

New Advances and Methodologies in the Field of Time Series and Forecasting ITISE-2024 [†]

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1. Introduction

The ITISE 2024 (10th International Conference on Time Series and Forecasting) seeks to provide a discussion forum for scientists, engineers, educators, and students regarding the latest ideas and realizations in the foundations, theory, models, and applications for inter-disciplinary and multidisciplinary research encompassing the disciplines of computer science, mathematics, statistics, forecasting, econometrics, etc., in the field of time series analysis and forecasting. The field of time series forecasting is multidisciplinary, involving economic, social, health, and engineering applications.

ITISE 2024 solicits high-quality original research papers (including significant work-in-progress) on any aspect of time series analysis and forecasting in order to motivate the generation and use of knowledge and new computational techniques and methods on forecasting in a wide range of fields.

As in previous editions, ITISE 2024 will be held in Gran Canaria (Spain) during 15–17 July 2024. The conference organizers are Prof. Olga Valenzuela, Prof. Fernando Rojas, Prof. Luis Javier Herrera, Prof. Hector Pomares, and Prof. Ignacio Rojas; they are all from the University of Granada, Spain. More information about the Scientific Committee can be found on the following web page: <https://itise.ugr.es/>.

2. Main Topics of ITISE

As is well known, ITISE aims to provide a friendly discussion forum for scientists, engineers, educators, and students to discuss the latest ideas and achievements in the fundamentals, theory, models, and applications in the field of time series analysis and forecasting. More specifically, the main topics of ITISE are as follows:

1. Time series analysis and forecasting

- Non-parametric and functional methods;
- Vector processes;
- Probabilistic approaches to modeling macroeconomic uncertainties;
- Uncertainties in forecasting processes;
- Non-stationarity;
- Forecasting with many models;
- Model integration;
- Forecasting theory and adjustment;
- Ensemble forecasting;
- Forecasting performance evaluation;
- Interval forecasting;
- Data preprocessing methods: data decomposition, seasonal adjustments, and singular adjustments;



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- Spectrum analysis, detrending methods, etc.
- 2. **Econometrics and forecasting**
 - Econometric models;
 - Economic and econometric forecasting;
 - Real macroeconomic monitoring and forecasting;
 - Advanced econometric methods.
- 3. **Advanced methods and online learning in time series**
 - Adaptivity of stochastic models;
 - Online machine learning for forecasting;
 - Aggregation of predictors;
 - Hierarchical forecasting;
 - Forecasting with computational intelligence;
 - Time series analysis with computational intelligence;
 - Integration of system dynamics and forecasting models.
- 4. **High-dimension and complex/big data**
 - Local vs. global forecasts;
 - Dimension reduction techniques;
 - Multi-scaling;
 - Forecasting complex/big data.
- 5. **Forecasting of real problems**
 - Health forecasting;
 - Atmospheric science forecasting;
 - Telecommunication forecasting;
 - Hydrological forecasting;
 - Traffic forecasting;
 - Tourism forecasting;
 - Marketing forecasting;
 - Modeling and forecasting in power markets;
 - Energy forecasting;
 - Climate forecasting;
 - Financial forecasting and risk analysis;
 - Forecasting electricity load and prices;
 - Forecasting and planning systems.

3. Special Issues in ITISE 2024

During ITISE 2024, several Special Issues were gathered. Special Issues are a very useful tool in order to complement the regular program with new and emerging topics of particular interest for the participating community. Special Issues that emphasized multidisciplinary and transversal aspects, as well as cutting-edge topics, were especially encouraged and welcomed, and in this edition of ITISE 2024 the following were received:

- **SI1. Economics As A Methodological Progression: The Pipeline From Conventional Methods To Supervised And Unsupervised Machine Learning:**
Papers such as “An Introduction to Machine Learning for Panel Data and Split Decisions: Practical Machine Learning for Empirical Legal Scholarship” have recognized the tantalizing possibility that a single dataset, if properly curated, can support the following methodological progression:
Organizers: Prof. Dr. James Ming Chen is the Justin Smith Morrill Chair in Law and Professor of Law at Michigan State University. Professor Chen holds a law degree from Harvard University and a master’s degree in data science from Northwestern University. He is a member of the American Law Institute and a senior fellow of the Administrative Conference of the United States. Professor Chen’s scholarship covers law, economics, and machine learning.

- **SI2. Time Series Analysis For Sustainable And Resilient Infrastructure Systems:** Resilient critical infrastructure is a must within Agenda 2030, where sustainable development goals (SDGs) recommend to “build resilient infrastructure to promote sustainable industrialization and foster innovation”. These systems, such as energy, water, and transport systems, are increasingly challenged by the frequency and intensity of natural adverse events. The availability of climate scenarios and environmental monitoring and forecast data, as well as the digitalization of the system control functions and processes, provide new opportunities for the development and application of analysis methods of time series: by allowing modeling of the systems behavior, time series analyses enable the evaluation of operational risks and support resilience enhancement. The application of theoretical methods for simulating the physical and functional performance of critical infrastructures is challenged by the complexity and availability of interdisciplinary domain knowledge, which is indeed required for building reliable models for behavior predictions and simulations of real systems.

This Special Issue aims to present successful applications of time series modeling and forecasting of series representing the behavior of complex socio-technical systems, such as critical infrastructures, to increase their sustainability and resilience to natural hazards. Submissions are expected to reflect both the advancements of theoretical methods based on real problems and the experimental works in statistical analysis and soft computing applications regarding time series related to such domains.

Suggested topics of this Special Issue include, but are not limited to, the following:

- Approaches for spatio-temporal data series modeling of safety-critical systems and their vulnerability to natural hazards.
- Critical evaluation and comparisons of alternative approaches for experimental time series modeling and analysis.
- Case studies for time series modeling and analyses of sustainable and resilient systems.
- New software environments, such as digital twins, for data analyzing and applications for solving problems related to sustainable and resilient systems.
- Soft computing and fuzzy techniques for engineering time series data.
- Novel approaches for incorporating uncertainty and variability in time series analysis of critical infrastructures.
- Application of advanced sensor technologies for real-time data collection and its impact on the resilient infrastructure systems.
- Resilience-oriented optimization methods for critical infrastructure design and operation based on time series insights.

Organizers: **Dr. Maria Luisa Villani** is a senior researcher at the ENEA National Agency for New Technologies, Energy, and Sustainable Economic Development in Rome, Italy.

Maria Luisa Villani is a senior researcher at the ENEA National Agency for New Technologies, Energy, and Sustainable Economic Development in Rome, Italy. She holds a Ph.D. in Mathematics from the University of Warwick (England). Her research interests include tools for risk assessment and resilience of critical infrastructures to natural hazards, which are based on artificial intelligence methods, and IoT system architectures for smart cities. ORCID ID: <https://orcid.org/0000-0002-7582-806X>.

Dr. Ebrahim Ehsanfar is a senior research fellow at the Fraunhofer Institute for Material Flow and Logistics in Dortmund, Germany. *Ebrahim Ehsanfar is a senior research fellow at the Fraunhofer Institute for Material Flow and Logistics in Dortmund, Germany. He possesses expertise in machine learning, and holds a master's degree in Computer Science and is currently pursuing a Ph.D. in Logistics at the Technical University of Dortmund. ORCID ID: <https://orcid.org/0000-0002-6782-1503>.*

Dr. Sonia Giovinazzi is a research project manager for ENEA in Rome, Italy. *She is an Associate Professor of Civil Engineering, an adjunct at Sapienza University of Rome, and acts as a consultant at the World Bank for climate change and disaster risk assessment for national infrastructure plans. Sonia holds a Ph.D. in Risk Management of Natural and Anthropogenic Hazards on the Built Environment. ORCID ID: <https://orcid.org/0000-0003-0820-5003>.*

- **SI3. Artificial Intelligence And Statistical Modeling In Water Resource Sustainability:** Guaranteeing the availability of water quantitatively and qualitatively is essential for not only preserving and maintaining the environment, but also for supporting socio-economic developments. However, the increasing population and economic growth, the increasing demand for water, and the more than evident modifications in the patterns of the hydrological cycle, mainly due to anthropogenic global warming, are seriously compromising the sustainability of water resources. This complexity also represents a challenge for the development of innovative approaches to capture and reveal the intrinsic nature of these induced modifications and to advance towards the sustainability of water resources. In this sense, approaches based on artificial intelligence and advanced statistical techniques can help to identify these modifications and to generate efficient and robust predictive models.

This Special Issue focuses on enhancing the resilience of water systems and covers a range of suggested topics: innovative methodologies for time series analysis, spatio-temporal hydrological-hydraulic analysis, advancements in forest restoration and agriculture, reusing of non-conventional water resources, techniques for improving water quality, the concept of water circularity, advances in water quality modeling, advances in the definition of new chemical and ecological water indices, and modifications in water quality parameters due to climate change. Through this collaborative effort, the objective is to make a significant contribution to the ongoing discussion on advancing the sustainability of water resources.

Guest Editors Profs. Dr. Santiago Zazo, Dr. José-Luis Molina, Dr. Fernando Espejo, and Dr. Carmen Patino-Alonso have published a Special Issue (SI), titled “Advances in water allocation and optimal reservoir operation: Artificial intelligence and statistical modeling in water resources sustainability”, in the journal *Water MDPI* (https://www.mdpi.com/journal/water/special_issues/L1LP417CR3).

Organizer: *Prof. Santiago Zazo del Dedo is a member of the IGA Research Group—University of Salamanca, Spain. Other organizers include Dr. José-Luis Molina, Dra. Carmen Patino, Dr. Fernando Espejo, and Dr. Juan Carlos García.*

- **SI4. Forecasting Financial Markets:** The Special Issue, titled “Forecasting Financial Markets”, which is included at the upcoming conference on ITISE, is designed to delve into the intricacies and evolving dynamics of financial market predictions. This Special Issue aims to bring together leading academics, researchers, and practitioners to explore cutting-edge methodologies and innovations in forecasting financial markets. Participants will have the opportunity to discuss the applications of traditional time series analysis techniques and newer machine learning approaches, including neural networks and deep learning, for predicting market movements, volatility, and trends. Emphasis will be placed on the challenges of modeling financial data, which is often non-linear, non-stationary, and influenced by a myriad of factors ranging from macroeconomic indicators to geopolitical events.

Furthermore, this Special Issue will explore the practical implications of financial market forecasting on portfolio management, risk assessment, algorithmic trading, and regulatory compliance. We will examine case studies that demonstrate the successful application of forecasting models in real-world scenarios, as well as discuss the ethical considerations and potential biases in model development and implementation. The goal is to foster a rich dialog on the future direction of financial markets forecasting, encouraging collaboration and innovation among participants. This Special Issue promises to provide valuable insights into how emerging technologies and analytical techniques can enhance our understanding and prediction of complex financial systems, ultimately contributing to more robust and resilient financial markets.

Organizers: *Prof. Dr. Hasanthi Pathberiya is a Senior Lecturer at the Statistics Department of the Statistics University of Sri Jayewardenepura.*

- **SI5. Functional Time Series Analysis And Application:** This Special Issue is set to provide a comprehensive overview of the latest advancements and methodologies

regarding the analysis of functional data observed over time. Functional time series analysis extends beyond traditional time series by considering data that are functions or curves at each time point, enabling a more nuanced understanding of complex dynamics in various fields.

Participants will delve into the theoretical underpinnings of functional data analysis (FDA) and discuss how these methods can be applied to capture the intrinsic variability in datasets.

Moreover, the Special Issue will highlight the practical applications of functional time series analysis across a diverse range of disciplines such as finance, meteorology, environmental science, and health sciences. Presentations and discussions will focus on how these techniques are used to model and forecast complex phenomena, such as intraday price curves in financial markets, daily temperature profiles, pollution levels over time, and growth curves in biostatistics. The goal is to foster an interdisciplinary exchange of ideas, promoting the integration of FDA techniques into mainstream time series analysis and encouraging collaboration between statisticians, data scientists, and domain experts. By exploring both the methodological innovations and their applications, this Special Issue aims to provide attendees with a deeper understanding of the potential of functional time series analysis to address contemporary challenges in data analysis and prediction.

Organizers: Prof. Nengxiang Ling is from the Hefei University of Technology in Hefei, China.

- **SI6. Forecasting In High-Dimension And Complex/Big Data:** This Special Issue is designed to address the growing challenges and opportunities presented by the analysis of high-dimensional and complex datasets. In an era where big data have become ubiquitous across various industries, from finance and marketing to healthcare and environmental studies, the need for sophisticated forecasting methods that can effectively handle the volume, variety, and velocity of such data is more critical than ever. This Special Issue aims to explore the latest developments in statistical and machine learning techniques tailored for high-dimensional time series forecasting. Topics will include dimensionality reduction, regularization methods, and advances in computational algorithms that enable the extraction of meaningful patterns and predictions from large datasets.

In addition, this Special Issue will provide a platform to discuss the application of these advanced forecasting methods in real-world scenarios and illustrate how they can uncover insights and support decision-making in complex systems. Attendees will hear from experts who have successfully overcome the challenges of working with big data, including dealing with sparsity and dependency structures in high-dimensional spaces, integrating heterogeneous data sources, and ensuring the interpretability and robustness of models. The discussions emphasize innovative approaches such as the use of deep learning and ensemble models to improve prediction accuracy and reliability. Through a combination of theoretical insights and practical case studies, this Special Issue aims to equip participants with the knowledge and tools to harness the power of big data for forecasting in their respective fields, paving the way for breakthrough advances in time series analysis.

Organizers: Prof. Fernando Rojas and Prof. Luis Javier Herrera are from the University of Granada in Spain.

- **SI7. Computational Intelligence Methods For Time Series:** Within the fields of science and engineering, it is very common to have data arranged in the form of time series data, which must be subsequently analyzed, modeled, and classified with the eventual goal of predicting future values. The literature shows that all these tasks related to time series can be undertaken using computational intelligence methods. In fact, new and further computational intelligence approaches, their efficiency, and their comparison to statistical methods and other fact-checked computational intelligence methods are significant topics in academic and professional projects and works. Therefore, this Special Issue aims at showing to our research community high-quality

and state-of-the-art computational intelligence (and statistical) related works applied to time series data and their tasks: analysis, forecasting, classification, and clustering. Furthermore, the experts can, from the starting point that the works shown provide, discuss different solutions and research issues for these topics.

In the rapidly evolving field of time series analysis, the integration of computational intelligence (CI) methods represents a frontier of innovation and exploration. The Special Issue, titled “Computational Intelligence Methods for Time Series”, will address the synergies between AI techniques and time series analysis, focusing on how artificial intelligence, machine learning, and evolutionary algorithms can improve predictive modeling and analysis. This convergence aims to tackle complex and dynamic time series data by utilizing AI’s adaptability, learning ability, and robustness to noise and uncertainty.

This Special Issue is not only about presenting novel AI methods but also about demonstrating their practical effectiveness in various areas such as finance, healthcare, environmental monitoring, and energy forecasting. The focus will be on the use of neural networks, fuzzy systems, genetic algorithms, and hybrid models to extract patterns, make predictions, and uncover hidden structures in time series data. The focus is on overcoming challenges such as non-linearity, high dimensionality, and prediction of rare events. Through a combination of technical presentations, case studies, and interactive discussions, participants will learn how AI methods can be used creatively to advance the field of time series analysis and provide solutions that are not only computationally efficient but also interpretable and scalable.

Organizers: Prof. Hector Pomares is from the University of Granada in Spain.

- **S18. Econometric Modeling Of Financial Market Trends:** This Special Issue aims to present the latest research on the study of risk in financial markets through econometric modeling of financial market trends. A wide range of studies applying econometric methods to financial issues are collected, covering topics such as interest rate fluctuations, volatility modeling, factor model analysis, risk and portfolio management, and the exploration of uncertainty in a financial framework. Moreover, as sustainable investment and financial products linked to sustainability, together with the different uses of cryptocurrencies, are current trends, several of the papers presented in this Special Issue will focus on these topics.

Organizers: Prof. María de la O González and Prof. Marta Tolentino are from the University of Castilla-La Mancha in Spain.

- **S19. Remote Sensing Time Series Analysis: Mapping And Classification:** Recent advances in remote sensing techniques have created a great opportunity to effectively and continuously monitor the land surface. These techniques include Interferometric Synthetic Aperture Radar (InSAR), Persistent Scatterer InSAR (PS-InSAR), Light Detection And Ranging (LiDAR), Global Navigation Satellite Systems (GNSS), Close-Range Photogrammetry (CRP), Robotic Total Station (RTS), and spectral indices, such as NDVI, EVI, NDWI, etc., by remote sensing satellites, such as MODIS, Landsat, Sentinel 2, etc. Spatio-temporal land surface monitoring can be rigorously carried out by analyzing the time series acquired from these techniques. Processing such time series can also be very challenging for several reasons, such as non-uniform sampling, biases as a result of preprocessing, and atmospheric/environmental noise. The aim of this Special Issue is to collect papers (original research articles and review papers) that offer insights into effectively monitoring and measuring land cover changes and land deformation using remotely sensed time series data.

Organizer: Prof. Ebrahim Ghaderpour works at the Department of Earth Sciences, Sapienza University of Rome, P.le Aldo Moro, 5, 00185 Rome, Italy, and at the Department of Geomatics Engineering, University of Calgary, Calgary, AB 2TN 1N4, Canada.

- **SI10. Soft Computing For Time Series In Civil Engineering And Environment:** Environmental and civil engineering are closely related disciplines that collaborate to address the environmental impacts of infrastructure development, promote sustainability, and protect natural resources. Their interdisciplinary approach is essential for addressing complex environmental challenges and creating a more sustainable built environment. With increasing concerns about environmental sustainability, civil engineers are tasked with incorporating environmentally friendly practices into their designs. This includes using environmentally friendly materials, utilizing energy-efficient technologies, and designing structures that minimize their impact on the environment.

Soft computing techniques, such as neural networks, fuzzy logic, and genetic algorithms, have become indispensable in various fields of engineering, especially in civil engineering, as they are able to process complex and uncertain data effectively, especially in the time series analysis. Time series data are widely used in civil engineering applications such as structural health monitoring, traffic flow prediction, and environmental monitoring. By employing soft computing methods, engineers can analyze and predict time series data, enabling flexible and robust approaches in these applications. In environmental monitoring and management, for example, soft computing techniques are used to analyze time series data related to parameters such as air quality, water levels, and temperature. This enables engineers to recognize trends, predict future environmental conditions, and make informed decisions about the environmental management of construction projects.

One significant application of soft computing in civil engineering is in structural health monitoring, where techniques like neural networks and fuzzy logic systems are used to analyze structural responses captured by sensors over time. These methods enable the real-time assessment of structural integrity, detection of anomalies, identification of damage, and prediction of future structural behavior, facilitating timely maintenance and repair decisions to ensure safety and longevity. Moreover, soft computing methods play a crucial role in predictive maintenance by analyzing historical sensor data to predict potential failures and prioritize maintenance activities, optimizing maintenance schedules, minimizing downtime, and extending the lifespan of critical infrastructure assets. Additionally, in construction project planning and management, soft computing techniques are employed to optimize schedules, resource allocation, and cost estimation, providing accurate planning and proactive management, while in construction monitoring, real-time sensor data analysis enables engineers to monitor progress, safety, and quality, ensuring project success through timely decision-making. In collaboration with colleagues from several countries as part of the IM4StEM project (<https://im4stem.eu/en/home/>), we emphasize the crucial link between the environment and civil engineering. Civil engineers have a major responsibility to design and monitor infrastructure in a way that minimizes environmental degradation and promotes sustainability.

Organizers: Prof. Marijana Hadzima-Nyarko is a Full Professor at the Faculty of Civil Engineering and Architecture Osijek, Josip Juraj Strossmayer University of Osijek, Croatia. Her scientific and professional fields include seismic engineering, seismic risk, and structural engineering of concrete and masonry structures. She is a member of several scientific committees of domestic and international journals, a member of conference organizing committees, and a reviewer for several domestic and international journals. ORCID DOI: <https://orcid.org/0000-0002-9500-7285>

Prof. Francisco Martínez-Álvarez is a Full Professor at the Data Science and Big Data Lab at the Pablo de Olavide University. His main research directions include time series forecasting, deep learning, and big data analytics. He has led a great number of research projects, both national and international. Moreover, he has been the principal investigator in industrial projects involved in IoT, machine learning, data mining, and artificial intelligence. ORCID ID: <https://orcid.org/0000-0002-6309-1785>

Prof. Dorin Radu is an Associate Professor at the Faculty of Civil Engineering, Transilvania

University of Braşov. He holds a Ph.D. in Civil Engineering—Structural Integrity of Steel Structures, and has teaching and research experience in Civil Engineering since 2003. His research interests include structural integrity, optimization of structural elements, neural networks applied in civil engineering, and new materials for sustainable constructions. ORCID ID: <https://orcid.org/0000-0001-5043-2723>

Prof. Borko Bulajic is an Associate Professor at the Faculty of Technical Sciences, University of Novi Sad, Serbia. He has given lectures on a variety of topics, including natural hazards, risk analysis methods, civil engineering design fundamentals, and earthquake engineering. His academic work focuses on how deep geological site surroundings affect surface's strong motion. He participated in a number of seismic microzonation studies as a member of an international team of experts from the USA, Serbia, Croatia, Bosnia and Hercegovina, North Macedonia, and India, being the person in charge of the geological zoning. In addition to working in academia, he has more than 18 years of expertise as a civil engineer. ORCID ID: <https://orcid.org/0000-0002-9241-1469>

Prof. Emmanuel Karlo Nyarko is an Associate Professor at the Department of Computer Engineering and Automation at the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek, Josip Juraj Strossmayer University of Osijek. He teaches various professional, (under)graduate, and postgraduate courses in automation, programming, artificial intelligence (machine learning and soft computing), and robot vision. His research interests include robot vision, artificial intelligence, and the application of machine learning methods in various fields. ORCID ID: <https://orcid.org/0000-0001-8041-3646>

- **SI11. Time Series Analysis With Computational Intelligence In Energy Forecasting:** Energy consumption forecasting is an operation of predicting the future energy consumption of electricity systems based on past or historical data, which has an increasing impact on society, in order to have an accurate forecast and prediction of electricity demand and, for example, to avoid the risk of temporary blackouts or a decrease in power quality. In several countries, these blackouts are a common system failure. This is because these sources (solar power plants and wind power plants) depend on weather conditions, which are stochastic by nature.

Electricity demand forecasting is becoming increasingly important. Correct forecasting makes it possible to plan and expand power sector facilities. Accurate forecasts can save operating and maintenance costs, increase the reliability of the energy supply and delivery system, and correct future development decisions.

The increasing share of renewable energy sources in energy production is a rapidly growing field of research, innovation, and transfer in recent years.

Surpluses and deficits in energy production negatively affect the operation of electricity grids. For a well-functioning energy system, it is essential to adapt energy production to current demand.

During the daily operation of conventional power plants, adjusting and determining energy production according to demand are tasks that can be achieved with accurate forecasting systems. However, these problems become more complicated in power plants based on renewable sources. This requires accurate forecasting of energy production from renewable sources, especially when the share of such plants is significant in relation to other sources of electricity. Currently, it is necessary to develop methods for forecasting electricity production from wind or solar power plants, or renewable energy in general, taking into account many exogenous factors and, of course, weather conditions.

Existing approaches for forecasting models can be classified into the following four categories: physical, statistical, machine learning, and hybrid. Currently, thanks to the powerful advancement of intelligent systems, advanced deep learning models have become an indispensable tool in the realization of accurate forecasting models.

Organizers: **Prof. Peter Glösekötter** is a Professor at the Department of Electrical Engineering and Computer Science at FH Münster, and is a researcher in the field of electronic and information technology, contributing extensively to advancements in sensors, magne-

tometers, and energy storage systems. His work, published across a variety of prestigious journals and conference proceedings, showcases a strong focus on nanotechnology, quantum sensing, and machine learning applications for robust measurements and diagnostic tools. Innovative approaches are evidenced by his leadership in developing zinc–air batteries and pioneering energy-autonomous systems, significantly impacting smart health and environmental resource management.

Dr. Joseph Moerschell is a Professor of Electronics and Mechatronics in HES-SO at the University of Applied Sciences of Western Switzerland, Sion. After completing a Ph.D. in Industrial Electronics at EPFL, Lausanne, he specialized in the instrumentation development for science applications, both in space missions and in extreme-environment applications in alpine and polar regions. This includes micro-mechanical manipulators, innovative sensors (optic and electromagnetic), and associated signal processing and autonomous power supply. More recently, his group developed laser spectroscopy and quantum sensing to probe such environments.

Prof. Ignacio Rojas is a Professor at the Department of Computer Engineering, Automation, and Robotics at the University of Granada. His field of research includes complex multidimensional systems, which are supported by high-performance computing platforms and focus on solving real problems in various fields, such as bioinformatics, biomedicine, and time series prediction. As a result of the research developed, he has published more than 270 contributions reflected in Clarivate Web of Science, has participated with papers in more than 125 international conferences related to his field of research, has directed 27 doctoral theses, and has organized a total of 23 international and 5 national conferences.

Prof. Tilman Sanders is a Professor at the Department of Electrical Engineering and Computer Science at FH Münster, and researcher in the field of power electronics and power system engineering. His work focuses on increased energy efficiency by utilizing new power semiconductor materials like SiC and GaN in power converters for drives and renewables; the integration of renewable power sources; and the integration of e-mobility and heat pumps into the power grid, while maintaining its stability.

Prof. Markus Gregor is a Professor at the Department of Engineering Physics at the FH Münster University of Applied Sciences. One particular focus of his quantum technology group is the implementation of quantum sensors based on NV centers within diamonds. The main areas of his research include cost-efficient and brilliant single-photon sources based on NV centers in nanodiamonds; functionalization of optical fibers with micro- and nanodiamonds for sensor technology; and microstructuring of optical waveguides with embedded nanodiamonds. Recently, his research also included the use of machine learning for quantum sensor applications.

Prof. Sarah Trinschek is a Professor at the Münster University of Applied Sciences. Her research activities involve modeling and simulation of physical systems, advanced data analysis, and machine learning. With a background in non-linear physics, complex systems, and soft matter, her recent research interests focused on projects in collaboration with experimental partners. These involve the development of intelligent sensor systems by the application of machine learning to sensor data, as well as the control and optimization of optical systems.

Prof. Ruxandra Stoean is an Associate Professor at the Department of Computer Science, Faculty of Sciences, University of Craiova, Romania. She holds a Ph.D. in Computer Science, with a thesis on optimization through evolutionary computation. Her current research interests involve the development of deep learning models for images and signals, with applications in engineering and renewable energy. She is a doctoral co-supervisor at the Inter-University Ph.D. Program, titled “Electric Energy Systems”, at the University of Malaga, Spain.

4. Plenary Talk in ITISE 2024

In this edition of ITISE, we are honored to have the following invited speaker:

1. **Prof. Hossein Bonakdari**, Ph.D., P.Eng., an esteemed Professor at the University of Ottawa, Canada.
He stands at the forefront of developing artificial intelligence techniques in time series

analysis. His innovative integration of stochastic and machine learning algorithms has opened new pathways for addressing time series problems, significantly impacting both national and international research landscapes. Dr. Bonakdari's pioneering work focuses on crafting cutting-edge models for real-time data analysis and forecasting, contributing profoundly to the field. His seminal work, titled "Stochastic Modeling: A Thorough Guide to Evaluate, Pre-Process, Model, and Compare Time Series," paves the way for groundbreaking approaches in time series analysis and predictive modeling, particularly in applying stochastic models.

As a prolific author, he has published over 280 papers in indexed journals, authored 14 book chapters, and penned 3 books. According to a Scopus report, his scholarly contributions are widely recognized and revered, amassing over 6500 citations with an impressive h-index of 46. As an acclaimed speaker, Dr. Bonakdari has delivered over 100 presentations at various national and international conferences, sharing his insights and research advancements.

Dr. Bonakdari is a respected section Board Member of the journal *Sustainability* and serves on the Editorial Boards of *Natural Resources* and *Earth*, further contributing to the scholarly community. Dr. Bonakdari's exceptional research achievements have garnered global recognition, consistently placing him in the top 2% of the world's top scientists across various fields for four consecutive years (2019–2023).

2. **Prof. Faramarz Famil Samavati**, Full Professor of Computer Science at the Department of Computer Science, University of Calgary.

His primary research focus lies in computer graphics, visualization, digital earth, and scientific computations. While achieving success in theoretical research, he actively pursues real-world and practical applications related to his fundamental research. His efforts on theory to real-world applications have made solid contributions to multiple technological innovations through various approaches, including industrial outreach, commercialization, tech transfer, and the development of software tools.

Dr. Samavati has been recognized with numerous awards, including the Peak Scholar Award for his excellence in Innovation and Knowledge Engagement; the Established Career Scholarship Excellence Award; the Digital Alberta Award; and the Association for Computing Machinery (ACM) Recognition of Service Award. Dr. Samavati leads the Graphics, Interaction, and Visualization (GIV) research lab and supervises a large team of graduate students and research staff. With over 150 peer-reviewed publications, Dr. Samavati has received eight Best Paper Awards for his innovative research.

These plenary lectures strengthened the aim of this conference—diffusion and discussion of high-quality research from some of the most recognized scientists in these fields.

5. ITISE 2024 and MDPI *Engineering Proceedings*

As in previous editions of ITISE 2024, a selection of papers was published in *Engineering Proceedings*. The first *Engineering Proceedings* paper, with the contributions from the congress, was published for ITISE 2021 [1], as well as for ITISE 2022 [2] and ITISE 2023 [3].

The editors of *Engineering Proceedings* certify to the publisher that all papers published in this Special Issue have been subjected to peer review performed by the editors themselves. Reviews are conducted by expert referees adhering to the professional and scientific standards expected of a *Engineering Proceedings* journal. Here, the type of peer review was single-blind; the conference submission management system used was Easy-chair (185 contributions were submitted, and on average have been reviewed by at least two expert reviewers). A total of 67 contributions were selected for MDPI *Engineering Proceedings* at ITISE 2024.

Conflicts of Interest: The editors declare no conflicts of interest.

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