



# European Safety and Reliability Association

# Newsletter

<http://www.esrahomepage.org>

December 2014

## Editorial



*Terje Aven  
ESRA Chairman  
University of Stavanger,  
Norway*

Dear ESRA Colleagues,

As the new ESRA Chairman it is a pleasure for me to address you in the opening of our newsletter. We are facing a new year 2015, and for ESRA the major event is the ESREL 2015 conference in Zurich 7-10 September. I hope you plan to go there. The abstract deadline is 31 January 2015, and full paper submission April 15. See <http://esrel2015.ethz.ch/>. I am confident that the conference will be a success and further advance the reliability, safety and risk fields. With the conference chairs Bozidar Stojadinovic, Wolfgang Kröger, Luca Podofillini, Enrico Zio and Bruno Sudret, the organisation has a very strong group of people leading the work. I am excited about the idea of highlighting special sessions and panel discussions during the conference. We need more interactions in our field. In my view we too seldom allow for in-depth reflections and dialogue related to central topics of our field. This is an area I will give priority to in the coming years as the ESRA Chairman. How can we stimulate more activities of this type?

Another area that I am enthusiastic about is young researchers and analysts. We need to obtain increased awareness and understanding of the importance of being

committed to, and take responsibility for, the development of the reliability and risk analysis fields. An initiative was taken in May 2014 with the Young Researcher Workshop in Italy where some 20 young researchers from Europe and the US met and spent two days exchanging ideas and discussing on foundational and practical issues of reliability and risk analyses, see the summary in the ESRA Newsletter June 2014. This was a start. I am pleased to see that some of the ideas from this workshop will be followed up during the ESREL 2015 conference.

An initiative that should be mentioned when speaking about foundational issues is the new glossary that the Society of Risk Analysis (SRA) is developing. This glossary is special in that it allows for more than one set of definitions. Past experience has shown that to agree on **one** set of definitions does not seem realistic - several attempts have been made earlier without success. The present glossary work is based on the conviction that it is still possible to establish an authoritative glossary, the key being to allow for different perspectives on fundamental concepts and make a distinction between overall qualitative definitions and their associated measurements. This glossary I think will also be very useful for our society. See <http://www.sra.org/frasg>.

November 21, 2014 the new ESRA Officers had their first meeting. We discussed many issues including the future of ESRA. Two areas of possible development and growth were highlighted, the potential for a stronger link to industry and new members in Eastern European countries. It is with pleasure I have noticed that the coming ESREL conferences plan to strengthen the industry contact, by for example opening up for alternative schemes for presentations and discussions.

A lot of good work is conducted by the various ESRA Technical Committees (TCs) and National chapters. I hope this work can be more visible, and the ESRA

newsletter is a main channel that can be used for this purpose. Perhaps you read about the Norwegian Chapter in the last issue of the Newsletter. This chapter has about 400 members and six to seven meetings a year. Impressive. I would like to use the opportunity to thank all of you who work for ESRA, being it in a chapter or a TC, or in relation to ESREL. Your contribution is important and is essential for the operation and development of our organisation.

Happy New Year!

Terje Aven  
Chairman of ESRA

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## Feature Articles

### Use the Power of Uncertainty Quantification



*Michael Beer  
Institute for Risk &  
Uncertainty, University of  
Liverpool  
Liverpool, UK*

Our structures, systems and infrastructure are characterised by a rapid growth in scale, complexity and interconnection with a significant involvement of diverse human behaviour with critical influence, so that uncertainties and risks are involved to a greater extent than ever before. These structures, systems and infrastructure are, to a significant extent, critical for the functionality of our economic and societal life, and thus, require proper approaches and measures to verify and ensure their reliable performance. Reliability and performance analysis, however, become increasingly complicated due to uncertainties and complexity. The realistic quantification of uncertainties and their numerically efficient processing in complex analyses are the two key challenges in this context. In order to address these challenges it is essential to utilise the capabilities of advanced and emerging concepts of uncertainty quantification. These emerging approaches and associated powerful technologies can be observed in three conceptual directions as discussed in detail in [1].

Approaches of *advanced stochastic modeling* capture the physics of the underlying problem with efficient approximate representations and solution methodologies. To efficiently assess the safety and reliability of an existing structure the effective identification and quantification of the uncertainty inherent in the structure's environment constitute the first steps. Structures, systems and infrastructure are

often subjected to a diverse range of evolutionary phenomena during their lifetime, such as ageing and excitations and extreme events such as seismic motions, winds, floods and hurricanes. Thus, to quantify the uncertain behaviour of such complex, multi-physics dynamic systems and, eventually, to assess their functionality and safety, novel uncertainty quantification methodologies need to be utilised. Indeed, recent theoretical advances in computational stochastic mechanics in conjunction with emerging signal processing concepts and potent tools from theoretical/statistical physics provide the necessary background for such initiatives. Such multi-disciplinary approaches offer a novel perspective/framework for addressing sustained and future challenges in the field of reliability and safety assessment of structures and infrastructure.

Concepts of *generalised uncertainty modelling* provide new features for coping with expert-based, limited and vague information. These developments enable uncertainty quantification in form of an optimum compromise solution in the balance between three goals: (i) the complete representation of available information in the theoretical uncertainty model, (ii) the modelling without assumptions, which cannot be justified and potentially introduce artificial information, and (iii) the most appropriate modelling in view of the purpose of the analysis in order to provide the best possible basis for informed decisions. The focus is on epistemic uncertainty, which can generally be quantified with either subjective probabilities (which is most instrumental for a Bayesian approach) or with set-theoretical descriptors (as typically used in an imprecise probabilities framework). It is noted that these approaches are not opposed to one another; they are complementary with some duality feature, and they can be combined. While subjective probabilities are suitable to express a belief to approach the result "from inside the epistemic uncertainty", imprecise probabilities capture indeterminacy using sets of probabilistic models, which result in probabilistic bounds on results approaching the result "from outside the epistemic uncertainty". An application of both approaches in parallel provides information from different angles to sandwich the results for an informed decision considering both views.

*Advanced stochastic simulation* in the form of potent Monte Carlo techniques is the most versatile approach to uncertainty quantification, but at the same time it is still very demanding in terms of numerical cost. Thus, the availability of efficient numerical methods is of paramount importance. In order to provide more accurate and realistic results, the complexity of the involved physical/structural/systems models is usually increased, which results in an even higher demand on computational efficiency. The explicit quantification of the effects of uncertainties increases these computational costs by orders of magnitude. Moreover, these numerical methods need to be scalable and perform efficiently with the nowadays

available hardware resources, i.e. high performance computing. This situation keeps pushing developments in two directions; (i) efficient simulation schemes for specific problem classes to reduce the sample size and (ii) concepts to manage the simulation efficiently exploiting the capabilities of the latest computational technology.

Significant advancements have been made in all three directions over the past decades. However, given the growing the complexity of our real-world structures, systems and infrastructure, individual approaches alone can hardly solve an entire big problem. Thus, it is quite important to utilise the entire framework of uncertainty quantification and the potential generated by combinations of developments from different conceptual directions. More recent developments show this tendency with quite promising initial success. For example, wavelet-based approaches for evolutionary power spectra estimation have been extended to dealing with process records with gaps and sparse data. These allow an efficient sampling for system performance and reliability assessment, for example in cases where measurement equipment delivered only partial information. Advanced Monte Carlo schemes have been developed for efficient Bayesian updates, specifically in the context of real-time system identification and health monitoring, and for stochastic simulation, performance and reliability assessment based on imprecise probability distributions to identify probability bounds for the results. These developments provide a clear indication of the huge potential of combining developments from the three directions in order to address our complex real-world challenges.

- [1] Beer, M.; Kougioumtzoglou, I.A.; Patelli, E., 2014. Emerging Concepts and Approaches for Efficient and Realistic Uncertainty Quantification  
In: Frangopol, D.M.; Tsompanakis, Y. (eds.) Maintenance and Safety of Aging Infrastructure Book Series “Structures & Infrastructures”, Vol 10  
Chapter 5, 121–154  
CRC Press, Taylor & Francis Group, Boca Raton, London, New York, Leiden

## **New supercomputer in IT4Innovations National Supercomputing Center, Czech Republic**

*Radim BRIŠ, ESRA Vice-Chairman  
Faculty of Electrical Engineering and Computer Science, IT4Innovations  
VŠB – Technical University of Ostrava*

New supercomputer, named Salomon, will be delivered to IT4Innovations National Supercomputing Center by a

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prestigious US company Silicon Graphics International Corp. (SGI®) during May 2015.

The supercomputer will provide the center with theoretical performance at 2 petaflops, exceeding the performance of the current Anselm supercomputer by nearly 20 times. Supercomputer Salomon, which will be put into operation in 2015, will be among the 100 largest supercomputers in the world, and will become the largest Intel® Xeon Phi™ coprocessor-based cluster in Europe.

SGI® ICE™ X solution will have 1,008 compute nodes and 129 terabytes (TB) of RAM. It will feature 864 Intel® Xeon Phi™ 7120 coprocessors cards with 52,704 cores and 13.8 TB of RAM. The storage will be two petabytes (PB) of disk-based solutions and three PB of tape backup. As a result of this advanced technology, the new supercomputer will be able to provide more precise simulations and modelling, as well as handle more workloads simultaneously than the Center's previous solution.

The name of the supercomputer refers to another of Ostrava's former coal mines and also to the name of a famous banker, tightly connected with the region and coal and steel industry - Salomon Mayer Rothschild.

The supercomputer enables massively parallel simulation, industrial calculations which plays a key role in assessing the probability of major accidents, risks (including financial), natural disasters, or safety of the population. The supercomputer is also used for enzymatic reactions, new drug designs, laser simulations, etc.

The computing time for the supercomputer for academic purposes is allocated through internal and open access competitions that depend on the quality of each given project. Every year, IT4Innovations announces 4 internal and 2 open access competitions; computing time can also be allocated through management decisions. Industrial enterprises can use computing time as a paid service, or within collaborative research projects. For more information please visit <http://www.it4i.cz/computing-resources-allocation/?lang=en>.

## **An Approach of Big Data Analytics for Fault Detection**



*Liangwei Zhang  
Luleå University of  
Technology  
Sweden*

Fault detection is clarified as a vital component of an Integrated Systems Health Management system and is a prerequisite for fault diagnosis and prognosis [1, 2]. However, due to the “curse of dimensionality”, which refers to the fact many algorithms work perfectly well in low dimensions but become intractable in high-dimensional settings [3], it is therefore difficult to conduct fault detection tasks in light of the existence of large amount of features in the dataset. High dimensionality has been clarified as the distinguishing feature of modern field reliability data (incl. System Operating/Environmental (SOE) data) [1]. It has also been recognized as one primary complexity of multivariate analysis and covariate-response analysis in reliability applications [4].

Recently, increasing attention is being devoted to big data analytics to extract information, knowledge and wisdom from big data. This emerging phenomenon reflects the ever-increasing significance of data in terms

of their growing volume, variety, velocity, veracity, value and complexity [4]. The aim of this study is to propose an approach of big data analytics to select meaningful feature subspace and carry out fault detection in the corresponding subspace projection, by which to enhance the precision and recall of the fault detection tasks.

In this study, the suggested approach, which is named Angle-based Subspace Anomaly Detection (ABSAD), assesses the angle between all pairs of two lines for one anomaly candidate (see Fig.1): the first line is connected by the concerned data point and the center of its adjacent points; the other is one of the axis-parallel lines. The dimensions which have a relatively small angle with the first line are then chosen to constitute the axis-parallel subspace of the anomaly candidate. Afterwards, a normalized Mahalanobis distance is introduced to measure the local outlier-ness of the data point in the subspace projection.

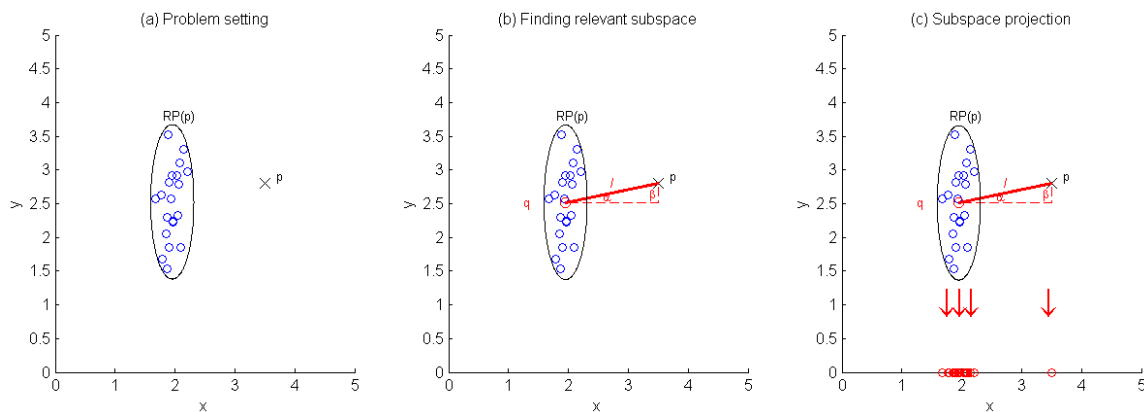


Fig. 1: relevant subspace and subspace projection

Based on the analytical study and comparison analysis (see Fig. 2; compared with the Local Outlier Factor (LOF), the Angle-Based Outlier Detection (ABOD), as well as the Subspace Outlier Detection (SOD) approach, separately), it can be concluded that: i) the approach is able to retain dimensions which present a large discrepancy between points and their neighboring points, i.e. a meaningful subspace. ii) the proposed criterion “pair cosine” for measuring vectorial angles in high-dimensional spaces is a bounded and asymptotically stable metric as dimensionality increases.

iii) the experiments on synthetic datasets with various dimensionality settings indicate that the suggested angle-based subspace anomaly detection algorithm can detect anomalies effectively and has a superior accuracy over the specified alternatives in high-dimensional spaces. iv) the experiment on a real-world dataset shows the applicability of the proposed algorithm in real-world applications, and feature ordering in relevant subspaces is informative to the ensuing analysis and diagnosis to abnormality.

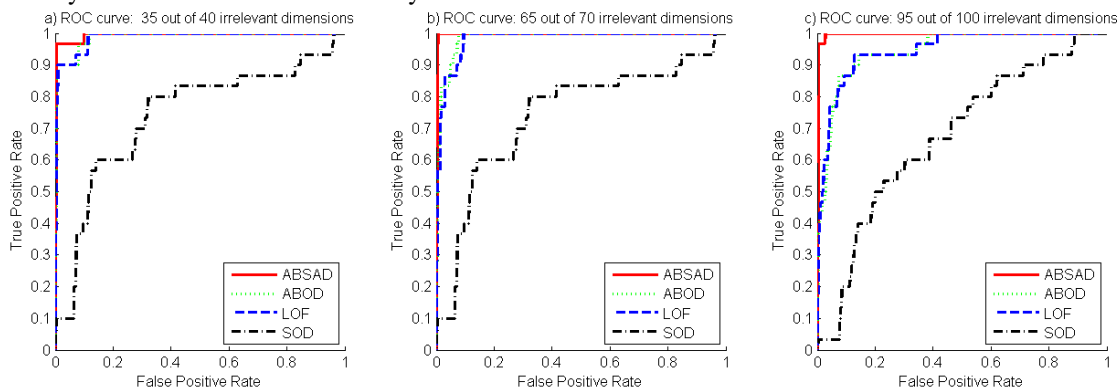


Fig. 2: ROC curve comparison



## Reference

1. W. Meeker and Y. Hong, "Reliability meets big data: Opportunities and challenges," *Qual. Eng.*, vol. 26, no. 1, pp. 102–116, 2014.
2. Z. Gao and X. Dai, "From model, signal to knowledge: a data-driven perspective of fault detection and diagnosis," *IEEE Trans. Ind. Informatics*, vol. 1, no. 1, pp. 2226–2238, 2013.
3. P. Domingos, "A few useful things to know about machine learning," *Commun. ACM*, vol. 55, no. 10, pp. 78–87, Oct. 2012.
4. R. Göb, "Discussion of 'Reliability Meets Big Data: Opportunities and Challenges,'" *Qual. Eng.*, vol. 26, no. 1, pp. 121–126, Dec. 2013.

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## PhD Degrees Completed

### Development of a Model to Suppress Piracy and other Maritime Crimes using Scientific Reasoning



*Sascha Pristrom  
Liverpool John Moores  
University, UK  
Supervisor: Prof. Jin  
Wang, Dr. Steve Bonsall,  
Prof. Zaili Yang*

Sascha Pristrom recently completed his PhD thesis in maritime security assessment at Liverpool John Moores University. The thesis is entitled "Development of a Model to Suppress Piracy and other Maritime Crimes using Scientific Reasoning".

Maritime piracy has risen in the public awareness as attacks off the coast of Somalia have significantly increased since 2007 and, more recently, in West Africa's Gulf of Guinea. Commercially operated ships are at high risk of becoming piracy victims unless robust security measures are taken a certain time and under certain environmental conditions. It was also envisaged to make an assessment on the threats that such an attack leads to hijacking of the ship.

Due to the highly complex environment a ship is operating in the likelihood of a successful hijacking depends on many factors such as wind and weather conditions, ship characteristics such as freeboard and speed, the cargo that is being carried, the presence of naval forces in the sea area as well as the security measures taken by the crew. In the current difficult economic climate for ship operations with low freight rates and tonnage overcapacity for many cargoes a ship-owner is reluctant to invest in unnecessary security measures. Especially the cost of a professional private armed security team is a great expenditure that has to be

well thought through and to be based on a realistic and profound risk analysis in order to balance the risk, cost and benefits.

This research proposes a Bayesian Network model (BN-model) for this multi-attribute decision analysis problem under high uncertainty to deal with such a complex environment. The generic BN-model accommodates for the relevant factors that contribute to a hijacking of a ship. Its appropriateness was tested. Given that some BN-nodes are not based on reliable historical data and further, that it is difficult to reflect the real-world problem using numerical values, domain experts were requested to provide their assessment using linguistic terms. The experts' judgments were processed and aggregated using an enhanced evidential reasoning approach.

The final refinement of the piracy BN-model was achieved by running a Monte-Carlo simulation on the root nodes that had been previously improved through the linguistic input from experts. The results of the simulation were then statistically analysed, i.e. statistical tools were applied including a sensitivity analysis. Such an assessment could be used in deciding which measure(s) are most appropriate to mitigate the risk for a ship while sailing through the piracy High Risk Area taking into account the budget constraints mentioned above.

This work, consisting of six chapters, followed a stepped approach with the aim of developing a commercially viable risk assessment product that, after refinement and conversion into a software tool, could be used by ship-owners, ship operators or charterers to assess the risk for a particular ship when transiting pirate-infested areas.

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## Past Safety and Reliability Events

### Continuing education course: Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment

*Piero Baraldi*

This year's professional one week training course: "Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment" took place at Politecnico di Milano, Milan (Italy) on November 17-21. This year course was the XVII edition of the series. Its goal has been to provide the 25 participants with the methodological competences and the computational tools necessary to tackle critical problems in the areas of reliability, availability, maintainability, diagnostics

and prognostics. To this purpose, the course has presented proven methods to improve safety, increase efficiency, manage equipment aging and obsolescence, automate maintenance and reduce maintenance costs of industrial systems.

Since the beginning, the course has been officially supported by ESRA and since 2005 official scholarships have been offered. The 2014 edition of the course has been supported by ESRA with two scholarships covering the registration fee. The 2014 scholarships have been offered to two Ph.D students, one of Islamic Azad University (Tehran, Iran) and the other of Politecnico di Milano (Milano, Italy).

The first part of the course has been devoted to the presentation of advanced methods for the availability, reliability and maintainability analysis of complex systems and for the development of Prognostics and Health Management (PHM) and Condition Based Maintenance (CBM) approaches. In this respect, the basics of Monte Carlo Simulation, nonlinear regression and filter models (Artificial Neural Networks, Principal Component Analysis, Auto Associative Kernel Regression, Ensemble Systems, Particle filter) is illustrated. In the second part of the course, exercise sessions on Monte Carlo simulation, Artificial Neural Networks, Auto Associative Kernel Regression and Ensemble systems provide the participants with the opportunity of directly applying the methods to practical case studies. Finally, in the last part of the course, real applications of the advanced methods have been presented by the course organizers and participants. The applications range from Monte Carlo Simulation for availability analysis and condition-based maintenance management to regression and classification techniques for fault detection, classification and prognosis in different industrial sectors.

During the last day of the course, participants had the opportunity to take part at the IEEE RELIABILITY OUTREACH Seminar&Workshop organized by IEEE Reliability Society, Italy Chapter with interventions of Dr. Francesco di Maio (Energy Department, Politecnico di Milano, Chairman of the IEEE Reliability Society, Italy Chapter), Prof. Michael Pecht (Director and Chair Professor, Center for Advanced Life Cycle Engineering, University of Maryland, College Park, Maryland), Prof. Enrico Zio (Energy Department, Politecnico di Milano and Chair on Systems Science and Energetic Challenge, European Foundation for New Energy-Electricite' de France, at Ecole Centrale Paris and Supelec, Paris), Dr. Pierre Dersin (Reliability-Availability-Maintainability Director Alstom Transport Information Solutions, St-Ouen, France) and Carmine Allegorico (Senior Engineer, GE Oil&Gas, Florence, Italy).

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## Calendar of Safety and Reliability Events

### **International Conference Creating Resilience Capability against Critical Infrastructure Disruptions: Foundations, Practices and Challenges** Copenhagen, Denmark 13th April 2015

The conference will take place at the Danish Engineering Association's Conference Center, Kalvebod Brygge 31, Copenhagen - <http://ida-moedecenter.ida.dk/>

The conference is arranged by DTU/Technical University of Denmark in collaboration with the Danish Risk Society IDA Risk, Copenhagen University's Disaster Programme, and EU project 'Resilience Capacities Assessment for Critical Infrastructures Disruptions' (READ) (<http://www.read-project.eu/>). The READ project is financially supported by the Prevention, Preparedness and Consequence Management of Terrorism and other Security-related Risks Programme, European Commission – Directorate-General Home Affairs.

Who should attend? Infrastructure managers and owners, safety managers, technical and administrative leaders of key services at municipal, regional and national level, press and liaison officers responsible for communication and community engagement in preparation for, during and recovery after major crises.

Organizing Committee: Henning Boje Andersen, DTU Management Engineering; Igor Kozine, DTU Management Engineering; Nijs Jan Duijm, The Danish Society of Engineers; Kristian Cedervall Laut, University of Copenhagen, Changing Disasters; Rasmus Dahlberg, Danish Emergency Management Agency.

For questions regarding registration contact Hanne Høy Kejser [hhk@ida.dk](mailto:hhk@ida.dk).

Registration mail: <https://ida.dk/event/313683>

## **8<sup>th</sup> Safety and Reliability Conference - KONBiN 2015**

Uniejów, Poland  
26-29 May 2015

The International Conferences on Safety and Reliability KONBiN are cyclic events that focus on issues of providing safety and reliability for any complex human being – engineering system – environment' system. The Conference is addressed to universities and research institutes, to scientists, industry and transport employees, government and municipal authorities, safety and reliability experts and consultant, and other persons interested in the Conference topics.

### Important dates

**February 28, 2015** - Submission of Abstracts  
**March 15, 2015** - Submission of Registration Forms  
**March 31, 2015** - Submission of Full Papers  
**April 15, 2015** - Remittance of Conference Fee

### Secretariat

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tel. +48 22 6851 310, fax: +48 22 6851 410  
e-mail: [konbin2015@itwl.pl](mailto:konbin2015@itwl.pl)

Conference Website: <http://www.konbin2015.itwl.pl>

## **9<sup>th</sup> Summer Safety & Reliability Seminars - SSARS 2015**

Gdańsk/Sopot, Poland  
21–27 June 2015

### Scope & Structure

The annual one-week *Summer Safety and Reliability Seminars* are organised to advance the methods for the safety and reliability analysis of complex systems and processes and to disseminate the newest achievements in the field. The subjects of the Seminars, different from year to year, are chosen by the Seminars Boards in an effort to dynamically represent the methodological advancements developed to meet the newly arising challenges in the field of safety and reliability. This year the emphasis is addressed to the following subjects: Reliability and Safety Improvement and Optimization Methods, Accident Consequences Modeling, Reliability of Complex Systems and Processes, Safety of Critical Infrastructures, Monte Carlo Simulation Methods in Safety and Reliability.

Contributions are in the form of 1-hour lectures on advanced methods (with corresponding full text of up to 12 pages) presented at Plenary Sessions and 20-minutes

papers (with corresponding full text of up to 8 pages) presented at Seminar Sessions. The written material of all accepted lectures and papers will be edited in the journal of Polish Safety and Reliability Association - JPSRA series (currently rated at 7 points on the Poland's Ministry of Science and Higher Education List of Scientific Journals and just sent to Thomson Reuters for evaluation and Impact Factor indexation) series which is distributed to the participants as reference textbook. Before the acceptance, the Members of JPSRA Editorial Board with the assistance of the Invited Professors will performed the evaluations of all contributions and as a results of this reviewing process the recommendations will be sent out to help the authors in improving their works.

Additionally, educational courses and workshops will be offered each year on selected safety and reliability topics.

Authors are requested to submit their lectures and papers electronically to the Secretariat using the following e-mail address: [ssars@am.gdynia.pl](mailto:ssars@am.gdynia.pl)

Only those contributions prepared according to the JPSRA Template available on the journal Website <http://jpsra.am.gdynia.pl> will be considered.

Conference Website: <http://ssars.am.gdynia.pl>

## **21<sup>st</sup> Advances in Risk and Reliability Technology Symposium (AR<sup>2</sup>TS 2015)**

Leicestershire, United Kingdom  
23-25 June 2015

The Safety and Reliability Society has been organising national, regional and local conferences and meetings for over thirty years. Following discussions with the organisers the Society is pleased to announce that it will now organise the bi-annual Advances in Risk and Reliability Technology Symposium (AR<sup>2</sup>TS) in 2015 and going forward.

The symposium will be an international forum for presenting and discussing recent advances made in the general area of reliability, risk, availability and maintainability. Contributions will be provided from both the university sector and from industry. It will be of benefit to both practitioners and academics involved in this field who want to keep in touch with the latest developments and perhaps through discussion, influence the future direction of work.

The AR<sup>2</sup>TS event, now in its 21<sup>st</sup> session, will take place on the 23<sup>rd</sup> – 25<sup>th</sup> June 2015 at Burleigh Court, Loughborough University. An initial call for papers has taken place but if you feel you have a paper or a poster to offer please contact the society via the contact details below.

Safety and Reliability Society's Chief Executive Officer Jacqueline Christodoulou said, 'This is a major opportunity for everyone involved in risk and reliability to come together at an international conference where cutting edge research meets industry innovation.'

Contacts:

Phone: 0161 918 6663

Mail: [info@sars.org.uk](mailto:info@sars.org.uk)

Conference Website: <http://www.ar2ts.org.uk>

**3<sup>rd</sup> International Conference on  
Transportation Information and  
Safety - ICTIS 2015**  
Wuhan, China  
26-28 June 2015

The 3rd International Conference on Transportation Information and Safety (ICTIS 2015) will be held from June 25th to June 28th 2015 in Wuhan, China. The theme of ICTIS 2015 is "Transportation Information and Safety in the Age of Big Data". Experts, scholars and practicing engineers of transportation systems are invited to the conference to discuss a broad range of topics related to the theories, technologies and applications of transportation information and safety technology. The conference will showcase international experiences in the research of multimodal transportation (including road, railway, navigation, and aviation) and development, and provide a platform for both domestic and overseas scholars and practicing engineers to exchange successful stories and share lessons learned in research and practice. The conference organizing committee sincerely invites transportation professionals and experts worldwide to submit papers and attend the conference in the beautiful River City – Wuhan, China.

Conference Website: <http://ictis.whut.edu.cn/>

**5<sup>th</sup> International Conference on  
Quality, Reliability, Risk,  
Maintenance, and Safety Engineering  
- QR2MSE 2015**  
Beijing, China  
21-24 July, 2015

Dear committee members of QR2MSE 2015,

We would like to take this opportunity to thank all of you for the acceptance of our invitation to be a member of QR2MSE 2015 committees!

Following the success of QR2MSE 2011, 2012, 2013, and 2014 which were held in Xi'an, Chengdu, Emeishan, and Dalian respectively, QR2MSE 2015 to be held in Beijing is the 5th of this conference series. The conference will be technically sponsored by European Safety and Reliability Association, European Federation of National Maintenance Societies, International Society of Engineering Asset Management, Korean Reliability Society, Reliability Engineering Association of Japan, Polish Safety and Reliability Association, The Maintenance Professional Committee of China Ordnance Society, Equipment Support Commission of China Ordnance Society, Reliability Committee of Chinese Operations Research Society, IEEE Chengdu Section, National Natural Science Foundation of China, and Institute of Reliability Engineering at University of Electronic Science and Technology of China.

As a committee member, we expect you to help us to distribute this e-mail together with the attached Call for Paper file as widely as possible through your professional networks, on your blogs or through twitter, targeting researchers and engineers who may not have learned of this conference yet.

In addition, we would like to invite you to **organize a special session** in QR2MSE2015. The special session should include more than 5 oversea submissions (not include submissions from the Mainland China). Both the full papers and extended abstracts can be submitted to the conference. As an incentive policy to the organizers of special sessions, we will waive your conference registration fee.

We are striving to make QR2MSE 2015 high quality conferences, and your supports will be greatly appreciated.

Thank you again for your support. We will be in touch with you on conference updates and if you have any queries, please don't hesitate to contact us.

Important dates

**10.03.2015** - Paper submission

**10.04.2015** - Full Paper Acceptance Notification

**30.04.2015** - Camera Ready Papers Due

Secretariat

International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering (QR2MSE 2015)

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Email: [icqrms@uestc.edu.cn](mailto:icqrms@uestc.edu.cn)

Conference Website: <http://www.qr2mse.org/>



## **25<sup>th</sup> European Safety and Reliability Conference – ESREL 2015**

Zürich, Switzerland  
7 - 10 September 2015

The 25th edition of the European Safety and Reliability Conference, ESREL 2015, will be held at the Swiss Federal Institute of Technology Zürich (ETH), 7 - 10 of September.

Our ambition for ESREL 2015 is to advance in the understanding, modeling, and managing the risk, safety and reliability of systems in our increasingly complex world. We will set up a multidisciplinary platform to address the multiple aspects characterizing these fields of research and applications. With the support of the ETH Risk Center (<http://www.riskcenter.ethz.ch/>), we engage in broadening the scope of risk, safety and reliability analyses from the technical to natural, financial and social complex systems, focusing on interdependencies of functions and cascading failures. To better emphasize these topics, we will introduce new special areas, along with the traditional methodology and application areas of ESREL:

- Understanding Complexity in Socio-Technical-Economic Systems
- Modelling Interdependencies and Cascades
- Risk Approaches in Insurance and Finance Sectors

We also encourage the organization of other special technical sessions addressing the current hot topics of our fields.

We look forward to seeing you in Zürich!

### Important dates

**15.01.2015** - Abstract submission

**15.04.2015** - Paper submission

**31.05.2015** - Early registration

Conference Website: <http://www.esrel2015.org>

## **24<sup>th</sup> International Conference Nuclear Energy for New Europe**

Portorož, Slovenia,  
14-17 September, 2015

Coordinator: Igor Jencic

The conference is a traditional annual meeting of professionals from nuclear research and educational institutions, nuclear vendors, utilities and regulatory bodies. It attracts around 200 participants from more than 20 countries. The topics discussed are general and include reactor physics, thermal hydraulics, probabilistic safety assessment, severe accidents, nuclear fusion,

nuclear power plant operation, nuclear materials, waste management and new reactor designs. The language of the conference is English.

The conference will take place in **GH Bernardin**, Portorož, Slovenia. GH Bernardin is the first and the largest convention hotel in Slovenia.

### Important dates

**April 30, 2015** - Abstract Submission

**June 21, 2015** - Abstract Acceptance

**August, 2015** – Submission of Full-Length paper

Conference Website: <http://www.nss.si/nene2015>

## **13<sup>th</sup> International Probabilistic Workshop (IPW2015)**

Liverpool, United Kingdom  
4th - 6th November 2015

The conference is intended for civil and structural engineers and other professionals concerned with structures, systems or facilities that require the assessment of safety, risk and reliability. Participants could therefore be consultants, contractors, suppliers, owners, operators, insurance experts, authorities and those involved in research and teaching.

**Key topics:** Safety, Risk, Probabilistic Computation, Reliability, Structural Safety

**Conference Language:** English

### **Conference Chairs:**

Edoardo Patelli, Institute for Risk & Uncertainty, UK  
Ioannis Kougioumtzoglou, Columbia University, USA

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# 2<sup>nd</sup> International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management - SMRLO'16

Beer Sheva, Israel  
15-18 February 2016

Symposium Chairs: Dr. Ilia Frenkel and Dr. Anatoly Lisnianski

Dear Colleague,

We are pleased and honored to invite you to participate in the Second International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management (SMRLO'16), to be held on February 15-18, 2016 at the SCE - Shamoon College of Engineering, Beer Sheva, Israel. This will be a continuous and enlarged symposium following the International Symposium on Stochastic Models in Reliability Engineering, Life Science and Operations Management (SMRLO'10) held in 2010.

This SCE symposium will constitute a forum for discussing different issues of Stochastic Models in Reliability Engineering, Life Science and Operations Management with respect to their applications. The symposium objective is to assemble researchers and practitioners from universities, institutions and industries from around the world, involved in these fields, and to encourage mutual exchange.

Common methods and models will be considered from a general point of view; theoretical modeling, computational and case studies will range from academic considerations to industrial approaches, as well as emphasizing topics on cooperation between industries and research institutions. The cooperation that will contribute to the advancement of research and solutions to engineering issues is of utmost importance.

The proceedings of **SMRLO'16** will be published by IEEE CPS and will be available in the [IEEE Xplore Digital Library](#)

We warmly invite you to share and enjoy with us a stimulating program at the SCE SMRLO'16 and sample the historical atmosphere of Beer Sheva and its captivating heritage.

## Important dates

**May 1, 2015** - Proposals of Invited Sessions

**May 15, 2015** - Announcement for Invited Session proposals acceptance

**June 15, 2015** - Abstracts submission

**June 30, 2015** - Abstracts acceptance

**September 30, 2015** - Deadline of papers submission

**September 30, 2015** - Deadline for early payment

**October 1, 2015** - 20% augmentation of fee registration

**February 15-18, 2016** - Presentation of invited and contributed papers

Conference Website: <http://info.sce.ac.il/smrlo16/>

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### 1 ESRA Membership

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- German Chapter
- Italian Chapter
- Polish Chapter
- Portuguese Chapter
- Spanish Chapter
- UK Chapter

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- The Safety and Reliability Society, UK
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- SRE Scandinavia Reliability Engineers, Denmark
- ESReDA, France
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- VDI-Verein Deutscher Ingenieure (ESRA Germany), Germany
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- Polish Safety & Reliability Association, Poland
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ESRA is a non-profit international organization for the advance and application of safety and reliability technology in all areas of human endeavour. It is an "umbrella" organization with a membership consisting of national societies, industrial organizations and higher education institutions. The common interest is safety and reliability.

For more information about ESRA, visit our web page at <http://www.esrahomepage.org>.

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