ESREL 2020 PSAM 15

The 30th European Safety and Reliability Conference
The 15th Probabilistic Safety Assessment and Management Conference

Reliability, safety and security
for a truly sustainable world

PROGRAM

ESREL 2020 PSAM 15
VENICE - ITALY
2-5 NOVEMBER 2020

Contents

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Foreword *– Message by the Chairman*

It is my pleasure to welcome you to the ESREL 2020 PSAM 15 Conference, the 30th European Safety and Reliability (ESREL) Conference and the 15th Probabilistic Safety Assessment and Management (PSAM) Conference, jointly organized by the European Safety and Reliability Association (ESRA) and the International Association of Probabilistic Safety Assessment and Management (IAPSAM). This conference brings together the top experts of the world in the science and practice of reliability and safety. It is a unique World Exposition (a real "Expo Tech") of scientific methodologies and technical solutions to advance knowledge for the reliable design and operation of components and systems, for the prevention and management of risk in complex systems and critical infrastructures.

This Conference takes place only every eight years: Crete 1996, Berlin 2004, Helsinki 2012 and now "virtual Venice" 2020. Actually, the conference was originally planned to be held in presence in Venice on June 21-26. In consideration of the outbreak of the CoViD-19 pandemic, the Conference had to be postponed but during the originally scheduled week a series of webinars (Aperitivo at ESREL 2020 PSAM 15) by experts in the field of risk assessment and reliability engineering was held with great success, as a Conference opening event.

Also, given the importance of the timely dissemination of the knowledge advancements and research results, starting from the original opening date of Monday, June 22, 2020 the papers of the Conference were made available with open access on the Conference website. The Conference theme is "Reliability of Complex Systems, Safety of Critical Infrastructures, Prevention and Management of Risk". It is quite timely as the healthy living of our World of the future, which we are building and which we will leave to those who follow, depends on the reliability and safety of the complex systems and infrastructures upon which it will stand: if we design and operate them in a way that they are reliable and safe, then it will, indeed, be a smart and sustainable world.

ESREL 2020 PSAM 15 is the most important appointment for researchers, experts, professionals, public managers and decision-makers working on safety and reliability of systems and infrastructures in the industrial, civil, public administration, university and research fields. The Conference allows all participants to share the challenges that institutions and companies in different industrial fields have to face to ensure the continuity of their productions, operations and services, the safety of their assets, infrastructures, people and the environment.
The organisation of the Conference has been a true roller-coaster ride, with continuous changes, up to three weeks before, to follow the crazy evolution of the pandemics and the associated restrictions and limitations. In this ride, we have been accompanied by extraordinary and extraordinarily available people from the city of Venice, the region of Veneto, the Italian government institutions, the partners (Beihang University, Cassa Depositi e Prestiti, Enel, Fincantieri, Huawei, Jensen Hughes, Saipem). But the only way to bring it home was to have a great driving team, highly motivated, highly trained and highly capable. All of us involved in the Conference and benefitting from it should deeply thank Prof. Piero Baraldi, Dr. Michele Compare, Dr. Raffaella Della Bianca, Mrs. Dorina Di Clemente, Prof. Francesco Di Maio, Mr. Luca Pinciroli, Mr. Dario Valcamonico.

I dare closing on a personal note. I wanted this Conference very bad and I worked hard for it because this was meant to be my tribute/thanksgiving to all the many outstanding professionals and colleagues from all over the World, who have accompanied me through my professional life, mentoring me, teaching me and allowing me to collaborate and work with them. I am heartbroken by the fact of not being able to give my tribute to them, to thank them in person. But I am also moved, once more, by their heartedly supportive response during this very difficult time of organizing the Conference and their demonstration of commitment as a community.

Enrico Zio
General Chair

Foreword – *Message by the Technical Chairmen*

In the highly uncertain times we live in, the Conference program witnesses the great resilience of our community.

The programt includes 728 abstracts and papers selected through a peer-review process conducted by more than 130 track directors, who have organized the work of more than 800 reviewers. These works range on a variety of technical and scientific methods and solutions for the reliability of complex systems, safety of critical infrastructures, prevention and management of risk. They cover all the 55 topics and 31 application areas of the Conference.

For the first time in the history of this Conference series, the participants have the opportunity of not only reading the written text of the works but also looking at their video-presentations, starting from the first day of the Conference and without any restriction for 1 year. The program of the Conference is enriched by 10 plenary lectures by speakers of international excellence, 5 panels, 11 special sessions and 2 innovation challenges. More than 8 hours of live streaming will be offered to the 763 participants remotely connected from all over the World, on more than 20 different time zones. While this is a much grander experiment than we had planned to run, we look forward to making it a success together with you.

Finally, the 233 members of the Technical Program Committee, the members of the local organizing committee, and all the reviewers have put an extraordinary effort in keeping the quality of the Conference with respect to both the technical and organizational aspects. To them gores our deepest appreciation.

Piero Baraldi
Technical Program Chair

Francesco Di Maio
Technical Program Chair

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	Distinguished Guest Professor at Tsinghua University, China
	Adjoint Professor at Beihang University, City University of Hong Kong and Wuhan University, China
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Dr George Apostolakis

**Professor Emeritus of the Nuclear Science and Engineering Department and of the
Engineering Systems Division of the Massachusetts Institute of Technology**

The George Apostolakis Fellowship is awarded to an 'early career' individual who is active in the field of Risk Assessment. The fellowship is intended to honor an individual who may be one of tomorrow's leaders in the advancement of probabilistic safety assessment and management. Candidates are graduate students, post-graduate researchers or early career professionals, who are nominated by a professor, a colleague or a supervisor. The George Apostolakis Fellow will receive recognition at the Conference, Conference fees waived and a plaque commemorating the award.

George Apostolakis

Dr. Apostolakis is a professor emeritus of the Nuclear Science and Engineering Department and of the Engineering Systems Division of the Massachusetts Institute of Technology. He served as a Commissioner of the U.S. Nuclear Regulatory Commission (NRC) from April 23, 2010 until June 30, 2014. From 1995 until 2010, he was a member and former Chairman (2001-2002) of the statutory Advisory Committee on Reactor Safeguards of the NRC. He is currently the Head of the Nuclear Risk Research Center in Japan. He is a member of the U.S. National Academy of Engineering and a Fellow of the American Nuclear Society and the Society for Risk Analysis. He has received the Tommy Thompson Award and the Arthur Holly Compton Award from the American Nuclear Society. He is a Corresponding Member of the Academy of Athens. Dr. Apostolakis holds a Ph.D. in Engineering Science and Applied Mathematics (awarded in 1973) and a Master of Science degree in Engineering Science (1970) from the California Institute of Technology. He earned his undergraduate degree in Electrical Engineering from the National Technical University in Athens, Greece, in 1969.

Fellowship Award Winner

Federico Antonello
Risk Analyst / Data Scientist / Nuclear Engineer

Federico Antonello is completing his PhD in Energy and Nuclear Science and Technology at Politecnico di Milano (Italy). He holds a BS in Energy Engineering from Università degli Studi di Padova (2014) and a MS in Nuclear Engineering at the Politecnico di Milano (2017).

His research efforts are mainly devoted at developing computational methods, data-mining and artificial intelligence tools for mining unknown information and knowledge relevant for complex technical infrastructures vulnerability assessment and resilience management. In his PhD research, Federico has developed a framework for identifying functional dependencies among components of complex infrastructures using large-scale databases of alarm messages. His work, which is carried out in collaboration with CERN (European Organization for Nuclear Research), makes use of association rule mining techniques, evolutionary algorithms and probabilistic models to reconstruct unknown chains of malfunctions and failures.

Federico has also mentored students during their MS diploma theses, developing with them methods and tools for improving the safety and reliability of industrial components. In addition to his research activities, he has been a teaching assistant for the course "Reliability Engineering and Quantitative Risk Analysis" from 2017 to 2020.

Previous ESREL/PSAM Conferences

ESREL2001
Torino, Italy *September 2001*

ESREL2002
Lyon, France *March 2002*

ESREL2003
Maastricht, Netherlands *June 2003*

ESREL2004 / PSAM 7
Berlin, Germany *June 2004*

ESREL2005
Tri City, Poland *June 2005*

ESREL2006
Estoril, Portugal *September 2006*

ESREL2007
Stavanger, Norway *June 2007*

ESREL2008
Valencia, Spain *September 2008*

ESREL2009
Prague, Czech Republic *September 2009*

ESREL2010
Rhodes, Greece *September 2010*

ESREL2011
Troyes, France *September 2011*

ESREL2012 / PSAM 11
Helsinki, Finland *June 2012*

ESREL2013
Amsterdam, Nederlands *September 2013*

ESREL2014
Wroclaw, Poland *September 2014*

ESREL2015
Zurich, Switzerland *September 2015*

ESREL2016
Glasgow, Scotland *September 2016*

ESREL2017
Portoroz, Slovenia *June 2017*

ESREL2018
Trondheim, Norway *June 2018*

ESREL2019
Hannover, Germany *September 2019*

PSAM 1
Beverly Hills, CA, USA *February 1991*

PSAM 2
San Diego, CA, USA *March 1994*

PSAM 3
Crete, Greece *June 1996*

PSAM 4
New York, New York, USA *September 1998*

PSAM 5
Osaka, Japan *November 2000*

PSAM 6
San Juan, Puerto Rico, USA *June 2002*

PSAM 7
Berlin, Germany *June 2004*

PSAM 8
New Orleans, USA *May 2006*

PSAM 9
Hong Kong, China *May 2008*

PSAM 10
Seattle, USA *June 2010*

PSAM 11
Helsinki, Finland *June 2012*

PSAM 12
Honolulu, USA *June 2014*

PSAM 13
Seoul, Korea *October 2016*

PSAM 14
Los Angeles, USA *September 2018*

Instructions for Chairs and Speakers

INSTRUCTIONS FOR CHAIRS

Please connect to your virtual session zoom room at least 10 minutes prior to the start of your session, using the link which you should have receveid by email. If not, please contact esrel2020psam15@agence-vert.com and esrel2020psam15@polimi.it. Collect possible biographical sketches (these should be very brief). Alternatively, you can ask each presenter to introduce herself/himself shortly.

For the sake of the meeting attendees, please keep the session synchronized as shown in the final program. You are supposed to signal the presenter when there is 3 minutes remaining in the time slot. Moderate the discussion after each presentation and restrict the discussion if necessary due to the time constraints. Before ending the session, please summarize the session briefly if you find it worthwhile.

INSTRUCTIONS FOR SPEAKERS

Each oral presentation should last not more than 12 minutes following maximum 3 minutes of discussion. Speakers are asked to adhere strictly to the 15 minute limit. The chairperson will interrupt the talk if you overrun the time.

Ten minutes before the start of their session, you are encouraged to access to the zoom virtual room and introduce to the session chair using the link which you should have receveid by email. If not, please contact esrel2020psam15@agence-vert.com and esrel2020psam15@polimi.it

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From Monday November 2nd, 2020 to Thursday November 5th, 2020 you can join the virtual conference trough:

1. the virtual conference platform (https://esrel2020psam15.event-vert.com/), for your access by the desktop;
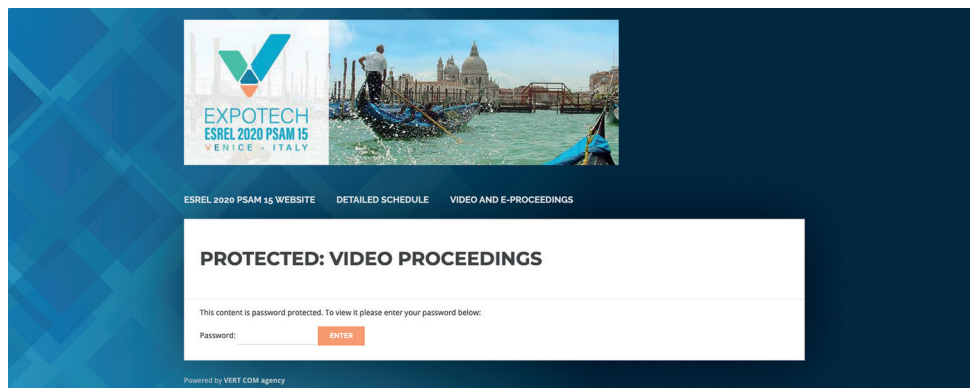
2. the Whova app (download it for free from Apple Store or Google Play, sign-in/register and search in the tab "Explore Events" for the ESREL 2020 PSAM 15 conference), for your access by mobile device.
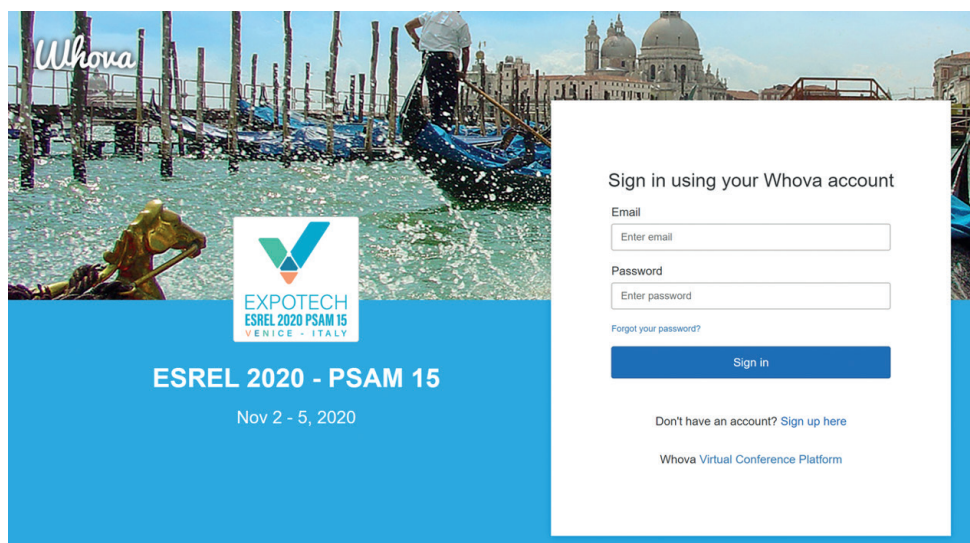
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- the links to access the ZOOM rooms where the events (opening/closing ceremony, panels, plenary lectures and special sessions) will be held. You will have to access the room few minutes before the beginning of the event you are interest in, clicking on the specific link provided.
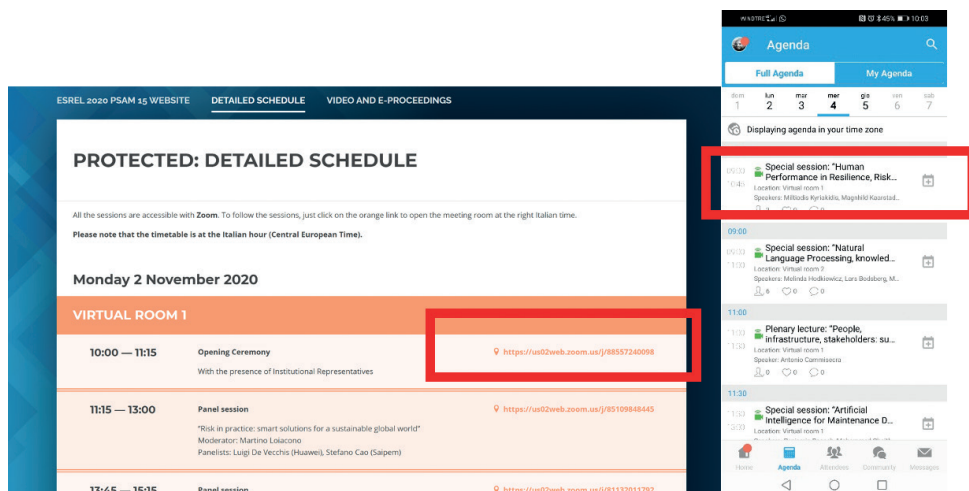
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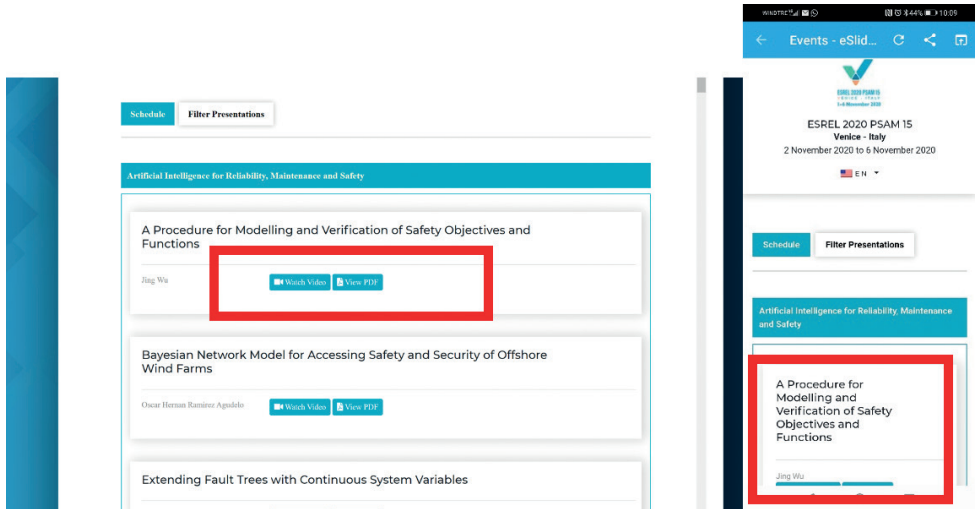
... and in case you wish to attend two events occurring in parallel, no worries: all the events will be recorded, and you will enjoy those later on;

Finally, to make the best out of the ESREL2020 PSAM15 Conference, we encourage you to interact with all participants using the:

- **Q&A panel** offered during the ZOOM sessions of the events in streaming;
- Whova app for one-to-one chat with authors and exhibitors, and for technical discussions and networking.

Opening Ceremony

Prof. Enrico Zio
General Chair of Esrel 2020 Psam 15 Conference

Dott. Luigi Brugnaro
Mayor of Venice Metropolitan City

Avv.to Elisa De Berti
Vice-president of the Veneto Region

On.le Raffaella Paita
President of the transport and telecommunications commissions
of the Chamber of Deputies

Sen. Paolo Arrigoni
Quaestor of the Senate of the Italian Republic

On. Stefano Buffagni
Deputy Minister of Economic Development

Janez Lenarčič
EU Commissioner for Crisis Management

Prof. Marko Čepin
Chair of the European Safety and Reliability Association (ESRA)

Prof. Piero Baraldi
Technical Program Chair of the ESREL 2020 PSAM 15 Conference

Prof. Francesco Di Maio
Technical Program Chair of the ESREL 2020 PSAM 15 Conference

Prof. Enrico Zio

General Chair of Expotech Esrel 2020 Psam 15 Conference

Enrico Zio received the MSc degree in nuclear engineering from Politecnico di Milano in 1991 and in mechanical engineering from UCLA in 1995, and the Ph.D. degree in nuclear engineering from Politecnico di Milano and in probabilistic risk assessment at MIT in 1996 and 1998, respectively. He is currently full professor at the Centre for research on Risk and Crises (CRC) of Ecole de Mines, ParisTech, PSL University, France, full professor and President of the Alumni Association at Politecnico di Milano, Italy, eminent scholar at Kyung Hee University, Republic of Korea, distinguished guest professor at Tsinghua University, Beijing, China, adjunct professor at City University of Hong Kong, Beihang University and Wuhan University, China and Co-Director of the Center for REliability and Safety of Critical Infrastructures (CRESCI) and the sino-french laboratory of Risk Science and Engineering (RISE), at Beihang University, Beijing, China.

In 2020, he has been awarded the prestigious Humboldt Research Award from the Alexander von Humboldt Foundation in Germany (https://www.humboldt-foundation.de/web/home.html), one the world's most prestigious research awards across all scientific disciplines. The Award is given to outstandingly qualified researchers and future leaders from science-related fields (but very seldom awarded to engineers!). The Award is granted in recognition of a researcher's entire achievements to date, to academics whose fundamental discoveries,

new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future. Professor Zio has been selected for the Award in light of being a World leading scientist in Risk and Resilience Assessment, Safety Analysis and Reliability Engineering of complex systems and infrastructures, in particular for energy applications. His H-index is 72. He has been one of the pioneers in using artificial intelligence (such as neural networks) and genetic algorithms in reliability engineering and risk assessment, solving key problems related to the safety and reliability of critical systems such as those used in the nuclear, oil and gas, transportation industries. He has promoted the use of computational modeling within various international initiatives.

His research focuses on the modeling of the failure-repair-maintenance behavior of components and complex systems, for the analysis of their reliability, maintainability, prognostics, safety, vulnerability, resilience and security characteristics, and on the development and use of Monte Carlo simulation methods, artificial intelligence techniques and optimization heuristics. He is author and co-author of seven books and more than 500 papers on international journals, Chairman and Co-Chairman of several international Conferences, associate editor of several international journals and referee of more than 20.

Dott. Luigi Brugnaro
Mayor of Venice Metropolitan City

Father of 5 – Valentina, Andrea, Piera Maria, Jacopo and Ettore –, in love with his wife Stefania, Luigi Brugnaro was born in 1961. His parents are Maria, an elementary school teacher, and Ferruccio, a workman, trade union leader and poet.

He founded Umana, a corporation with 700 million Euros in revenue that includes 23 companies active in the fields of utilities, manufacturing, building industry, sports and agricolture. But Umana is also the name of the employment agency opened in 1997, that became one of the leading companies in the sector in just a few years.

In 2006 he took over the Reyer basketball club. Umana Reyer men's team claimed the Italian Basketball Championship on 2017 and on 2019, and won the FIBA Europe Cup in 2018.

He has been president of Confindustria Venezia from 2009 to 2013 and member of the national Confindustria board unito 2015.

Since 2015 he is Mayor of Venice, vice President of the Fondazione Musei Civici di Venezia, president of the Fondazione Teatro La Fenice and vice president of the Biennale. He was re-elected in 2020. He was the first in Italy to put his assets in a blind trust.

He is also Mayor of the Venice Metropolitan City and came in second place on the 2020 Governance Poll by Il Sole24Ore, becoming the fiftht most loved city leader in Italy that year.

Opening Ceremony

Avv.to Elisa De Berti
Vice-president of the Veneto Region

- Resident in Verona
- Born 22nd October 1974
- Italian nationality
- Married with two 14-year-old children

ADMINISTRATIVE EXPERIENCE

From 17th October 2020 she is Vice President and Councilor for Legal Affairs, Infrastructure, Transport and Public Works of the Veneto Region

From 29th June 2015 Veneto Region Councilor for Infrastructure, Transport, Public Works, Inland Navigation and Port Navigation

May 2014 August 2015 Mayor of the municipality of Isola Rizza (VR) - Lega Nord list and others

August 2009 August 2013 President of the Union of Municipalities Destra Adige

June 2009 May 2014 Mayor of the Municipality of Isola Rizza (VR) - June 2004 June 2009 Minority councilor of the Municipal Council of Isola Rizza (VR) Civic list (group leader)

PROFESSIONAL EXPERIENCE

January 2008-May 2015
Freelance Lawyer

Civil law, credit recovery, bankruptcies, separations, divorces, contractual advice, out-of-court, road code sanctions appeals, succession, real estate divisions

April 2005 Enrollment in the Verona Bar Association Training and education

October 2001
Degree in law from the University of Ferrara

Opening Ceremony

On.le Raffaella Paita

**President of the transport and telecommunications commissions
of the Chamber of Deputies**

Raffaella Paita was born in La Spezia on the 23rd November 1974. She began her political career in 1997 in the role of Left Democratic Group Leader of the City Council of La Spezia, Mayor Giorgio Pagano.

From 2002 to 2007 she worked in the Cabinet office of the Mayor of La Spezia, Mayor Giorgio Pagano

From 2007 to 2010 she covered the position of City Councilor of La Spezia, Mayor Massimo Federici, with powers: La Spezia seaside town, Strategic coastal line projects, Strategic planning, Reorganization of investee companies and the cultural system, Organization of the Municipality, Times and hours of the city, Communication, e-government projects, International cooperation.

In May 2010 she became the President of the PD Group of the Liguria Region IX Legislature and in October 2010 the Councilor for infrastructures of the Liguria Region IX Legislature.

She became Deputy Chamber in March 2018 and in July 2020 the President of the IX Commission for Transport and Telecommunications Camera Italia Viva.

A freelance journalist, she dedicated her entire institutional and political path to her territory, deepening her knowledge of infrastructures and transport over the years that allowed her to play key roles in the Government of the Liguria Region and today at the Chamber of Deputies, where she holds the role of President of the IX Transport and Telecommunications Commission.
He coordinated the drafting of the Italia Shock Plan on infrastructural works still at a standstill in the country, a plan that was partly included in the Government's Simplification Decree.

Sen. Paolo Arrigoni
Quaestor of the Senate of the Italian Republic

Born in Lecco on 14 June 1964, senator Arrigoni grew up in the neighbouring village of Calolziocorte, where he still lives with his wife Wilma and his beautiful daughters Aurora and Noemi. He graduated in Electronic Engineering from the Milan Polytechnic in 1992 and became a chartered engineer in 1994.

After a one-year experience as a teacher at Pacinotti Institute in Milan while attending university, he worked as a Project Engineer at Italcementi in Bergamo (1992-2000). In March 2000 he opened his own firm specialising in the design of and consultancy for electrical and automation systems for the civil, tertiary and industrial sectors.

His political engagement began in 1997, when he joined the local Northern League office at Calolziocorte, of which he later became administrative officer. In 2000-2001, he was elected leader of the Calolziocorte office and member of the Northern League coordinating committee for the Lecco Province.

He was elected to the municipal council of Calolziocorte in 1998 and was local cabinet member for Ecology, Environment, Traffic and Transport in 2001-2003. On 26 May 2003 he became Mayor of Calolziocorte, an office he held for two terms until March 2013.

In those years, he served as an opposition councillor in the Province of Lecco 2004-2009, and as a government councillor 2009-2014. In both terms, he was the league's most voted councillor and chief whip of the political group.

From February 2002 to March 2005, he was board member of NORDCOM S.p.A., the ICT arm of Ferrovie Nord. From July 2003 to February 2006, he sat on the board of GRTN S.p.A., a nation-wide power grid operator. In February 2013, he ran for the Senate of the Republic and was elected in the Lombardy constituency for the 2013-2018 Parliament. He sat on the Senate Standing Committee on Environment, Environmental Properties and the Land; the Special Committee on Italians Abroad; and the Joint Committee on Schengen, Europol and Immigration. In 2014, he also became a member of the Joint Committee of Inquiry on Waste Recycling Crimes and other Environmental Offences (a.k.a., the Ecomafia Committee).

His political ethics reflects responsibility towards the citizens who put their trust in him and pride of being a member of the League, the parliamentary group holding a five-year straight record for introducing the most Bills!

In those five years, Senator Arrigoni held a number of offices: leader of the political movement "Noi con Salvini" in the Abruzzo Region from November 2015 to 17 July 2017; campaign leader for the Molise regional election from 11 to 20 April 2018; first regional commissioner of the League in Northern Marche from December 2017 to 4 March 2020 and Acting Leader of the League in the Marche Region until 14 May 2020.

On 4 March 2018 he was re-elected to the Senate and on 28 March he was elected Quaestor of the Senate of the Republic. He has been a member of the Senate Standing Committee on Environment, Environmental Properties and the Land also during the present parliamentary term. On 18 July 2018 he was designated as member of the Parliamentary Committee for the Security of the Republic (COPASIR).

He has led the League's Energy Department since 17 February 2020.

He has been a Knight of the Order of Merit of the Italian Republic since June 2005.

Opening Ceremony

On. Stefano Buffagni
Deputy Minister of Economic Development

Stefano Buffagni (Milan, 6th September 1983) is a Chartered Accountant, Statutory Auditor and an Italian politician of "Movimento 5 Stelle".

September 13th 2019 – Deputy Minister to the Ministry of economic Development.

June 13th 2018 - Undersecretary to the Presidency of the Council of Ministers.

March 4th 2018 – Deputy of the Republic of the 18th parliamentary term - Member of the Committee on Budgetary Control.

From 2013 to 2018 – Regional Councilor of Lombardy during the 10th parliamentary term –

Member of the Committee on Budgetary Control, Productive Activities and Employment, Trade and Tourism. Chartered Accountant and tax Advisor - He deals with budgets, business assessments, tax planning, international taxation, due diligence, M&E and, in particular, with evaluation of multiannual works and tenders procedures, acting as Advisor for important engineering design activities.

Master's Degree in Economics and Management for Business at the Catholic University of the Sacred Heart, Milan.

Degree in Economics and Business Management from the Catholic University of the Sacred Heart, Milan.

Opening Ceremony

Janez Lenarčič
EU Commissioner for Crisis Management

Ambassador, Permanent Representative of the Republic of Slovenia to the EU, Brussels
Present

State Secretary for European and Foreign Affairs, Office of the Prime Minister
2014-2016

Director of the OSCE Office for Democratic Institutions and Human Rights (ODIHR), Warsaw
2008-2014

State Secretary, Head of the Government Office for European Affairs, Ljubljana
2006-2008

Representative of the Presidency of the Council in the European parliament
2008

Ambassador, Permanent Representative of the Republic of Slovenia to the OSCE, Vienna
2003-2006

Chairman of the Permanent Council of the OSCE
2005

State Secretary in the Office of the Prime Minister
2002-2003

Diplomatic Adviser to the Prime Minister
2001

Adviser to the Minister for Foreign Affairs
2000

First Secretary, Permanent Mission of Slovenia to the United Nations, New York
1996-1999

Third Secretary, Permanent Mission of Slovenia to the United Nations, New York
1994-1996

Department for Multilateral Relations, Ministry of Foreign Affairs, Ljubljana
1993-1994

Entered the Slovenian diplomatic service
1992

Degree in international law, Ljubljana University
1992

Opening Ceremony

Prof. Marco Čepin
Chair of the European Safety and Reliability Association (ESRA)

Prof. Dr. Marko Čepin is a professor at the Faculty of Electrical Engineering, University of Ljubljana. He is full time teacher for the subjects related to power systems, specifically conventional and alternative sources of electric energy including renewable sources.

His research interests include energy engineering, power plants and reliability of power systems.

His main functions include: president of Nuclear Society of Slovenia (2010-2014, 2014-2018), president of European Safety and Reliability Association (2018-2020), an associate editor of scientific journal Reliability Engineering and System Safety (2019-2022).

He wrote one book and more than 50 articles published in internationally recognised scientific journals and more than 150 conference contributions.

Opening Ceremony

Prof. Piero Baraldi
Technical Program Chair of the ESREL 2020 PSAM 15 Conference

Piero Baraldi (BS in nuclear engng., Politecnico di Milano, 2002; European PhD in 'Radiation science and engineering', Politecnico di Milano, 2006) has been associate professor of Nuclear Engineering at the Department of Energy at the Politecnico di Milano (Italy) since 2015 and he has obtained the Italian national scientific qualification to function as full professor since 2015.

His main research efforts are currently devoted to the development of methods and techniques for system health monitoring, fault diagnostics, prognostics and maintenance. He is also interested in methodologies for rationally handling the uncertainty and ambiguity in the information.

He has been invited keynote Lecturer at the plenary sessions of the European Safety and Reliability Conference, ESREL 2014, at Wroclaw (Poland), of the 2016 Prognostics and System Health Management Conference, at Chengdu (China) and of the 4th International Conference on System Reliability and Safety (ICSRS 2019),

at Rome (Italy). He has been invited to present 4 tutorials at international conferences. He has been functioning as Technical Programme Chair of the 2013 Prognostics and System Health Management Conference (PHM-2013), Milano (Italy) 2013, of the ESREL2020PSAM15 Conference, Venice (Italy) and as Technical Committee Co-Chair of the European Safety and Reliability Conference, ESREL 2014, Wroclaw (Poland), 2014. He is serving as editorial board member of three international scientific journals and he is associated editor of the 'Journal of Risk and Reliability'.

He has been treasurer of the European Safety and Reliability Association (ESRA) from 2014 to 2018 and he is Chairman of the ESRA Technical Committee on "Prognostics and System Health Management".
He is co-author of 2 books and more than 175 papers on international journals and proceedings of international conferences.

Prof. Francesco Di Maio
Technical Program Chair of the ESREL 2020 PSAM 15 Conference

Francesco Di Maio (B.Sc. in Energetic Engineering, 2004, Politecnico di Milano; M.Sc. in Nuclear Engineering, 2006, Politecnico di Milano; Double EU-China PhD in Nuclear Engineering, 2010, Politecnico di Milano and Tsinghua University) is Associate Professor in Nuclear Power Plants at Politecnico di Milano (Milano, Italy) since 2019, and has obtained Scientific Qualification to function as Full Professor in 2014.

His research aims at studying, developing and applying efficient computational intelligence methods and data mining techniques (Neural Networks, Fuzzy Logic, Genetic Algorithms, etc.) for addressing a number of open issues relevant for risk analysis, such as integration of deterministic and probabilistic methods for computational risk assessment, and cyber-physical systems risk and resilience assessment. In 2009-2010 he has been Research Fellow of the Science and Technology Programme (STFP) in China, financed by the European Commission, and spent 24 months of practical research at Tsinghua University (Beijing, China). In 2010, he has been appointed as Senior Researcher in City University of Hong Kong. In 2016 he has been Project team member of the "Evaluation of the management and impacts of fusion and fission research supported by the Euratom Research and Training Programme 2014-2018 and previous Euratom Programmes", contracted by Fondazione Politecnico and Ernst&Young under commitment of the Directorate-General for Reseach&Innovation of the European Commission. Starting from 2016, he has become Technical Peer reviewer for the Innovative Nuclear Research (INR) Integration Office of the Department of Energy (DOE) Office of Nuclear Energy, USA. He has been collaborator of the Italian Embassy in China and acted as technical committee member for a number of international conferences. He has been invited keynote Lecturer at the plenary sessions the 4th International Conference on System Reliability and Safety (ICSRS 2019) in Rome (Italy). He has been functioning as Technical Programme Chair of the 2nd and 3rd International Conference on System Reliability and Safety (ICSRS 2018 and 2019), and of the ESREL2020PSAM15 Conference, Venice (Italy).

He is an active reviewer for more than 12 scientific international peer-reviewed journals and has been Associate Editor of the International Journal of Performability Engineering (2011-2015). He has published more than 150 papers in peer-reviewed international journals and conferences. He is Co-Chair of the Technical Commitee on Nuclear Industry of the European Safety and Reliability Association (ESRA) and Chair of the Italian IEEE Reliability Chapter.

Panel: "Risk in practice: smart solutions for sustainable global world"

Moderator:

Martino Loiacono
Journalist for ItaliaOggi

Speakers:

Prof. Enrico Zio
General Chair of Esrel 2020 Psam 15 Conference

Stefano Cao
Chief Executive Officer of Saipem S.p.A.

Pankaj Duggal
President and COO of Jensen Hughes

Francesco Starace
CEO and General Manager of Enel Spa

Luigi De Vecchis
President of Huawei Italy

Panel: "Risk in practice: smart solutions for sustainable global world"

Martino Loiacono
Journalist for ItaliaOggi

Martino Loiacono (born September 10, 1993) is an Italian journalist. He is a columnist for ItaliaOggi. He has previously taught as Visiting language coordinator at University of Mary Washington (US).

Panel: "Risk in practice: smart solutions for sustainable global world"

Prof. Enrico Zio
General Chair of Expotech Esrel 2020 Psam 15 Conference

Enrico Zio received the MSc degree in nuclear engineering from Politecnico di Milano in 1991 and in mechanical engineering from UCLA in 1995, and the Ph.D. degree in nuclear engineering from Politecnico di Milano and in probabilistic risk assessment at MIT in 1996 and 1998, respectively. He is currently full professor at the Centre for research on Risk and Crises (CRC) of Ecole de Mines, ParisTech, PSL University, France, full professor and President of the Alumni Association at Politecnico di Milano, Italy, eminent scholar at Kyung Hee University, Republic of Korea, distinguished guest professor at Tsinghua University, Beijing, China, adjunct professor at City University of Hong Kong, Beihang University and Wuhan University, China and Co-Director of the Center for REliability and Safety of Critical Infrastructures (CRESCI) and the sino-french laboratory of Risk Science and Engineering (RISE), at Beihang University, Beijing, China.

In 2020, he has been awarded the prestigious Humboldt Research Award from the Alexander von Humboldt Foundation in Germany (https://www.humboldt-foundation.de/web/home.html), one the world's most prestigious research awards across all scientific disciplines. The Award is given to outstandingly qualified researchers and future leaders from science-related fields (but very seldom awarded to engineers!). The Award is granted in recognition of a researcher's entire achievements to date, to academics whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future. Professor Zio has been selected for the Award in light of being a World leading scientist in Risk and Resilience Assessment, Safety Analysis and Reliability Engineering of complex systems and infrastructures, in particular for energy applications. His H-index is 72. He has been one of the pioneers in using artificial intelligence (such as neural networks) and genetic algorithms in reliability engineering and risk assessment, solving key problems related to the safety and reliability of critical systems such as those used in the nuclear, oil and gas, transportation industries. He has promoted the use of computational modeling within various international initiatives.

His research focuses on the modeling of the failure-repair-maintenance behavior of components and complex systems, for the analysis of their reliability, maintainability, prognostics, safety, vulnerability, resilience and security characteristics, and on the development and use of Monte Carlo simulation methods, artificial intelligence techniques and optimization heuristics. He is author and co-author of seven books and more than 500 papers on international journals, Chairman and Co-Chairman of several international Conferences, associate editor of several international journals and referee of more than 20.

Panel: "Risk in practice: smart solutions for sustainable global world"

Stefano Cao
Chief Executive Officer of Saipem S.p.A.

Stefano Cao is an Italian engineer and senior business management executive with vast experience in the energy and infrastructure sector.

Since 30 April 2015 he has been Chief Executive Officer of Saipem S.p.A., a leading global company in the Engineering & Construction and Drilling business lines, with a strong bias towards oil & gas-related activities in remote areas and deep waters.

After graduating in Mechanical Engineering from the "La Sapienza" University in Rome, Mr. Cao began his career in the Eni Group in 1976, first in Saipem S.p.A. - which he left as Executive Chairman in 2000 - and subsequently in Eni S.p.A. - which he left in 2008 as Chief Operating Officer of the Exploration & Production Division. Between 2000 and 2008, the hydrocarbon production of the latter Division increased from 1,200,000 to 1,800,000 boe/day with the entry into production of new fields, the acquisition of independent exploration and production companies and the purchase of productive assets.

From February 2009 to June 2012 Mr Cao was Managing Director and CEO of Sintonia SA, a holding company in the infrastructure sector established as the result of a joint venture between Edizione Holding, Goldman Sachs Infrastructure Partners, Mediobanca and GIC.

Other positions held include Chairman of Eni Corporate University, Chairman of Assomineraria, member of the Boards of Directors of Telecom Italia S.p.A., Aeroporti di Roma (ADR) S.p.A. and Autostrade per l'Italia (ASPI) S.p.A., member of the Management Board of A2A S.p.A. and Non Executive Director of Petrofac Ltd.

Panel: "Risk in practice: smart solutions for sustainable global world"

Pankaj Duggal
President and COO of Jensen Hughes

With nearly three decades of experience, Pankaj Duggal brings to his role as the President and Chief Operating Officer of Jensen Hughes strong operations and sales leadership across global market sectors – from corporate, mission critical and institutional to science and technology as well as government. In his role, Pankaj provides business leadership across the company's operating divisions in the U.S., Canada, U.K., Europe, Middle East and Asia Pacific and supports the achievement of strategic initiatives and financial goals.

Pankaj's diverse executive leadership experience and technical background allows him to engage strategically with both internal operational leaders and teams as well as clients to deliver solutions that yield high-value, long-term, social, environmental and business outcomes. His interest areas include strategy development, integrated design, alternative delivery, total cost of ownership, and high-performance built environment. His key areas of expertise include:

• Diverse architecture, engineering and construction market experience
• Strategic leadership with business acumen and client relationship management
• Inclusive growth-oriented business approach and collaborative decision-making

Pankaj serves on the Dean's Advisory Board for the College of Architecture and Urban Planning at the University of Michigan. He earned a Master of Architecture with Distinction and a Master of Urban Planning from the University of Michigan, and a Bachelor of Architecture from the School of Planning & Architecture in Delhi, India. His industry affiliations include AIA, APA, AICP, ULI, CoreNet, SAME, DBIA, and CMAA.

Panel: "Risk in practice: smart solutions for sustainable global world"

Francesco Starace
CEO and General Manager of Enel Spa

Francesco Starace is CEO and General Manager of Enel S.p.A. since May 2014. Starace joined the Enel Group in 2000, holding various leading managerial positions, including that of Director of the Business Power Area (from July 2002 to October 2005) and Director of the Market Division (from November 2005 to September 2008).

From 2008 to 2014 he was CEO and General Manager of Enel Green Power, a Group company dedicated to the generation of energy from renewable sources and one of the main players in the renewable energy sector at a global level.

In November 2010, Starace led the company's placement on the Milan and Madrid stock exchange lists with a market capitalization of 8 billion euros.

He began his career in the management of the construction of electricity generation plants, initially in the General Electric group, then in the ABB Group and later in the Alstom Power Corporation, as head of global sales for the Gas Turbine Division.

Francesco Starace further consolidated his professional experience internationally, having worked in Saudi Arabia, Egypt, the United States, and Switzerland.

He has been a member of the Board of the Polytechnic of Milan since January 2014 and of the Board of the Italian Institute of Technology (IIT) since February 2015.

Since June 2014 he has been a member of the Advisory Board of the United Nations Sustainable Energy 4 All. Since May 2015 he has been a member of the Board of Directors of the United Nations Global Compact. Member of the General Council and of the Advisory Board of Confindustria respectively from 2015 and 2016. From January 2016 to January 2018 he was co-president of the World Economic Forum's Energy Utilities and Energy Technologies Community.

In October 2016 he was appointed co-president of the B20 Climate & Resource Efficiency Task Force and again in January 2020 co-president of the B20 Saudi Arabia "Energy, Sustainability and Climate Taskforce". From June 2017 to May 2019 he was President of Eurelectric, the sector association of the electricity industry at European level.
In September 2017 he was appointed by the European Commission as a member of the "Multi-stakeholder Platform on the Implementation of the Sustainable Development Goals in the EU".

At the invitation of the Rockefeller Foundation, Engineer Starace became a member of the Global Commission to End Energy Poverty since September 2019.
Graduated in nuclear engineering at the Politecnico di Milano, he is a passionate cyclist.

Panel: "Risk in practice: smart solutions for sustainable global world"

Luigi De Vecchis
President of Huawei Italy

Luigi De Vecchis is the President of Huawei Italy. He is responsible for representing the company at the highest institutional levels, increasing relations with the business community and bringing Huawei's contribution to the trade associations. He owns a degree in Telecommunications Engineering and has always carried out activities of technological innovation, in the areas of telecommunications and energy production plants from fourth generation nuclear reactors.

Before joining Huawei, De Vecchis was General Manager at Telesoft, an IT company owned by Telecom Italia, where he was responsible for the international development of the former Stet Group. Then he was appointed President and CEO of Siemens Italy and managed a group of 7,000 people for ten years, two manufacturing facilities based in Italy for the global production of RAN and radio links, and an R&D center. After the merger of Nokia and Siemens, he became President and CEO of Nokia Siemens Networks.

Born and raised with a strong entrepreneurial spirit, De Vecchis founded the company Merivus Srl and participated in the worldwide program Generation Four International Forum (GIF) for the research and development of fourth generation reactors. He was Advisor to the Ministry of Agriculture with a focus on sustainable energy and member of the inter-ministerial working group to evaluate the extension of the incentives for energy generated from renewable sources. For more than ten years De Vecchis has been Honorary Scientific Director and voluntary at Occam, a non-profit organization founded by UNESCO, where he was responsible for innovation in the fields of energy, waste disposal, and medicine with the aim of finding a sustainable way to extend health care to the most disadvantaged populations.

Technical Program

Technical Program Tracks

CONFERENCE TOPICS

T1 Accelerated Degradation and Life Test
T2 Accident and Incident Modeling
T3 Artificial Intelligence for Reliability, Maintenance and Safety
T4 Augmented Reality for Safety
T5 Big Data and IoT Applications in Reliability and Maintenance
T6 Computational Reliability/Risk Assessment
T7 Consequence Modeling and Management
T8 Crisis Management
T9 Cyber Security
T10 Dependability
T11 Dependence and Common Cause Failures Modeling and Analysis
T12 Disaster Management
T13 Dynamic Reliability / Risk Assessment
T14 Economic Analysis in Risk Management
T15 Environmental Risk Analysis
T16 External Hazards Risk Assessment
T17 Foundational Issues in Risk Assessment and Management
T18 Geological Risk Assessment
T19 Human Factors and Human Reliability
T20 Industrial Safety
T21 Industry 4.0 Reliability and Safety
T22 Insurance Risk
T23 Internal Hazards Risk Assessment
T24 Machine Learning for Reliability Maintenance and Safety
T25 Maintenance Modeling and Applications
T26 Mathematical Models and Methods for Reliability and Safety
T27 Medical Risk
T28 Natural Hazards Risk Assessment
T29 Occupational Safety
T30 Optimization of Reliability Maintenance and Safety
T31 Organizational Factors
T32 Policy Making and Legislative Issues
T33 Predictive Maintenance
T34 Prognostics and System Health Management
T35 Quality
T36 Resilience Analysis, Assessment and Management
T37 Risk Acceptance Criteria
T38 Risk Analysis and Safety in Standardization
T39 Risk Assessment
T40 Risk Governance and Societal Safety
T41 Risk Informed Applications
T42 Risk Management
T43 Risk Perception and Communication
T44 Risk Prevention
T45 Risk-based Decision Making
T46 Safety Culture
T47 Security
T48 Site Level Multi-Unit Multi-Source Risk Assessment
T49 Smart Devices and Systems Reliability
T50 Software Reliability and Safety

Technical Program Tracks

T51   Structural Health Management
T52   Structural Reliability
T53   System Reliability
T54   Uncertainty and Sensitivity Analysis
T55   Virtual Reality for Safety
T56   Web Security
T57   Multi-Unit Nuclear Plant PSA

INDUSTRIAL AREAS

A1   Aeronautics and Aerospace Industry
A2   Agriculture and Aquaculture Systems
A3   Automotive Industry
A4   Autonomous Transportation
A5   Banking and Finance
A6   Chemical and Process Industry
A7   Civil Engineering
A8   Critical Infrastructures
A9   Cyber-Physical Systems
A10   Data Centers
A11   Electric Power Industry
A12   Electronics
A13   Energy Industry
A14   Food Industry
A15   Health and Medicine
A16   Health Service Industry
A17   Information Technology and Telecommunications
A18   Insurance
A19   Land Transportation
A20   Land Use Planning
A21   Manufacturing
A22   Maritime and Offshore Technology
A23   Materials
A24   Nuclear Industry
A25   Oil and Gas Industry
A26   Railway Industry
A27   Renewable Energy Industry
A28   Smart Cities and Systems
A29   Socio-Technical-Economic Systems
A30   Supply Chains
A31   Water Transportation systems
A32   Web Systems

SPECIAL SESSIONS

S1   Reliability of Passive Systems in Nuclear Power Plants - Perspectives and Challenges
S2   Life Cycle-Based Resilience Assessment and Management of Structural and Infrastructural Assets

Technical Program Tracks

INNOVATION CHALLENGES

MONDAY 2 November

TIME					SESSIONS	
Venice	Africa Cape Town	Asia Beijing	Oceania Canberra	America Washington DC	VIRTUAL ROOM 1	VIRTUAL ROOM 2
10:00 11:15	11:00 12:15	17:00 18:15	20:00 21:15	4:00 5:15	Opening Ceremony at the presence of Institutional Representatives	
11:15 13:00	12:15 14:00	18:15 20:00	21:15 23:00	5:15 7:00	Panel: "Risk in practice: smart solutions for a sustainable global world"	
13:00 13:45	14:00 14:45	20:00 20:45	23:00 23:45	7:00 7:45	PAUSE	
13:45 15:15	14:45 16:15	20:45 22:15	23:45 1:15	7:45 9:15	Panel: "Global Risk in the Post Covid-19 world"	
15:15 17:15	16:15 18:15	22:15 0:15	1:15* 3:15	9:15 11:15	Special Session: "Reinforcement Learning For Industry 4.0"	
17:15 17:30	18:15 18:30	0:15 0:30	3:15* 3:30	11:15 11:30	PAUSE	
17:30 18:15	18:30 19:15	0:30 1:15	3:30* 4:15	11:30 12:15	Plenary Lecture: "Hybrid Threats and Disaster Risk Management: Changing Paradigm in Security" by **Georg Peter** (European Commission)	

* +1 DAY

● PANEL   ● SPECIAL SESSION   ● PLENARY LECTURE

TUESDAY 3 November

TIME					SESSIONS	
Venice	Africa Cape Town	Asia Beijing	Oceania Canberra	America Washington DC	VIRTUAL ROOM 1	VIRTUAL ROOM 2
9:00 10:30	10:00 11:30	16:00 17:30	19:00 20:30	3:00 4:30	Special Session: "Advanced Diagnosis and Prognosis in Bio-medical Engineering"	
10:30 10:45	11:30 11:45	17:30 17:45	20:30 20:45	4:30 4:45	PAUSE	
10:45 11:30	11:45 12:30	17:45 18:30	20:45 21:30	4:45 5:30	Plenary Lecture: "Risk Mitigation – A Shared Responsibility in the 5G Ecosystem" by **Bob Xie** (Huawei)	
11:30 12:15	12:30 13:15	18:30 19:15	21:30 22:15	5:30 6:15	Plenary Lecture: "Living out zero harm under the new normal" by **Vincent Ho** (Immediate Past President IOSH)	
12:15 14:00	13:15 15:00	19:15 21:00	22:15 0:00	6:15 8:00	PAUSE	
14:00 15:30	15:00 16:30	21:00 22:30	0:00* 1:30	8:00 9:30	Panel: "System of Systems: Reliability Challenges"	Special Session: "Human Reliability Analysis today: data and other challenges"
15:30 15:45	16:30 16:45	22:30 22:45	1:30* 1:45	9:30 9:45	PAUSE	
15:45 17:15	16:45 18:15	22:45 0:15	1:45* 3:15	9:45 11:15	Special Session: "Text Mining applied to Risk Analysis, Maintenance and Safety"	Special Session: "Reliability of Passive Systems in Nuclear Power Plants - Perspectives and Challenges"
17:15 18:00	18:15 19:00	0:15 1:00	3:15* 4:00	11:15 12:00	Plenary Lecture: "Decision Programming for Optimizing Multi-Stage Decision Problems under Uncertainty" by **Ahti Salo** (Aalto University, Finalnd)	
18:30 20:00	19:30 21:00	1:30 3:00	4:30* 6:00	12:30 14:00	ESRA General Assembly Meeting	

* +1 DAY

● ● ●
PANEL   SPECIAL   PLENARY
SESSION   LECTURE

WEDNESDAY 4 November

TIME					SESSIONS	
Venice	Africa Cape Town	Asia Beijing	Oceania Canberra	America Washington DC	VIRTUAL ROOM 1	VIRTUAL ROOM 2
9:00 10:45	10:00 11:45	16:00 17:45	19:00 20:45	3:00 4:45	Special Session: "Human Performance in Resilience, Risk and Safety Assessment"	Special Session: "NLP, knowledge graphs and ontologies"
10:45 11:00	11:45 12:00	17:45 18:00	20:45 21:00	4:45 5:00	PAUSE	
11:00 11:30	12:00 12:30	18:00 18:30	21:00 21:30	5:00 5:30	Plenary Lecture: "People, infrastructure, stakeholders: sustainable risk mitigation in power grids" by **Antonio Cammisecra** (ENEL)	
11:30 13:00	12:30 14:00	18:30 20:00	21:30 23:00	5:30 7:00	Special Session: "Artificial Intelligence for Maintenance Decision Support"	Special Session: "Bayesian Network Modelling for Risk Assessment in the Oil&Gas Industry"
13:00 14:00	14:00 15:00	20:00 21:00	23:00 0:00	7:00 8:00	PAUSE	
14:00 15:30	15:00 16:30	21:00 22:30	0:00* 1:30	8:00 9:30	Panel: "Human reliability and performance in digital I&C and modern, automated systems"	
15:30 15:45	16:30 16:45	22:30 22:45	1:30* 1:45	9:30 9:45	PAUSE	
15:45 16:30	16:45 17:30	22:45 23:30	1:45* 2:30	9:45 10:30	Plenary Lecture: "Risk management in the Covid-19 era" by **Andrea Giacchero** (Cassa Depositi e Prestiti)	
16:30 18:00	17:30 19:00	23:30 1:00	2:30* 4:00	10:30 12:00	Special Session: "Fault-Tolerant and Attack-Resilient Cyber-Physical Systems (CPS)"	Special Session: "Life Cycle-Based Resilience Assessment and Management of Structural and Infrastructural Assets"

* +1 DAY

PANEL   SPECIAL SESSION   PLENARY LECTURE

THURSDAY 5 November

TIME					SESSIONS	
Venice	Africa Cape Town	Asia Beijing	Oceania Canberra	America Washington DC	VIRTUAL ROOM 1	VIRTUAL ROOM 2
9:00 9:45	10:00 10:45	16:00 16:45	19:00 19:45	3:00 3:45	Plenary Lecture: "Realtime Damage Decision Support System for ship recovery" by **Alessandro Bonvicini** (Fincantieri)	
9:45 10:30	10:45 11:30	16:45 17:30	19:45 20:30	3:45 4:30	Plenary Lecture: "Maintenance in an Industry 4.0 World - Transforming Maintenance through Data Science" by **Melinda Hodkiewicz** (University of Western Australia, Australia)	
10:30 10:45	11:30 11:45	17:30 17:45	20:30 20:45	4:30 4:45	PAUSE	
10:45 12:00	11:45 13:00	17:45 19:00	20:45 22:00	4:45 6:00	Innovation Challenge: "Prognostic and Health Management in Evolving Environments"	
12:00 12:45	13:00 13:45	19:00 19:45	22:00 22:45	6:00 6:45	Plenary Lecture: "Industrial risk management in oil and gas construction and drilling projects – Saipem experience" by **Abrate Silvia** (Saipem)	
12:45 13:15	13:45 14:15	19:45 20:15	22:45 23:15	6:45 7:15	PAUSE	
13:15 15:15	14:15 16:15	20:15 22:15	23:15 1:15	7:15 9:15	Innovation Challenge: "The NASA Langley UQ Challenge on Optimization under Uncertainty"	
15:15 16.30	16:15 17:30	22:15 23:30	1:15* 2:30	9:15 10:30	Panel: "How Can Risk Science Improve the Understanding, Communication and Handling of Risks in Society?"	
16:30 17:15	17:30 18:15	23:30 0:15	2:30* 3:15	10:30 11:15	Plenary Lecture: "Overcoming Regulatory Barriers to the Application of Machine Learning in Safety and Security Critical Applications" by **Chris Johnson** (Queen's University Belfast, UK)	
17:15 18:00	18:15 19:00	0:15 1:00	3:15* 4:00	11:15 12:00	CLOSING CEREMONY	

* +1 DAY

PANEL   PLENARY LECTURE   INNOVATION CHALLENGE

Keynote Speakers

Georg Peter

**Head of Unit, Technology Innovation in Security
European Commission, Joint Research Center
EU**

Dr.Ing. Georg Peter, born in 1959 in Frankfurt, Germany, holds a degree as Mechanical Engineer and a Ph.D. in nuclear safety. He joined the European Commission in 1989 as a research engineer in the Joint Research Center in Ispra analysing accident scenarios in nuclear power plants and in hydrocarbon facilities by developing and applying complex computer simulation models.

After having been responsible for the Safety & Security Unit of the JRC Ispra site, he was appointed as Head of the Unit "Technology Innovation in Security" in the Directorate "Space, Security and Migration" of the Joint Research Center of the European Commission.

His team is dealing with innovative solutions for the protection and resilience of critical infrastructures in Europe, hybrid threats, advanced radio signal processing such as 5G, spectrum sharing and interference studies, scientific support to the European Global Navigation Satellite System Galileo, hazards in chemical industry and consequences of natural hazards to technological installations as well as possible policy aspects of future quantum technologies.

Hybrid Threats and Disaster Risk Management: Changing Paradigm in Security

The European project which has brought unprecedented peace, prosperity and democracy faces severe and acute challenges that undermine its very existence. The current geopolitical situation, emerging security threats and societal challenges are menacing the resilience of European countries and eventually the one of the EU project as a whole.

Security is a fundamental issue for European societies. The events in Ukraine have showed that a new realm of security threats has emerged that poses an acute threat to the integrity of a state and that the internal-external security are tightly linked. In addition, security is linked with the citizens' perceptions about a country's governance performance. As a consequence, addressing security challenges is not anymore an exclusive competence of security professionals and related policy makers. It is much broader requiring a serious and systematic consideration of societal aspects and changes. The Digital Transformation of our society, migration and Artificial Intelligence (just to name a few) are changing completely the way societies will function in the next decades. The limits between traditional disciplines are blurring and actually create a continuum upon which policy makers need to act. The EU has recognized the need to act in a holistic manner in the domain of security and has published two communications on the issue of Hybrid Threats. Hybrid Threats are the mixture of coercive and subversive activity, conventional and unconventional methods (i.e. diplomatic, military, economic, technological), which can be used in a coordinated manner by state or non-state actors to achieve specific objectives while remaining below the threshold of formally declared warfare.

Critical infrastructures are an essential element of hybrid threats. However, compromising their performance is not the final objective but rather the means to more overarching objectives such as affecting the core values of societies and trust to institutions. Disruptive events in critical infrastructures might be leveraged to undermine the trust of citizens to the risk and disaster management capabilities of their government and discredit leadership.

Today internal security is mainly tackled at sectoral level (e.g. cyber security, physical security, fight against terrorism, critical infrastructure protection, etc.). This has to change. Security has to be seen in the context of the overall resilience of the society. The political framework at EU level related to Hybrid Threats supports addressing security related issues in a holistic manner. If the EU aspires to maintain or even increase its role as a global actor as well as maintain a high level of security for its citizens, it is necessary to act urgently and step-up efforts building upon the existing momentum. This requires also a change of thinking in risk analysis.

We have to find answers to questions such as:

•　How can we change our risk management approach to improve the protection and resilience of our critical infrastructures given this new complex threat vectors?
•　How can we build resilience against security related incidents that aim at leveraging existing societal vulnerabilities in order to potentiate their impact?
•　How can we bolster resilience at societal level introducing a whole of governance and whole of society approach?

The JRC responds to these questions by supporting the conceptualization of Hybrid Threats. This aims to assist Member States to identify such threats and support attribution. Tools allowing an early identification of Hybrid Threats are of outmost importance for security analysists in an effort to connect the dots and to get a coherent and overarching view of the security threats. The Conceptual Framework for Hybrid Threats developed jointly by EC Joint Research Center and the Center of Excellence for countering Hybrid Threats in Helsinki aims to provide a basis for a better understanding of the phenomena, and for developing analysis tools to detect and counter Hybrid Threats in an early phase.

Tuesday 3 November

Virtual room 1

10.45 / 11.30

Risk Mitigation – A Shared Responsibility in the 5G Ecosystem
Keynote Speaker: Bob Xie
Chair: Mariagrazia Fugini (Politecnico di Milano, Italy)

**PLENARY
LECTURE:
HUAWEI**

Bob Xie
**Cyber Security Officer for the Western European Region
HUAWEI**

Bob Xie has been working at Huawei for 22 years. He gained experience in Marketing and R&D as Senior Engineer, Senior Marketing Manager and Director. In 2010, he was entrusted with the mission to set up the Huawei Cyber Security Evaluation Centre in the UK, first of its kind. He directed the HCSEC from 2010 till July 2018. Then he moved on to set up the Huawei Cyber Security Transparency Centre in Brussels, which officially opened in March 2019. In August 2019, he was also appointed as the CSO for the Huawei Western European Region. Bob Xie is well versed on the cyber security management system and practices of the company.

Tuesday 3 November

Virtual room 1

11.30 / 12.15

Living out zero harm under the new normal
Keynote Speaker: Vincent Ho (HONG KONG)

**PLENARY
LECTURE**

Vincent Ho

**Head of Corporate Safety MTR Corporation
BS, MS, PhD, MBA, CEng, PE, RPE, CSP, SMS
CFIOSH, FIMechE, FCILT, FHKIE**

Over 35 years of experience in transportation, nuclear, and defence industries; actively promoting the application of risk management in enhancing safety.

At MTR, manage the corporate safety governance system, lead 2nd line of defence on safety, and champion corporate response to COVID-19.

Key positions in professional bodies:
•   52nd President, Institution of Occupational Safety & Health
•   Chairman: HK Association of Risk Management and Safety
•   Past Chairman: IOSH (Hong Kong), HKIE-SSC, HKIE-MMNC Division, HKIE-Nuclear Division, OSHC-Construction Industry OSH Committee, Society for Risk Analysis-Southern California

Adjunct Professor / Lecturer in MSc and BSc programmes on risk management and safety (HKU-EEE, HKUST-MAE and CityU-MNE).

Living out zero harm under the new normal

This Lecture addresses the aspiration of global 'Vision Zero' movement, and the systems and processes organisations need to take on the journey in reduction health and safety accidents. The speaker, Dr Vincent Ho, will discuss how MTR Corporation takes on 'Vision Zero' and transforms it into its own Zero Harm campaign with an aim to promulgate a preventive safety culture among the workforce. Dr Ho will discuss the impact of COVID-19 to the workforce under the new normal, and share experience for management to achieve a high level of health and safety using the Zero Harm approach during this difficult time.

Athi Salo
Aalto University, Finland

Professor Ahti Salo has worked extensively on the development of decision analytic methods and their uses in resource allocation, risk management, and efficiency analysis. In June 2019, he received the Edgeworth-Pareto Award from the International Society of Multiple Criteria Decision Making. In 2013, he won the Publication Award of the INFORMS Decision Analysis Society for the book Portfolio Decision Analysis: Improved Methods for Resource Allocation which he co-authored and co-edited with Professors Jeffrey Keisler and Alec Morton.

Salo has directed numerous research projects funded by firms, industrial federations, and funding agencies. He has worked as visiting professor at the London Business School, Université Paris-Dauphine and the University of Vienna. He has been the President of the Finnish Operations Research Society (FORS) for two biennial terms. In 2010-16, he was jury member of the EDDA Doctoral Dissertation Award of the Association of European Operational Research Societies (EURO), and chaired this jury in 2016. In 2015 2019, he has been member of the Foresight Steering Group appointed by the Prime Minister's Office of Finland.

Decision Programming for Optimizing Multi-Stage Decision Problems under Uncertainty

At present, trends such as the wider adoption of sensors, communication devices and data science tools make it possible to develop increasingly accurate representations of techno-economic systems and their safety performance. Together with methodological advances in portfolio decision analysis, such representations support the formulation of increasingly comprehensive decision models which are systemic in that they account simultaneously for multiple objectives and associated preferences; the full range of alternative risk mitigation actions; logical and probabilistic dependencies within the system; as well as relevant resource and risk constraints, including budgets and regulatory requirements.

In this talk, we show how these kinds of systemic decision models can be developed and transformed into optimization problems which can be solved with tailored knapsack algorithms or techniques of mixed integer linear programming (MILP). A major benefit of these models is that they recommend portfolios of risk mitigation actions which are guaranteed to be optimal in view of the stated constraints: thus, these actions will, as a rule, contribute more to the chosen objectives (such as safety performance) than selecting actions one-by-one based on "piecemeal" approaches such as the comparison of individual risk importance measures or benefit-to-cost ratios. Furthermore, these models can capture many kinds of probabilistic and chance constraints (such as conditional Value-at-Risk) while they also help identify which actions are robust selections subject to different assumptions about the numerical values of model parameters. Several examples are given to illustrate how these advances in portfolio decision analysis provide information that serves to improve decisions.

People, infrastructure, stakeholders: sustainable risk mitigation in power grids
Keynote Speaker: Antonio Cammisecra (ITALY)
Chair: Michael Beer (Leibniz Universität Hannover, Germany)

Antonio Cammisecra

Head of the Global Infrastructure & Networks business line at ENEL GROUP

Prior to that, he was Head of Global Power Generation since October 2019 and served as Chief Executive Officer of Enel Green Power and Head of the Africa, Asia and Oceania region since 2017. Until 2019 he was also Head of the North and Central America region.

He joined the International Department of Enel Group in 1999. He was then appointed Business Development Manager for Latin America, working in various countries in South and Central America.
He joined Enel Green Power on its foundation in 2009, as Head of Business Development Italy, and in 2012 was named Head of Operations and Maintenance Hydro, Wind & Solar.
In 2013, he became Head of Global Business Development, leading a team of more than 200 people, working in over 20 countries across 5 continents.

Antonio Cammisecra was born in Naples (Italy) in 1970. He graduated cum laude in Mechanical Engineering from the University of Naples "Federico II" in 1996. In 2004 he obtained an Executive MBA at Bocconi University, Milan.

Risk management in the Covid-19 era
Keynote Speaker: Andrea Giacchero (ITALY)
Chair: Enrico Zio (MINES ParisTech, France, and Politecnico di Milano, Italy)

Andrea Giacchero
Head of Operational and ICT Risk, Cassa Depositi e Prestiti

Currently Head of Operational & ICT Risk in Cassa Depositi e Prestiti, with more than a ten-year experience on operational risks in the banking sector. He earned his PhD in economic and management engineering at the "Tor Vergata" University of Rome, developing an intersectoral framework for the management of operational risks. He is author of several national and international publications within his areas of expertise. His research interests are mainly focused on risk management and corporate social responsibility.

Thursday 5 November	**Realtime Damage Decision Support System for ship recovery**	**PLENARY**
Virtual room 1	Keynote Speaker: Alessandro Bonvicini (ITALY)	**LECTURE:**
9:00 / 9:45	Chair: Sylwia Werbinska-Wojciechowska (Wroclaw University of Science and Technology, Poland)	**FINCANTIERI**

Alessandro Bonvicini

Naval Architect CETENA S.p.A.
Engineering & Technical Consultancy – Head of Design for Safety B.U.

Alessandro is a Naval Architect and Marine Engineer working in CETENA, leading the "Design for Safety" Business Unit. The BU supports Fincantieri, Classification societies and ship-owners in risk analysis studies such as Alternative design, Safe Return to Port (SRtP) and Ship Design Risk Assessment. Moreover he is involved in NATO working groups and he is technical committee member at RINA (Registro Italiano Navale) and Italian Administration Adviser at IMO for Safety. The BU is also involved in research activities in both merchant and navy fields.

FINCANTIERI

Thursday 5 November

Virtual room 1

9:45 / 10:30

Maintenance in an Industry 4.0 World
Transforming Maintenance through Data Science
Keynote Speaker: Melinda Hodkiewicz (AUSTRALIA)
Chair: Marko Čepin (University of Ljubljana, Slovenia)

PLENARY
LECTURE

Melinda Hodkiewicz

B.A. (Hons) Oxon, PhD (Eng), C.Eng(UK)
Professor and BHP Fellow for Engineering for Remote Operations
Faculty of Engineering and Mathematical Sciences, University of Western Australia

Melinda Hodkiewicz is an engineering academic working on multi-disciplinary projects to improve maintenance, asset management and safety practices. Her academic career started in 2005 after an earlier engineering career in maintenance in the resources industry. She currently has a 5-year A$1.3MFellowship at the University of Western Australia funded by BHP, a major resources company. The aim of the Fellowship is to improve academic-industry collaboration and work to support the communities in which BHP operates. She endeavours to do the latter by research that impacts maintenance to make it more productive and safer. In October 2019 she has been elected a Fellow of the Australian Academy of Technology and Engineering.

She has four research areas: ontology and natural language processing of maintenance and safety unstructured records. This work supports validation of remaining useful life models, which in turn assists the maintainer of the future, who will be using MEMS-IIOT sensing systems for industrial maintenance applications. She works with academic and industry collaborators from a wide range of disciplines in a number of different countries.

Organisationally she co-leads the data science program for the $10M ARC funded Offshore Structures Hub, manages the UWA Critical Mass Research group on Engineering System Health, leads the UWA System Health Lab, and has conventional academic and teaching responsibilities. She also holds two external national positions, one as a member of the Board of Australia's National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) and the other on the advisory committee for the Australian Government's mining equipment, technology and services (METS) Ignited Growth Centre, one of the six Government Growth Centres charged with distributing A$238M of funds 2017-2021. She is currently a visitor at the Alan Turing Institute, this is the national centre for data science in the UK.

In October 2019 she has been elected a Fellow of the Australian Academy of Technology and Engineering.

Professor Hodkiewicz is an international leader in asset management through research, education and digitalization.

Maintenance in an industry 4.0 world – Transforming Maintenance through Data Science

Maintenance management practices underpin the export earnings and infrastructure of our national economies but these practices have changed little in the last 20 years. Global companies are trying to bring computational methods, statistics, and artificial intelligence to determine how, when and why maintenance is conducted. However, evidence of positive return on investment is patchy. In an Industry 4.0 world, we need to be able to apply data science methods to maintenance at scale. The slow uptake by maintenance personnel of these methods is due to poor prediction performance in practice and lack of validation of these algorithms in the field. Solutions include natural language processing and ontologies for unlocking data in inspection and repair records, bayesian methods for supporting asset-specific predictions under uncertainty, and culture evolution for shifting to secure sharing of industry data and codes. Together, these developments are building transparency and trust in prediction recommendations for maintenance.

Thursday 5 November	Industrial risk management in oil and gas construction	PLENARY
Virtual room 1	and drilling projects – Saipem experience	LECTURE:
12:00 / 12.45	Keynote Speaker: Silvia Abrate (ITALY)	SAIPEM
	Chair: Terje Aven (University of Stavanger, Norway)	

Silvia Abrate

Risk Management, Supply Chain and Business Integrity Director of SAIPEM GROUP

Silvia Abrate began her career in 1994 at Arthur Andersen and subsequently worked in the Internal Audit Function of Schneider Electric. She was hired by Saipem in 2003 as a Senior Internal Auditor and since then he has held various positions within the Internal Audit Function, the last of which since 2013 as the Audit Planning, Methodologies and Relations with Control Bodies Manager. Over the years she has also worked as a member of the Compliance Committee at various Group subsidiaries. Silvia Abrate is currently the Risk Management, Supply Chain and Business Integrity Director of Saipem Group.

Industrial risk management in oil and gas construction and drilling projects – Saipem experience

Industrial Risk Management is a fundamental tool for managing risks in contractor's projects. The purpose is to present the industrial risk management framework in Saipem, which is based on 4 pillars: the Risk Appetite, the Bid Complexity Index, the Golden Rules and Silver Guidelines and the Project Risk Management. An overview of the industrial risk management organization and risk managers' role during commercial and execution phases is also given, together with an example of assessing Covid-19 risks.

Thursday 5 November

Virtual room 1

16:30 / 17:15

Overcoming Regulatory Barriers to the Application of Machine Learning in Safety and Security Critical Applications
Keynote Speaker: Chris Johnson (UK)
Chair: Todd Paulos (Jet Propulsion Laboratory, USA)

PLENARY LECTURE

Chris Johnson

Head of School/Professor of Computing Science
Queen's University Belfast, UK

Chris Johnson develops new techniques to support the development of complex safety and security critical systems. Over the last ten years, he has helped to author guidelines for the investigation of incidents and accidents across both the European aviation and railway industries. He has worked with members of the European Space Agency and with NASA on the software engineering of future space missions. He has also worked on security concerns with global navigation satellite systems. His team have also worked with various agencies around the world to develop simulations of mass evacuations following terrorist attacks and natural disasters. He is co-chair of the scientific advisory board for the €2 billion SESAR programme for the modernisation of European Air Traffic Management.

Research Interests:
- Safety
- Security
- Risk Assessment
- Software
- Configuration Management
- Contingency Planning
- Accident Analysis
- Incident reporting

Overcoming Regulatory Barriers to the Application of Machine Learning in Safety and Security Critical Applications

Many international standards including IEC 61508, ISO 26262 and EN 50126 place either explicit or implicit barriers to the use of Machine Learning in safety-critical applications, especially at higher levels of integrity.   Traditional approaches to the development of high-reliability systems use risk assessment techniques to focus resources on   software that makes the greatest contribution to the mitigation of functional hazards. At the higher levels of integrity, this requires the use of deterministic verification and validation techniques based on strong assumptions about the eventual context of use. They also imply high levels of traceability and of transparency that enable independent inspection, for instance by regulatory agencies.   In contrast, machine learning algorithms have proven to be extremely effective in identifying statistical patterns in complex data without necessarily making the justifications for the correlations in training sets transparent either to external agencies, to the software developers or to end users.

In this talk we will present a range of techniques that have been pioneered, often for use in military applications, that provide regulatory agencies and assessment boards with the confidence that is required to permit the use of Machine Learning in Safety-Critical Systems.   In many cases, these techniques limit the application of ML, for example, to advisory approaches in which the human remains in ultimate control. Other approaches extend conventional methods from high-reliability engineering, including massive exposure to   potential operating environments through "exhaustive" testing.   These techniques are unlikely to satisfy the growing demand for the integration of autonomous and semi-autonomous systems into a host of application domains. Analytical approaches to representing and reasoning about ML, often shift the problem away from understanding these algorithms but create further problems for regulators and end users in understanding the underlying mathematical abstractions that support the analysis. We will conclude the presentation by explaining how hybrid ML and deterministic algorithms can be integrated with the appropriate use of adversarial networks to increase confidence in ML applications and yet still retain sufficient prospect that these approaches will yield significant operational benefits in complex, uncertain safety-related domains.

Special
Sessions

Monday 2 November	**Reinforcement Learning For Industry 4.0**	SPECIAL SESSION
15:15 17:15	*Organizers:* **Michele Compare** (Aramis S.r.l., Italy) **Luigi Manca** (Engineering Ingegneria Informatica S.p.a., Italy) **Enrico Zio** (MINES ParisTech, France and Politecnico di Milano, Italy)	
Virtual room 1		

S12-01	Optimal Part Flow in Maintenance Service Contracts of Gas Turbines Luca Bellani, Michele Compare, Enrico Zio, Marzia Sepe, Francesco Annunziata, Fausto Carlevaro
S12-02	Circuit Breaker Data Analysis Using Copula Correlation Michy Alice, Loredana Cristaldi, Enrico Ragaini
S12-03	Agent-based modeling and reinforcement learning for optimizing energy systems operation and maintenance: the Pathmind solution Luca Pinciroli, Piero Baraldi, Michele Compare, Sahar Esmaeilzadeh, Mohammed Farhan, Brett Göhre, Roberto Grugni, Luigi Manca, Enrico Zio
S12-04	Development of Two-Level Autonomous System for Startup and Shutdown Operation of Nuclear Power Jae Min Kim, Seung Jun Lee
S12-05	Autonomous Algorithm for Bubble Creation Operation in Pressurizer by Using Deep Reinforcement Learning Daeil Lee, Jonghyun Kim

Tuesday 3 November	**Advanced Diagnosis and Prognosis in Bio-medical Engineering**	SPECIAL SESSION
9:00 10:30	*Organizers:* **Shaoping Wang** (Beihang University, China)	
Virtual room 1		

S08-01	Bayesian filter observers based estimation of glucose and insulin concentration in plasma Weijie Wang, Shaoping Wang, Xingjian Wang, Yixuan Geng
S08-02	Transfer Learning From Grid-Structured Data To Graph-Structured Data: Application To Diagnosis Of Depression Jiawei Yang, Shaoping Wang, Xingjian Wang, Rui Liu, Yun Wang, Jian Cui, Yuan Zhou, Jingjing Zhou, Yuan Feng, Lei Feng, Gang Wang
S08-03	IMU-Based Online Load Spectrum Estimation for Human Knee-joint Zhangtao Wang, Xingjian Wang, Shaoping Wang
S08-04	Blood Coagulation Monitoring and Thrombus Formulation Assessment based on Bioimpedance Spectroscopy Xuesong Luo, Shaoping Wang, Jian Shi

S08-05   Video-based Automatic Early Parkinson's Disease Detection System Using Biomechanical Features
Changhong Lin, Shaoping Wang

Tuesday 3 November	**Human Reliability Analysis today: data and other challenges**	**SPECIAL SESSION**
14:00 15:30	*Organizers:* **Xuhong He (Lloyd's Register Consulting, Sweden)**	
Virtual room 2		

S03-01   Comparisons of Human Reliability Data between Analog and Digital Environment
Jinkyun Park and Yochan Kim

S03-03   FLEX and HRA Challenges in Common Backbone Models
Jeffery Julius, Kaydee Gunter, Michael Hirt

S03-04   A Framework to Analyze Human Performance Outside the Control Room
Rossella Bisio, Alexandra Fernandes, Claire Blackett

S03-05   Unified Definitions for Dependency in Quantitative Human Reliability Analysi
Vincent P. Paglioni, Katrina M. Groth

Tuesday 3 November	**Text Mining applied to Risk Analysis, Maintenance and Safety**	**SPECIAL SESSION**
15:45 17:15	*Organizers:* **Piero Baraldi (Politecnico di Milano, Italy) Márcio das Chagas Moura (Universidade Federal de Pernambuco, Brazil) Enrico Zio (MINES ParisTech, France, and Politecnico di Milano, Italy)**	
Virtual room 1		

S05-01   Verification of Safety Rules Using Nlp
Coen van Gulijk, Violeta Holmes

S05-02   Extracting Knowledge from Near Miss Reports using Machine-Learning Techniques
Silvia M. Ansaldi, Carla Simeoni, Alessandro Di Francesco, Roberto Martini, Luca Di Piramo, Flavia Fattori

S05-03   A text mining and NLP approach for identifying potential consequences of accidents in an oil refinery
July Macêdo, Diego Aichele, Márcio das Chagas Moura, Isis Lins

S05-04   Automated classification of injury leave based on accident description and natural language processing
Caio Bezerra Souto Maior, João Mateus Marques de Santana, Márcio das Chagas Moura, Isis Didier Lins

S05-05   An NLP and Text Mining–based approach to categorize occupational accidents
Marcela Silva Guimarães, Hiago Henrique Gomes de Araújo, Thais Campos Lucas, Márcio das Chagas Moura, Isis Didier Lins, Rômulo Fernando Teixeira Vilela

| S05-06 | Text mining for the automatic classification of road accident reports |
| | Dario Valcamonico, Piero Baraldi, Francesco Amigoni, Enrico Zio |

Tuesday 3 November	**Reliability of Passive Systems in Nuclear Power Plants Perspectives and Challenges**	
15:45 17:15	*Organizers:*	**SPECIAL SESSION**
	Andrea Bersano (POLITO, Italy)	
	Anis Bousbia Salah (BelV, Belgium)	
	Francesco Di Maio (Politecnico di Milano, Italy)	
Virtual room 2	**Marco Lanfredini** (Università di Pisa, Italy)	
	Fulvio Mascari (ENEA, Italy)	
	Jose Villanueva (UPV, Spain)	
	Enrico Zio (MINES ParisTech, France and Politecnico di Milano, Italy)	

| S01-01 | Assessment Of Relap5-3d For Application On In-Pool Passive Power Removal Systems |
| | Vincenzo Narcisi, Lorenzo Melchiorri, Fabio Giannetti, Gianfranco Caruso |

| S01-02 | Assessing the Impact of Passive Autocatalytic Recombiners on the Accident Progression in a VVER 1000 |
| | P. Groudev, P. Petrova, A. Stefanova, R. Gencheva, P. Vryashkova |

| S01-03 | Qualification of RELAP5-3D code against the in-pool passive energy removal system PERSEO data |
| | Andrea Bersano, Cristina Bertani, Nicolò Falcone, Mario De Salve, Fulvio Mascari, Paride Meloni |

| S01-04 | The Passive Safety Concept of KERENA: From Design to Experimental Verification |
| | Thomas Wagner, Thomas Mull |

| S01-05 | Risk Assessment of Operation Strategy using High Pressure Emergency Makeup System during SBO |
| | Sang Hee Kang, Ho Rim Moon, Sang Won Lee |

Wednesday 4 November	**Human Performance in Resilience, Risk and Safety Assessments**	
9:00 10:45	*Organizers:*	**SPECIAL SESSION**
	Tina Comes (Delft University of Technology, Netherlands)	
Virtual room 1	**Maria Nogal** (Delft University of Technology, Netherlands)	
	Pieter van Gelder (Delft University of Technology, Netherlands)	

| S11-01 | Assessing Human Performance In The Era Of Resilience Engineering – A Paradigm Shift? |
| | Miltos Kyriakidis, Vinh N. Dang |

| S11-02 | Role Independency in Nuclear Power Plant Control Room Teams – Background for an Empirical Simulator Study |
| | Magnhild Kaarstad and Espen Nystad |

| S11-03 | A Bayesian Network Approach for the Quantitative Assessment of Resilience of Critical Systems |
| | T.V. Santhosh, Edoardo Patelli |

S11-04   Transfer Learning-based Driving Style Recognition
SHI Yuchen, WANG Yi, CHEN Nan

S11-05   Crowd sensitive indicators for proactive safety management: a theoretical framework
Francesco Costantino, Antonio De Nicola, Giulio Di Gravio, Andrea Falegnami, Riccardo Patriarca, Giordano Vicoli, Maria Luisa Villani, Massimo Tronci

S11-06   The Relation Between Behavioral Factors and Humans' Reactions During Catastrophic Events
Georgia Kaltsidi, Yiannis Xenidis

T12-02   Enhancing Disaster Response with Architectonic Capabilities by Leveraging Machine and Human Intelligence Interplay
Karla Saldana Ochoa

Wednesday 4 November **9:00 10:45** **Virtual room 2**	**Natural Language Processing, Knowledge Graphs and Ontologies** *Organizers:* **Melinda Hodkiewicz (University of Western Australia, Australia)**	**SPECIAL SESSION**

S09-01   Pipeline for machine reading of unstructured maintenance work order records
Yiyang Gao, Caitlin Woods, Wei Liu, Tim French, Melinda Hodkiewicz

S09-02   STANDARDISED FAILURE REPORTING AND CLASSIFICATION OF FAILURES OF SAFETY INSTRUMENTED SYSTEMS
Stein Hauge, Solfrid Håbrekke, Mary Ann Lundteigen, Lars Bodsberg

S09-03   Cleaning and visualization of unstructured text in safety records
Michael Stewart, Wei Liu, Rachel Cardell-Oliver, and Mark Griffin

S09-04   An Ontology for the Management of Equipment Ageing
Silvia M. Ansaldi, Paolo Bragatto, Patrizia Agnello, Maria Francesca Milazzo

S09-05   Research on Named Entity Recognition in Chinese Airworthiness Regulation Texts Based on Deep Learning Method
Haotian Niu, Cunbao Ma, Yihan Guo, Pei Han, Siyuan Li

S09-06   TECHNICAL LANGUAGE PROCESSING FOR MAINTENANCE WORK ORDER TEXTS
MICHAEL P. BRUNDAGE, MELINDA HODKIEWICZ, and THURSTON SEXTON

S09-07   Semantic knowledge kernels for service chat bots
Mikkel H. Brynildsen

Wednesday 4 November	**Artificial Intelligence for Maintenance Decision Support**	
11:30 13:00	*Organizers:* **Christophe Bérenguer** (University of Grenoble Alpes, France) **Pierre Dersin** (Alstom Digital Mobility, France) **Olga Fink** (ETHZ, Switzerland)	**SPECIAL SESSION**
Virtual room 1		

S04-06	4R Innovative Resilience Strategy for Power Distribution Networks **Representative of ENEL**
S04-01	An unsupervised machine learning approach to extract wheel and track health status indicators from train-borne accelerometer data **Benjamin Baasch, Michael Roth, Sebastian Schulz, Jörn C. Groos**
S04-02	Predicting State of Health and End of Life for Batteries in Hybrid Energy Buses **Mohammed Ghaith Altarabichi, Yuantao Fan, Sepideh Pashami, Sławomir Nowaczyk, Thorsteinn Rögnvaldsson**
S04-03	Agent-based maintenance decision support system for power grids operating in electricity markets **Pegah Rokhforoz, Blazhe Gjorgiev, Giovanni Sansavini, and Olga Fink**
S04-04	Impact of the decision horizon on railway systems maintenance and service scheduling **Omar Bougacha, Christophe Varnier, Noureddine Zerhouni, and Pierre Dersin**
S04-05	Anomaly Detection And Classification In Time Series With Kervolutional Neural Networks **Oliver Ammann, Gabriel Michau and Olga Fink**
S04-07	Deep reinforcement learning for optimizing operation and maintenance of energy systems equipped with PHM capabilities **Luca Pinciroli, Piero Baraldi, Guido Ballabio, Michele Compare, Enrico Zio**

Wednesday 4 November	**Bayesian Network Modelling for Risk Assessment in the Oil&Gas Industry**	
11:30 13:00	*Organizers:* **Luca Decarli** (Eni, Italy) **Francesco Di Maio** (Politecnico di Milano, Italy) **Enrico Zio** (MINES ParisTech, France and Politecnico di Milano, Italy)	**SPECIAL SESSION**
Virtual room 2		

S06-01	A Safety-Barrier-based Risk Analysis Model for Offshore Oil and Gas leakage Incidents **Yangfan Zhou, Shengnan Wu, Jianchun Fan, Baoqian Dai**
S06-02	A Multistate Bayesian Network for accounting the degradation of safety Barriers in the Living Risk Assessment of Oil and Gas Plants **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**

S06-03	A Novel KPI for Continuously Monitored Safety Barriers based on Probabilistic Safety Margins **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**
S06-04	Analytic Hierarchy Process for the Estimation of the Probability of Failures of Safety Barriers in Oil and Gas Installations **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**
S06-05	The Risk Assessment and Management of Premature Screen-Out During Hydraulic Fracturing Based on The Bayesian Belief Network Model **Enrico Zio, Maryam Mustafayeva And Andrea Montanaro**

Wednesday 4 November	**Fault-Tolerant and Attack-Resilient Cyber-Physical Systems**	
16:30 18:00	*Organizers:* **Francesco Di Maio** (Politecnico di Milano, Italy) **Masood Parvania** (University of Utah, USA) **Roozbeh Razavi-Far** (University of Windsor, Canada) **Enrico Zio** (MINES ParisTech, France and Politecnico di Milano, Italy)	**SPECIAL SESSION**
Virtual room 1		

S07-01	Fault Diagnosis in Smart Grids Using a Deep Long Short-Term Memory-based Feature Learning Architecture **Hossein Hassani, Roozbeh Razavi-Far, and Mehrdad Saif**
S07-02	Allocation of Defense Resources against Cyber Attacks to Cyber-Physical Systems **Wei Wang, Francesco Di Maio, Enrico Zio**
S07-03	Model-based Fault Injection Experiments for the Safety Analysis of Exoskeleton System **Tagir Fabarisov, Ilshat Mamaev, Andrey Morozov, Klaus Janschek**
S07-04	Enhancing Detection Accuracy of Cyber Attacks Through Dimensionality Reduction **Ehsan Hallaji, Roozbeh-Razavi-Far, and Mehrdad Saif**
S07-05	Anomaly and Attack Detection in Supervisory Control Networks for Cyber-PhysicalSystems **Ernesto Del Prete, Fabio Pera, Luca Faramondi, Camilla Fioravanti, Simone Guarino, Gabriele Oliva, and Roberto Setola**
S07-06	Is Smartness Risky? A Framework to Evaluate Smartness in Cyber-Physical Systems **Christos Chronopoulos, Nelson Humberto Carreras Guzman**

Wednesday 4 November	**Life Cycle-Based Resilience Assessment and Management of Structural and Infrastructural Assets**	
16:30 18:00	*Organizers:* **Ruud Binnekamp** (Delft University of Technology, Netherlands) **Omar Kammouh** (Delft University of Technology, Netherlands) **Maria Nogal** (Delft University of Technology, Netherlands) **Rogier Wolfer** (Delft University of Technology, Netherlands)	**SPECIAL SESSION**
Virtual room 2		

S02-01	Improving Uncertainty Representation of Offshore Wind Farms Reliability using Expert Judgments **Georgios Leontaris, Georgios Katsouris**

S02-02   Interdependent Infrastructure Interventions Optimization: an Integrative Systems Thinking Approach
Omar Kammouh, Maria Nogal, Mark de Bruijne, Ruud Binnekamp, A. Rogier M. Wolfert

S02-03   Resilience Quantification of Large-Scale Water Distribution Networks: a Probabilistic Approach
Omar Kammouh, Maria Nogal, Gian Paolo Cimellaro, A. Rogier M. Wolfert

S02-04   Security and Resilience for Airport Infrastructure
Corinna Köpke, Louis König, Katja Faist, Mirjam Fehling-Kaschek, Jörg Finger, Alexander Stolz, Kelly Burke, Eftichia Georgiou, Vasiliki Mantzana, Ioannis Chasiotis, Isabel Praça, Eva Maia, Nikolaos Papagiannopoulos, Filipe Apolinário, Nelson Escravana

S02-05   Resilience assessment of safety-critical systems with credal networks
Hector Diego Estrada-Lugo; T.V. Santhosh; Marco de Angelis; Edoardo Patelli

Plenary Lectures

Monday 2 November	Hybrid Threats and Disaster Risk Management: Changing Paradigm in Security	
17:30 18:15	*Keynote Speaker:* **George Peter (European Commission)**	**PLENARY LECTURE**
Virtual room 1	*Chair:* **Marina Rowenkamp (GRS, Germany)**	

Tuesday 3 November	Risk Mitigation – A Shared Responsibility in the 5G Ecosystem	
10:45 11:30	*Keynote Speaker:* **Bob Xie (Huawei)**	**PLENARY LECTURE**
Virtual room 1	*Chair:* **Mariagrazia Fugini (Politecnico di Milano, Italy)**	

Tuesday 3 November		
11:30 12:15	Living out zero harm under the new normal *Keynote Speaker:* **Vincent Ho (Immediate Past President IOSH)**	**PLENARY LECTURE**
Virtual room 1		

Tuesday 3 November	**Decision Programming for Optimizing Multi-Stage Decision Problems under Uncertainty**	**PLENARY LECTURE**
17:15 18:00	*Keynote Speaker:* **Athi Salo** (Aalto University, Finalnd)	
Virtual room 1	*Chair:* **Anne Barros** (Centrale Supelec, France)	

Wednesday 4 November	**People, infrastructure, stakeholders: sustainable risk mitigation in power grids**	**PLENARY LECTURE**
11:00 11:30	*Keynote Speaker:* **Antonio Cammisecra** (ENEL)	
Virtual room 1	*Chair:* **Michael Beer** (Leibniz Universität Hannover, Germany)	

Wednesday 4 November	**Risk management in the Covid-19 era**	**PLENARY LECTURE**
15:45 16:30	*Keynote Speaker:* **Andrea Giacchero** (Cassa Depositi e Prestiti)	
Virtual room 1	*Chair:* **Enrico Zio** (MINES ParisTech, France, and Politecnico di Milano, Italy)	

Thursday 5 November	Realtime Damage Decision Support System for ship recovery	
9:00 9:45	*Keynote Speaker:* **Alessandro Bonvicini (Fincantieri)**	**PLENARY LECTURE**
Virtual room 1	*Chair:* **Sylwia Werbinska–Wojciechowska** (Wroclaw University of Science and Technology, Poland)	

Thursday 5 November	Maintenance in an Industry 4.0 World Transforming Maintenance through Data Science	
9:45 10:30	*Keynote Speaker:* **Melinda Hodkiewicz** (University of Western Australia, Australia)	**PLENARY LECTURE**
Virtual room 1	*Chair:* **Marko Čepin** (University of Ljubljana, Slovenia)	

Thursday 5 November	Industrial risk management in oil and gas construction and drilling projects – Saipem experience	
12:00 12:45	*Keynote Speaker:* **Silvia Abrate (Saipem)**	**PLENARY LECTURE**
Virtual room 1	*Chair:* **Terje Aven** (University of Stavanger, Norway)	

**Thursday
5 November**

**16:30
17:15**

**Virtual room
1**

Overcoming Regulatory Barriers to the Application of Machine Learning in Safety and Security Critical Applications

Keynote Speaker:
Chris Johnson (Queen's University Belfast, UK)

Chair:
Todd Paulos (Jet Propulsion Laboratory, USA)

PLENARY LECTURE

Panels

Monday 2 November **11:15 13:00** **Virtual room 1**	**Risk in practice: smart solutions for a sustainable global world** *Moderator:* **Martino Loiacono** (Journalist for ItaliaOggi) *Panellists:* **Giuseppe Bono** (Fincantieri) **Stefano Cao** (Saipem) **Luigi De Vecchis** (Huawei) **Fabrizio Palermo** (Cassa Depositi e Prestiti) **Francesco Starace** (Enel)	**PANEL**

Monday 2 November **13:45 15:15** **Virtual room 1**	**Global Risk in the Post Covid-19 world** *Moderator:* **Tiziano Treu** (President CNEL, Italy) *Panellists:* **Terje Aven** (University of Stavanger, Norway) **Michael Beer** (Leibniz Universität Hannover, Germany) **Fabrizio Curcio** (Casa Italia, Italia) **Way Kuo** (City University of Hong Kong, Hong Kong - China) **Ahti Salo** (Aalto University, Finalnd) **Enrico Zio** (MINES ParisTech, France, and Politecnico di Milano, Italy)	**PANEL**

Tuesday 3 November **14:00 15:30** **Virtual room 1**	**System of Systems: Reliability Challenges** *Moderator:* **Pierre Dersin** (ALSTOM, France) *Panellists:* **Olivier Blancke** (Hydro-Québec, Canada) **Witold Krasny** (Cosmo Tech, France)	**PANEL**

Wednesday 4 November	**Human reliability and performance in digital I&C and modern, automated systems**	
14:00 15:30	*Moderator:* **Andreas Bye** (IFE, OECD Halden Reactor Project, Norway) *Panellists:* **Chiara Leva** (Technological University Dublin, Ireland) **Vinh Dang** (PSI, Switzerland) **Yochan Kim** (KAERI, South Korea) **Ali Mosleh** (University of California, Los Angeles, USA)	**PANEL**
Virtual room 1		

Thursday 5 November	**How Can Risk Science Improve the Understanding, Communication and Handling of Risks in Society**	
15:15 16:30	*Moderators:* **Terje Aven** (University of Stavanger, Norway) **Enrico Zio** (MINES ParisTech, France, and Politecnico di Milano, Italy) *Panellists:* **Frederic Bouder** (University of Stavanger, Norway) **Scira Menoni** (Politecnico di Milano, Italy) **Ortwin Renn** (Institute for Advance Sustainability Studies, Germany) **Marja Ylönen** (Technical Research Centre of Finland, Finland)	**PANEL**
Virtual room 1		

Innovation Challenges

Thursday 5 November

10:45 12:00

Virtual room 1

Prognostic and Health Management in Evolving Environments

Organizers:
Piero Baraldi (Politecnico di Milano, Italy)
Francesco Cannarile (Aramis Srl, Italy)
Michele Compare (Aramis Srl, Italy)
Zhe Yang (Politecnico di Milano, Italy)
Enrico Zio (Politecnico di Milano, Italy and MINES ParisTech, France)

INNOVATION CHALLENGE

C01-01   Stacking Ensembles of Heterogenous Classifiers for Fault Detection in Evolving Environments
Mohammed Ghaith Altarabichi, Peyman Mashhadi, Yuantao Fan, Sepideh Pashami, Sławomir Nowaczyk, Pablo Del Moral, Mahmoud Rahat and Thorsteinn Rögnvaldsson

C01-02   Scenario-based Generalization bound for Anomaly Detection Support Vector Machine Ensembles
Roberto Rocchetta, Milan Petkovic, Qi Gao

C01-03   A Deep Learning Framework For Health Anomaly Detection of Multi-component Systems in Evolving Environments: A Case Study in PHM
Shahin Siahpour, Abhijeet Ainapure, Xiang Li, Jay Lee

C01-04   The Aramis Data Challenge: Prognostics and Health Management in Evolving Environments
Francesco Cannarile, Michele Compare, Piero Baraldi, Zhe Yang, Enrico Zio

Thursday 5 November

13:30 15:15

Virtual room 1

The NASA Langley UQ Challenge on Optimization under Uncertainty

Organizers:
Luis G. Crespo (NASA Langley Research Center, USA)
Sean P. Kenny (NASA Langley Research Center, USA)

INNOVATION CHALLENGE

C02-02   The NASA Langley Challenge on Optimization Under Uncertainty
Luis Crespo, Sean Kenny

C02-01   Reliability Optimization of Black Box Uncertain Control System in NASA Uncertainty Quantification Challenge
Mu-Xia Sun, Chuan-Zhou Jia, Chen Zhang, Han-Xiao Zhang, Yan-Fu Li

C02-03   Contribution to the NASA Langley UQ Challenge on Optimization Under Uncertainty
Christian Agrell, Simen Eldevik, Odin Gramstad, Andreas Hafver

C02-04   Bayesian calibration and probability bounds solution to the Nasa 2020 UQ challenge on optimization under uncertainty
Ander Gray, Alexander Wimbush, Marco De Angelis, Roberto Rocchetta, Peter O. Hristov, Enrique Miralles-Dolz, Dominic Calleja

C02-05   Computational Methods for System Optimization Under Uncertainty
Nicola Pedroni

C02-06   A Distributionally Robust Optimization Approach to the NASA Langley Uncertainty Quantification Challenge
Yuanlu Bai, Zhiyuan Huang, Henry Lam

Posters

A06-03 Perspectives in environmental management in the light of the implementation of bio-circular economy principles
Carla Mazziotti Gomez de Teran, Lia Millucci, Antonio Fardelli, Massimo Mari

T15-03 Circular bioeconomy growth to face the increasing industrial risk
Massimo Mari, Lia Millucci, Antonio Fardelli, Carla Mazziotti

T26-15 A Perturbed Gamma Process with Random Effect and State-Dependent Errors
Bruno Castanier, Nicola Esposito, Massimiliano Giorgio, and Agostino Mele

T42-12 FRAM Approach for Barrier Management in Offshore Drilling
Seyed Iliya Pezeshki, Behnaz Hosseinnia, Nicola Paltrinieri, Valerio Cozzani

Video and E-Proceedings

A01	AERONAUTICS AND AEROSPACE INDUSTRY

A01-01	Bayesian Framework for Bioburden Density Calculations To Perform Planetary Protection Probabilistic Risk Assessment Andrei Gribok, J. Nick Benardini, Arman Seuylemezian
A01-02	Estimating Runway Friction Using Flight Data Alise Midtfjord and Arne Bang Huseby
A01-03	Reliability Evaluation of an Experimental Set-Up Using Limited Flight Test Data Lidia Travascio, Gianpiero Buzzo, Mario Antonio Solazzo, Angela Vozella
A01-04	Influence of Tire Pressure On Airfield Pavement's Roughness Test Result in the Scope of Air Operations' Safety Mariusz Wesołowski, Paweł Iwanowski, Paweł Pietruszewski
A01-05	Analysis on the Insulation Failure of the Electrical Connector under Low Pressure Environment Mei Le, Yuanyuan Li, Xiaogang Li
A01-06	Loss of (human) control in complex socio-technical systems: A conceptual framework for managing decision authority for improved safety Tor Erik Evjemo
A01-07	Applications of the Measures of Betweenness Centrality for Airlines Scheduling for Robustness Andrzej Słodownik, Mirosław Kowalski, Józef Żurek, Mariusz Zieja

A03	AUTOMOTIVE INDUSTRY

A03-01	A General Approach for a Fail-Operational System Design Tobias Kain, Hans Tompits, Julian-Steffen Müller, Philipp Mundhenk, Maximilian Wesche, and Hendrik Decke
A03-02	A Cellular Automaton Model for Signalized Intersection with Auxiliary Traffic Light Yongrui Wen, Zhiqiang Hou, Chaoyu Ruan, Majing Lan , Junyong Wang
A03-03	Scenario-based Extended HARA Incorporating Functional Safety & SOTIF for Autonomous Driving Marzana Khatun, Michael Glaß, Rolf Jung
A03-04	An Approach of Fail Operational Power Supply for Next Generation Vehicle Powernet Architectures Armin Köhler, Bernd Bertsche
A03-05	Intrusion Detection System for CAN using Simple Neural Networks Jo Laufenberg, Thomas Kropf, Oliver Bringmann

A04	AUTONOMOUS TRANSPORTATION

A04-01	Using The Operational Envelope To Make Autonomous Ships Safer K. E. Fjørtoft, Ø. J. Rødseth
A04-02	A Qualitative Modeling for Reliability and Safety Assessment of Fully Autonomous Vehicle based on System-Theoretic Process Analysis Diana Filipa Martins Miranda Lomelino de Araújo, Yan-Fu Li and Hendrik Frölian
A04-03	Reliability methods and procedures for error and failure management and system reconfiguration in safety critical autonomous driving applications Fabian Plinke, Johannes Heinrich, Timo Frederik Horeis, Julian-Steffen Mueller, Hendrik Decke

A04-04	Safety Assessment Of Scenarios For The Simulation-Based Validation Process Of AV With Regards To Its Functional Insufficiencies **Tchoya Florence Koné, Eric Levrat, Eric Bonjour, Frédérique Mayer, Stéphane Géronimi**
A04-05	Dynamic Safety Analysis for Automated Driving **Khelfa Basma and Tordeux Antoine**
A04-06	Formal System and Safety Design of a System of Systems: a proof of concepts **Ismet Addoui, Michel Batteux, Anouk Dubois and Romain Kerneis**
A04-07	Autonomous Driving: Reliability and Risk Issues **Wolfgang Kröger**
A04-08	Risk Analysis of Autonomous Ships **Thomas Johansen, Ingrid Bouwer Utne**
A04-09	True Detection Rate and False Positives Targets on Road Side Detectors for autonomous Vehicle Traffic **Pierre Dersin, Erio Piana**
A04-10	System Theoretic Process Analysis for a Vehicle SAE Level four **Greta Koelln, Michael Klicker, Tobias Schmid, Stephan Schmidt**
A04-11	Optimizing the Placement of Applications in Autonomous Vehicles **Tobias Kain, Hans Tompits, Julian-Steffen Müller, Maximilian Wesche, Yael Abelardo Martinez Flores, and Hendrik Decke**

A06	**CHEMICAL AND PROCESS INDUSTRY**
A06-01	A Mathematical Programming Approach for Minimizing Occupational Exposures to Chemical Agents **Elena Stefana, Roberto Zanotti, Filippo Marciano, Renata Mansini**
A06-02	Ageing Assessment for Static and Dynamic Containment Systems at Seveso Sites **Paolo Bragatto, Corrado Delle Site, Maria Francesca Milazzo**
A06-03	Perspectives in Environmental Management in the Light of the Implementation of Bio-Circular Economy Principles **Carla Mazziotti Gomez de Teran, Lia Millucci, Antonio Fardelli, Massimo Mari**

A07	**CIVIL ENGINEERING**
A07-01	Using Hybrid Fuzzy Mathematical Method in Dam Failure Risk Path Identification **Yantao Zhu, Chongshi Gu, Siyu Chen, Qiang Sun**
A07-02	Safe Management of Stone Balconies: an Overview **Giuseppe Manzone, Mario Patrucco, Rebecca Nebbia**
A07-03	Model Uncertainty in Skin Friction Prediction for Shafts in Granular Soil **Sahar Ismail and Shadi Najjar**
A07-04	Sampling-Based Calcuation of Seismic Fragility Curve Considering Structural Nonlinear Hysteretic Behavior **Heekun Ju, Hyung-Jo Jung**
A07-05	Probabilistic Soil-Structure Interaction Response Of Nonlinear Npp Structure in Time Domain **Yuree Choi, Heekun Ju, Hyung-Jo Jung**

A07-06	Fragility Curves for Buildings Based on Damage Data in Uki City due the 2016 Kumamoto, Japan, Earthquake
	Kazuaki Torisawa, Kei Horie, Ken Kawabe, Masashi Matsuoka, Munenari Inoguchi, Fumio Yamazaki

A07-07	Predicting the Shear Resistance of Steel Fiber Reinforced Concrete Structures using Random Forest-Based Model
	Oladimeji Benedict Olalusi, Mariam Akinlolu, Theo C Haupt

A08	**CRITICAL INFRASTRUCTURES**

A08-01	Rigidity and Flexibility – Using Experiences 3d Printing for Training in Construction Industry
	Gunnar M. Lamvik, Ivonne A. Herrera

A08-02	Comparison of the Post-Disaster Recovery of Water Supply System By Ga Optimization and Heuristics
	Kento Wakayama, Taro Kanno, Yuji Kawase, Hiroyuki Takahashi and Kazuo Furuta

A08-03	Risk and Resilience Assessment and Improvement in the Telecommunication Industry
	Mirjam Fehling-Kaschek, Natalie Miller, Gael Haab, Katja Faist, Alexander Stolz, Ivo Häring, Alberto Neri, Giuseppe Celozzi, Jose Sanchez, Javier Valera, Rodoula Makri

A08-04	Tabletop Exercise as a Tool to Foster Resilience in the Energy Sector: Lessons Learned in the Baltic States
	Vytis Kopustinskas, Rimantas Šikas, Lawrence Walzer, Bogdan Vamanu, Marcelo Masera, Julia Vainio, Romualdas Petkevičius

A08-05	Security and Resilience for Airport Infrastructure
	Corinna Köpke, Louis König, Katja Faist, Mirjam Fehling-Kaschek, Jörg Finger, Alexander Stolz, Kelly Burke, Eftichia Georgiou, Vasiliki Mantzana, Ioannis Chasiotis, Isabel Praça, Eva Maia, Nikolaos Papagiannopoulos, Filipe Apolinário, Nelson Escravana

A08-06	Towards Understanding Critical Flows – A Literature Review
	Josefin Lindström, Jonas Johansson

A08-07	Remote and Agile Improvement of Industrial Control and Safety Systems Processes
	Thor Myklebust, Mary Ann Lundteigen, Lars Bodsberg, Geir K. Hanssen

A08-08	Quantifying the Interdependency Strength Across Critical Infrastructure Systems Using a Dynamic Network Flow Redistribution Model
	Yu Wang, Jin-Zhu Yu, Hiba Baroud

A08-09	Estimating the Impact of Earthquake-Induced Power Outages on Different Economic Sectors In Chile
	Elisa Ferrario, Mauricio Monsalve, Alan Poulos, Juan Carlos de la Llera, Giovanni Sansavini

A08-10	Evaluating Network Reduction Strategies for Consistent Risk Assessment of Critical Infrastructures
	Mauricio Monsalve, Elisa Ferrario, Yolanda Alberto, Felipe Arróspide, Sebastián Castro, Alan Poulos, Juan Carlos de la Llera

A08-11	Analysing The Reliability of Electronic Systems Used in Critical Infrastructure and Exposed to the Impact of Strong Electromagnetic Pulses
	Jacek Paś, Adam Rosiński, Marek Szulim, Jarosław Łukasiak

A08-12	**GEORGE APOSTOLAKIS FELLOWSHIP AWARD WINNER**
	A Method for Inferring Casual Dependencies Among Abnormal Behaviours of Components in Complex Technical Infrastructures
	Federico Antonello, Piero Baraldi, Ahmed Shokry, Enrico Zio, Luigi Serio, Ugo Gentile

A08-13	Adapting Public Transport to Covid-19 Contingencies: Evaluating Unlock Policies in the Metropolitan Area of Milan Through Dmci Simulation
	Paolo Trucco, Pietro Maggia, Boris Petrenj

A08-14	**GEORGE APOSTOLAKIS FELLOWSHIP AWARD WINNER** Multi-Objective Evolutionary Algorithm for the Identification of Rare Functional Dependencies in Complex Technical Infrastructures **Federico Antonello, Piero Baraldi, Enrico Zio, Luigi Serio**

A09 — CYBER-PHYSICAL SYSTEMS

A09-01	Is Smartness Risky? A Framework to Evaluate Smartness in Cyber-Physical Systems **Christos Chronopoulos, Nelson Humberto Carreras Guzman**
A09-02	Anomaly and Attack Detection in Supervisory Control Networks for Cyber-PhysicalSystems **Ernesto Del Prete, Fabio Pera, Luca Faramondi, Camilla Fioravanti, Simone Guarino, Gabriele Oliva, and Roberto Setola**
A09-03	A Protocol Reverse Test Scenario Choreography Method for CPS **Dongli Yang, Xiaodong Gou, Hongman Li, Shunkun Yang**
A09-04	Enhancing Detection Accuracy of Cyber Attacks Through Dimensionality Reduction **Ehsan Hallaji, Roozbeh-Razavi-Far, and Mehrdad Saif**

A11 — ELECTRIC POWER INDUSTRY

A11-01	Start and Stop Costs for Hydro Power Plants: A Critical Literature Review **Olivian Savin, Carmen Badina, Julien Baroth, Sylvie Charbonnier, Christophe Bérenguer**
A11-02	Just Tell Us What To Do" Regulations and Cyber Risk Appetite in the Electric Power Industry **Silje Aakre**

A12 — ELECTRONICS

A12-01	Managing Risks in Lithium-Ion Battery Applications **Richard Vicars, Kevin Hecksher**

A13 — ENERGY INDUSTRY

A13-01	Paraconsistent Annotated Logic (PAL) Applied in the Decision-Making Process of Maintenance Policy for Kaplan Turbine **Marjorie Maria Bellinello, Gilberto Francisco Martha de Souza, Carlos Alberto Murad, Adherbal Caminada Netto, Arthur Henrique de Andrade Melani, Miguel Ângelo de Carvalho, Marcelo Rodrigues**
A13-02	Defining Maintenance Performance Indicators for Asset Management Based on ISO 55000 and Balanced Scorecard: A Hydropower Plant Case Study **Renan Favarão da Silva, Arthur Henrique de Andrade Melani, Miguel Angelo de Carvalho Michalski, Gilberto Francisco Martha de Souza, Silvio Ikuyo Nabeta, Fernando Hiroyuki Hamaji**
A13-03	Failure Modes and Effects Analysis of an Aquaculture Feeding Barge Equipped with Wind Turbines **Xue Xu, Maurizio Collu, Abhinav K A, Athanasios Kolios**

A15 — HEALTH AND MEDICINE

A15-01	Safe Management of Pressure Dewar in Magnetic Resonance Devices **Giuseppe Giannelli, Antonino Muratore, Vincenzo Nastasi, Giuseppe Sferruzza, Andrea Tonti**

A15-02	Trusted Data Provenance in Medical Systems **Gabriela Limonta, Ian Oliver, Kiti M¨uller**
A15-03	Application of Structure Function Based Reliability Analysis in Medical Domain **Elena Zaitseva, Vitaly levashenko, jan Rabcan**
A15-04	Prediction Of Severe Hypertension Complications Based On Xgblr Model **Yinglailiu, Wenbing Chang, Shenghanzhou, Fajie Wei**
A15-05	Predicting the rate of CoVid-19 infected cases by Learning Theory **Romney B Duffey, Enrico Zio**
A15-06	COVID-19 pandemic data analytics: Data heterogeneity, spreading behavior, and lockdown impact **Stefan Bracke, Lars Grams and Alicia Puls**

A16 — HEALTH SERVICE INDUSTRY

A16-01	Laser Safety in Healthcare Sector: Index Method for Risk Assessment **Giuseppe Giannelli, Antonino Muratore, Vincenzo Nastasi**
A16-02	Identifying Criticalities of Interoperable e-Health Systems on Hospital Triage **Stergiani Spyrou, Anastasios Mandalidis, Agapios N. Platis, Panagiotis Bamidis, Nikolaos Sapidis**

A17 — INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS

A17-01	A Tool for Automated Generation of Availability Models for Service Function Chains **Mario Di Mauro, Giovanni Galatro, Maurizio Longo, Arcangelo, Palma, Fabio Postiglione, Marco Tambasco**
A17-02	Energy Efficiency for Radio Communication Systems in Mission-Critical Applications **Francesco Grimaccia, Federica Giudici, Matteo Mascherpa, Sonia Leva**

A18 — INSURANCE

A18-01	Optimal reinsurance in the multivariate case **Arne Bang Huseby and Daniel Christensen**

A19 — Land Transportation

A19-01	Safety Approval Process for Guided Transportation **Robert Bains, Thor Myklebust, Narve Lyngby**
A19-02	Test-oriented rider training and its effect on safety for powered two-wheeler classes in Norway – a qualitative study **Jan Petter Wigum, Petter Helmersen Bogfjellmo, Gunhild Birgitte Sætren**
A19-03	Competition in the Rider Training Industry – Beneficial or a Threat to Safety? **Gunhild Birgitte Sætren, Jan Petter Wigum, Petter Helmersen Bogfjellmo**
A19-04	Green Fixed Tour Scheduling Problem with Electric Vehicles Considering Time-Varying Traffic Congestion **Siyue Zhang, Yiyong Xiao, Pei Yang**

A19-05	Prospects of model-based fault diagnostics for dynamic traffic control systems on freeways
	Thorsten Neumann, Anja Estel

A19-06	Accepting driving simulators as a tool in driver instructor training
	Gunhild Birgitte Sætren, Toril Fagerli Birkeland, Thor Owe Holmquist, Pål Andreas Pedersen, Martin Rasmussen Skogstad, Catharina Lindheim, Jonas Rennemo Vaag

A19-07	A dynamic risk assessment model for hazardous chemicals vehicle aggregation
	Yuying Lai, Yuntao Li

A19-08	Systematized knowledge regarding guided transport systems safety; from railway to hyperloop
	Marek Pawlik

A19-09	Performance Analysis on Raster-based Modelling of Urban Streets
	Jinjun Zhao, Hui Zhang, Liu Hong, Min Ouyang

A19-10	State of Charge Model Application for a Battery Electric Vehicle Exploiting Regenerative Braking in a Virtual Reality Simulator
	Michela Longo, Seyedmahdi Miraftabzade, Marika Lamanuzzi, Jacopo Andrea Di Antonio, Federica Foiadelli

A19-11	Evacuation of an hyperloop pod in a long tunnel
	Narve Lyngby, Eivind Grøv and Thor Myklebust

A19-12	Children's development of speed perception and its effect on road traffic safety: A high-density EEG study
	Stefania Rasulo, Gunhild Birgitte Sætren, and Audrey L. H. van der Meer

A19-13	Buyers of Road Transport Services: Sustainability and Safety Responsibility?
	Katrine Grinerud, Gunhild Birgitte Sætren, Wenche Kristin Aarseth

A20   LAND USE PLANNING

A20-01	Risk Management Plan For Process Associated With Technical Facility Designing, Conctruction And Commissioning
	Dana Prochazkova, Jan Prochazka

A20-02	Managing multiple risks in land use planning – a literature review
	Anna Ståhle Bofjäll, Henrik Hassel, Alexander Cedergren

A21   MANUFACTURING

A21-01	Analysis of the Linkage between Operational Risk Profiles and Performance in Supply Chains
	Thanhhai Pham and Chiara Verbano

A21-02	Runtime Safety Analysis for Reconfigurable Production Systems
	Chee Hung Koo, Nishanth Laxman, Felix Möhrle

A21-03	Investigation of the standstill clamping force during milling with three-jaw chuck
	Max Engelmann, Adrian Albero Rojas, Joachim Regel, Matthias Putz

A22   MARITIME AND OFFSHORE TECHNOLOGY

A22-01	Risk Assessment for LNG storage and bunkering at ports
	Olga Aneziris,Marko Gerbec,Ioanna Koromila, Zoe Nivolianitou, Francesco Pilo, Ernesto Salzano

A22-02	Modelling of Ship Navigation in Extreme Weather Events using Machine Learning
	Andrew Rawson, Mario Brito

A22-03	A Trustable Architecture over Blockchain to Facilitate Maritime Administration for Autonomous Shipping Ecosystem
	Yang Wang, Peng Chen, Bing Wu, Zaili Yang

A22-04	A New Fuzzy Bayesian Approach for Two-Stroke Engine Operational Health Analysis
	Muhammad Usman, Zhuohua Qu, Chia-Hsun Chang, Zaili Yang

A22-05	Human-System Concurrent Task Analysis: An Application to Autonomous Remotely Operated Vehicle Operations
	Marilia Abilio Ramos, Christoph Alexander Thieme, Xue Yang

A22-06	Assuring Safe Implementation of Decision Support Functionality based on Data-driven Methods for Ship Navigation
	Andreas Brandsæter , Georg Smefjell, Koen van de Merwe , Vegard Kamsvåg

A22-07	Influence of the Personnel Availability on Offshore Wind Farm Maintenance
	Bartosz Skobiej, Arto Niemi, Nikolai Kulev, Frank Sill Torres

A22-08	Towards the Dynamic probabilistic simulation of the human activities in ship collision accident scenario
	Zhuo Li, Youan Xiao, Tengfei Wang, Jinfen Zhang

A23 — MATERIALS

A23-01	Uncertainty Analysis Of Experiment And Numerical Simulation Of Spallation
	Miao ZHENG , Lan WEI

A23-02	The effect of temperature and u-shaped notches on fracture of carbon steel
	Wojciech Grodzki, Adam Tomczyk

A24 — NUCLEAR INDUSTRY

A24-01	Role and Practice of PSA in Practical Elimination Demonstration of Advanced PWR Plant
	Wenkui Lu, Jinlong Sun, Xinli Yu

A24-02	Application of Bayesian Statistics to Probabilistic Safety Assessment of Thai Research Reactor-1/ Modification 1
	Wasin Vechgama, Kampanart Silva, Anantachai Pechrak and Saensuk Wetchagarun

A24-03	Age Differences In Multi-Unit Nuclear Power Plants: Cross-Unit Influences For Plants At Different Points In Their Lifeciycl
	Dagmar Baumann, Lena Gaukel

A24-04	Safety Evaluation of a Package for Radioactive Waste by Full-Scale Drop Testing
	Thomas Quercetti, Frank Wille, Martin Neumann, Konrad Linnemann

A24-05	Level 2 PSA for the Spent Fuel Pool of the Paks NPP
	Tamas Siklossy, Attila Bareith, David Hollo, Gabor Lajtha

A24-06	Methods for Modeling Shutdown States in a Full-Scope Probabilistic Risk Assessment for a Nuclear Power Plant
	Jeffery Wood

A24-07	Status of the ETHZ Curated Nuclear Events Database
	Ali Ayoub, Andrej Stankovski, Wolfgang Kröger, and Didier Sornette

| A24-08 | Extension of evaluation time in event sequences analysis |
| | Mora García Espiño, Mariela Grinberg, Cecilia Garay, Pablo Zanocco, Marcelo Giménez |

| A24-09 | The Korea SOARCA Study: Insights on the Level 2 Accident Progression and Source Term Analysis |
| | Kwang-Il Ahn and Seok-Won Hwang |

| A24-10 | A Maintenance Time Prediction Method Based on Modular Arrangement of Predetermined Time Standard and Maintenance interfaces |
| | Dai Chao, Zhou Dong, Fan yu, Huan Zhang, Dianxin Zhao |

| A24-11 | Risk Assessment of Operation Strategy using High Pressure Emergency Makeup System during SBO |
| | Sang Hee Kang , Ho Rim Moon, Sang Won Lee |

| A24-12 | Analysis of LBLOCA accidents in nuclear power plants using classification and regression techniques |
| | Jose Felipe Villanueva, Ana Isabel Sánchez, Sebastián Martorell And Sofia Carlos |

| A24-13 | Full Scope PSA for the High Flux Reactor in Petten |
| | Cor Molenaar, Hans Brinkman |

| A24-14 | Risk analysis for the extended pre-defueled phase of BWR-4 in the decommissioning process |
| | Tai-Hung Wu, Po-Jung Chiu, and Chung-Kung Lo |

| A24-15 | Functional Safety Assessment Of A Liquid Metal Divertor For The European Demo Fusion Reactor |
| | Giuseppe Francesco Nallo, Nicola Pedroni, Anna Chiara Uggenti, Andrea Carpignano and Roberto Zanino |

| A24-16 | Autonomous Algorithm For Bubble Creation Operation In Pressurizer By Using Deep Reinforcement Learning |
| | Daeil Lee, Jonghyun Kim |

| A24-17 | The Process of Living Probabilistic Safety Assessment for NPP Paks |
| | Attila Bareith, David Hollo, Zoltan Karsa, Jeno Nigicser, Peter Siklossy, Tamas Siklossy, Peter Ruckert |

| A24-18 | A Method To Estimate The Release Frequency Of Source Term In A Multi-Unit Nuclear Power Plant |
| | Ching-Han CHEN, Chung-Kung LO |

| A24-19 | Development Of A Diagnostic Algorithm For Abnormal Situations Using Lstm And Vae |
| | Hyojin Kim, Jaemin Yang, Jonghyun Kim |

| A24-20 | Causes of Disasters with Presence of Radioactive Substances |
| | Dana Prochazkova, Jan Prochazka, Vaclav Dostal |

| A24-21 | The Risk-Informed Systems Analysis Pathway Activities |
| | Curtis Smith, Hongbin Zhang, Yong-Joon Choi |

| **A25** | **OIL AND GAS INDUSTRY** |

| A25-01 | Quantifying the Added Value of Adopting Condition Monitoring to Subsea Blowout Preventer (BOP) |
| | Tobiloba Elusakin, Mahmood Shafiee |

| A25-02 | Proposition of Reliability-Based Methodology for Well Integrity Management during Operational Phase |
| | Luiz Müller, Marcelo Ramos Martins |

| A25-03 | Adjusted Method for Updating Failure Rates and Test Intervals of Safety Instrumented Systems |
| | Solfrid Håbrekke, Mary Ann Lundteigen, Stein Hauge |

| A25-04 | Safety Assessment of Underground Gas Storage Based on Matter Element Multilevel Extension Method |
| | Qingqing Xu, Xuan Li, Shaohua Dong, Donghua Peng, Caixia Bi |

| A25-05 | Safety and security of drones in the oil and gas industry |
| | S. O. Johnsen, T. Bakken, A. A. Transeth, S. Holmström, M. Merz, E. I. Grøtli, S. R. Jacobsen, R. Storvold |

| A25-06 | Towards Risk and Resilience Quantification of Gas Networks based on Numerical Simulation and Statistical Event Assessment |
| | Sebastian Ganter, Kushal Srivastava, Georg Vogelbacher, Jörg Finger, Bogdan Vamanu, Vytis Kopustinskas, Ivo Häring, Alexander Stolz |

| A25-07 | Blowout events and their importance in estimating accident frequencies in the offshore oil and gas exploration and production industry |
| | Myrto Konstantinidou and Michalis Christou |

| A25-08 | An Overview of Regulatory Principles for Safety Demonstration on the Norwegian Continental Shelf |
| | Christine L. Berner Nyvik, Andreas Falck, Roger Flage |

| A25-09 | Liquefied Natural Gas Plant Maintenance: A Case Study of Marine Loading Arms Seal Failure Analysis |
| | E Pereira, B Alkali, O Niculitae |

| A25-10 | A Case Study of Reliability Analysis of The Deep-Water Disposal (DWD) Pumps in An Oil Plant |
| | Soud Al-Toubi, Alkali Babakalli, David Harrison, and Sudhir CV |

| A25-11 | Multidimensional risk evaluation: sensitivity analysis to support decision making in natural gas pipelines |
| | Francisco Filipe Cunha Lima Viana, Marcelo Hazin Alencar, Rodrigo José Pires Ferreira and Adiel Teixeira de Almeida |

| A25-12 | Speaking up about safety issues: Towards a conceptualization of safety voice in the Norwegian petroleum industry |
| | Martha Hanssen, Ole Andreas Engen and Kjersti Melberg |

| A25-13 | Oil Well Blowout: Merging CAST and System Dynamics Analysis |
| | Joaquim Rocha dos Santos, Danilo Taverna Martins Pereira de Abreu, Carlos Henrique Bittencourt de Morais, Marco Aurelio Pestana, Danilo Colombo, Marcelo Ramos Martins |

| A25-14 | Underground Blowout in the Frade Oilfield: A CAST Analysis |
| | Marco Aurelio Pestana, Joaquim Rocha dos Santos and Marcelo Ramos Martins |

| A25-15 | Optimizing Plant Fire Water Requirement for Worst-Case Scenario through Consequence Analysis |
| | Nugrahanto Widagdo |

| A25-16 | Identifying Challenges for Major Accident Prevention in Onshore Drilling Operations - A Case Study from a Middle East Onshore Oilfield |
| | Guicang Peng, Knut Eric Bang, Tore Markeset |

| **A26** | **RAILWAY INDUSTRY** |

| A26-01 | Towards a Model-Based Safety Assessment of Railway Operation Using GNSS Localization |
| | Ouail Himrane, Julie Beugin, Mohamed Ghazel |

| A26-02 | Unsupervised domain adaptation for dynamic in weighing motion system of freight rail carriages under varying ballast conditions |
| | Francesco Cannarile, Michele Compare, Enrico Zio, Elisa Duca, Ilario Febi, Massimo Platini |

| A26-03 | Allocating imprecise safety targets in satellite-based localization systems used in railway signaling operations |
| | Insaf Sassi, Julie Beugin, Mohamed Sallak, Nourdine Ait Tmazirte |

A26–04	What is the Point: Formal Analysis and Test Generation for a Railway Standard
	Mark Bouwman, Djurre van der Wal, Bas Luttik, Mariëlle Stoelinga, Arend Rensink

A26–05	General Framework To Model The Maintenance Requirements Of Critical Systems In A Railway Company
	Tomás Grubessich, Raúl Stegmaier, Pablo Viveros, Oscar Aranda, Luis Jara, Fredy Kristjanpoller

A26–06	Maintenance Knowledge Recovery For A Maintenance Demand & Costs Estimation
	Oscar Aranda, Tomás Grubessich, Pablo Viveros, Fredy Kristjanpoller, Raul Stegmaier

A26–07	Application of First- and Second-Order Derivatives of Track Irregularity to Plan Local Maintenance Activities
	Hamid Khajehei, Iman Soleimanmeigouni, Alireza Ahmadi, Arne Nissen, Mohammad Haddadzade

A26–08	Track Geometry Measurements Alignment: A Comparative Study of Three Relative Position-Based Methods
	Mahdi Khosravi, Iman Soleimanmeigouni, Alireza Ahmadi, Arne Nissen, Mohammad Haddadzade, Hamid Khajehei

A26–09	Risk assessment of assets based on FMMA and enhanced FMEA: a use case applied on railway infrastructure
	Johannes Pan, Clemens Gutschi, Nikolaus Furian, Siegfried Vössner, Robert Matt, Roman Heissenberger

A27 — RENEWABLE ENERGY INDUSTRY

A27–01	An Ensemble Of Echo State Networks For Predicting The Energy Production Of Wind Plants
	Sameer Al-Dahidi, Piero Baraldi, Eleonora Nigro, Enrico Zio, Montelatici Lorenzo

A27–02	Liquid Hydrogen Storage System FMEA and Data Requirements for Risk Analysis
	Camila Correa-Jullian, Katrina M Groth

A27–03	Wind Turbine Failures Review and Gearbox Condition Monitoring
	Albara Mustafa, Tore Markeset, Abbas Barabadi

A27–04	Application of the Overall Equipment Effectiveness Concept in Wind Energy Assets
	Kelvin Palhares Bastos Sathler, Athanasios Kolios, Shaikha Al-Sanad, Jafarali Parol

A27–05	Downtime Cost Estimation A Wind Farm in the Arctic Case Study
	Albara Mustafa, Tore Markeset, Abbas Barabadi

A27–06	Ultimate Loads and Fatigue Damage Convergence of Floating Wind Turbine Components
	Salem Okpokparoro, Srinivas Sriramula

A29 — RENEWABLE ENERGY INDUSTRY

A29–01	Analysis of Resilient Performance Measurement Systems using Q4-Balance Framework
	Roseneia Melo, Fernanda Brandalise, Douglas Brito, Ivonne Herrera, Dayana Costa, Carlos Formoso

A29–02	Quantitative Decision-making Model for Consumer Panic Buying in Disaster Scenarios
	Rithika Dulam, Kazuo Furuta, Taro Kanno

A30 — SUPPLY CHAINS

A30–01	A System Reliability Approach for Assessing the Vulnerability of United States Pharmaceutical Supply Chains
	Zachary Tillman, Matthew Rosenberg, Roberto Delhy, Cesar Ruiz-Barnes, Reza Kazemi

| A30-02 | Energy Supply Chains Planning: Risk-Based Optimization of The Planning of Energy Supply Chains |
| | Shiyu Chen, Wei Wang, Enrico Zio |

A31	**WATER TRANSPORTATION SYSTEMS**
A31-01	Effects Of Topology On Water Distribution Systems Resilience
	Beatrice Cassottana, Nazli Yonca Aydin, Loon Ching Tang
A31-02	Deconflicting Maritime Autonomous Surface Ship traffic using Moving Havens
	Thomas Porathe
A31-03	Ship's Main Engine Availability Analysis and Bunker Contamination: A Multi-State Approach
	Thomas Markopoulos, Agapios N. Platis
A31-04	Study on Emergency Rescue System of Inland Waters in China
	Han Chao, Shi Zhixiang
A31-05	The Research on Maritime Search and Rescue and Aided Decision Technology
	Jiang Lili, Han Chao, Wang Guobo, Chen Fengyun

C01	**PROGNOSTIC AND HEALTH MANAGEMENT IN EVOLVING ENVIRONMENTS** **(Innovation Challenge)**
C01-01	Stacking Ensembles of Heterogenous Classifiers for Fault Detection in Evolving Environments
	Mohammed Ghaith Altarabichi, Peyman Mashhadi, Yuantao Fan, Sepideh Pashami, Sławomir Nowaczyk, Pablo Del Moral, Mahmoud Rahat and Thorsteinn Rögnvaldsson
C01-02	Scenario-based Generalization bound for Anomaly Detection Support Vector Machine Ensembles
	Roberto Rocchetta, Milan Petkovic, Qi Gao
C01-03	A Deep Learning Framework For Health Anomaly Detection of Multi-component Systems in Evolving Environments: A Case Study in PHM
	Shahin Siahpour, Abhijeet Ainapure, Xiang Li, Jay Lee
C01-04	The Aramis Data Challenge: Prognostics and Health Management in Evolving Environments
	Francesco Cannarile, Michele Compare, Piero Baraldi, Zhe Yang, Enrico Zio

C02	**THE NASA LANGLEY UQ CHALLENGE ON OPTIMIZATION UNDER UNCERTAINTY** **(Innovation Challenge)**
C02-01	Reliability Optimization of Black Box Uncertain Control System in NASA Uncertainty Quantification Challenge
	Mu-Xia Sun, Chuan-Zhou Jia, Chen Zhang, Han-Xiao Zhang, Yan-Fu Li
C02-02	The NASA Langley Challenge on Optimization Under Uncertainty
	Luis Crespo, Sean Kenny
C02-03	Contribution to the NASA Langley UQ Challenge on Optimization Under Uncertainty
	Christian Agrell, Simen Eldevik, Odin Gramstad, Andreas Hafver
C02-04	Bayesian calibration and probability bounds solution to the Nasa 2020 UQ challenge on optimization under uncertainty
	Ander Gray, Alexander Wimbush, Marco De Angelis, Roberto Rocchetta, Peter O. Hristov, Enrique Miralles-Dolz, Dominic Calleja
C02-05	Computational Methods for System Optimization Under Uncertainty
	Nicola Pedroni

C02-06   A Distributionally Robust Optimization Approach to the NASA Langley Uncertainty Quantification Challenge
Yuanlu Bai, Zhiyuan Huang, Henry Lam

S01   RELIABILITY OF PASSIVE SYSTEMS IN NUCLEAR POWER PLANTS PERSPECTIVES AND CHALLENGES (Special session)

S01-01   Assessment Of Relap5-3d For Application On In-Pool Passive Power Removal Systems
Vincenzo Narcisi, Lorenzo Melchiorri, Fabio Giannetti, Gianfranco Caruso

S01-02   Assessing the Impact of Passive Autocatalytic Recombiners on the Accident Progression in a VVER 1000
P. Groudev, P. Petrova, A. Stefanova, R. Gencheva, P. Vryashkova

S01-03   Qualification of RELAP5-3D code against the in-pool passive energy removal system PERSEO data
Andrea Bersano, Cristina Bertani, Nicolò Falcone, Mario De Salve, Fulvio Mascari, Paride Meloni

S01-04   The Passive Safety Concept of KERENA: From Design to Experimental Verification
Thomas Wagner, Thomas Mull

S01-05   Risk Assessment of Operation Strategy using High Pressure Emergency Makeup System during SBO
Sang Hee Kang , Ho Rim Moon, Sang Won Lee

S02   LIFE CYCLE-BASED RESILIENCE ASSESSMENT AND MANAGEMENT OF STRUCTURAL AND INFRASTRUCTURAL ASSETS (Special session)

S02-01   Improving Uncertainty Representation of Offshore Wind Farms Reliability using Expert Judgments
Georgios Leontaris, Georgios Katsouris

S02-02   Interdependent Infrastructure Interventions Optimization: an Integrative Systems Thinking Approach
Omar Kammouh, Maria Nogal, Mark de Bruijne, Ruud Binnekamp, A. Rogier M. Wolfert

S02-03   Resilience Quantification of Large-Scale Water Distribution Networks: a Probabilistic Approach
Omar Kammouh, Maria Nogal, Gian Paolo Cimellaro, A. Rogier M. Wolfert

S02-04   Security and Resilience for Airport Infrastructure
Corinna Köpke, Louis König, Katja Faist, Mirjam Fehling-Kaschek, Jörg Finger, Alexander Stolz, Kelly Burke, Eftichia Georgiou, Vasiliki Mantzana, Ioannis Chasiotis, Isabel Praça, Eva Maia, Nikolaos Papagiannopoulos, Filipe Apolinário, Nelson Escravana

S02-05   Resilience assessment of safety-critical systems with credal networks
Hector Diego Estrada-Lugo; T.V. Santhosh; Marco de Angelis; Edoardo Patelli

S03   HUMAN RELIABILITY ANALYSIS TODAY: DATA AND OTHER CHALLENGES (Special session)

S03-01   Comparisons of Human Reliability Data between Analog and Digital Environment
Jinkyun Park and Yochan Kim

S03-02   Assessing Human performance and Human reliability in collaborative intelligence scenarios: upcoming challenges and opportunities
Maria Chiara Leva, Luca Podofilini

S03-03   FLEX and HRA Challenges in Common Backbone Models
Jeffery Julius, Kaydee Gunter, Michael Hirt

S03-04	Evaluating the Adverse Effects of Radioactive Releases in Multi-Unit Probabilistic Safety Assessment Jae Young Yoon, Dong-San Kim

S04 — ARTIFICIAL INTELLIGENCE FOR MAINTENANCE DECISION SUPPORT (Special session)

S04-01	An unsupervised machine learning approach to extract wheel and track health status indicators from train-borne accele-rometer data Benjamin Baasch, Michael Roth, Sebastian Schulz, Jörn C. Groos
S04-02	Predicting State of Health and End of Life for Batteries in Hybrid Energy Buses Mohammed Ghaith Altarabichi, Yuantao Fan, Sepideh Pashami, Sławomir Nowaczyk, Thorsteinn Rögnvaldsson
S04-03	Agent-based maintenance decision support system for power grids operating in electricity markets Pegah Rokhforoz, Blazhe Gjorgiev, Giovanni Sansavini, and Olga Fink
S04-04	Impact of the decision horizon on railway systems maintenance and service scheduling Omar Bougacha, Christophe Varnier, Noureddine Zerhouni, And Pierre Dersin
S04-05	Anomaly Detection And Classification In Time Series With Kervolutional Neural Networks Oliver Ammann, Gabriel Michau and Olga Fink
S04-06	4R Innovative Resilience Strategy for Power Distribution Networks Representative of ENEL
S04-07	Deep reinforcement learning for optimizing operation and maintenance of energy systems equipped with PHM capabilities Luca Pinciroli, Piero Baraldi, Guido Ballabio, Michele Compare, Enrico Zio

S05 — TEXT MINING APPLIED TO RISK ANALYSIS, MAINTENANCE AND SAFETY (Special session)

S05-01	Verification Of Safety Rules Using Nlp Coen van Gulijk, Violeta Holmes
S05-02	Extracting Knowledge from Near Miss Reports using Machine-Learning Techniques Silvia M. Ansaldi, Carla Simeoni, Alessandro Di Francesco, Roberto Martini, Luca Di Piramo, Flavia Fattori
S05-03	A text mining and NLP approach for identifying potential consequences of accidents in an oil refinery July Macêdo, Diego Aichele, Márcio das Chagas Moura, Isis Lins
S05-04	Automated classification of injury leave based on accident description and natural language processing Caio Bezerra Souto Maior, João Mateus Marques de Santana, Márcio das Chagas Moura, Isis Didier Lins
S05-05	An NLP and Text Mining–based approach to categorize occupational accidents Marcela Silva Guimarães, Hiago Henrique Gomes de Araújo, Thais Campos Lucas, Márcio das Chagas Moura, Isis Didier Lins, Rômulo Fernando Teixeira Vilela
S05-06	Text mining for the automatic classification of road accident reports Dario Valcamonico, Piero Baraldi, Francesco Amigoni, Enrico Zio

S06 — BAYESIAN NETWORK MODELLING FOR RISK ASSESSMENT IN THE OIL AND GAS INDUSTRY (Special session)

S06-01	A Safety-Barrier-based Risk Analysis Model for Offshore Oil and Gas leakage Incidents Yangfan Zhou, Shengnan Wu, Jianchun Fan, Baoqian Dai

S06-02	A Multistate Bayesian Network for accounting the degradation of safety Barriers in the Living Risk Assessment of Oil and Gas Plants **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**
S06-03	A Novel KPI for Continuously Monitored Safety Barriers based on Probabilistic Safety Margins **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**
S06-04	Analytic Hierarchy Process for the Estimation of the Probability of Failures of Safety Barriers in Oil and Gas Installations **Francesco Di Maio, Oscar Scapinello, Enrico Zio, Costanza Ciarapica Alunni, Luca Decarli, Laura La Rosa**
S06-05	The Risk Assessment And Management Of Premature Screen-Out During Hydraulic Fracturing Based On The Bayesian Belief Network Model **Enrico Zio, Maryam Mustafayeva And Andrea Montanaro**

S07 — FAULT-TOLERANT AND ATTACK-RESILIENT CYBER-PHYSICAL SYSTEMS (CPS) (Special session)

S07-01	Fault Diagnosis in Smart Grids Using a Deep Long Short-Term Memory-based Feature Learning Architecture **Hossein Hassani, Roozbeh Razavi-Far, and Mehrdad Saif**
S07-02	Allocation of Defense Resources against Cyber Attacks to Cyber-Physical Systems **Wei Wang, Francesco Di Maio, Enrico Zio**
S07-03	Model-based Fault Injection Experiments for the Safety Analysis of Exoskeleton System **Tagir Fabarisov, Ilshat Mamaev, Andrey Morozov, Klaus Janschek**
S07-04	Enhancing Detection Accuracy of Cyber Attacks Through Dimensionality Reduction **Ehsan Hallaji, Roozbeh-Razavi-Far, and Mehrdad Saif**
S07-05	Anomaly and Attack Detection in Supervisory Control Networks for Cyber-PhysicalSystems **Ernesto Del Prete, Fabio Pera, Luca Faramondi, Camilla Fioravanti, Simone Guarino, Gabriele Oliva, and Roberto Setola**
S07-06	Is Smartness Risky? A Framework to Evaluate Smartness in Cyber-Physical Systems **Christos Chronopoulos, Nelson Humberto Carreras Guzman**

S08 — ADVANCED DIAGNOSIS AND PROGNOSIS IN BIO-MEDICAL ENGINEERING (Special session)

S08-01	Bayesian filter observers based estimation of glucose and insulin concentration in plasma **Weijie Wang, Shaoping Wang, Xingjian Wang, Yixuan Geng**
S08-02	Transfer Learning From Grid-Structured Data To Graph-Structured Data: Application To Diagnosis Of Depression **Jiawei Yang, Shaoping Wang, Xingjian Wang, Rui Liu, Yun Wang, Jian Cui, Yuan Zhou, Jingjing Zhou, Yuan Feng, Lei Feng, Gang Wang**
S08-03	IMU-Based Online Load Spectrum Estimation for Human Knee-joint **Zhangtao Wang, Xingjian Wang, Shaoping Wang**
S08-04	Blood Coagulation Monitoring and Thrombus Formulation Assessment based on Bioimpedance Spectroscopy **Xuesong Luo, Shaoping Wang, Jian Shi**
S08-05	Video-based Automatic Early Parkinson's Disease Detection System Using Biomechanical Features **Changhong Lin, Shaoping Wang**

S09 — NLP, KNOWLEDGE GRAPHS AND ONTOLOGIES (Special session)

S09–01	Pipeline For Machine Reading Of Unstructured Maintenance Work Order Records
	Yiyang Gao, Caitlin Woods, Wei Liu, Tim French, Melinda Hodkiewicz

S09–02	Standardised Failure Reporting And Classification Of Failures Of Safety Instrumented Systems
	Stein Hauge, Solfrid Håbrekke, Mary Ann Lundteigen, Lars Bodsberg

S09–03	Cleaning And Visualization Of Unstructured Text In Safety Records
	Michael Stewart, Wei Liu, Rachel Cardell-Oliver, And Mark Griffin

S09–04	An Ontology For The Management Of Equipment Ageing
	Silvia M. Ansaldi, Paolo Bragatto, Patrizia Agnello, Maria Francesca Milazzo

S09–05	Research On Named Entity Recognition In Chinese Airworthiness Regulation Texts Based On Deep Learning Method
	Haotian Niu, Cunbao Ma, Yihan Guo, Pei Han, Siyuan Li

S09–06	Technical Language Processing For Maintenance Work Order Texts
	Michael P. Brundage, Melinda Hodkiewicz, And Thurston Sexton

S09–07	Semantic Knowledge Kernels For Service Chat Bots
	Mikkel H. Brynildsen

S11 — HUMAN PERFORMANCE IN RESILIENCE, RISK AND SAFETY ASSESSMENTS (Special session)

S11–01	Assessing Human Performance In The Era Of Resilience Engineering – A Paradigm Shift?
	Miltos Kyriakidis, Vinh N. Dang

S11–02	Role Independency In Nuclear Power Plant Control Room Teams – Background For An Empirical Simulator Study
	Magnhild Kaarstad and Espen Nystad

S11–03	A Bayesian Network Approach for the Quantitative Assessment of Resilience of Critical Systems
	T.V. Santhosh, Edoardo Patelli

S11–04	Transfer Learning-based Driving Style Recognition
	SHI Yuchen, WANG Yi, CHEN Nan

S11–05	Crowd sensitive indicators for proactive safety management: a theoretical framework
	Francesco Costantino, Antonio De Nicola, Giulio Di Gravio, Andrea Falegnami, Riccardo Patriarca, Giordano Vicoli, Maria Luisa Villani, Massimo Tronci

S11–06	The Relation Between Behavioral Factors and Humans' Reactions During Catastrophic Events
	Georgia Kaltsidi, Yiannis Xenidis

S12 — REINFORCEMENT LEARNING FOR INDUSTRY 4.0 (Special session)

S12–01	Optimal Part Flow In Maintenance Service Contracts Of Gas Turbines
	Luca Bellani, Michele Compare, Enrico Zio, Marzia Sepe, Francesco Annunziata, Fausto Carlevaro

S12–02	Circuit Breaker Data Analysis Using Copula Correlation
	Michy Alice, Loredana Cristaldi, Enrico Ragaini

S12-03	Agent-based modeling and reinforcement learning for optimizing energy systems operation and maintenance: the Pathmind solution Luca Pinciroli, Piero Baraldi, Michele Compare, Sahar Esmaeilzadeh, Mohammed Farhan, Brett Göhre, Roberto Grugni, Luigi Manca, Enrico Zio
S12-04	Development Of Two-Level Autonomous System For Startup And Shutdown Operation Of Nuclear Power Jae Min Kim, Seung Jun Lee
S12-05	Autonomous Algorithm for Bubble Creation Operation in Pressurizer by Using Deep Reinforcement Learning Daeil Lee, Jonghyun Kim

T01 — ACCELERATED DEGRADATION AND LIFE TEST

T01-01	Evaluation of optimality criteria for efficient reliability demonstration testing Herzig Thomas, Dazer Martin, Grundler Alexander, Bertsche, Bernd
T01-02	Reliability Prediction using Design of Experiments Alexander Kremer; Levente Dücsö; Bernd Bertsche
T01-03	Bias Corrected Weibull Parameter Estimation and Impact on Confidence Bounds Tamer Tevetoglu, Bernd Bertsche
T01-04	Evaluation of Electronic Components Degradation Using the Accelerated Reliability Testing Data Zdenek Vintr, Xuan Phong Cu, Cao Vu Tran
T01-05	Research on Accelerated Degradation Test of Aero-generator Based on Text Mining Yao Jinyong,Wei Shuochen
T01-06	An approach to predict the lifetime of shape memory actuators based on Accelerated Testing measurements Philipp Heß and Stefan Bracke
T01-07	Reliability estimation by usage rate method varying the quantity of warranty data censored Eugenio Zappa Neto, Gilberto Fransciso Martha de Souza, Messias Borges Silva
T01-08	An Accelerated Life Test and Reliability Evaluation Method on Ultrasonic Motors Under Increased Torque Load Shouqing Huang, Jiacheng Guo, Tengfei Ma, Shouwen Liu, Yun Jia
T01-09	Research on Identification Method of Bearing Performance Degradation in NPP Based on GG Clustering Zhang Jiyu, Xia Hong, Wang Zhichao
T01-10	Research on burn-in technology of SiP TianRui Zhu, Lei Chen, YiFei Han

T02 — ACCIDENT AND INCIDENT MODELING

T02-01	Identification of Near-Miss Situations Between Ships Using AIS Data Analysis and Risk Indicators Martin Hassel, Martin Grossmann, Asbjørn Lein Aalberg, Rodmar Arntsen
T02-02	Application of a Severe Accident Program to the Evaluation of SAMG Strategy by using Uncertainty Analysis Sooyong Park, Kwang-Il Ahn, Seok-Won Hwang
T02-03	Analysis of the Causes of Aviation Accidents during Controlled Flight into Terrain Justyna Tomaszewska, Marta Woch, Jakub Krzyszkowski, Mariusz Zieja, Norbert Grzesik

T02-04	An Interdisciplinary Approach For Investigating An Accident Originating From Leakage In A Gasketed Bolted Joint
	Michele Compare, Enrico Zio, Piero Pantaleone, Raffaele Lardani, Dario Palumbo

T02-05	Scraping Damage Hazard due to Trawling Interference on Subsea Pipelines
	Lorenzo Masu, Leonardo Cardinali, Stefania Benucci

T02-06	Identification of FEP critical paths from a Bayesian network model for the risk assessment of nuclear waste repositories
	Edoardo Tosoni, Francesco Di Maio, Enrico Zio

T02-07	Research for Temporal and Spatial Distribution of Ship Accidents in the Fluctuating Backwater Area of Three Gorges Reservoir Region
	Jie Xue, P.H.A.J.M. van Gelder, Eleonora Papadimitriou, Dan Jiang, Chaozhong Wu

T02-08	A Preliminary Analysis of a Clandestine Take Explosion in Mexico City
	Vladimir Avalos-Bravo, Diego Alfredo Padilla Pérez, Blanca Barragan-Tognola

T02-09	The GRS Source Term Prognosis Software FaSTPro: New Developments for a More Precise Prognosis
	Michael Hage, Sören Johst

T02-10	Implementation of Mitigative Human Actions During Severe Accidents in a Level 2 PSA Event Tree
	Sören Johst, Michael Hage

T02-11	Simulation of Pb-Free Solder Bumps under Thermal-Electric Coupling Conditions
	Jiaxin Yuan, Sujuan Zhang, Maogong Jiang, Guicui Fu

T02-12	Research on Evaluation Analysis Model of Optimal Amount of Redundancy Based on Integrated Navigation System
	Jingyue Yang, Feng Zeng and Zhichao Pang

T03 — ARTIFICIAL INTELLIGENCE FOR RELIABILITY, MAINTENANCE AND SAFETY

T03-01	Adaptive Support Vector Machine Combined With Fuzzy Simulation For Failure Possibility Analysis
	Chunyan Ling, Zhenzhou Lu

T03-02	A Procedure for Modelling and Verification of Safety Objectives and Functions
	Jing Wu, Mengchu Song, Xinxin Zhang, Morten Lind

T03-03	Long Short-Term Memory Network for Future State Prediction in Water Injection Pump
	Joaquín Eduardo Figueroa Barraza, Luis Felipe Guarda Bräuning, Enrique López Droguett, Marcelo Ramos Martins

T03-04	Generation of a Failure Mode and Effects Analysis with smartflow
	Christian Müller, Rüdiger Lunde, Philipp Hönig

T03-05	Towards a Framework for Risk Monitoring of Complex Engineering Systems with Online Operation Data: A Deep Learning Based Solution
	Ramin Moradi, Andrés Ruiz-Tagle Palazuelos, Enrique López Droguett, Katrina M. Groth

T03-06	A Procedure Performing System Using Deep Learning Algorithm for Nuclear Power Plant
	Jeeyea AHN, Seung Jun LEE

T03-07	A Study on the Influence of Signal Number on Performance of AAKR
	Wei Li, Zhenfeng Qi, Juan Chen, Yidan Yuan, Shuhong Du

T03-08	A System-Level Prognostics and Health Management Framework Based on Graph Convolutional Neural Networks
	Andres Ruiz-Tagle Palazuelos, Enrique Lopez Droguett, Katrina M. Groth

T03-09	A Reliable Data-Driven Method for Condition Monitoring in Nuclear Power Plants Zhenfeng Qi, Wei Li, Juan Chen, Yidan Yuan, Shuhong Du
T03-10	Fault detection in the manufacturing process of printed circuit boards using computer vision Christoph Rosebrock, Lars Grams, Stefan Bracke
T03-11	Bayesian Network for Failure Prediction in Different Seasons Reza Khoshkangini, Slawomir Nowaczyk, Sepideh Pashami
T03-12	Application of Long Short-Term Memory Neural Networks for Co2 Concentration Forecast on Amine Plants Luis Felipe Guarda, Carlos Morais, Joaquin Figueroa, Enrique López Droguett, Marcelo Ramos Martins
T03-13	Application of Computer Vision in the Analysis and Prediction of Fine Grinded Surfaces Marcin Hinz, Lea Hannah Guenther, Stefan Bracke
T03-14	Offshore Workover Operations: Reducing Uncertainty of Critical Weather Scenarios by Optimal Use of Simulations and Probabilistic Machine Learning Simen Eldevik, Stian Sætre
T03-15	Research on Modeling and Simulation Technology of Aviation Equipment Support System of System Based on Multi-Agent Ding Gang, Cui Li-Jie, Zhang Liang, Zhang Ya, Wang Jian-Hao
T03-16	Methodology for the Identification of the Critical Components of the Electrical Distribution Network of CERN's Large Hadron Collider Ahmed Shokry, Piero Baraldi, Andrea Castellano, Ugo Gentile, Luigi Serio, Enrico Zio
T03-17	Extending Fault Trees with Continuous System Variables Ayse Karacaorenli, Luigi Portinale
T03-18	Extreme gradient boosting algorithms for analyzing reliability factors of natural gas transmission assets Amel Belounnas, Florent Brissaud
T03-19	Bayesian Network Model for Accessing Safety and Security of Offshore Wind Farms Oscar Hernan Ramirez-Agudelo, Corinna Köpke, Frank Sill Torres
T03-20	Fault Detection Based on Optimal Transport Theory Bingsen Wang, Piero Baraldi, Xuefei Lu, Enrico Zio
T03-21	A Coevolutionary Optimization Approach with Deep Sparse Autoencoder for the Extraction of Equipment Degradation Indicators Ali Eftekhari Milani, Federico Antonello, Piero Baraldi, Enrico Zio

T04	**AUGMENTED REALITY FOR SAFETY**
T04-01	An Object Tracking Method to Track Maintenance Objects by Object Detection Based on Deep Learning in Induced Maintenance Environment ChuanSheng Liang, Chuan Lv
T04-02	AN AUGMENTED AND INTERACTIVE AID FOR OCCUPATIONAL SAFETY Andrea Tarallo, Francesco Carbone, Giuseppe Di Gironimo, Domenico Coccorese, Valerio Minopoli, Antonio Lanzotti, Domenico Marzullo, Raffaele d'Angelo
T04-03	Inail procedure for augmented reality remote survey Giuseppe Augugliaro, Riccardo Balistreri, Francesco Giacobbe, Elisa Pichini Maini

T05	**BIG DATA AND IOT APPLICATIONS IN RELIABILITY AND MAINTENANCE**

T05-01 Automating Reliability Analysis: Data-driven Learning and Analysis of Multi-state Fault Trees
Sanja Lazarova-Molnar, Parisa Niloofar, and Gabor Kevin Barta

T05-02 A Lossless Compression Algorithm of Nc code of CNC machine tool Based on bi-directional GRU
Yanbo Wang, Guofa Li, Jialong He, Lingda Kong

T06	**COMPUTATIONAL RELIABILITY/RISK ASSESSMENT**

T06-01 Towards A Design Framework for Maritime Asset Servitization
Markus Heimdal, Knut Erik Knutsen and Jose Ignacio Aizpurua

T06-02 Optimization of Deterministic Sub-model to reduce large sample size runs
Cédric J. Sallaberry, Robert E. Kurth

T06-03 A method for the risk analysis of energy supply in Integrated Energy Systems
Huai Su, Enrico Zio, Jinjun Zhang

T06-04 Enhancing Realism in Fire Probabilistic Risk Assessment of Nuclear Power Plants
Tatsuya Sakurahara, Ha Bui, Seyed Reihani, Ernie Kee, Zahra Mohaghegh

T06-05 A Modeling Framework For Wind-Integrated Power Systems Operations Accounting For Uncertainty And Flexibility Assessment
Rodrigo Mena, Matías Godoy And Pablo Viveros

T06-06 Continued Discussion of Failure Mode Modeling and Overall Component Reliability:Are the Data Missing or Censored?
Todd Paulos, Andrew Ho, Curtis Smith

T06-07 Model Cartography Diving In Complex PSA Models
Hibti Mohamed, Friedlhuber Thomas, Abdellatif Tesnim

T06-08 Automatic Translation From Dynamic Models To Boolean Representation Suitable For I&Ab Quantification
Marc Bouissou

T07	**CONSEQUENCE MODELING AND MANAGEMENT**

T07-01 Modelling Liquid Hydrogen BLEVEs: A Comparative Assessment with Hydrocarbon Fuels
Federico Ustolin, Ernesto Salzano, Gabriele Landucci, Nicola Paltrinieri

T07-02 A Research on Effect of Natural Disasters on Evacuation in Case of a Severe NPP Accident
Veda Duman Kantarcioglu, Şule Ergun

T07-03 The Potential of CFD Simulators for Jet Fire Analysis: The USP-UNESP Experimental Campaigns
Mariana Alves Silva, Marcelo Ramos Martins, Adriana Miralles Schleder

T07-04 Risk and consequence of rapid phase transition for liquid hydrogen
Eskil Aursand, Lars H. Odsæter, Hans L. Skarsvåg, Gunhild A. Reigstad, Federico Ustolin, Nicola Paltrinieri

| T07-05 | Albarella Future - Zero Carbon Emission
Augusto Zanella, Cristian Bolzonella, Mauro Rosatti, Enrico Longo, Andrea Squartini, Giuseppe Concheri, Damien Banas, Guoliang Xu, Cristina Menta, Vasco Boatto, Steve Taff, Claudio Porrini, Lingzi Mo, Giulia Ranzani, Viatliy Linnyk, Francesca Visentin, Allan J. Yeomans |

T08 — CRISIS MANAGEMENT

| T08-01 | Risk Assessment And Resource Demand Analysis Of Emergencies On Expressway
Kailun Li, Xuan Liu, Dianliang Xiao |

| T08-02 | Preparedness In Crisis Management
Katerina Tomanova, Lenka Brumarova, Jakub Brumar |

| T08-03 | A Case Study on Building Safety The Coupling of Outdoor and Indoor Air Modeling
William B. Jones, Brandon Ingram |

| T08-04 | Crisis Team Setup for Better Improvisation
Jean-Jaques Kohler and Emmanuel Fragnière |

| T08-05 | Gamified Decision Making for a Participatory Post-Crisis Recovery: a Model Based Process
Antonio De Nicola, Sonia Giovinazzi, Massimo Guarascio, Paola Rizzi, Maria Luisa Villani |

| T08-06 | Crisis management: use of systemic approach for strategic decision-making training
Antonin Hamon, Florian Tena-Chollet, Aurélia Bony-Dandrieux, Vincent Chapurlat |

| T08-07 | Operation of the Notified Body according to the Directive 2014/68/UE (PED) during the covid-19 emergency. Case study of a surveillance audit according to module H1
Riccardo Balistreri, Elisabetta Bemporad, Francesco Giacobbe |

| T08-08 | Managing Human Reliability In The Context Of Telework – An Approach Based On The Job Demands-Resources Model, Combined With The Bow-Tie Methody
Jean-Jaques Kohler, Emmanuel Fragnière |

T09 — CYBER SECURITY

| T09-01 | Cybersecurity of Safety Instrumented Systems in the Context of Digitalization: Some Issues and Challenges within Oil and Gas Production Assets
Pengyu Zhu, Jayantha Liyanage |

| T09-02 | Certification Cycles of Train Cyber Gateway
Jan Prochazka, Dana Prochazkova, Petr Novobilský |

| T09-03 | Cybersecurity Maturity Assessment Of A Critical Infrastructure Organisation – Approach And Obsvervations
Vikash Katta, John Eidar Simensen, Kine Reegård, Siv Hilde Houmb and Erlend Agøy Engum |

| T09-04 | Clarification of the Cybersecurity and Functional Safety Interrelationship in Industrial Control Systems
Bálint Z. Téglásy, Bjørn Axel Gran, Sokratis Katsikas, Vasileios Gkioulos, Mary Ann Lundteigen |

| T09-05 | Assessing Dependability Of Web Services Under Moving Target Defense Techniques
Salvatore Distefano Marco Scarpa, Xiaolin Chang Andrea Bobbio |

| T09-06 | Experiences from implementing and testing an approach for cybersecurity event detection in a critical aviation system
Erlend Agøy Engum, John Eidar Simensen |

| T09-07 | Optimal Attack Assignment on Remote State Estimation in Multi Nonlinear Systems: Structural and Asymptotic Policy |
| | **Amirreza Zaman, Jafar Zarei, Roozbeh Razavi-Far, Mehrdad Saif** |

| T09-08 | Development and Application of PSA-based Vital Digital Assets Identification Method |
| | **Meejeong Hwang** |

| T09-09 | Twin Based Continuous ICT Risk Management |
| | **Fabrizio Baiardi, Federico Tonelli** |

| T09-10 | Dynamic Probabilistic Risk Assessment for Cyber Security Risk Analysis of the Electric Grid |
| | **Yunfei Zhao, Nihanth Adina, Katya Blanc, Craig Rieger, Brian K. Johnson, Hangtian Lei, Timothy McJunkin, Pavan Kumar Vaddi, Thomas Ulrich, Ruixuan Li, Carol Smidts** |

| T09-11 | EIDS: Embedded Intrusion Detection System using Machine Learning to detect attack over the CAN-BUS |
| | **Marco Lombardi, Francesco Pascale, Domenico Santaniello** |

| T09-12 | Warning and management of cyber threats by a hybrid AI system (robot and operator) |
| | **Isaac Faber, Elisabeth Paté-Cornell** |

| T09-13 | Addressing Cybersecurity in Energy Islands |
| | **Per-Arne Jørgensen, John Eidar Simensen, Coralie Esnoul, Xueli Gao, Silje Arendt Olsen, Bjørn Axel Gran** |

T10 DEPENDABILITY

| T10-01 | Making Safeconcert Security-Informed To Enable Multi-Concern Modelling |
| | **Barbara Gallina, Zulqarnain Haider** |

| T10-02 | Model-based Analysis of Timing Errors for Reliable UAV Design |
| | **Thomas Mutzke, Mikael Steurer, Andrey Morozov, Klaus Janschek** |

| T10-03 | Utilizing Model-based Timing Analysis for Holistic Dependability Assessment of Unmanned Aerial Vehicles |
| | **Mikael Steurer, Thomas Mutzke, Andrey Morozov, Klaus Janschek, Klaus-Peter Neitzke** |

T11 DEPENDENCE AND COMMON CAUSE FAILURES MODELING AND ANALYSIS

| T11-01 | Reliability Analysis for Dependent Competing Failure Processes with Two-stage Degradation and External Shocks |
| | **Yukun Wang, Guanqi Fang, Rong Pan** |

| T11-02 | Mathematical Justification of the Staggered Test Scheme by a Time-Dependent Failure Model |
| | **Shota Soga** |

| T11-03 | Recent Insights from the International Common Cause Failure Data Exchange (ICDE) Project |
| | **Hayat Chatri, Gunnar Johanson, Jeffery Wood, Yolande Akl** |

| T11-04 | Framework for safety analysis of complex systems |
| | **Odd Ivar Haugen** |

| T11-05 | Conditional Quantification in PSA |
| | **Pavel Krcal, Xuhong He, Pengbo Wang, Ola Bäckström** |

| T11-06 | A multidimensional network approach for analyzing hazard impact dependencies |
| | **Nadine Berner, Josef Scheuer** |

T12	DISASTER MANAGEMENT

T12-01	Human Damage Estimation in Evacuation from Tsunami Caused by a Common Scenario Trench-Type Earthquake Ken-ichi Fujita, Harumi Yashiro
T12-02	Enhancing Disaster Response with Architectonic Capabilities by Leveraging Machine and Human Intelligence Interplay Karla Saldana Ochoa
T12-03	Developing a System for Automated Selection of Immediate Actions During Major Catastrophic Events Florian Lüttner, Jörg Finger, Christian Hanz, Marcel Roth
T12-04	Opportunities and Challenges for Building Community Preparedness towards Disasters in Malaysia Siti Hasliah Salleh, Nor Ashikin Mohamed Yusof, Intan Sazrina Saimy, Fadillah Ismail
T12-05	The response of the rescue system to large scale emergencies A case study: the collapse of the Morandi bridge Part 2 of 2: Technologies for rescue service Filippone Francesco, Bolognese Ciro, Roncalli Luciano, Monterosso Matteo
T12-06	The response of the rescue system to large scale emergencies A case study: the collapse of the Morandi bridge Part 1 of 2: the coordination of several actors involved Battaglia Marcella, Piccinini Fabrizio, Romano Giuseppe, Filippone Francesco

T13	DYNAMIC RELIABILITY / RISK ASSESSMENT

T13-01	Comprehensive Safety Modeling Technology for Space Man-Machine System based on Dynamic Probabilistic Safety Analysis Lu Chen, Xiaopeng Li, Fuqiu Li, Jing Yang
T13-02	Coping Time Analysis for Chromium coated Zircaloy for Station Blackout Scenario based on Dynamic Risk Assessment Lu Asad Ullah Amin Shah, Robby Christian, Junyung Kim, Hyun Gook Kang
T13-03	Simulation-Based Level 2 Multi-Unit PRA Using RAVEN and a Simplified Thermal-Hydraulic Code Xiaoyu Zheng, Diego Mandelli, Andrea Alfonsi, Curtis Smith, Tomoyuki Sugiyama
T13-04	Dynamic Reliability and Reliability-Based Sensitivity Model with Stochastic Load Di Zhou, Ershun Pan
T13-05	Application of Dynamic PSA Framework Using Performance-based Surrogate Method to Large LOCA Scenario Jong Woo Park and Seung Jun Lee
T13-06	Enhancement of the Treatment of System Interactions in a Dynamic PRA Tool Yoichi Tanaka, Hitoshi Tamaki, Xiaoyu Zheng, Tomoyuki Sugiyama
T13-07	Exploring and Generating Thermal-Hydraulic Models for Dynamic PRA Using Statecharts: The example of MAAP5 Claudia Picoco, Valentin Rychkov, Tunc Aldemir
T13-08	Display of Dynamical Behaviour of Nuclear Power Plant States in Risk Monitor System - Use of the GO-FLOW Methodology and Interactive Update Takeshi Matsuoka
T13-09	Multi-State Hybrid System Reliability Model Based on Hybrid Automaton Lulu Jia; Cheng Qian; Yi Ren; Dezhen Yang ; Qiang Feng; Bo Sun; Zhifeng Li
T13-10	Reliability Analysis Of A Reconfigurable Safety System Using Petri Net And Comparison With Smart Component Method Darpan Krishnakumar Shukla, A. John Arul

| T13-11 | Importance Measures in Repairable Systems |
| | Marc Bouissou, Ola Bäckström, Pavel Krcal, Pengbo Wang |

| T13-12 | A Multi-State Model of the Aging Process of Cyber-Physical Systems |
| | Zhaojun Hao, Francesco Di Maio, Enrico Zio |

| T13-13 | Dynamic Risk Analysis of Operation of the Autonomous Underwater Vehicle (AUV) |
| | Ruochen Yang, Ingrid Bouwer Utne, Yiliu Liu, Nicola Paltrinieri |

| T13-14 | Decision Making for Optimal Primary-Support Selection to Minimise Tunnel-Squeezing Risk |
| | Yu Chen, Edoardo Patelli, Peng Zeng, Ben Edwards, Tianbin Li, Michael Beer |

| T13-15 | A Dynamic Probabilistic Safety Assessment Method Combining Biasing Technique with MCDET |
| | Pan Xiaolei |

| T13-16 | A Probabilistic Approach to Dynamic Resilience Assessment of Power |
| | Farshid Faghihi, Pierre Henneaux, Pierre-Etienne Labeau, Mathaios Panteli |

| T13-17 | Dynamic PRA of Flooding-Initiated Accident Scenarios Using THALES2-RAPID |
| | Kotaro Kubo, Xiaoyu Zheng, Yoichi Tanaka, Hitoshi Tamaki, Tomoyuki Sugiyama, Sunghyon Jang, Takashi Takata and Akira Yamaguchi |

| T13-18 | Reliability Forecasting for Components/Systems with respect to 1-, 2- and 3- Dimensions of Stress Factors |
| | Abderrahim Krini; Josef Börcsök |

| T13-19 | Quasi-Simultaneous System Modeling in ADAPT |
| | Brian Cohn, Todd Noel, Troy Haskin, Doug Osborn, Tunc Aldemir |

| T13-20 | Advanced Methods for Loss-Of-Flow Accident Precursors identification in a Superconducting Magnet Cryogenic Cooling Circuit |
| | Vincenzo Destino, Roberto Bonifetto, Francesco Di Maio, Nicola Pedroni, Laura Savoldi, Enrico Zio |

| T13-21 | Integration of Hidden Markov Modeling and Bayesian Network for Fault Detection and Fault Prediction: an Automotive Case Study |
| | Morteza Soleimani, Felician Campean, Daniel Neagu, Aleksandr Doikin |

| T13-22 | A Method of Health Assessment for On-orbit Satellite Equipment based on Bayesian Network and FMEA |
| | Zixia Zheng, Dongteng Long, Bo Zhou, Heng Zheng |

| T13-23 | Dynamic reliability modeling for k-out-of-N:G redundant system with common cause failure and parametric uncertainty |
| | Yufei Song, Jinhua Mi, Yuhua Cheng, Libing Bai |

| T13-24 | Study on Quantitative Evaluation Method of Interaction Multi-Layer Model for Nuclear Fuel Facilities Considering External Natural Hazard |
| | Kenji Mori, Hitoshi Muta, Yasuki Ohtori |

T14 — ECONOMIC ANALYSIS IN RISK MANAGEMENT

| T14-01 | The Economic Effects of Regional Airports on Societal Resilience: A Swedish Case |
| | Christine Große, Pär M. Olausson |

| T14-02 | Towards a Framework for Assessing the Customer Value of Digital Solutions |
| | Minna Räikkönen, Joni Keski-Rahkonen, Helena Kortelainen, Mika Tikkanen, Pasi Valkokari, Ari Vehanen, Susanna Pirttikangas |

| T14-03 | FLEET SIZING BASED ON RELIABILITY MODELLING UNDER A LIFE CYCLE COST SCOPE |
| | FREDY KRISTJANPOLLER, PABLO VIVEROS, RODRIGO MENA, TOMAS GRUBESSICH and VICENTE GONZALEZ-PRIDA |

| T14-04 | Business Continual Management System for Value Added Securing of Organization Readiness at its Predictable Perils |
| | Olga Burianova, Jiri Urbanek |

| T14-05 | Predictability Principle of Tax Sanctions Threats in the Legal System |
| | Olga Burianova, Jiri Urbanek |

T15 — ENVIRONMENTAL RISK ANALYSIS

| T15-01 | Using Level 3 PSA to Inform Emergency Planning for Severe Accidents |
| | Donal Gallagher |

| T15-02 | Health Impacts of Current and Future Cars |
| | Stefan Hirschberg, Christian Bauer, Thomas Heck, Matteo Spada, Peter Burgherr, Christopher Mutel, Romain Sacchi |

| T15-03 | Circular bioeconomy growth to face the increasing industrial risk |
| | Massimo Mari, Lia Millucci, Antonio Fardelli, Carla Mazziotti |

| T15-04 | Using Machine Learning Models to Detect Oil Spills |
| | Ana Cláudia Souza Vidal de Negreiros; Caio Bezerra Souto Maior; Isis Didier Lins; Paulo Renato Soares and Márcio José das Chagas Moura |

| T15-05 | Odour nuisance: decision support tools to anticipate and represent levels of odor nuisance on a territory |
| | Billy Pottier, Veronica Artigue, Jérôme Tixier, Sylvain Olivier, Jean-Louis Fanlo |

T16 — EXTERNAL HAZARDS RISK ASSESSMENT

| T16-01 | A Framework of RI-PB Seismic Design/Part 1 : Characteristics of the Proposed RI-PB seismic Design |
| | Toshiaki Sakai, Yoshifumi Katayama, Yasuki Ohtori, Hitoshi Muta, Masato Nakajima |

| T16-02 | A Framework of RI-PB Seismic Design/Part 2: Evaluation of seismic diversity of SSCs focusing on response spectrum characteristics of ground motion |
| | Yoshifumi Katayama, Yasuki Ohtori, Toshiaki Sakai, Hitoshi Muta |

| T16-03 | A Framework of RI-PB Seismic Design |
| | Hitoshi Muta, Yasuki Ohtori, Yosei Tateno, Toshiaki Sakai, Yoshifumi Katayama and Masato Nakajima |

| T16-04 | The Effect of Full Seismic Correlation Assumption in Seismic Probabilistic Safety Assessment |
| | Woo Sik Jung and Geon Gyu Choi |

| T16-05 | Comparison of Two Approaches for Seismic Probabilistic Safety Assessment |
| | Ji Suk Kim, Man Cheol Kim |

| T16-06 | Risk-Informed Analysis of Nuclear Power Plant FLEX Storage Building |
| | Pegah Farshadmanesh, Tatsuya Sakurahara, Seyed Reihani, Ernie Kee, Zahra Mohaghegh |

| T16-07 | Uncertainty quantification of tsunami parameters for tsunami fragility assessment based on tsunami hazard assessment and inundation simulation |
| | Yoshiyuki Takahashi, Yoshinori Mihara, Hideki Kaida, Naoto Kihara |

| T16-08 | A Framework of RI-PB Seismic Design/Part 4: - Case Studies of Accident Sequence Analysis Considering Seismic Correlation |
| | Yosei Tateno, Hitoshi Muta, Yasuki Ohtori, Toshiaki Sakai, Yoshifumi Katayama |

| T16–09 | Risk assessment of escalation scenarios triggered by extreme flooding events: the role of safety barriers |
| | Alessio Misuri, Gabriele Landucci, Valerio Cozzani |

| **T17** | **FOUNDATIONAL ISSUES IN RISK ASSESSMENT AND MANAGEMENT** |

| T17-01 | A formal representation of terms and processes for the transition from risk to resilience and sustainability management |
| | Ralf Mock, Christian Zipper |

| T17-02 | Panarchy Process for Risk Control and Resilience Quantification and Improvement |
| | Ivo Häring, Sebastian Ganter, Jörg Finger, Kushal Srivastava, Evita Agrafioti, Clemente Fuggini, Fabio Bolletta |

| T17-03 | Individual and Overall Assessment related to the Work Environment – Regulatory context and application in the Norwegian Petroleum Industry |
| | Hans Thore Smedbold, Roger Flage, Marie Røyksund |

| **T18** | **GEOLOGICAL RISK ASSESSMENT** |

| T18-01 | Comparison of Empirical Sampling Planning and Planning Based on Value of Information for Identification of Contamination Area in Soils |
| | Ikumasa Yoshida, Yosuke Tasaki |

| **T19** | **HUMAN FACTORS AND HUMAN RELIABILITY** |

| T19-01 | HRA model modification for Human-Factors Engineering |
| | Yuto Hakuta, Tomoaki Uchiyama |

| T19-02 | Validating Operating Manual by Reasoning about State Transitions Through System's Function Models |
| | Mengchu Song, Jing Wu, Morten Lind |

| T19-03 | Copying with uncertainty in nuclear emergencies: The RAWFS heuristic in the main control room |
| | Marialaura Delvecchio, Salvatore Massaiu |

| T19-04 | An Empirical Study on the Use of the Rancor Microworld Simulator to Support Full-Scope Data Collection |
| | Jooyoung Park, Thomas A. Ulrich, Ronald L. Boring, Sungheon Lee, Bumjun Park, Jonghyun Kim |

| T19-05 | An Approach to Dependence Assessment in Human Reliability Analysis: Application of Lag and Linger Effects |
| | Jooyoung Park and Ronald L. Boring |

| T19-06 | Application and Improvement of HRA Guide for Qualitative Analysis with Emphasis on Narrative |
| | Yukihiro Kirimoto, Yuko Hirotsu, Kohei Nonose, Kunihide Sasou |

| T19-07 | Quantifying Psf Effects On Human Reliability In Digital Control Rooms Based On Simulation Records |
| | Yochan Kim, Jinkyun Park, Hee Eun Kim, Seung Ki Shin, and Mary Presley |

| T19-08 | A Framework to Analyze Human Performance Outside the Control Room |
| | Rossella Bisio, Alexandra Fernandes, Claire Blackett |

| T19-09 | Human Reliability Analysis of Water Supply with Portable Water Injection Equipment in Tsunami Probabilistic Risk Assessment |
| | Kenichi Hayase, Kohei Nonose, Daisuke Takeda, Yukihiro Kirimoto |

| T19-10 | Vulnerability revitalized: how can vulnerable groups enhance societal resilience? |
| | Lillian K. Stene, Christian H.A. Kuran, Claudia Morsut, Bjørn I. Kruke |

T19-11	Improving sensemaking in dynamic positioning operations: HMI and training measures
	Lars Hurlen, Andreas Bye

T19-12	Unified Definitions for Dependency in Quantitative Human Reliability Analysi
	Vincent P. Paglioni, Katrina M. Groth

T19-13	Modelling human-robot interaction to optimize their safety, sustainability and efficiency: Identifying relevant characteristics
	Wouter. M.P. Steijn, Jeroen van Oosterhout, Joeri Willemsen, Anne Jansen

T19-14	How much do Greek drivers know about safety when driving through road tunnels?
	Konstantinos Kirytopoulos; Panagiotis Ntzeremes; George Chatzistelios; Athanassios Saramourtsis; Athanassios Tsantsanoglou; Myrto Konstandinidou

T19-15	Estimating the Probability of Committing Traffic Infraction due to Mobile Use: Driving Simulator Study
	Carlos A. Catalina Ortega, Susana García-Herrero, Amin Azimian, Adrián García, Miguel A. Mariscal

T19-16	Case Study on Quantification for FIre Human Reliability Analysis
	Sun Yeong Choi, Daeil Kang

T19-17	Future Needs of HRA: The Link between New Technology, Crew Roles and Performance
	Andreas Bye

T19-18	HRA Methodology Development for Digital Main Control Rooms of NPPs
	Awwal M. Arigi, Jonghyun Kim

T19-19	Social Cognition Theory Applied on Human Reliability Assessment of Offshore Drilling Operations
	Carlos Henrique Bittencourt Morais, Ulrico Barini Filho, Marcos Coelho Maturana, Marcelo Ramos Martins

T19-20	Training for Operational Resilience Capabilities (TORC); advancing from a positive first response
	T.O. Grøtan

T19-21	Comparisons of Human Reliability Data between Analog and Digital Environment
	Jinkyun Park and Yochan Kim

T19-22	Analysis of Cyber Security For nuclear I&C systems with FPGA Platforms
	Jiye Jeong, Gyunyoung Heo

T19-23	Modelling Crew Performance Variability in Emergency Situations from Simulator Data for Human Reliability Analysis
	Salvatore F. Greco, Luca Podofillini, Vinh N. Dang

T19-24	Beyond Failure Counts: Performance Measures to Enhance Simulator Data Usage for HRA
	Markus Porthin, Luca Podofillini, Vinh N. Dang

T19-25	ERRORS OF COMMISSIONS FROM RECENT OPERATIONAL EXPERIENCE: (CESA) ANALYSIS
	Luca Podofillini, Vinh Dang

T19-26	FLEX and HRA Challenges in Common Backbone Models
	Jeffery Julius, Kaydee Gunter, Michael Hirt

T19-27	The Distracted Behaviors of the Unlicensed Drivers: Effects of the Zone and Vehicle Type
	BOULAGOUAS Wafa, FEBRES Juan Diego, MARISCAL Miguel Ángel, GARCIA-HERRERO Susana

T19-28	Getting personal: physiological measurements and human performance in safety critical tasks. Facing the ethical implications
	Fiachra O'Brolcháin, Maria Chiara Leva

T19-29	Assessing Human performance and Human reliability in collaborative intelligence scenarios: upcoming challenges and opportunities
	Maria Chiara Leva, Luca Podofilini

T20 — INDUSTRIAL SAFETY

T20-01	Four perspectives on safety analysis
	Tor Stålhane, Timo Malm

T20-02	SecureSafety; state-of-the-art and remaining challenges
	T.O. Grøtan, S. Petersen, T. Myklebust, G.K. Hanssen

T21 — INDUSTRY 4.0 RELIABILITY AND SAFETY

T21-01	Agile Supply Chains through Smart Digital Twins
	Barbara Pernici, Pierluigi Plebani, Massimo Mecella, Francesco Leotta, Federica Mandreoli, Riccardo Martoglia, Giacomo Cabri

T21-02	IRIS: a novel approach to risk monitoring in safety critical plants
	Elisa Calà, Guglielmo Carrubba, Michele Compare, Alessio Martini, Roberto Mascherona, Maurizio Ricci, Enrico Zio

T21-03	Comparison of Workers performance in Human-Human and Human-Cobot Interactions
	Mariscal M.A., González-Pérez J., Azimian A., Lopez-Perea E., García-Herrero S.

T21-04	Automated Graph-Guided Fault Injection Strategies for Robustness Evaluation Using Virtual Prototypes
	Jo Laufenberg, Thomas Kropf, Oliver Bringmann

T21-05	Managing the Combinatorics of IT Service Failure Modes in Complex Systems
	Sebastian Klabes , Marc Zeller

T24 — MACHINE LEARNING FOR RELIABILITY, MAINTENANCE AND SAFETY

T24-01	Application of an Unvalidated Process Model to Define Operational Functional Failures
	Melissa M. Schwarz, Paul Schepers, Johan van Boggelen, Richard Loendersloot, Tiedo Tinga

T24-02	Machine Learning for Risk Ranking Automation in IRSN Level 2 PSA
	Guillaume Kioseyian and Marine Marcilhac-Fradin

T24-03	Pipe Drift Estimation Based on the Measurements of Geometrical Paramaters from a Single Pipe
	Luca Bellani, Michele Compare, Enrico Zio, Gustavo Almeida, Pedro Filguerais

T24-04	Meta-learning Potential to Assess Uncertainties in Dynamic Risk Management
	Elena Stefana, Nicola Paltrinieri

T24-05	Development of bivariate machine-learning approach for decision support in offshore drilling operations
	Surbhi Bansal, Nejm Saadallah, Jon T. Selvik, Eirik B. Abrahamsen

T24-06	Bayesian Model Updating of Reliability Parameters using Transitional Markov Chain Monte Carlo with Slice Sampling
	Adolphus Lye, Alice Cicirello, Edoardo Patelli

T24-07	Adaptive Monte Carlo Simulation for Detecting Critical Regions in Accident Analyses
	Kloos, Berner, Peschke

| T24-08 | Lessons from past hazardous events: data analytics for severity prediction |
| | Nicola Paltrinieri, Riccardo Patriarca, Michael Pacevicius, Pierluigi Salvo Rossi |

| T24-09 | Increasing safety at smart elderly homes by Human fall detection from video using Transfer Learning approaches |
| | Zahra Kharazian, Mahmoud Rahat, Emad Fatemizadeh, Ali Motie Nasrabadi |

| T24-10 | Deep Learning approach for short-term Storm Forecasting |
| | Franc̦ois-Xavier Ferlande, Guillaume Hochard |

| T24-11 | Research on Nonlinear Hysteresis of the Flight Control System |
| | Yihan Guo, Cunbao Ma, Haotian Niu, Zhiyu She, Yan Liang |

| T24-12 | Audio-Visual and Heart Signals for Attention and Emotion Analysis |
| | Ilyes Bendjoudi, Denis Hamad, Frédéric Vanderhaegen, Fadi Dornaika |

| T24-13 | A Physics-Informed Deep Learning Approach for Fatigue Crack Propagation |
| | Sergio Cofre-Martel, Enrique Lopez Droguett, Mohammad Modarres |

| T24-14 | Optimizing Replacement of Power Distribution Network Cables With Graph Computing and Machine Learning |
| | Jérémie Merigeault, Sébastien Folleville, Odilon Faivre |

| T24-15 | Knowledge-Enabled Machine Learning for Predictive Diagnostics: A Case Study for an Automotive Diesel Particulate Filter |
| | Aleksandr Doikin, Felician Campean, Daniel Neagu, Martin Priest, Morteza Soleimani, Chunxing Lin |

| T24-16 | Graphical Models for Missing Data Analysis in Reliability |
| | Vimal Vijayan And Sanjay Kumar Chaturvedi |

| T24-17 | Optimimal Gain Tunning of Two Stage Switching Controller for Uav Autonomous Formation Flight |
| | Arkadiusz Bożko, Leszek Ambroziak |

| T24-18 | Theory-Guided Machine Learning for Licensee Event Reports of U.s. Nuclear Power Plants To Quantify Organizational Factors in Probabilistic Risk Assessment |
| | Justin Pence, Jaemin Yang, Pegah Farshadmanesh, Tatsuya Sakurahara, Seyed Reihani, Zahra Mohaghegh |

| T24-19 | Localizing Cliff-Edge Effects in Accident Analyses Via an Adaptive Gauss Process Sampling Approach |
| | Nadine Berner, Martina Kloos, Joerg Peschke |

T25 — MAINTENANCE MODELLING AND APPLICATIONS

| T25-01 | Is It Too Late? In-Life Change to Optimal Maintenance Strategy Based on Advanced Reliability Models in Wind Farms |
| | Juan Izquierdo, Adolfo Crespo, Jone Uribetxebarria and Asier Erguido |

| T25-02 | Maintenance Strategy for the Road Infrastructure for the Autonomous Vehicle |
| | Ikram Najeh, Laurent Bouillaut, Dimitri Daucher And Maxime Redondin |

| T25-03 | Modified Repair Quality Index for Complex Repairable Systems |
| | Garima Sharma, Rajiv Nandan Rai |

| T25-04 | Modeling Imperfect Maintenance With Stochastic Petri Nets |
| | Florent Brissaud, Cyrille Folleau |

| T25-05 | Cost-Effective Planning Reliability-Based Inspections of Fatigued Structures in the Case of Log-Location-Scale Distributions of Lifetime Under Parametric Uncertainty |
| | Nicholas Nechval, Gundars Berzins, Konstantin Nechval |

T25-06	Maintenance Optimization on a Network Flow
	Michele Urbani, Matteo Brunelli

T25-07	Risk-Based Prioritization of Technological Obsolescence Issues
	Isabel Martón, Ana Sánchez, Sebastián Martorell, Sofia Carlos

T25-08	Improving Maintenance Information Retrieval with Auto-generated Question-Answer Pairs
	Yu Fan, Chuan Lv, Xiaoyu Sun, Chao Dai, Huan Zhang

T25-09	Modelling and Prognostics of system degradation using Variance Gamma process
	Marwa Belhaj Salem, Estelle Deloux, Mitra Fouladirad

T25-10	Predictive Maintenance Policies for Multi-Site Deteriorating Systems Subject to Limited Resources
	Nourelhouda AZELI , Khac Tuan HUYNH and Antoine GRALL

T25-11	Maintenance With Learning for a System Subject To Random Shocks And Degradation
	Bruno Castanier, Firoozeh Haghighi

T25-12	An External Shock - Internal Barrier Degradation Model to Account for Operational Loads
	Jørn Vatn and Frank Børre Pedersen

T25-13	Optimal Grouping and Scheduling of Preventive Maintenance Activities
	Pablo Viveros Gunckel, Rodrigo Mena Bustos, Enrico Zio, Sebastian Campos Briones

T25-14	Unobserved Heterogeneity in Imperfect Maintenance Models
	Xingheng Liu, Jørn Vatn, Yann Dijoux

T25-15	Preventive Maintenance of a Compressor Station: a Modeling Framework for the Assessment of Performance
	Renny Arismendi, Anne Barros, Antoine Grall

T25-16	Estimation of Failure Probabilities for Maintenance Activities Regarding Product Fleets in Use: Censored Data Handling An Automotive Engineering Case Study
	Stefan Bracke and Franz-Georg Neupert

T25-17	Condition-Based Maintenance Model for a Single Component Subject to Long Preparation Time and Limited Maintenance Opportunities
	Abu MD Ariful Islam, Jørn Vatn

T26 — MATHEMATICAL MODELS AND METHODS FOR RELIABILITY AND SAFETY

T26-01	Coverage Probability of Methods for Steady-State Availability Inference with a Confidence Interval
	Frank Müller, Peter Zeiler, Bernd Bertsche

T26-02	Calibration of Contributing Factors for Model-Based Predictive Analysis Using Polynomial Chaos Expansion Methods
	Xiaolong Wang, Xiang Fang, Lukas Beller, and Florian Holzapfel

T26-03	Operating Reliability in the Special Air Transport of the Aircraft Gulfstream G55
	Justyna Tomaszewska, Marta Woch, Mariusz Zieja

T26-04	Quasi-static approach for modeling dynamic effects in large PSA models
	Gerben Dirksen, Heiko Kollasko

T26-05	Automatic Petri Net Generation from Smart Component Reliability Models
	Darpan Krishnakumar Shukla, A. John Arul

| T26-06 | Selecting representative Hazard Scenarios for Engineering Systems with Inverse FORM |
| | Hugo ROSERO-VELÁSQUEZ, Daniel STRAUB |

| T26-07 | Reliability at Use Condition Considering the Statistical Uncertainty and Distribution of Life-Stress Model and a Sample of Load Spectra |
| | Peter Zeiler and Aleksandar Eric |

| T26-08 | Two-dimensional Simulation Study on the Response Processes of Explosive in Thermal Environment |
| | Lan Wei, Xiaomian Hu |

| T26-09 | Availability of Critical Industrial Equipment based on a FMEA-AHP Analysis |
| | António Carvalho, José Sobral |

| T26-10 | A Weak Interactions Based Method For Pipeline Leak Detection |
| | Karol Golak, Rafal Gradzki, Pawel Lindstedt |

| T26-11 | Evaluation of Empirical Bayes Estimators of Correlated Event Rates and Implications for Predicting New Product Reliability |
| | Rafael Schwarzenegger, John Quigley, Lesley Walls |

| T26-12 | Detecting Out Of Distribution Objects In Semantic Segmentation Of Street Scenes |
| | Dominik Brüggemann, Robin Chan, Stefan Bracke, Hanno Gottschalk, Matthias Rottmann |

| T26-13 | Misspecification Analysis of a Gamma- with an Inverse Gaussian-Based Degradation Model in the presence of Measurement Error |
| | Bruno Castanier, Nicola Esposito, and Massimiliano Giorgio |

| T26-14 | Low-Cycle Fatigue Life Prediction and Reliability Evaluation of Turbine Blades With Distributed Collaborative LSSVR |
| | Hai-Feng Gao, Enrico Zio and Anjenq Wang |

| T26-15 | A Perturbed Gamma Process with Random Effect and State-Dependent Error |
| | Bruno Castanier, Nicola Esposito, Massimiliano Giorgio, and Agostino Mele |

| T26-16 | Minimal Cut Vectors of Multi-State Systems Identified Using Logic Differential Calculus and Multi-Valued Decision Diagrams |
| | Miroslav Kvassay, Patrik Rusnak, Elena Zaitseva, Jozef Kostolny |

| T26-17 | DHS Model for the Analysis of a Repairable System |
| | A. Syamsundar, V. N. A. Naikan and Shaomin Wu |

| T26-18 | Application of Maximum Likelihood Decision Rules for Handling Class Imbalance in Semantic Segmentation |
| | Robin Chan, Matthias Rottmann, Fabian Hüger, Peter Schlicht, Hanno Gottschalk |

| T26-19 | Reliability and Sensitivity Analysis of a Repairable K-Out-Of-N:f System With General Life - And Repair Times Distribution |
| | Vladimir Rykov and Nika Ivanova |

| T26-20 | Reliability Analysis of a Homogeneous Hot Standby Data Transmission System |
| | Houankpo Hector Gibson Kinmanhon, Kozyrev Dmitry Vladimirovich, Nibasumba Emmanuel, Mouale Moutouama N'dah Bienvenu |

| T26-21 | Cross-Entropy-Based Importance Sampling With Projection in Low Dimensional Subspace for Rare Event Simulation in High Dimension |
| | Maxime El Masri, Jérome Morio, Florian Simatos |

T27 — MEDICAL RISK

T27–01	Bridging the Gap between Safety and Risk for the Risk-Informed Design of a Medical Device
	Roberto Filippini

T27–02	When Considering The Asymptotic Availability Is Not a Safe Bet
	Christian Tanguy

T27–03	Towards Mental Wellbeing in Cities: A Data-driven Learning from Mental Health—Environment Nexus
	Sayanti Mukherjee; Nisha Botchwey; Emmanuel Frimpong Boamah

T27–04	Decreasing Medical Risk by Designing and Implementing eHealth Data Exchange in the Dawn of the new General Healthcare System (GESY) of Cyprus: A Nationwide Survey
	Chris Bachtsetzis and George Athanasiou

T28 — NATURAL HAZARDS RISK ASSESSMENT

T28–01	Natech Scenarios in the Process Industries and Reliability Analysis: An Inclusive Approach to the Seismic Effect
	Paolo Mocellin, Chiara Vianello, Ernesto Salzano, Giuseppe Maschio

T28–02	Development of Drought Risk in the Selected Territory
	Alena Oulehlova, Leona Karaskova, Pavel Kincl

T28–03	Earthquake Natech Risk: Index Method for critical Plants covered by Seveso III Directive
	Giuseppe Giannelli, Giovanni Grillone, Antonino Muratore, Vincenzo Nastasi, Giuseppe Sferruzza

T28–04	Seismic Risk Assessment in Workplaces
	Giovanni Grillone, Antonino Muratore, Vincenzo Nastasi

T28–05	A Multicriteria Model For Urban Flood Risk Management: A Case Study In A Brazilian Town
	Lucas Borges Leal da Silva, Júlia Santos Humberto, Marcelo Hazin Alencar, Rodrigo José Pires Ferreira, and Adiel Teixeira de Almeida

T28–06	Flooding occurrences in the portuguese continental coastal zone: a database for the period 1980-2018
	José Leandro Barros; Paula Freire; Luís Perdiz; Alexandre Oliveira Tavares

T28–07	Preliminary Seismic Risk Analysis of a Data Network
	Simona Esposito, Alessio Botta, Melania De Falco, Adriana Pacifico, Eugenio Chioccarelli, Antonio Pescapè, Antonio Santo, Iunio Iervolino

T28–08	Seismic Safety of Buildings vs Other Risks in Italy: Preliminary Analysis
	Adriana Pacifico and Iunio Iervolino

T29 — OCCUPATIONAL SAFETY

T29–01	Working Conditions and Safety in The Gig Economy – A Media Coverage Analysis
	Marie Nilsen, Trond Kongsvik and Stian Antonsen

T29–02	Working Situation's Reference Model for Risk Assessment on Automated Assembly Linesy
	Romain Duponnois, Pascal Lamy, Eric Levrat, Ali Siadat

T29–03	Comparative Study between China and France for Accident Prevention in Confined Spaces
	Yan Dong, Yan Liu, Olivier Salvi, Jessica Queron

| T29-04 | WorkingAge: Providing Occupational Safety through Pervasive Sensing and Data Driven Behavior Modeling |
| | Mariagrazia Fugini, Alessandro Barenghi, Sara Comai, Gerardo Pelosi, Roberto Tedesco, Marteyn van Gasteren, Carlos Alberto Catalina, Estefania Arribas Leal, Raquel Losada Duran, Rosa Maria Martins de Almeida, Alexander Mertens, Vera Rick, Hatice Gunes, Tian Xu, Gianluca Borghini, Vincenzo Ronca, Hesam Sagha |

| T29-05 | Safety Measures for Released Workpieces in Vertical Turning |
| | Adrian Albero Rojas, Volker Wittstock, Patrick Puschmann, Matthias Putz |

| T29-06 | Occupational Safety in Micro Firms using Chemicals: Evidence from Cyprus, Greece and Romania |
| | Chris Bachtsetzis, Kostas Tzanas, Ioannis Anyfantis, George Boustras |

| T29-07 | Accident Types and Barrier Failures in 69 Fatal Accidents in the Construction Industry |
| | Stig Winge, Eirik Albrechtsen |

T30 — OPTIMIZATION OF RELIABILITY MAINTENANCE AND SAFETY

| T30-01 | The Two-Stage Cloud Platform Scheduling Strategy of Stress Simulation Analysis of Electronic Devices |
| | Jiayue Fang, Ying Chen, Rui Kang |

| T30-02 | Environmental Contours and Optimal Design |
| | Kristina R. Dahl, Arne B. Huseby |

| T30-03 | Enhanced Reliability Centered Maintenance for Application Ti the Railway Industry |
| | Roberto Mascherona, Luca Bellani, Michele Compare, Enrico Zio, Roberto Trucco |

| T30-04 | Belief Reliability-Based Design Optimization of Structures |
| | Yubing Chen, Meilin Wen, Rui Kang, Qingyuan Zhang |

| T30-05 | ate Top Event Prevention Analysis |
| | Robert Youngblood |

| T30-06 | The R-interdiction Continuous P-median Problem with Uncertain Attacks |
| | Pei Yang, Yiyong Xiao, Siyue Zhang, Wenbing Chang, Shenghan Zhou |

| T30-07 | A Reliability-Based Optimization Framework for Offshore Wind Turbine Support Structures |
| | Mohammad Rezvanipour, Peyman Amirafshari, Lin Wang, Athanasios Kolios |

| T30-08 | A Model To Estimate the Optimal Time of Replacement of Potential Transformer in Power Transmission System |
| | Gabriel Alves da Costa Lima, Luís Augusto Nagasaki Costa, Alberto Magno Teodoro Filho, Gisele Maria de Oliveira Salles, Ailton Pinto |

| T30-09 | Modelling Resource Reservation in A Two Parking Lot Problem With Client Priorities |
| | Athanasia Kadrefi, Vasilis P. Koutras, Agapios N. Platis |

| T30-10 | An Empirical Approach To Reliability-Based Design Using Scenario Optimization |
| | Roberto Rocchetta, Luis G. Crespo |

| T30-11 | A Comparative Study of Markov Decision Process Algorithms for Multi-Component Condition-Based Maintenance |
| | Jesper Fink Andersen, Anders Reenberg Andersen, Bo Friis Nielsen, Murat Kulahci |

| T30-12 | Research on Reliability Growth Program and Method Based on W Model and AMASS Model |
| | Wei Wang, Jiake Li, Jingfen Li |

T30–13	System approach to reliability engineering - case wave energy converter Risto Tiusanen, Eetu Heikkilä, Minna Räikkönen, Tero Välisalo
T30–14	A Quantum-Inspired Genetic Algorithm for Optimization of a Joint-Maintenance Strategy on Multi-Component Engineering Systems Jinrong Cao, Xuan Wang, Diyin Tang

T31	**ORGANIZATIONAL FACTORS**
T31–01	Managerial Sense-making During Technological Changes Mina Saghafian, Nadezhda Gotcheva, Karin Laumann and Martin Rasmussen Skogstad
T31–02	Organizational Influences on the Emergence and Mitigation of Catastrophic Events Clemens Heitsch, Michael Paßens, and Jan C. Stiller
T31–03	Mindful Safety Practices in the Maritime Industry – The Significance of Safety Climate Trond Kongsvik, Maria Zakharova, Asbjørn Lein Aalberg
T31–04	Role of Leadership Types in Managers' Commitment to Safety David Levovnik, Marko Gerbec
T31–05	Job Safety Analysis in Large Construction Projects – An Inter-organizational Approach to Risk Analysis and Learning Heidi Helledal, Kenneth Pettersen Gould, Kari Anne Holte
T31–06	How Tendering Affects the Resilience of Critical Societal Functions – a Literature Review Tone N. Slotsvik, Asle Gauteplass, Torgeir Kolstø Haavik, Kristine Vedal Størkersen, Berit Therese Nilsen, Petter G. Almklov
T31–07	Integrated Management of Safety and Security in Seveso Plants Marja Ylönen, Jouko Heikkilä, Minna Nissilä
T31–08	Risks Assessment in Multidisciplinary Project Development Based on OTSM-TRIZ and DSM Piñones Eduardo, Nikulin Christopher, Zuñiga Marcos, Cardenas Daniel, Pedraza Manuel, Carvajal Gonzalo, Carvajal Rodrigo and Castro Nicolás
T31–09	Trust Me, You Can Soon Start Tearing Down Your Workplace! Ann Britt Skjerve, Kine Reegård, Grete Rindahl
T31–10	Socio-Technical Perspectives on Cyber Security and Definitions of Digital Transformation – A Literature Review Stine Skaufel Kilskar

T33	**PREDICTIVE MAINTENANCE**
T33–01	Interpretable Survival Models for Predictive Maintenance Paul Castle, Janet Ham, Melinda Hodkiewicz, and Adriano Polpo
T33–02	Low-Cost Solutions for Maintenance with a Raspberry Pi Martin Larrañaga, Riku Salokangas, Olli Saarela, Petri Kaarmila
T33–03	Machine Learning-enabled Modeling Approach for Predictive Maintenance Decision-making Support Chunsheng Yang, Yubin Yang, Xiaohui Yang, Qiangqiang Cheng
T33–04	The SUPREEMO Experiment for Smart Monitoring for Energy Efficiency and Predictive Maintenance of Electric Motor Systems Sarantis Kotsilitis, Konstantinos Chairetakis, Athina Katsari & Effie Marcoulaki

| T33-05 | Degradation modelling of centrifugal pumps as input to predictive maintenance |
| | Tom I. Pedersen, Jørn Vatn, Kim A. Jørgensen |

| T33-06 | Modeling turbocharger failures using Markov process for predictive maintenance |
| | Mahmoud Rahat, Sepideh Pashami, Slawomir Nowaczyk, Zahra Kharazian |

| T33-07 | Data Analysis To Facilitate Offshore Seawater Ultrafiltration Membrane Replacement Decision and Scheduling of Chemical Wash |
| | Abu MD Ariful Islam, Jørn Vatn |

| T33-08 | Remaining Useful Life Estimation Using Vibration-based Degradation Signals |
| | Bahareh Tajiani, Jørn Vatn, Viggo Gabriel Borg Pedersen |

| T33-09 | Condition Monitoring and Reliability of A Resistance Spot Welding Process |
| | Matteo Strozzi, Marco Cocconcelli, Riccardo Rubini, Gianmarco Genchi, Alessandro Zanella |

| T33-10 | Avenues for Future Research on Predictive Maintenance Purposes in Terms of Risk Minimization |
| | Rim Louhichi, Mohamed Sallak, Jacques Pelletan |

T34 — PROGNOSTICS AND SYSTEM HEALTH MANAGEMENT

| T34-01 | Online Framework of Prognostic and Health Management for CMG under Multiphysics |
| | Limei Tian, Danyang Han, Jinsong Yu, Liwen Zhang, Qiang Zhang |

| T34-02 | Input-Output Hidden Markov Model to Manage the Remaining Useful Life of System Under Missing Data |
| | Kamrul Islam Shahin, Christophe Simon, Philippe Weber |

| T34-03 | Method for condition characterization of industrial components by dynamic discovering of their pattern behaviour |
| | Pablo CalvoBascones, Miguel A. Sanz-Bobi, Tomás Álvarez Tejedor |

| T34-04 | A Machine Learning Method Applied to the Evaluation of the Condition in a Fleet of Similar Vehicles |
| | Pablo CalvoBascones, Miguel A. Sanz-Bobi, Chiara Brighenti, Mattia Ricatto |

| T34-05 | Combination of Probabilistic and Deterministic Models in Degradation Prognostics With Limited Data |
| | Petteri Ojala, Jari Rämö, Minna Niittymäki, Juha Miettinen |

| T34-06 | Prognostics for Gas Distribution Networks: Models Based on Interval-Valued Time Series |
| | Victor Krymsky, Ramis Imilbaev, and Andrey Yunusov |

| T34-07 | Estimating the Remaining Useful Life of a Flow Distribution System |
| | Kamrul Islam Shahin, Christophe Simon, Philippe Weber |

| T34-08 | Online Remaining Useful Life Management Considering Operating Conditions to Match the Given Maintenance Date |
| | Kamrul Islam Shahin, Christophe Simon, Philippe Weber |

| T34-09 | Degradation and maintenance modeling of dynamic systems |
| | Yves Langeron, Khac Tuan Huynh and Antoine Grall |

| T34-10 | Calculation of the Prediction Interval for Negative Correlation Learning via Delta Method |
| | Simon Hagmeyer and Peter Zeiler |

| T34-11 | Industrial Component Wear Classification Using Machine Learning Models |
| | Aleksander Jakubowski, Rafał Grądzki, Marcin Derlatka |

T34-12	Analysis of Lifetime Prediction of The on Board Starter Current **Mariusz Michalski, Justyna Tomaszewska, Mariusz Zieja**
T34-13	Swarm Artificial Intelligence Systems for Prognosis and Preventive Management in Engineering and Medicine **Sergei Kirillov, Aleksandr Kirillov, Natalia Kirillova, Michael Pecht**
T34-14	Performance Analysis of Redundant Safety-Instrumented Systems Considering the Imprecision of Information in Proof Tests **Aibo Zhang, Himanshu Srivastav, Anne Barros, Dariusz Mazurkiewicz, Yiliu Liu**
T34-15	Degradation Modelling Using a Phase Type Distribution **Ewa Laskowska, Jørn Vatn**
T34-16	Phase Type Modelling for Approximation of the Geometric Brownian Motion **Jørn Vatn**
T34-17	Configurable Monitoring of Machine Tools Status in Smart Factories **Luca Landi, Nicola Chiavatti, Luca Grilli, Marco Preteni**
T34-18	Hybrid Architecture of Deep Convolutional Variational Auto-Encoder for Remaining Useful Life Prediction **Ryad Zemouri, Zeina Al Masry, Ikram Remadna, Sadek Labib Terrissa, Noureddine Zerhouni**
T34-19	Study of packaging and installation of FBG sensors for monitoring of aircraft systems **Pier Carlo Berri, Matteo Davide Lorenzo Dalla Vedova, Paolo Maggiore, Cosimo Corsi, Alessio Laudani, Cristian Secci**
T34-20	Comparison of Metaheuristic Optimization Algorithms for Electromechanical Actuator Fault Detection **Matteo Davide Lorenzo Dalla Vedova, Pier Carlo Berri, Javier Bravo Lendinez**
T34-21	Back-EMF Reconstruction for Electromechanical Actuators in Presence of Faults **Pier Carlo Berri, Matteo Davide Lorenzo Dalla Vedova, Paolo Maggiore, Gaetano Quattrocchi**
T34-22	Launch Vehicle Fault Injection and Fault Diagnosis Based on MIL-STD-1553B Data Bus **Juan Chen, Shilu Xie, Jia Li, Botao Guo, Deyi Wang**
T34-23	A Novel Degradation State Indicator for Steam Generators of Nuclear Power Plants **Luca Pinciroli, Piero Baraldi, Ahmed Shokry and Enrico Zio**
T34-24	Fleet Prognostics for Assets with Heterogeneous Deterioration Characteristic **Junqi Zeng and Zhenglin Liang**
T34-25	Degradation Modeling of Roller Bearings using Two Different Health Indicators **Bahareh Tajiani, Jørn Vatn**
T34-26	Model-based Prognostic of the Remaining Useful Life of Bearings Considering Model Parameter Uncertainty **Fatemeh Hosseinpour, Mehdi Behzad, Enrico Zio**
T34-27	Fault Diagnostics by Conceptors-Aided Clustering **Mingjing Xu, Piero Baraldi, Enrico Zio**

T35	**QUALITY**
T35-01	Conformity Assessment Procedures of the Directive 2014/68/UE (PED) and Implementation of the Quality Management System ISO 9001:2015 **Francesco Giacobbe, Elisabetta Bemporad, Fabio Pera**

T35-02	A Method Evaluate the Work Realization Degree of General Quality Characteristics
	Wei Wang, Jingfen Li, Jiake Li

T35-03	Examination of Mediating Effects of Safety on the Relationship Between Quality Management and Live Working Performance
	Viktor Lovrenčić, Alenka Brezavšček, Matjaž Maletič, Damjan Maletič, Miloš Pantoš, Boštjan Gomišček

T36	RESILIENCE ANALYSIS, ASSESSMENT AND MANAGEMENT

T36-01	Resilience Assessment of Bunkering Operations for a Lng Fuelled Ship
	Tomaso Vairo, Paola Gualeni, Bruno Fabiano, Agostino Carlo Benvenuto

T36-02	Modeling Emergency Management Capabilities and Information Flows of Interdependent Systems
	Mariachiara Piraina, Paolo Trucco

T36-03	Quantifiable Resilience Analytics of Electrical Grids by Simulating Power Flows
	Daniel Hupp, Tomas Hruz, Ralf Mock

T36-04	Are Safe and Resilient Systems Less Effective and Productive?
	Trine Marie Stene, Kay Fjørtoft

T36-05	A Bayesian Network Approach To Predicting Transmission Line Down Times
	Erlend Sandø Kiel, Gerd Hovin Kjølle

T36-06	Resilience Metrics for Interdependent Infrastructure Systems: A Literature Review (Part 1)
	Paolo Trucco, Boris Petrenj, Riccardo Lodi Rizzini & Mattia Landi

T36-07	Supply Chain Resilience Under a Performance-based Contract
	Araceli Zavala, David Nowicki, and Jose E. Ramirez-Marquez

T36-08	Assessing the Resilience of an Electrified Transportation Network Considering Failures of Charging Stations
	Hongping Wang, Yi-Ping Fang, Islam Abdin, Enrico Zio

T36-09	The Evolution of the Resilience Framework through EU Funded Research
	Anastasia Tzioutziou, Yiannis Xenidis

T36-10	Cross Border Critical Infrastructure: A New Approach for the Protection Evaluation
	Fabio Borghetti, Giovanna Marchionni, Elena Gugiatti, Christian Ambrosi, Dorota Czerski, Carmela Melzi

T36-11	Resilience Assessment of Safety-Critical Systems With Credal Networks
	Hector Diego Estrada-Lugo; T.V. Santhosh; Marco de Angelis; Edoardo Patelli

T36-12	A Condition-Based Maintenance Strategy in Support Of Risk Management for Buildings Refrigeration Units Hospital
	Francesco Rota, Alberto Maldarella, Cinzia Maria Luisa Talamo, Giancarlo Paganin

T36-13	Metrics for Bridge Resilience Indicators
	Zehra Irem Turksezer, Maria Pina Limongelli, Michael Havbro Faber

T36-14	Resilience Based Maintenance: a Conceptual Approach
	Lech Bukowski, Sylwia Werbińska-Wojciechowska

T36-15	Operationalization and Application of Resilience Enhancing Design Principles for District Heating Systems
	Tino Mitzinger, Johannes Röder, Pablo Their

| T36–16 | A View of the New Space Sector Resilience |
| | Olga Sokolova, Matteo Madi |

| T36–17 | Enhancing The Organizational Resilience Through The Safety Management System |
| | Fabio Pera, Marianna Madonna, Ernesto Del Prete |

| T36–18 | Contribution of Diversity to the Resilience of Energy Systems – A literature review |
| | Pablo Thier, Cécile Pot d'or |

| T36–19 | Resilience Analysis of Multistate Energy System With Time-Dependent Behaviors |
| | Shijia Du, Zhiguo Zeng |

| T36–20 | Quantitative Resilience Assessment of Urban Buried Gas Pipeline Network System |
| | Yue Zhang, Wenguo Weng |

| T36–21 | A Quantitative Model To Define the Priority of Recovery of Road Network Elements Following a Relevant Event |
| | Fabio Borghetti, Marco Ponti, Giovanna Marchionni, Luca Studer, Paolo Gandini, Roberto Maja |

| T36–22 | Generating Worst-Case Scenarios by Randomly Distributing Loads for Risk Assessment in Low Voltage Residential Electricity Grids |
| | Shangdan Yang, Peggy Bergmann, Karen Derendorf, Frank Schuldt, Karsten von Maydell |

| T36–23 | A Supervised Classification Method Based on Logistic Regression With Elastic-Net Penalization for Heat Waves Identification To Enhance Resilience Planning In Electrical Power Distribution Grids |
| | Luca Bellani, Michele Compare, Roberto Mascherona, Bartolomeo Greco, Andrea Morotti, Luca Perfetto, Gaetano Iannarelli, Enrico Zio |

T37 RISK ACCEPTANCE CRITERIA

| T37–01 | Study on Nuclear Safety Goals Based on Chinese Societal Risks |
| | Jinghan Zhang, Jun Zhao, Jiejuan Tong |

| T37–02 | Mindsets of Risk Acceptance in the Light of Vision Zero and Tunnel Safety |
| | Tonja Knapstad, Morten Sommer and Eirik Bjorheim Abrahamsen |

| T37–03 | Integrated Use of Defense-in-Depth and Probabilistic Safety Assessment for Risk Acceptance |
| | Stefano La Rovere, Gian Luigi Fiorini, Paolo Vestrucci, Giovanni Tenaglia |

| T37–04 | Competence Constraints for Fire and Rescue Personnel Involved in Tunnel Fire Safety as Part of the Tunnel's Risk Acceptability |
| | Gabriela Bjørnsen and Ove Njå |

T38 RISK ANALYSIS AND SAFETY IN STANDARDIZATION

| T38–01 | Variability of Human Approach Speeds To Hazardous Areas in the Work Area of Metal Working Machine Tools |
| | Martin Schmauder, Karl Klöber, Carolin Kreil |

| T38–02 | Evaluation of Upgrading Options for Single-channel Mechatronic Safety Functions Into Category 2 Structure According to ISO 13849 Based on Standard PLC's |
| | Martin Dazer, Dennis Hügle, Bernd Bertsche, Maik Messner, Eberhard Beck, Heinrich Mödden |

| T38–03 | Safety of Machinery: Sample Size of Test Persons to Achieve the Required PValues |
| | Heinrich Moedden |

T38-04	Correction of Under-Reporting in Wind Turbine Structural Failure Data John Spouge
T38-05	Improved Design Conventions for Separating Guards of Grinding Machines Matthias Timm, Christian Adler, Olaf Mewes, Heinrich Moedden
T38-06	Modeling the impact of grinding wheel fragments on steel sheets using Finite Element Analyses Eckart Uhlmann, Simon Thom, Zachary Schellin, Lukas Prasol
T38-07	Harmonization of International Standards and Chinese National Standards for Making Life Cycle RAMS Management Guideline for Nuclear Power Plants in China Renyou Zhang, Zhizhong Li
T38-08	A Safety Regulatory Framework for Certification and Authorization Process of Self-Driving Cars: Experience from European Railways Ales Filip, Francesco Rispoli, Roberto Capua
T38-09	Reliability Test Information for Production Assurance and Reliability Management Based on Iso 20815:2018 - Uncertainty Linked To Test Requirements Jon T. Selvik, Endre Willmann, and Alex Green
T38-10	A Taxonomy for Cross-domain Fire Hazards in Building Design Balaji Kalluri Mallikarjuna, Hannah Rosenqvist, Anja Kivac
T38-11	Calibration of an Air Cannon for Safety Penetration Tests Luca Landi, Alessandro Stecconi, Fabio Pera, Ernesto Del Prete
T38-12	Study on Safety Evaluation of Freeway Tunnel Operation Based on the Grey Correlation Method and IAHP Kaijiang Chen, Shaoxiong Huang, Ran Li, Mengqian Li
T38-13	The Basis for Debating Standardization of Risk for Land-use Planning is Incomplete Johan Ingvarson

T39	RISK ASSESSMENT
T39-01	Safety Risk Control on Construction of Highway Tunnel Undercrossing Existing Highway Haoran Song, Shaoxin Liu
T39-02	Waste Disposal Facilities Fires: Prevention and Management. The Veneto Region Experience Chiara Vianello, Paolo Mocellin, Giuseppe Maschio, Gianpaolo Bottacin, Fabio Dattilo
T39-03	A Comparison of Hazardous Scenarios in Architectures with Different Integration Types Nanda Anugrah Zikrullah, Meine J.P. van der Meulen, Gunleiv Skofteland, and Mary Ann Lundteigen
T39-04	Real-time Risk Analysis of Natural Gas Pipeline Emergency Repair Process Based on Dynamic FAHP Zhao Likang and Xiong Yi
T39-05	A Maintenance Scheduling Optimization for Wind Farms Abolfazl Shojaei Barjouei, Abbas Barabadi, Javad Barabady
T39-06	A Comparative Risk Assessment for Passenger Cars in Europe Matteo Spada, Peter Burgherr
T39-07	A Conceptual Study on the Complex Behaviour of Radiological Emergency Evacuation – Focusing on Resilience Gibeom Kim, Yujeong Hwang and Gyunyoung Heo

T39-08   Technical Safety Studies to Save Money
            Andrea Mancini, Stefania Benucci

T39-09   CFD Modelling of Pressurized Gas Releases: Sensitivity Analysis of Driving Parameters
            Alberto Moscatello, Gianmario Ledda, Anna Chiara Uggenti, Raffaella Gerboni, Andrea Carpignano

T39-10   Impact of Human and Organizational Factors Applying HAZOP: Results from a Systematic Literature Review and Interviews
            Silje Arendt Olsen, Sizarta Sarshar, John Eidar Simensen, Kine Reegård, Coralie Esnoul

T39-11   Implementing Into Practice an Uncertainty-Based Risk Perspective: Main Challenges and Opportunities
            Røyksund, Marie, Aven, Terje & Wiencke, Hermann S.

T39-12   Application of Formal Assessment (FSA) Methodology on Offshore Salt Caverns Projects
            Marco Aurelio Pestana, Carlos Henrique Bittencourt Morais, Marcelo Ramos Martins

T39-13   Comparison of CFD numerical approaches for the simulation of accidental gas release in energy applications
            Fabrizio Pappalardo, Alberto Moscatello, Anna Chiara Uggenti, Raffaella Gerboni, Andrea Carpignano, Francesco Di Maio,
            Riccardo Mereu, Enrico Zio

T39-14   Consequence Analysis – A state-of-the-art Public Dose Calculation Tool
            Manorma Kumar, Joakim Klug, Riccardo Bevilacqua, Gustaf Holst, Leif Spanier, Sigrid Kozielski, Peter Jacobsson

T39-15   Scrutinizing Subjective Likelihood Judgments
            Rainald S. Kasprik

T39-16   Analysis of gas pipeline characteristics in risk assessment results
            Edmilson P. Silva, André P. Soares, Giovani S. Dellamea

T39-17   Checklist for Risk Assessment of Chemical Substance Hazards to Prevent Process Accidents
            Yukiyasu Shimada, Yoshihiko Sato, Akiko Takahashi

T39-18   Lessons Learned on, from, and for PSA – Perspective of the ETSON Experts
            Marina Roewekamp, Veronique Jacques,Gabriel Georgescu, Attila Bareith, Robertas Alzbutas, Mirela Nitoi, Neil Harman

T39-19   OECD/NEA WGRISK: Overview on Ongoing and Potential Future Activities
            Marina Roewekamp, Kwang-Il Ahn, Sung Min Shin, Attila Bareith, Vinh N. Dang, Markus Porthin

T39-20   Establishing the Recovery Failure Curve by Plant Specific Data
            Min-Hua Lee, Chung-Kung Lo

T39-21   Risk Assessment in the E-LAND Project
            Xueli Gao, Coralie Esnoul, Silje Arendt Olsen and Per-Arne Jørgensen, Bjørn Axel Gran

T39-22   COHeReNT: A HRN-based risk assessment method tailored to human-robot collaboration
            Erik Mollbach, Magnus Albert

T39-23   The Establishment and Quantification of Risk Evaluation Index System in Tank Farm
            Jiang Lili, Han Chao, Chen Fengyun, Xu Liansheng

T39-24   An IntegratedAnalysis Approach Based on PSA and RAMI for Fusion Device
            Ming Sun, Jin Wang,Pengcheng Long, LijuanHao, Shanqi Chen, Fang Wang, JieYu

T39-25   Risk Assessment in Visual Inspection of Critical Hardware Using Bayesian Belief Network: A Case Study
            Alexandre Gomes Vinagre,Marcelo Póvoas, Rennan Arrighi, Lincoln Campelo Dias, Daniel Cunha de Araujo Junior,
            José Cristiano Pereira, Gilson Brito Alves Lima

| T39-26 | Uncertainty Representation with Extended Evidential Networks for Modeling Safety of the Intended Functionality (SOTIF) |
| | Ahmad Adee, Peter Munk, Roman Gansch, Peter Liggesmeyer |

| T39-27 | Limitations of Traditional PRA tools in External Hazard Risk Assessment for Beyond Design Basis Events |
| | Pragya Vaishanav, Abhinav Gupta, Saran Bodda, Emmanuel Viallet |

| T39-28 | Integrating FRAM with Dynamic Graph Approach for Risk Analysis during Maintenance Operation |
| | Behnaz Hosseinnia, Stein Haugen, Nima Khakzad, Nicola Paltrinieri |

| T39-29 | An Algorithm for Risk-Informed Analysis of Advanced Nuclear Reactors with a Case Study of Pipe Failure Rate Estimation |
| | John Beal, Tatsuya Sakurahara, Seyed Reihani, Ernie Kee, Zahra Mohaghegh |

| T39-30 | Concept for a Second Life Use of Traction Batteries in Private Households: The Impact of an Adapted Environmental Setting on The Product Reliability |
| | Stefan Bracke and Lea Hannah Günther |

| T39-31 | Increasing the Effectiveness of the Risk Assessment in the Project Management through Implementing the Poisson Process and Poisson Distribution |
| | Katarína Hollá, Pavol Prievozník, Michal Brutovský |

T40 — RISK GOVERNANCE AND SOCIETAL SAFETY

| T40-01 | Risk Governance State-of-Affair Across Swedish Interdependent Infrastructures |
| | Tove Rydén Sonesson, Evelina Kallträsk, Jonas Johansson, and Alexander Cedergren |

| T40-02 | Irregular Migration And Risk: Mapping Risks For Those Leaving And For Those Receiving |
| | Claudia Morsut and Bjørn Ivar Kruke |

| T40-03 | Fire Regulation In Norway: An Assessment Of The Authority's Approach To Functional Regulations |
| | Morten Sommer, Martha Hanssen, Ole Andreas H. Engen |

| T40-04 | Land-use planning as a basis for risk management in the territory |
| | Barbora Machalova, Jiri Pokorny, Lenka Brumarova, Katerina Tomanova |

| T40-05 | Classification Of Strategies For Aggregating Sub-System Risk Information To System Risk Assessments In A Societal Safety Context |
| | Henrik Hassel |

| T40-06 | Developing A New Framework For Earthquake Resilience: Stakeholders' Needs Assessment |
| | Vadim Bobrovskiy, Paolo Trucco |

T41 — RISK INFORMED APPLICATIONS

| T41-01 | Lessons Learned from the Application of Risk Monitor in Configuration Risk Management for Nuclear Plant |
| | Dong Fangyu, Wu Licun and Deng Wei |

| T41-02 | Enhancement of Risk Informed Validation Framework for External Hazard Scenario |
| | Saran Bodda, Abhinav Gupta, Nam Dinh |

| T41-03 | Establishment of the Implementation Standard Concerning Integrated Risk-Informed Decision Making for the Safety Improvement in Nuclear Power Plants |
| | Takahiro Kuramoto, Yoshiyuki Narumiya, Shingo Ueno and Kenta Murakami |

T41-04	Pilot Study for the PWR Plant to Establishment of Risk Informed Accident Management and Management Classification in Severe Accident **Shinya Kamata, Takahiro kuramoto**
T41-05	Academia-Industry Collaboration to Advance Screening Processes in Fire PRA of Nuclear Power Plants **Sari Alkhatib, Tatsuya Sakurahara, Seyed Reihani, Ernie Kee, Brian Ratte, and Zahra Mohaghegh**

T42	RISK MANAGEMENT
T42-01	Record Flooding Risk And Emergency Power Outage Restoration **Romney B Duffey**
T42-02	Resilience or Faith **Ben J.M. Ale, Des N.D. Hartford, David H. Slater**
T42-03	The Risk Picture of Dynamic Positioning Operations within the Oil and Gas Industry **Sandra Hogenboom, Jan Erik Vinnem, Ingrid Bouwer Utne**
T42-04	Selected Risk Treatment of Electronic Warfare Development **Petr Hlavizna, Alena Oulehlova**
T42-05	Inherent Safety Assessment: Current State Of The Art And Why Is Still Not Effectively Adopted By Industry **Sharmin Sultana, Jan Erik Vinnem, Jan Dahlsveen, Stein Haugen**
T42-06	Emergency Response Alliances on the Norwegian Continental Shelf **rond Stillaug Johansen, Stine Albertsen Ranum, Maria Snørteland Wold, Jan Erik Vinnem, Mads Lindberg, Sigurd R. Jacobsen and Arnt-Heikki Steinbakk**
T42-07	Barrier Management Digitalization in the Oil and Gas Industry – Status and Challenges **Knut Øien, Stein Hauge and Tor Olav Grøtan**
T42-08	Risk Informed BIM Models – A Data Gathering with End Users **André A. Hauge, Morten Gustavsen, Sizarta Sarshar, Rune Winther, Sunniva N. Hansen**
T42-09	Risk And Security Practices: Experiences From The E-LAND Project **Coralie Esnoul, Silje Arendt Olsen, Bjørn Axel Gran, Xueli Gao, Per-Arne Jørgensen, John Eidar Simensen**
T42-10	Risk Analysis In The Eddy-Current Process Utilizing Bayesian Belief Networks (BBN) **Lincoln Campelo Dias; José Cristiano Pereira**
T42-11	Research On Double-Preventive Model Of Expressway Operation Safety Risk And Hidden Danger **Shaoxiong Huang, Bo Zhang**
T42-12	FRAM Approach for Barrier Management in Offshore Drilling **Seyed Iliya Pezeshki, Behnaz Hosseinnia, Nicola Paltrinieri, Valerio Cozzani**

T43	RISK PERCEPTION AND COMMUNICATION
T43-01	A preliminary psychometric validation of the Safety Perception Index on Norwegian Vessels (SPIN-V) **Asbjørn Lein Aalberg, Rolf Johan Bye, Anastasiia Tkalich, Leif Inge K Sørskår, Vegar Berntsen**
T43-02	One Foot in Each Culture: Exercising Social Responsibility and Reducing Risk in a New Culture **Kristiane Marie Fjaer Lindland and Feodosiya Pavlovna Ermakova**

T43-03	Does the Public Misperceive Automated Vehicles? Manqing Du, Peng Liu
T43-04	The Dynamics Of Safety Risk Perception In High Reliability Organizations Natalia Jubault Krasnopevtseva, Catherine Thomas, Renata Kaminska

T44 — RISK PREVENTION

T44-01	Ageing Aspects In Safety Evaluation Of Special Form Radioactive Material Annette Rolle, Steffen Komann, Frank Wille
T44-02	Research on the TRL Assessment and Critical Technology Elements Determination Method Considering Reliability Impacts Hao Lu, Bing Zhang, Xin Zhao, Yaqi Deng, Qi Zhao

T45 — RISK-BASED DECISION MAKING

T45-01	Improving safety and efficiency through digital decision support. A case-based descriptive analysis of digital adoption at small group level Helen von Hirsch-Maclean and Ole Harald Utvik
T45-02	Risk analysis for decision support --- a case study on fatigue assessment of a steel bridge Ruoqi Wang, John Leander, Raid Karoumi
T45-03	A Risk-Based Diagnostic Campaign Optimization For Electric Power Distribution Networks Luca Bellani, Roberto Mascherona, Michele Compare, Enrico Zio, Gaetano Iannarelli, Vittorio Giarola, Andrea Ruffini, Bartolomeo Greco, Andrea Morotti, Manuel Intini
T45-04	Design for Contract Mechanism of Acceptance Sampling Plans Based on Two-Person Game Dayu Chen, Xiaoyang Li, Rui Kang
T45-05	Knowledge-based system for risk engineering during the bidding process Rania Ayachi, Elise Vareilles, Thierry Coudert, Konstantinos Kirytopoulos, Michel Aldanondo and Laurent Geneste
T45-06	Towards Simulation Of Dynamic Risk-Based Border Crossing Checkpoints Aishvarya Kumar Jain, Yupak Satsrisakul, Mirjam Fehling-Kaschek, Ivo Häring, Jeroen Van Rest
T45-07	Industrial Investment and Operation of Energy Storage for Power Outage Mitigation Katherine Emma Lonergan, Raphael Wu, Giovanni Sansavini
T45-08	Transmission System Expansion Planning Considering the Risk of Systemic Failures in Electric Power Grids Blazhe Gjorgiev, Alexander E. David, Giovanni Sansavini
T45-09	Solution Set-Up For Airport Protection From Intruder Drones Angela Vozella, Francisco Muñoz Sanz, Mario Antonio Solazzo, Pierre Bieber, Giancarlo Ferrara, Edgar Martinavarro Armengol
T45-10	Simulation-based Multi-Criteria Evaluation of Cost-Risk-Effectiveness in Prognostic Maintenance Operations: A Case Study from Railway Industry Fateme Dinmohammadi, Babakalli Alkali, Mahmood Shafiee, Saber Saati, Ashraf Labib
T45-11	New Advances and Developments in Risk-based Inspection (RBI) of Marine Structures Mahmood Shafiee, Carlos Guedes Soares

T45-12	Integrated Risk-informed Decision Framework to Minimize Wildfire-induced Power Outage Risks: A County-level Spatiotemporal Analysis Nima Masoudvaziri; Prasangsha Ganguly; Sayanti Mukherjee; Kang Sun
T45-13	Adopting a robust attitude: risk-constrained decisions and knowledge acquisition William Fauriat, Enrico Zio
T45-14	Optimizing Technology-Based Decision-Support For Management Of Infrastructures Under Risk: The Case Of Power Grids Michael F. Pacevicius, Marilia A. Ramos, Nicola Paltrinieri
T45-15	Simulation-Based Derived Maintenance Spare Criticality Assessment James Wakiru, Liliane Pintelon, Peter Muchiri, Peter Chemweno
T45-16	Development Of An Algorithm To Convert Linear Belief Function Inputs To Exponential Conditional Probability Functions For Multiple Method Applications Sean Loughney, Jin Wang
T45-17	Optimal Sensors Positioning For Condition-Based Risk Assessment By Particle Swarm Optimization Seyed Mojtaba Hoseyni, Francesco Di Maio, Enrico Zio
T45-18	A Probabilistic Risk Analysis In The Overhaul Of Turbo Fan Engines Using Bayesian Belief Networks: A Case Study Joel Tzaschel Alves Meira,José Cristiano Pereira
T45-19	State-of-the-Art on Artificial Intelligence for Risk-based Decision-making in Autonomous Marine Vehicles Renan Guedes Maidana, Ingrid Bouwer Utne, Asgeir Johan Sørensen

T46	SAFETY CULTURE
T46-01	Design Of Safety Education Activities For Safety-Critical Facilities Kerstin Eriksson, Jonas Borell, Åsa Ek
T46-02	The Intangible Concept Of Good Seamanship – A Comparison Of The Ingredients Of Seafarers' Descriptions Using A Hybrid Qualitative-Quantitative Approach Asbjørn Lein Aalberg, Rolf Johan Bye
T46-03	Embedding Taking Safe Decisions Principles In Practice – A Gb Rail Perspective Ben Gilmartin, David Griffin
T46-04	Professionalization In Safety: A Study Of The Fundamental Knowledge Of Future Safety Professionals Wim Van Wassenhove, Christian Foussard
T46-05	Harnessing Inter-Dependencies At An Airport For Safety – The Safety Stack Approach Mihai Ogica, Barry Kirwan, Beatrice Bettignies-Thiebaux, Tom Reader, Don Harris
T46-06	A Distributionally Robust Optimization Approach To The Nasa Langley Uncertainty Quantification Challenge Yuanlu Bai, Zhiyuan Huang, Henry Lam

T47	SECURITY
T47-01	"Shall We Play A Game?" The Pros And Cons Of Wargaming Reachback Support In Security Risk Analysis Håvard Fridheim, Stein Malerud
T47-02	Threat Analysis: Scenarios And Their Likelihoods Dustin Witte, Daniel Lichte, Kai-Dietrich Wolf

T47-03	Norwegian Societal Safety And State Security – Challenges And Dilemmas Tonje Grunnan, Monica Endregard, Ragnhild E. Siedler, Ann-Kristin Elstad
T47-04	Factors Influencing The Spread Of Poisoning Substances In The Subway And Their Impact On Passengers Petra Roupcova, Hana Kubatova, Karel Klouda, Marek Nechvatal, Katerina Batrlova
T47-05	Approach To Generic Multilevel Risk Assessment Of Automotive Mobile Access Systems Thomas Termin, Daniel Lichte, Kai-Dietrich Wolf
T47-06	Standardizing Homeland Security Through First-Line Vigilant Surveillance. Fields, Habitus And The Redistribution Of Counterterrorist Responsibilities In Scandinavia Martin Meggele Sjøen

T48	**SITE LEVEL MULTI-UNIT MULTI-SOURCE RISK ASSESSMENT**
T48-01	Initiating Event Analysis For Site Risk Assessment Yongjin Kim, Seunghyun Jang, Yein Seo, Mina Cho, Moosung Jae
T48-02	Uncertainty Analysis For Seismic Multi Unit Ccdp In Simplifid Method Using Bbn Yunyeong Heo, Seung Jun Lee

T49	**SMART DEVICES AND SYSTEMS RELIABILITY**
T49-01	Towards Self-Healing in the Internet of Things by Log Analytics and Process Mining Prasannjeet Singh, Francesco Flammini, Mauro Caporuscio, Mehdi Saman Azari, Johan Thornadtsson

T50	**SOFTWARE RELIABILITY AND SAFETY**
T50-01	Agile Safety Case And Devops For The Automotive Industry Thor Myklebust, Tor Stålhane, Geir K. Hanssen
T50-02	Enhancing State-Of-The-Art Safety Case Patterns To Support Change Impact Analysis Carmen Cârlan, Barbara Gallina
T50-03	A Model-Based Systematic Approach For Evaluation Of Potential Faults In Application Software Of Digital I&C Systems In Nuclear Power Plants Hervé Mbonjo, Ewgenij Piljugin, Felix Gärner
T50-04	Fault Injectors For Tensorflow: Evaluation Of The Impact Of Random Hardware Faults On Deep Cnns Michael Beyer, Andrey Morozov, Emil Valiev, Christoph Schorn, Lydia Gauerhof, Kai Ding, Klaus Janschek

T51	**STRUCTURAL HEALTH MANAGEMENT**
T51-01	Structural Health Monitoring reliability enhancement by an automated sensor tuning procedure Michelangelo Maria Malatesta, Federiza Zonzini, Denis Bogomolov, Nicola Testoni, Luca De Marchi, Alessandro Marzani
T51-02	Evaluation of Structural Health Monitoring Systems in Bridge Engineering for Increase of Safety in Operations Robert Hartung, Lennart Senger, Julika Arpe, Katharina Klemt-Albert
T51-03	Research on Fault Diagnosis Method of Rotating Machinery Based on EWT-Threshold Denoising and Teager Energy Spectrum Zhi Chao Wang, Hong Xia, Shao min Zhu, Bo Yang, Bin sen Peng, Ji yu Zhang, Ying ying Jiang

T52	STRUCTURAL RELIABILITY

T52-01 Reliable Design of Adaptive Load-Bearing Structures with Focus on Sustainability
Andreas Ostertag, Friederike Schlegl, Andreas Gienger, Julia Wagner, Martin Dazer, Bernd Bertsche, Stefan Albrecht, Philip Leistner, Cristina Tarín, Oliver Sawodny

T52-02 Approach to Service Life of Concrete Structures
Milan Holicky, Jan Mlcoch, Miroslav Sykora

T52-03 Probabilistic Analyses of Chimneys, Towers and Masts
Markova Jana and Karel Jung

T52-04 A Science Mapping Review of Human and Organizational Factors in Structural Reliability
Xin Ren, Karel C. Terwel, Jie Li, Pieter H.A.J.M. van Gelder

T52-05 Probabilistic Fatigue Analysis of the Existing Steel Crane Runway
Martin Krejsa, Jiri Brozovsky, Petr Lehner, Premysl Parenica

T52-06 Probabilistic models for penstock integrity assessment
Bryla Philippe, Ardillon Emmanuel, Dumas Antoine

T52-07 Improvement of FORM/SORM Estimates by Markov Chain Monte Carlo
Karl Breitung

T52-08 Statistical Parameters of Steel Rebars of Reinforced Concrete Existing Structures
Pietro Croce, Paolo Formichi, Filippo Landi, Francesca Marsili, Benedetta Puccini, Vincenzo Zotti

T52-09 Probabilistic Methodology To Assess Impact Of Climate Change On Structural Safety
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T52-10 Reliability Of Roof Structures Subjected To Snow Loads
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T52-11 Probabilistic Safety Assessment Of Concrete Columns By Approximate Bayesian Computation
Manuel Chiachío Ruano, José Barros Cabezas, Juan Chiachío Ruano

T52-12 Structural Reliability Of Liquid-Filled Steel Tanks Subjected To Seismic Demands
Daniel Moreno, Konstantinos V. Belivanis, Bret A. Tegeler

T52-13 Robustness Evaluation of Reliability Assessments of Penstocks Using Info-Gap Method
Antoine Ajenjo, Emmanuel Ardillon, Vincent Chabridon, Scott Cogan and Emeline Sadoulet-Reboul

T53	SYSTEM RELIABILITY

T53-01 Efficient Reliability Analysis of an Axial Compressor in Consideration of Epistemic Uncertainty
Julian Salomon, Niklas Winnewisser, Pengfei Wei, Matteo Broggi, Michael Beer

T53-02 Procedure To Solve Mutually Dependent Fault Trees (Ft With Loops)
Takeshi Matsuoka

T53-03 A Novel Reliability Allocation Method for Uncertain Random System Based on Structural Importance
Zhicong Chen, Tianpei Zu, Rui Kang, Haowei Wang

| T53-04 | Lifecycle Operational Reliability Evaluation of Water Distribution Networks Using Probability Density Evolution Method
Liu,Wei; Song, Zhaoyang |

| T53-05 | Weibull distribution model: Empirical study with regard to the scatter behaviour of threshold parameter - impact on risk analytics
Stefan Bracke and Alicia Puls |

| T53-06 | Advanced Reactor System Design Insights from STAMP-based Analysis of Historical Parallels
Megan Harkema, Steven Krahn, Paul Marotta |

| T53-07 | Reliability-Based Group Mobility Model and Reliability Evaluation Algorithm for Hierarchical and Heterogeneous Mobile Ad Hoc Networks
Jiatao He, Shihu Xiang, Jun Yang |

| T53-08 | Dynamic Dependability Assessment of Industrial Control Systems using colored stochastic Petri nets
Grâce Boyer, Nicolae Brînzei, Jacques Camerini, Moulaye Ndiaye, Jean-François Pétin |

| T53-09 | Reduction Methods on Probabilistic Control-flow Programs for Reliability Analysis
Clemens Dubslaff, Andrey Morozov, Christel Baier, and Klaus Janschek |

| T53-10 | Improvement and Verification Methods for Components/Systems in Automobile Applications in the Field of Reliability Forecasting with respect to One and Two Dimensions of Stress Factors
Abderrahim Krini; Josef Börcsök |

| T53-11 | Application of Agent-Based Modelling and Simulation in System Reliability Analysis
Masoud Naseri |

| T53-12 | Modelling the Dependability Measures of a Multi-state Degraded Wind Farm System With Minimal Repairs Using the UGF Technique
Panagiotis Psomas, Agapios Platis and Vasilis Koutras |

| T53-13 | Modeling the consequences of a feared event by Stochastic Hybrid Automata
nicolae.brinzei@univ-lorraine.fr carole.duval@edf.fr hassane.chraibi@edf.fr mickael.hassanaly@edf.fr |

| T53-14 | Reliability Evaluation of Heterogeneous Drone Fleet by Structure Function Based Method
Elena Zaitseva, Vitaly Levashenko, Miroslav Kvassay, Vyacheslav Kharchenko |

| T53-15 | An adaptive Subset Simulation algorithm for system reliability analysis with discrete random variables
Jianpeng Chan, Iason Papaioannou and Daniel Straub |

| T53-16 | SIL Verification of Hardware Safety Integrity of a Radiation Monitoring Safety System for CERN Accelerator Facilities
Saskia Hurst, Hamza Boukabache, Daniel Perrin |

| T53-17 | Modelling refinery pump system reliability using Branching Processes
Ioanna Mitrofani, Vasilis Koutras |

| **T54** | **UNCERTAINTY AND SENSITIVITY ANALYSIS** |

| T54-01 | Uncertainties in Failure Rates of LNG Bunkering Risk Assessment
Marko Gerbec, Olga Aneziris |

| T54-02 | Joint Optimization of Statistical Process Control and Maintenance Policy under Random Maintenance Time: A GERT Network Method
Li, Yaping; Shu, Lianjie |

T54–03	Global Sensitivity Analysis of Input variables for a Train Accident Risk Model **Joanna Weng, Monika Reif, Christoph Zaugg**	
T54–04	Variance analysis of AK-MCS failure probability estimator and algorithmic application **Morgane Menz, Sylvain Dubreuil, Jérôme Morio, Nathalie Bartoli and Christian Gogu**	
T54–05	Uncertainty Analysis of Loviisa PRA **Kalle E. Jänkälä and Sami Sirén**	
T54–06	On The Impact of Uncertainty on Quantitative Security Risk Assessment **Daniel Lichte, Thomas Termin, Kai-Dietrich Wolf**	
T54–07	A Non-Intrusive Reduced Order Model For Light Water Reactor Core Stability Analysis **Nicolo' Abrate, Sandra Dulla, Nicola Pedroni**	
T54–08	A Possibilistic Interpretation Of Ensemble Predictions: Application To Shipping Optimization In Tidal Areas **Noémie Le Carrer, Scott Ferson**	
T54–09	Reliability Sensitivity Analysis With Value Of Information **Daniel Straub, Iason Papaionnou And Max Ehre**	
T54–10	Virtual Sensors: An Analysis In Term Of Metrological Performance **Loredana Cristaldi, Alessandro Ferrero, Amirabbas Mehrafshan, Marco Macchi, Pasquale Arpaia**	
T54–11	Uncertainty Propagation To Evaluate Reliability Of Gas Transmission Pipes **Leïla Marle And Guillaume Causse**	
T54–12	Breaking The Double Loop: Operator Norm Theory As A Tool To Compute With Imprecise Probabilities **Matthias G.r. Faes, Marcos A. Valdebenito, David Moens, Michael Beer**	

T55 — VIRTUAL REALITY FOR SAFETY

T55–01	Evaluating the Use of Virtual Reality in Work Safety: A Literature Review **Simone Grassini, Karin Laumann**	
T55–02	Understanding HSE implications of remote work through a digital complexity perspective **Tor Olav Grøtan**	
T55–03	Possibility of automated ergonomic evaluations in virtual reality environments **Zdeněk Tůma, Luboš Kotek, Petr Blecha, Jiří Kroupa, František Bradáč**	

T57 — MULTI-UNIT NUCLEAR PLANT PSA

T57–01	Demonstration of a Fukushima Inspired Multiunit Nuclear Power Accident Risk Assessment Framework for Analysis of Accident Scenarios and Improving Responses **Yinan Cai, Michael W. Golay**	
T57–02	Modeling and Quantification Uncertainties in Multi-unit PSA **Woo Sik Jung and Seong Kyu Park**	
T57–03	Actual Status of Development of Multi-units PSA in France **Angélique Pasco, Sylvain Boulley, Gabriel Georgescu**	
T57–04	Evaluating the Adverse Effects of Radioactive Releases in Multi-Unit Probabilistic Safety Assessment **Jae Young Yoon, Dong-San Kim**	

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Honolulu, Hawaii, USA
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December 1: Submission for Special Session

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February 28: Abstract Acceptance

March 30: Full Paper Submission

April 30: Notification of Acceptance & Registrations opening

May 20: Final revised full paper submission

July 31: Early bird registration deadline

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