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# Testing Software and Systems

28th IFIP WG 6.1 International Conference, ICTSS 2016  
Graz, Austria, October 17–19, 2016  
Proceedings

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# Preface

This volume contains the conference proceedings of the IFIP 28th International Conference on Testing Software and Systems, which was held October 17–19, 2016. The International Conference on Testing Software and Systems (ICTSS) addresses the conceptual, theoretic, and practical problems of testing software systems, including communication protocols, services, distributed platforms, middleware, embedded- and cyber-physical systems, and security infrastructures. ICTSS is the successor of previous (joint) conferences TESTCOM and FATES and aims to be a forum for researchers, developers, testers, and users to review, discuss, and learn about new approaches, concepts, theories, methodologies, tools, and experience in the field of testing communicating systems and software.

In 2016, the conference took place at the main building of the Technische Universität Graz, Austria. Conjointly with the main conference, three workshops were organized as part of the ICTSS workshop program, namely: the 4th International Workshop on Risk Assessment and Risk-Driven Quality Assurance (RISK), the Workshop on Digital Eco-Systems, and the Workshop on Quality Assurance in Computer Vision (QACV).

ICTSS received 41 submissions from 24 countries, which were evaluated in a rigorous single-blind peer reviewing process by a Program Committee including 53 experts and ten external reviewers. From the 41 submission, six were desk rejected because of substantial deviations from the submission requirements and lack of acceptable content. For the remaining 35 submissions, we received 105 reviews. Based on the reviews, of the 41 submissions, 13 (32 %) were accepted for inclusion in these proceedings as full papers, and eight (20 %) were accepted as short papers. From the short paper's authors decided to retract three papers from these proceedings.

We wish to thank all Program Committee members and additional reviewers for their great efforts in reviewing and discussing the submissions during the reviewing process. The outcome of the review process shows the effectiveness of the selection process and the commitment of the Program Committee to continue the high-quality standards of ICTSS.

The ICTSS 2016 program also included three keynotes given by distinguished scientists. Special thanks go to Gordon Fraser, Arnaud Gotlieb, and Jeff Offutt for their thought-provoking keynotes and their active participation in discussions during the conference.

Last but not least, we want to thank everyone who helped make ICTSS 2016 a success. This of course includes all authors, Program Committee members, Steering Committee members, reviewers, and keynote speakers, as well as the organizers, reviewers, and authors of the workshops. In addition we want to sincerely thank the participants of ICTSS, without whom a conference would never be a success.

October 2016

Franz Wotawa  
Mihai Nica  
Natalia Kushik

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## **Keynotes (Abstracts)**

# Gamifying Software Testing

Gordon Fraser

University of Sheffield, Sheffield, UK

**Abstract.** Writing good software tests is difficult and not every developer's favourite occupation. If an activity is so difficult, boring, or otherwise unattractive that people do not want to engage with it, then gamification offers a solution: By turning the activity into a fun and competitive task, participants engage, compete, and excel. In this talk, I will explore how this idea can be applied to software testing. Our ongoing work with the Code Defenders game demonstrates that players engage with testing, and perceive it as a fun activity. At the same time, by participating in the game, players produce test suites that are far superior to anything automated testing tools generate. This illustrates the potential of using gamification to address some of the many problems that we are facing today in software testing. There are, however, many challenges ahead, and I will outline some of the challenges and research opportunities related to gamifying software testing.

# Constraint-Based Test Suite Optimization

Arnaud Gotlieb

Simula Research Laboratory, Fornebu, Norway

**Abstract.** Test suite optimization is a crucial topic in software testing which was recently boosted by the contributions of constraint programming and search-based algorithms. The increased complexity of testing procedures and the combinatorial nature of the underlying testing problems, namely (multi-criteria) test suite reduction, prioritization and scheduling requires the usage of advanced techniques which have been developed in other contexts. In this talk, I will review some of these advances and their application to real-world testing problems that we address in Certus, the Norwegian research-based innovation centre dedicated to Software Validation and Verification.

# Beyond Test Automation

Jeff Offutt

George Mason University, Fairfax, USA

**Abstract.** Many software testing researchers have the goal of making their research valuable to industry. For example, STVR's tagline is "Useful research in making better software," and a common exhortation is that software engineering research should "help real engineers make real software better." If so, then improving test automation is certainly an effective strategy. Increasing test automation is currently one of the most important and pervasive changes in the software industry. This talk will overview the key elements of test automation, summarize some of the recent research advances in test automation, explore how this change is playing out in industry, and present some current challenges in test automation. The talk will conclude by asking a simple question to go beyond test automation: "why are my tests so dumb?"

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