# 2018 ACM/IEEE 40th International Conference on Software Engineering ICSE 2018

#### **Table of Contents**

essage from the General Chairxxiii
essage from the Program Chairsxxvi
essage from the Journal First Chairxxviii
rganizing Committee xxix
ogram Boardxxxiii
ogram Committeexxxvi
onsors and Supportersxlv
ession 1: Software Repair I
ontext-Aware Patch Generation for Better Automated Program Repair
owards Practical Program Repair with On-demand Candidate Generation
Jooyong Yi (Innopolis University), Shin Hwei Tan (National University of Singapore), Sergey Mechtaev (National University of Singapore), Marcel Böhme (National University of Singapore), and Abhik Roychoudhury (National University of Singapore)
ournal First] Do Automated Program Repair Techniques Repair Hard and Important Bugs?

# **Session 2: Apps and App Stores I**

Software Protection on the Go: A Large-Scale Empirical Study on Mobile App Obfuscation
GUILeak: Tracing Privacy Policy Claims on User Input Data for Android Applications 37  Xiaoyin Wang (University of Texas at San Antonio), Xue Qin (University of Texas at San Antonio), Mitra Bokaei Hosseini (University of Texas at San Antonio), Rocky Slavin (University of Texas at San Antonio), Travis D. Breaux (Carnegie Mellon University), and Jianwei Niu (University of Texas at San Antonio)
Online App Review Analysis for Identifying Emerging Issues
[Journal First] EARMO: An Energy-Aware Refactoring Approach for Mobile Apps
Session 3: Software Evolution and Maintenance I
Neuro-Symbolic Program Corrector for Introductory Programming Assignments
Automated Localization for Unreproducible Builds
Enlightened Debugging
[Journal First] Experiences and Challenges in Building a Data Intensive System for Data Migration

# **Session 4: Human and Social Aspects of Computing I**

Sentiment Analysis for Software Engineering: How Far Can We Go?  Bin Lin (Università della Svizzera italiana), Fiorella Zampetti (University of Sannio), Gabriele Bavota (Università della Svizzera italiana (USI)), Massimiliano Di Penta (University of Sannio), Michele Lanza (Faculty of Informatics), and Rocco Oliveto (STAKE Lab - University of Molise)	94
Identifying Features in Forks  Shurui Zhou (Carnegie Mellon University), Stefan Stanciulescu (IT  University of Copenhagen), Olaf Leßenich (University of Passau),  Yingfei Xiong (Peking University), Andrzej Wasowski (IT University of  Copenhagen), and Christian Kästner (Carnegie Mellon University)	105
Roles and Impacts of Hands-on Software Architects in Five Industrial Case Studies  Inayat Rehman (Rochester Institute of Technology), Mehdi Mirakhorli (Rochester Institute of Technology), Meiyappan Nagappan (University of Waterloo), Azat Aralbay Uulu (Rochester Institute of Technology), and Matthew Thornton (Rochester Institute of Technology)	117
[Journal First] Sentiment Polarity Detection for Software Development	128
Session 5: Software Repair II	
Session 5: Software Repair II  Semantic Program Repair Using a Reference Implementation	129
Semantic Program Repair Using a Reference Implementation  Sergey Mechtaev (National University of Singapore), Manh-Dung Nguyen (National University of Singapore), Yannic Noller (Humboldt University of Berlin), Lars Grunske (Humboldt University of Berlin), and Abhik	
Semantic Program Repair Using a Reference Implementation  Sergey Mechtaev (National University of Singapore), Manh-Dung Nguyen (National University of Singapore), Yannic Noller (Humboldt University of Berlin), Lars Grunske (Humboldt University of Berlin), and Abhik Roychoudhury (National University of Singapore)  Automated Repair of Mobile Friendly Problems in Web Pages  Sonal Mahajan (University of Southern California), Negarsadat Abolhassani (University of Southern California), Phil McMinn (University of Sheffield), and William G. J. Halfond (University of	140

# **Session 6: Apps and App Stores II**

[Journal First] Studying the Dialogue Between Users and Developers of Free Apps in the Google Play Store  Safwat Hassan ((SAIL), Queen's University), Chakkrit Tantithamthavorn (The University of Adelaide, Australia), Cor-Paul Bezemer ((SAIL), Queen's University), and Ahmed E. Hassan ((SAIL), Queen's University)	. 164
Automated Reporting of GUI Design Violations for Mobile Apps	. 165
Leveraging Program Analysis to Reduce User-Perceived Latency in Mobile Applications  Yixue Zhao (University of Southern California), Marcelo Schmitt Laser  (Pontifical Catholic University of Rio Grande do Sul), Yingjun Lyu  (University of Southern California), and Nenad Medvidovic (University  of Southern California)	176
Repairing Crashes in Android Apps	187
Session 7: Regression Testing	
Hybrid Regression Test Selection	199
Fine-Grained Test Minimization  Arash Vahabzadeh (University of British Columbia), Andrea Stocco (University of British Columbia), and Ali Mesbah (University of British Columbia)	. 210
FAST Approaches to Scalable Similarity-Based Test Case Prioritization	222
Towards Refactoring-Aware Regression Test Selection  Kaiyuan Wang (University of Texas at Austin), Chenguang Zhu  (University of Texas at Austin), Ahmet Celik (University of Texas at  Austin), Jongwook Kim (Iona College), Don Batory (University of Texas  at Austin), and Milos Gligoric (University of Texas at Austin)	233
Session 8: Open-Source Systems	
Inheritance Usage Patterns in Open-Source Systems	245

Almost There: A Study on Quasi-Contributors in Open-Source Software Projects  Igor Steinmacher (Federal University of Technology), Gustavo Pinto (Federal University of Pará), Igor Scaliante Wiese (Federal University of Technology), and Marco Aurélio Gerosa (Northern Arizona University)	256
[Journal First] Analyzing a Decade of Linux System Calls  Mojtaba Bagherzadeh (Queen's University), Nafiseh Kahani (Queen's  University), Cor-Paul Bezemer (Queen's University), Ahmed E. Hassan  (Queen's University), Juergen Dingel (Queen's University), and James  R. Cordy (Queen's University)	. 267
To Distribute or Not to Distribute? Why Licensing Bugs Matter  Christopher Vendome (The College of William and Mary), Daniel German  (University of Victoria), Massimiliano Di Penta (University of  Sannio), Gabriele Bavota (Universita della Svizzera italiana (USI)),  Mario Linares-Vásquez (Universidad de los Andes), and Denys Poshyvanyk  (The College of William and Mary)	. 268
Session 9: Test Generation	
Augusto: Exploiting Popular Functionalities for the Generation of Semantic GUI Tests with Oracles	280
Towards Optimal Concolic Testing	291
DeepTest: Automated Testing of Deep-Neural-Network-Driven Autonomous Cars	303
Precise Concolic Unit Testing of C Programs Using Extended Units and Symbolic Alarm Filtering	315
Session 10: Program Reduction Techniques	
Spatio-Temporal Context Reduction: A Pointer-Analysis-Based Static Approach for Detecting	227
Use-After-Free Vulnerabilities  Hua Yan (University of New South Wales), Yulei Sui (University of Technology Sydney), Shiping Chen (Data61), and Jingling Xue (University of New South Wales)	341
Program Splicing	338
Yanxin Lu (Rice University), Swarat Chaudhuri (Rice University), Chris Jermaine (Rice University), and David Melski (Grammatech Inc.)	

Chopped Symbolic Execution	. 350
Perses: Syntax-Guided Program Reduction	361
Session 11: Security, Privacy and Trust I	
Secure Coding Practices in Java: Challenges and Vulnerabilities  Na Meng (Virginia Tech), Stefan Nagy (Virginia Tech), Danfeng (Daphne)  Yao (Virginia Tech), Wenjie Zhuang (Virginia Tech), and Gustavo  Arango-Argoty (Virginia Tech)	. 372
EnMobile: Entity-Based Characterization and Analysis of Mobile Malware  Wei Yang (University of Illinois at Urbana-Champaign), Mukul Prasad  (Fujitsu Laboratories of America), and Tao Xie (University of Illinois  at Urbana-Champaign)	.384
[Journal First] Model Comprehension for Security Risk Assessment: An Empirical Comparison of Tabular vs. Graphical Representations	. 395
[Journal First] Privacy by Designers: Software Developers' Privacy Mindset  Irit Hadar (University of Haifa), Tomer Hasson (University of Haifa),  Oshrat Ayalon (Tel Aviv University), Eran Toch (Tel Aviv University),  Michael Birnhack (Tel Aviv University), Sofia Sherman (University of Haifa), and Arod Balissa (Tel Aviv University)	396
Session 12: Empirical Software Engineering	
Does the Propagation of Artifact Changes Across Tasks Reflect Work Dependencies? Christoph Mayr-Dorn (Johannes Kepler University) and Alexander Egyed (Johannes Kepler University)	. 397
Large-Scale Analysis of Framework-Specific Exceptions in Android Apps  Lingling Fan (East China Normal University), Ting Su (Nanyang Technological University), Sen Chen (East China Normal University), Guozhu Meng (Chinese Academy of Sciences), Yang Liu (Nanyang Technological University), Lihua Xu (East China Normal University), Geguang Pu (East China Normal University), and Zhendong Su (University of California)	408
[Journal First] Effect Sizes and their Variance for AB/BA Crossover Design Studies	. 420

A Large-Scale Empirical Study on the Effects of Code Obfuscations on Android Apps and Anti-Malware Products	421
Mahmoud Hammad (University of California, Irvine), Joshua Garcia (University of California, Irvine), and Sam Malek (University of	
California, Irvine)	
[Journal First] An Empirical Study on the Interplay Between Semantic Coupling and Co-change of Software Classes	432
Nemitari Ajienka (Edge Hill University), Andrea Capiluppi (Brunel University London), and Steve Counsell (Brunel University London)	
Session 13: Test Improvement	
DeFlaker: Automatically Detecting Flaky Tests  Jonathan Bell (George Mason University), Owolabi Legunsen (University of Illinois at Urbana-Champaign), Michael Hilton (Carnegie Mellon University), Lamyaa Eloussi (University of Illinois at Urbana-Champaign), Tifany Yung (University of Illinois at Urbana-Champaign), and Darko Marinov (University of Illinois at Urbana-Champaign)	433
DetReduce: Minimizing Android GUI Test Suites for Regression Testing  Wontae Choi (University of California, Berkeley), Koushik Sen (University of California, Berkeley), George Necul (University of California, Berkeley), and Wenyu Wang (University of Illinois, Urbana-Champaign)	445
Time to Clean Your Test Objectives	456
Prioritizing Browser Environments for Web Application Test Execution	468
Session 14: Empirical Studies of Code	
[Journal First] An Empirical Study of Early Access Games on the Steam Platform  Dayi Lin (SAIL - Queen's University), Cor-Paul Bezemer (SAIL - Queen's  University), and Ahmed E. Hassan (SAIL - Queen's University)	480
[Journal First] Correctness Attraction: A Study of Stability of Software Behavior Under Runtime	101
Perturbation	401
[Journal First] On the Diffuseness and the Impact on Maintainability of Code Smells: A Large Scale	
Empirical Investigation  Fabio Palomba (University of Zurich), Gabriele Bavota (Università	482
della Svizzera Italiana), Massimiliano Di Penta (University of Sannio), Fausto Fasano (University of Molise), Rocco Oliveto	
(University of Molise), and Andrea De Lucia (University of Salerno)	

Accurate and Efficient Refactoring Detection in Commit History
Session 15: Security, Privacy and Trust II
[Journal First] ENTRUST: Engineering Trustworthy Self-Adaptive Software with Dynamic Assurance Cases 495 Radu Calinescu (University of York), Danny Weyns (Katholieke Universiteit Leuven), Simos Gerasimou (University of York), M. Usman Iftikhar (Linnaeus University), Ibrahim Habli (University of York), and Tim Kelly (University of York)
[Journal First] The Good, the Bad and the Ugly: A Study of Security Decisions in a Cyber-Physical
Systems Game
(Lancaster University) [Journal First] Lightweight, Obfuscation-Resilient Detection and Family Identification of Android
Malware
[Journal First] Are Vulnerabilities Discovered and Resolved Like Other Defects?
Session 16: Communities and Ecosystems
How Modern News Aggregators Help Development Communities Shape and Share Knowledge
Adding Sparkle to Social Coding: An Empirical Study of Repository Badges in the npm Ecosystem
"Was My Contribution Fairly Reviewed?" A Framework to Study the Perception of Fairness in Modern
Code Reviews

[Journal First] Collaborative Model-Driven Software Engineering: A Classification Framework and a Research Map [Extended Abstract]	5
Davide Di Ruscio (University of L'Aquila, Italy), Mirco Franzago	
(University of L'Aquila, Italy), Ivano Malavolta (Vrije Universiteit	
Amsterdam), and Henry Muccini (University of L'Aquila, Italy)	
Session 17: Testing I	
[Journal First] ChangeLocator: Locate Crash-Inducing Changes Based on Crash Reports 53  Rongxin Wu (The Hong Kong University of Science and Technology), Ming Wen (The Hong Kong University of Science and Technology), Shing-Chi Cheung (The Hong Kong University of Science and Technology), and Hongyu Zhang (The University of Newcastle)	6
Are Mutation Scores Correlated with Real Fault Detection? A Large Scale Empirical Study on the	
Relationship Between Mutants and Real Faults	7
Mike Papadakis (University of Luxembourg), Donghwan Shin (Korea Advanced Institute of Science and Technology), Shin Yoo (Korea	
Advanced Institute of Science and Technology), and Doo-Hwan Bae (Korea	
Advanced Institute of Science and Technology)	
Efficient Sampling of SAT Solutions for Testing	9
Rafael Dutra (University of California, Berkeley), Kevin Laeufer	
(University of California, Berkeley), Jonathan Bachrach (University of	
California, Berkeley), and Koushik Sen (University of California, Berkeley)	
THE STATE OF THE S	
[Journal First] Are Fix-Inducing Changes a Moving Target?: A Longitudinal Case Study of Just-in-Time  Defect Prediction	0
	0
Defect Prediction	0
Defect Prediction	
Defect Prediction	1
Defect Prediction	1 2 4
Defect Prediction	1 2 4

# Session 19: Program Analysis I

Dataflow Tunneling: Mining Inter-Request Data Dependencies for Request-Based Applications	586
Launch-Mode-Aware Context-Sensitive Activity Transition Analysis	598
UFO: Predictive Concurrency Use-After-Free Detection  Jeff Huang (Texas A&M University)	609
Collective Program Analysis  Ganesha Upadhyaya (Iowa State University) and Hridesh Rajan (Iowa State University)	620
Session 20: Human and Social Aspects of Computing II	
Statistical Learning of API Fully Qualified Names in Code Snippets of Online Forums	632
When Not to Comment: Questions and Tradeoffs with API Documentation for C++ Projects	643
Deuce: A Lightweight User Interface for Structured Editing  Brian Hempel (University of Chicago), Justin Lubin (University of Chicago), Grace Lu (University of Chicago), and Ravi Chugh (University of Chicago)	654
From UI Design Image to GUI Skeleton: A Neural Machine Translator to Bootstrap Mobile GUI Implementation  Chunyang Chen (Nanyang Technological University), Ting Su (Nanyang Technological University), Guozhu Meng (Nanyang Technological University), Zhenchang Xing (Australian National University), and Yang Liu (Nanyang Technological University)	665
Session 21: Testing II	
When Testing Meets Code Review: Why and How Developers Review Tests  Davide Spadini (Delft University of Technology / Software Improvement  Group), Maurício Aniche (Delft University of Technology),  Margaret-Anne Storey (University of Victoria), Magiel Bruntink  (Software Improvement Group), and Alberto Bacchelli (University of  Zurich)	677

Redefining Prioritization: Continuous Prioritization for Continuous Integration  Jingjing Liang (University of Nebraska - Lincoln), Sebastian Elbaum  (University of Nebraska - Lincoln), and Gregg Rothermel (University of Nebraska - Lincoln)	. 688
[Journal First] MAHAKIL: Diversity Based Oversampling Approach to Alleviate the Class Imbalance Issue in Software Defect Prediction  Kwabena Ebo Bennin (City University of Hong Kong), Jacky Keung (City  University of Hong Kong), Passakorn Phannachitta (Chiang Mai  University), Akito Monden (Okayama University), and Solomon Mensah  (Chiang Mai University)	. 699
[Journal First] On the Use of Hidden Markov Model to Predict the Time to Fix Bugs	700
Session 22: Studying Software Engineers II	
[Journal First] What Makes a Great Manager of Software Engineers?  Eirini Kalliamvakou (University of Victoria), Christian Bird (Microsoft), Thomas Zimmermann (Microsoft), Andrew Begel (Microsoft), Robert DeLine (Microsoft), and Daniel German (University of Victoria)	. 701
[Journal First] Older Adults and Hackathons: A Qualitative Study	. 702
[Journal First] Does Syntax Highlighting Help Programming Novices?  Christoph Hannebauer (University of Duisburg-Essen), Marc Hesenius  (University of Duisburg-Essen), and Volker Gruhn (University of Duisburg-Essen)	. 704
Do Programmers Work at Night or During the Weekend?  Maëlick Claes (University of Oulu), Mika Mäntylä (University of Oulu),  Miikka Kuutila (University of Oulu), and Bram Adams (Polytechnique  Montreal)	705
Session 23: Program Analysis II	
Multi-granular Conflict and Dependency Analysis in Software Engineering Based on Graph Transformation	. 716

Self-Hiding Behavior in Android Apps: Detection and Characterization	28
[Journal First] The Scent of a Smell: An Extensive Comparison Between Textual and Structural Smells	40
ConflictJS: Finding and Understanding Conflicts Between JavaScript Libraries	41
Session 24: Software Comprehension	
Debugging Data Flows in Reactive Programs 7  Herman Banken (Delft University of Technology), Erik Meijer (Delft University of Technology), and Georgios Gousios (Delft University of Technology)	52
Do You Remember This Source Code?	64
Inferring Hierarchical Motifs from Execution Traces	76
[Journal First] A Comparison of Program Comprehension Strategies by Blind and Sighted Programmers 7. Ameer Armaly (University of Notre Dame), Paige Rodeghero (University of Notre Dame), and Collin McMillan (University of Notre Dame)	88
Session 25: Performance and Maintenance	
Identifying Patch Correctness in Test-Based Program Repair	'89
How not to Structure Your Database-Backed Web Applications: A Study of Performance Bugs in the Wild8.  Junwen Yang (University of Chicago), Cong Yan (University of Washington), Pranav Subramaniam (University of Chicago), Shan Lu (University of Chicago), and Alvin Cheung (University of Washington)	,00

Speedoo: Prioritizing Performance Optimization Opportunities
[Journal First] Empirical Study on the Discrepancy Between Performance Testing Results from Virtual and Physical Environments
Session 26: Requirements and Recommender Systems
The Evolution of Requirements Practices in Software Startups
Traceability in the Wild: Automatically Augmenting Incomplete Trace Links
A Temporal Permission Analysis and Enforcement Framework for Android
[Journal First] Global-Aware Recommendations for Repairing Violations in Exception Handling
Session 27: Testing III
RFC-Directed Differential Testing of Certificate Validation in SSL/TLS Implementations
Symbolic Verification of Regular Properties
[Journal First] Metamorphic Testing of RESTful Web APIs

[Journal First] Integrating Technical Debt Management and Software Quality Management Processes: A Framework and Field Tests	002
Narayan Ramasubbu (University of Pittsburgh) and Chris Kemerer (University of Pittsburgh)	663
Session 28: Mining Software Repositories	
[Journal First] Understanding the Factors for Fast Answers in Technical Q&A Websites: An Empirical Study of Four Stack Exchange Websites  Mike Papadakis (University of Luxembourg), Shaowei Wang (SAIL Queen's University), Tse-Hsun Chen (Concordia University), and Ahmed E. Hassan	884
(SAIL Queen's University)  [Journal First] Towards Reusing Hints from Past Fixes: An Exploratory Study on Thousands of Real Samples	885
Hao Zhong (Shanghai Jiao Tong University) and Na Meng (Virginia Tech)	
Are Code Examples on an Online Q&A Forum Reliable?: A Study of API Misuse on Stack Overflow  Tianyi Zhang (University of California, Los Angeles), Ganesha  Upadhyaya (Iowa State University), Anastasia Reinhardt (George Fox  University), Hridesh Rajan (Iowa State University), and Miryung Kim  (University of California, Los Angeles)	886
[Journal First] Inference of Development Activities from Interaction with Uninstrumented Applications	897
Session 29: Models and Modeling I	
Propagating Configuration Decisions with Modal Implication Graphs  Sebastian Krieter (University of Magdeburg; Harz University of Applied Sciences), Thomas Thüm (TU Braunschweig), Sandro Schulze (University of Magdeburg), Reimar Schröter (University of Magdeburg), and Gunter Saake (University of Magdeburg)	898
A Combinatorial Approach for Exposing Off-Nominal Behaviors	910
Identifying Design Problems in the Source Code: A Grounded Theory  Leonardo Sousa (PUC-Rio), Anderson Oliveira (PUC-Rio), Willian Oizumi  (PUC-Rio), Simone Barbosa (PUC-Rio), Alessandro Garcia (PUC-Rio),  Jaejoon Lee (Lancaster University), Marcos Kalinowski (PUC-Rio),  Rafael de Mello (PUC-Rio), Baldoino Fonseca (UFAL), Roberto Oliveira  (PUC-Rio), Carlos Lucena (PUC-Rio), and Rodrigo Paes (UFAL)	921
[Journal First] Predicting Future Developer Behavior in the IDE Using Topic Models	932

# Session 30: Code Search, Synthesis, Performance

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)	933
[Journal First] Augmenting and Structuring User Queries to Support Efficient Free-Form Code Search	945
FaCoY – A Code-to-Code Search Engine	946
Generalized Data Structure Synthesis	958
Session 31: Software Tools and Environments	
A Graph Solver for the Automated Generation of Consistent Domain-Specific Models	. 969
Automatically Finding Bugs in a Commercial Cyber-Physical System Development Tool Chain With SLforgo	
Shafiul Azam Chowdhury (The University of Texas at Arlington), Soumik Mohian (The University of Texas at Arlington), Sidharth Mehra (The University of Texas at Arlington), Siddhant Gawsane (The University of Texas at Arlington), Taylor T. Johnson (The University of Texas at Arlington), and Christoph Csallner (The University of Texas at Arlington)	2. 981
Mohian (The University of Texas at Arlington), Sidharth Mehra (The University of Texas at Arlington), Siddhant Gawsane (The University of Texas at Arlington), Taylor T. Johnson (The University of Texas at Arlington), and Christoph Csallner (The University of Texas at	

# Session 32: Search-Based Software Engineering I

Testing Vision-Based Control Systems Using Learnable Evolutionary Algorithms
To Preserve or Not to Preserve Invalid Solutions in Search-Based Software Engineering: A Case Study in Software Product Lines
Nemo: Multi-criteria Test-Suite Minimization with Integer Nonlinear Programming 1039  Jun-Wei Lin (University of California, Irvine), Reyhaneh Jabbarvand  (University of California, Irvine), Joshua Garcia (University of  California, Irvine), and Sam Malek (University of California, Irvine)
Is "Better Data" Better Than "Better Data Miners"?
Session 33: Testing IV
[Journal First] Analyzing the Effects of Test Driven Development in GitHub
[Journal First] A Comparative Study to Benchmark Cross-Project Defect Prediction Approaches
[Journal First] MSeer – An Advanced Technique for Locating Multiple Bugs in Parallel
[Journal First] Journal First Presentation of an Experience Report on Applying Software Testing  Academic Results in Industry: We Need Usable Automated Test Generation
Session 34: Software Evolution and Maintenance II
CCAligner: A Token Based Large-Gap Clone Detector
HireBuild: An Automatic Approach to History-Driven Repair of Build Scripts
The Road to Live Programming: Insights from the Practice

Assessing the Threat of Untracked Changes in Software Evolution
Session 35: Models and Modeling II
Programming Not Only by Example
Goal-Conflict Likelihood Assessment Based on Model Counting
[Journal First] A Posteriori Typing for Model-Driven Engineering: Concepts, Analysis, and  Applications
A Static Verification Framework for Message Passing in Go Using Behavioural Types
Session 36: Inference and Invariants
Inferring and Asserting Distributed System Invariants
DroidStar: Callback Typestates for Android Classes
Debugging with Intelligence via Probabilistic Inference
Reducer-Based Construction of Conditional Verifiers

# **Session 37: Surveys and Reviews**

[Journal First] Challenges and Pitfalls on Surveying Evidence in the Software Engineering Technical Literature: An Exploratory Study with Novices	1194
Statistical Errors in Software Engineering Experiments: A Preliminary Literature Review	1195
Synthesizing Qualitative Research in Software Engineering: A Critical Review  Xin Huang (Nanjing University), He Zhang (Nanjing University), Xin  Zhou (Nanjing University), Muhammad Ali Babar (University of  Adelaide), and Song Yang (Nanjing University)	1207
[Journal First] Automatic Software Repair: A Survey	1219
Session 38: Search-Based Software Engineering II	
Search-Based Test Data Generation for SQL Queries  Jeroen Castelein (Delft University of Technology), Maurício Aniche (Delft University of Technology), Mozhan Soltani (Delft University of Technology), Annibale Panichella (Delft University of Technology), and Arie van Deursen (Delft University of Technology)	1220
Multi-objective Integer Programming Approaches for Solving Optimal Feature Selection Problem: A New Perspective on Multi-objective Optimization Problems in SBSE	1231
[Journal First] Automated Refactoring of OCL Constraints with Search  Hong Lu (Simula Research Laboratory), Shuai Wang (Simula Research  Laboratory), Tao Yue (Simula Research Laboratory), Shaukat Ali (Simula  Research Laboratory), and Jan Nygard (Cancer Registry of Norway)	1243
Automatically Generating Search Heuristics for Concolic Testing	1244
Author Index	1255