Proceedings of
the 18th International Symposium on
Open Collaboration

September 6–10, 2022
Madrid, Spain

General Chair
Gregorio Robles, Universidad Rey Juan Carlos, Spain

Program Co-Chairs
Amel Charleux, University of Montpellier, France
Igor Steinmacher, Northern Arizona University, United States of America

Associate Program Co-Chairs
Javier Arroyo, Universidad Complutense de Madrid, Spain
Antonio Balderas, Universidad de Cádiz, Spain
Gemma Catolino, Jheronimus Academy of Data Science, The Netherlands
Alexandre Decan, University of Mons, Belgium
Francisco Martín-Rico, Universidad Rey Juan Carlos, Spain
Amit Kumar Verma, CoreCLM, USA

Sponsors
Universidad Rey Juan Carlos – Vicerrectorado de Extensión Universitaria
Programamos.es
Universidad Rey Juan Carlos – LibreSoft Research Group

In-cooperation
ACM SIGSOFT
ACM SIGWEB
General Chair’s Foreword
Welcome to OpenSym 2022, the 18th International Symposium on Open Collaboration which is organised 6th to 10th September. OpenSym 2022 will be held at the beautiful Círculo de Bellas Artes de Madrid (Calle de Alcalá, 42), a cultural center located in the heart of the city’s historic center where young Picasso attended as a pupil to his painting classes.

I am very pleased to host the premier conference on open collaboration research and practice and thereby promote stimulating discussions and dissemination of results in many areas of open collaboration, including open source, open data, open science, open education, wikis and related social media, Wikipedia, and IT-driven open innovation research.

Open collaboration is egalitarian (everyone can join, no principled or artificial barriers to participation exist), meritocratic (decisions and status are merit-based rather than imposed) and self-organizing (processes adapt to people rather than people adapt to pre-defined processes)\(^1\).

Many people have contributed greatly to make OpenSym 2022 happen and we owe them a great deal of thanks.

We are very grateful to all the researchers and practitioners that contributed to OpenSym 2022. The two program co-chairs, Amel Charleux and Igor Steinmacher have made considerable contributions in time and effort for the conference program, as well as our Associate Program Co-Chairs (Javier Arroyo, Antonio Balderas, Gemma Cantolino, Alexandre Decan, Francisco Martin Rico and Amit Kumar Verma) and all of the PC members.

Sincere thanks go to Simon Butler for his considerable efforts as proceedings chair, to Antonio J. Romero for having website, to Vahid Etemadi for managing the social media, and to Jesús M. González Barahona for his commitment as organisation chair. A special thanks goes to Dirk Riehle for his support and encouragement! We also want to thank all members of the Program Committee, the external reviewers, and all participants that contributed to OpenSym 2022.

Finally, we are also very grateful for the financial support from the Universidad Rey Juan Carlos, who has contributed with funding from the Vicerrectorado de Extensión Universitaria and from the GsyC/LibreSoft research group, to Programamos.es, and The John Ernest Foundation, our financial sponsor.

Without the aforementioned valuable contributions, OpenSym 2022 would never have happened!

Gregorio Robles
General Chair, OpenSym 2022

\(^1\)https://opensym.org/about-us/definition/
Program Chairs’ Foreword

We welcome you to the 18th International Symposium on Open Collaboration (OpenSym 2022), joint with the 18th International Conference on Open Source Systems (OSS 2022) held in Madrid 6-10 September 2022. OpenSym joined forces with OSS with a shared program, a shared call for papers, and a common program and organization committees. Following this historical situation, we decided to put both conferences under the theme: “Openness in Emergency Situations.”

As premier conferences in their fields, OpenSym and OSS provide an excellent forum for reporting the latest developments on open collaboration research and practice, including open source software, open hardware/robotics, open data, open science, wikis, and related social media.

We are pleased to present the proceedings of joint conferences as its published record. We received 20 submissions to OpenSym/OSS 2022, which were carefully reviewed, and we ended up including 7 full research papers (35% acceptance rate), 1 New Ideas and Emerging Results paper, and 4 extended abstracts to the program. All of the submitted papers went through a rigorous 2-round double-anonymous peer-reviewing process (extended abstracts were reviewed, followed by the complete version review). Each paper was reviewed by at least three members of the Program Committee. The papers cover different topics related to Open Collaboration, and we noticed a focus on some specific topics: open data, open hardware and robotics. We hope that you find the OpenSym 2022 proceedings useful for your professional and academic activities and that you enjoyed the conference. Finally, we would like to thank all the people who have contributed, including the authors, the sponsors, the reviewers, the volunteers, and the chairs.

The conference program represents the efforts of many people. We want to express our gratitude to the members of the Program Committee and the external reviewers for their hard work in reviewing the submissions. The General Chair, Gregorio Robles, guided us and gave us all the support throughout the process. We also acknowledge the fantastic work that Simon Butler, our Proceedings Chair, did in managing the conference proceedings. We thank all the authors for their contributions and their participation in OpenSym/OSS 2022! We feel honored and privileged to serve as Program Chairs for these conferences and hope that this program will further stimulate exciting research in all areas of open collaboration.

Amel Charleux and Igor Steinmacher
Program Co-Chairs, OpenSym 2022
Organization

General Chair
Gregorio Robles, Universidad Rey Juan Carlos, Spain

Program Co-Chairs
Amel Charleux, University of Montpellier, France
Igor Steinmacher, Northern Arizona University, United States of America

Associate Program Co-Chairs
Javier Arroyo, Universidad Complutense de Madrid, Spain
Antonio Balderas, Universidad de Cádiz, Spain
Gemma Catolino, Jheronimus Academy of Data Science, The Netherlands
Alexandre Decan, University of Mons, Belgium
Francisco Martín-Rico, Universidad Rey Juan Carlos, Spain
Amit Kumar Verma, CoreCLM, United States of America

Web Chair
Antonio J. Romero, Universidad Rey Juan Carlos, Spain

Publicity Chair
Vahid Etemadi, Shiraz University of Technology, Iran

Steering Committee Chair
Dirk Riehle, Friedrich-Alexander University Erlangen-Nürnberg, Germany

Proceedings Chair
Simon Butler, University of Skövde, Sweden

Program Committee

Adam Alami Aalborg University, Denmark
Michel Albonico Universidade Tecnológica Federal do Paraná, Brazil
Ann Barcomb University of Calgary, Canada
John Businge University of Antwerp, Belgium
Andrea Capiluppi University of Groningen, The Netherlands
Anamika Chhabra Indian Institute of Technology Ropar, India
Kevin Crowston Syracuse University, United States of America
Neeru Dubey Indian Institute of Technology Ropar, India
Kristofer Erickson University of Leeds, United Kingdom
Daniel Franzen Freie Universität Berlin, Germany
Felipe Fronchetti Virginia Commonwealth University, United States of America
Jonas Gamalielsson University of Skövde, Sweden
Matt Germonprez University of Nebraska at Omaha, United States of America
Jesús M. González  Universidad Rey Juan Carlos, Spain
Barahona

Nikolay Harutyunyan Friedrich-Alexander University Erlangen Nürnberg, Germany

Benjamin Mako Hill University of Washington, United States of America

Akinori Ihara Wakayama University, Japan

Sudarshan Iyengar Indian Institute of Science, India

Javier Luis Canovas Izquierdo IN3 - Universitat Oberta de Catalunya, Spain

Mahdi Jaberzadeh Ansari University of Calgary, Canada

Dariusz Jemielniak Kozminski University, Poland

Nicolas Jullien iSchool, Télécom Bretagne, LEGO-M@rsouin, France

Daniel S. Katz University of Illinois Urbana-Champaign, United States of America

Sherlock Licorish University of Otago, New Zealand

Kevin Lumbard University of Nebraska - Omaha, United States of America

Bjorn Lundell University of Skövde, Sweden

Roisin Lyons University of Limerick, Ireland

Paulo Meirelles Federal University of ABC, Brazil

Amanda Menking Trust & Safety Professional Association, United States of America

Reed Milewicz Sandia National Laboratories, United States of America

Lucas Nussbaum LORIA - AlGorille, France

Edson Oliveira Jr State University of Maringá, Brazil

Felipe Ortega GSyC, ETSIT, Universidad Rey Juan Carlos, Spain

Ivanilton Polato Universidade Tecnológica Federal do Paraná

Mikko Rajanen University of Oulu, Finland

Dirk Riehle Friedrich-Alexander University Erlangen-Nürnberg, Germany

Sheila O’Riordan University College Cork, Ireland

David Rozas Universidad Complutense de Madrid, Spain

Kate Stewart The Linux Foundation, United States of America

Klaas Stol Lero, University College Cork, Ireland

Christoph Treude The University of Melbourne, Australia
Bianca Trinkenreich  Northern Arizona University, United States of America
Robert Viseur  University of Mons, Belgium
Dong Wang  Nara Institute of Science and Technology, Japan
Anthony Wasserman  Carnegie Mellon University Silicon Valley, United States of America
Mairieli Wessel  Radboud University, The Netherlands
Astrid Wichmann  Ruhr Universität Bochum, Germany
Igor Scaliante Wiese  Federal University of Technology – Paraná - UTFPR, Brazil
Stefano Zacchioli  Télécom Paris, Polytechnic Institute of Paris, France
Ahmed Zerouali  Vrije Universiteit Brussel, Belgium
Sponsors

Universidad Rey Juan Carlos

In-cooperation

acm In-Cooperation

SIGSOFT

sig web
# Table of Contents

General Chair’s Foreword iii  
Program Chairs Foreword iv  
Organization v  
Program Committee v  
Sponsors viii

## Open Data and Open Knowledge

**Surveying the Open Science Knowledge in a Southern Brazilian University**  
Edson Oliveira Jr (State University of Maringá), André F. R. Cordeiro (State University of Maringá), Danillo Nascimento (State University of Maringá)  

**How do Non-profit Open Data Intermediaries Enhance Open Data Usability? A Systematic Literature Review**  
Liubov Pilshchikova (Delft University of Technology), Anneke Zuiderwijk (Delft University of Technology), Marijn Janssen (Delft University of Technology)  

**Improving Open Data Quality Through Citizen Engagement and Data Engineering**  
César García Sáez (La Hora Maker)

## Open Hardware and Robotics

**An Exploration of Openness in Hardware and Software Through Implementation of a RISC-V Based Desktop Computer**  
Simon Butler (University of Skövde), Jonas Gamalielsson (University of Skövde), Björn Lundell (University of Skövde), Christoffer Brax (Combitech AB), Tomas Persson (Digitalist Sweden AB), Anders Mattsson (Husqvarna AB), Tomas Gustavsson (PrimeKey Solutions AB), Jonas Feist (RedBridge AB), Jonas Öberg (Scania CV AB)

**On Engagement with Open Source Software, Open Source Hardware, and Standard Setting: The Case of White Rabbit**  
Jonas Gamalielsson (University of Skövde), Björn Lundell (University of Skövde), Simon Butler (University of Skövde), Christoffer Brax (Combitech AB), Tomas Persson (Digitalist Sweden AB), Anders Mattsson (Husqvarna AB), Tomas Gustavsson (PrimeKey Solutions AB), Jonas Feist (RedBridge AB), Jonas Öberg (Scania CV AB)
**MOCAP4ROS2: An Open Source Framework for Motion Capture Systems in Robotics**
Francisco Martín (Universidad Rey Juan Carlos), José Miguel Guerrero (Universidad Rey Juan Carlos), A. Alberto García (Universidad Rey Juan Carlos), Francisco J Rodríguez (Universidad de León), Vicente Matellán (Universidad de León)

**HelloArduBot: A DSL for Teaching Programming to Incoming Students with Open-Source Robotic (OSR) Projects**
Gustavo Slomski (Federal University of Technology), Adair José Rohling (Federal University of Technology) Paulo Varela (Federal University of Technology), Michel Albonico (Federal University of Technology)

**3D Printer Builders’ Open-hardware Strategies**
Robert Viseur (Université de Mons), Nicolas Jullien (IMT Atlantique, LEGO/Marsouin)

### Open Source Software Communities

**Why People Trust Wikipedia Articles: Credibility-Assessment Strategies Used by Readers**
Houda Elmimouni (University of Indiana), Andrea Forte (Drexel University), Jonathan Morgan (CrowdStrike)

**Sustaining Open Data as a Digital Common – Design Principles for Common Pool Resources Applied to Open Data Ecosystems**
Johan Linäker (RISE Research Institutes of Sweden), Per Runeson (Lund University)

**How to Characterize the Health of an Open Source Software Project? A Snowball Literature Review of an Emerging Practice**
Johan Linäker (RISE Research Institutes of Sweden), Efi Papatheocharous (RISE Research Institutes of Sweden), Thomas Olsson (RISE Research Institutes of Sweden)

**Efficient Prior Publication Identification for Open Source Code**
Daniele Serafini (University of Turin), Stefano Zacchirol (LTCI, Télécom Paris, Institut Polytechnique de Paris)