

# **2019 34th IEEE/ACM International Conference on Automated Software Engineering (ASE 2019)**

**San Diego, California, USA  
11-15 November 2019**

**Pages 1-639**



**IEEE Catalog Number: CFP19075-POD  
ISBN: 978-1-7281-2509-1**

**Copyright © 2019 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:	CFP19075-POD
ISBN (Print-On-Demand):	978-1-7281-2509-1
ISBN (Online):	978-1-7281-2508-4
ISSN:	1938-4300

**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

# 2019 34th IEEE/ACM International Conference on Automated Software Engineering (ASE) **ASE 2019**

## Table of Contents

Message from the Chairs .xx	.....
ASE 2019 Organization .xxvi	.....
Program Committees and Reviewers .xxviii	.....
Steering Committee .xxxiv	.....
Sponsors and Supporters .xxxv	.....
Keynotes .xxxvi	.....

## Main Track

Assessing the Generalizability of Code2vec Token Embeddings .1	.....
<i>Hong Jin Kang (Singapore Management University), Tegawendé F. Bissyandé (University of Luxembourg, Luxembourg), and David Lo (Singapore Management University)</i>	
Multi-modal Attention Network Learning for Semantic Source Code Retrieval .13	.....
<i>Yao Wan (Zhejiang University), Jingdong Shu (Zhejiang University), Yulei Sui (University of Technology Sydney), Guandong Xu (University of Technology Sydney), Zhou Zhao (Zhejiang University), Jian Wu (Zhejiang University), and Philip Yu (University of Illinois at Chicago)</i>	
Experience Paper: Search-Based Testing in Automated Driving Control Applications .26	.....
<i>Christoph Gladisch (Robert Bosch GmbH, Corporate Research), Thomas Heinz (Robert Bosch GmbH, Corporate Research), Christian Heinzemann (Robert Bosch GmbH, Corporate Research), Jens Oehlerking (Robert Bosch GmbH, Corporate Research), Anne von Vietinghoff (Robert Bosch GmbH, Corporate Research), and Tim Pfitzer (Robert Bosch Automotive Steering GmbH)</i>	
AutoFocus: Interpreting Attention-Based Neural Networks by Code Perturbation .38	.....
<i>Nghi D. Q. Bui (Singapore Management University), Yijun Yu (The Open University, UK), and Lingxiao Jiang (Singapore Management University)</i>	
Test Transfer Across Mobile Apps Through Semantic Mapping .42	.....
<i>Jun-Wei Lin (University of California, Irvine), Reyhaneh Jabbarvand (University of California, Irvine), and Sam Malek (University of California, Irvine)</i>	

Test Migration Between Mobile Apps with Similar Functionality .54.....	
	<i>Farnaz Behrang (Georgia Institute of Technology) and Alessandro Orso (Georgia Institute of Technology)</i>
DaPanda: Detecting Aggressive Push Notifications in Android Apps .66.....	
	<i>Tianming Liu (Beijing University of Posts and Telecommunications), Haoyu Wang (Beijing University of Posts and Telecommunications), Li Li (Monash University), Guangdong Bai (The University of Queensland), Yao Guo (Peking University), and Guoai Xu (Beijing University of Posts and Telecommunications)</i>
Automatic Self-Validation for Code Coverage Profilers .79.....	
	<i>Yibiao Yang (Nanjing University), Yanyan Jiang (Nanjing University), Zhiqiang Zuo (Nanjing University), Yang Wang (Nanjing University), Hao Sun (Nanjing University), Hongmin Lu (Nanjing University), Yuming Zhou (Nanjing University), and Baowen Xu (Nanjing University)</i>
Efficient Test Generation Guided by Field Coverage Criteria .91.....	
	<i>Ariel Godio (ITBA), Valeria Bengolea (UNRC), Pablo Ponzio (UNRC), Nazareno Aguirre (UNRC), and Marcelo Fabian Frias (ITBA)</i>
A Qualitative Analysis of Android Taint-Analysis Results .102.....	
	<i>Linghui Luo (Paderborn University), Eric Bodden (Paderborn University &amp; Fraunhofer IEM), and Johannes Späth (Fraunhofer IEM)</i>
Goal-Driven Exploration for Android Applications .115.....	
	<i>Duling Lai (University of British Columbia) and Julia Rubin (University of British Columbia)</i>
RANDR: Record and Replay for Android Applications via Targeted Runtime Instrumentation .128.....	
	<i>Onur Sahin (Boston University), Assel Aliyeva (Boston University), Hariharan Mathavan (Boston University), Ayse Coskun (Boston University), and Manuel Egele (Boston University)</i>
MalScan: Fast Market-Wide Mobile Malware Scanning by Social-Network Centrality Analysis .139.....	
	<i>Yueming Wu (Huazhong University of Science and Technology), Xiaodi Li (University of Texas at Dallas), Deqing Zou (Huazhong University of Science and Technology), Wei Yang (University of Texas at Dallas), Xin Zhang (Huazhong University of Science and Technology), and Hai Jin (Huazhong University of Science and Technology)</i>
Discovering, Explaining and Summarizing Controversial Discussions in Community Q&A Sites .151.....	
	<i>Xiaoxue Ren (Zhejiang University, Ningbo Research Institute, PengCheng Laboratory), Zhenchang Xing (Australian National University), Xin Xia (Monash University), Guoqiang Li (Shanghai Jiao Tong University), and Jianling Sun (Zhejiang University)</i>
Automating App Review Response Generation .163.....	
	<i>Cuiyun Gao (The Chinese University of Hong Kong), Jichuan Zeng (The Chinese University of Hong Kong), Xin Xia (Monash University), David Lo (Singapore Management University), Michael R. Lyu (The Chinese University of Hong Kong), and Irwin King (The Chinese University of Hong Kong)</i>
Automatic Generation of Pull Request Descriptions .176.....	
	<i>Zhongxin Liu (Zhejiang University), Xin Xia (Monash University), Christoph Treude (University of Adelaide), David Lo (Singapore Management University), and Shanping Li (Zhejiang University)</i>

Systematically Covering Input Structure .189.....	
<i>Nikolas Havrikov (CISPA Helmholtz Institute for Information Security)</i> <i>and Andreas Zeller (CISPA Helmholtz Institute for Information Security)</i>	
SEGATE: Unveiling Semantic Inconsistencies between Code and Specification of String Inputs .200.....	
<i>Devika Sondhi (IIIT Delhi) and Rahul Purandare (IIIT Delhi)</i>	
Detecting Error-Handling Bugs without Error Specification Input .213.....	
<i>Zhouyang Jia (National University of Defense Technology), Shanshan Li (National University of Defense Technology), Tingting Yu (University of Kentucky), Xiangke Liao (National University of Defense Technology), Ji Wang (National University of Defense Technology), Xiaodong Liu (National University of Defense Technology), and Yunhuai Liu (Peking University)</i>	
Grading-Based Test Suite Augmentation .226.....	
<i>Jonathan Osei-Owusu (University of Illinois at Urbana-Champaign), Angello Astorga (University of Illinois at Urbana-Champaign), Liia Butler (University of Illinois at Urbana-Champaign), Tao Xie (Peking University; Ministry of Education), and Geoffrey Challen (University of Illinois at Urbana-Champaign)</i>	
Emotions Extracted from Text vs. True Emotions—An Empirical Evaluation in SE Context .230.....	
<i>Yi Wang (Rochester Institute of Technology)</i>	
Learning from Examples to Find Fully Qualified Names of API Elements in Code Snippets .243.....	
<i>C M Khaled Saifullah (University of Saskatchewan), Muhammad Asaduzzaman (Queen's University), and Chanchal K. Roy (University of Saskatchewan)</i>	
Inferring Program Transformations From Singular Examples via Big Code .255.....	
<i>Jiajun Jiang (Peking University), Luyao Ren (Peking University), Yingfei Xiong (Peking University), and Lingming Zhang (University of Texas at Dallas)</i>	
Performance-Boosting Sparsification of the IFDS Algorithm with Applications to Taint Analysis .267.....	
<i>Dongjie He (UNSW Sydney; SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), Haofeng Li (SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), Lei Wang (SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), Haining Meng (SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), Hengjie Zheng (SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), Jie Liu (UNSW Sydney), Shuangwei Hu (Vivo AI Lab, China), Lian Li (SKL of Computer Architecture, ICT, CAS, China; University of Chinese Academy of Sciences), and Jingling Xue (UNSW Sydney)</i>	
Characterizing Android App Signing Issues .280.....	
<i>Haoyu Wang (Beijing University of Posts and Telecommunications), Hongxuan Liu (Peking University), Xusheng Xiao (Case Western Reserve University), Guozhu Meng (SKLOIS, Chinese Academy of Sciences), and Yao Guo (Peking University)</i>	

OAUTHLINT: An Empirical Study on OAuth Bugs in Android Applications .293.....	
<i>Tamjid Al Rahat (University of Virginia), Yu Feng (University of California at Santa Barbara), and Yuan Tian (University of Virginia)</i>	
History-Guided Configuration Diversification for Compiler Test-Program Generation .305.....	
<i>Junjie Chen (Tianjin University), Guancheng Wang (Peking University), Dan Hao (Peking University), Yingfei Xiong (Peking University), Hongyu Zhang (The University of Newcastle), and Lu Zhang (Peking University)</i>	
ReduKtor: How We Stopped Worrying About Bugs in Kotlin Compiler .317.....	
<i>Daniil Stepanov (Saint Petersburg Polytechnic University), Marat Akhin (Saint Petersburg Polytechnic University), and Mikhail Belyaev (Saint Petersburg Polytechnic University)</i>	
Targeted Example Generation for Compilation Errors .327.....	
<i>Umair Z. Ahmed (IIT Kanpur), Renuka Sindhgatta (Queensland University of Technology), Nisheeth Srivastava (IIT Kanpur), and Amey Karkare (IIT Kanpur)</i>	
Understanding Exception-Related Bugs in Large-Scale Cloud Systems .329.....	
<i>Haicheng Chen (The Ohio State University), Wensheng Dou (Chinese Academy of Sciences), Yanyan Jiang (Nanjing University), and Feng Qin (The Ohio State University)</i>	
iFeedback: Exploiting User Feedback for Real-Time Issue Detection in Large-Scale Online Service Systems .352.....	
<i>Wujie Zheng (Tencent Inc.), Haochuan Lu (Fudan University), Yangfan Zhou (Fudan University), Jianming Liang (Tencent Inc.), Haibing Zheng (Tencent Inc.), and Yuetang Deng (Tencent Inc.)</i>	
Continuous Incident Triage for Large-Scale Online Service Systems .364.....	
<i>Junjie Chen (Tianjin University), Xiaoting He (Microsoft Research), Qingwei Lin (Microsoft Research), Hongyu Zhang (The University of Newcastle), Dan Hao (Peking University), Feng Gao (Microsoft Azure), Zhangwei Xu (Microsoft Azure), Yingnong Dang (Microsoft Azure), and Dongmei Zhang (Microsoft Research)</i>	
Apricot: A Weight-Adaptation Approach to Fixing Deep Learning Models .376.....	
<i>Hao Zhang (City University of Hong Kong) and W.K. Chan (City University of Hong Kong)</i>	
Re-Factoring Based Program Repair Applied to Programming Assignments .388.....	
<i>Yang Hu (The University of Texas at Austin), Umair Z. Ahmed (National University of Singapore), Sergey Mechtaev (University College London), Ben Leong (National University of Singapore), and Abhik Roychoudhury (National University of Singapore)</i>	
InFix: Automatically Repairing Novice Program Inputs .399.....	
<i>Madeline Endres (University of Michigan), Georgios Sakas (University of California San Diego), Benjamin Cosman (University of California San Diego), Ranjit Jhala (University of California San Diego), and Westley Weimer (University of Michigan)</i>	
Understanding Automatically-Generated Patches Through Symbolic Invariant Differences .411.....	
<i>Padraic Cashin (Arizona State University), Carianne Martinez (University of New Mexico), Westley Weimer (University of Michigan), and Stephanie Forrest (Arizona State University)</i>	

Regexes are Hard: Decision-Making, Difficulties, and Risks in Programming Regular Expressions .415.....	
<i>Louis G. Michael IV (Virginia Tech), James Donohue (University of Bradford), James C. Davis (Virginia Tech), Dongyoon Lee (Stony Brook University &amp; Virginia Tech), and Francisco Servant (Virginia Tech)</i>	
Testing Regex Generalizability And Its Implications: A Large-Scale Many-Language Measurement Study .427.	
<i>James C Davis (Virginia Tech), Daniel Moyer (Virginia Tech), Ayaan M Kazerouni (Virginia Tech), and Dongyoon Lee (Stony Brook University)</i>	
Accurate String Constraints Solution Counting with Weighted Automata .440.....	
<i>Elena Sherman (Boise State University) and Andrew Harris (Boise State University)</i>	
Subformula Caching for Model Counting and Quantitative Program Analysis .453.....	
<i>William Eiers (University of California Santa Barbara), Seemanta Saha (University of California Santa Barbara), Tegan Brennan (University of California Santa Barbara), and Tevfik Bultan (University of California Santa Barbara)</i>	
ACTGAN: Automatic Configuration Tuning for Software Systems with Generative Adversarial Networks .465	
<i>Liang Bao (XiDian University), Xin Liu (University of California, Davis), Fangzheng Wang (XiDian University), and Baoyin Fang (XiDian University)</i>	
V2: Fast Detection of Configuration Drift in Python .477.....	
<i>Eric Horton (North Carolina State University) and Chris Parnin (North Carolina State University)</i>	
Feature-Interaction Aware Configuration Prioritization for Configurable Code .489.....	
<i>Son Nguyen (The University of Texas at Dallas, USA), Hoan Nguyen (Amazon Corporation), Ngoc Tran (The University of Texas at Dallas), Hieu Tran (The University of Texas at Dallas, USA), and Tien Nguyen (The University of Texas at Dallas, USA)</i>	
Combining Spectrum-Based Fault Localization and Statistical Debugging: An Empirical Study .502.....	
<i>Jiajun Jiang (Peking University), Ran Wang (Peking University), Yingfei Xiong (Peking University), Xiangping Chen (Sun Yat-sen University), and Lu Zhang (Peking University)</i>	
SCMiner: Localizing System-Level Concurrency Faults from Large System Call Traces .515.....	
<i>Taranum Shaila Zaman (University of Kentucky), Xue Han (University of Kentucky), and Tingting Yu (University of Kentucky)</i>	
Root Cause Localization for Unreproducible Builds via Causality Analysis Over System Call Tracing .527.....	
<i>Zhilei Ren (Dalian University of Technology), Changlin Liu (Case Western Reserve University), Xusheng Xiao (Case Western Reserve University), He Jiang (Dalian University of Technology), and Tao Xie (Peking University)</i>	
Mutation Analysis for Coq .539.....	
<i>Ahmet Celik (The University of Texas at Austin), Karl Palmskog (The University of Texas at Austin), Marinela Parovic (The University of Texas at Austin), Emilio Jesús Gallego Arias (MINES ParisTech), and Milos Gligoric (The University of Texas at Austin)</i>	

Verifying Arithmetic in Cryptographic C Programs .552.....	
<i>Jiaxiang Liu (Shenzhen University), Xiaomu Shi (Shenzhen University), Ming-Hsien Tsai (Institute of Information Science, Academia Sinica), Bow-Yaw Wang (Institute of Information Science, Academia Sinica), and Bo-Yin Yang (Institute of Information Science, Academia Sinica)</i>	
Model Checking Embedded Control Software using OS-in-the-Loop CEGAR .565.....	
<i>Dongwoo Kim (Kyungpook National University) and Yunja Choi (Kyungpook National University)</i>	
Get Rid of Inline Assembly through Verification-Oriented Lifting .577.....	
<i>Frédéric Recoules (CEA LIST), Sébastien Bardin (CEA LIST), Richard Bonichon (CEA LIST), Laurent Mounier (Univ. Grenoble Alpes), and Marie-Laure Potet (Univ. Grenoble Alpes)</i>	
CodeKernel: A Graph Kernel Based Approach to the Selection of API Usage Examples .590.....	
<i>Xiaodong Gu (The Hong Kong University of Science and Technology), Hongyu Zhang (The University of Newcastle), and Sunghun Kim (The Hong Kong University of Science and Technology)</i>	
Machine Learning Based Recommendation of Method Names: How Far are We .602.....	
<i>Lin Jiang (Beijing Institute of Technology), Hui Liu (Beijing Institute of Technology), and He Jiang (Dalian University of Technology)</i>	
MARBLE: Mining for Boilerplate Code to Identify API Usability Problems .615.....	
<i>Daye Nam (Carnegie Mellon University), Amber Horvath (Carnegie Mellon University), Andrew Macvean (Google), Brad Myers (Carnegie Mellon University), and Bogdan Vasilescu (Carnegie Mellon University)</i>	
DIRE: A Neural Approach to Decompiled Identifier Naming .628.....	
<i>Jeremy Lacomis (Carnegie Mellon University), Pengcheng Yin (Carnegie Mellon University), Edward Schwartz (Carnegie Mellon University Software Engineering Institute), Miltiadis Allamanis (Microsoft Research), Claire Le Goues (Carnegie Mellon University), Graham Neubig (Carnegie Mellon University), and Bogdan Vasilescu (Carnegie Mellon University)</i>	
Accurate Modeling of Performance Histories for Evolving Software Systems .640.....	
<i>Stefan Mühlbauer (Bauhaus-University Weimar), Sven Apel (Saarland University), and Norbert Siegmund (Bauhaus-University Weimar)</i>	
An Industrial Experience Report on Performance-Aware Refactoring on a Database-Centric Web Application .653.....	
<i>Boyuan Chen (York University), Zhen Ming (Jack) Jiang (York University), Paul Matos (Copywell Inc.), and Michael Lacaria (Copywell Inc.)</i>	
How Do API Selections Affect the Runtime Performance of Data Analytics Tasks? .665.....	
<i>Yida Tao (Shenzhen University), Shan Tang (Shenzhen University), Yepang Liu (Southern University of Science and Technology), Zhiwu Xu (Shenzhen University), and Shengchao Qin (Teesside University)</i>	
An Experience Report of Generating Load Tests Using Log-Recovered Workloads at Varying Granularities of User Behaviour .669.....	
<i>Jinfu Chen (Concordia University), Weiyi Shang (Concordia University), Ahmed E. Hassan (Queen's University), Yong Wang (Alibaba Group), and Jiangbin Lin (Alibaba Group)</i>	



Demystifying Application Performance Management Libraries for Android .682.....	
<i>Yutian Tang (The Hong Kong Polytechnic University), Xian Zhan (The Hong Kong Polytechnic University), Hao Zhou (The Hong Kong Polytechnic University), Xiapu Luo (The Hong Kong Polytechnic University), Zhou Xu (Wuhan University), Yajin Zhou (Zhejiang University), and Qiben Yan (Michigan State University)</i>	
Predicting Licenses for Changed Source Code .686.....	
<i>Xiaoyu Liu (Southern Methodist University), LiGuo Huang (Southern Methodist University), Jidong Ge (Nanjing University), and Vincent Ng (University of Texas at Dallas)</i>	
Empirical Evaluation of the Impact of Class Overlap on Software Defect Prediction .698.....	
<i>Lina Gong (China University of Mining and Technology), Shujuan Jiang (China University of Mining and Technology), Rongcun Wang (China University of Mining and Technology), and Li Jiang (China University of Mining and Technology)</i>	
Combining Program Analysis and Statistical Language Model for Code Statement Completion .710.....	
<i>Son Nguyen (The University of Texas at Dallas), Tien Nguyen (The University of Texas at Dallas), Yi Li (New Jersey Institute of Technology), and Shaohua Wang (New Jersey Institute of Technology)</i>	
MAP-Coverage: A Novel Coverage Criterion for Testing Thread-Safe Classes .722.....	
<i>Zan Wang (Tianjin University), Yingquan Zhao (Tianjin University), Shuang Liu (Tianjin University), Jun Sun (Singapore Management University), Xiang Chen (Nantong University), and Huarui Lin (Tianjin University)</i>	
Automating Non-Blocking Synchronization In Concurrent Data Abstractions .735.....	
<i>Jiange Zhang (University of Colorado at Colorado Springs), Qing Yi (University of Colorado at Colorado Springs), and Damian Dechev (University of Central Florida)</i>	
Automating CUDA Synchronization via Program Transformation .748.....	
<i>Mingyuan Wu (Southern University of Science and Technology), Lingming Zhang (University of Texas at Dallas), Cong Liu (University of Texas at Dallas), Shin Hwei Tan (Southern University of Science and Technology), and Yuqun Zhang (Southern University of Science and Technology)</i>	
Efficient Transaction-Based Deterministic Replay for Multi-threaded Programs .760.....	
<i>Ernest Pabee (City University of Hong Kong), Xiupei Mei (City University of Hong Kong), and W.K. Chan (City University of Hong Kong)</i>	
Wuji: Automatic Online Combat Game Testing Using Evolutionary Deep Reinforcement Learning .772.....	
<i>Yan Zheng (Tianjin University), Xiaofei Xie (Nanyang Technological University), Ting Su (Nanyang Technological University), Lei Ma (Kyushu University), Jianye Hao (Tianjin University), Zhaopeng Meng (Tianjin University), Yang Liu (Nanyang Technological University), Ruimin Shen (Fuxi AI Lab, Netease, Inc.), Yingfeng Chen (Fuxi AI Lab, Netease, Inc.), and Changjie Fan (AI Lab, Netease, Inc.)</i>	
A Study of Oracle Approximations in Testing Deep Learning Libraries .785.....	
<i>Mahdi Nejadgholi (Concordia University) and Jinqiu Yang (Concordia University)</i>	

Property Inference for Deep Neural Networks .797.....	<i>Divya Gopinath (Carnegie Mellon University), Hayes Converse (The University of Texas at Austin), Corina Pasareanu (Carnegie Mellon University and NASA Ames), and Ankur Taly (Fiddler labs)</i>
An Empirical Study Towards Characterizing Deep Learning Development and Deployment Across Different Frameworks and Platforms .810.....	<i>Qianyu Guo (Tianjin University), Sen Chen (Nanyang Technological University), Xiaofei Xie (Nanyang Technological University), Lei Ma (Kyushu University), Qiang Hu (Kyushu University), Hongtao Liu (Tianjin University), Yang Liu (Nanyang Technological University), Jianjun Zhao (Kyushu University), and Xiaohong Li (Tianjin University)</i>
RefBot: Intelligent Software Refactoring Bot .823.....	<i>Vahid Alizadeh (University of Michigan-Dearborn), Mohamed Amine Ouali (University of Michigan), Marouane Kessentini (University of Michigan), and Meriem Chater (University of Michigan)</i>
Automated Refactoring to Reactive Programming .835.....	<i>Mirko Köhler (Technische Universität Darmstadt) and Guido Salvaneschi (Technische Universität Darmstadt)</i>
Empirical Study of Programming to an Interface .847.....	<i>Benoît Verhaeghe (Berger-Levrault, France), Christopher Fuhrman (École de Technologie Supérieure, Montreal, Canada), Latifa Guerrouj (École de Technologie Supérieure, Montreal, Canada), Nicolas Anquetil (Université de Lille, France), and Stéphane Ducasse (RMoD - Inria Nord Europe, Lille, France)</i>
Statistical Log Differencing .851.....	<i>Lingfeng Bao (Zhejiang University City College, China), Nimrod Busany (Tel Aviv University), David Lo (Singapore Management University, Singapore), and Shahar Maoz (Tel Aviv University)</i>
Logzip: Extracting Hidden Structures via Iterative Clustering for Log Compression .863.....	<i>Jinyang Liu (Sun Yat-Sen University &amp; The Chinese University of Hong Kong), Jieming Zhu (Huawei Noah's Ark Lab, China), Shilin He (The Chinese University of Hong Kong), Pinjia He (ETH Zurich), Zibin Zheng (Sun Yat-Sen University), and Michael R. Lyu (The Chinese University of Hong Kong)</i>
Code-First Model-Driven Engineering: On the Agile Adoption of MDE Tooling .874.....	<i>Artur Boronat (University of Leicester)</i>
Size and Accuracy in Model Inference .887.....	<i>Nimrod Busany (Tel Aviv University), Shahar Maoz (Tel Aviv University), and Yehonatan Yulazari (Tel Aviv University)</i>
Debreach: Mitigating Compression Side Channels via Static Analysis and Transformation .899.....	<i>Brandon Paulsen (University of Southern California), Chungha Sung (University of Southern California), Peter A.H. Peterson (University of Minnesota, Duluth), and Chao Wang (University of Southern California)</i>
Fine-Grain Memory Object Representation in Symbolic Execution .912.....	<i>Martin Nowack (Imperial College London)</i>

RENN: Efficient Reverse Execution with Neural-Network-Assisted Alias Analysis .924.....	
<i>Dongliang Mu (Nanjing University), Wenbo Guo (The Pennsylvania State University), Alejandro Cuevas (The Pennsylvania State University), Yueqi Chen (The Pennsylvania State University), Jinxuan Gai (The Pennsylvania State University), Xinyu Xing (The Pennsylvania State University), Bing Mao (Nanjing University), and Chengyu Song (UC Riverside)</i>	
Batch Alias Analysis .936.....	
<i>Jyothi Vedurada (Indian Institute of Technology Madras) and V. Krishna Nandivada (Indian Institute of Technology Madras)</i>	
Improving the Decision-Making Process of Self-Adaptive Systems by Accounting for Tactic Volatility .949.....	
<i>Jeffrey Palmerino (RIT), Qi Yu (RIT), Travis Desell (RIT), and Daniel Krutz (RIT)</i>	
Learning-Guided Network Fuzzing for Testing Cyber-Physical System Defences .962.....	
<i>Yuqi Chen (Singapore University of Technology and Design), Christopher M. Poskitt (Singapore University of Technology and Design), Jun Sun (Singapore Management University), Sridhar Adepur (Singapore University of Technology and Design), and Fan Zhang (Zhejiang University and Alibaba-Zhejiang University Joint Institute of Frontier Technologies)</i>	
Cautious Adaptation of Defiant Components .974.....	
<i>Paulo Henrique Maia (State University of Ceará, Fortaleza, CE, Brazil), Lucas Vieira (State University of Ceará, Fortaleza, CE, Brazil), Matheus Chagas (State University of Ceará, Fortaleza, CE, Brazil), Yijun Yu (The Open University, UK), Andrea Zisman (The Open University, UK), and Bashar Nuseibeh (The Open University, UK)</i>	
Active Hotspot: An Issue-Oriented Model to Monitor Software Evolution and Degradation .986.....	
<i>Qiong Feng (Drexel University), Yuanfang Cai (Drexel University), Rick Kazman (University of Hawaii &amp; SEI/CMU), Di Cui (Xi'an Jiaotong University), Ting Liu (Xi'an Jiaotong University), and Hongzhou Fang (Drexel University)</i>	
Automated Trainability Evaluation for Smart Software Functions .998.....	
<i>Ilias Gerostathopoulos (Technical University of Munich), Stefan Kugele (Technical University of Munich), Christoph Segler (BMW Group Research), Tomas Bures (Charles University in Prague), and Alois Knoll (Technical University of Munich)</i>	
The Impact of Structure on Software Merging: Semistructured Versus Structured Merge .1002.....	
<i>Guilherme Cavalcanti (Federal University of Pernambuco), Paulo Borba (Federal University of Pernambuco), Georg Seibt (University of Passau), and Sven Apel (Saarland University)</i>	
Semistructured Merge in JavaScript Systems .1014.....	
<i>Alberto Trindade Tavares (Federal University of Pernambuco), Paulo Borba (Federal University of Pernambuco), Guilherme Cavalcanti (Federal University of Pernambuco), and Sérgio Soares (Federal University of Pernambuco)</i>	

- CLCDSA: Cross Language Code Clone Detection using Syntactical Features and API Documentation .1026..  
*Kawser Wazed Nafi (University of Saskatchewan), Tonny Shekha Kar (University of Saskatchewan), Banani Roy (University of Saskatchewan), Chanchal K. Roy (University of Saskatchewan), and Kevin A. Schneider (University of Saskatchewan)*
- B2SFinder: Detecting Open-Source Software Reuse in COTS Software .1038.....  
*Zimu Yuan (Chinese Academy of Sciences), Muyue Feng (Chinese Academy of Sciences), Feng Li (Chinese Academy of Sciences), Gu Ban (Chinese Academy of Sciences), Yang Xiao (Chinese Academy of Sciences), Shiyang Wang (Chinese Academy of Sciences), Qian Tang (Chinese Academy of Sciences), He Su (Chinese Academy of Sciences), Chendong Yu (Chinese Academy of Sciences), Jiahuan Xu (Chinese Academy of Sciences), Aihua Piao (Chinese Academy of Sciences), Jingling Xue (University of New South Wales), and Wei Huo (Chinese Academy of Sciences)*
- CoRA: Decomposing and Describing Tangled Code Changes for Reviewer .1050.....  
*Min Wang (Peking University), Zeqi Lin (Microsoft Research), Yanzhen Zou (Peking University), and Bing Xie (Peking University)*

## Tool Demonstrations

- A Quantitative Analysis Framework for Recurrent Neural Network .1062.....  
*Xiaoning Du (Nanyang Technological University), Xiaofei Xie (Nanyang Technological University), Yi Li (Nanyang Technological University), Lei Ma (Kyushu University), Yang Liu (Nanyang Technological University), and Jianjun Zhao (Kyushu University)*
- LIRAT: Layout and Image Recognition Driving Automated Mobile Testing of Cross-Platform .1066.....  
*Shengcheng Yu (Nanjing University), Chunrong Fang (Nanjing University), Yang Feng (Nanjing University), Wenyuan Zhao (Nanjing University), and Zhenyu Chen (Nanjing University)*
- Humanoid: A Deep Learning-Based Approach to Automated Black-box Android App Testing .1070.....  
*Yuanchun Li (Peking University), Ziyue Yang (Peking University), Yao Guo (Peking University), and Xiangqun Chen (Peking University)*
- TestCov: Robust Test-Suite Execution and Coverage Measurement .1074.....  
*Dirk Beyer (LMU Munich) and Thomas Lemberger (LMU Munich)*
- VisFuzz: Understanding and Intervening Fuzzing with Interactive Visualization .1078.....  
*Chijin Zhou (Tsinghua University), Mingzhe Wang (Tsinghua University), Jie Liang (Tsinghua University), Zhe Liu (Nanjing University of Aeronautics and Astronautics), Chengnian Sun (Waterloo University), and Yu Jiang (Tsinghua University)*
- Developer Reputation Estimator (DRE) .1082.....  
*Sadika Amreen (The University of Tennessee), Andrey Karnauch (The University of Tennessee), and Audris Mockus (The University of Tennessee)*
- CocoQa: Question Answering for Coding Conventions Over Knowledge Graphs .1086.....  
*Tianjiao Du (Shanghai Jiao Tong University), Junming Cao (Shanghai Jiao Tong University), Qinyue Wu (Shanghai Jiao Tong University), Wei Li (Shanghai Jiao Tong University), Beijun Shen (Shanghai Jiao Tong University), and Yuting Chen (Shanghai Jiao Tong University)*

MutAPK: Source-Codeless Mutant Generation for Android Apps .1090.....	Camilo Escobar-Velázquez (Universidad de los Andes), Michael Osorio-Riaño (Universidad de los Andes), and Mario Linares-Vásquez (Universidad de los Andes)
SWAN_ASSIST: Semi-Automated Detection of Code-Specific, Security-Relevant Methods .1094.....	Goran Piskachev (Fraunhofer IEM), Lisa Nguyen Quang Do (Paderborn University), Oshando Johnson (Fraunhofer IEM), and Eric Bodden (Paderborn University and Fraunhofer IEM)
Sip4J: Statically Inferring Access Permission Contracts for Parallelising Sequential Java Programs .1098.....	Ayesha Sadiq (Monash University, Australia), Li Li (Monash University, Australia), Yuan-Fang Li (Monash University, Australia), Ijaz Ahmed (University of Lahore, Pakistan), and Sea Ling (Monash University, Australia)
Visual Analytics for Concurrent Java Executions .1102.....	Cyrille Artho (KTH Royal Institute of Technology), Monali Pande (KTH Royal Institute of Technology), and Qiyi Tang (Imperial College London)
NeuralVis: Visualizing and Interpreting Deep Learning Models .1106.....	Xufan Zhang (Nanjing University), Ziyue Yin (Nanjing University), Yang Feng (Nanjing University), Qingkai Shi (Nanjing University), Jia Liu (Nanjing University), and Zhenyu Chen (Nanjing University)
Kotless: A Serverless Framework for Kotlin .1110.....	Vladislav Tankov (JetBrains), Yaroslav Golubev (JetBrains Research), and Timofey Bryksin (JetBrains Research)
FogWorkflowSim: An Automated Simulation Toolkit for Workflow Performance Evaluation in Fog Computing.... 1114	Xiao Liu (Deakin University), Lingmin Fan (Anhui University), Jia Xu (Anhui University), Xuejun Li (Anhui University), Lina Gong (Anhui University), John Grundy (Monash University), and Yun Yang (Swinburne University of Technology)
PraPR: Practical Program Repair via Bytecode Mutation .1118.....	Ali Ghanbari (University of Texas at Dallas) and Lingming Zhang (University of Texas at Dallas)
SPrinter: A Static Checker for Finding Smart Pointer Errors in C++ Programs .1122.....	Xutong Ma (Institute of Software, Chinese Academy of Sciences), Jiwei Yan (Institute of Software, Chinese Academy of Sciences), Yaqi Li (Institute of Software, Chinese Academy of Sciences), Jun Yan (Institute of Software, Chinese Academy of Sciences), and Jian Zhang (Institute of Software, Chinese Academy of Sciences)
FPChecker: Detecting Floating-Point Exceptions in GPU Applications .1126.....	Ignacio Laguna (Lawrence Livermore National Laboratory)
Pangolin: An SFL-Based Toolset for Feature Localization .1130.....	Bruno Castro (IST, University of Lisbon), Alexandre Perez (Palo Alto Research Center), and Rui Abreu (IST, University of Lisbon and INESC-ID)

SiMPOSE - Configurable N-Way Program Merging Strategies for Superimposition-Based Analysis of Variant-Rich Software .1134.....	
<i>Dennis Reuling (University of Siegen), Udo Kelter (University of Siegen), Sebastian Ruland (Real-Time Systems Lab, TU Darmstadt), and Malte Lochau (Real-Time Systems Lab, TU Darmstadt)</i>	
VeriAbs : Verification by Abstraction and Test Generation .1138.....	
<i>Mohammad Afzal (Tata Research Development and Design Center, India), A. Asia (Tata Research Development and Design Center, India), Avriti Chauhan (Tata Research Development and Design Center, India), Bharti Chimdyalwar (Tata Research Development and Design Center, India), Priyanka Darke (Tata Research Development and Design Center, India), Advaita Datar (Tata Research Development and Design Center, India), Shrawan Kumar (Tata Research Development and Design Center, India), and R. Venkatesh (Tata Research Development and Design Center, India)</i>	
SGUARD: A Feature-Based Clustering Tool for Effective Spreadsheet Defect Detection .1142.....	
<i>Da Li (Nanjing University), Huiyan Wang (Nanjing University), Chang Xu (Nanjing University), Ruiqing Zhang (Microsoft, China), Shing-Chi Cheung (The Hong Kong University of Sci. and Tech.), and Xiaoxing Ma (Nanjing University)</i>	
PeASS: A Tool for Identifying Performance Changes at Code Level .1146.....	
<i>David Georg Reichelt (Universität Leipzig), Stefan Kühne (Universität Leipzig), and Wilhelm Hasselbring (Christian-Albrechts-Universität zu Kiel)</i>	
VeriSmart 2.0: Swarm-Based Bug-Finding for Multi-threaded Programs with Lazy-CSeq .1150.....	
<i>Bernd Fischer (Stellenbosch University), Salvatore La Torre (University of Salerno), and Gennaro Parlato (University of Molise)</i>	
CONVUL: An Effective Tool for Detecting Concurrency Vulnerabilities .1154.....	
<i>Ruijie Meng (State Key Laboratory of Computer Science, Institute of Software Chinese Academy of Sciences; University of Chinese Academy of Sciences), Biyun Zhu (State Key Laboratory of Computer Science, Institute of Software Chinese Academy of Sciences; University of Chinese Academy of Sciences), Hao Yun (State Key Laboratory of Computer Science, Institute of Software Chinese Academy of Sciences; University of Chinese Academy of Sciences), Haicheng Li (State Key Laboratory of Computer Science, Institute of Software Chinese Academy of Sciences; University of Chinese Academy of Sciences), Yan Cai (State Key Laboratory of Computer Science, Institute of Software Chinese Academy of Sciences), and Zijiang Yang (GuardStrike Inc.)</i>	
DeepMutation++: A Mutation Testing Framework for Deep Learning Systems .1158.....	
<i>Qiang Hu (Kyushu University, Japan), Lei Ma (Kyushu University, Japan), Xiaofei Xie (Nanyang Technological University, Singapore), Bing Yu (Kyushu University, Japan), Yang Liu (Nanyang Technological University, Singapore), and Jianjun Zhao (Kyushu University, Japan)</i>	
Coverage-Guided Fuzzing for Feedforward Neural Networks .1162.....	
<i>Xiaofei Xie (Nanyang Technological University), Hongxu Chen (Nanyang Technological University), Yi Li (Nanyang Technological University), Lei Ma (Kyushu University), Yang Liu (Nanyang Technological University), and Jianjun Zhao (Kyushu University)</i>	

Prema: A Tool for Precise Requirements Editing, Modeling and Analysis .1166.....	
<i>Yihao Huang (East China Normal University), Jincao Feng (East China Normal University), Hanyue Zheng (East China Normal University), Jiayi Zhu (East China Normal University), Shang Wang (East China Normal University), Siyuan Jiang (Eastern Michigan University), Weikai Miao (East China Normal University; Tongji University, China), and Geguang Pu (East China Normal University; Shanghai Trusted Industrial Control Platform Co., Ltd, China)</i>	
TsmartGP: A Tool for Finding Memory Defects with Pointer Analysis .1170.....	
<i>Yuexing Wang (Tsinghua University), Guang Chen (Tsinghua University), Min Zhou (Tsinghua University), Ming Gu (Tsinghua University), and Jianguang Sun (Tsinghua University)</i>	
Ares: Inferring Error Specifications through Static Analysis .1174.....	
<i>Chi Li (Tsinghua University), Min Zhou (Tsinghua University), Zuxing Gu (Tsinghua University), Ming Gu (Tsinghua University), and Hongyu Zhang (Tsinghua University)</i>	
PMExec: An Execution Engine of Partial UML-RT Models .1178.....	
<i>Mojtaba Bagherzadeh (Queen's University), Karim Jahed (Queen's University), Nafiseh Kahani (Queen's University), and Juergen Dingel (Queen's University)</i>	
mCUTE: A Model-Level Concolic Unit Testing Engine for UML State Machines .1182.....	
<i>Reza Ahmadi (Queen's University), Karim Jahed (Queen's University), and Juergen Dingel (Queen's University)</i>	
Manticore: A User-Friendly Symbolic Execution Framework for Binaries and Smart Contracts .1186.....	
<i>Mark Mossberg (Trail of Bits), Felipe Manzano (Trail of Bits), Eric Hennenfent (Trail of Bits), Alex Groce (Trail of Bits), Gustavo Grieco (Trail of Bits), Josselin Feist (Trail of Bits), Trent Brunson (Trail of Bits), and Artem Dinaburg (Trail of Bits)</i>	
BuRRiTo: A Framework to Extract, Specify, Verify and Analyze Business Rules .1190.....	
<i>Pavan Kumar Chittimalli (Tata Consultancy Services Ltd.; TCS Research), Kritika Anand (Tata Consultancy Services Ltd.), Shrishti Pradhan (Tata Consultancy Services Ltd.), Sayandeep Mitra (Tata Consultancy Services Ltd.), Chandan Prakash (Tata Consultancy Services Ltd.), Rohit Shere (Tata Consultancy Services Ltd.), and Ravindra Naik (Tata Consultancy Services Ltd.)</i>	
XRaSE: Towards Virtually Tangible Software using Augmented Reality .1194.....	
<i>Rohit Mehra (Accenture Labs, India), Vibhu Saujanya Sharma (Accenture Labs, India), Vikrant Kaulgud (Accenture Labs, India), and Sanjay Podder (Accenture Labs, India)</i>	
MuSC: A Tool for Mutation Testing of Ethereum Smart Contract .1198.....	
<i>Zixin Li (Nanjing University), Haoran Wu (Nanjing University), Jiehui Xu (Nanjing University), Xingya Wang (Nanjing University), Lingming Zhang (University of Texas at Dallas), and Zhenyu Chen (Nanjing University)</i>	
Lancer: Your Code Tell Me What You Need .1202.....	
<i>Shufan Zhou (Shanghai Jiao Tong University), Beijun Shen (Shanghai Jiao Tong University), and Hao Zhong (Shanghai Jiao Tong University)</i>	

## Industry Showcase

- PHANTA: Diversified Test Code Quality Measurement for Modern Software Development .1206.....  
*Susumu Tokumoto (Fujitsu Laboratories Ltd.) and Kuniharu Takayama (Fujitsu Laboratories Ltd.)*
- Test Automation and Its Limitations: A Case Study .1208.....  
*Ahyoung Sung (Samsung Electronics), Sangjun Kim (Samsung Electronics), Yangsu Kim (Samsung Electronics), Younggun Jang (Samsung Electronics), and Jongin Kim (Samsung Electronics)*
- PTracer: A Linux Kernel Patch Trace Bot .1210.....  
*Yang Wen (ZTE Corporation), Jicheng Cao (ZTE Corporation), and Shengyu Cheng (ZTE Corporation)*
- Trusted Software Supply Chain .1212.....  
*Kapil Singi (Accenture Labs, India), Jagadeesh Chandra Bose R P (Accenture Labs, India), Sanjay Podder (Accenture Labs, India), and Adam P. Burden (Accenture, Singapore)*
- A Journey Towards Providing Intelligence and Actionable Insights to Development Teams in Software Delivery .1214.....  
*Vibhu Saujanya Sharma (Accenture Labs, India), Rohit Mehra (Accenture Labs, India), Sanjay Podder (Accenture Labs, India), and Adam P. Burden (Accenture, Singapore)*
- Better Development of Safety Critical Systems: Chinese High Speed Railway System Development Experience Report .1216.....  
*ZhiWei Wu (East China Normal University), Jing Liu (East China Normal University), and Xiang Chen (R&D Institute, CASCO Signal Ltd.)*

## Doctoral Symposium

- Improving Collaboration Efficiency in Fork-Based Development .1218.....  
*Shurui Zhou (Carnegie Mellon University)*
- Inference of Properties from Requirements and Automation of Their Formal Verification .1222.....  
*Marina Reich (Chemnitz University of Technology, Airbus Defence and Space GmbH)*
- Generating Tests to Analyse Dynamically-Typed Programs .1226.....  
*Stephan Lukasczyk (University of Passau)*
- Improving Patch Quality by Enhancing Key Components of Automatic Program Repair .1230.....  
*Mauricio Soto (Carnegie Mellon University)*
- Automatic Generation of Graphical User Interface Prototypes from Unrestricted Natural Language Requirements .1234.....  
*Kristian Kolthoff (Institute for Enterprise Systems (InES), University of Mannheim)*
- Automatically Repairing Binary Programs Using Adapter Synthesis .1238.....  
*Vaibhav Sharma (University of Minnesota)*



Tackling Build Failures in Continuous Integration .1242.....	<i>Foyzul Hassan (University of Texas at San Antonio)</i>
Enabling Continuous Improvement of a Continuous Integration Process .1246.....	<i>Carmine Vassallo (University of Zurich)</i>

## ACM Student Research Competition

Retrieve and Refine: Exemplar-Based Neural Comment Generation .1250.....	<i>Bolin Wei (Peking University)</i>
API Design Implications of Boilerplate Client Code .1253.....	<i>Daye Nam (Carnegie Mellon University)</i>
Compile-Time Detection of Machine Image Sniping .1256.....	<i>Martin Kellogg (Paul G. Allen University of Washington)</i>
An Image-Inspired and CNN-Based Android Malware Detection Approach .1259.....	<i>Xusheng Xiao (Case Western Reserve University)</i>
Toward Practical Automatic Program Repair .1262.....	<i>Ali Ghanbari (University of Texas at Dallas)</i>
User Preference Aware Multimedia Pricing Model using Game Theory and Prospect Theory for Wireless Communications .1265.....	<i>Krishna Murthy Kattiyam Ramamoorthy (San Diego State University)</i>
An Approach for Investigating Emotion Dynamics in Software Development .1268.....	<i>Krishna Neupane (Rochester Institute of Technology)</i>
Verifying Determinism in Sequential Programs .1271.....	<i>Rashmi Mudduluru (University of Washington)</i>
Empirical Study of Python Call Graph .1274.....	<i>Li Yu (Nanjing University)</i>
Crowdsourced Report Generation via Bug Screenshot Understanding .1277.....	<i>Shengcheng Yu (Nanjing University)</i>
Boosting Neural Commit Message Generation with Code Semantic Analysis .1280.....	<i>Shuyao Jiang (Fudan University, China)</i>
Towards Comprehensible Representation of Controllers using Machine Learning .1283.....	<i>Gargi Balasubramaniam (Birla Institute of Technology and Science, Pilani, Goa, India)</i>
A Machine Learning Based Approach to Identify SQL Injection Vulnerabilities .1286.....	<i>Kevin Zhang (Wayne State University)</i>

## Author Index