

# **2022 IEEE International Conference on Software Maintenance and Evolution (ICSME 2022)**

**Limassol, Cyprus  
2 – 7 October 2022**



**IEEE Catalog Number: CFP22079-POD**  
**ISBN: 978-1-6654-7957-8**

**Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP22079-POD
ISBN (Print-On-Demand):	978-1-6654-7957-8
ISBN (Online):	978-1-6654-7956-1
ISSN:	1063-6773

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2022 IEEE International Conference on Software Maintenance and Evolution (ICSME) **ICSME 2022**

## Table of Contents

Message from the General Co-Chairs and Program Co-Chairs .....	xv
Organizing Committee .....	xvii
Program Committee .....	xix
Steering Committee .....	xxiv

### Research

An Effective Approach for Parsing Large Log Files .....	1
<i>Issam Sedki (Concordia University, Canada), Abdelwahab Hamou-Lhadj (Concordia University, Canada), Otmane Ait-Mohamed (Concordia University, Canada), and Mohammed A. Shehab (Concordia University, Canada)</i>	
An Empirical Study of Challenges in Converting Deep Learning Models .....	13
<i>Moses Openja (Polytechnique Montréal, Canada), Amin Nikanjam (Polytechnique Montréal, Canada), Ahmed Haj Yahmed (Polytechnique Montréal, Canada), Foutse Khomh (Polytechnique Montréal, Canada), and Zhen Ming Jiang (York University, Canada)</i>	
An Empirical Study of Flaky Tests in JavaScript .....	24
<i>Negar Hashemi (Massey University, New Zealand), Amjed Tahir (Massey University, New Zealand), and Shawn Rasheed (Massey University, New Zealand)</i>	
An Empirical Study on Performance Bugs in Deep Learning Frameworks .....	35
<i>Tarek Makkouk (Concordia University, Canada), Dong Jae Kim (Concordia University, Canada), and Tse-Hsun Chen (Concordia University, Canada)</i>	
An Empirical Study on the Fault-Inducing Effect of Functional Constructs in Python .....	47
<i>Fiorella Zampetti (University of Sannio, Italy), François Belias (Politechnique Montréal, Canada), Cyrine Zid (Polytechnique Montréal, Canada), Giuliano Antoniol (Polytechnique Montréal, Canada), and Massimiliano Di Penta (University of Sannio, Italy)</i>	
An Empirical Study on the Usage of Automated Machine Learning Tools .....	59
<i>Forough Majidi (Polytechnique Montreal, Canada), Moses Openja (Polytechnique Montreal, Canada), Foutse Khomh (Polytechnique Montreal, Canada), and Heng Li (Polytechnique Montreal, Canada)</i>	

Automatic Pull Request Title Generation .....	71
<i>Ting Zhang (Singapore Management University), Ivana Clairine Irsan (Singapore Management University), Ferdian Thung (Singapore Management University), DongGyun Han (Singapore Management University), David Lo (Singapore Management University), and Lingxiao Jiang (Singapore Management University)</i>	
BASHEXPLAINER: Retrieval-Augmented Bash Code Comment Generation based on Fine-Tuned CodeBERT .....	82
<i>Chi Yu (Nantong University, China), Guang Yang (Nantong University, China), Xiang Chen (Nantong University, China), Ke Liu (Nantong University, China), and Yanlin Zhou (Nantong University, China)</i>	
Cross-Modal Contrastive Learning for Code Search .....	94
<i>Zejian Shi (Fudan University, China), Yun Xiong (Fudan University, China), Xiaolong Zhang (Fudan University, China), Yao Zhang (Fudan University, China), Shanshan Li (National University of Defense Technology, China), and Yangyong Zhu (Fudan University, China)</i>	
Dazed and Confused: Studying the Prevalence of Atoms of Confusion in Long-Lived Java Libraries .....	106
<i>Wendell Mendes (Federal University of Ceará, Brazil), Oton Pinheiro (Federal University of Ceará, Brazil), Emanuele Santos (Federal University of Ceará, Brazil), Lincoln Rocha (Federal University of Ceará, Brazil), and Windson Viana (Federal University of Ceará, Brazil)</i>	
Deceiving Deep Neural Networks-Based Binary Code Matching with Adversarial Programs .....	117
<i>Wai Kin Wong (Hong Kong University of Science and Technology), Huaijin Wang (Hong Kong University of Science and Technology), Pingchuan Ma (Hong Kong University of Science and Technology), Shuai Wang (Hong Kong University of Science and Technology), Mingyue Jiang (Zhejiang Sci-Tech University), Tsong Yueh Chen (Swinburne University of Technology), Qiyi Tang (Tencent Security Keen Lab), Sen Nie (Swinburne University of Technology), and Shi Wu (Tencent Security Keen Lab)</i>	
Evaluation of Context-Aware Language Models and Experts for Effort Estimation of Software Maintenance Issues .....	129
<i>Mohammed Alhamed (University of Glasgow, UK) and Tim Storer (University of Glasgow, UK)</i>	
Exploring the Notion of Risk in Code Reviewer Recommendation .....	139
<i>Farshad Kazemi (University of Waterloo, Canada), Maxime Lamothe (Polytechnique Montreal, Canada), and Shane McIntosh (University of Waterloo, Canada)</i>	
FFL: Fine-Grained Fault Localization for Student Programs via Syntactic and Semantic Reasoning .....	151
<i>Thanh-Dat Nguyen (University of Melbourne), Thanh Le-Cong (Hanoi University of Science and Technology), Duc-Minh Luong (Hanoi University of Science and Technology), Van-Hai Duong (Independent Researcher), Xuan-Bach D. Le (University of Melbourne), David Lo (Singapore Management University), and Quyet-Thang Huynh (Hanoi University of Science and Technology)</i>	

Guiding Automated Test Case Generation for Transaction-Reverting Statements in Smart Contracts .....	163
<i>Mitchell Olsthoorn (Delft University of Technology, The Netherlands), Arie van Deursen (Delft University of Technology, The Netherlands), and Annibale Panichella (Delft University of Technology, The Netherlands)</i>	
Heterogeneous Vulnerability Report Traceability Recovery by Vulnerability Aspect Matching .....	175
<i>Jiamou Sun (Australian National University, Australia), Zhenchang Xing (CSIRO's, Australia; Australian National University, Australia), Xiwei Xu (CSIRO, Australia), Liming Zhu (CSIRO's, Australia; The University of New South Wales, Australia), and Qinghua Lu (CSIRO, Australia)</i>	
INFUSE: Towards Efficient Context Consistency by Incremental-Concurrent Check Fusion .....	187
<i>Lingyu Zhang (State Key Laboratory for Novel Software Technology, Nanjing University, China), Huiyan Wang (State Key Laboratory for Novel Software Technology, Nanjing University, China), Chang Xu (State Key Laboratory for Novel Software Technology, Nanjing University, China), and Ping Yu (State Key Laboratory for Novel Software Technology, Nanjing University, China)</i>	
Improving Fault Localization Using Model-Domain Synthesized Failing Test Generation .....	199
<i>Zhuo Zhang (Chongqing University, China; Guangzhou College of Commerce, China), Yan Lei (Chongqing University, China; Peng Cheng Laboratory, China), Xiaoguang Mao (National University of Defense Technology, China), Meng Yan (Chongqing University, China), and Xin Xia (Software Engineering Application Technology Lab at Huawei, China)</i>	
Is Kernel Code Different From Non-Kernel Code? A Case Study of BSD Family Operating Systems .....	211
<i>Gunnar Kudrjavoets (University of Groningen, Netherlands), Jeff Thomas (Meta Platforms, Inc., USA), Nachiappan Nagappan (Meta Platforms, Inc., USA), and Ayushi Rastogi (University of Groningen, Netherlands)</i>	
On the Security of Python Virtual Machines: An Empirical Study .....	223
<i>Xinrong Lin (University of Science and Technology of China, China), Baojian Hua (University of Science and Technology of China, China), and Qiliang Fan (University of Science and Technology of China, China)</i>	
On the use of GitHub Actions in Software Development Repositories .....	235
<i>Alexandre Decan (University of Mons, Belgium), Tom Mens (University of Mons, Belgium), Pooya Rostami Mazrae (University of Mons, Belgium), and Mehdi Golzadeh (University of Mons, Belgium)</i>	
OpenCBS: An Open-Source COBOL Defects Benchmark Suite .....	246
<i>Dylan Lee (Phase Change Software, USA), Austin Henley (Microsoft, USA), Bill Hinshaw (Phase Change Software, USA), and Rahul Pandita (Phase Change Software, USA; GitHub Inc., USA)</i>	

Peeler: Learning to Effectively Predict Flakiness without Running Tests .....	257
<i>Yihao Qin (National University of Defense Technology, China), Shangwen Wang (National University of Defense Technology, China), Kui Liu (Huawei Software Engineering Application Technology Lab, China), Bo Lin (National University of Defense Technology, China), Hongjun Wu (National University of Defense Technology, China), Li Li (Monash University, Australia), Xiaoguang Mao (National University of Defense Technology, China), and Bissyandé Tegawendé F. (University of Luxembourg)</i>	
Quantifying the Potential to Automate the Synchronization of Variants in Clone-and-Own .....	269
<i>Alexander Schultheiß (Humboldt University of Berlin, Germany), Paul Maximilian Bittner (University of Ulm, Germany), Thomas Thüm (University of Ulm, Germany), and Timo Kehrer (University of Bern, Switzerland)</i>	
RMove: Recommending Move Method Refactoring Opportunities using Structural and Semantic Representations of Code .....	281
<i>Di Cui (Xidian University, China), Siqi Wang (Xidian University, China), Yong Luo (Xidian University, China), Xingyu Li (Xidian University, China), Jie Dai (Xidian University, China), Lu Wang (Xidian University, China), and Qingshan Li (Xidian University, China)</i>	
Smart Money Wasting: Analyzing Gas Cost Drivers of Ethereum Smart Contracts .....	293
<i>Benedikt Severin (University of Duisburg-Essen, Germany), Marc Hesenius (University of Duisburg-Essen, Germany), Florian Blum (University of Duisburg-Essen, Germany), Michael Hettmer (University of Duisburg-Essen, Germany), and Volker Gruhn (University of Duisburg-Essen, Germany)</i>	
Stronger Together: On Combining Relationships in Architectural Recovery Approaches .....	305
<i>Evelien Boerstra (The University of British Columbia, Canada), John Ahn (The University of British Columbia, Canada), and Julia Rubin (The University of British Columbia, Canada)</i>	
The Energy Cost of the Visitor Pattern .....	317
<i>Déaglán Connolly Bree (University College Dublin, Ireland) and Mel Ó Cinnéide (University College Dublin, Ireland)</i>	
VERJava: Vulnerable Version Identification for Java OSS with a Two-Stage Analysis .....	329
<i>Qing Sun (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), Lili Xu (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), Yang Xiao (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), Feng Li (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), He Su (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), Yiming Liu (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China), Hongyun Huang (Zhejiang Sci-Tech University, China), and Wei Huo (Institute of Information Engineering, Chinese Academy of Sciences \ China; University of Chinese Academy of Sciences, China)</i>	

What Is Thrown? Lightweight Precise Automatic Extraction of Exception Preconditions in Java Methods .....	340
<i>Diego Marcilio (USI Università della Svizzera italiana, Switzerland)</i> <i>and Carlo A. Furia (USI Università della Svizzera italiana, Switzerland)</i>	
What Made This Test Flake? Pinpointing Classes Responsible for Test Flakiness .....	352
<i>Sarra Habchi (Ubisoft), Guillaume Haben (University of Luxembourg), Jeongju Sohn (University of Luxembourg), Adriano Franci (University of Luxembourg), Michail Papadakis (University of Luxembourg), Maxime Cordy (University of Luxembourg), and Yves Le Traon (University of Luxembourg)</i>	
 <b>New Ideas and Emerging Results</b>	
A Conceptual Antifragile Microservice Framework for Reshaping Critical Infrastructures .....	364
<i>Hind Bangui (Faculty of Informatics, Masaryk University, Czech Republic), Bruno Rossi (Faculty of Informatics, Masaryk University, Czech Republic), and Barbora Buhnova (Faculty of Informatics, Masaryk University, Czech Republic)</i>	
A First Look at Information Highlighting in Stack Overflow Answers .....	369
<i>Shahla Shaan Ahmed (University of Manitoba, Canada), Shaowei Wang (University of Manitoba, Canada), Haoxiang Zhang (Hauwei, Canada), Tse-Hsun Chen (Concordia University, Canada), and Yuan Tian (Queen's University, Canada)</i>	
Adding Context to Source Code Representations for Deep Learning .....	374
<i>Fuwei Tian (The University of Melbourne, Australia) and Christoph Treude (The University of Melbourne, Australia)</i>	
An Exploratory Study of Documentation Strategies for Product Features in Popular GitHub Projects .....	379
<i>Tim Puhlfürß (Universität Hamburg, Germany), Lloyd Montgomery (Universität Hamburg, Germany), and Walid Maalej (Universität Hamburg, Germany)</i>	
Apples, Oranges & Fruits - Understanding Similarity of Software Repositories Through The Lens of Dissimilar Artifacts .....	384
<i>A Eashaan Rao (Indian Institute of Technology Tirupati, India) and Sridhar Chimalakonda (Indian Institute of Technology Tirupati, India)</i>	
Developers Struggle with Authentication in Blazor WebAssembly .....	389
<i>Pascal Marc André (University of Bern, Switzerland), Quentin Stiévenart (Vrije Universiteit Brussel, Belgium), and Mohammad Ghafari (TU Clausthal, Germany)</i>	
Don't Reinvent the Wheel: Towards Automatic Replacement of Custom Implementations with APIs .....	394
<i>Rosalía Tufano (Università della Svizzera italiana, Switzerland), Emad Aghajani (Università della Svizzera italiana, Switzerland), and Gabriele Bavota (Università della Svizzera italiana, Switzerland)</i>	

Elevating Jupyter Notebook Maintenance Tooling by Identifying and Extracting Notebook Structures .....	399
<i>Yuan Jiang (Carnegie Mellon University), Christian Kästner (Carnegie Mellon University), and Shurui Zhou (University of Toronto)</i>	
Evaluating Atoms of Confusion in the Context of Code Reviews .....	404
<i>Victoria Bogachenkova (Eindhoven University of Technology, The Netherlands), Linh Nguyen (Eindhoven University of Technology, The Netherlands), Felipe Ebert (Jheronimus Academy of Data Science, Tilburg University, The Netherlands), Alexander Serebrenik (Eindhoven University of Technology, The Netherlands), and Fernando Castor (Utrecht University, The Netherlands)</i>	
FuzzNT : Checking for Program Non-Termination .....	409
<i>Hrishikesh Karmarkar (TCS Research), Raveendra Kumar Medicherla (TCS Research), Ravindra Metta (TCS Research), and Prasanth Yeduru (TCS Research)</i>	
How to Configure Masked Event Anomaly Detection on Software Logs? .....	414
<i>Jesse Nyysölä (University of Oulu, Finland), Mika Mäntylä (University of Oulu, Finland), and Martin Varela (Profience, Finland)</i>	
Impact of Defect Instances for Successful Deep Learning-Based Automatic Program Repair .....	419
<i>Misoo Kim (Sungkyunkwan University, Republic of Korea), Youngkyoung Kim (Sungkyunkwan University, Republic of Korea), Jinseok Heo (Sungkyunkwan University, Republic of Korea), Hohyeon Jeong (Sungkyunkwan University, Republic of Korea), Sungoh Kim (Sungkyunkwan University, Republic of Korea), and Eunseok Lee (Sungkyunkwan University, Republic of Korea)</i>	
Inferring Fine-Grained Traceability Links between Javadoc Comment and JUnit Test Code .....	424
<i>Jeewoong Kim (Handong Global University) and Shin Hong (Handong Global University)</i>	
Integrating Software Issue Tracking and Traceability Models .....	429
<i>Naveen Ganesh Muralidharan (McMaster University, Canada), Vera Pantelic (McMaster University, Canada), Victor Bandur (McMaster University, Canada), and Richard Paige (McMaster University, Canada)</i>	
Together or Apart? Investigating a Mediator Bot to Aggregate Bot's Comments on Pull Requests .....	434
<i>Eric Ribeiro (Pontifical Catholic University of Minas Gerais, Brazil), Ronan Nascimento (Pontifical Catholic University of Minas Gerais, Brazil), Igor Steinmacher (Northern Arizona University, USA), Laerte Xavier (Pontifical Catholic University of Minas Gerais, Brazil), Marco Gerosa (Northern Arizona University, USA), Hugo de Paula (Pontifical Catholic University of Minas Gerais, Brazil), and Mairieli Wessel (Radboud University, The Netherlands)</i>	



"When the Code becomes a Crime Scene" Towards Dark Web Threat Intelligence with Software Quality Metrics .....	439
<i>G. Cascavilla (Jheronimus Academy of Data Science, The Netherlands), G. Catolino (Jheronimus Academy of Data Science - Tilburg University, The Netherlands), F. Ebert (Jheronimus Academy of Data Science, The Netherlands), D.A. Tamburri (Eindhoven University of Technology - Jheronimus Academy of Data Science, The Netherlands), and WJ van den Heuvel (Jheronimus Academy of Data Science - Tilburg University, The Netherlands)</i>	

Why Don't XAI Techniques Agree? Characterizing the Disagreements Between Post-Hoc Explanations of Defect Predictions .....	444
<i>Saumendu Roy (University of Saskatchewan, Canada), Gabriel Laberge (Polytechnique Montréal, Canada), Banani Roy (University of Saskatchewan, Canada), Foutse Khomh (Polytechnique Montréal, Canada), Amin Nikanjam (Polytechnique Montréal, Canada), and Saikat Mondal (University of Saskatchewan, Canada)</i>	

## Tool Demonstrations

AIP: Scalable and Reproducible Execution Traces in Energy Studies on Mobile Devices .....	449
<i>Olivier Nourry (Kyushu University, Japan), Yutaro Kashiwa (Nara Institute of Science and Technology, Japan), Bin Lin (Università della Svizzera italiana, Switzerland), Gabriele Bavota (Università della Svizzera italiana, Switzerland), Michele Lanza (Università della Svizzera italiana, Switzerland), and Yasutaka Kamei (Kyushu University, Japan)</i>	

AutoPRTitle: A Tool for Automatic Pull Request Title Generation .....	454
<i>Ivana Clairine Irsan (Singapore Management University), Ting Zhang (Singapore Management University), Ferdian Thung (Singapore Management University), David Lo (Singapore Management University), and Lingxiao Jiang (Singapore Management University)</i>	

CATTO: Just-in-Time Test Case Selection and Execution .....	459
<i>Dario Amoroso d' Aragona (Tampere University, Finland), Fabiano Pecorelli (Tampere University, Finland), Simone Romano (University of Salerno, Italy), Giuseppe Scanniello (University of Salerno, Italy), Maria Teresa Baldassarre (University of Bari, Italy), Andrea Janes (Free University of Bozen-Bolzano, Italy), and Valentina Lenarduzzi (University of Oulu, Finland)</i>	

COBRES: A Tool for Extracting Business Rules from COBOL .....	464
<i>Mir Sameed Ali (Indian Institute of Technology Tirupati, India), Nikhil Manjunath (Indian Institute of Technology Tirupati, India), and Sridhar Chimalakonda (Indian Institute of Technology Tirupati, India)</i>	

Community Smell Detection and Refactoring in SLACK: The CADOCS Project .....	469
<i>Gianmario Voria (University of Salerno, Italy), Vioiana Pentangelo (University of Salerno, Italy), Antonio Della Porta (University of Salerno, Italy), Stefano Lambiase (University of Salerno, Italy), Gemma Catolino (Tilburg University, Netherlands), Fabio Palomba (University of Salerno, Italy), and Filomena Ferrucci (University of Salerno, Italy)</i>	

DiscOrDance: Visualizing Software Developers Communities on Discord .....	474
<i>Marco Raglianti (Università della Svizzera italiana, Switzerland), Csaba Nagy (Università della Svizzera italiana, Switzerland), Roberto Minelli (Università della Svizzera italiana, Switzerland), and Michele Lanza (Università della Svizzera italiana, Switzerland)</i>	
Defuse: A Data Annotator and Model Builder for Software Defect Prediction .....	479
<i>Stefano Dalla Palma (Tilburg University, The Netherlands), Dario Di Nucci (University of Salerno, Italy), and Damian Tamburri (Eindhoven University, The Netherlands)</i>	
eTagger - An Energy Pattern Tagging Tool for GitHub Issues in Android Projects .....	484
<i>Shriram Shanbhag (Indian Institute of Technology Tirupati, India), Sridhar Chimalakonda (Indian Institute of Technology Tirupati, India), Vibhu Saujanya Sharma (Accenture Labs, India), and Vikrant Kaulgud (Accenture Labs, India)</i>	
LiFUSO: A tool for Library Feature Unveiling based on Stack Overflow Posts .....	489
<i>Camilo Velázquez-Rodríguez (Vrije Universiteit Brussel, Belgium), Eleni Constantinou (Eindhoven University of Technology, The Netherlands), and Coen De Roover (Vrije Universiteit Brussel, Belgium)</i>	
The Visual Debugger Tool .....	494
<i>Tim Kräuter (Western Norway University of Applied Sciences, Norway), Harald König (FHDW Hannover, Germany; Western Norway University of Applied Sciences, Norway), Adrian Rutle (Western Norway University of Applied Sciences, Norway), and Yngve Lamo (Western Norway University of Applied Sciences, Norway)</i>	
Perun: Performance Version System .....	499
<i>Tomáš Fiedor (Brno University of Technology, Czech Republic), Jiří Pavela (Brno University of Technology, Czech Republic), Adam Rogalewicz (Brno University of Technology, Czech Republic), and Tomáš Vojnar (Brno University of Technology, Czech Republic)</i>	
RestTestGen: An Extensible Framework for Automated Black-Box Testing of RESTful APIs .....	504
<i>Davide Corradini (University of Verona, Italy), Amedeo Zampieri (University of Verona, Italy), Michele Pasqua (University of Verona, Italy), and Mariano Ceccato (University of Verona, Italy)</i>	
RepoQuester: A Tool Towards Evaluating GitHub Projects .....	509
<i>Kowndinya Boyalakuntla (Indian Institute of Technology, India), Meiyappan Nagappan (University of Waterloo, Canada), Sridhar Chimalakonda (Indian Institute of Technology, India), and Nuthan Munaiah (Rochester Institute of Technology, USA)</i>	
VSCoDe Migrate: Semi-Automatic Migrations for Low Coverage Projects .....	514
<i>Tim Vahlbrock (TIS Technische Informationssysteme GmbH &amp; Westphalian University of Applied Sciences, Germany), Martin Guddat (Westphalian University of Applied Sciences, Germany), and Tom Vierjahn (Westphalian University of Applied Sciences, Germany)</i>	

## Industry

Automated Server Testing: an Industrial Experience Report .....	519
<i>Chao Peng (ByteDance, China), Yujun Gao (ByteDance, China), and Ping Yang (ByteDance, China)</i>	
Generating Customised Control Flow Graphs for Legacy Languages with Semi-Parsing .....	523
<i>Céline Deknop (UCLouvain, Belgium; Raincode Labs, Belgium), Johan Fabry (Raincode Labs, Belgium), Kim Mens (UCLouvain, Belgium), and Vadim Zaytsev (UTwente, The Netherlands)</i>	
Learning-Based Identification of Coding Best Practices from Software Documentation .....	533
<i>Neela Sawant (Amazon, India) and Srinivasan H. Sengamedu (Amazon, USA)</i>	
MUBot: Learning to Test Large-Scale Commercial Android Apps like a Human .....	543
<i>Chao Peng (ByteDance, China), Zhao Zhang (ByteDance, China), Zhengwei Lv (ByteDance, China), and Ping Yang (ByteDance, China)</i>	
Mining Annotation Usage Rules: A Case Study with MicroProfile .....	553
<i>Batyr Nuryyev (University of Alberta, Canada), Ajay Kumar Jha (University of Alberta, Canada), Sarah Nadi (University of Alberta, Canada), Yee-Kang Chang (IBM, Canada), Emily Jiang (IBM, Canada), and Vijay Sundaresan (IBM, Canada)</i>	
On Quantifying the Benefits of Dead Code Removal .....	563
<i>Gunnar Kudrjavets (University of Groningen, Netherlands), Ayushi Rastogi (University of Groningen, Netherlands), Jeff Thomas (Meta Platforms, Inc., USA), and Nachiappan Nagappan (Meta Platforms, Inc., USA)</i>	
Selecting Test Cases Based on Similarity of Runtime Information: A Case Study of an Industrial Simulator .....	564
<i>Kazumasa Shimari (Nara Institute of Science and Technology, Japan), Masahiro Tanaka (Osaka University, Japan), Takashi Ishio (Nara Institute of Science and Technology, Japan), Makoto Matsushita (Osaka University, Japan), Katsuro Inoue (Nanzan University, Japan), and Satoru Takanezawa (Daikin Industries, Ltd., Japan)</i>	
The Engineering Implications of Code Maintenance in Practice .....	568
<i>Noah Lee (Meta Platforms, Inc., USA), Rui Abreu (Meta Platforms, Inc., USA), Mehmet Yatbaz (Meta Platforms, Inc., USA), Hang Qu (Meta Platforms, Inc., USA), and Nachiappan Nagappan (Meta Platforms, Inc., USA)</i>	
There Ain't No Such Thing as a Free Custom Memory Allocator .....	578
<i>Gunnar Kudrjavets (University of Groningen, Netherlands), Jeff Thomas (Meta Platforms, Inc., USA), Aditya Kumas (Snap, Inc., USA), Nachiappan Nagappan (Meta Platforms, Inc., USA), and Ayushi Rastogi (University of Groningen, Netherlands)</i>	
Using a Nearest-Neighbour, BERT-Based Approach for Scalable Clone Detection .....	582
<i>Muslim Chochlov (University of Limerick, Ireland), Gul Aftab Ahmed (Trinity College Dublin, Ireland), James Vincent Patten (University of Limerick, Ireland), Guoxian Lu (Huawei Technologies Co., Ltd., China), Wei Hou (Huawei Technologies Co., Ltd., China), David Gregg (Trinity College Dublin, Ireland), and Jim Buckley (University of Limerick, Ireland)</i>	

## Doctoral Symposium

Assessing and Improving the Quality of Docker Artifacts .....	592
<i>Giovanni Rosa (University of Molise, Italy), Simone Scalabrino (University of Molise, Italy), and Rocco Oliveto (University of Molise, Italy)</i>	
On the Evolution of Code Readability .....	597
<i>Valentina Piantadosi (University of Molise, Italy)</i>	
Quality Analysis of iOS Applications with Focus on Maintainability and Security .....	602
<i>Kristiina Rahkema (University of Tartu, Estonia) and Dietmar Pfahl (University of Tartu, Estonia)</i>	
Synthesising Linear API Usage Examples for API Documentation .....	607
<i>Seham Alharbi (University of York, United Kingdom; Qassim University, Saudi Arabia), Dimitris Kolovos (University of York, United Kingdom), and Nicholas Matragkas (University of Paris-Saclay, France)</i>	
The Phantom Menace: Unmasking Security Issues in Evolving Software .....	612
<i>Emanuele Iannone (University of Salerno, Italy) and Fabio Palomba (University of Salerno, Italy)</i>	
<b>Author Index</b> .....	<b>617</b>