Lecture Notes in Artificial Intelligence 12986

Subseries of Lecture Notes in Computer Science

More information about this subseries at http://www.springer.com/series/1244

Carlos Soares · Luis Torgo (Eds.)

Discovery Science

24th International Conference, DS 2021
Halifax, NS, Canada, October 11–13, 2021
Proceedings

Springer

Editors
Carlos Soares
Universidade do Porto and Fraunhofer
Portugal AICOS
Porto, Portugal

Luis Torgo
Dalhousie University
Halifax, NS, Canada

Preface

This volume contains the papers selected for presentation at the 24th International Conference on Discovery Science (DS 2021), which was organized to be held in Halifax, Canada, during October 11–13, 2021. Due to the restrictions associated with the COVID-19 pandemic, the conference was moved online and held virtually over the same time period.

DS is a conference series that started in 1986. Held every year, DS continues its tradition as the unique venue for the latest advances in the development and analysis of methods for discovering scientific knowledge, coming from machine learning, data mining, and intelligent data analysis, along with their application in various scientific domains. In particular, major areas selected for DS 2021 included the folllowing: applications (including a relevant number of papers addressing the COVID-19 pandemic), classification, data streams, feature selection, graph and network mining, neural networks and deep learning, preferences, recommender systems, representation learning, responsible artificial intelligence, and spatial, temporal and spatiotemporal data.

DS 2021 received 76 international submissions that were carefully reviewed by three or more Program Committee (PC) members or external reviewers, with a few exceptions. After a rigorous reviewing process, 15 regular papers and 21 short papers were accepted for presentation at the conference and publication in the DS 2021 volume.

We would like to sincerely thank all people who helped this volume come into being and made DS 2021 a successful and exciting event. In particular, we would like to express our appreciation for the work of the DS 2021 PC members and external reviewers who helped assure the high standard of accepted papers. We would like to thank all authors of submissions to DS 2021, without whose work it would not have been possible to have such high-quality contributions in the conference.

We are grateful to the Steering Committee chair, Sašo Džeroski, for his extraordinary support in critical decisions concerning the event plan, particularly important in these challenging times. We are also very grateful to the Program Committee chairs of DS 2020, Annalisa Appice and Grigorios Tsoumakas, for all the information provided, which made the whole organization much easier. We wish to express our thanks to the local organization chairs, David Langstroth, Nuno Moniz, Paula Branco, Vitor Cerqueira, and Yassine Baghoussi, for their support and incredible work. We would like to express our deepest gratitude to all those who served as organizers, session chairs, and hosts, who made great efforts to meet the online challenge to make the virtual conference a real success. Finally, our thanks are due to Alfred Hofmann and Anna Kramer of Springer for their continuous support and work on the proceedings. We are grateful to Springer for a special issue on Discovery Science to be published in the Machine Learning journal. All authors were given the possibility to extend and rework versions of their papers presented at DS 2021 for a chance to be published in this prestigious journal. For DS 2021, Springer also supported a Best Student Paper Award, which was given to Bart Bussmann and his co-authors, Jannes Nys and Steven Latré, for their paper "Neural Additive Vector Autoregression Models for Causal Discovery in Time Series."

This paper presents high quality work on a very relevant topic and is complemented with the materials to reproduce it. We would like to congratulate the authors for this achievement.

September 2021   Carlos Soares
                                                                             Luis Torgo

Organization

Program Committee Chairs

Carlos Soares	Universidade do Porto and Fraunhofer Portugal AICOS, Portugal
Luis Torgo	Dalhousie University, Canada

Program Committee

Martin Atzmueller	Tilburg University, The Netherlands
Colin Bellinger	National Research Council of Canada, Canada
Paula Branco	Ottawa University, Canada
Alberto Cano	Virginia Commonwealth University, USA
Daniel Castro Silva	University of Porto, Portugal
Michelangelo Ceci	University of Bari Aldo Moro, Italy
Victor Cerqueira	Dalhousie University, Canada
Bruno Cremilleux	University of Caen Normandy, France
Nicola Di Mauro	University of Bari Aldo Moro, Italy
Ivica Dimitrovski	Ss. Cyril and Methodius University in Skopje, North Macedonia
Wouter Duivesteijn	Eindhoven University of Technology, The Netherlands
Sašo Džeroski	Jožef Stefan Institute, Slovenia
Johannes Fürnkranz	Johannes Kepler University Linz, Austria
Mohamed Gaber	Birmingham City University, UK
Dragan Gamberger	Rudjer Bošković Institute, Croatia
Manco Giuseppe	Italian National Research Council, Italy
Kouichi Hirata	Kyushu Institute of Technology, Japan
Dino Ienco	Irstea, France
Nathalie Japkowicz	American University, USA
Stefan Kramer	Johannes Gutenberg University Mainz, Germany
Vincenzo Lagani	Ilia State University, Georgia
Pedro Larranaga	University of Madrid, Spain
Nada Lavrač	Jožef Stefan Institute, Slovenia
Tomislav Lipic	Rudjer Bošković Institute, Croatia
Gjorgji Madjarov	Ss. Cyril and Methodius University in Skopje, North Macedonia
Rafael Gomes Mantovani	Federal University of Technology – Paraná, Brazil
Elio Masciari	Institute for High Performance Computing and Networking, Italy
Nuno Moniz	University of Porto, Portugal
Anna Monreale	University of Pisa, Italy

Catarina Oliveira	Portucalense University, Portugal
Sageev Oore	Dalhousie University and Vector Institute, Canada
Rita P. Ribeiro	University of Porto, Portugal
George Papakostas	International Hellenic University, Greece
Ruggero G. Pensa	University of Turin, Italy
Pedro Pereira Rodrigues	University of Porto, Portugal
Bernhard Pfahringer	University of Waikato, New Zealand
Gianvito Pio	University of Bari Aldo Moro, Italy
Pascal Poncelet	LIRMM Montpellier, France
Jan Ramon	Inria, France
André L. D. Rossi	Universidade Estadual Paulista, Brazil
Kazumi Saito	University of Shizuoka, Japan
Tomislav Smuc	Rudjer Bošković Institute, Croatia
Marina Sokolova	University of Ottawa and Dalhousie University, Canada
Jerzy Stefanowski	Poznan University of Technology, Poland
Luis Filipe Teixeira	University of Porto, Portugal
Herna Viktor	University of Ottawa, Canada
Baghoussi Yassine	University of Porto, Portugal
Albrecht Zimmermann	University of Caen Normandy, France

Additional Reviewers

Ana Mestrovic
Daniela Santos
Emanuel Guberovic
Fabrizio Lo Scudo
Francesca Pratesi
Francesco S. Pisani
Francesco Spinnato
Isabel Rio-Torto
Ivan Grubisic
João Almeida

João Alves
Leonardo Ferreira
Miha Keber
Narjes Davari
Nima Dehmamy
Nunziato Cassavia
Paolo Mignone
Rafaela Leal
Roberto Interdonato

Contents

Graph and Network Mining

Machine Learning for COVID-19

Neural Networks and Deep Learning

Preferences and Recommender Systems

Representation Learning and Feature Selection

Responsible Artificial Intelligence

Spatial, Temporal and Spatiotemporal Data