

**2023 IEEE/ACM 31st
International Conference on
Program Comprehension
(ICPC 2023)**

**Melbourne, Australia
15-16 May 2023**



**IEEE Catalog Number: CFP23009-POD
ISBN: 979-8-3503-3751-8**

**Copyright © 2023 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:	CFP23009-POD
ISBN (Print-On-Demand):	979-8-3503-3751-8
ISBN (Online):	979-8-3503-3750-1
ISSN:	2643-7147

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
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2023 IEEE/ACM 31st International Conference on Program Comprehension (ICPC) **ICPC 2023**

Table of Contents

Message from the Chairs	x
Organizing Committee	xii
Program Committee	xiii
Steering Committee	xvi
Additional Reviewers	xvii
Keynote	xviii

31st IEEE/ACM International Conference on Program Comprehension (ICPC 2023)

QTC4SO: Automatic Question Title Completion for Stack Overflow	1
<i>Yanlin Zhou (Nantong University, China), Shaoyu Yang (Nantong University, China), Xiang Chen (Nantong University, China), Zichen Zhang (Nantong University, China), and Jiahua Pei (Nantong University, China)</i>	
APIContext2Com: Code Comment Generation by Incorporating Pre-Defined API Documentation ..	13
<i>Ramin Shahbazi (University of British Columbia, Canada) and Fatemeh Fard (University of British Columbia, Canada)</i>	
PyVerDetector: A Chrome Extension Detecting the Python Version of Stack Overflow Code Snippets	25
<i>Shiyu Yang (Osaka University, Japan), Tetsuya Kanda (Osaka University, Japan), Davide Pizzolotto (Osaka University, Japan), Daniel M. German (University of Victoria, Canada), and Yoshiki Higo (Osaka University, Japan)</i>	
RCGraph - A Tool to Integrate Readme and Commits Through Temporal Knowledge Graphs	30
<i>Akhila Sri Manasa Venigalla (Indian Institute of Technology Tirupati, India), 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>	
Performance Prediction from Source Code is Task and Domain Specific	35
<i>Markus Böck (TU Wien, Austria), Sarra Habchi (Ubisoft, Canada), Mathieu Nayrolles (Ubisoft, Canada), and Jürgen Cito (TU Wien, Austria)</i>	

Understanding Initial API Comprehension	43
<i>Ava Heinsonen (Aalto University, Finland) and Fabian Fagerholm (Aalto University, Finland)</i>	
Evaluating a Language Workbench: From Working Memory Capacity to Comprehension to Acceptance	54
<i>Giovanna Broccia (ISTI - CNR, Italy), Alessio Ferrari (ISTI-CNR, Italy), Maurice Ter Beek (ISTI-CNR, Italy), Walter Cazzola (University of Milan, Italy), Luca Favalli (University of Milan, Italy), and Francesco Bertolotti (University of Milan, Italy)</i>	
Conversation Disentanglement As-a-Service	59
<i>Edoardo Riggio (Università della Svizzera italiana, Switzerland), Marco Raglianti (Università della Svizzera italiana, Switzerland), and Michele Lanza (Università della Svizzera italiana, Switzerland)</i>	
Slicito: Using Computational Notebooks for Program Comprehension	64
<i>Robert Husák (Charles University, Czech Republic), Jan Kofroň (Charles University, Czech Republic), and Filip Zavoral (Charles University, Czech Republic)</i>	
SYN: Ultra-Scale Software Evolution Comprehension	69
<i>Gianlorenzo Occhipinti (Software Institute - USI, Switzerland), Csaba Nagy (Software Institute - USI, Switzerland), Roberto Minelli (Software Institute - USI, Switzerland), and Michele Lanza (Software Institute - USI, Switzerland)</i>	
Microuisity: A Testing Tool for Backends for Frontends (BFF) Microservice Systems	74
<i>Pattarakrit Rattanukul (Mahidol University, Thailand), Chansida Makaranond (Mahidol University, Thailand), Pumipat Watanakulcharus (Mahidol University, Thailand), Chaiyong Ragkhitwetsagul (Mahidol University, Thailand), Tanapol Nearunchorn (Lineman Wongnai, Thailand), Vasaka Visoottiviseth (Mahidol University, Thailand), Morakot Choetkiertikul (Mahidol University, Thailand), and Thanwadee Sunetnanta (Mahidol University, Thailand)</i>	
WebEV: A Dataset on the Behavior of Testers for Web Application End to End Testing	79
<i>Mridha Md. Nafis Fuad (University of Dhaka, Bangladesh) and Kazi Sakib (University of Dhaka, Bangladesh)</i>	
Towards a Classification of Log Parsing Errors	84
<i>Issam Sedki (Concordia University, Canada), Abdelwahab Hamou-Lhadj (Concordia University, Canada), Otmane Ait-Mohamed (Concordia University, Canada), and Naser Ezzati-Jivan (Brock University, Canada)</i>	
An Extensive Study of the Structure Features in Transformer-Based Code Semantic Summarization	89
<i>Kang Yang (National University of Defense Technology, China), Xinjun Mao (National University of Defense Technology, China), Shangwen Wang (National University of Defense Technology, China), Yihao Qin (National University of Defense Technology, China), Tanghaoran Zhang (National University of Defense Technology, China), Yao Lu (National University of Defense Technology, China), and Kamal Al-Sabahi (University of Technology and Applied Sciences-ibra, Oman)</i>	

Label Smoothing Improves Neural Source Code Summarization	101
<i>Sakib Haque (University of Notre Dame, USA), Aakash Bansal (University of Notre Dame, USA), and Collin McMillan (University of Notre Dame, USA)</i>	
Interpretation-Based Code Summarization	113
<i>Mingyang Geng (National University of Defense Technology, China), Shangwen Wang (National University of Defense Technology, China), Dezun Dong (National University of Defense Technology, China), Haotian Wang (National University of Defense Technology, China), Shaomeng Cao (Peng Cheng Laboratory, China), Kechi Zhang (Peking University, China), and Zhi Jin (Peking University, China)</i>	
Naturalness in Source Code Summarization. How Significant is it?	125
<i>Claudio Ferretti (University of Milano-Bicocca, Italy) and Martina Saletta (University of Trieste, Italy)</i>	
Comparing 2D and Augmented Reality Visualizations for Microservice System Understandability: A Controlled Experiment	135
<i>Amr S. Abdelfattah (Baylor University, USA), Tomas Cerny (Baylor University, USA), Davide Taibi (Tampere University, Finland; University of Oulu, Finland), and Sira Vegas (Universidad Politecnica de Madrid, Spain)</i>	
ChameleonIDE: Untangling Type Errors Through Interactive Visualization and Exploration	146
<i>Shuai Fu (Monash University, Australia), Tim Dwyer (Monash University, Australia), Peter J. Stuckey (Monash University, Australia), Jackson Wain (Monash University, Australia), and Jesse Linossier (Monash University, Australia)</i>	
Implant Global and Local Hierarchy Information to Sequence Based Code Representation Models	157
<i>Kechi Zhang (Peking University, China), Zhuo Li (Peking University, China), Zhi Jin (Peking University, China), and Ge Li (Peking University, China)</i>	
Pathways to Leverage Transcompiler Based Data Augmentation for Cross-Language Clone Detection	169
<i>Subroto Nag Pinku (University of Saskatchewan, Canada), Debajyoti Mondal (University of Saskatchewan, Canada), and Chanchal K. Roy (University of Saskatchewan, Canada)</i>	
Investigating the Generalizability of Deep Learning-Based Clone Detectors	181
<i>Eunjong Choi (Kyoto Institute of Technology, Japan), Norihiro Fuke (Osaka University, Japan), Yuji Fujiwara (Osaka University, Japan), Norihiro Yoshida (Ritsumeikan University, Japan), and Katsuro Inoue (Nanzan University, Japan)</i>	
UnityLint: A Bad Smell Detector for Unity	186
<i>Matteo Bosco (University of Sannio, Italy), Pasquale Cavoto (University of Sannio, Italy), Augusto Ungolo (University of Sannio, Italy), Biruk Asmare Muse (Ecole Polytechnique de Montréal, Canada), Foutse Khomh (Ecole Polytechnique de Montréal, Canada), Vittoria Nardone (University of Sannio, Italy), and Massimiliano Di Penta (University of Sannio, Italy)</i>	

REMS: Recommending Extract Method Refactoring Opportunities via Multi-view Representation of Code Property Graph	191
<i>Di Cui (Xidian University, China), Qiangqiang Wang (Xidian University, China), Siqi Wang (Xidian University, China), Jianlei Chi (Xidian University, China), Jianan Li (Xidian University, China), Lu Wang (Xidian University, China), and Qingshan Li (Xidian University, China)</i>	
Automating Method Naming with Context-Aware Prompt-Tuning	203
<i>Jie Zhu (University of Chinese Academy of Sciences, China), Lingwei Li (University of Chinese Academy of Sciences, China), Li Yang (Chinese Academy of Sciences, China), Xiaoxiao Ma (Chinese Academy of Sciences, China), and Chun Zuo (Sinosoft Company Limited, China)</i>	
Generation-Based Code Review Automation: How Far Are We?	215
<i>Xin Zhou (Singapore Management University, Singapore), Kisub Kim (Singapore Management University, Singapore), Bowen Xu (Singapore Management University, Singapore), DongGyun Han (Royal Holloway University of London, UK), Junda He (Singapore Management University, Singapore), and David Lo (Singapore Management University, Singapore)</i>	
Reanalysis of Empirical Data on Java Local Variables with Narrow and Broad Scope	227
<i>Dror G. Feitelson (The Hebrew University, Israel)</i>	
Properly Offer Options to Improve the Practicality of Software Document Completion Tools	237
<i>Zhipeng Cai (Wuhan University, China), Songqiang Chen (Wuhan University, China), and Xiaoyuan Xie (Wuhan University, China)</i>	
How Well Static Type Checkers Work with Gradual Typing? A Case Study on Python	242
<i>Wenjie Xu (Nanjing University, China), Lin Chen (Nanjing University, China), Chenghao Su (Nanjing University, China), Yimeng Guo (Nanjing University, China), Yanhui Li (Nanjing University, China), Yuming Zhou (Nanjing University, China), and Baowen Xu (Nanjing University, China)</i>	
Too Simple? Notions of Task Complexity used in Maintenance-Based Studies of Programming Tools	254
<i>Patrick Rein (University of Potsdam, Germany), Tom Beckmann (University of Potsdam, Germany), Eva Krebs (University of Potsdam, Germany), Toni Mattis (University of Potsdam, Germany), and Robert Hirschfeld (University of Potsdam, Germany)</i>	
Path Complexity Correlates with Source Code Comprehension Effort Indicators	266
<i>Sofiane Dissem (Harvey Mudd College, USA), Eli Pregerson (Harvey Mudd College, USA), Adi Bhargava (Harvey Mudd College, USA), Josh Cordova (Harvey Mudd College, USA), and Lucas Bang (Harvey Mudd College, USA)</i>	
Revisiting Deep Learning for Variable Type Recovery	275
<i>Kevin Cao (Vanderbilt University, USA) and Kevin Leach (Vanderbilt University, USA)</i>	
Improving Code Search with Multi-modal Momentum Contrastive Learning	280
<i>Zejian Shi (Fudan University, China), Yun Xiong (Fudan University, China; Peng Cheng Laboratory, China), Yao Zhang (Fudan University, China), Zhijie Jiang (National University of Defense Technology, China), Jinjing Zhao (National Key Laboratory of Science and Technology on Information System Security, China), Lei Wang (National University of Defense Technology, China), and Shanshan Li (National University of Defense Technology, China)</i>	

Revisiting Lightweight Compiler Provenance Recovery on ARM Binaries	292
<i>Jason Kim (Georgia Tech), Daniel Genkin (Georgia Tech), and Kevin Leach (Vanderbilt University)</i>	
Mitigating the Effect of Class Imbalance in Fault Localization Using Context-Aware Generative Adversarial Network	304
<i>Yan Lei (Chongqing University, China), Tiantian Wen (Chongqing University, China), Huan Xie (Chongqing University, China), Lingfeng Fu (Chongqing University, China), Chunyan Liu (Chongqing University, China), Lei Xu (Haier Smart Home Co., Ltd., China), and Hongxia Sun (Qingdao Haidacheng Purchasing Service Co., Ltd., China)</i>	
Still Confusing for Bug-Component Triaging? Deep Feature Learning and Ensemble Setting to Rescue	316
<i>Yanqi Su (Australian National University, Australia), Zheming Han (Australian National University, Australia), Zhipeng Gao (Zhejiang University, China), Zhenchang Xing (Data61, CSIRO, Australia), Qinghua Lu (Data61, CSIRO, Australia), and Xiwei Xu (Data61, CSIRO, Australia)</i>	
Understanding Bugs in Multi-language Deep Learning Frameworks	328
<i>Zengyang Li (Central China Normal University, China), Sicheng Wang (Central China Normal University, China), Wenshuo Wang (Central China Normal University, China), Peng Liang (Wuhan University, China), Ran Mo (Central China Normal University, China), and Bing Li (Wuhan University, China)</i>	
FVA: Assessing Function-Level Vulnerability by Integrating Flow-Sensitive Structure and Code Statement Semantic	339
<i>Chao Ni (Zhejiang University, China), Liyu Shen (Zhejiang University, China), Wei Wang (Zhejiang University, China), Xiang Chen (Nantong University, China), Xin Yin (Zhejiang University, China), and Lexiao Zhang (Zhejiang University, China)</i>	
Author Index	351