# Contents

## Preface

Message from the Chairs ..................................................... xix
Committees ............................................................................ xxiii
Sponsors ................................................................................. xxx

## Technical Research

### Fault Handling

**A Systematic Study of Automated Program Repair: Fixing 55 out of 105 Bugs for $8 Each**
Claire Le Goues, Michael Dewey-Voogt, Stephanie Forrest, and Westley Weimer — University of Virginia, USA; University of New Mexico, USA ........................................ 3

**Where Should the Bugs Be Fixed? - More Accurate Information Retrieval-Based Bug Localization Based on Bug Reports**
Jian Zhou, Hongyu Zhang, and David Lo — Tsinghua University, China; Singapore Management University, Singapore ................................................................. 14

**Developer Prioritization in Bug Repositories**
Jifei Xuan, He Jiang, Zhilei Ren, and Weiqin Zou — Dalian University of Technology, China ................................................................. 25

**WhoseFault: Automatic Developer-to-Fault Assignment through Fault Localization**
Francisco Servant and James A. Jones — UC Irvine, USA ................................................................. 36

### Code Generation and Recovery

**Recovering Traceability Links between an API and Its Learning Resources**
Barthélémy Dagenais and Martin P. Robillard — McGill University, Canada ........................................ 47

**Generating Range Fixes for Software Configuration**
Yingfei Xiong, Arnaud Hubaux, Steven She, and Krzysztof Czarnecki — University of Waterloo, Canada; University of Namur, Belgium ........................................ 58

**Graph-Based Pattern-Oriented, Context-Sensitive Source Code Completion**
Anh Tuan Nguyen, Tung Thanh Nguyen, Hoan Anh Nguyen, Ahmed Tamrawi, Hung Viet Nguyen, Jafar Al-Kofahi, and Tien N. Nguyen — Iowa State University, USA ........................................ 69

**Automatic Input Rectification**
Fan Long, Vijay Ganesh, Michael Carbin, Stelios Sidiroglou, and Martin Rinard — MIT, USA ........................................ 80

### Empirical Studies of Development

**Overcoming the Challenges in Cost Estimation for Distributed Software Projects**
Narayan Ramasubbu and Rajesh Krishna Balan — Singapore Management University, Singapore ........................................ 91

**Characterizing Logging Practices in Open-Source Software**
Ding Yuan, Soyeon Park, and Yuanyuan Zhou — University of Illinois at Urbana-Champaign, USA; UC San Diego, USA ........................................ 102

**The Impacts of Software Process Improvement on Developers: A Systematic Review**
Mathieu Lavallée and Pierre N. Robillard — École Polytechnique de Montréal, Canada ........................................ 113
Combining Functional and Imperative Programming for Multicore Software: An Empirical Study Evaluating Scala and Java
Victor Pankratius, Felix Schmidt, and Gilda Garretón — KIT, Germany; Oracle Labs, USA .......................... 123

Performance Analysis
Uncovering Performance Problems in Java Applications with Reference Propagation Profiling
Dacong Yan, Guoqing Xu, and Atanas Rountev — Ohio State University, USA; UC Irvine, USA ...................... 134
Performance Debugging in the Large via Mining Millions of Stack Traces
Shi Han, Yinguong Dang, Song Ge, Dongmei Zhang, and Tao Xie — Microsoft Research, China; North Carolina State University, USA ......................................................... 145
Automatically Finding Performance Problems with Feedback-Directed Learning Software Testing
Mark Grechanik, Chen Fu, and Qing Xie — Accenture Technology Labs, USA; University of Illinois at Chicago, USA .... 156
Predicting Performance via Automated Feature-Interaction Detection
Norbert Siegmund, Sergiy S. Kolesnikov, Christian Kästner, Sven Apel, Don Batory, Marko Rosenmüller, and Gunter Saake — University of Magdeburg, Germany; University of Passau, Germany; Philipps University of Marburg, Germany; University of Texas at Austin, USA .................................................. 167

Defect Prediction
Sound Empirical Evidence in Software Testing
Gordon Fraser and Andrea Arcuri — Saarland University, Germany; Simula Research Laboratory, Norway ............ 178
Privacy and Utility for Defect Prediction: Experiments with MORPH
Fayola Peters and Tim Menzies — West Virginia University, USA ................................................................. 189

Bug Prediction Based on Fine-Grained Module Histories
Hideaki Hata, Osamu Mizuno, and Tohru Kikuno — Osaka University, Japan; Kyoto Institute of Technology, Japan .... 200

Refactoring
Reconciling Manual and Automatic Refactoring
Xi Ge, Quinton L. DuBose, and Emerson Murphy-Hill — North Carolina State University, USA ........................... 211
WitchDoctor: IDE Support for Real-Time Auto-Completion of Refactorings
Stephen R. Foster, William G. Griswold, and Sorin Lerner — UC San Diego, USA ........................................... 222

Use, Disuse, and Misuse of Automated Refactorings
Mohsen Vakilian, Nicholas Chen, Stas Negara, Balaji Ambresh Rajkumar, Brian P. Bailey, and Ralph E. Johnson — University of Illinois at Urbana-Champaign, USA .................................................. 233

Human Aspects of Development
Test Confessions: A Study of Testing Practices for Plug-In Systems
Michaela Greiler, Arié van Deursen, and Margaret-Anne Storey — TU Delft, Netherlands; University of Victoria, Canada 244
How Do Professional Developers Comprehend Software?
Tobias Roehm, Rebecca Tiarks, Rainer Koschke, and Walid Maalej — TU Munich, Germany; University of Bremen, Germany 255

Asking and Answering Questions about Unfamiliar APIs: An Exploratory Study
Ekwa Duala-Ekoko and Martin P. Robillard — McGill University, Canada ...................................................... 266

Bug Detection
Automated Repair of HTML Generation Errors in PHP Applications Using String Constraint Solving
Hesam Samimi, Max Schäfer, Shay Artzi, Todd Millstein, Frank Tip, and Laurie Hendren — UC Los Angeles, USA; IBM Research, USA; McGill University, Canada ................................................... 277
Leveraging Test Generation and Specification Mining for Automated Bug Detection without False Positives
Michael Pradel and Thomas R. Gross — ETH Zurich, Switzerland ................................................................. 288
Axis: Automatically Fixing Atomicity Violations through Solving Control Constraints
Peng Liu and Charles Zhang — Hong Kong University of Science and Technology, China ............................... 299

CBCD: Cloned Buggy Code Detector
Jingyue Li and Michael D. Ernst — DNV Research and Innovation, Norway; University of Washington, USA ........ 310
### Multiversion Software
Crosscutting Revision Control System
Sagi Ifrah and David H. Lorenz — Open University, Israel

Where Does This Code Come from and Where Does It Go? - Integrated Code History Tracker for Open Source Systems -
Katsuro Inoue, Yusuke Sasaki, Pei Xia, and Yuki Manabe — Osaka University, Japan

Improving Early Detection of Software Merge Conflicts
Mário Luís Guimarães and António Rito Silva — Technical University of Lisbon, Portugal

A History-Based Matching Approach to Identification of Framework Evolution
Sichen Meng, Xiaoyin Wang, Lu Zhang, and Hong Mei — Key Laboratory of High Confidence Software Technologies, China; Peking University, China

### Similarity and Classification
Detecting Similar Software Applications
Collin McMillan, Mark Grechanik, and Denys Poshvyvanyk — College of William and Mary, USA; Accenture Technology Labs, USA; University of Illinois at Chicago, USA

Content Classification of Development Emails
Alberto Bacchelli, Tommaso Dal Sasso, Marco D’Ambros, and Michele Lanza — University of Lugano, Switzerland

Identifying Linux Bug Fixing Patches
Yuan Tian, Julia Lawall, and David Lo — Singapore Management University, Singapore; INRIA/LIP6, France

Active Refinement of Clone Anomaly Reports
Lucia, David Lo, Lingxiao Jiang, and Aditya Budi — Singapore Management University, Singapore

### Analysis for Evolution
Automated Analysis of CSS Rules to Support Style Maintenance
Ali Mesbah and Shabnam Mirshokraie — University of British Columbia, Canada

Graph-Based Analysis and Prediction for Software Evolution
Pamela Bhattacharya, Marios Iliofotou, Iulian Neamtiu, and Michalis Faloutsos — UC Riverside, USA

Integrated Impact Analysis for Managing Software Changes
Malcom Gethers, Bogdan Dit, Huzefa Kagdi, and Denys Poshvyvanyk — College of William and Mary, USA; Wichita State University, USA

Detecting and Visualizing Inter-worksheet Smells in Spreadsheets
Felienne Hermans, Martin Pinzger, and Arie van Deursen — TU Delft, Netherlands

### Debugging
An Empirical Study about the Effectiveness of Debugging When Random Test Cases Are Used
Mariano Ceccato, Alessandro Marchetto, Leonardo Mariani, Cu D. Nguyen, and Paolo Tonella — Fondazione Bruno Kessler, Italy; University of Milano-Bicocca, Italy

Reducing Confounding Bias in Predicate-Level Statistical Debugging Metrics
Ross Gore and Paul F. Reynolds, Jr. — University of Virginia, USA

BugRedux: Reproducing Field Failures for In-House Debugging
Wei Jin and Alessandro Orso — Georgia Tech, USA

Object-Centric Debugging
Jorge Ressia, Alexandre Bergel, and Oscar Nierstrasz — University of Bern, Switzerland; University of Chile, Chile

### Human Aspects of Process
Disengagement in Pair Programming: Does It Matter?
Laura Plonka, Helen Sharp, and Janet van der Linden — Open University, UK

Ambient Awareness of Build Status in Collocated Software Teams
John Downs, Beryl Plimmer, and John G. Hosking — University of Melbourne, Australia; University of Auckland, New Zealand; Australian National University, Australia
### What Make Long Term Contributors: Willingness and Opportunity in OSS Community
Minghui Zhou and Audris Mockus — Peking University, China; Key Laboratory of High Confidence Software Technologies, China; Avaya Labs Research, USA

### Development of Auxiliary Functions: Should You Be Agile? An Empirical Assessment of Pair Programming and Test-First Programming
Otávio Augusto Lazzarini Lemos, Fabiano Cutigi Ferrari, Fábio Fagundes Silveira, and Alessandro Garcia — UNIFESP, Brazil; UFSCar, Brazil; PUC-Rio, Brazil

### Models
#### Maintaining Invariant Traceability through Bidirectional Transformations
Yijun Yu, Yu Lin, Zhenjiang Hu, Soichiro Hidaka, Hiroyuki Kato, and Lionel Montrieux — Open University, UK; University of Illinois at Urbana-Champaign, USA; National Institute of Informatics, Japan

#### Slicing MATLAB Simulink Models
Robert Reicherdt and Sabine Glesner — TU Berlin, Germany

#### Partial Evaluation of Model Transformations
Ali Razavi and Kostas Kontogiannis — University of Waterloo, Canada; National Technical University of Athens, Greece

#### Partial Models: Towards Modeling and Reasoning with Uncertainty
Michalis Famelis, Rick Salay, and Marsha Chechik — University of Toronto, Canada

### Concurrency and Exceptions
#### Static Detection of Resource Contention Problems in Server-Side Scripts
Yunhui Zheng and Xiangyu Zhang — Purdue University, USA

#### Amplifying Tests to Validate Exception Handling Code
Pingyu Zhang and Sebastian Elbaum — University of Nebraska-Lincoln, USA

#### MagicFuzzer: Scalable Deadlock Detection for Large-Scale Applications
Yan Cai and W. K. Chan — City University of Hong Kong, China

### Software Architecture
#### Does Organizing Security Patterns Focus Architectural Choices?
Koen Yskout, Riccardo Scandariato, and Wouter Joosen — KU Leuven, Belgium

#### Enhancing Architecture-Implementation Conformance with Change Management and Support for Behavioral Mapping
Yongjie Zheng and Richard N. Taylor — UC Irvine, USA

#### A Tactic-Centric Approach for Automating Traceability of Quality Concerns
Mehdi Mirakhorli, Yonghee Shin, Jane Cleland-Huang, and Murat Cinar — DePaul University, USA

### Formal Verification
#### Build Code Analysis with Symbolic Evaluation
Ahmed Tamrawi, Hoan Anh Nguyen, Hung Viet Nguyen, and Tien N. Nguyen — Iowa State University, USA

#### An Automated Approach to Generating Efficient Constraint Solvers
Dharini Balasubramaniam, Christopher Jefferson, Lars Kotthoff, Ian Miguel, and Peter Nightingale — University of St. Andrews, UK

#### Simulation-Based Abstractions for Software Product-Line Model Checking
Maxime Cordy, Andreas Classen, Gilles Perrouin, Pierre-Yves Schobbens, Patrick Heymans, and Axel Legay — University of Namur, Belgium; INRIA, France; LIFL-CNRS, France; IRISA, France; Aalborg University, Denmark; University of Liège, Belgium

### Invariant Generation
#### Using Dynamic Analysis to Discover Polynomial and Array Invariants
ThanhVu Nguyen, Deepak Kapur, Westley Weimer, and Stephanie Forrest — University of New Mexico, USA; University of Virginia, USA

#### Metadata Invariants: Checking and Inferring Metadata Coding Conventions
Myoungkyu Song and Eli Tilevich — Virginia Tech, USA
Generating Obstacle Conditions for Requirements Completeness
Dalal Alrajeh, Jeff Kramer, Axel van Lamsweerde, Alessandra Russo, and Sebastián Uchitel — Imperial College London, UK; Université Catholique de Louvain, Belgium

Regression Testing
make test-zesti: A Symbolic Execution Solution for Improving Regression Testing
Paul Dan Marinescu and Cristian Cadar — Imperial College London, UK

BALLERINA: Automatic Generation and Clustering of Efficient Random Unit Tests for Multithreaded Code
Adrian Nistor, Qingzhou Luo, Michael Pradel, Thomas R. Gross, and Darko Marinov — University of Illinois at Urbana-Champaign, USA; ETH Zurich, Switzerland

On-Demand Test Suite Reduction
Dan Hao, Lu Zhang, Xingxia Wu, Hong Mei, and Gregg Rothermel — Peking University, China; Key Laboratory of High Confidence Software Technologies, China; University of Nebraska, USA

Software Vulnerability
Automated Detection of Client-State Manipulation Vulnerabilities
Anders Møller and Mathias Schwarz — Aarhus University, Denmark

Understanding Integer Overflow in C/C++
Will Dietz, Peng Li, John Regehr, and Vikram Adve — University of Illinois at Urbana-Champaign, USA; University of Utah, USA

A Large Scale Exploratory Analysis of Software Vulnerability Life Cycles
Muhammad Shahzad, Muhammad Zubair Shafiq, and Alex X. Liu — Michigan State University, USA

API Learning
Synthesizing API Usage Examples
Raymond P. L. Buse and Westley Weimer — University of Virginia, USA

Semi-automatically Extracting FAQs to Improve Accessibility of Software Development Knowledge
Stefan Henß, Martin Monperrus, and Mira Mezini — TU Darmstadt, Germany; University of Lille, France; INRIA, France

Temporal Analysis of API Usage Concepts
Gias Uddin, Barthélémy Dagenais, and Martin P. Robillard — McGill University, Canada

Inferring Method Specifications from Natural Language API Descriptions
Rahul Pandita, Xusheng Xiao, Hao Zhong, Tao Xie, Stephen Oney, and Amit Paradkar — North Carolina State University, USA; Chinese Academy of Sciences, China; CMU, USA; IBM Research, USA

Code Recommenders
Automatic Parameter Recommendation for Practical API Usage
Cheng Zhang, Juyuan Yang, Yi Zhang, Jing Fan, Xin Zhang, Jianjun Zhao, and Peizhao Ou — Shanghai Jiao Tong University, China

On the Naturalness of Software
Abram Hindle, Earl T. Barr, Zhendong Su, Mark Gabel, and Premkumar Devanbu — UC Davis, USA; University of Texas at Dallas, USA

Recommending Source Code for Use in Rapid Software Prototypes
Collin McMillan, Negar Hariri, Denys Poshvyvanyk, Jane Cleland-Huang, and Bamshad Mobasher — College of William and Mary, USA; DePaul University, USA

Active Code Completion
Cyrus Omar, YoungSeok Yoon, Thomas D. LaToza, and Brad A. Myers — CMU, USA

Test Automation
Automated Oracle Creation Support, or: How I Learned to Stop Worrying about Fault Propagation and Love Mutation Testing
Matt Staats, Gregory Gay, and Mats P. E. Heimdahl — KAIST, South Korea; University of Minnesota, USA

Automating Test Automation
Suresh Thummalapenta, Saurabh Sinha, Nimit Singhania, and Satish Chandra — IBM Research, India; IBM Research, USA
Stride: Search-Based Deterministic Replay in Polynomial Time via Bounded Linkage
Jinguo Zhou, Xiao Xiao, and Charles Zhang — Hong Kong University of Science and Technology, China 892

iTree: Efficiently Discovering High-Coverage Configurations Using Interaction Trees
Charles Song, Adam Porter, and Jeffrey S. Foster — University of Maryland, USA 903

Validation of Specification
Inferring Class Level Specifications for Distributed Systems
Sandeep Kumar, Siau-Cheng Khoo, Abhik Roychoudhury, and David Lo — National University of Singapore, Singapore; Singapore Management University, Singapore 914

Statically Checking API Protocol Conformance with Mined Multi-Object Specifications
Michael Pradel, Ciera Jaspan, Jonathan Aldrich, and Thomas R. Gross — ETH Zurich, Switzerland; CMU, USA 925

Behavioral Validation of JFSL Specifications through Model Synthesis
Carlo Ghezzi and Andrea Mocci — Politecnico di Milano, Italy 936

Verifying Client-Side Input Validation Functions Using String Analysis
Muath Alkhalaf, Tevfik Bultan, and Jose L. Gallegos — UC Santa Barbara, USA 947

Keynotes
Digital Formations of the Powerful and the Powerless (Keynote)
Saskia Sassen — Columbia University, USA 961

Supporting Sustainability with Software - An Industrial Perspective (Keynote)
Frank-Dieter Clesle — SAP, Germany 962

Whither Software Architecture? (Keynote)
Jeff Kramer — Imperial College London, UK 963

Software Engineering in Practice
Services and Analytics
Towards a Federated Cloud Ecosystem (Invited Industrial Talk)
Clovis Chapman — Dell, Ireland 967

Specification Patterns from Research to Industry: A Case Study in Service-Based Applications
Domenico Bianculli, Carlo Ghezzi, Cesare Pautasso, and Patrick Senti — University of Lugano, Switzerland; Politecnico di Milano, Italy; Credit Suisse, Switzerland 968

Methodology for Migration of Long Running Process Instances in a Global Large Scale BPM Environment in Credit Suisse’s SOA Landscape
Tarmo Ploom, Stefan Scheit, and Axel Glaser — Credit Suisse, Switzerland 977

Information Needs for Software Development Analytics
Raymond P. L. Buse and Thomas Zimmermann — University of Virginia, USA; Microsoft Research, USA 987

Mini-Tutorial: Software Analytics
Software Analytics in Practice: Mini Tutorial
Dongmei Zhang and Tao Xie — Microsoft Research, China; North Carolina State University, USA 997

Invited Industrial Experts
Software as an Engineering Material: How the Affordances of Programming Have Changed and What to Do about It (Invited Industrial Talk)
Keith Braithwaite — Zühlke Engineering, UK 998

Software Architecture - What Does It Mean in Industry? (Invited Industrial Talk)
Eberhard Wolff — adeo, Germany 999
Tom Sprenger — AdNovum Informatik, Switzerland ................................................................. 1000

Formal Methods
Ten Years of Automated Code Analysis at Microsoft (Invited Industrial Talk)
Wolfram Schulte — Microsoft Research, USA ................................................................. 1001
Large-Scale Formal Verification in Practice: A Process Perspective
June Andronick, Ross Jeffery, Gerwin Klein, Rafał Kolanski, Mark Staples, He Zhang, and Liming Zhu — NICTA, Australia; UNSW, Australia .................................................. 1002
Constructing Parser for Industrial Software Specifications Containing Formal and Natural Language Description
Futoshi Iwama, Taiga Nakamura, and Hironori Takeuchi — IBM Research, Japan ............... 1012
Formal Correctness, Safety, Dependability, and Performance Analysis of a Satellite
Marie-Aude Esteve, Joost-Pieter Katoen, Viet Yen Nguyen, Bart Postma, and Yuri Yushteen — European Space Agency, Netherlands; RWTH Aachen University, Germany; University of Twente, Netherlands ........................................ 1022

Goldfish Bowl Panel: Software Development Analytics
Goldfish Bowl Panel: Software Development Analytics
Tim Menzies and Thomas Zimmermann — West Virginia University, USA; Microsoft Research, USA ................................................................. 1032

Re-engineering
Making Sense of Healthcare Benefits
Jonathan Bnayahu, Maayan Goldstein, Mordechai Nisenson, and Yahalomit Simionovici — IBM Research, Israel ................................................................. 1034
On the Proactive and Interactive Visualization for Feature Evolution Comprehension: An Industrial Investigation
Renato Novais, Camila Nunes, Caio Lima, Elder Cirilo, Francisco Dantas, Alessandro Garcia, and Manoel Mendonça — Federal University of Bahia, Brazil; Federal Institute of Bahia, Brazil; PUC-Rio, Brazil ........................................ 1044
Extending Static Analysis by Mining Project-Specific Rules
Boya Sun, Gang Shu, Andy Podgurski, and Brian Robinson — Case Western Reserve University, USA; ABB Research, USA ................................................................. 1054

Debugging
Debugger Canvas: Industrial Experience with the Code Bubbles Paradigm
Robert DeLine, Andrew Bragdon, Kael Rowan, Jens Jacobsen, and Steven P. Reiss — Microsoft Research, USA; Brown University, USA ................................................................. 1064
Characterizing and Predicting Which Bugs Get Reopened
Thomas Zimmermann, Nachiappan Nagappan, Philip J. Guo, and Brendan Murphy — Microsoft Research, USA; Stanford University, USA; Microsoft Research, UK ........................................ 1074
ReBucket: A Method for Clustering Duplicate Crash Reports Based on Call Stack Similarity
Yingnong Dang, Rongxin Wu, Hongyu Zhang, Dongmei Zhang, and Peter Nobel — Microsoft Research, China; Tsinghua University, China; Microsoft, USA ................................................................. 1084

Case Studies
Understanding the Impact of Pair Programming on Developers Attention: A Case Study on a Large Industrial Experimentation
Alberto Sillitti, Giancarlo Succi, and Jelena Vlasenko — Free University of Bolzano, Italy ................................................................. 1094
How Much Does Unused Code Matter for Maintenance?
Sebastian Eder, Maximilian Junker, Elmar Jürgens, Benedikt Hauptmann, Rudolf Vaas, and Karl-Heinz Prommer — TU Munich, Germany; Munich Re, Germany ................................................................. 1102
Using Knowledge Elicitation to Improve Web Effort Estimation: Lessons from Six Industrial Case Studies
Emilia Mendes — Zayed University, United Arab Emirates ................................................................. 1112

Testing
Large-Scale Test Automation in the Cloud (Invited Industrial Talk)
John Penix — Google, USA ................................................................. 1122
Efficient Reuse of Domain-Specific Test Knowledge: An Industrial Case in the Smart Card Domain
Nicolas Devos, Christophe Ponsard, Jean-Christophe Deprez, Renaud Bauvin, Benoist Moriau, and Guy Anckaerts
— CETIC, Belgium; STMicroelectronics, Belgium

The Quamoco Product Quality Modelling and Assessment Approach
Stefan Wagner, Klaus Lochmann, Lars Heinemann, Michael Kläs, Adam Trendowicz, Reinhold Plösch, Andreas Seidl, Andreas Goeb, and Jonathan Streit — University of Stuttgart, Germany; TU Munich, Germany; Fraunhofer IESE, Germany; JKU Linz, Austria; Capgemini, Germany; SAP, Germany; itestra, Germany

Industrial Application of Concolic Testing Approach: A Case Study on libexif by Using CREST-BV and KLEE
Yunho Kim, Moonzoo Kim, YoungJoo Kim, and Yoonkyu Jang — KAIST, South Korea; Samsung Electronics, South Korea

Software Engineering Education

The Role of Software Projects in Software Engineering Education
Teaching Software Engineering and Software Project Management: An Integrated and Practical Approach
Gabriele Bavota, Andrea De Lucia, Fausto Fasano, Rocco Oliveto, and Carlo Zottoli — University of Salerno, Italy; University of Molise, Italy

Teaching Collaborative Software Development: A Case Study
Terhi Kilamo, Imed Hammouda, and Mohamed Amine Chatti — Tampere University of Technology, Finland; RWTH Aachen University, Germany

Using Continuous Integration of Code and Content to Teach Software Engineering with Limited Resources
Jörn Guy Süß and William Billingsley — University of Queensland, Australia

Aspects of Teaching Software Engineering
Stages in Teaching Software Testing
Tony Cowling — University of Sheffield, UK

Integrating Tools and Frameworks in Undergraduate Software Engineering Curriculum
Christopher Fuhrman, Roger Champagne, and Alain April — University of Québec, Canada

What Scope Is There for Adopting Evidence-Informed Teaching in SE?
David Budgen, Sarah Drummond, Pearl Brereton, and Nikki Holland — Durham University, UK; Keele University, UK

Software Engineering Education in Industry
FOCUS: An Adaptation of a SWEBOK-Based Curriculum for Industry Requirements
Ganesh Samarthyam, Girish Suryanarayana, Arbind Kumar Gupta, and Raghu Nambiar — Siemens, India

Teaching Distributed Software Engineering
Ten Tips to Succeed in Global Software Engineering Education
Ivica Ćrnković, Ivana Bosnić, and Mario Žagar — Mälardalen University, Sweden; University of Zagreb, Croatia

Collaboration Patterns in Distributed Software Development Projects
Igor Ćavrak, Marin Orlić, and Ivica Ćrnković — University of Zagreb, Croatia; Mälardalen University, Sweden

Improving PSP Education by Pairing: An Empirical Study
Guoping Rong, He Zhang, Mingjuan Xie, and Dong Shao — Nanjing University, China; NICTA, Australia; UNSW, Australia

Five Days of Empirical Software Engineering: The PASED Experience
Massimiliano Di Penta, Giuliano Antoniol, Daniel M. Germán, Yann-Gaël Guéhéneuc, and Bram Adams — University of Sannio, Italy; École Polytechnique de Montréal, Canada; University of Victoria, Canada

New Ideas and Emerging Results

NIER in Support of Software Engineers
Automatically Detecting Developer Activities and Problems in Software Development Work
Tobias Roehm and Walid Maalej — TU Munich, Germany
Software Process Improvement through the Identification and Removal of Project-Level Knowledge Flow Obstacles
Susan M. Mitchell and Carolyn B. Seaman — University of Maryland in Baltimore County, USA

Symbiotic General-Purpose and Domain-Specific Languages
Colin Atkinson, Ralph Gerbig, and Bastian Kennel — University of Mannheim, Germany

Evaluating the Specificity of Text Retrieval Queries to Support Software Engineering Tasks
Sonia Haiduc, Gabriele Bavota, Rocco Oliveto, Andrian Marcus, and Andrea De Lucia — Wayne State University, USA; University of Salerno, Italy; University of Molise, Italy

Co-adapting Human Collaborations and Software Architectures
Christoph Dorn and Richard N. Taylor — UC Irvine, USA

Release Engineering Practices and Pitfalls
Hyrum K. Wright and Dewayne E. Perry — University of Texas at Austin, USA

Augmented Intelligence - The New AI - Unleashing Human Capabilities in Knowledge Work
James M. Corrigan — Stony Brook University, USA

NIER for Mining Product and Process Data
On How Often Code Is Cloned across Repositories
Niko Schwarz, Mircea Lungu, and Romain Robbes — University of Bern, Switzerland; University of Chile, Chile

Mining Input Sanitization Patterns for Predicting SQL Injection and Cross Site Scripting Vulnerabilities
Lwin Khin Shar and Hee Beng Kuan Tan — Nanyang Technological University, Singapore

Inferring Developer Expertise through Defect Analysis
Tung Thanh Nguyen, Tien N. Nguyen, Evelyn Duesterwald, Tim Klinger, and Peter Santhanam — Iowa State University, USA; IBM Research, USA

Green Mining: Investigating Power Consumption across Versions
Abram Hindle — University of Alberta, Canada

Multi-label Software Behavior Learning
Yang Feng and Zhenyu Chen — Nanjing University, China

Trends in Object-Oriented Software Evolution: Investigating Network Properties
Alexander Chatzigeorgiou and George Melas — University of Macedonia, Greece

Exploring Techniques for Rationale Extraction from Existing Documents
Benjamin Rogers, James Gung, Yechen Qiao, and Janet E. Burge — Miami University, USA

NIER to Leverage Social Aspects
Continuous Social Screencasting to Facilitate Software Tool Discovery
Emerson Murphy-Hill — North Carolina State University, USA

Udesignn: Towards Social Media for Community-Driven Design
Phil Greenwood, Awais Rashid, and James Walkerdine — Lancaster University, UK

Influencing the Adoption of Software Engineering Methods Using Social Software
Leif Singer and Kurt Schneider — Leibniz Universität Hannover, Germany

Toward Actionable, Broadly Accessible Contests in Software Engineering
Jane Cleland-Huang, Yonghee Shin, Ed Keenan, Adam Czauderna, Greg Leach, Evan Moritz, Malcom Gethers, Denys Poshyvanyk, Jane Huffman Hayes, and Wenbin Li — DePaul University, USA; College of William and Mary, USA; University of Kentucky, USA

CodeTimeline: Storytelling with Versioning Data
Adrian Kuhn and Mirko Stocker — University of British Columbia, Canada; University of Applied Sciences Rapperswil, Switzerland

NIER for Verification and Evolution
Analyzing Multi-agent Systems with Probabilistic Model Checking Approach
Songzheng Song, Jianye Hao, Yang Liu, Jun Sun, Ho-Fung Leung, and Jin Song Dong — National University of Singapore, Singapore; Chinese University of Hong Kong, China; University of Technology and Design, Singapore
Formal Research Demonstrations

Formal Demos 1
Facilitating Communication between Engineers with CARES
   Anja Guzzi and Andrew Begel — TU Delft, Netherlands; Microsoft Research, USA 1367

Interactive Refinement of Combinatorial Test Plans
   Itai Segall and Rachel Tzoref-Brill — IBM Research, Israel 1371

TraceLab: An Experimental Workbench for Equipping Researchers to Innovate, Synthesize, and Comparatively Evaluate Traceability Solutions
   Ed Keenan, Adam Czauderna, Greg Leach, Jane Cleland-Huang, Yonghee Shin, Evan Moritz, Malcom Gethers, Denys Poshyvanyk, Jonathan Maletic, Jane Huffman Hayes, Alex Dekhtyar, Daria Manukan, Shervin Hossein, and Derek Hearn — DePaul University, USA; College of William and Mary, USA; Kent State University, USA; University of Kentucky, USA; CalPoly, USA 1375

Specification Engineering and Modular Verification Using a Web-Integrated Verifying Compiler
   Charles T. Cook, Heather Harton, Hampton Smith, and Murali Sitaraman — Clemson University, USA 1379

Writing Dynamic Service Orchestrations with DSOL
   Leandro Sales Pinto, Gianpaulo Cugola, and Carlo Ghezzi — Politecnico di Milano, Italy 1383

MASH: A Tool for End-User Plug-In Composition
   Leonardo Mariani and Fabrizio Pastore — University of Milano-Bicocca, Italy 1387

BabelRef: Detection and Renaming Tool for Cross-Language Program Entities in Dynamic Web Applications
   Hung Viet Nguyen, Hoan Anh Nguyen, Tung Thanh Nguyen, and Tien N. Nguyen — Iowa State University, USA 1391

MDSheet: A Framework for Model-Driven Spreadsheet Engineering
   Jácome Cunha, João Paulo Fernandes, Jorge Mendes, and João Saraiva — University of Minho, Portugal; University of Porto, Portugal 1395

Formal Demos 2
WorkItemExplorer: Visualizing Software Development Tasks Using an Interactive Exploration Environment
   Christoph Treude, Patrick Gorman, Lars Grammel, and Margaret-Anne Storey — University of Victoria, Canada 1399

Runtime Monitoring of Component Changes with Spy@Runtime
   Carlo Ghezzi, Andrea Mocci, and Mario Sangiorgio — Politecnico di Milano, Italy; MIT, USA 1403

GraPacc: A Graph-Based Pattern-Oriented, Context-Sensitive Code Completion Tool
   Anh Tuan Nguyen, Hoan Anh Nguyen, Tung Thanh Nguyen, and Tien N. Nguyen — Iowa State University, USA 1407
Posts and Informal Demonstrations

Posters

Augmenting Test Suites Automatically
Konstantin Rubinov and Jochen Wuttke — University of Lugano, Switzerland; University of Washington, USA

Using the GPGPU for Scaling Up Mining Software Repositories
Rina Nagano, Hiroki Nakamura, Yasutaka Kamei, Bram Adams, Kenji Hisazumi, Naoyasu Ubayashi, and Akira Fukuda — Kyushu University, Japan; École Polytechnique de Montréal, Canada

FastFix: Monitoring Control for Remote Software Maintenance
Dennis Pagano, Miguel A. Juan, Alessandra Bagnato, Tobias Roehm, Bernd Bruegge, and Walid Maalej — TU Munich, Germany; S2 Grupo, Spain; TXT e-solutions, Italy

Modeling Cloud Performance with Kriging
Alessio Gambi and Giovanni Toffetti — University of Lugano, Switzerland

SOA Adoption in the Italian Industry
Maurizio Leotta, Filippo Ricca, Marina Ribaudo, Gianna Reggio, Egidio Astesiano, and Tullio Vernazza — Università di Genova, Italy

A Bidirectional Model-Driven Spreadsheet Environment
Jácome Cunha, João Paulo Fernandes, Jorge Mendes, and João Saraiva — University of Minho, Portugal

A Self-Healing Technique for Java Applications
Antonio Carzaniga, Alessandra Gorla, Andrea Mattavelli, and Nicolò Perino — University of Lugano, Switzerland

When Open Source Turns Cold on Innovation - The Challenges of Navigating Licensing Complexities in New Research Domains
Christopher Forbes, Iman Keivanloo, and Juergen Rilling — Concordia University, Canada

Informal Demonstrations

Language Modularity with the MPS Language Workbench
Markus Voelter and Vaclav Pech — itemis, Germany; voelter ingenieurburo fuer softwretechnologie, Germany; JetBrains, USA

Mining Application Repository to Recommend XML Configuration Snippets
Sheng Huang, Yi Qi Lu, Yanghua Xiao, and Wei Wang — Fudan University, China

Locating Features in Dynamically Configured Avionics Software
Maxime Ouellet, Ettore Merlo, Neset Sozen, and Martin Gagnon — École Polytechnique de Montréal, Canada; CMC Electronics, Canada

Detecting Metadata Bugs on the Fly
Myoungkyu Song and Eli Tilevich — Virginia Tech, USA

Blaze
Jan-Peter Krämer, Joachim Kurz, Thorsten Karrer, and Jan Borchers — RWTH Aachen University, Germany
ConTexter Feedback System
Tristan Wehrmaker, Stefan Gärtner, and Kurt Schneider — Leibniz Universität Hannover, Germany ........................................... 1459

xMapper: An Architecture-Implementation Mapping Tool
Yongjie Zheng and Richard N. Taylor — UC Irvine, USA ................................................................. 1461

ConcernReCS: Finding Code Smells in Software Aspectization
Péricles Alves, Diogo Santana, and Eduardo Figueiredo — UFMG, Brazil .................................................. 1463

Egidio: A Non-Invasive Approach for Synthesizing Organizational Models
Saulius Astromskis, Andrea Janes, and Alireza Rezaei Mahdiraji — Free University of Bolzano, Italy ............ 1465

SDIC: Context-Based Retrieval in Eclipse
Bruno Antunes, Joel Cordeiro, and Paulo Gomes — University of Coimbra, Portugal ........................................ 1467

An Integrated Bug Processing Framework
Xiangyu Zhang, Mengxiang Lin, and Kai Yu — Beihang University, China .................................................... 1469

Repository for Model Driven Development (ReMoDD)
Robert B. France, James M. Bieman, Sai Pradeep Mandalaparty, Betty H. C. Cheng, and Adam Jensen — Colorado State University, USA; Michigan State University, USA ........................................... 1471

Doctoral Symposium

Posters 1-12

Going Global with Agile Service Networks
Damian A. Tamburri — VU University Amsterdam, Netherlands ................................................................. 1475

Using Structural and Semantic Information to Support Software Refactoring
Gabriele Bavota — University of Salerno, Italy ............................................................................................ 1479

An Approach to Variability Management in Service-Oriented Product Lines
Sedigheh Khoshnevis — Shahid Beheshti University G.C., Iran ................................................................. 1483

Using Machine Learning to Enhance Automated Requirements Model Transformation
Erol-Valeriu Chioacă — University of Manchester, UK ............................................................................ 1487

Security Testing of Web Applications: A Research Plan
Andrea Avancini — Fondazione Bruno Kessler, Italy .................................................................................... 1491

Application of Self-Adaptive Techniques to Federated Authorization Models
Christopher Bailey — University of Kent, UK .................................................................................................. 1495

Improving Information Retrieval-Based Concept Location Using Contextual Relationships
Tezcan Dilshener — Open University, UK ..................................................................................................... 1499

Effective Specification of Decision Rights and Accountabilities for Better Performing Software Engineering Projects
Monde Kalumbilo — University College London, UK .................................................................................... 1503

Search Based Design of Software Product Lines Architectures
Thelma Elita Colonzi — Federal University of Paraná, Brazil ................................................................. 1507

Software Fault Localization Based on Program Slicing Spectrum
Wanzhi Wen — Southeast University, China; Chinese Academy of Sciences, China .................................... 1511

Architectural Task Allocation in Distributed Environment: A Traceability Perspective
Salma Imtiaz — International Islamic University, Pakistan ......................................................................... 1515

Using Invariant Relations in the Termination Analysis of While Loops
Wided Ghardallou — University of Tunis El Manar, Tunisia .................................................................... 1519

Presentations 1-4

Software Regression as Change of Input Partitioning
Marcel Böhme — National University of Singapore, Singapore ............................................................. 1523

A Generic Methodology to Derive Domain-Specific Performance Feedback for Developers
Dennis Westermann — SAP Research, Germany ......................................................................................... 1527
Towards the Verification of Multi-diagram UML Models
Alfredo Motta — Politecnico di Milano, Italy ................................................................. 1531

Documenting and Sharing Knowledge about Code
Anja Guzzi — TU Delft, Netherlands ................................................................. 1535

Presentations 5-6
Timely and Efficient Facilitation of Coordination of Software Developers’ Activities
Kelly Blincoe — Drexel University, USA ................................................................. 1539
Stack Layout Transformation: Towards Diversity for Securing Binary Programs
Benjamin Rodes — University of Virginia, USA .................................................. 1543

Posters 13-25
Synthesis of Event-Based Controllers: A Software Engineering Challenge
Nicolas D’Ippolito — Imperial College London, UK ............................................. 1547

Empirically Researching Development of International Software
Malte Ressin — University of West London, UK ................................................... 1551

Model Translations among Big-Step Modeling Languages
Fathiyeh Faghih — University of Waterloo, Canada ........................................... 1555

HARPPIE: Hyper Algorithmic Recipe for Productive Parallelism Intensive Endeavors
Pedro Monteiro — Universidade Nova de Lisboa, Portugal .................................. 1559

On the Analysis of Evolution of Software Artefacts and Programs
Fehmi Jaafar — University of Montreal, Canada .................................................. 1563

Social Computing
Swapneel Sheth — Columbia University, USA ..................................................... 1567

Finding Suitable Programs: Semantic Search with Incomplete and Lightweight Specifications
Kathryn T. Stolee — University of Nebraska-Lincoln, USA .................................... 1571

Certification-Based Development of Critical Systems
Panayiotis Steele — University of Virginia, USA .................................................. 1575

Testing and Debugging UML Models Based on fUML
Tanja Mayerhofer — Vienna University of Technology, Austria ........................ 1579

Bridging the Divide between Software Developers and Operators Using Logs
Weiyi Shang — Queen’s University, Canada ........................................................ 1583

The Co-evolution of Socio-technical Structures in Sustainable Software Development: Lessons from the Open Source Software Communities
Marcelo Serrano Zanetti — ETH Zurich, Switzerland ........................................... 1587

Log-Based Testing
Alexander Elyasov — Utrecht University, Netherlands ....................................... 1591

Moving Mobile Applications between Mobile Devices Seamlessly
Volker Schuchardt — University of Duisburg-Essen, Germany ............................ 1595

ACM Student Research Competition
Timely Detection of Coordination Requirements to Support Collaboration among Software Developers
Kelly Blincoe — Drexel University, USA ................................................................. 1601

Improving Failure-Inducing Changes Identification Using Coverage Analysis
Kai Yu — Beihang University, China ................................................................. 1604

A Study on Improving Static Analysis Tools: Why Are We Not Using Them?
Brittany Johnson — North Carolina State University, USA ............................... 1607

Winbook: A Social Networking Based Framework for Collaborative Requirements Elicitation and WinWin Negotiations
Nupul Kukreja — University of Southern California, USA .................................. 1610