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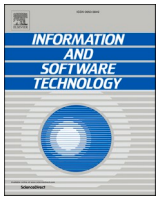

Editorial

ISSRE 2021 special section

This special section contains the extended version of four papers from the 32th IEEE International Symposium on Software Reliability Engineering (ISSRE 2021).

ISSRE focuses on innovative techniques and tools for assessing, predicting, and improving the reliability, safety, and security of software products. ISSRE emphasizes scientific methods, industrial relevance, rigorous empirical validation, and shared value of practical tools and experiences. ISSRE boasts a large number of authors and participants from international corporations.

Based on the reviews from program committee members and the journal's topics of interest, we invited the authors of six ISSRE 2021 papers to submit extended versions of their papers to this special section. The extended papers underwent a rigorous peer-review process including reviewers from the ISSRE 2021 Program Committee along with other experts from the software engineering community. Ultimately, we accepted four papers for inclusion in this special section.

The first paper, *Automatically Repairing Tensor Shape Faults in Deep Learning Programs* by Dangwei Wu, Beijun Shen, Yuting Chen, He Jiang, and Lei Qiao, describes the construction of the SFData dataset, which consists of 146 buggy programs that contain tensor shape faults that result in crashes. The paper also reports an empirical study on these faults that categorizes them into four types and reveals twelve repair patterns. The paper then describes Tensfa2, an automated approach to detecting and repairing crashing tensor shape faults, that exploits search-based methods and ranking strategies applied to the repair patterns. The results of the studies show Tensfa2 successfully repaired 82 out of 146 buggy programs in the SFData dataset.

The second paper, *Software Defect Prediction with Semantic and Structural Information of Codes Based on Graph Neural Networks* by Chunying Zhou, Peng He, Cheng Zeng, and Ju Ma, proposes a classification model that can accurately predict defects based on analysis of Abstract Syntax Trees (ASTs) and Class Dependency Networks (CDN) constructed from source code. For ASTs, the approach extracts symbolic tokens and encodes them into vectors. These vectors are inputs to a CNN that captures semantic information. For CDN, the approach uses a Graph Convolutional Network (GCN) to automatically learn structural information about the network. The approach then combines the semantic and structural information, along with traditional hand-crafted features, to train a classifier that can provide accurate defect prediction. Experiments using 21 open-source projects show the proposed method outperforms state-of-the-art defect prediction models for both within-project prediction and cross-project prediction.

The third paper, *Guidelines for the development of a critical software under emergency* by Andrea Bombarda, Silvia Bonfanti, Cristiano Galbiati, Angelo Gargantini, Patrizio Pelliccione, Elvinia Riccobene, and Masayuki Wada, describes a case study on the certification of healthcare devices under emergency situations. The case study includes the inspection and analysis of a comprehensive set of artifacts, including source code, code comments, change requests, test reports, deliverables produced for the software certification (safety concepts, requirements specifications, architecture and design, testing activities, etc.), notes, whiteboard sketches, and emails. The paper includes a number of interesting findings, especially in terms of lessons learned and guidelines for experts, about certifying software for healthcare devices produced with strict and pressing time constraints and with the difficulty of establishing a heterogeneous development team made of volunteers.

The fourth paper, *Understanding and predicting incident mitigation time* by Weijing Wang, Junjie Chen, Lin Yang, Hongyu Zhang, and Zan Wang, proposes TTMPred, a deep-learning-based approach for Time To Mitigation (TTM) prediction in the continuous triage scenario. The paper includes both an empirical study, designed to reveal information about incidents, and the design of TTMPred, which is trained on the features identified with the empirical study. Experiments show that proposed approach performs better than the compared approaches for both incident TTM prediction and bug-fixing time prediction.

We express our profound gratitude to all those who contributed to the success of ISSRE 2021 and this special section. We extend our sincere thanks to the authors for their invaluable efforts in extending their papers and submitting them to the field of software reliability engineering. We also express our gratitude to the panel of experts for providing insightful and constructive feedback, ensuring the quality of the papers. We would like to acknowledge the support and effort of the ISSRE steering committee, organizing committee, program committee, and program board. Lastly, we would like to extend our gratitude to Günther Ruhe, Editor-in-Chief, for his unwavering support and to Jeffrey Carver, Special Content Editor, for his continued guidance in this special section.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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