

PROCEEDINGS OF SPIE

# ***International Conference on Statistics, Data Science, and Computational Intelligence (CSDSCI 2022)***

**Grigorios N. Beligiannis**  
*Editor*

**19–21 August 2022**  
**Qingdao, China**

*Organized by*  
University of Évora (Portugal)

*Sponsored by*  
AEIC Academic Exchange Information Centre (China)

*Published by*  
SPIE

**Volume 12510**

Proceedings of SPIE 0277-786X, V. 12510

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

International Conference on Statistics, Data Science, and Computational Intelligence (CSDSCI 2022),  
edited by Grigorios N. Beligiannis, Proc. of SPIE Vol. 12510, 1251001  
© 2023 SPIE · 0277-786X · doi: 10.1117/12.2670007

Proc. of SPIE Vol. 12510 1251001-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:  
Author(s), "Title of Paper," in *International Conference on Statistics, Data Science, and Computational Intelligence (CSDSCI 2022)*, edited by Grigorios N. Beligiannis, Proc. of SPIE 12510, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X  
ISSN: 1996-756X (electronic)

ISBN: 9781510661325  
ISBN: 9781510661332 (electronic)

Published by  
**SPIE**  
P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time)  
[SPIE.org](http://SPIE.org)  
Copyright © 2023 Society of Photo-Optical Instrumentation Engineers (SPIE).

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL LIBRARY**  
[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

vii *Conference Committee*

---

## APPLIED STATISTICS AND STATISTICAL ANALYSIS OF INDUSTRY FACTORS

---

- 12510 02 **International trends analysis for subject of rare earth-magnesium alloys** [12510-51]
- 12510 03 **Research on carbon emission in key areas of Anhui Province and development of energy and power industry** [12510-78]
- 12510 04 **The development and industry risks of new energy vehicles in China** [12510-58]
- 12510 05 **Discussion of marketing decision-making strategies based on market research** [12510-25]
- 12510 06 **The economic impact of COVID-19 on biotech companies** [12510-56]
- 12510 07 **Real estate risk analysis based on support vector machine** [12510-5]
- 12510 08 **Prediction of excavation-type heritage crimes based on random forests** [12510-17]
- 12510 09 **How the price keeps constant in oligopoly market through a non-concurrent game** [12510-54]
- 12510 0A **Tourist trajectory prediction based on improved LightGBM** [12510-22]
- 12510 0B **Construction of a comprehensive evaluation system for the high-quality development of foreign trade under the dual-cycle paradigm** [12510-43]
- 12510 0C **Research hotspots and trends analysis of investigative interrogation methods based on CiteSpace** [12510-21]
- 12510 0D **Parallel design and evaluation of GFSR (521,32) on FPGA** [12510-38]
- 12510 0E **3D digital core reconstruction for deep shale gas reservoirs based on Markov chain-Monte Carlo method** [12510-24]
- 12510 0F **Study on the synergy development degree of regional port logistics and economy** [12510-72]
- 12510 0G **Identification of Chinese medicinal materials based on cluster analysis** [12510-71]
- 12510 0H **Research on rural nonuse value evaluation based on the questionnaire data of Shuikou Township, Huzhou City** [12510-47]
- 12510 0I **Research on the measurement method of barefoot footprint similarity** [12510-18]

- 12510 OJ **Research trends of human resource management: a bibliometric analysis based on keywords network topological structure** [12510-16]
- 12510 OK **Research on the evaluation of economic vitality of districts in Beijing on experimental and mathematical statistics analysis** [12510-4]
- 12510 OL **Photovoltaic building integration industry index statistics and modeling forecast analysis** [12510-37]

---

**BIG DATA APPLICATION AND DATA DEVELOPMENT FORECAST**

---

- 12510 OM **The application of regression models to market rate of return prediction** [12510-44]
- 12510 ON **Stock prediction and analysis using LSTM network** [12510-28]
- 12510 OO **Composition of interval-valued fuzzy relations with Bandler-Kohout subproduct in marine pollution assessment** [12510-14]
- 12510 OP **Current status, hot spots, and trends of cross-border e-commerce research in the context of Internet+: an analytical study based on CNKI domestic bibliometrics 2015–2022** [12510-35]
- 12510 OQ **Adaptive Lasso based on regularized weight and its application in variable selection for regression** [12510-73]
- 12510 OR **Analysis of loan defaults based on data mining** [12510-39]
- 12510 OS **Revenue distribution mechanism of data services in power grid enterprises** [12510-70]
- 12510 OT **Development overview of electric vehicle industry based on patent data analysis** [12510-23]
- 12510 OU **Data mining based wind turbine operating condition monitoring method research** [12510-68]
- 12510 OV **Health monitoring data driven prediction of the civil aircraft structural condition** [12510-45]
- 12510 OW **Analysis of optimum time granularity selection in traffic prediction based on Pearson correlation coefficient** [12510-31]
- 12510 OX **Research on private data security based on multiparty computation** [12510-66]
- 12510 OY **Using information entropy to analyze survey data on rural environmental protection in China** [12510-65]
- 12510 OZ **Security protection method of power system database based on cloud platform** [12510-60]
- 12510 IO **Correlation coefficient of 110 alert amount and weather factors based on SPSS** [12510-69]

- 12510 11 **Selecting optimal cut-off points for multiple variables in binary outcome settings** [12510-8]
- 12510 12 **Predictors selection strategy based on stepwise random forests and logistic regression model** [12510-46]
- 12510 13 **Detecting DDoS issues under 5G with ResNet** [12510-81]
- 12510 14 **Demand analysis and training scheme research of big data talents based on Python** [12510-3]
- 12510 15 **Static game analysis of listed companies' financial fraud based on prospect theory** [12510-29]

---

**ARTIFICIAL INTELLIGENCE ALGORITHMS AND INFORMATION MONITORING MODELING**

---

- 12510 16 **A study on systematic risk among financial sub-markets based on the SETAR-Copula model** [12510-20]
- 12510 17 **Housing price forecast based on XGBoost algorithm house price: advanced regression techniques** [12510-57]
- 12510 18 **Radar cognitive jamming decision method based on incomplete information game** [12510-64]
- 12510 19 **Trend analysis and prediction of heritage crime in China using prophet model** [12510-10]
- 12510 1A **Research on the influence of securities markets on cross-border capital flows based on the DCC-MVGARCH model** [12510-76]
- 12510 1B **Research on target detection based on clustering and Hough transform** [12510-41]
- 12510 1C **Research on the reform of audit model in the era of artificial intelligence** [12510-30]
- 12510 1D **An improved dingo optimization algorithm based on periodic convergence factor strategy** [12510-49]
- 12510 1E **Trajectory fusion algorithm based on adaptive weight coefficient** [12510-12]
- 12510 1F **An improved sparrow search algorithm based on weighted mutation and neighborhood perturbation** [12510-27]
- 12510 1G **Short-term passenger flow forecasting method of urban rail transit based on combined model** [12510-42]
- 12510 1H **Matching application of logging data based on DTW and its improved algorithm** [12510-15]
- 12510 1I **Forecasting of PM2.5 concentration time series based on SSA-LSTM model** [12510-74]
- 12510 1J **Identification and prevention of shill bidding behavior based on XGBoost algorithm** [12510-19]

- 12510 1K **Beijing population migration analysis based on WPD-BP neural network** [12510-55]
- 12510 1L **Gridding-based tensor decomposition algorithm for points of interest prediction in LBSNs** [12510-80]
- 12510 1M **A threat and monitoring model based on multi-data source information fusion** [12510-61]
- 12510 1N **Research on task scheduling in satellite edge computing** [12510-9]
- 12510 1O **PEVGraphRec: a PEV method-based graph neural networks for social recommendations** [12510-33]
- 12510 1P **Method of power grid operation rules information recognition based on deep learning** [12510-36]
- 12510 1Q **A snapshot cluster segmentation method based on dynamic network** [12510-50]
- 12510 1R **Smart learning of foreign languages: rationale, framework, and path** [12510-26]
- 12510 1S **Speech emotion recognition based on SVM and CNN using MFCC feature extraction** [12510-77]

# Conference Committee

## *Conference Chair*

**Hari Mohan Srivastava**, University of Victoria (Canada)

## *Conference Review Committee*

**Francesco Zirilli**, Universita di Roma La Sapienza (Italy)

**Seppo Sirkemaa**, Turku School of Economics at the University of Turku  
(Finland )

**Grigorios N. Beligiannis**, University of Patras – Agrinio Campus (Greece)

**Cristina Freitas**, University of Coimbra (Portugal)

**Carlos Guardado da Silva**, University of Lisbon (Portugal)

**Luís Corujo**, University of Lisbon (Portugal)

**Zoran Bojkovic**, University of Belgrade (Serbia)

**Xinyao Yang**, Xi'an Jiaotong Liverpool University (China)

## *Technical Program Committee Chair*

**Paulo Batista**, University of Évora (Portugal)

## *Technical Program Committee*

**Amiya Kumar Tripathy**, Don Bosco Institute of Technology (India)

**Okba Kazar**, University of Biskra (Algeria)

**Luisa Maria Arvide Cambra**, University of Almeria (Spain)

**Jawad Rasheed**, Istanbul Aydin University (Turkey)

**Srinivasarao Thota**, SR University (India)

**Sheak Rashed Haider Noori**, Daffodil International University (Bangladesh)

**Dalvan Griebler**, Pontifical Catholic University of Rio Grande do Sul (Brazil)

**Ang Miin Huey**, Universiti Sains Malaysia (Malaysia)

**Nikola Ivković**, University of Zagreb (Croatia )

**Mohammed Lataifeh**, University of Sharjah (United Arab Emirates)

**Akharin Khunkitti**, King Mongkut's Institute of Technology Ladkrabang  
(Thailand)

