] Proceedings for the Study Group Mathematics with Industry 2022, *Personalised Health Monitoring for Early Disease Detection*

HONOURS AND AWARDS

- **Job offers**, research position on "*Power grid cascading simulation*", at the Luxembourg research institute LIST.
- **Postdoc Research Fellowship,** "*Alexander von Humboldt foundation*", kindly declined due to other job offers.
- **Postdoctoral job offers,** "*Uncertainty in AI*", at Oxford Brookes and TU/Delft with topic.
- **Best poster award,** 3rd place at the ISIPTA conference 2021.
- **Best paper award,** the top 10 at the *"Postdoctoral award ceremony",* TU/Eindhoven internal prize.
- **Best score,** at the innovation challenge "*Health management in changing environments*", ESREL conference 2020.
- **Best image of risk**, 3rd place at the best *Image of Risk Competition*, ESREL conference 2017, Portoroz, Slovenia
- **First prize,** "An *MC approach to compute the success probability of sending objects to the Moon*", Math. Competitive Game 2016.
- **Second prize,** "*Uncertainties in GPS Positioning*", Math. Competitive Game 2016.
- **Presentation award:** best presentation (co-author) at the NAFEMS world congress 2015.

THESIS

- **R. Rocchetta**, "*Computational Frameworks for Power Grid Reliability, Vulnerability and Resilience Analysis*", PhD thesis, University of Liverpool. link to publication
- **R. Rocchetta**, "*Robust Probabilistic Risk/Safety Analysis of Complex Systems and Critical Infrastructures*", MRes, link to publication

TEACHING AND SUPERVISION

- ***Teacher/Tutoring:*** *Survival and Reliability Analysis (TU/Eindhoven, Bachelor program, 2021)*
- ***Master Student***: *van der Putten, J. J. 2021 "Data mining in ECG data to predict patient deterioration in low resource settings* link to thesis
- ***Master Student***: *Coverage of lifetime confidence bounds for highly censored, and few Weibull distributed data, Jongerius, S. C. (Author). 31 Aug 2022,* link to thesis

OTHER PROFESSIONAL ACTIVITIES (SEMINAR, KEYNOTE, EDITORIAL WORK)

- Invited keynote session ICSRS 2023
- Invited keynote session ICSRS 2022
- Invited speaker: Julia-reach and Julia Interval workshop (12/2021) youtube link 1   youtube link 2
- Topic Board Editor for the journal Mathematics, MDPI
- Session Chair: uncertain systems and robustness at the DSCC 2019, Grand Summit Hotel, Park City, Utah, USA
- Seminar Accounting for Uncertainty Caused by Lack of Data and Conflicting Knowledge. Robust Reliability via Uncertainty Quantification, National Institute for aerospace (NIA), Hampton, Virginia, USA
- Technical committee, International Workshop on Reliable Engineering Computing 2018 Liverpool, UK
- Poster: COSSAN X software for uncertainty quantification, international conference SIAM UQ 2016, EPFL Lausanne
- Reviewer for NOW micro grants (Dutch research council)
- Reviewer for the journal "Applied Energy and International Journal of Electrical Power & Energy Systems" (Elsevier)
- Reviewer for the journals "Reliability Engineering and System Safety", "Mechanical Systems and Signal Processing", (Elsevier)
- Reviewer for the journals "Engineering Reports", "Risk analysis", and "IET Generation, Transmission & Distribution" (Wiley)
- Reviewer for the journal "Mathematics" and "Energies" (MDPI)
- Reviewer of the "ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems" (ASCE)
- European Safety and Reliability Association, Newsletter ESRA September 2019

ACADEMIC NETWORK, ADVISORS AND REFEREES (SELECTED)

1. **Prof. Vasco Medici, Dr. Lorenzo Nespoli**, SUPSI, collaborators vasco.medici@supsi.ch
2. **Prof. Dr. Alessandro Di Bucchianico**, TU/Einghoven, postdoc collaborator a.d.bucchianico@tue.nl
3. **Prof. Dr. Edoardo Patelli**, Strathclyde university, former Ph.D, supervisor edoardo.patelli@strath.ac.uk
4. **Dr. Luis G. Crespo,** former collaborator at NASA Langley Research Center, luis.g.crespo@nasa.gov
5. **Prof. Dr. Milan Petkovic,** project coordinator at TU/e and Philips, m.petkovic@tue.nl
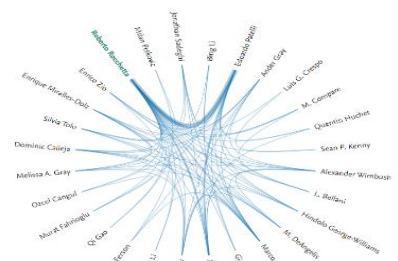
6. **Prof. Dr. Ing- Enrico Zio**, Polytechnic Milan and Mines ParisTech, enrico.zio@poilimi.it
7. **Prof. Dr. Ing- Giovanni Sansavini**, ETH Zurich, sansavig@ethz.ch
8. **Prof. Dr. Ing- Michael Beer**, Leibniz University Hannover, beer@bauinf.uni-hannover.de
9. **Prof Dr. Scott Ferson**, Chair in risk and uncertainty, Liverpool, Scott.Ferson@liverpool.ac.uk

LANGUAGE

Italian	Mother tongue
English (IELTS & Cambridge Certificates)	Working proficiency
Dutch	Just started (A1)
Spanish	Basic conversational skills (A1-A2)
French	Basic conversational skills (A1-A2)

WEB PAGES

Research Gate   GitHub Web Page   Google Scholar profile

SOFTWARE KNOWLEDGE

- **Data analysis, simulation, and modelling**: MATLAB, Python, Julia, R-Studio, VSCode, Pycharm.
- **Data base, data management**: Vertica, SQL.
- **Energy system simulation**: Matpower
- **Writing, Visualization, Editing, Management**: Notion, Slack, Overleaf, LaTeX, JabRef, Mendeley, Office, Inkscape.

KEY WORDS, RESEARCH INTERESTS

Imprecise probability theory, Uncertainty Quantification; Energy Systems, Complex and Dynamic Systems and Networks, Resilience, Reliability, Vulnerability and Risk, Stochastic Optimization, Machine Learning, Reliability Based Design, assessment of lack of data situations, Power grids, Generalization bounds; .