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# Quality of Information and Communications Technology

15th International Conference, QUATIC 2022  
Talavera de la Reina, Spain, September 12–14, 2022  
Proceedings

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Málaga, Spain

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Leiden, The Netherlands

Ricardo Pérez-Castillo   
University of Castila-La Mancha  
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# Preface

The International Conference on the Quality of Information and Communications Technology (QUATIC) serves as a forum for disseminating advanced methods, techniques, and tools for supporting quality approaches to ICT engineering and management. Practitioners and researchers meet at the conference to exchange ideas and approaches on how to adopt a quality culture in ICT process and product improvement and to provide practical studies in varying contexts.

QUATIC 2022 was held during September 12–14, 2022, in Talavera de la Reina, Spain, with Antonio Vallecillo (University of Málaga) and Joost Visser (University of Leiden) as Program Chairs. The Organizing Chair of this 15th edition of QUATIC was Ricardo Pérez-Castillo (University of Castilla-La Mancha) and it was locally organized by the University of Castilla-La Mancha. Fortunately, it was the first edition conducted in a face-to-face manner after the effects of the COVID-19 pandemic.

This volume collates the papers selected by the members of the Program Committee to be presented at the conference and published in the conference proceedings. QUATIC 2022 attracted a good number of submissions from different areas spanning several thematic tracks, proposed in the call for papers, in various cutting-edge technologies of specialized focus. The following ten thematic tracks (together with their track chairs) were considered in QUATIC 2022:

- ICT Verification and Validation (Domenico Amalfitano, University of Naples, Italy)
- Safety, Security, and Privacy (Valentina Casola, University of Naples Federico II, Italy)
- ICT Process Improvement, Organisation, and Governance (Karol Frühauf, INFOGEM AG, Switzerland)
- Quality Aspects in Modeling and Low Code Environments (Alfonso Pierantonio, Università degli Studi dell'Aquila, Italy)
- Quality Aspects in Software Product Management and Requirements Engineering (Emilio Insfran, Valencia Polytechnic University, Spain)
- Quality Aspects in Machine Learning, AI and Data Analytics (Michael Felderer, University of Innsbruck, Austria)
- Quality Aspects in Digital Twins and Cyber-physical Systems (Aitor Arrieta, Mondragon University, Spain)
- Quality Aspects in Quantum Computing (Rui Abreu, University of Porto and INESC-ID, Portugal)
- Software Quality Education and Training in Academia and Industry (Kathia Oliveira, Université Polytechnique Hauts-de-France, France)
- Quality Aspects in Software Evolution (Péter Hegedűs, University of Szeged, Hungary)

Due to the exigent review process, some of the tracks had no papers accepted, while others with few accepted papers were merged into another related session. As a result,

the following five sessions were finally organized within the scientific program of QUATIC 2022, which correspond with the proceedings' sections:

- Smart and Advanced Systems
- Verification and Validation
- Skills and Education
- Industrial Experiences and Applications
- Safety, Security and Privacy

The Program Committee of QUATIC 2022 was formed by 164 international academic and industrial domain experts, from organizations in 31 different countries on five continents. Based on a rigorous peer-review process by the Program Committee members along with external experts as reviewers, the best quality papers were identified for presentation and publication.

The review was carried out using a double-blind process, with a minimum of three reviews per submission. Submitted papers came from more than 32 countries and accepted papers originated from 14 countries. Out of the submission pool of 54 papers, 18 (33.3%) were accepted as full papers for inclusion in the proceedings, and three (5.5%) as short papers. Thus, the total acceptance ratio was 38.9%.

Apart from these papers, three 'Journal-first' papers were included in the QUATIC 2022 program. These papers correspond to articles published in 2021 or 2022 in top-notch journals that did not have any prior publication as workshop or conference papers. These three papers were the following:

- Amna, A. R., & Poels, G. (2022). Ambiguity in user stories: A systematic literature review. *Information and Software Technology*, 145, 106824. <https://doi.org/10.1016/j.infsof.2022.106824>
- Garcia-Alonso, J., Rojo, J., Valencia, D., Moguel, E., Berrocal, J., & Murillo, J. M. (2022). Quantum Software as a Service Through a Quantum API Gateway. *IEEE Internet Computing*, 26(1), 34–41. <https://doi.org/10.1109/MIC.2021.3132688>
- Gualo, F., Rodriguez, M., Verdugo, J., Caballero, I., & Piattini, M. (2021). Data quality certification using ISO/IEC 25012: Industrial experiences. *Journal of Systems and Software*, 176, 110938. <https://doi.org/10.1016/j.jss.2021.110938>

QUATIC 2022 featured three invited talks presented by outstanding keynote speakers.

The first keynote speaker was Mauricio Aniche. Mauricio leads the Tech Academy of Adyen, a Dutch payment company that allows businesses to accept e-commerce, mobile, and point-of-sale payments. Mauricio is also an assistant professor of software engineering at Delft University of Technology in the Netherlands, where he conducts research on improving developers' productivity in testing and maintenance. His talk in QUATIC 2022 was entitled "Software Engineering Theory in Practice: The Good, The Bad, and The Ugly". In the talk, he described many examples from industry and academia where both worlds are perfectly aligned, and where they are not.

The second keynote speaker was Sergio Segura, who is an associate professor at the University of Seville, Spain, and a senior member of the Applied Software Engineering

(ISA) research group. He is also a co-founder and a member of the direction board of the Unit of Excellence Smart Computer Systems Research and Engineering (SCORE), where he leads the university's research line on software and services engineering. His talk entitled "Quality assessment of untestable programs: the metamorphic way" aimed to guide researchers and practitioners through the area of metamorphic testing, including an introduction to the technique, its evolution, successful applications, and open problems.

Last but not least, Nicole Novielli, who is an assistant professor at the University of Bari, Italy, delivered the third keynote speech. Her research interests lie at the intersection of software engineering and affective computing, with a specific focus on emotion mining from software repositories, natural language processing of developers' communication traces, and biometric recognition of developers' emotions. Her talk was entitled "Recognizing Developers' Emotions: Advances and Open Challenges", which provided an overview of recent research findings of sentiment analysis in software engineering (SE), addressed the open challenges, and provided empirically-based guidelines for safe (re)use of SE-specific tools in order to obtain meaningful results.

As proceedings editors, we wish to thank all the people and organizations that directly or indirectly supported this event. Thanks to the thematic track chairs and all other members of the Program Committee for their many contributions and reviews that guarantee the overall quality of the QUATIC 2022 conference.

Thanks to our colleagues from the University of Castilla-La Mancha for all the organizational details required for hosting the conference. Thanks to our colleagues that participate at different levels in the organization of the conference. Thanks to the Steering Committee members for trusting us to organize the conference, and for their guidance and support throughout this process.

Also, a special thanks to all the organizations involved in this conference, including supporters at the University of Castilla-La Mancha (Facultad de Ciencias Sociales de Talavera de la Reina, Instituto de Tecnologías y Sistemas de Información, Departamento de Tecnologías y Sistemas de Información, and Alarcos Research Group), as well as our sponsors (AQC Lab, aQuantum, DQTeam, Cátedras Telefónica, and Aula SMACT by avanttic) and promoters (IPQ and CS03).

Finally, special thanks to all the authors and participants at the conference. Without their efforts, there would be no conference or proceedings. Thank you for contributing to the critical mass of researchers that keep this conference alive for what we expect to be many years to come.

September 2022

Antonio Vallecillo  
Joost Visser  
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# Contents

## Smart and Advanced Systems

Quality Characteristics of a Software Platform for Human-AI Teaming in Smart Manufacturing .....	3
<i>Philipp Haindl, Thomas Hoch, Javier Dominguez, Julen Aperribai, Nazim Kemal Ure, and Mehmet Tunçel</i>	
Architectural Decisions in AI-Based Systems: An Ontological View .....	18
<i>Xavier Franch, Silverio Martínez-Fernández, Claudia P. Ayala, and Cristina Gómez</i>	

## Verification and Validation

An Empirical Study to Quantify the SetUp and Maintenance Benefits of Adopting WebDriverManager .....	31
<i>Maurizio Leotta, Boni García, and Filippo Ricca</i>	
Assessing Black-box Test Case Generation Techniques for Microservices .....	46
<i>Luca Giamattei, Antonio Guerriero, Roberto Pietrantuono, and Stefano Russo</i>	
ReSuMo: Regression Mutation Testing for Solidity Smart Contracts .....	61
<i>Morena Barboni, Francesco Casoni, Andrea Morichetta, and Andrea Polini</i>	
Is NLP-based Test Automation Cheaper Than Programmable and Capture &Replay? .....	77
<i>Maurizio Leotta, Filippo Ricca, Simone Stoppa, and Alessandro Marchetto</i>	
Effective Spectrum Based Fault Localization Using Contextual Based Importance Weight .....	93
<i>Qusay Idrees Sarhan and Árpád Beszédes</i>	
Comparing the Effectiveness of Assertions with Differential Testing in the Context of Web Testing .....	108
<i>Maurizio Leotta, Davide Paparella, and Filippo Ricca</i>	

**Skills and Education**

Roadblocks to Attracting Students to Software Testing Careers:  
Comparisons of Replicated Studies ..... 127  
*Rodrigo E. C. Souza, Ronnie E. de Souza Santos,  
Luiz Fernando Capretz, Marlon A. S. de Sousa,  
and Cleyton V. C. de Magalhães*

Analyzing Quality Issues from Software Testing Glossaries Used  
in Academia and Industry ..... 140  
*Luis Olsina, Philip Lew, and Guido Tebes*

Can Source Code Analysis Indicate Programming Skills? A Survey  
with Developers ..... 156  
*Johnatan Oliveira, Maurício Souza, Matheus Flauzino, Rafael Durelli,  
and Eduardo Figueiredo*

**Industrial Experiences and Applications**

Improving the Quality of ICT and Forestry Service Processes with Digital  
Service Management Approach: A Case Study on Forestry Liquids ..... 175  
*Marko Jäntti and Markus Aho*

Towards a Process Reference Model for Clinical Coding ..... 190  
*Ismael Caballero, Júlio Souza, Fernando Lopes, João Vasco Santos,  
and Alberto Freitas*

Digital Twin for IoT Environments: A Testing and Simulation Tool ..... 205  
*Luong Nguyen, Mariana Segovia, Wissam Mallouli,  
Edgardo Montes de Oca, and Ana R. Cavalli*

**Safety, Security and Privacy**

Simpler Is Better: On the Use of Autoencoders for Intrusion Detection ..... 223  
*Marta Catillo, Antonio Pecchia, and Umberto Villano*

A Proposal for FPGA-Accelerated Deep Learning Ensembles in MPSoC  
Platforms Applied to Malware Detection ..... 239  
*Alessandro Cilaro, Vincenzo Maisto, Nicola Mazzocca,  
and Franca Rocco di Torrepadula*

Automated Threat Modeling Approaches: Comparison of Open Source  
Tools ..... 250  
*Daniele Granata, Massimiliano Rak, and Giovanni Salzillo*



Understanding Black-Box Attacks Against Object Detectors from a User's Perspective .....	266
<i>Kim André Midtlid, Johannes Åsheim, and Jingyue Li</i>	
Alice in (Software Supply) Chains: Risk Identification and Evaluation .....	281
<i>Giacomo Benedetti, Luca Verderame, and Alessio Merlo</i>	
Evaluating Tangle Distributed Ledger for Access Control Policy Distribution in Multi-region Cloud Environments .....	296
<i>Carlo Mazzocca, Andrea Sabbioni, Rebecca Montanari, and Michele Colajanni</i>	
Toward the Adoption of Secure Cyber Digital Twins to Enhance Cyber-Physical Systems Security .....	307
<i>Alessandra De Benedictis, Christiancarmine Esposito, and Alessandra Somma</i>	
<b>Author Index</b> .....	323