MathMet2019

Portugal | Lisbon | LNEC
20-22 | November 2019

PROGRAMME

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

Instituto Português da Qualidade

RELACRE

PTB
Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

Table of contents

Chair Welcome Message

As chairman of the 2019 MATHMET International Workshop, it is an honour and a privilege to welcome you to Lisbon, Portugal. Lisbon is the city where in the XV century Portuguese sailors set out to give new worlds to the world, starting the first economic globalization. This wonderful cosmopolitan city, full of history, existing long before Roman times, was chosen to host the 2019 MATHMET International Workshop, to be held on November 20-22, 2019.

The event is jointly organized by IPQ – Portuguese Institute for Quality, LNEC – National Laboratory for Civil Engineering, RELACRE, Portuguese Network of Accredited Laboratories, MATHMET – The European Centre for Mathematics and Statistics in Metrology and PTB – Physikalisch-Technische Bundesanstalt. It has the support of the Portuguese Societies of Metrology, Mathematics, Statistics, Materials, Engineers and Chemistry.

The Symposium website is available at http://mathmet2019.lnec.pt/ where you will find useful details concerning the scientific programme, along with information about the accommodation, venue and social events. This website is the principal communication channel for the conference, so be sure to visit it often.

The Executive Committee, the Scientific Committee and the National Organizing Committee will do their best to offer you a Workshop at least as successful as the previous ones, held in Berlim, Germany, in 2016, 2014 and 2010. The aim is to provide a forum for applied mathematicians, statisticians, and metrologists to present and discuss contemporary methods and challenges in applications of mathematical models and statistical data analysis to measurement science, including uncertainty quantification, interlaboratory studies, medical and industrial imaging, atmospheric science and climatology, chemometrics, molecular biology, machine learning, dynamic measurements and big data. I do hope that such goals will contribute to the continued effort towards excellence in MATHMET events.

It is my special pleasure to host this MATHMET event. I hope that you will find it technically fulfilling and highly entertaining and that it will be an opportunity for useful interactions and communications with colleagues from all over the world, to network in sessions on theoretical and applied science, bringing together experts from related fields of knowledge. Beyond the technical and scientific aspects of the Symposium, I do hope that you will have the opportunity to enjoy Lisbon and its surroundings as well as the many cultural and recreational activities available in Portugal. A warm welcome to all of you coming to Lisbon, Portugal, for the MATHMET International Workshop.

Tony O'Hagan

Tony O'Hagan is Emeritus Professor of Statistics at the University of Sheffield, UK. His research in the methodology and applications of Bayesian Statistics is internationally recognised and has influenced practice in many other fields, including medicine, engineering, numerical analysis, health economics and environmental science. He has had some collaboration with metrologists, particularly with members of the GUM working party, since 2012.

A Solid Foundation for the Expression of Uncertainty in Measurement

Abstract: In any structure or enterprise, it is important to ensure that the foundations are solid. We can go on adding more fancy elements but if the foundations are weak then at some point cracks will appear.

Metrology is a fascinating field, the GUM is a remarkable document and some truly outstanding technical methods have been built on this foundation, but it is a mess. So this talk is about rebuilding the foundations and making them solid and fit for purpose. Any such rebuilding must ask fundamental questions. What do we mean by (the) measurement? What is the meaning of standard uncertainty, and is it fit for purpose?

My answers may be a little radical, so it is important to ask: are they realistic? The metrology community has already rejected change once because they didn't like, and didn't accept the need for, the practical consequences. But I will try to show that my proposals can be workable for testing labs, just as much as for NMIs.

Wendy Parker

Wendy Parker is Associate Professor of Philosophy and Co-Director of the Institute for Data Science (IDAS) at Durham University, UK. Her research examines the practices of contemporary science, especially meteorology and climate science, with a particular focus on the practice of computer simulation. Her work has been published in a variety of philosophical and scientific journals. She is currently Co-Editor-in-Chief of The British Journal for the Philosophy of Science.

Can we measure via computer simulation?

Abstract: In various fields, scientists now speak of “observing” or “measuring” the world via computer simulation. Some metrologists also now characterize measurement as an experimental or computational process of a particular sort. Does allowing that we can measure via computer simulation mark a radical shift in our understanding of measurement? Are there special conceptual or practical challenges associated with computational measurement? This talk will explore these and related questions, drawing on recent work in philosophy of science and examples from particular sciences.

Nicolas Fischer

Nicolas Fischer is a principal researcher in statistics and is head of the Data Science and Uncertainty department at LNE. He has more than ten years of experience as a statistician within LNE. Since 2010 he is responsible for the mathematical and statistical research program for metrology. His research mainly concerns the methods for evaluating the uncertainty of measurement and processing of interlaboratory comparisons. He provides numerous training courses in data analysis, sampling, quality control and evaluation of uncertainty. Since September 2014, he became a member of the Joint Committee for Guides in Metrology, Working group1 (JCGM-WG1) of the BIPM, international expert group, which produces and maintains the Guide to the expression of uncertainty in measurement. He is also involved in several scientific bodies (Société Française de Statistique, Institut de Maitrise des risques) as group leader within the french statisticians' community.

Characterization in size of aggregated nanoparticles measured by SEM: an illustration of deep generative models in metrology

Abstract: Recent advances in deep generative models based on convolutional neural networks (CNNs) are used to demonstrate the potential of these approaches for the estimation of particle size distribution on images of aggregated TiO2 particles obtained by Scanning Electron Microscopy (SEM).This very promising framework shall permit effective automation of SEM measurements analysis. Indeed, common image processing software bring the end-users with segmentation algorithms as well as measuring tools to estimate individual particle diameters. In the case of aggregated nanoparticles, most particles suffer missing contents and are not considered in the computations. In this work, we have used a recently developed method called "context encoders" to predict missing parts of the nanoparticles. The approach is tested against simulated and real dropped image regions.

Finally Consideration is made to evaluate the performance of the method based on both real and simulated particles using cross validation.

Clemens Elster

Clemens Elster is leading PTB's Working Group "Data Analysis and Measurement Uncertainty" since 2004. His research interests are mainly in the field of statistical data analysis with focus on Bayesian methods, and he has co-authored more than 100 papers in peer-reviewed journals.

Clemens Elster received his diploma with a thesis on developing a regularization method for solving an ill-posed inverse problem from the Faculty of Physics at the University of Freiburg, Germany, in 1990, and his PhD on designing methods for experimental design and the optimization of noisy functions in 1993 also from Freiburg University. He joined the Physikalisch-Technische Bundesanstalt (PTB), Braunschweig and Berlin, Germany, in 1994. Since 2004 he is leading the Working Group "Data Analysis and Measurement Uncertainty". In 2010 he also became a member of the JCGM Working Group on the Expression of Uncertainty in Measurement (GUM).

Application of Gaussian Markov random field priors for Bayesian spatial modeling

Abstract: Gaussian Markov Random Field (GMRF) priors are a popular tool in the Bayesian inference of spatially distributed parameters whose variation is expected to be smooth. Examples of applications comprise the analysis of functional magnetic resonance imaging or the inference of electron density of earth's upper atmosphere in the geosciences.

Applications involving GMRF priors are often high-dimensional which challenges the numerical calculation of the results of a Bayesian inference. This contribution reviews the concepts of GMRF priors and presents two examples of applications. The examples are high-dimensional and different approximation techniques are employed, including the use of Laplace-type approximations and approximate analytical expressions facilitating the sampling from the posterior.

Carola-Bibiane Schönlieb

Carola-Bibiane Schönlieb is Professor of Applied Mathematics at the Department of Applied Mathematics and Theoretical Physics, University of Cambridge. There, she is head of the Cambridge Image Analysis group, Director of the Cantab Capital Institute for Mathematics of Information, Director of the EPSRC Centre for Mathematical and Statistical Analysis of Multimodal Clinical Imaging, and a fellow of Jesus College Cambridge. Her current research interests focus on variational methods, partial differential equations and machine learning for inverse imaging problems. Her research has been acknowledged by scientific prizes, among them the LMS Whitehead Prize 2016, and by invitations to give plenary lectures at several renowned applied mathematics conference, among them the SIAM conference on Imaging Science in 2014, the SIAM annual meeting in 2017, the Applied Inverse Problems Conference in 2019 and the GAMM in 2020.

In her research she is interested in both the rigorous theoretical and computational analysis of the problems considered as well as their practical implementation and their use for real-world applications. She has active interdisciplinary collaborations with clinicians, biologists and physicists on biomedical imaging topics, chemical engineers and plant scientists on image sensing, as well as collaborations with artists and art conservators on digital art restoration.

From shallow to deep learning for inverse imaging problems: some recent approaches

Abstract: In this talk we discuss the idea of data-driven regularisers for inverse imaging problems. We are in particular interested in the combination of model-based and purely data-driven inversion approaches. In this context we will make a journey from “shallow” learning for computing optimal parameters for variational regularisation models by bilevel optimization to the investigation of different approaches that use deep neural networks for solving inverse imaging problems. The talk is furnished with application of these ideas to medical imaging, in particular computed tomography.

Peter Harris

Dr Peter Harris has worked at NPL since 1986 in the areas of mathematical and statistical modelling and experimental data analysis, uncertainty evaluation, algorithm design, numerical software development and software testing applied to a wide variety of measurement problems. He received a BSc in Mathematics from the University of Bath in 1986 and his PhD on spline approximation from the University of Brunel in 1991. He is a Principal Research Scientist in the Data Science Group at NPL, currently involved in projects on using sensor networks for environmental and climate monitoring, and on using data within the “factory of the future” and the “digitally-enabled supply chain” in support of advanced manufacturing.

Evaluating long-term trends in underwater noise in the Southern Ocean

Abstract: Underwater noise is classified as a form of pollution by international regulation, and there is increasing understanding of the effects such noise can have on the wellbeing of marine ecosystems. In this work we describe a method for performing long-term trend analysis of deep-ocean noise data measured by the hydro-acoustic monitoring stations of the Preparatory Commission for the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO). The analysis method uses a flexible discrete model that incorporates terms that capture seasonal variations in the data together with a moving-average statistical model to describe the serial correlation of residual deviations. The results show that statistically significant reductions in deep-ocean noise are observed at some of the monitoring stations. Strong seasonal variation in the recorded data is also observed, with a high degree of correlation with climatic factors such as sea surface temperature and Antarctic ice coverage. Some possible explanations for the observed behaviour are presented.

Blaza Toman

Blaza Toman is a member of the Statistical Engineering Division at the National Institute of Standards and Technology in the USA. Prior to this she taught statistics at Rutgers University and at George Washington University. She earned a PhD in statistics from Ohio State University and is interested mainly in Bayesian statistical methods as applied to uncertainty evaluation and design of experiments. Her recent publications include a new realization of the international system of units for organic chemical measurement, and a new procedure for interlaboratory studies and meta-analysis involving the novel concept of shades of dark uncertain

Design of a calibrated experiment for quantitation of a chemical composition

Abstract: Efficient experimental design is a critical aspect of practical scientific planning and measurement execution. Achieving fit-for-purpose measurement results using limited resources is a significant priority for laboratories. For new applications or procedures, specification of such an experimental design may not be straightforward or readily informed by comparable precedent. In this presentation we show how to optimally construct fit-for-purpose measurement schemes that achieve appropriate confidence. Specifically, we plan a two-stage experiment with a calibration phase followed by the measurement of an unknown. One such procedure is the determination of mass fraction of an analyte species *A* via LC-IDMS, using an isotopically-enriched internal standard *I*. An experimental design for the two phased procedure consists of the following quantities: the number of calibration standards n_I, the number of replications of the measurements for each calibration standard n_J, the set of nominal values of the standards $(\theta_1,\ldots,\theta_I)$, the number of samples of the unknown in the second experiment n_q, and the number of replicates per sample n_s. We will show how to select the experimental design $D= (n_I, n_J, (\theta_1,\ldots,\theta_I), n_q, n_s)$ which is locally optimum, and guarantees that the expected relative measurement uncertainty is at most p %. We will demonstrate, using our software App, the experimental design procedure on a specific example of measurement of mass fraction of 25(OH)D3 in serum.

Juris Meija

Juris Meija is a senior research officer at the National Research Council Canada whose research is aimed to improve the reliability of chemical measurements through development of certified reference materials and better understanding of the measurements themselves. His expertise lies in theoretical analytical chemistry, isotope ratio measurements, and data analysis. He serves as the Chair of the IUPAC Commission on Isotopic Abundances and Atomic Weights and is also IUPAC delegate to the Joint Committee for Guides in Metrology Working Group. He has been actively involved in many recent international activities such as the redefinition of the mole, naming of the new chemical elements, and revisions of the GUM.

Traceability in chemical measurements: the role of data analysis

Abstract: Countless chemical measurements are performed worldwide each day. While the results of a chemical measurement are determined by many crucial components such as the primary standards, choice of measurement methods, or the act of measurement, choice of the measurement model and its consequences is often less appreciated. This talk will address the importance to distinguish between the measurements and the measurement results. In this vein, chemical measurements cannot be performed without the recourse to data analysis, mathematical or statistical measurement models. These models, and their implementation, form an integral part of the measurement process and, much like the physical act of measurement, can lead to errors. This presentation will feature a variety of examples from traditional chemical analyses, including the titration, standard additions, and isotope dilution, showing that choices on how we interpret and model our measurements often have significant effects. The challenge is therefore for the analysts to explore the rich variety of modeling options and recognize that larger statistical toolkit can raise the bar for more reliable results.

Maria Antónia Turkman

Maria Antónia Amaral Turkman was, until 2013, full-time Professor in the Department of Statistics and Operations Research, Faculty of Sciences, University of Lisbon where she has taught courses on Bayesian Statistics and Computational Statistics, among many others. Though retired from the university, she is still an integrated member of its Centre of Statistics and Applications, where she held the position of scientific coordinator until 2017. Her research interests are Bayesian Statistics, Medical and Environmental Statistics, and Spatiotemporal Modelling, with most recent publications on computational methods in Bayesian statistics, with an emphasis on applications in health and forest fires. Her most recent book "Computational Bayesian Statistics: An Introduction", co-authored by Carlos Daniel Paulino and Peter Muller, was published in February 2019 by Cambridge University as the first text book on a series of the Institute of Mathematical Statistics (IMS) with International Society of Bayesian Statistics (ISBA). She was a founding member of the Portuguese Statistical Society (SPE), has served as vice president of the Society and is currently Chairman of the SPE General Assembly.

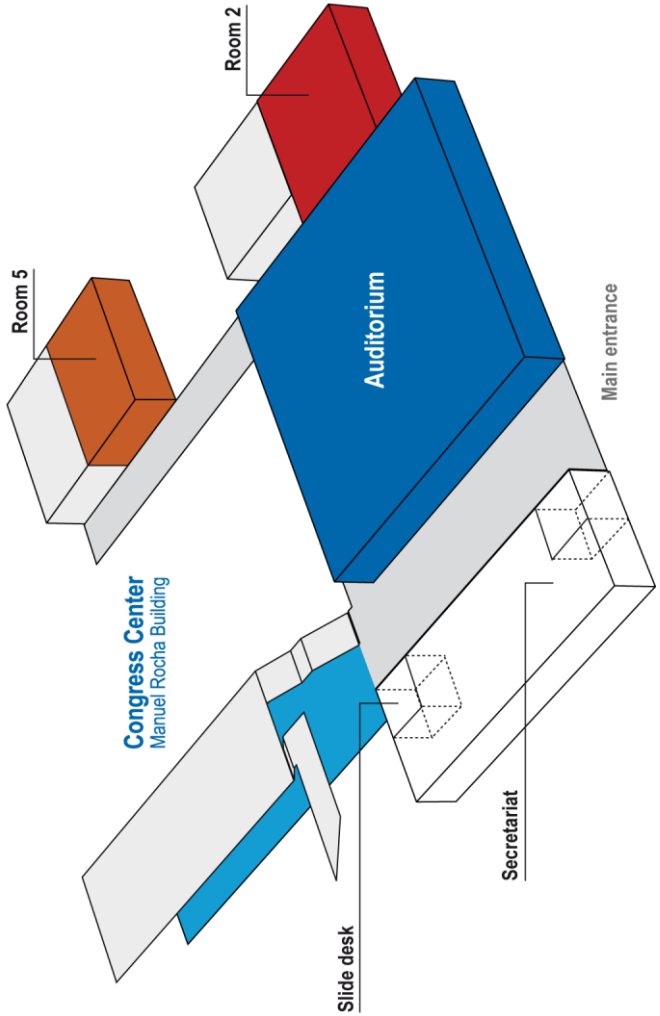
Data fusion/calibration methods to update simulated data based on the observed data: an application to wind speed data

Abstract: Extreme values of certain spatio-temporal processes, such as wind speeds, are the main cause of severe damage in property, from electricity distribution grid to road and agricultural infrastructures. Accurate assessment of causal relationships between environmental processes and their effects on risk indicators, are highly important in risk analysis, which in return depends on sound inferential methods as well as on good quality informative data. Often, information on the relevant environmental processes comes from monitoring networks, as well as from numerical-physical models (simulators) that typically solve a large set of partial differential equations, capturing the essence of the physical process under study.

Overall Schedule

	Tuesday // 19 November //	
18:30 – 20:00	Welcome Reception	
	Wednesday // 20 November //	**Chairperson**
8:45 – 9:15	Registration	
9:15 – 9:45	Opening Ceremony	
9:45 – 10:30	Invited Speaker: Tony O'Hagan	Maurice Cox
10:30 – 11:15	Invited Speaker: Wendy Parker	António Possolo
11:15 – 11:45	Coffee break	
11:45 – 13:15	Parallel session 1 (Measurement Uncertainty 1)	Tony O'Hagan
	Parallel session 2 (Machine Learning and Dynamic Measurements)	Sascha Eichstaedt
13:15 – 14:15	Lunch	
14:15 – 15:00	Invited Speaker: Nicolas Fischer	Markus Baer
15:00 – 15:45	Invited Speaker: Clemens Elster	Gertjan Kok
15:45 – 16:15	Coffee break	
16:15 – 18:00	Parallel session 3 (Modelling and Inverse Problems)	Clemens Elster
	Parallel session 4 (Measurement Uncertainty Training)	Katy Klauenberg
	Thursday // 21 November //	**Chairperson**
9:15 – 10:00	Invited Speaker: Carola Schönlieb	Francesca Pennecchi
10:00 – 10:45	Invited Speaker: Peter Harris	Álvaro Ribeiro
10:45 – 11:45	Coffee break + Poster session	
11:45 – 13:00	Parallel session 5 (Uncertainty Quantification for Computationally Expensive Models)	Peter Harris
	Parallel session 6 (Mathematics and Metrology in Medicine 1)	Carola Schonlieb
13:00 – 14:15	Lunch	
14:15 – 15:00	Invited Speaker: Blaza Toman	Olivier Pellegrino
15:00 – 15:45	Invited Speaker: Juris Meija	Alen Bosnjakovich
15:45 – 16:15	Coffee break	
16:15 – 17:35	Parallel session 7 (Statistical Methods for Interlaboratory Comparisons and Conformity Assessment)	Blaza Toman
	Parallel session 8 (Statistical Calibration and Regression Problems)	Juris Meija
19:30 – 23:30	Conference Dinner	
	Friday // 22 November //	**Chairperson**
9:30 – 11:10	Parallel session 9 (Mathematics and Metrology in Medicine 2)	Nicolas Fischer
	Parallel session 10 (Measurement Uncertainty 2)	Antónia Turkman
11:10 – 11:45	Coffee break	
11:45 – 12:30	Invited Speaker: Antónia Turkman	João A. Sousa
12:30 – 13:00	Invited Speaker: Emma Woolliams	João A. Sousa
13:00 – 13:15	Closing	
13:15 – 14:15	Lunch	
14:15 – 18:30	Special session on Introduction to Machine Learning for Metrology Apllications	
14:15 – 18:30	MATHMET meeting	

Congress Center Plan



Themes

- Measurement Uncertainty
- Statistical Calibration and Regression Problems
- Modeling and Inverse Problems
- Uncertainty Quantification for Computationally Expensive Model
- Statistical Methods for Interlaboratory Comparisons and Conformity Assessment
- Statistical Methods for Chemistry, Bioanalysis and Molecular Biology
- Machine Learning
- Dynamic Measurement
- Mathematics and Metrology in Medicine
- Measurement Uncertainty Training: A Survey and Developments
- Type A evaluations of measurement uncertainty

Tuesday // 19 November //

18:30 – 20:00 Welcome Reception

Wednesday // 20 November //

8:45 Registration

9:15 Opening Ceremony

9:45 **INVITED SPEAKERS** **AUDITORIUM**
Tony O'Hagan / Wendy Parker
Chairperson: Maurice Cox / António Possolo

11:15 **Coffee break**

11:45 **PARALLEL SESSION 1** **ROOM 2**
Measurement Uncertainty 1
Chairperson: Tony O'Hagan

11:45 1.1 Asymmetrical uncertainties
ID1005 – Antonio Possolo

12:05 1.2 Evaluating the uncertainty in the measurement of nanoparticle size by means of SEM and DLS
ID1007 – Ignacio Lira

12:25 1.3 Redundant information in sensor networks and uncertainty quantification
ID1011 – Gertjan Kok

12:55 1.4 Uncertainty budget for gas mixtures preparation by dynamic dilution and subsequent use in the calibration of analytical instrumentation
ID1015 – Francesca Pennecchi

11:45 **PARALLEL SESSION 2** **ROOM 5**
Machine Learning and Dynamic Measurements
Chairperson: Sascha Eichstaedt

11:45 2.1 Mathematical framework for metrology in the factory of the future
ID1034 – Sascha Eichstaedt

12:05 2.2 Metrology for virtual measuring systems: new competence centre: "VirtMet" at PTB
ID1033 – Sascha Eichstaedt

12:25 2.3 Influence of synchronization within a sensor system on machine learning results
ID1004 – Tanja Dorst

12:55 2.4 On the influence of inlet perturbations on the development of slugs in horizontal two-phase flow
ID1043 – Sonja Schmelter

13:15 **Lunch**

14:15 **INVITED SPEAKERS** **AUDITORIUM**
Nicolas Fischer / Clemens Elster
Chairperson: Markus Baer / Gertjan Kok

15:45 **Coffee break**

16:15 **PARALLEL SESSION 3** **ROOM 2**
Modelling and Inverse Problems
Chairperson: Clemens Elster

16:15 3.1 Recovery of smooth low-rank matrices using Bayesian inference
ID1009 – Gerd Wübbeler

16:35 3.2 Large scale inference with applications to environmental monitoring
ID1054 – Louis Sharrock

16:55 3.3 Development of a virtual flow meter
ID1051 – Andreas Weissenbrunner

17:15 3.4 Model-based determination of optical and geometrical properties of red blood cells from light scattering
ID1046 – Markus Bär

17:35 3.5 Targeted high-fidelity data to enrich surrogate models for uncertainty quantification in climate prediciton
ID1062 – Oliver Dunbar

16:15 PARALLEL SESSION 4 **ROOM 5**

Measurement Uncertainty Training

Chairperson: Katy Klauenberg

16:15 4.1 Tutorial for a Bayesian evaluation of measurement uncertainty and its implementation
Séverine Demeyer

16:36 4.2 Measurement uncertainty training at PTB
Katy Klauenberg

16:46 4.3 Measurement uncertainty training at NPL
Peter Harris

16:55 4.4 Measurement uncertainty training at LNE
Michèle Désenfant

17:04 4.5 Measurement uncertainty training at METAS
Marc-Olivier André

17:13 4.6 Measurement uncertainty training: experiences at the INRIM and ideas for developing a dedicated international community
Francesa Pennecchi

17:22 4.7 Methodology of teaching the concept of measurement uncertainty
Anna Chunovkina

17:30 4.8 Discussion on future developments
All

Thursday // 21 November //

8:45 Registration

9:15 INVITED SPEAKERS **AUDITORIUM**

Carola Schönlieb / Peter Harris

Chairperson: Francesca Pennecchi / Álvaro Ribeiro

10:45 Coffee break + Poster session

POSTERS

Calculating coverage factors and coverage probabilities in study cases
ID1044 – Anna Chunovkina

Modelling of flow time series as an approach to compute its uncertainty
ID1036 – Maria Silva

Towards a new GUM – the suggested draft
ID1022 – Igor Zakharov

Indirect multiparameter measurements with correlated uncertainties
ID1021 – Jacek Puchalski

Estimation of the uncertainty in selected points of measured function from two control measurements
ID1035 - Jacek Puchalski

Testing software that implements least-squares fitting for nonlinear models
ID1024 – Ian Smith

Confidence regions for parameters in two-dimensional linear comparative calibration model
ID1013 – Gejza Wimmer

Mathematical model of the volume of no-OIML R111-1 standard weights
ID1059 – Omar-Jair Purata-Sifuentes

Musing on modelling in measurement science: from the perspective model to the descriptive model implementing the former in experiments
ID1058 – Franco Pavese

Efficient reliability analysis with model reduction techniques
ID1052 – Jörg Unger

Binary linear regression in dynamic force measurement and uncertainty estimation
ID1056 – Jun Yang

Research on analysis of amplitude-frequency response in dynamic pressure calibration with shock tube
ID1057 – Jun Yang

A statistical metrology approach to compare the quality of periodic cardiovascular waveforms
ID1055 – Janos Palhalmi

Implementation of GUM principles in Western Balkan countries
ID1047 – Alen Bosnjakovic

11:45 PARALLEL SESSION 5 **ROOM 5**
Uncertainty Quantification for Computationally Expensive Models
Chairperson: Peter Harris

11:45 5.1 Recurrent networks for parameter estimation in MV and LV grids
ID1008 – Natallia Makarava

12:05 5.2 Global sensitivity analysis using polynomial chaos
ID1041 – Nando Farchmin

12:25 5.3 Bayesian inversion for CD determination with uncertainties
ID1040 – Sebastian Heidenreich

11:45 PARALLEL SESSION 6 **ROOM 2**
Mathematics and Metrology in Medicine 1
Chairperson: Carola Schonlieb

11:45 6.1 Quantitative imaging biomarkers: the need for Metrology
ID1025 – Nadia Smith

12:00 6.2 A model for complex shape and motion pattern analysis in medical images
ID1042 – Noemie Debroux

12:15 6.3 Managing uncertainties in calculations involving normal tissue complication probability
ID1037 – Maurice Cox

13:00 Lunch

14:15 INVITED SPEAKERS **AUDITORIUM**
Blaza Toman / Juris Meija
Chairperson: Olivier Pellegrino / Alen Bosnjakovich

15:45 Coffee break

16:15 PARALLEL SESSION 7 **ROOM 2**

Statistical Methods for Interlaboratory Comparisons and Conformity Assessment

Chairperson: Blaza Toman

16:15 7.1 Shades of dark uncertainty and consensus value for the Newtonian constant of gravitation
ID1049 – Antonio Possolo

16:35 7.2 Efficient sampling plans for the EU measuring instruments directive
ID1026 – Cord Müller

16:55 7.3 CASoft: practical implementation of risk calculations in conformity assessment
ID1001 – Alexandre Allard

17:15 7.4 CASoft: an approach for the verification of software for conformity assessment
ID1023 – Ian Smith

16: 15 PARALLEL SESSION 8 **ROOM 5**

Statistical Calibration and Regression Problems

Chairperson: Juris Meija

16:15 8.1 Bayesian uncertainty analysis versus application of the GUM and its supplements for error-in-variables straight-line regression
ID1012 – Steffen Martens

16:35 8.2 Effective number of degrees of freedom and prior information
ID1031 – Alistair Forbes, Andrew Thompson

16:55 8.3 On inverse and direct prediction in polynomial comparative calibration
ID1014 – Viktor Witkovsky

17:15 8.4 Activities of EURADOS Working Group 6 "Computational Dosimetry"
ID1017 – Hans Rabus

19:30 Conference Dinner

Friday // 22 November //

9:00 Registration

9:30 PARALLEL SESSION 9 ROOM 5
Mathematics and Metrology in Medicine 2
Chairperson: Nicolas Fischer

9:30 9.1 Measurement of drug-induced changes in cardiac contractility using blood pressure data
ID1020 – Philip Aston

9:50 9.2 Proper modelling of errors in B1-mapping for uncertainty quantification in electric properties tomography
ID1018 – Alessandro Arduino

10:10 9.3 Risk based assessment of the degree of severity of myocardial perfusion and the determination of an optimal decision rule
ID1039 – Kavya Jagan

10:30 9.4 Obtaining high accuracy measurements of brain stents from 2D X-Ray images
ID1029 – Philip Aston

10:50 9.5 Uncertainty related to flow modelling errors in medical perfusion imaging
ID1045 – Gertjan Kok

9:30 PARALLEL SESSION 10 ROOM 2
Measurement Uncertainty 2
Chairperson: Antónia Turkman

9:30 10.1 Bayesian sample size determination for Type A uncertainty evaluation
ID1010 – Jörg Martin

9:50 10.2 Assessing the uncertainty contribution of detection thresholds to the uncertainty of frequencies of radiation-induced and background DNA damage foci obtained by automatic scoring
ID1016 – Hans Rabus

10:10 10.3 Distribution detection and information loss in a measurement uncertainty network
ID1028 – Paul Duncan

10:30 10.4 Role of measurement uncertainty in the comparison of average areal rainfall methods and its impact on conformity assessment
ID1060 – Álvaro Ribeiro

10:50 10.5 Non-informative Bayesian Inference for Heterogeneity in a Generalized Marginal Random Effects Meta-Analysis
ID1030 – Olha Bodnar

11:10 Coffee break

11:45 INVITED SPEAKERS **AUDITORIUM**
Antónia Turkman / Emma Woolliams
Chairperson: João A. Sousa

13:00 Closing

13:15 Lunch

14:15 **SPECIAL SESSION** on Introduction to Machine Learning for Metrology Apllications

14:15 MATHMET meeting

Institutional Support

EURAMET

EMRP
European Metrology Research Programme
Programme of EURAMET

The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union

eurolab aisbl
European Federation of National Associations of Measurement, Testing and Analytical Laboratories

spm
SOCIEDADE PORTUGUESA DE MATEMÁTICA

SPMet
Sociedade Portuguesa de Metrologia

SOCIEDADE PORTUGUESA DE QUÍMICA

http://mathmet2019.lnec.pt/