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Preface

As a continuation of the last five years' special section on software systems, this special section encourages and promotes research to address challenges from the perspective of software systems. The goal of this special section is to present state-of-the-art and high-quality original research in the area of software systems.

Similar to the last year's special section, this special section includes two different major themes: 1) Internetware and Beyond; 2) Dependable Software Engineering.

Internetware and Beyond. The Internet, not only of computers, but also of things and human users, has been rapidly and profoundly changing how software applications are constructed, deployed, and used. To achieve their application goals, software systems on this Internet platform need to coordinate autonomous third-party services and resources, adapt to constant changes in the environment where they are situated and in the requirements that they must satisfy, and continuously maintain for a level of service quality satisfactory to users. This theme aims to provide a forum where researchers and professionals from multiple disciplines and domains share ideas to explore and address the challenges brought by Internetware.

Dependable Software Engineering. Formal methods emerged as an important area in computer science and software engineering about half a century ago. An international community is formed researching, developing and teaching formal theories, techniques and tools for software modeling, specification, design and verification. However, the impact of formal methods on the quality improvement of software systems in practice is lagging behind. This is for instance reflected by the challenges in applying formal techniques and tools to engineering large-scale systems such as Cyber-Physical Systems (CPS), Internet-of-Things (IoT), Enterprise Systems, Cloud-Based Systems, and so forth.

The special section received 47 submissions. Many of them are of highly competitive quality. After the thorough review and revision process, we had to make very difficult decisions to accept only 15 articles to assemble this special section. The accepted 15 peer-reviewed articles in this special section cover the major hot topics in the two major themes.

Our journal's Vol.35 No.5 issue already includes the following three articles from the theme of Internetware and Beyond: "Mining Design Pattern Use Scenarios and Related Design Pattern Pairs: A Case Study on Online Posts" by Liu *et al.*, "FATOC: Bug Isolation Based Multi-Fault Localization by Using OPTICS Clustering" by Wu *et al.*, "Predicted Robustness as QoS for Deep Neural Network Models" by Wang *et al.*; and one article from the theme of Dependable Software Engineering: "EasyModel: A Refinement-Based Modeling and Verification Approach for Self-Adaptive Software" by Han *et al.*.

This journal issue includes the remaining 11 articles. In particular, the theme of Internetware and Beyond includes three articles: "ProSy: API-Based Synthesis with Probabilistic Model" by Liu *et al.*, "Learning Human-Written Commit Messages to Document Code Changes" by Huang *et al.*, and "Automatically Identifying Calling-Prone Higher-Order Functions to Assist Testers" by Xu *et al.*.

The theme of Dependable Software Engineering includes eight articles: "Reachability of Patterned Conditional Pushdown Systems" by Li *et al.*, "Specification and Verification of the Zab Protocol with TLA+" by Yin *et al.*, "Modelling and Verification of the RTPS Protocol using Uppaal and Simulink/Stateflow" by Lin *et al.*, "Jupiter Made Abstract, and Then Refined" by Wei *et al.*, "Verifying ReLU Neural Networks from A Model Checking Perspective" by Liu *et al.*, "Modular Verification of SPARCv8 Code" by Zha *et al.*, "Automatic Buffer Overflow Warning Validation" by Gao *et al.*, and "Predicting Code Smells and Analysis of Predictions: Using Machine Learning Techniques and Software Metrics" by Mhawish and Gupta.

We thank all the authors who submitted to this special section. We appreciate great help from the guest editors for the theme of Internetware and Beyond: Zhi Jin (Peking University, Beijing), Xuan-Dong Li (Nanjing University,

Nanjing), Gang Huang (Peking University, Beijing), and Hausi A. Muller (University of Victoria, British Columbia); and the guest editors for the theme of Dependable Software Engineering: Jun Pang (University of Luxembourg, Luxembourg) and Li-Jun Zhang (Institute of Software, Chinese Academy of Sciences, Beijing). We are also highly appreciative to the reviewers who provided valuable review feedback on the submissions in a tight schedule. All these preceding contributions make this special section possible.

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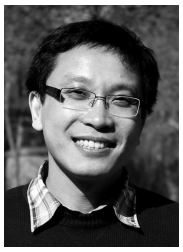
Hausi A. Muller is a professor of computer science at the University of Victoria, British Columbia, Canada, and an adjunct professor at Icesi University in Cali, Colombia. He was the associate dean of research, Faculty of Engineering (2009-2019). He is the Co-Chair of IEEE Future Directions Quantum Initiative and serves on the IEEE Conferences Committee (2019-2021). He was Vice President of IEEE Computer Society (CS) Technical and Conferences Activities (T&C) Board (2016-2018), a member of the CS Board of Governors (2015-2017), chair of TCSE, the CS Technical Council on Software Engineering (2011-2015). He received an IEEE CS Golden Core Member Award (2016) and IEEE TCSE Distinguished Service Award (2016). In 2011 his research team won the IBM Canada CAS Research Project of the Year Award. With his research group, he collaborates extensively with industry as an international expert in software engineering, software evolution, quantum computing, adaptive systems, IoT, and intelligent cyber-physical systems. He is a Canadian Academy of Engineering (FCAE) Fellow and a professional engineer (PEng) registered with APEGBC.



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