

ER 2023

Companion Proceedings of the 42nd International Conference on
Conceptual Modeling: ER Forum, 7th Symposium on Conceptual
Modeling Education (SCME), Project Exhibitions, Posters and Demos,
and Doctoral Consortium

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Edited by

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<https://er2023.inesc-id.pt/>

Preface

Conceptual modeling is the process of building models that abstract aspects of the real world with the purpose of promoting communication and a common understanding of a domain of interest. Frequently, conceptual modeling precedes the development of information systems designed to manage information about the domain of interest.

The International Conference on Conceptual Modeling (ER) series offers to all members of the conceptual modeling community and its adjacent areas a forum for the advancement of the *state-of-the-art* in the field, bringing together researchers and practitioners alike. In its 42nd edition, the conference series returns to Europe for its first in-person edition since 2019. ER 2023 was held at the *Instituto Superior Técnico* in Lisbon, Portugal, between November 06-09, 2023.

The Companion Proceedings of the 42nd International Conference on Conceptual Modeling brings together the works presented in five of the tracks of the conference: ER Forum, the 7th Symposium on Conceptual Modeling Education (SCME), Project Exhibitions, Posters and Demos, and Doctoral Consortium. Unlike the other proceedings volumes, the tracks here compiled are characterized by their shared goal of providing an open discussion forum on their specific interest areas, where their peer-reviewed submissions are subject to a higher acceptance rate, allowing for and promoting the presence of works in earlier development stages.

We would like to express our gratitude to all the people who made the organization of another successful edition of the ER conference series possible. First, we would like to thank the members of the ER Steering Committee, who entrusted this organization committee with the responsibility of organizing this edition of such a traditional conference. We thank the several members of the program committees of each track of ER 2023, especially those involved in the tracks here compiled. We thank all participants of ER 2023, including both the authors of the hundreds of submissions received, and the attendees who joined us in Lisbon. Finally, we thank all members of the organization committee and the local organization team at the *Instituto Superior Técnico* for all the work put into making this event possible.

ER 2023 Organization

General Chairs

José Borbinha	INESC-ID, IST, Universidade de Lisboa, Portugal
Giancarlo Guizzardi	University of Twente, The Netherlands

CEUR Proceedings Chair

Claudenir M. Fonseca	University of Twente, The Netherlands
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Program Chairs

João Paulo A. Almeida	Federal University of Espírito Santo, Brazil
Jelena Zdravkovic	Stockholm University, Sweden

Doctoral Consortium Chairs

H. Sofia Pinto	INESC-ID, IST, Universidade de Lisboa, Portugal
Ladjel Bellatreche	LIAS/ISAE-ENSMA, France
Simon Hacks	Stockholm University, Sweden

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Claudenir M. Fonseca	University of Twente, The Netherlands

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Sérgio Guerreiro	INESC-ID, IST, Universidade de Lisboa, Portugal

Volunteers Chair

André Vasconcelos	INESC-ID, IST, Universidade de Lisboa, Portugal
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Daniel Faria	INESC-ID, IST, Universidade de Lisboa, Portugal
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António Higgs	INESC-ID, Portugal
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ER Forum

The ER Forum is a vibrant and interactive platform for presenting and discussing novel and diverse research reports and artifacts on the full range of conceptual modeling topics. It supplements the main ER track with papers and presentations that report on new and promising research results, novel applications, experience reports, proposed research endeavors still in early stages, and updates from earlier work. The focus is on innovation and exciting new ideas and emerging new research topics that have not yet reached full maturity. The main goal of the event is to facilitate the interaction, discussion, and exchange of ideas among presenters and participants.

The 2023 offering of the ER Forum invited three types of submissions. The first were *forum papers* (long and short), which present novel and innovative research in conceptual modeling that is not necessarily mature or fully evaluated but includes interesting early results or carries promise for relevant future impact. Forum papers may also present novel applications of conceptual modeling in industrial contexts, or vision statements describing new and innovative research endeavors that are still in the conceptualization, design, or exploratory stage. Furthermore, *vision papers* have a particular focus on the future of conceptual modeling and/or discuss new challenges and opportunities. Finally, *follow-up notes* report new experiences about previously published papers in the ER conference or elsewhere.

A total of twenty-six (26) papers were submitted. Six (6) of these papers were initially submitted on the main track and were, taking into account review results, subsequently transferred to the ER Forum on the recommendation of the ER 2023 program committee. The remaining twenty (20) papers were submitted directly to the ER Forum and underwent review by a program committee composed of twenty-one members. All papers were found to be of sufficient quality to be included in the ER Forum program in accordance to the ER Forum goals and principles; five (5) of them underwent a short shepherding period to ensure reviewer comments were sufficiently addressed in an improved version. In total, eighteen (18) full Forum papers, four (4) short forum papers one (1) vision paper, and three (3) follow-up notes were presented. The topics of the submitted work ranged widely from tool and analysis techniques to contributions on specific kinds of models and purposes. The presentations were hence thematically organized into seven (7) sections titled: *tools and technology, towards... a challenge, models for purpose, models in business, modeling with goals, on the meta plateau, and analyzing models*.

The ER Forum 2023 Chairs would like to extend their sincere gratitude to the authors, reviewers, participants, and ER 2023 Chairs for their invaluable contributions to the success of the event. We hope that it was a rewarding and constructive experience for everyone involved.

ER Forum Chairs

Sotirios Liaskos
David Aveiro

York University, Canada
Universidade da Madeira, Portugal

Program Committee

Raian Ali	Hamad Bin Khalifa University, Qatar
Anna Bernasconi	Politecnico di Milano, Italy
Dominik Bork	TU Wien, Austria
Drazen Brdjanin	University of Banja Luka, Bosnia and Herzegovina
Karen Davis	Miami University, USA
Hans-Georg Fill	University of Fribourg, Switzerland
Mohamad Gharib	University of Tartu, Estonia
Simon Hacks	University of Southern Denmark, Denmark
Martin Henkel	Stockholm University, Sweden
Jānis Kampars	Riga Technical University, Latvia
Evangelia Kavakli	University of the Aegean, Greece
Elena Kornyshova	CNAM, France
Raimundas Matulevicius	University of Tartu, Estonia
Ben Roelens	Open Universiteit, Ghent University, Belgium
Mattia Salnitri	Politecnico di Milano, Italy
Markus Stumptner	University of South Australia, Australia
Arnon Sturm	Ben-Gurion University, Israel
Eric-Oluf Svee	Stockholm University, Sweden
Yves Wautelet	Katholieke Universiteit Leuven, Belgium
Hans Weigand	Tilburg University, The Netherlands
Manuel Wimmer	Johannes Kepler University Linz, Austria

7th Symposium on Conceptual Modeling Education (SCME)

The Symposium on Conceptual Modeling Education (SCME) provides a forum for the ER community to discuss the education and teaching of aspects related to conceptual modeling. This includes, among others, methods and tools for developing and communicating conceptual modeling techniques, for transforming conceptual models into effective implementations, as well as case studies of interesting projects on conceptual modeling education. In this 7th edition of the Symposium, we stimulated specific attention to experiences with the pivot to online and hybrid teaching during the COVID-19 pandemic, and which practices of those experiences, if any, were kept afterward.

SCME 2023 was organized in two sessions. The first session sets the stage with a very interesting keynote by Prof. Dr. Monique Snoeck, from the Research Center of Management Informatics at KU Leuven and Université de Namur, on "What does really matter? Lessons learned from +20 years of teaching conceptual modeling". Afterward, a regular session presents four research papers. Each submitted paper was peer-reviewed by at least two and mostly three members of the program committee.

We thank all authors of the submitted papers for their efforts in promoting education in conceptual modeling; all members of the program committee for their thoughtful and contributing reviews and discussions; and the ER 2023 chairs for their help in organizing the Symposium. We hope that SCME 2023 provides an environment for fruitful discussions on how to improve education on conceptual modeling.

7th Symposium on Conceptual Modeling Education (SCME) Chairs

Estefanía Serral	KU Leuven, Belgium
Fernanda Baião	Pontifical Catholic University of Rio de Janeiro, Brazil
C. Maria Keet	University of Cape Town, South Africa

Program Committee

Alberto Abello	Universitat Politècnica de Catalunya, Spain
Dominik Bork	TU Wien, Austria
Fabiano Dalpiaz	Utrecht University, The Netherlands
Jordi Cabot	Luxembourg Institute of Science and Technology, Luxembourg
Marcela Ruiz	Zurich University of Applied Sciences, Switzerland
Maria Luiza Campos	Federal University of Rio de Janeiro, Brazil
Monique Snoeck	KU Leuven, Belgium
Oscar Pastor	Universidad Politécnica de Valencia, Spain
Sonia Berman	University of Cape Town, South Africa
Janis Stirna	Stockholm University, Sweden
Ernest Teniente	Universitat Politècnica de Catalunya, Spain
Pedro Valderas	Universidad Politécnica de Valencia, Spain
Yves Wautelet	KU Leuven, Belgium

Project Exhibitions

The ER 2023 Project Exhibition track provides the opportunity for presenters to disseminate the intermediate results of their projects, and to get feedback for ready-to-start or ongoing projects, or even before submitting a project proposal. Thus, to participants, it offers a moment to get an updated view of innovative ongoing research and networking with potential research partners.

We have considered innovative projects that tackled relevant conceptual modeling challenges or used conceptual modeling techniques, and intended to address a challenge posed by an organization or a funding entity. We accepted five out of six project exhibitions' submissions that covered a variety of topics (Quantum Computing, Crisis Management, Context-Aware Data Analytics, AI, and Conceptual Modeling for Data Intensive-Domains, and Process Factories), resulting in a rich program for this track.

We want to thank the the program committee members who provided valuable feedback to the authors, and also the authors for submitting their papers and making this track possible.

Project Exhibitions Chairs

João Araújo
Tiago Prince Sales

Universidade Nova de Lisboa, Portugal
University of Twente, The Netherlands

Program Committee

Sergio Guerreiro
Karen Davis
Pnina Soffer

INESC-ID, Instituto Superior Técnico, Portugal
Miami University, USA
University of Haifa, Israel

Posters and Demos

As part of the 42nd International Conference on Conceptual Modeling, the ER 2023 Posters and Demos track is aimed at showcasing emerging research ideas and work-in-progress as well as demonstrating novel methods and tools in any area related to conceptual modeling.

We received 12 submissions. Each submission was reviewed by three members of the program committee. Based on the reviews received, seven papers were accepted for presentation at the conference. The papers cover a range of topics that are both timely and relevant to the field of conceptual modeling. Each paper addresses emerging problems or explores traditional themes in novel ways. The posters and demos accepted for this track help to understand the future research directions in conceptual modeling as well as discuss the practical applications of tools and prototypes.

Themes that emerge from the accepted papers include augmented reality, natural language interfaces, model-driven generation of patterns, ontology-driven conceptual modeling, goal modeling, and modeling resilience.

The Posters and Demos track required the significant efforts of many people. We would like to thank the authors of all submitted papers, program committee members, reviewers, the ER 2023 general chairs, program chairs, and the local organizing committee.

Posters and Demos Chairs

Sergio de Cesare	University of Westminster, UK
Miguel Mira da Silva	INOV, IST, University of Lisbon, Portugal

Program Committee

Mike Bennett	Hypercube, UK
João Varela da Costa	Universidade de Lisboa, Portugal
Tony Clark	Aston University, UK
André Fernandes	Universidade de Lisboa, Portugal
Frederik Gailly	Ghent University, Belgium
Guido Geerts	University of Delaware, USA
Silvia Boguea Gomez	Universidade de Lisboa, Portugal
Renata Guizzardi	University of Twente, The Netherlands
Oscar Pastor	Universitat Politècnica de València, Spain
Tiago Sales	University of Twente, The Netherlands
Elcelina Silva	University of Cape Verde, Cape Verde
Monique Snoeck	KU Leuven, Belgium
Marzieh Talebpour	University of Westminster
Michael Verdonck	Stardekk, Belgium

Doctoral Symposium

The 42nd International Conference on Conceptual Modeling (ER'2023) was held in Lisbon, Portugal, on 6-9 November 2023. The Ph.D. Symposium of ER'2023 was organized to provide a platform for Ph.D. research scholars in a fairly advanced stage of their Ph.D. program to present their thesis proposals for expert feedback. The call attracted five submissions from Brazil, Czechia, Spain, and Israel. All submissions were reviewed by the three doctoral consortium chairs from three countries. Four out of five proposals were accepted as a result of the review.

Within a workshop format on the first day, the four students discussed their works intensively with each other and their mentors. Based on the feedback, the students presented their work orally during the main conference, allowing a separate interaction with the conference experts for critical feedback and directions. Finally, the students got the opportunity to have a poster about their work present during the entire conference to allow further interaction with the participants.

We thank all students for preparing, submitting, and presenting their PhD projects at ER'2023. Moreover, we are very grateful to the mentors for being available for individual discussions and feedback to the PhD students. Finally, we thank the general chairs of ER'2023 for their great support.

Doctoral Consortium Chairs

H. Sofia Pinto	INESC-ID, IST, Universidade de Lisboa, Portugal
Ladjel Bellatreche	LIAS/ISAE-ENSMA, France
Simon Hacks	Stockholm University, Sweden

Mentors

Glenda Moura Amaral	University of Twente, The Netherlands
Amin Jalali	Stockholm University, Sweden
Manfred Jeusfeld	University of Skövde, Sweden
António Rito Silva	INESC-ID, IST, Universidade de Lisboa, Portugal
Sergio Guerreiro	INESC-ID, Instituto Superior Técnico, Portugal