



ENBIS-26 ANNUAL CONFERENCE PROCEEDINGS



UNIVERSITÀ
DEGLI STUDI
FIRENZE

Dipartimento di Statistica,
Informatica, Applicazioni
“Giuseppe Parenti”

Eccellenza 2023-2027



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ENBIS-26 ANNUAL CONFERENCE PROCEEDINGS

Proceedings contain all the abstracts accepted for the ENBIS-26 Annual Conference

Firenze, Italy

September 6-10, 2026

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Welcome to The 26th annual conference of ENBIS, the European Network for Business and Industrial Statistics!

Dear participants of ENBIS-26 in Florence

On behalf of the Scientific Program Committee of ENBIS-26, it is my great honor and pleasure to welcome you to the 26th Annual Conference of the European Network for Business and Industrial Statistics host by the University of Florence at the Centro Didattico Morgagni in Florence (Italy) from September 6 to 10, 2026.

We are proud to present you with a program reflecting a strong and dynamic network in applied statistics, both from academia, industry & business, and demonstrating numerous and fruitful interfaces with other disciplines. With many talks and interactive sessions, covering a broad range of topics in statistics, we hope you will find it stimulating and relevant for your own interests.

We are also very proud of our plenary sessions. The opening keynote speaker is Laura Maria Sangalli, Politecnico di Milano (Italy), and the closing keynote speaker is Peter Bühlmann, ETH Zürich (Switzerland). Bradley Jones (EFFEX) is the 2026 George Box Medal recipient, and the Greenfield Challenge winner is Lluís Marco Almagro (Universitat Politècnica de Catalunya & BarcelonaTech). Their talks will take place on Tuesday afternoon. Two more speakers, whose presentations are scheduled in the Award Session on Monday afternoon, will receive ENBIS awards in 2026: Sophie Carr (Bays Consulting) for the Best Manager Award and : Fabio Centofanti (KU Leuven) for the Young Statistician Award.

Besides these keynote sessions, there will be 11 sessions' slots, each involving 4 or 5 sessions held in parallel. Among these, around 30 contributed sessions (more than 80 talks) will address the following topics:

- AI: Machine Learning and Predictive Analytics
- Data Analytics and Data Science: Case Studies
- Design of Experiments
- Measurement Uncertainty and Metrology
- Reliability
- Statistical / Stochastic Modelling and Statistical Computing
- Statistical Process Monitoring
- Statistics in Industry, Business and Finance
- Statistics in Pharma / Healthcare
- Teaching, Consulting and Knowledge Transfer in Statistics
- Time Series, Forecasting and Dynamic Systems
- Trustworthy and Explainable AI
- Uncertainty quantification and computer experiments

In addition, the conference hosts 19 invited sessions featuring more than 50 talks. Some are institutional and/or traditional ones, like the Software, Editor's Corner, Mathmet, INFORMS/QSR, itENBIS, frENBIS, ISEA, Young Statistician and JQT/QE/Technometrics. There are also new sessions reflecting the subject trends, for example the links between Statistics & Data Science/Artificial Intelligence, the topics of Uncertainty Quantification, Sensitivity Analysis &

Computer Experiments, and some scientific or technological fields as Climate Science and Digital Twins. A strong emphasis is finally made on Active/Interactive sessions, Generative AI tools and discussions on Teaching.

As usual, pre- and post-conference events of the ENBIS-26 conference will take place:

- On Sunday (6th of September) afternoon, the joint ECAS-ENBIS course on Adaptive Machine Learning for Time Series Forecasting,
- On Wednesday (10th of September) morning, the JMP Workshop: Human + AI in the Loop: AI-Supported Analysis and Learning in JMP,
- On Wednesday (10th of September) afternoon, Consultancy Skills: Storytelling with Data.

This year, as an exceptional additional event to celebrate the ENBIS hosting in Florence, a Satellite Event organized by the StEering Research Center will be held on Saturday 5th September, bringing high-level talks on Railway (Reliability, Safety and Sustainability), Reliability (Design of Experiments, Maintenance, Degradation Models), Tourism (Predictions and Sustainability) and Statistics for biomedical engineering.

Finally, a special issue of the Quality and Reliability Engineering International (QREI) Journal will feature (expected in 2027) selected papers presented in ENBIS-26. It will be edited by Véronique Maume-Deschamps (Université Claude Bernard Lyon 1, France), and Panagiotis Tsiamyrtzis (Athens University of Economics and Business, Athens, Greece). A formal Call for Papers will be issued after the conference.

I want to express my deepest thanks to the dedicated Program and Organizing Committee members, in particular Rossella Berni who has agreed to organize this conference in this wonderful city of Florence. Organizing this conference on an annual basis is essential to maintaining the vitality of the ENBIS community. I would like to take this opportunity to call for volunteers to embark on this adventure which, despite the administrative challenges, proves to be a source of valuable professional and personal insights for the organizers.

I am also grateful to the ENBIS Executive and Office members, who have helped get this conference rolling. Lara Kuhlmann de Canaviri is a highly efficient person who activates all the keys to solving many issues concerning the organization and the administration of the conference website. Finally, I am grateful to all colleagues and friends who have organized the invited sessions and/or have agreed to chair the different contributed sessions.

Last, but not least, I would like to express my greatest gratitude to all of you who will contribute to the success of ENBIS-26 with your talks and discussions between sessions and during the different social events. As you know, networking is the primary purpose of the ENBIS annual conference, and we must draw particular attention to involve in our discussions the newcomers.

Please enjoy the ENBIS-26 Conference and have a good time in Florence!

Bertrand Iooss

Chair of the Scientific Program Committee for ENBIS-26 Florence Conference

The Scientific Program and Organising Committees of ENBIS-26

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Address of the ENBIS Permanent Office: European Network for Business and Industry Statistics (ENBIS), Westzanerdijk 170, 1507AM Zaandam, The Netherlands.

Keynote Speakers

The conference will feature five keynote lectures delivered by leading experts, combining invited international speakers and distinguished ENBIS award recipients.

Invited Keynote Speakers

- Laura Maria Sangalli (Politecnico di Milano, Italy) – Laura Maria Sangalli's work focuses on spatial statistics and functional data analysis, with impactful applications in environmental and biomedical sciences.
Her lecture introduces physics-informed statistical learning methods that combine data with known physical principles, such as differential equations, to improve inference and decision-making in complex, high-dimensional, and structured applications. By integrating statistical modeling with physically grounded regularization, these approaches enhance interpretability and predictive performance across fields including environmental science, engineering, pharmacokinetics, and medical research.
- Peter Bühlmann (ETH Zürich, Switzerland) – Peter Bühlmann is internationally recognised for his contributions to high-dimensional statistics, machine learning, and causal inference, with wide-ranging applications across science and industry.
His lecture examines the challenge of applying statistical and machine learning models to new populations, particularly in digital health settings such as international ICU datasets. It presents Distributionally Robust Invariance Learning as a method for identifying stable patterns across environments and discusses the opportunities and limitations of emerging foundation models for improving generalization and adaptation.

ENBIS Award Keynote Speakers

- Bradley Jones – 2026 Box Medal – Bradley Jones is recognized for his outstanding contributions to the development and application of statistical methods in business and industry, particularly in design of experiments and industrial quality improvement.
His talk presents recent advances in Definitive Screening Designs (DSDs), extending their use beyond continuous and two-level categorical factors to include categorical factors with three or more levels. It introduces a general framework for constructing these enhanced designs and illustrates their application through practical examples.
- Sophie Carr (Bays Consulting, England) – 2026 Best Manager Award – Sophie Carr's keynote will explore the role of statistics and data science in addressing societal challenges, with a focus on communication, ethics, and interdisciplinary collaboration.
Her work highlights the impact of statistical thinking beyond academia, particularly in industry and decision-making contexts.
- Fabio Centofanti (KU Leuven, Belgium) – 2026 Young Statistician Award – Fabio Centofanti works focus on robust statistics, functional data analysis, and statistical process monitoring, addressing challenges in complex and high-dimensional data.
His talk explores statistical process monitoring methods for industrial profile data using functional data analysis, where profiles are treated as smooth functions observed over continuous domains. It presents a general framework for monitoring multivariate functional data and reviews recent advances addressing practical challenges such as outliers, partially observed profiles, adaptive detection strategies, and the integration of additional functional covariates.

Detailed Program

Sunday, September 6

Sun, September 6

1:45 –5:45 PM

ECAS-ENBIS Course: Adaptive Machine Learning for Time Series Forecasting

Location: Auditorium B | **Instructor:** Yannig Goude

Sun, September 6

3:15 –4:15 PM

Exec + Office meeting

Location: Room 107

Sun, September 6

4:30 –6:00 PM

Council Meeting

Location: Room 107

Monday, September 7

Mon, September 7

9:00 –9:30 AM

Opening Ceremony

Location: Auditorium B

Mon, September 7

9:30 –10:30 AM

Keynote

Location: Auditorium B | Chair: Biagio Palumbo

9:30 –10:30 AM **Physics-Informed Statistical Learning for Data-Driven Decision Making in Science and Industry**

Speaker: Laura M. Sangalli

Mon, September 7

10:55 –11:55 AM

AI: Machine Learning and Predictive Analytics

Location: Conference Room 103 | Chair: Nicolas Bousquet

10:55-11:15 AM **Data-Efficient Upscaling and Optimal Control of Fed-Batch Bioprocesses via Hybrid Modelling and Transfer Learning**

Speaker: Luca Riezzo

11:15 –11:35 AM **Local Constrained Bayesian Optimization for High-Dimensional Industrial Design**

Speaker: Jingzhe Jing

11:35 –11:55 AM **Extending Inverse Distance-based Exploration for Active Learning to Streaming: On-line Active Learning for Regression**

Speaker: Bernhard Spangl

Mon, September 7

10:55 –11:55 AM

Design of Experiments

Location: Auditorium B | Chair: Marco P. Seabra dos Reis

10:55-11:15 AM **Quality by Design: Data-Efficient Active Learning Approaches**

Speaker: Marco P. Seabra dos Reis

11:15 –11:35 AM **Fighting Antimicrobial Resistance, Functional Data Analysis, and the Future of Multi-factor Experiments**

Speaker: Phil Kay

11:35 –11:55 AM **Optimizing multi-arm clinical trials for personalized medicine using a genetic algorithm**

Speaker: Karla Cervantes

Mon, September 7

10:55 –11:55 AM

Statistical / Stochastic Modelling and Statistical Computing

Location: Conference Room 102 | Chair: Véronique Maume-Deschamps

10:55-11:15 AM **Least trimmed squares regression with missing values and cellwise outliers**

Speaker: Peter Rousseeuw

11:15 –11:35 AM **Characterization of multi-way binary tables with uniform margins and fixed correlations**

Speaker: Fabio Rapallo

11:35 –11:55 AM **Estimating Multivariate Generalized Gamma Convolutions via Kernel Stein Discrepancy**

Speaker: Léo Gonin

Mon, September 7

10:55 –11:55 AM

Statistical Process Monitoring**Location:** Conference Room 107 | **Chair:** Antonio Lepore**10:55-11:15 AM** **An entropy-based distribution-free approach for profile monitoring****Speaker:** Praise Obanya**11:15 –11:35 AM** **Nonparametric Statistical Process Control for Monitoring Structural Changes in Regional Drought Dynamics****Speaker:** Michele Scagliarini**11:35 –11:55 AM** **Linear Profile Monitoring of Functional Data****Speaker:** Davide Forcina**Mon, September 7**

10:55 –11:55 AM

Statistics in Pharma / Healthcare: Pharmaceutical Process Modelling and Manufacturing Analytics**Location:** Conference Room 106 | **Chair:** Marina Vives-Mestres**10:55-11:15 AM** **Estimating Stabilization Time in Continuous Manufacturing****Speaker:** Chellafe Ensoy-Musoro**11:15 –11:35 AM** **Incorporating Factor Variability into Risk Estimation in Pharmaceutical Manufacturing****Speaker:** Olympia Tumolva**Mon, September 7**

12:00 –1:00 PM

Design of Experiments**Location:** Auditorium B | **Chair:** Marco P. Seabra dos Reis**12:00 –12:20 PM** **Bayesian Optimisation under system drift****Speaker:** Stefanie Feiler**12:20 –12:40 PM** **Powerful Foldover Designs****Speaker:** Jonathan Stallrich**12:40 –1:00 PM** **Possible Pitfalls in Using Bayesian Optimization (BO) to Quickly Optimize the Levels of Factors in a Physical Experiment****Speaker:** Jacqueline Asscher**Mon, September 7**

12:00 –1:00 PM

Statistical / Stochastic Modelling and Statistical Computing**Location:** Conference Room 107 | **Chair:** Biagio Palumbo**12:00 –12:20 PM** **Tourist Mobility: A Markov Chain Approach Using Origin–Destination Survey Data****Speaker:** Francesca Atzori**12:20 –12:40 PM** **Adaptive Particle MCMC for non-linear battery state-space models****Speaker:** Edvinas Juozapaitis**12:40 –1:00 PM** **Robust graphical modeling under data contamination****Speaker:** Christian Capezza**Mon, September 7**

12:00 –1:00 PM

Statistical Process Monitoring**Location:** Conference Room 102 | **Chair:** Panagiotis Tsiamyrtzis**12:00 –12:20 PM** **When a Cusum Stops, What Confidence Is There that the Alarm Is Not False?****Speaker:** Moshe Pollak**12:20 –12:40 PM** **On the Design and Performance of a Control Chart for Monitoring Continuous data in (0,1) when Process Parameters are Unknown****Speaker:** Athanasios Rakitzis**12:40 –1:00 PM** **Some Stylized Facts of the Conditional Expected Delay (CED)****Speaker:** Sven Knoth

Mon, September 7

12:00 –1:00 PM

Statistics in Pharma / Healthcare: Statistical Decision Support in Healthcare and Biomedical Development**Location:** Conference Room 106 | **Chair:** Marina Vives-Mestres**12:00 –12:20 PM** Towards an Adaptive Framework for Longitudinal Survival Modeling in Clinical Decision Support: Case of the ISPY 1 Trial**Speaker:** Abdelaziz Berrado**12:20 –12:40 PM** Predicting Study Success in Diagnostic Test Evaluation: A Case Study Using Frequentist and Bayesian Approaches**Speaker:** Moreno Muñoz**Mon, September 7**

12:00 –1:00 PM

Truthworthy and explainable AI**Location:** Conference Room 103 | **Chair:** Nicolas Bousquet**12:00 –12:20 PM** Statistical Evaluation of CPU-Based Offline LLMs for Industrial Text Processing on Low-Cost Edge Hardware**Speaker:** Guido Moeser**12:20 –12:40 PM** Ups and Downs with AI and Old Data**Speaker:** Shirley Coleman**12:40 –1:00 PM** Towards the reliable use of metamodels in critical systems - Application to nuclear safety studies**Speaker:** Nicolas Bousquet, Bertrand Iooss**Mon, September 7**

2:00 –3:30 PM

Editors' Corner Session - INFORMS Journal on Data Science**Location:** Auditorium B | **Chair:** Yu Ding**2:00 –2:30 PM** Introduction to INFORMS Journal on Data Science (IJDS)**Speaker:** Yu Ding**2:30 –3:00 PM** Using Operational Data Analytics for Planning Decisions Under Uncertainty**Speaker:** Natarajan Gautam**3:00 –3:30 PM** Estimating Hidden Epidemic: A Bayesian Spatiotemporal Compartmental Modeling Approach**Speaker:** Kamran Paynabar**Mon, September 7**

2:00 –3:30 PM

Generative AI for Statistics: Practice, Productivity, and Prioritization**Location:** Conference Room 106 | **Chair:** Marina Vives-Mestres**2:00 –3:30 PM** Generative AI for Statistics: Practice, Productivity, and Prioritization**Speaker:** Christian Ritter, Morten Bormann Nielsen, Winfried Theis**Mon, September 7**

2:00 –3:30 PM

Statistics and data science in the technological field: current issues and new proposals**Location:** Conference Room 102 | **Chair:** Nedka Dechkova Nikiforova**2:00 –2:30 PM** ADeS: A Flexible Adaptive Design Strategy for Ethical and Covariate-Balanced Clinical Trials**Speaker:** Marco Novelli**2:30 –3:00 PM** Online Quality Monitoring in Selective Laser Melting via Image-Based Statistical Methods**Speaker:** Panagiotis Tsiamyrtzis**3:00 –3:30 PM** Fisher's Principles of Experimental Design and Why They Are Still Important**Speaker:** Geoff Vining

Mon, September 7

2:00 –3:30 PM

Young Statisticians Session**Location:** Conference Room 103 | **Chair:** Fabio Centofanti**2:00 –2:30 PM** **A Registration-free Approach for Shape and Color Monitoring of Functionally Graded Materials via 4D Point Clouds****Speaker:** Mariafrancesca Patalano**2:30 –3:00 PM** **On stochastic network trends in network time series****Speaker:** Amandine Pierrot**3:00 –3:30 PM** **Active Learning for Effect Screening in Manufacturing****Speaker:** Marcus Engsig**Mon, September 7**

4:00 –5:30 PM

Award session**Location:** Auditorium B | **Chair:** Winfried Theis**4:15 –4:45 PM** **The Irreducible Error: What Statistics and Management Have in Common****Speaker:** Sophie Carr**4:45 –5:15 PM** **Statistical Process Monitoring Based on Functional Data Analysis****Speaker:** Fabio Centofanti**Mon, September 7**

5:30 –6:30 PM

General Assembly**Location:** Auditorium B

Tuesday, September 8

Tue, September 8

9:00 –10:30 AM

Data science for climate and environment

Location: Conference Room 103 | **Chair:** Véronique Maume-Deschamps

9:00 –9:30 AM Model selection for extremal dependence structures using deep learning: Application to environmental data

Speaker: Pierre Ribereau

9:30 –10:00 AM Multivariate Discrete Generalized Pareto distributions: Theory, likelihood-free inference, and applications to drought risk assessment

Speaker: Samira Aka

10:00 –10:30 AM Concepts and methods for better predictions in climate and environmental science

Speaker: Georgia Papacharalampous

Tue, September 8

9:00 –10:30 AM

From Automation to Autonomy: New Frontiers of AI and Statistics for Data in Business and Industry

Location: Auditorium B | **Chair:** Christian Capezza, Mostafa Reisi Gahrooei

9:00 –10:30 AM From Automation to Autonomy: New Frontiers of AI and Statistics for Data in Business and Industry

Speaker: Bianca Maria Colosimo, Kamran Paynabar

Tue, September 8

9:00 –10:30 AM

ISBIS Session - Advances in Statistical Analysis for Large-Scale Dynamic Networks, Labour Market Outcomes, and Interpretable Ensemble Methods

Location: Conference Room 102 | **Chair:** Antonio Lepore

9:00 –9:30 AM Real-Time Change Detection in Large-Scale Dynamic Networks

Speaker: Nathaniel Stevens

9:30 –10:00 AM Heterogeneity in STEM Graduate Wages Across Italian Universities: A Weighted Mixed-Effects Analysis

Speaker: Andrea Carta

10:00 –10:30 AM Agreement over Association in Explainable Ensemble Trees

Speaker: Agostino Gnasso

Tue, September 8

9:00 –10:30 AM

Software Session

Location: Conference Room 106 | **Chair:** Volker Kraft

9:00 –9:30 AM Optimal design, analysis and optimization in the presence of random effects using Minitab DoE by Effex platform

Speaker: Jose Nunez Ares

9:30 –10:00 AM JASP for Quality Control: An Open-Source Software for Industrial Statistics

Speaker: Julius Pfadt, Don van den Bergh, Frantisek Bartos, Henrik Godmann, Jonas Petter, Johnny van Doorn, Simon Kucharsky, Eric-Jan Wagenmakers

10:00 –10:30 AM JMP Developments in JMP 19 and Coming in JMP 20

Speaker: Chris Gotwalt

Tue, September 8

10:55 –11:55 AM

Data Analytics and Data Science: Case Studies**Location:** Conference Room 103 | **Chair:** Morten Bormann Nielsen**10:55-11:15 AM** **Health Insurance Fraud Detection using Claim-Based Profiling****Speaker:** Sotiris Bersimis**11:15 –11:35 AM** **Simulating a key performance index for a family of future products****Speaker:** Carlo Leardi**11:35 –11:55 AM** **Dirty laundry –A data quality journey from ENBIS Active session to nationwide system redesign for industrial textile management****Speaker:** Morten Bormann Nielsen, Robert Heck**Tue, September 8**

10:55 –11:55 AM

Reliability**Location:** Conference Room 107 | **Chair:** Antonio Pievatolo**10:55-11:15 AM** **Statistical Travel Time Inference Under Incomplete Data: A Queueing-Theoretic Approach****Speaker:** Dingyi Wang**11:15 –11:35 AM** **A scheme for the predictive replacement of lithium-ion batteries, using reinforcement learning****Speaker:** Antonio Pievatolo**Tue, September 8**

10:55 –11:55 AM

Statistics in Industry, Business and Finance**Location:** Conference Room 102 | **Chair:** Jean-Michel Poggi**10:55-11:15 AM** **Lot Heterogeneity in Statistical Quality Control: An enhanced Optimization Approach for the Design of Rectifying Sampling Plans****Speaker:** Jaqueline Bojer**11:15 –11:35 AM** **Stacking Evidence across tests in R&D****Speaker:** Jan-Willem Bikker**11:35 –11:55 AM** **A Requirements-Driven Lifecycle Digital Twin Methodology for Innovative SMRs: Architecture Integration and Expected Benefits****Speaker:** Taecheol Park**Tue, September 8**

10:55 –11:55 AM

Teaching, Consulting and Knowledge Transfer in Statistics**Location:** Conference Room 106 | **Chair:** Shirley Coleman**10:55-11:15 AM** **Bayesian Optimization as Design of Experiments: The Entropy Connection****Speaker:** Arno Strouwen**11:15 –11:35 AM** **A Practical Roadmap for Choosing Correct Statistical Tests, Based on Three Decades of Teaching Experience****Speaker:** Hossein Bevrani**11:35 –11:55 AM** **Plackett and Burman arrays Revisited****Speaker:** Jonathan Smyth-Renshaw**Tue, September 8**

10:55 –11:55 AM

Uncertainty quantification and computer experiments**Location:** Auditorium B | **Chair:** Julien Pelamatti**10:55-11:15 AM** **Prediction of physical fields under linear constraints****Speaker:** Mahamat Hamdan Nassouradine**11:15 –11:35 AM** **Multifidelity Gaussian process regression for solving nonlinear partial differential equations****Speaker:** Fatima-Zahrae El-Boukkouri**11:35 –11:55 AM** **Taxonomy of statistical models for investigating order picking systems****Speaker:** Larissa Sander

Tue, September 8

12:00 –1:00 PM

Data Analytics and Data Science: Case Studies**Location:** Conference Room 103 | **Chair:** Andrea Ahlemeyer-Stubbe**12:00 –12:20 PM** **An IoT-inspired concept for data-driven service provision and resource planning in the tourism sector, using a campsite as an example****Speaker:** Eva Scheideler**12:20 –12:40 PM** **Multivariate Six Sigma for the Optimization of the Meat Roasting Process in the Ready-to-Eat Food Industry****Speaker:** Alberto Ferrer-Hermenegildo**12:40 –1:00 PM** **Risk analysis of forest fires in Sicily, based on 2010-2023 observation period****Speaker:** Stefano Barone**Tue, September 8**

12:00 –1:00 PM

Reliability**Location:** Conference Room 107 | **Chair:** Antonio Pievatolo**12:00 –12:20 PM** **Variable Selection under Cumulative Exposure Model for Time-to-Event Data with Time-Varying Covariates****Speaker:** Yueyao Wang**12:20 –12:40 PM** **Reliability testing of repairable systems available in diverse configuration variants****Speaker:** Nikolaus Haselgruber**Tue, September 8**

12:00 –1:00 PM

Statistics in Industry, Business and Finance**Location:** Conference Room 102 | **Chair:** Jean-Michel Poggi**12:00 –12:20 PM** **A Scalable Analytics Platform for Enterprise Level Quality Management****Speaker:** Manuel Martin**12:20 –12:40 PM** **Adaptive soft sensor for product quality estimation in clinker production****Speaker:** Pierantonio Facco**12:40 –1:00 PM** **The Lack of Impact of Lean Six Sigma in Textiles, Apparel and Other Basic Industries****Speaker:** A. Blanton Godfrey**Tue, September 8**

12:00 –1:00 PM

Teaching, Consulting and Knowledge Transfer in Statistics**Location:** Conference Room 106 | **Chair:** Marina Vives-Mestres**12:00 –12:20 PM** **CROSSVALI: A Method for Prompting AI for Data Analysis****Speaker:** Anne Driscoll, Jennifer Van Mullekom**12:20 –12:40 PM** **Bridging the Gap: Interactive Discovery as a Booster for Preparing Industry-Ready Graduates****Speaker:** Paolo Chiappa, Volker Kraft**12:40 –1:00 PM** **Deep Adaptive Design for Model-Based DOE, Screening, and Bayesian Optimization****Speaker:** Arno Strouwen**Tue, September 8**

12:00 –1:00 PM

Uncertainty quantification and computer experiments**Location:** Auditorium B | **Chair:** Julien Pelamatti**12:00 –12:20 PM** **Spectral Clustering for Detecting Stationary Subregions in Gaussian Process Regression****Speaker:** Théo Sylvestre**12:20 –12:40 PM** **Multi-fidelity Gaussian processes for noisy outputs and non-nested experiment designs: a comparison between the recursive and non-recursive formulations****Speaker:** Nils Baillie**12:40 –1:00 PM** **Integrating Global Sensitivity Analysis into Bayesian Optimization for Tactical Decision Support in Transport Logistics****Speaker:** Lara Kuhlmann de Canaviri

Tue, September 8

2:00 –3:30 PM

Design and modeling of computer experiments**Location:** Conference Room 102 | **Chair:** Bertrand Iooss**2:00 –2:30 PM** Random Designs for Quantisation in High Dimension**Speaker:** Luc Pronzato**2:30 –3:00 PM** Active Subspace Embedding for Parsimonious Gaussian Process Surrogates**Speaker:** Amandine Marrel**10:00 –10:30 AM** Multivariate sensitivity analysis for risk analysis with spatial outputs: a comparison exercise**Speaker:** J  r  my Rohmer**Tue, September 8**

2:00 –3:30 PM

Hands-on with physical experiments for teaching Design of Experiments**Location:** Conference Room 103 | **Chair:** Morten Bormann Nielsen, Christian Ritter**2:00 –3:30 PM** Hands-on with physical experiments for teaching Design of Experiments**Speaker:** Christian Ritter, Morten Bormann Nielsen**Tue, September 8**

2:00 –3:30 PM

ISEA Session - Statistical Engineering**Location:** Auditorium B | **Chair:** Inez Zwetsloot**2:00 –2:30 PM** XAI for signal diagnosis in SPM**Speaker:** Inez Zwetsloot**2:30 –3:00 PM** Assessing inter-rater reliability of LLMs with the probability of agreement**Speaker:** Nathaniel Stevens**10:00 –10:30 AM** A Cooperative Framework for Raw Material Acceptance: Integrating Supplier and Customer Perspectives via SMB-PLS**Speaker:** Alberto J. Ferrer-Riquelme**Tue, September 8**

2:00 –3:30 PM

Mathmet session - Digital twins for industrial machine vision systems and reference data generation**Location:** Conference Room 106 | **Chair:** Hichem Nouira**2:05 –2:25 PM** Digital Twin for optimal positioning of an industrial machine vision camera**Speaker:** Dario Pasin**2:25 –2:45 PM** Enhancing photogrammetric measurement systems through Gaussian Splatting**Speaker:** Mattia Trombini**2:45 –3:05 PM** Development of digital twins in metrology for a stereovision system**Speaker:** Katarina Josic**3:05 –3:30 PM** Generalized constraints on reference data generation for software verification**Speaker:** Louis-Ferdinand Lafon**Tue, September 8**

4:00 –5:00 PM

Box medal**Location:** Auditorium B | **Chair:** Winfried Theis**4:00 –5:00 PM** Enhancing Definitive Screening Designs with Multilevel Categorical Factors**Speaker:** Bradley Jones**Tue, September 8**

5:00 –5:10 PM

Greenfield challenge**Location:** Auditorium B | **Chair:** Winfried Theis**5:00 –5:10 PM** An Academic Year Dedicated to George E. P. Box at the Faculty of Mathematics and Statistics in Barcelona**Speaker:** Llu  s Marco-Almagro

Wednesday, September 9

Wed, September 9

9:00 –10:30 AM

INFORMS Session - Quality Statistics Reliability (QSR)

Location: Auditorium B | **Chair:** Christian Capezza, Mostafa Reisi Gahrooei

9:00 –9:30 AM Response Grid Plots for Model-Agnostic Explainable AI

Speaker: Russell Barton

9:30 –10:00 AM FedCOT: Personalized Federated Transfer Learning With Conditional Optimal Transport for Manufacturing Predictive Modeling

Speaker: Jiaqi Qiu

10:00 –10:30 AM Spatial–Temporal Large Language Models for Time-Series Data

Speaker: Ziyue Li

Wed, September 9

9:00 –10:30 AM

Uncertainty quantification and sensitivity analysis

Location: Conference Room 103 | **Chair:** Véronique Maume-Deschamps

9:00 –9:30 AM Sensitivity analysis for sets: Application to pollutant concentration maps

Speaker: Celine Helbert

9:30 –10:00 AM Explicit functional ANOVA and new results in model and algorithm explainability and sensitivity analysis

Speaker: Nicolas Bousquet

10:00 –10:30 AM Sensitivity Measures for Continuous Actions

Speaker: Lea Friedli

Wed, September 9

9:00 –10:30 AM

itENBIS Session - Flexible and Scalable Models for Complex Data Structures

Location: Conference Room 106 | **Chair:** Amalia Vanacore

9:00 –9:30 AM Fuzzy jump models for soft and hard clustering of mixed-type multivariate time series

Speaker: Federico Cortese

9:30 –10:00 AM Variable selection and high dimension in multinomial models

Speaker: Marcella Niglio

10:00 –10:30 AM Small area models for count data: an area-level EFD model

Speaker: Serena Arima

Wed, September 9

9:30 –10:30 AM

AI: Machine Learning and Predictive Analytics

Location: Conference Room 102 | **Chair:** Francesca Bassi

9:30 –9:50 AM Belief Propagation for Early Sequential Feature Selection in Manufacturing

Speaker: Joana Martins

9:50 –10:10 AM Decision Reliability in Uplift Modeling: A Stability- and Value-Driven Framework for Customer Retention Policy Selection

Speaker: Massimo Pacella

10:10 –10:30 AM Wrapper-Based Variable Selection for Interacting Variables in Manufacturing

ing

Speaker: Marcus Engsig

Wed, September 9

10:55 –11:55 AM

AI: Machine Learning and Predictive Analytics**Location:** Conference Room 102 | **Chair:** Riccardo Ceccato**10:55 –11:15 AM** **A Two-Dimensional View of Classification Difficulty: Local Ambiguity and Global Separability****Speaker:** Yariv N. Marmor**11:15 –11:35 AM** **Ranking Sets of Variables by Multivariate Association: a Non Parametric Combination Approach****Speaker:** Elena Barzizza**11:35 –11:55 AM** **A two-layer model for opinion spread in hypergraphs as a Markov chain and as the object of machine learning methods****Speaker:** András Zempléni**Wed, September 9**

10:55 –11:55 AM

Design of Experiments**Location:** Auditorium B | **Chair:** Luc Pronzato**10:55 –11:15 AM** **Gradient-Based Line Search for Continuous Optimal Designs in Spatial Statistics****Speaker:** Helmut Waldl**11:15 –11:35 AM** **Robust D-Optimal Designs for Ordinal Split-Plot Experiments via Surrogate Objective Functions****Speaker:** Marcus Perry**11:35 –11:55 AM** **Model Selection for Screening Experiments with Random Effects: An Adaptation of the SAMS Algorithm****Speaker:** Robin van der Haar**Wed, September 9**

10:55 –11:55 AM

Statistics in Industry, Business and Finance**Location:** Conference Room 103 | **Chair:** Andrea Ahlemeyer-Stubbe**10:55 –11:15 AM** **Understanding Tourism Demand: A Tree-Based Analysis of Territorial Drivers****Speaker:** Giulia Contu**11:15 –11:35 AM** **Gastronomic Tourism in Italy: Measuring Tourist Attitudes and Identifying Market Segments****Speaker:** Francesca Bassi**Wed, September 9**

10:55 –11:55 AM

Time Series, Forecasting and Dynamic Systems**Location:** Conference Room 106 | **Chair:** Ouassim Feliachi**10:55 –11:15 AM** **A Semi-Supervised Framework for Optimisation-Based Label Inference in RUL Prediction****Speaker:** Joseph Cupit**11:15 –11:35 AM** **Diffusion Models for Multivariate Probabilistic Net Load Forecasting in Transmission Grid Congestion Management****Speaker:** Maxime Ducourau**11:35 –11:55 AM** **INAR(1) Processes based on the Zipf-PSS distribution****Speaker:** Marta Perez-Casany**Wed, September 9**

12:00 –1:30 PM

Active Session - ENBIS-Live: Real Problems**Location:** Conference Room 103 | **Chair:** Jennifer Van Mullekom**12:00 –1:30 PM** **ENBIS-Live: Real Problems. Real Time. Real Stats.****Speaker:** Jennifer Van Mullekom

Wed, September 9

12:00 –1:30 PM

Bridging AI and Statistics**Location:** Conference Room 102 | **Chair:** Bart De Ketelaere**12:00 –12:30 PM** **Applied Statistics in the Era of Artificial Intelligence: A focus on AI Assurance****Speaker:** Jie Min**12:30 –1:00 PM** **Novel AI Solutions for Process Monitoring and Optimization****Speaker:** Bianca Maria Colosimo**1:00 –1:30 PM** **Discriminative Open Set Active Learning (DOSAL)****Speaker:** Bart De Ketelaere**Wed, September 9**

12:00 –1:30 PM

QT / QE / Technometrics Session**Location:** Auditorium B | **Chair:** Sven Knoth**12:00 –12:30 PM** **Constructing large OMARS designs by concatenating two definitive screening designs****Speaker:** Peter Goos**12:30 –1:00 PM** **The allure and the perils of summarizing process performance in a single index****Speaker:** Mahmut Onur Karaman**1:00 –1:30 PM** **Time series models for cultural heritage preservation: The case of the Brunelleschi's Dome****Speaker:** Fiammetta Menchetti**Wed, September 9**

12:00 –1:30 PM

frENBIS Session - Advances in machine learning and sensitivity analysis**Location:** Conference Room 106 | **Chair:** Jean-Michel Poggi**12:00 –12:30 PM** **Geographically Weighted Regression for Low-Cost Sensors Calibration****Speaker:** Jean-Michel Poggi**12:30 –1:00 PM** **Quantile oriented sensitivity analysis: why and how?****Speaker:** Véronique Maume-Deschamps**1:00 –1:30 PM** **Shapelet learning via sparse feature selection for interpretable time series classification****Speaker:** Julien Pelamatti**Wed, September 9**

2:30 –3:30 PM

AI: Machine Learning and Predictive Analytics**Location:** Conference Room 103 | **Chair:** Morten Bormann Nielsen**2:30 –2:50 PM** **Semi-Supervised PARAFAC2 Decomposition for Computational Phenotyping Using Electronic Health Records****Speaker:** Mostafa Reisi Gahrooei**2:50 –3:10 PM** **Sustainable specialty chemical design through multi-objective latent-variable model inversion****Speaker:** Pierantonio Facco**3:10 –3:30 PM** **Decomposition of Serially Dependent Data into Static and Dynamic Latent****Structures****Speaker:** Moritz Bauchrowitz**Wed, September 9**

2:30 –3:30 PM

Data Analytics and Data Science: Case Studies**Location:** Conference Room 107 | **Chair:** Elena Barzizza**2:30 –2:50 PM** **Nonparametric tests for multivariate stability data****Speaker:** Riccardo Ceccato**2:50 –3:10 PM** **Clustering for Detecting Careless Respondents: A Case Study****Speaker:** Silvia Villanova**3:10 –3:30 PM** **Preference mapping for product optimization: a case study****Speaker:** Alessandro Fanesi

Wed, September 9

2:30 –3:30 PM

Measurement Uncertainty and Metrology**Location:** Conference Room 106 | **Chair:** Hichem Nouria**2:30 –2:50 PM Bias and Multiplicity in Producer Risk Estimation under Simplified Conformity Assessment Models****Speaker:** Omar Jair Purata Sifuentes**2:50 –3:10 PM A study of prior sensitivity in random effects models for decisions in interlaboratory comparisons: credible intervals versus Bayesian evidence****Speaker:** Séverine Demeyer**3:10 –3:30 PM An Interactive Software Application for Gauge R&R Analysis****Speaker:** Mahmut Onur Karaman**Wed, September 9**

2:30 –3:10 PM

Statistical Process Monitoring**Location:** Auditorium B | **Chair:** Sven Knoth**2:30 –2:50 PM Self-Starting Control Charts for Few-Shot In Situ Monitoring in Customized Manufacturing****Speaker:** Bianca Maria Colosimo**2:50 –3:10 PM Practical challenges and statistical solutions for process monitoring and control in dairy production****Speaker:** Ewa Szymanska**Wed, September 9**

2:30 –3:30 PM

Statistics in Pharma / Healthcare: Statistical Modelling and Learning for Biomedical Systems**Location:** Conference Room 102 | **Chair:** Hichem Nouria**2:30 –2:50 PM Kinetic Models by Physics-Informed Statistical Learning Methods****Speaker:** Marco Galliani**2:50 –3:10 PM Bayesian network-based Tikhonov MRI reconstruction****Speaker:** Sébastien Marmin**3:10 –3:30 PM Statistics Can Go Farther****Speaker:** Dibyen Majumdar**Wed, September 9**

3:35 –4:35 PM

Keynote**Location:** Auditorium B | **Chair:** Bertrand Iooss**3:35 –4:35 PM Domain Generalization and Adaptation in Digital Health (and beyond)****Speaker:** Peter Bühlmann**Wed, September 9**

4:35 –4:45 PM

Closing Ceremony**Location:** Auditorium B**Wed, September 9**

5:00 –6:00 PM

ENBIS 2026 debrief meeting (Head LOC/POC Florence & Barcelona, Exec, Office)**Location:** Auditorium B

Thursday, September 10

Thu, September 10

9:00 AM –1:00 PM

JMP Workshop: Human + AI in the Loop: AI-Supported Analysis and Learning in JMP

Location: Auditorium B | **Instructor:** Volker Kraft, Winfrid Theis

Thu, September 10

1:45 –5:45 PM

Consultancy Skills: Storytelling with Data

Location: Auditorium B | **Instructor:** Winfried Theis, Morten Bormann Nielsen

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ISBIS Session - Advances in Statistical Analysis for Large-Scale Dynamic Networks, Labour Market Outcomes, and Interpretable Ensemble Methods / 108

Real-Time Change Detection in Large-Scale Dynamic Networks

Author: Nathaniel Stevens¹

¹ *University of Waterloo*

In this talk we present a real-time change detection method for monitoring large, dynamic networks with community structure. We model the propensity for communication within and between communities to incorporate the structure of the underlying network. Our focus on communities makes our method scalable to large-scale networks and we use a window-based approach to accommodate network dynamics and a changing node set over time. We monitor deviations from the underlying model, where unexpectedly large deviations indicate potential changes. We benchmark our method using a simulation study with networks of 10,000 nodes and demonstrate its flexibility and detection accuracy. We apply the proposed method to a Reddit network defined by discussions on the r/WallStreetBets subreddit about the stock GME, which experienced one of the most notorious short squeezes in market history as retail investors took on hedge funds to drive GameStop's stock price sky-high. Our method is able to identify changes in the network well before the short squeeze.

Keywords:

anomaly detection, multivariate control chart, network monitoring

ISBIS Session - Advances in Statistical Analysis for Large-Scale Dynamic Networks, Labour Market Outcomes, and Interpretable Ensemble Methods / 93

Heterogeneity in STEM Graduate Wages Across Italian Universities: A Weighted Mixed-Effects Analysis

Author: Andrea Carta¹

Co-authors: Francesca Atzori¹; Giulia Contu²; Luca Frigau²

¹ *university of Cagliari*

² *University of Cagliari*

This study examines wage outcomes at the cohort level among STEM graduates in Italy, using data from the AlmaLaurea surveys covering 60 institutions over the period 2008-2023. The unit of analysis is a graduate cohort sharing the same university, degree level, and disciplinary category, observed one, three, or five years after completing their studies. Given the nested structure of the data and the heteroscedasticity arising from differences in cohort size, estimation relies on a weighted linear mixed-effects model incorporating random intercepts for both institution and survey year.

The findings reveal significant predictors of mean cohort remuneration. Geographic relocation for work is positively linked to earnings, whereas a greater share of women within a programme is negatively associated with cohort-average wages, capturing a composition effect at the programme level. Graduates holding a master's degree and those specialising in Computer Science and ICT or Industrial and Information Engineering command higher wages, while cohorts in Architecture and Civil Engineering earn considerably less relative to the Scientific baseline. Time since graduation emerges as one of the strongest predictors, with average wages rising markedly across survey intervals. A clear territorial divide is apparent, with cohorts based in the North earning substantially more than their Southern counterparts.

The cohort-level perspective treats average wages as synthetic indicators of the labour market returns associated with specific educational paths. Goodness of fit is evaluated via the correlation between fitted and observed cohort means and a size-weighted root mean squared error. The core findings hold across four robustness checks.

Keywords:

Returns to Education, STEM, Wages, Mixed-Effects Models, Italy, regression