Piero Baraldi

1. EDUCATION

<u>UNIVERSITY</u>

2002: Laurea in Nuclear Engineering at the Polytechnic of Milan, Milan, Italy, with the final degree score of 100/100 cum laude. The dissertation thesis was entitled "*Development of fuzzy methods for classification: application to nuclear diagnostics*".

POST LAUREA STUDIES

May 2006: European PhD in 'Radiation science and engineering' at the Polytechnic of Milan, Milan, Italy. The PhD thesis was entitled "Soft computing methods for on line diagnostics of nuclear components and systems".

PARTICIPATION TO SUMMER SCHOOLS

2007: "SSARS 2007, Summer Safety & Reliability Seminars", July 22-29, Sopot, Poland.

2003: "International Summer School on Design and Evaluation of Human-System interfaces (HSIs)", August 25-29, Halden, Norway.

2003: "Advanced School and Workshop on Soft Computing and Complex Systems", June 23-27, Faculdade de Ciências e Tecnologia, Universitade de Coimbra, Portugal.

2. MAIN STEPS IN ACADEMIC CAREER

Since 2021: Full Professor at the Energy Department, Polytechnic of Milan, Milan, Italy.

2015-2021: Associate Professor at the Energy Department, Polytechnic of Milan, Milan, Italy.

2014: Italian national scientific qualification to function as full professor.

2013: Italian national scientific qualification to function as associate professor.

2008 - 2015: Assistant professor and permanent staff researcher at the Energy Department, Polytechnic of Milan, Italy.

2007 - 2008: Assistant professor at the Department of Nuclear Engineering, Polytechnic of Milan, Italy.

2006 - 2007: Postdoctoral position at the Department of Nuclear Engineering, Polytechnic of Milan, Italy.

2002 - 2003: Research grant at the Department of Nuclear Engineering, Polytechnic of Milan, Italy.

3. ACADEMIC ACTIVITY

3.1 Academic courses

3.1.1 Courses for Master of Science students at Polytechnic of Milan

Since academic year 2017/2018: Professor of the academic course "*Reliability, safety and risk analysis* A+B" (10 ECTS credits) for Master of Science students in Management, Nuclear and Energy Engineering, Polytechnic of Milan.

From academic year 2014/2015 to 2016/2017: Professor of the academic course "*Reliability, safety and risk analysis B*" (5 ECTS credits) for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

Academic years 2015/2016 and 2016/2017: Professor of the academic course "*Computational methods for reliability, availability and maintenance*" (5 ECTS credits) for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

From academic year 2011/2012 to 2013/2014: Professor of the academic course "*Nuclear power plants operation and maintenance*" (5 ECTS credits) for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

3.1.2 Other courses for Master of Science students

2020: Professor of the 15 hours course "*Predictive Maintenance of Equipment of Nuclear Power Plants*" for Nuclear and Quantum Engineering students at the Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea.

From 2012 to 2016: Professor-in-charge of the academic course (5 ECTS credits) "*Maintenance of nuclear installations*" at the international master in "Nuclear Energy" organized by University Paris Sud XI, Paristech, Supelec, Ecole Centrale Paris, CEA/INSTN in Paris, France.

Within this course, 12 hours of lectures in the academic year 2011/2012 and 15 hours of lectures in the academic years 2012/2013, 2013/2014, 2014/2015, 2015/2016.

3.1.3 Courses for PhD students

From 2016 to 2017: Co-proposer and co-professor-in-charge of the inter-doctoral PhD course *"Monte Carlo simulation methods: theory and applications to stochastic and uncertain system, structures and components"* organized by the PhD School of the Polytechnic of Milan. Within this course, 12 hours of lectures in the academic years 2015/2016 and 2016/2017

2016: Professor of the 15 hours PhD course "*Fault Prognostics of Engineering Systems*" at the University Joseph Fourier, Grenoble, France

From 2009 to 2012: Co-proposer and co-professor-in-charge of the inter-doctoral PhD course *"Monte Carlo simulation methods for the quantitative analysis of stochastic and uncertain systems"* organized by the PhD School of the Polytechnic of Milan. Within each edition of this course, 8 hours of lectures and 8 hours of exercise sessions.

3.2 Other lectures in academic courses

3.2.1 Lectures in academic courses to Master of Science students

Since 2018: 2 lectures (5 hours) in each edition of the academic course "Artificial intelligence and advanced simulation for the safety, reliability and maintenance of energy systems" for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

From 2015 to 2018: 1 lecture (3 hours) in each edition of the academic course "*Maintenance, fiabilité, TPM*" for Master of Science students in Industrial Engineering at Ecole Centrale Paris, Paris, France.

2014: 12 hours of lectures within the academic course "*Computational methods for safety and risk analysis i* + ii" for Master of Science students in Mathematical Engineering and Safety and Prevention Engineering in the Process Industry, Polytechnic of Milan.

2013: 10 hours of lectures within the academic course "*Reliability, safety and risk analysis,* A+B" for Master of Science students in Mathematical Engineering, Nuclear Engineering and Safety and Prevention Engineering in the Process Industry, Polytechnic of Milan.

From 2012 to 2014: 2 lectures (6 hours) in each edition of the academic course "*Maintenance, fiabilité, TPM*" for Master of Science students in Industrial Engineering at Ecole Centrale Paris, Paris, France.

2012: 2 lectures (5 hours) within the academic course "*Nuclear design and technology*" for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

2011: 1 lecture (4 hours) within the academic course "*Reliability, safety and risk analysis,* A+B" for Master of Science students in Nuclear, Environmental, Safety and Chemical Engineering, Polytechnic of Milan.

From 2008 to 2010: 3 lectures (10 hours) in each edition of the academic course "*Computational methods for safety and risk analysis* I + II" for Master of Science students in Nuclear, Environmental, Safety and Chemical Engineering, Polytechnic of Milan.

From 2006 to 2007: 2 lectures (7 hours) in each edition of the academic course "*Computational methods for safety and risk analysis* I + II" for Master of Science students in Nuclear, Environmental, Safety and Chemical Engineering, Polytechnic of Milan.

2004: 2 lectures (6 hours) within the course "*Nuclear plants II*" for Master of Science students in Nuclear Engineering, Polytechnic of Milan.

3.2.2 Lectures in academic courses to PhD students

2017: 14 hours of lectures within the academic course "*Advanced topics in risk and reliability analysis of energy systems*" for PhD students at the Polytechnic of Milan.

2017: 1 lecture (3 hours) at the 6th PhD School on "Vulnerability, risk and resilience of complex systems and critical infrastructures" at CentraleSupélec, Université Paris-Saclay, Paris, France organized within the T.I.M.E. programme.

2016: 1 lecture (3 hours) at the 5th PhD School on "Vulnerability, risk and resilience of complex systems and critical infrastructures" at Beihang University, Beijing, China organized within the T.I.M.E. programme.

2016: 2 lectures (4 hours) within the academic course "*Dealing with uncertainty in construction management*" for PhD students at the Polytechnic of Milan.

2016: 1 lecture (3 hours) within the academic course "*Diagnostics of machines and mechanical systems*" for PhD students at the Polytechnic of Milan.

2014: 14 hours of lectures within the academic course "Advanced Topics in Risk and Reliability Analysis of Energy Systems" for PhD students at the Polytechnic of Milan.

3.3 Lectures in continuing education courses and summer schools

From 2010 to 2021 (editions XIII-XXIII): Professor at the continuing education course "*Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment*" organized by the Energy Department, Polytechnic of Milan (2010: 11 hours; 2011: 7 hours; 2012: 4 hours; 2013-2015: 6 hours; 2016-2019: 4 hours; 2021: 12 hours)

2016: Professor (1 lecture of 3 hours).at the continuing education course "*Training in the PHM technology*" organized by the Center for Resilience and Safety of Critical Infrastructures (CRESCI), Chengdu, China.

2014: Professor (8 hours of lectures) at the summer school "Maintenance Modeling and Applications" organized for the student of the European Project "Innovation through human factors in risk analysis and management", Alghero, Italy.

2012: Professor (16 hours of lectures) at the continuing education course "Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment organized by General Electrics - Oil & Gas, Florence, Italy.

2011: Professor (8 hours of lectures) at the continuing education course "*Reliability, availability and maintainability with application in the development phases for oil & gas upstream projects*" organized by ENI Corporate University, San Donato, Milan, Italy.

2010: Professor (1 lecture of 2 hours) at the continuing education course "*Sicurezza industriale: tecniche di valutazione del rischio*" organized by Air Liquide, Milan, Italy

From 2006 to 2010 (editions I-V): Professor at the continuing education course "*Sicurezza industriale: tecniche di valutazione del rischio*" organized by the Energy Department, Polytechnic of Milan (2006: 2 hours; 2007: 6 hours; 2008 and 2009: 4 hours; 2010: 6 hours).

2009: Professor (4 hours of lectures) at the continuing education course "Quantitative Risk Assessment" organized by ENI Corporate University, San Donato, Milan, Italy.

From 2006 to 2009 (Editions IX-XII): Professor at the continuing education course "*Tecniche innovative per l'affidabilità, disponibilità, manutenzione e diagnostica di sistemi e impianti industriali*" organized by the Energy Department, Polytechnic of Milan (2006: 2 hours; 2007-2009: 4 hours).

2007: Professor (1 lecture of 4 hours) at the continuing education course "Ingegneria di manutenzione organized by CNIM (Comitato Nazionale Italiano per la Manutenzione), Bergamo, Italy.

3.4 Students opinion on teaching assignments at Polytechnic of Milan

<u>Course: Reliability, safety and risk analysis A+B" (10 ECTS credits)</u> for Master of Science students at Polytechnic of Milan. Comprehensive student evaluation of the course:

Academic Year 2020/2021: 3.6 (Average for all courses of Polytechnic of Milan: 3.1) Academic Year 2019/2020: 3.43 (Average for all courses of Polytechnic of Milan: 3.16) Academic Year 2018/2019: 3.39 (Average for all courses of Polytechnic of Milan: 3.10) Academic Year 2017/2018: 3.23 (Average for all courses of Polytechnic of Milan: 3.11)

Course: *Reliability, safety and risk analysis B* (5 ECTS credits) for Master of Science students at Polytechnic of Milan. Comprehensive student evaluation of the course:

Academic Year 2016/2017: 3.6 (Average for all courses of Polytechnic of Milan: 3.09) Academic Year 2015/2016: 3.63 (Average for all courses of Polytechnic of Milan: 3.10) Academic Year 2014/2015: 3.55 (Average for all courses of Polytechnic of Milan: 3.08) Academic Year 2013/2014: 2.67 (Average for all courses of Polytechnic of Milan: 3.06)



Figure 1: Students evaluations of the Course "Reliability, safety and risk analysis B" (5 ECTS credits) in the academic years 2013-14, 2014-15, 2015/16, 2016/17 and "Reliability, safety and risk analysis A+B" (10 ECTS credits) in the academic years 2017/18, 2018/2019, 2019/2020.

<u>Course: Computational methods for reliability, availability and maintenance (5 ECTS credits)</u> for Master of Science students at Polytechnic of Milan. Comprehensive student evaluation of the course:

Academic Year 2016/2017: 3.60 (Average for all courses of Polytechnic of Milan: 3.09) Academic Year 2015/2016: 4.00 (Average for all courses of Polytechnic of Milan: 3.10)

Course: Nuclear power plants operation and maintenance for Master of Science students at Polytechnic of Milan). Comprehensive student evaluation of the course:

Academic Years 2012/2013 and 2013/2014: Not available due to insufficient number of responses for statistical analysis).

Academic Year 2011/2012: 3.33 (Average for all courses of the school: 2.94)

3.5 Academic committees

3.5.1 Thesis examining committees for Master of Science students

2019: President of one operative thesis examining committee in Nuclear Engineering at Polytechnic of Milan

Since 2008: Member of several thesis examining committee in Nuclear, Energy, Mechanical and Mathematical Engineering at Polytechnic of Milan.

3.5.2 Admission committee for Master of Science students

Since 2018: Member of the admission committee of the Master of Science in Nuclear Engineering at Polytechnic of Milan

3.5.3 Didactic commission

Since 2020: Member of the didactic commission of the Energy Department at Polytechnic of Milan

From 2017 to 2019: elected member of the didactic commission of the Energy Department at Polytechnic of Milan

3.5.4 Committees of PhD thesis defences

2021: Politecnico di Torino

2020: University of Oslo, Norway.

2019: University of Liverpool, United Kingdom.

2018: Communauté Université Grenoble Alpes, France.

2018: University of Liverpool, United Kingdom.

2016: Centrale Paris – Supelec, France.

2016: Universidad de Navarra, Spain.

2014: Université de Franche – Compté, Besançon, France.

3.5.5 Supervision and co-supervision of Master of Science and PhD theses

Since 2015: Supervisor of 5 PhD theses at Polytechnic of Milan

Since 2012: Supervisor of several one-year Master of Science theses at Polytechnic of Milan.

Since 2008: Co-supervisor of 6 PhD theses at Polytechnic of Milan.

Since 2006: Co-supervisor of several one year Master of Science theses at Polytechnic of Milan.

3.6 Keynote lectures, tutorials and seminars

3.6.1 Keynote lectures

2019: Invited Keynote Lecturer at the Plenary Session of the 4th International Conference on System Reliability and Safety, ICSRS 2019, at Rome, Italy, November 20-22.

2016: Invited Keynote Lecturer at the Plenary Session of the Prognostics and System Health Management Conference, at Chengdu, China, October 19-21.

2014: Invited Keynote Lecturer at the Plenary Session of the European Safety and Reliability Conference, ESREL 2014, Wroclaw, Poland, September 14-18.

2007: Invited Keynote Lecturer at the Plenary Session of the International Conference "Risk, Quality and Reliability (RQR)", Ostrava, Czech Republic, September 20-21.

3.6.2 Tutorials in international conferences

2016: "Ensembles of Models for Prognostics and Health Management" at the Third European Conference of the Prognostics and Health Management Society, PHME 2016, Bilbao, Spain, July 5-8.

2014: "*Particle Filters for Prognostics*" at the Second European Conference of the Prognostics and Health Management Society, PHME 2014, Nantes, France, July 8-10.

2013: "Application: Ensemble for Prognostics and Health Management" at the 2013 Prognostics and System Health Management Conference, PHM-2013, Milan, Italy, September 8-11.

2012: *"Ensemble methods for Prognostics and Health Management"* at the 2012 IEEE Conference on Prognostics and Health Management, Denver, Colorado, USA, June 18-21.

3.6.3 Invited lectures in workshops and seminars

2017: "*Reservoir Computing Methods for Prognostics and Health Management (PHM)*", at the seminar "Reliability and Maintenance 4.0: the present future of industry development" organized by IEEE Reliability (ITALY CHAPTER) jointly with IEEE Industry Applications Society, Power Electronics Society and Industrial Electronics Society (NORTH ITALY CHAPTER), Milan, Italy, October 13.

2017: *"Predizione della vita residua di componenti industriali ai fini della definizione di strategie di manutenzione predittiva"* at the seminar on 'Analisi delle incertezze nei calcoli di ingegneria' organized by the International Association for the Engineering Modelling, Analysis and Simulation, NAFEMS, Milan, Italy, April 10.

2013: "Prognostics and Health Management with Industrial Applications" at the ESRA/ESReDA Workshop on Future topics in risk and reliability jointly organized by the International Association for Probabilistic Safety Assessment and Management (IAPSAM), the European Safety and Reliability Association (ESRA) and the European Safety, REliability & Data Association (ESREDA), Helsinki, Finlandia, June 30.

3.6.4 Others

Since 2019: IEEE Distinguished Lecturer.

4. RESEARCH ACTIVITY

4.1 Research activity in national and international projects

4.1.1 Coordination activity in research projects sponsored by the European Union

From 2012 to 2015: Coordinator for the Polytechnic of Milan of the project "*Electrical powertrain HEalth Monitoring for Increased Safety of FEVs*", HEMIS, sponsored by the European Union within the Seventh Framework Programme for a total of $2M \in$. The Polythecnic of Milan was leader of the two Work-Packages "*Monitoring of the physical characteristics of the motor and control and prediction of their RUL*" and "*Dissemination and exploitation*".

From 2011 to 2015: Coordinator for the Polytechnic of Milan of the Initial Training Network "*INNovation through Human Factors in risk analysis and management*", INNHF, sponsored by the European Union within the Seventh Framework Programme for a total of $3.6M\epsilon$. The project will last for 48 months and involves 9 partners of 4 different countries. The Polytechnic of Milan is leader of the Work-Package 5: "*Categorization of current issues*".

4.1.2 Participation to research projects sponsored by the European Union

Since 2020: Co-coordinator for the Energy Department of Polytechnic of Milan of the project, *"Intelligent Reliability 4.0 - IRel4.0"* sponsored by the European Union within the Horizon 2020 Programme- -ECSEL JU for a total of $25M \in$. The project will last for 36 months and involves 78 partners of 13 different countries.

Since 2020: Participant in the Initial Training Network "*Grey-Box Models for Safe and Reliable Intelligent Mobility Systems*", GREYDIENT, sponsored by the European Union within the Horizon2020 Programme for a total of 3.9M€. The project will last for 48 months and involves 10 partners of 6 different countries. The Polytechnic of Milan is leader of the Work-Package 3: "Continuous monitoring, optimization and control of continuous systems".

Since 2020: Co-coordinator for the the Energy Department of Polytechnic of Milan of the project "*Reliable Energy and Cost Efficient Traction System For Railway*", RECET4RAIL, sponsored by the European Union within the Horizon 2020 Programme – Shift2rail for a total of 2.3M. The project will last for 30 months and involves 13 partners of 8 different countries.

From 2017 to 2019: Participant in the project "Sensor development, intelligent data logging, mining and analysis, model updating and statistical methods to predict the performance of aging infrastructures", SAF€RA 2016, funded by INAIL within the European Union's Seventh Framework Programme.

From 2006 to 2009: Participant in the project '*VIrtual RealiTy and HUman Factors AppLications for Improving Safety*' sponsored by the European Union within the Sixth Framework programme. VIRTHUALIS involves 42 international partners of 13 European countries.

4.1.3 Coordination activity in national research projects

Since 2019: Co-coordinator for the Polytechnic of Milan of the project "Manutenzione intelligente (smart maintenance) di impianti industriali e opere civili mediante tecnologie di

monitoraggio 4.0°, MAC4PRO sponsored by INAIL within the BRIC2018 Programme for a total of 1M€. The project will last for 24 months and involves 4 Italian Universities.

4.1.4 Participation to research contracts

2021 Investigator of the 6 months contract "A multistate Bayesian Network framework for risk assessment in the Oil & Gas industry", with ENI S.pA.

2018: Investigator of the 9 months contract "Development of machine learning techniques for asset monitoring, production optimization and prescriptive maintenance in the Oil & Gas Industry" with ENI S.p.A.

From 2017 to 2018: Investigator of the 20 months contract "Development of advanced datadriven methods for the prediction of electricity production by renewable energy sources" with EDISON.

From 2017 to 2018: Investigator of the 20 months contract "Analysis, design and development of a Performance Framework for CERN technical infrastructure" with European Centre for Nuclear Research (CERN).

From 2016 to 2017: Investigator of the 18 months contract "Development of methods for the analysis of long term, high dimensional data and their use for detection of abnormal patterns in systems, structures and components of electricity production plants" with Électricité de France (EDF) - R&D.

Since 2016: Scientific advisor for the Energy Department, Polytechnic of Milan in contracts between ARAMIS S.r.l and Alstom, Ansaldo Energia, BHGE, CNH, Edison, Fameccanica and Tetrapak.

2014: Scientific advisor for the Energy Department, Polytechnic of Milan, in the contract *"Signal validation methods"* between ARAMIS S.r.l and General Electric (GE) Oil & GAS.

2013: Scientific advisor for the Energy Department, Polytechnic of Milan in the contract *"Benchmark on Fault Detection Innovative Techniques"* between ARAMIS S.r.l and General Electric (GE) Oil & GAS.

2013: Investigator of the 24 months contract "*Processing condition monitoring data for diagnosis and prognosis of components in a fleet of electricity production plants*" with Électricité de France (EDF) - R&D, department "Simulation et Traitement de l'information pour l'exploitation des systèmes de production".

2011: Investigator of the 30 months contract "*Processing condition monitoring data for diagnosis and prognosis of components of electricity production plants*" with Électricité de France (EDF) - R&D, department: "Simulation et Traitement de l'information pour l'exploitation des systèmes de production".

2010: Investigator of the 36 months contract "Advanced computational methods for modelling the mechanisms of degradation in equipments of electricity production plants and uncertainty modelling and propagation" with Électricité de France (EDF) - R&D, department "Management des Risques Industriels".

2009: Investigator of the 18 months contract "Advanced computational methods for condition monitoring of components of electricity productions plants" with Électricité de France (EDF) - R&D, department "Simulation et Traitement de l'information pour l'exploitation des systèmes de production".

2008: Investigator of the 18 months contracts "Investigation on advanced computational methods for modeling the mechanisms of degradation in equipment of electricity production plants" with Électricité de France (EDF) – R&D, department "Management des Risques Industriels".

2007: Investigator of the contract "*Modelling of a new non-linear functional behaviors for Data Analysis and Interpretation (DAI-DLL)*" with the European Commission Joint Research Centre (JRC) Ispra.

2007: Investigator of the contract "Methods for the Verification and Interpretation of a Fuzzy Model for Dependence Assessment in Human Reliability Analysis" with the Paul Scherrer Institut (PSI), Switzerland.

2006: Investigator of the contract "Investigation on the feasibility of using fuzzy logic models in Human Reliability Analysis with application to the treatment of human actions dependencies" with the Paul Scherrer Institut (PSI), Switzerland.

2005: Investigator of the contract "Development and consolidation of soft computing models of the fire response of power cables" with Prysmian cables and Systems.

2004: Investigator of the contract "Development and consolidation of soft computing models of the fire response of power cables" with Prysmian cables and Systems.

2003: Investigator of the contract 'Investigating the use of soft computing techniques, neural networks and/or fuzzy logic, in the development of predictive models of the fire response of power cables' with Pirelli Cavi.

4.1.5 Research activity abroad

2020: research period of 2 weeks as visiting scientist at the department of Nuclear and Quantum Engineering of the Korea Advanced Institute of Science & Technology (KAIST), Daejeon, South Korea.

2015: research period of 1 week as visiting scientist at the Chair on Complex Systems and the Energy Challenge at Ecole Centrale Paris and Supelec in Paris, France.

2013: research period of 1 week as visiting scientist at the Chair on Complex Systems and the Energy Challenge at Ecole Centrale Paris and Supelec in Paris, France.

2010: research period of 2 weeks as visiting scientist at the department "Management des Risques Industriels", Recherche et Développement (R&D) of Eletricite de France (EdF), Paris, France.

2008: research period of 3 months as visiting scientist at the department "Management des Risques Industriels", Recherche et Développement (R&D) of Eletricite de France (EdF), Paris, France. The objective of the research was the development of degradation models for nuclear power plant components.

2006-2007: research period of 3 weeks as visiting scientist at the Paul Scherrer Institut (PSI), Villigen, Switzerland. The objective of the research was the development of an expert system based the use of Fuzzy logic for human reliability analysis applications.

2003-2005: research period of 13 months at the Institutt For Energiteknikk, Oecd, Halden Reactor Project, Halden, Norway. The research objective was the development of soft computing techniques for on line diagnostics in nuclear components.

4.2 Organizational activities at the national and international level

4.2.1 International Associations

Since 2019: Member of the European committee of the Prognostic and Health Management Society (PHM Society).

From 2014 to 2018: Elected Treasurer of the European Safety and Reliability Association, ESRA.

Since 2010: Chairman of the technical committee on "*Prognostics and System Health Management*" of the European Safety and Reliability Association, ESRA.

4.2.2 Associated editor of international journals

Since 2017: "Journal of Risk and Reliability, Proceedings of the Institution of Mechanical Engineers, Part O".

4.2.3 Member of editorial boards of international journals

From 2013 to 2014: "International Journal of Performability Engineering".

From 2014 to 2015: "Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering".

Since 2012: "Journal of Risk and Reliability, Proceedings of the Institution of Mechanical Engineers, Part O".

4.2.4 Guest Co-Editor of international journals

2021: Guest Co-editor of the special issue on "*Text Mining Applied to Risk Analysis, Maintenance and Safety*" of the Journal of Risk and Reliability, Proceedings of the Institution of Mechanical Engineers, Part O. Expected publication in June 2021.

2014: Guest Co-Editor of the special issue on "*Prognostics and Health Management*" of the International Journal of Performability Engineering", Vol. 10(5), pp. 440-442, 2014.

2013: Guest Co-Editor of "Chemical Engineering Transactions", Vol. 33.

2007: Guest Co-Editor of the special issue on "*Soft Computing Methods in Nuclear Engineering*" of the International Journal of Nuclear Knowledge Management", vol. 2, No. 3, pp. 199-203.

4.2.5 Referee for the following international journals:

IEEE Transactions on Evolutionary Computation, IEEE Transactions on Fuzzy Systems, IEEE Transactions on Nuclear Science, IEEE Transactions on Reliability, Information Fusion, International Journal on Prognostics and Health Management, Journal of Aircraft, Nuclear Technology, Proceedings of the Institution of Mechanical Engineers, Part O, Journal of Risk and Reliability, Reliability Engineering & System Safety", Risk Analysis", "Sensors".

4.2.6 Chairman of international conferences

2020: Chairman of the technical program of the international conference European Safety and Reliability Conference (ESREL 2020) and the 15th Probabilistic Safety Assessment and Management Conference (PSAM 15), ESREL2020 PSAM15, Venice, Italy, November 1-5.

2014: Co-Chairman of the technical program of the international conference European Safety and Reliability conference, ESREL 2014, Wroclaw, Poland, September 14-18.

2013: Chairman of the technical program of the "2013 Prognostics and System Health Management Conference", PHM-2013, Milan, Italy, September 8-11.

4.2.7 Coordinator of technical areas in international conferences

Since 2015: "*Prognostics and System Health Management*" for the editions 2015, 2016, 2017, 2018, 2019, 2020 and 2021 of the "European Safety and Reliability, ESREL" conference.

2012: "*Non-probabilistic/Soft Methods in Reliability and Risk Analysis*" for the "Probabilistic Safety Assessment and Management, PSAM 11" & "European Safety and Reliability ESREL 2012" conference, Helsinki, Finland, June 25-29.

2011: *"Fault Diagnosis, Prognosis and System Health Management"* for the *"European Safety and Reliability, ESREL 2011"* conference, Troyes, France, September 18-22.

4.2.8 Member of technical program committees of international conferences and workshops

2021: "European Safety and RELiability Conference (ESREL 2020, Anger, France, 19-23 September.

2021: "4th International Conference on Nuclear Power Plants; Structures, Risk, Control & Decommissioning, NUPP 2021", London, United Kingdom, June 10-11.

2021: "15th Global Congress on Manufacturing and Management GCMM2020/21 and 3rd International Conference on Intelligent Systems in Production Engineering and Maintenance, ISPEM2020/21, Liverpool John Moores University, Liverpool, United Kingdom, April 21-22.

2021: Sixth European Conference of the PHM Society 2020 (PHME21)", Virtual Event, 28 June – 2 July.

2020: "European Safety and RELiability Conference (ESREL 2020) and the 15th Probabilistic Safety Assessment and Management Conference (PSAM 15), ESREL2020 PSAM15", Venice, Italy, November 2-5.

2020: "Fifth European Conference of the PHM Society 2020 (PHME20)", Turin, Italy, July 27-31.

2019: "European Safety and RELiability, ESREL 2019" conference, Hannover, Germany, September 22-26.

2018: "16th IFAC Symposium on INformation COntrol problems in Manufacturing, INCOM 2018", Bergamo, Italy, June 11-13.

2017: "European Safety and RELiability, ESREL 2017" conference, Portorož, Slovenia, June 18-22.

2017: "1st International Conference "Intelligent Systems in Production Engineering and Maintenance, ISPEM 2017", Wroclaw, Poland, September 28-29.

2017: "Prognostics and System Health Management Conference, PHM-2017, Harbin, China, July 9-12.

2016: European Safety and RELiability, ESREL 2016" conference, Glasgow, Scotland, September 25-29.

2015: "European Safety and RELiability, ESREL 2015" conference, Zurich, Switzerland, September 6-10.

2015: "13th International Probabilistic Workshop (IPW 2015)", Liverpool, UK, November 4-6.

2014: "International Workshop on Reliability Technologies", Zilina, Slovakia, July 9-11.

2014: "International Symposium on Future I&C for Nuclear Power Plants", ISOFIC 2014/ISSNP 2014, Jeju, Korea, August 24-28.

2013: "44th ESReDA Seminar on RAMS impact on Asset Management Stakeholders and Risk Assessment Methodologies", Porto, Portugal, May 9-10.

2012: "FLINS 2012, Conference on Uncertainty Modeling in Knowledge Engineering and Decision Making", Istanbul, Turkey, August 27-29.

2012: "Prognostics and System Health Management Conference", Beijing, China, May 23-25.

2011: "Probabilistic Safety Analysis" (PSA 2011), Wilmington, NC, USA, March 13-17.

2010: "Probabilistic Safety Assessment and Management, PSAM10", Seattle, Washinhton, USA, June 7-11.

2010: "FLINS 2010, Conference on Foundations and Applications of Computational Intelligence", Chengdu, China, August 2-4.

2010: "European Safety and RELiability, ESREL 2010", Rhodes, Greece, September 5-9.

2008: "European Safety and RELiability, ESREL 2008", Valencia, Spain, September 22-25.

2008: "Probabilistic Safety Assessment and Management, PSAM9", Hong Kong, China, May 19-22.

2007: "European Safety and RELiability, ESREL 2007", Stavanger, Norway, June 25-27.

2007: "XXXI ESReDA seminars on Maintenance Modelling and Applications" Alghero, Italy, May 3-6.

4.2.9 Organizers of sessions and innovation challenges at international conferences

2020: Co-organizer of the innovation challenge "Prognostic and Health Management in Evolving Environments" at the European Safety and RELiability Conference (ESREL 2020) and the 15th Probabilistic Safety Assessment and Management Conference (PSAM 15), ESREL2020 PSAM15", Venice, Italy, November 2-5.

2020: Co-organizer of the session "Text Mining applied to Risk Analysis, Maintenance and Safety" at the European Safety and RELiability Conference (ESREL 2020) and the 15th Probabilistic Safety Assessment and Management Conference (PSAM 15), ESREL2020 PSAM15", Venice, Italy, November 2-5.

2013: Co-organizers of the sessions "Uncertainty in PHM", "PHM in Nuclear Industry" and "Condition-Based and Predictive Maintenance" at the "2013 Prognostics and System Health Management Conference, PHM-2013", Milan, Italy, September 8-11.

2012: Co-organizers of the session "*System health monitoring, fault diagnosis and prognosis*" at the "Probabilistic Safety Assessment and Management, PSAM 11 & "European Safety and RELiability ESREL 2012" conference, Helsinki, Finland, June 25-29.

2011: Co-organizer of the session "System health monitoring and prognostics" at the "Probabilistic Safety Analysis" (PSA 2011) conference, Wilmington, NC, USA, March 13-17.

2011: Co-organizer of the session "*Maintenance modelling for practical applications*" at the "International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering (ICQR2MSE 2011), Xi'an, China, June 17-19.

2011: Co-organizer of the session "*System health monitoring, fault diagnosis and prognosis*" at the "European Safety and RELiability, ESREL 2011" conference, Troyes, France, September 18-22.

2010: Co-organizer of the session "*Computational Intelligence Methods for Risk Analysis*" at the "Probabilistic Safety Assessment and Management" (PSAM10) conference, Seattle, Washington, USA, June 7-11.

2009: Co-organizer of the session "Signal analysis for health monitoring of NPP instrumentation and components" at the "International Topical Meeting on Nuclear Plant Instrumentation, Control and Human Machine Interface Technology, NPIC&HMIT, 2009", Knoxville, Tennessee, USA, April 5-9.

2008: Co-organizer of the session "*Computational methods for fault diagnostics and failure prognostics*" at the "European Safety and RELiability, ESREL 2008" conference, Valencia, Spain, September 22-25.

2008: Co-organizer of the session "Soft computing methods for diagnostics and prognostics" at the "Fuzzy Logic in Nuclear Systems, FLINS 2008" conference, Madrid, Spain, September 21-24.

2007: Co-organizer of the session "*System health monitoring, fault diagnosis and prognosis*" at the "European Safety and Reliability, ESREL 2007" conference, Stavanger, Norway, June 25-27.

4.2.10 Chairman of plenary keynote sessions in international conferences

2013: "2013 Prognostics and System Health Management Conference, PHM-2013", Milan, Italy, September 8-11.

2007: "Risk, Quality And Reliability, RQR 2007", Ostrava, Check Republic, September 20-21, chaired a keynote plenary lecture "*Applications of Probabilistic Safety Assessment*".

4.2.11 Chairman of technical sessions in international conferences

2020: "European Safety and RELiability Conference (ESREL 2020) and the 15th Probabilistic Safety Assessment and Management Conference (PSAM 15), ESREL2020 PSAM15", Venice, Italy, November 2-5"

2020: "Fifth European Conference of the PHM Society 2020 (PHME20)", Turin, Italy, July 27-31.

2019: "European Safety and RELiability, ESREL 2019" conference, Hannover, Germany, September 22-26.

2017: "European Safety and RELiability, ESREL 2017" conference, Portorož, Slovenia, June 18-22.

2016: "European Safety and RELiability, ESREL 2016" conference, Glasgow, Scotland, September 25-29.

2016: "Prognostics and System Health Management Conference" Chengdu, China, October 19-21.

2015: "European Safety and RELiability, ESREL 2015" conference, Zurich, Switzerland, September 6-10.

2014: "Second European conference of the prognostics and health management society 2014, PHME 2014", Nantes, France, July 8-10.

2014: "European Safety and Reliability, ESREL 2014", Wroclaw, Poland, September 14-18.

2013: "2013 Prognostics and System Health Management Conference, PHM-2013", Milan, Italy, September 8-11, chaired three technical sessions.

2012: "Probabilistic Safety Assessment and Management, PSAM 11 & "European Safety and RELiability ESREL 2012", Helsinki, Finland, June 25-29.

2011: "European Safety and Reliability, ESREL 2011", Troyes, France, 18-22 September.

2010: "Instrumentation, Control and Human-Machine Interface Technologies NPIC&HMIT 2010", Las Vegas, Nevada, USA, November 7-11.

2010: XXXVIII European Safety, REliability & Data Association (ESREDA) seminars on "Advanced Maintenance Modelling", Pecs, Hungary, May 4-5.

2009: "European Safety and Reliability, ESREL 2009", Praga, Check Republic, September 7-10.

2008: "8th World Cogress on Computational Mechanics – 5th European Congress on Computational Methods in Applied Sciences and Engineering" VCCM8-ECCOMAS 2008, Venice, Italy, June 30 – July 4.

2008: "Probabilistic Safety Assessment and Management, PSAM9", Hong Kong, China, May 19-22.

2008: "8th international FLINS Conference on Computational Intelligence in Decision and Control", Madrid, Spain, September 21-24.

2007: "Risk, Quality And Reliability, RQR 2007", Ostrava, Check Republic, September 20-21, chaired a keynote plenary lecture "*Applications of Probabilistic Safety Assessment*".

2007: "XXXI ESReDA Seminars on "Maintenance Modelling and Applications", Alghero, Italy, 3-6 May.

4.2.12 Other Organizational activities

2014: Director of the summer school "*Maintenance Modeling and Applications*" organized for the student of the European Project "Innovation through human factors in risk analysis and management", Alghero, Italy, 28 September – 2 October.

From 2010 to 2012: Scientific secretariat of the XIV, XV and XVI editions of the continuing education course "Advance methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment" organized by the Energy Department, Polytechnic of Milan.

2008: Co-promoter, co-coordinator and co-organizer of the PhD course (35 hours) "Advanced topics in Reliability analysis and risk assessment" given by Prof. Tunc Aldemir for students of the PhD programs of the Polytechnic of Milan.

From 2007 to 2010: Scientific secretariat of the editions X, XI, XII and XIII of the continuing education course "*Metodi avanzati per analisi di affidabilità e disponibilità, sicurezza, manutenzione, prognostica e diagnostica di sistemi e impianti industriali*" organized by the Energy Department, Polytechnic of Milan.

4.3 Awards and scholarships

2017: Best paper presentation award at the "International Conference on System Reliability and Science", ICSRS 2017, Milan, Italy, December 20-22.

2009 and 2011: winner of the award for the young researcher of the Energy Department, Polythecnic of Milan with the largest number of publications during the year.

2005: winner of the scholarship of the Lombardia Region: Progetto DRIN "Dottorati di Ricerca, Innovazione e Nuova Industria" for a five month studies abroad.

2003: winner of a scolarship for the partecipation at the summer school "Advanced School and Workshop on Soft Computing and Complex Systems', Faculdade de Ciências e Tecnologia, Universidade di Coimbra, Portugal.

2003: first-place winner of the Italian Ministry of University and Scientific Research Fellowship for a three-year doctorate in *Science and Technology in Nuclear plants* at the Polytechnic of Milan.

5 SCIENTIFIC PUBLICATIONS

A total of 250 works distributed as follows: 2 international books, 4 guest editorials on international journals, 113 papers on international journals, 5 contributions on international books, 3 papers on electronic journals, 102 works on proceedings of international conferences, 18 papers on proceedings of summer school, workshops and international seminars, 3 technical reports for international institutions.

5.1 Metrics overview

5.1.1 Scopus (April 24, 2021)

- 181 documents
- 2785 citations by 1975 documents
- h index: 32
- Co-authors: 126



Figure 1: Number of documents by year (source: Scopus, April 24,2021).



Figure 2: Number of citations by year (source: Scopus, April 24,2021).

5.2 Most relevant contributions and corresponding works

Topic	Contribution	Description	Papers
Risk	Uncertainty analysis T. Aven, P. Baraldi, R. Flage, E. Zio, "Uncertainty in Risk Assessment: The Representation and Treatment of Uncertainties by Probabilistic and Non- probabilistic Methods", WILEY BLACKWELL, 2014	Development of methods of parameter and model uncertainty analysis based on probabilistic and non- probabilistic approaches	 P. Baraldi, E. Zio, "A combined Monte Carlo and possibilistic approach to uncertainty propagation in event tree analysis", RISK ANALYSIS, 2008 P. Baraldi, E. Zio, "A comparison between probabilistic and Dempster- Shafer Theory approaches to Model Uncertainty Analysis in the Performance Assessment of Radioactive Waste Repositories", RISK ANALYSIS, 2010
	Dependence analysis and important components identification	Development of methods of signal and data analysis for dependencies and important components identification in complex systems	F. Antonello, P. Baraldi, A. Shokry, E. Zio, U. Gentile, L. Serio, "Association rules extraction for the identification of functional dependencies in complex technical infrastructures", RELIABILITY ENGINEERING AND SYSTEM SAFETY, 2021 X. Lu, P. Baraldi, E. Zio, "A data-driven framework for identifying important components in complex systems", RELIABILITY ENGINEERING AND SYSTEM SAFETY, 2020
Reliability	Prognostics and health management for condition-based and predictive maintenance	Development of data-driven techniques of signal and data analysis for fault detection in nuclear and other industrial plants	F. Di Maio, P. Baraldi, E. Zio, R. Seraoui, "Fault Detection in Nuclear Power Plants Components by a Combination of Statistical Methods", IEEE TRANSACTION ON RELIABILITY, 2013
		Development of data-driven techniques of signal and data analysis for fault diagnostics in nuclear power plants and other industrial systems.	 E. Zio, P. Baraldi, G. Gola, <i>"Feature-based classifier ensembles for diagnosing multiple faults in rotating machinery"</i>, APPLIED SOFT COMPUTING, 2008. L. Pinciroli, P. Baraldi, A. Shokry, E. Zio, R. Seraoui, C. Mai, <i>"A semi-supervised"</i>

	Development of model- based, data-driven and hybrid techniques of data, text and image analysis for the prediction of equipment failure time	method for the characterization of degradation of nuclear power plants steam generators", PROGRESS IN NUCLEAR ENERGY, 2021
		 theory" EXPERT SYSTEMS WITH APPLICATIONS, 2017 P. Baraldi, M. Compare, S. Sauco, E. Zio, "Ensemble neural network-based particle filtering for prognostics", MECHANICAL SYSTEMS AND SIGNAL PROCESSING, 2013 Z. Yang, P. Baraldi, E. Zio, "A multi- branch deep neural network model for failure prognostics based on multimodal data", JOURNAL OF MANUFACTURING SYSTEMS, 59, pp. 42-50, 2021
Human reliability analysis	Development of expert systems for modeling dependence among human errors	E. Zio, P. Baraldi, M. Librizzi, L. Podofillini, V.N. Dang, "A fuzzy set- based approach for modeling dependence among human errors", FUZZY SETS AND SYSTEMS, 2009

5.3 Summary of Citations in Publications with international circulation

Dr. Baraldi research has been cited over 2700 times in prestigious and leading international journals. Descriptions of a selection of these journals, their impact and international prominence appear below:

Reliability Engineering & System Safety (<u>https://www.journals.elsevier.com/reliability-engineering-and-system-safety</u>) normally publishes only articles that involve the analysis of substantive problems related to the reliability of complex systems or present techniques and/or theoretical results that have a discernable relationship to the solution of such problems. With an impact factor 5.04, it is the

most influential journal in the field of reliability engineering. Dr. Baraldi has published 15 papers in this journal.

IEEE Transactions on Nuclear Science (<u>http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=23</u>) focuses on all aspects of the theory and applications of nuclear science and engineering, including instrumentation for the detection and measurement of ionizing radiation; particle accelerators and their controls; nuclear medicine and its application; effects of radiation on materials, components, and systems; reactor instrumentation and controls; and measurement of radiation in space. With an impact factor 1.57, it is one of the most influential journal in nuclear engineering. Dr. Baraldi has published 3 papers in this journal.</u>

Applied Energy (<u>https://www.journals.elsevier.com/applied-energy</u>) provides a forum for information on innovation, research, development and demonstration in the areas of energy conversion and conservation, the optimal use of energy resources, analysis and optimization of energy processes, mitigation of environmental pollutants, and sustainable energy systems. With an impact factor of 8.85, it is one of the leading journals in power sources. Dr. Baraldi has published one paper in this journal.

Mechanical Systems and Signal Processing (MSSP) (<u>https://www.journals.elsevier.com/mechanical-systems-and-signal-processing</u>) is an interdisciplinary journal in Mechanical, Aerospace and Civil Engineering with the purpose of reporting scientific advancements of the highest quality arising from new techniques in sensing, instrumentation, signal processing, modelling and control of dynamic systems. MSSP papers are expected to make a demonstrable original contribution to engineering knowledge, which should be significant in terms of advancement over established methods. With an impact factor 6.47, it is one of the most influential journal in the mechanical engineering area. Dr. Baraldi has published 6 papers in this journal.

IEEE Transactions on Power Electronics (<u>https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?</u> <u>punumber=63</u>) covers all issues of widespread or generic interest to engineers who work in the field of power electronics. The Journal applies a review policy equivalent to IEEE Transactions, and publishes only papers of high technical quality. With an impact factor 6.37, it is the top journal in power engineering. Dr. Baraldi has published 2 papers in this journal.

IEEE Internet of Things Journal (<u>https://ieee-iotj.org/</u>) offers a site for the dissemination of new research contributions in the swiftly developing fields of General Computer Science, Hardware, Robotics & Electronics, Signal Processing and Web, Mobile & Multimedia Technologies. With an impact factor 9.94, it is one of the most influential journals on IoT related topics. Dr. Baraldi has published one paper in this journal.

IEEE Transactions on Neural Networks and Learning Systems (<u>https://ieeexplore.ieee.org</u>/<u>xpl/RecentIssue.jsp?punumber=5962385</u>) publishes technical articles that deal with the theory, design, and applications of neural networks and related learning systems. With an impact factor 8.79, it is one of the most influential journals in neural networks and AI. Dr. Baraldi has published one paper in this journal.

Expert Systems with Applications (<u>https://www.journals.elsevier.com/expert-systems-with-applications</u>) publishes papers dealing with the design, development, testing, implementation, and/or management of expert and intelligent systems, and provides practical guidelines in the development and management of these systems. With an impact factor 5.45, it is one of the leading journal in artificial intelligence applications. Dr. Baraldi has published 3 papers in this journal.

Fuzzy Sets and Systems (<u>https://www.journals.elsevier.com/fuzzy-sets-and-systems/</u>) has been devoted to the international advancement of the theory and application of fuzzy sets and systems. With an

impact factor of 3.30, it is one of the most influential journal in the area of fuzzy theory. Dr. Baraldi has published 2 papers in this journal.

5.4 List of the twenty works with the largest number of citations (Scopus, April 24, 2021)

1) T. Aven, P. Baraldi, R. Flage, E. Zio, "Uncertainty in Risk Assessment: The Representation and Treatment of Uncertainties by Probabilistic and Non-probabilistic Methods", Wiley Blackwell, 2014 (107 citations).

2) P. Baraldi, E. Zio, "A Combined Monte Carlo and Possibilistic Approach to Uncertainty Propagation in Event Tree Analysis", Risk Analysis, Vol. 28 (5), pp. 1309-1325, 2008 (95 citations).

3) R. Flage, T. Aven, E. Zio, P. Baraldi, "Concerns, Challenges, and Directions of Development for the Issue of Representing Uncertainty in Risk Assessment", Risk Analysis, Vol. 34(7), pp. 1196-1207, 2014 (88 citations).

4) P. Baraldi, F. Mangili, E. Zio, "Investigation of uncertainty treatment capability of modelbased and data-driven prognostic methods using simulated data" Reliability Engineering and System Safety, Vol. 112, pp. 94-108, 2013 (78 citations).

5) E. Zio, P. Baraldi, M. Librizzi, L. Podofillini, V.N. Dang, "A fuzzy set-based approach for modeling dependence among human errors", Fuzzy Sets and Systems, Vol. 60 (13), pp. 1947-1964, 2009 (75 citations).

6) Y. Hu, P. Baraldi, F. Di Maio, E. Zio, "A particle filtering and kernel smoothing-based approach for new design component prognostics", Reliability Engineering and System Safety, Vol. 134, pp. 19-31 (71 citations).

7) P. Baraldi, F. Cadini, F. Mangili, E. Zio, "*Model-based and data-driven prognostics under different available information*", Probabilistic Engineering Mechanics, Vol. 32, pp. 66-79, 2013 (68 citations).

8) E. Zio, P. Baraldi, E. Patelli, "Assessment of the availability of an off-shore installation by *Monte Carlo simulation*". International Journal of Pressure Vessels and Piping, Vol 83 (4), pp. 312-320, 2006 (65 citations).

9) P. Baraldi, L. Podofillini, L. Mkrtchyan, E. Zio, V. N. Dang, "Comparing the treatment of uncertainty in Bayesian networks and fuzzy expert systems used for a human reliability analysis application", Reliability Engineering and System Safety, Vol. 138, pp. 176-193, 2015 (64 citations).

10) P. Baraldi, M. Compare, S. Sauco, E. Zio, "*Ensemble neural network-based particle filtering for prognostics*", Mechanical Systems and Signal Processing, Vol. 41, pp.288-300, 2013 (63 citations).

11) R. Flage, P. Baraldi, E. Zio, T. Aven, "Probability and Possibility-Based Representations of Uncertainty in Fault Tree Analysis", Risk Analysis, Vol. 33 (1), pp. 121-133, 2013, (Citation 60)

12) P. Baraldi, F. Mangili, E. Zio, "A Kalman Filter-based Ensemble Approach for Turbine Creep Prognostics". IEEE Transactions on Reliability, Vol 61, Issue 4, pp. 966-977, 2012 (Citation 59).

13) E. Zio, P. Baraldi, "Identification of Nuclear Transients via Optimized Fuzzy Clustering", Annals of Nuclear Energy, Vol 32 (10), pp. 1068-1080, 2005 (Citation 58).

14) P. Baraldi, R. Canesi, E. Zio, R. Seraoui, R. Chevalier, "*Generic algorithm-based wrapper approach for grouping condition monitoring signal of nuclear power plant components*". Integrated Computer-Aided Engineering, Vol. 18 (3), pp. 221-234, 2011 (Citation 57).

15) P. Baraldi, F. Cannarile, F. Di Maio, E. Zio, "*Hierarchical k-nearest neighbours classification and binary differential evolution for fault diagnostics of automotive bearings operating under variable conditions*", Engineering Applications of Artificial Intelligence, Vol. 56, pp. 1-13, 2016 (Citation 55).

16) M. Rigamonti, P. Baraldi, E. Zio, D. Astigarraga, A. Galarza, "*Particle Filter-Based Prognostics for an Electrolytic Capacitor Working in Variable Operating Conditions*", IEEE Transactions on Power Electronics, 31 (2), art. no. 7073576, pp. 1567-1575, 2016 (Citation 55).

17) E. Zio, P. Baraldi, G. Gola, "Feature-based classifier ensembles for diagnosing multiple faults in rotating machinery". Applied Soft Computing, Vol. 8 (4), pp. 1365–1380, 2008 (Citation 49).

18) D. Astigarraga, F.M. Ibanez, A. Galarza, J.M. Echeverria, I. Unanue, P. Baraldi, E. Zio, "Analysis of the Results of Accelerated Aging Tests in Insulated Gate Bipolar Transistors", IEEE Transactions on Power Electronics, Vol. 31 (11), pp. 7953-7962, 2016 (Citation 48).

19) E. Zio, P. Baraldi, N. Pedroni, "Selecting Features for Nuclear Transients Classification by means of Genetic Algorithms", IEEE Transactions on Nuclear Science, Vol. 53 (3), pp. 1479-1493, 2006 (Citation 47).

20) M. Rigamonti, P. Baraldi, E. Zio, I. Roychoudhury, K. Goebel, S. Poll, "*Ensemble of optimized echo state networks for remaining useful life prediction*" Neurocomputing, Vol. 281, pp. 121-138, 2018 (Citation 45).

5.5 List of publications

5.5.1 International books (2 books)

2014: T. Aven, P. Baraldi, R. Flage, E. Zio, "Uncertainty in Risk Assessment: The Representation and Treatment of Uncertainties by Probabilistic and Non-probabilistic Methods, Wiley Blackwell, 2014.

2011: E. Zio, P. Baraldi, F. Cadini, "Basics of Reliability and Risk Analysis: Worked Out Problems and Solutions". World Scientific, 2011.

5.5.2 Editorials (4 editorials)

2015: P. Baraldi, E. Zio, "*Guest Editorial*". Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, Vol. 229 (4), pp. 277-278, 1015.

2014: P. Baraldi, F. Di Maio, E. Zio, "*Guest Editorial*", International Journal of Performability Engineering, Vol. 10(5), pp. 440-442, 2014.

2013: E. Zio, P. Baraldi, "Editorial", Chemical Engineering Transactions, Vol. 33, 2013.

2007: E. Zio, P. Baraldi, F. Cadini, *Editorial*, International Journal of Nuclear Knowledge Management (IJNKM). Vol. 2, No. 3. pp. 199-203, 2007.

5.5.3 International journals (113 works)

2021: (6 works)

1) H.-P. Nguyen, P. Baraldi, E. Zio, "Ensemble empirical mode decomposition and long shortterm memory neural network for multi-step predictions of time series signals in nuclear power plants", Applied Energy, 283, art. no. 116346, 2021.

2) L. Pinciroli, P. Baraldi, A. Shokry, E. Zio, R. Seraoui, C. Mai, "A semi-supervised method for the characterization of degradation of nuclear power plants steam generators", Progress in Nuclear Energy, 131, Article number 103580, 2021.

3) Z. Yang, P. Baraldi, E. Zio, "A multi-branch deep neural network model for failure prognostics based on multimodal data", Journal of Manufacturing Systems, 59, pp. 42-50, 2021.

4) Y. Hu, P. Baraldi, F. Di Maio, J. Liu, E. Zio, "A method for fault diagnosis in evolving environment using unlabeled data", Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, Vol. 235(1), pp.33-49, 2021.

5) F. Antonello, P. Baraldi, A. Shokry, E. Zio, U. Gentile, L. Serio, "Association rules extraction for the identification of functional dependencies in complex technical infrastructures", Reliability Engineering and System Safety, 209, art. no. 107305, 2021.

6) F. Antonello, P. Baraldi, A. Shokry, E. Zio, U. Gentile, L. Serio, "A novel association rule mining method for the identification of rare functional dependencies in Complex Technical Infrastructures from alarm data" Expert Systems with Applications, 170, art. no. 114560, 2021.

2020: (9 works)

1) M. Compare, P. Baraldi, E. Zio, "Challenges to IoT-Enabled Predictive Maintenance for Industry 4.0", IEEE Internet of Things Journal, Vol. 7(5), pp. 4585-4597, 2020.

2) P. Baraldi, A. Castellano, A. Shokry, U. Gentile, L. Serio, E. Zio, "A Feature Selection-based Approach for the Identification of Critical Components in Complex Technical Infrastructures: Application to the CERN Large Hadron Collider", Reliability Engineering and System Safety, Vol. 201, art. no. 106974, 2020.

3) X. Lu, P. Baraldi, E. Zio, "A data-driven framework for identifying important components in complex systems", Reliability Engineering and System Safety, Vol. 204, art. no. 107197, 2020.

4) Z. Yang, S. Al-Dahidi, P. Baraldi, E. Zio, L. Montelatici, "A Novel Concept Drift Detection Method for Incremental Learning in Nonstationary Environments", IEEE Transactions on Neural Networks and Learning Systems, Vol. 31 (1), pp. 309-320, 2020.

5) Z. Yang, P. Baraldi, E. Zio, "A novel method for maintenance record clustering and its application to a case study of maintenance optimization", Reliability Engineering and System Safety, Vol. 203, 2020.

6) M. Xu, P. Baraldi, S. Al-Dahidi, E. Zio, "Fault prognostics by an ensemble of Echo State Networks in presence of event based measurements" Engineering Applications of Artificial Intelligence, Vol. 87, 2020.

7) M. Compare, P. Baraldi, I. Bani, E. Zio, D. McDonnell, "Industrial equipment reliability estimation: A Bayesian Weibull regression model with covariate selection", Reliability Engineering and System Safety, Vol. 200, art. no. 106891, 2020.

8) M. Compare, P. Baraldi, P. Marelli, E. Zio, "*Partially observable Markov decision processes for optimal operations of gas transmission networks*", Reliability Engineering and System Safety, Vol. 199, art. no. 106893, 2020.

9) A. Shokry, P. Baraldi, E. Zio, A. Espuña, "Dynamic Surrogate Modeling for Multistep-ahead Prediction of Multivariate Nonlinear Chemical Processes", Industrial and Engineering Chemistry Research, Vol. 59 (35), pp. 15634-15655, 2020.

2019: (4 works)

1) M.R. Termite, P. Baraldi, S. Al-Dahidi, L. Bellani, M. Compare, E. Zio, "A never-ending learning method for fault diagnostics in energy systems operating in evolving environments", Energies, Vol. 12(24), art. no. 4802, 2019.

3) F. Cannarile, P. Baraldi, E. Zio, "An evidential similarity-based regression method for the prediction of equipment remaining useful life in presence of incomplete degradation trajectories", Fuzzy Sets and Systems, Vol. 367, pp. 36-50, 2019.

3) D. Zhang, P. Baraldi, C. Cadet, N. Yousfi-Steiner, C. Bérenguer, E. Zio, "An ensemble of models for integrating dependent sources of information for the prognosis of the remaining useful life of Proton Exchange Membrane Fuel Cells", Mechanical Systems and Signal Processing, Vol. 124, pp. 479-501, 2019.

4) F. Cannarile, M. Compare, P. Baraldi, G. Diodati, V. Quaranta, E. Zio, "*Elastic net multinomial logistic regression for fault diagnostics of on-board aeronautical systems*", Aerospace Science and Technology, Vol. 94, art. no. 105392, 2019.

2018: (8 works)

1) S. Al-Dahidi, F. Di Maio, P. Baraldi, E. Zio, R. Seraoui, "A framework for reconciliating data clusters from a fleet of nuclear power plants turbines for fault diagnosis", Applied Soft Computing Journal, Vol. 69, pp. 213-231, 2018.

2) P. Baraldi, G. Bonfanti, E. Zio, "*Differential evolution-based multi-objective optimization for the definition of a health indicator for fault diagnostics and prognostics*" Mechanical Systems and Signal Processing, Vol. 102, pp. 382-400, 2018.

3) F. Cannarile, P. Baraldi, P. Colombo and E. Zio, "A novel method for sensor data validation based on the analysis of wavelet transform scalograms", International Journal on Prognostics and Health Management, Vol. 9, pp. 1-15, 2018.

4) F. Cannarile, M. Compare, P. Baraldi, F. Di Maio, E. Zio, "Homogeneous continuous-time, finite-state hidden semi-markov modeling for enhancing empirical classification system diagnostics of industrial components", Machines, Vol. 6 (3), art. no. 34, 2018.

5) M. Rigamonti, P. Baraldi, E. Zio, I. Roychoudhury, K. Goebel, S. Poll, "*Ensemble of optimized echo state networks for remaining useful life prediction*" Neurocomputing, Vol. 281, pp. 121-138, 2018.

6) M. Compare, P. Marelli, P. Baraldi, E. Zio, "A Markov decision process framework for optimal operation of monitored multi-state systems", Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, Vol. 232 (6), pp. 677-689, 2018.

7) M. Rigamonti, P. Baraldi, A. Alessi, E. Zio, D. Astigarraga, A. Galarza, "An Ensemble of Component-Based and Population-Based Self-Organizing Maps for the Identification of the Degradation State of Insulated-Gate Bipolar Transistors", IEEE Transactions on Reliability, Vol. 67 (3), pp. 1304-1313, 2018.

8) F. Khayatian, M. Meshkinkiya, P. Baraldi, F. Di Maio, E. Zio, "*Hybrid Probabilistic*-*Possibilistic Treatment of Uncertainty in Building Energy Models: A Case Study of Sizing Peak Cooling Loads*", ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part B: Mechanical Engineering, Vol. 4 (4), art. no. 041008, 2018.

2017: (4 works)

1) S. Al-Dahidi, F. Di Maio, P. Baraldi, E. Zio, "A locally adaptive ensemble approach for data-driven prognostics of heterogeneous fleets" (2017) Proceedings of the Institution of Mechanical Engineers, Part O: Journal of Risk and Reliability, Vol. 231 (4), pp. 350-363, 2017.

2) P. Baraldi, F. Di Maio, S. Al-Dahidi, E. Zio, F. Mangili, "Prediction of industrial equipment Remaining Useful Life by fuzzy similarity and belief function theory" Expert Systems with Applications, Vol. 83, pp. 226-241, 2017.

3) Y Hu, P. Baraldi, F. Di Maio, E. Zio, "A Systematic Semi-Supervised Self-adaptable Fault Diagnostics approach in an evolving environment", Mechanical Systems and Signal Processing, Vol. 88, pp. 413-427, 2017.

4) M. Compare, P. Baraldi, I. Bani, E. Zio, D. Mc Donnell, "Development of a Bayesian multistate degradation model for up-to-date reliability estimations of working industrial components" Reliability Engineering and System Safety, Vol. 166, pp. 25-40, 2017.

2016: (7 works)

1) S. Al-Dahidi, F. Di Maio, P. Baraldi, E. Zio, "*Remaining useful life estimation in heterogeneous fleets working under variable operating conditions*", Reliability Engineering and System Safety, Vol. 156, pp. 109-124, 2016.

2) P. Baraldi, F. Cannarile, F. Di Maio, E. Zio, "*Hierarchical k-nearest neighbours classification and binary differential evolution for fault diagnostics of automotive bearings operating under variable conditions*", Engineering Applications of Artificial Intelligence, Vol. 56, pp. 1-13, 2016.

3) Y. Hu, P. Baraldi, F. Di Maio, E. Zio, "Online Performance Assessment Method for a Model-Based Prognostic Approach", IEEE Transactions on Reliability, Vol. 65 (2), pp. 718-735, 2016.

4) M. Naseri, P. Baraldi, M. Compare, E. Zio, "Availability assessment of oil and gas processing plants operating under dynamic Arctic weather conditions", Reliability Engineering and System Safety, Vol. 152, pp. 66-82, 2016.

5) D. Astigarraga, F.M. Ibanez, A. Galarza, J.M. Echeverria, I. Unanue, P. Baraldi, E. Zio, "Analysis of the Results of Accelerated Aging Tests in Insulated Gate Bipolar Transistors", IEEE Transactions on Power Electronics, Vol. 31 (11), pp. 7953-7962, 2016.

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5.5.4 Contributions in International books (5 works)

2011: P. Baraldi, M. Compare, G. Rossetti, E. Zio, A. Despujols, "A modelling framework to assess maintenance policy performance in electrical production plants", chapter of the book "Maintenance Modelling and Applications", editors: J. Andrews, C. Berenguer, L. Jackson, pp. 263-282, Det Norske Veritas AS, 2011.

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2020: (12 works)

1) A. E. Milani, F. Antonello, P. Baraldi, E. Zio, "A Coevolutionary Optimization Approach with Deep Sparse Autoencoder for the Extraction of Equipment Degradation Indicators", Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference, ESREL2020 PSAM15, 1-5 November, Venice, Italy, 2020.

2) L. Pinciroli, P. Baraldi, G. Ballabio, M. Compare, E. Zio "Deep reinforcement learning for optimizing operation and maintenance of energy systems equipped with PHM capabilities", Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference, ESREL2020 PSAM15, 1-5 November, Venice, Italy, 2020.

3) L. Pinciroli, P. Baraldi, M. Compare, S. Esmaeilzadeh, M. Farhan, B. Göhre, R. Grugni, L. Manca, E. Zio "Agent-Based Modeling and Reinforcement Learning for Optimizing Energy Systems Operation and Maintenance: The Pathmind Solution" Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference, ESREL2020 PSAM15, 1-5 November, Venice, Italy, 2020.

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11) F. Cannarile, M. Compare, P. Baraldi, Z. Yang, E. Zio, "The Aramis Data Challenge: Prognostics and Health Management in Evolving Environments", Proceedings of the 30th

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2005: (1 work)

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2004 (1 work)

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2003 (1 work)

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2002: (1 work)

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2011: P. Baraldi, E. Zio, F. Mangili, G. Gola, B. Nystad "An ensemble based approach for process parameter estimation in offshore oil platforms", Proceedings of Enlarged Halden Program Group meeting, Man-Technology Organization, Ref. C5.7, Rica Park Hotel, Sandefjord, Norway, 2-7 October, 2011.

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