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PREFACE

It is our great privilege to present to you the Proceedings of the Central European Conference on Information and Intelligent Systems 2021. We hope that you will find it useful, exciting and inspiring.

These Proceedings contain full text conference papers presented at the annual international Central European Conference on Information and Intelligent Systems (CECIIS), held at the Faculty of Organization and Informatics in Varaždin, Croatia on October 13-15, 2021. CECIIS has been held for 32 years with the aim to be the interface between researchers and professionals involved in research and development in the field of information and intelligent systems and related areas and the official language of the Conference is English. Due to pandemic and travel restrictions, and having in mind the health of the participants and organizers, the conference was held online.

The international participants, Program Committee members and reviewers enabled CECIIS to become one of the most important conferences in the area of applied information science in Central Europe. The conference and the accompanying events are also the most significant annual scientific event at the Faculty of Organization and Informatics, University of Zagreb (FOI). Together with the scientific journal JIOS, CECIIS is one of the pillars of scientific research activities at FOI.

The special topic of CECIIS 2021 Conference – “Networked Society”, was designed to provide our participants with an opportunity to research and discuss the possibilities and challenges of networked society. The Proceedings of CECIIS 2021 contain 43 scientific papers, peer-reviewed by at least two independent reviewers and accepted by the international Program Committee within the following sections: Computer Games, Data and Knowledge Bases, Digital Transformation and Corporate Culture, Education and Learning Analytics, ICT Entrepreneurship and Innovation, Intelligent Systems, Quality in ICT, Strategic Planning and Decision Making and Trends in Software Engineering. All papers focus on actual problems and present theoretical and practical results and applications thus exploiting innovative approaches. The papers were accepted for publication based on their interest, relevance, innovation and application to the information and intelligent systems.

The review process has been conducted with the wholehearted dedication of 84 reviewers (36 reviewers from Croatia and 48 from abroad) who conducted 127 reviews which resulted with 43 accepted papers. The papers were prepared by 111 authors from 15 countries and presented online during the conference. After the conference, the selected papers will be further reviewed with the possibility of being extended and published within the Journal of Organizational and Information Sciences (JIOS), the international scientific journal published by the Faculty of Organization and Informatics or within the European Journal of Open, Distance and E-Learning (EURODL).

The special value of this year's conference is featured by outstanding invited keynote lecturers, who have left a deep mark in the scientific and professional areas of their interest. Within CECIIS 2021, the following invited keynote speakers presented their lectures:

Professor Dunja Mladenić, PhD: “Artificial Intelligence in/for the Society”- Professor Mladenić leads the Department of Artificial Intelligence that connects over 50 experts and graduate students focusing on different research areas including real-time analysis of text, sensor and multimodal data, modelling and visualization of complex systems, semantic and language technologies. She has extensive research experience in study and development of machine learning, text mining, sensor data analysis, data science, semantic technology techniques and their application on real-world problems. She has published a number of scientific papers and book chapters, organized scientific events, served on a number of research panels evaluating research proposals including ERC panel. She served on the Institute's Scientific Council for several years, currently serves on Executive Board of Slovenian Artificial Intelligence Society and on Advisory Board of ACM Slovenia.

Professor Henry Muccini, PhD: “Architecting Sustainable Software through Machine Learning: an experience report” - Professor Muccini's main research is on how to engineer software running nowadays smart systems. More specifically, his main competence is in architecting smart modern systems, including IoT Architectures for smart cities, data-driven Microservice-based architectures, Architecting Self-Adaptive IoT Systems with Machine Learning. He is currently the Head of the CINI Smart Cities and Communities Lab at the University of L'Aquila, he is leading the crowd-management project with the Uffizi Galleries in Florence. Professor Muccini has the pleasure to serve as associated Editor in Chief for IEEE Software, as well as Steering Committee Vice-chair of the ICSA inter-

national conference on Software Architecture, Steering Committee Chair of the MOBILESoft Int. Conference on Mobile Software Engineering and Systems. He is also proud to be the Head of the study programs in Computer Science at the University of L'Aquila, as well as the coordinator of the Master in Mobile and Web Technologies.

Within its poster and presentation section, CECIIS 2021 gathered students from Croatia, USA (Carlow University, and Albania (Luigj Gurakuqi University of Shkodër and European University of Tirana). The posters and presentations were presented and discussed during the conference.

The conference program also included two panel discussions. The panel discussion "Accelerating smart industry and digital transformation" was moderated by Neven Vrček (Faculty of Organization and Informatics, University of Zagreb, Croatia) and was attended by the distinguished panellists: Rastislav Iglar (Slovak University of Technology in Bratislava), Dimitris Karagiannis (Head of Research Group Knowledge Engineering, University of Vienna), Slavko Vidović (Founder of Infodom) and Henry Muccini (Full Professor in Computer Science at the University of L'Aquila).

The panel discussion "Emerging research areas: the vision of journal editors" was moderated by Igor Balaban (Faculty of Organization and Informatics, University of Zagreb, Croatia) and was attended by the distinguished panellists: Wim Van Petegem (KU Leuven, Belgium, Editor-in-chief of the European Journal of Open, Distance and E-Learning), Josep M. Duart (Universitat Oberta de Catalunya, Spain, Editor-in-chief of the International Journal of Educational Technology in Higher Education), Denise Whitelock (Editor-in-chief of the Open Learning: The Journal of Open, Distance and e-Learning, from the Open University, UK) and Alen Lovrenčić (Faculty of Organization and Informatics, University of Zagreb, Croatia, Editor-in-chief of the Journal of Information and Organizational Sciences).

We would like to thank all participants for their contributions to the Conference program and for their contributions to these Proceedings. Our special thanks go to the invited speakers, authors, reviewers, session chairs, as well as Program and Organizing Committee members for their time and effort. The organizational and supporting assistance of the Faculty of Organization and Informatics was crucial for the overall success of the conference. Finally, we are especially grateful to all our industrial partners and sponsors for their support. CECIIS 2021 was financially supported by the following sponsors: InfoDom d.o.o., Oracle d.o.o., DignetSoftware d.o.o., City of Varaždin and Varaždin County.

Finally, it is our wish that all the participants of CECIIS 2021 will have a wonderful and fruitful time at the conference and find relevant and interesting papers in the following pages.

We are looking forward to the following Central European Conference on Information and Intelligent Systems to be held in autumn 2022.

October, 2021

On the behalf of the Program and Organizing Committees

Neven Vrček, Elisabeth Pergler and Petra Grd
Editors

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Data and Knowledge Bases: Sandra Lovrenčić, University of Zagreb, Croatia and Patrizia Poščić, University of Rijeka, Croatia

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Education and Learning Analytics: Blaženka Divjak, University of Zagreb, Croatia, Igor Balaban, University of Zagreb, Croatia and Josep M Duart, Universitat Oberta de Catalunya, Spain

ICT Entrepreneurship and Innovation: Ksenija Vuković and Marina Klačmer Čalopa, University of Zagreb, Croatia

Intelligent Systems: Jasminka Dobša, University of Zagreb, Croatia and Dunja Mladenčić, Jožef Stefan Institute, Slovenia

Quality in ICT: Valentina Kirinić and Melita Kozina, University of Zagreb, Croatia

Strategic Planning and Decision Making: Nina Begičević Ređep and Tihomir Hunjak, University of Zagreb, Croatia

Trends in Software Engineering: Zlatko Stapić, University of Zagreb, Croatia, William Steingartner, Technical University of Košice, Slovakia and Luis de Marcos Ortega, University of Alcalá, Spain

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