## Contents

### Preface

Message from the Chairs .................................................. iii

### Keynote

Improving Program Comprehension by Answering Questions (Keynote)
  Brad A. Myers — CMU, USA ................................................. 1

### Technical Research

#### Textual Analysis

Part-of-Speech Tagging of Program Identifiers for Improved Text-Based Software Engineering Tools
  Samir Gupta, Sana Malik, Lori Pollock, and K. Vijay-Shanker — University of Delaware, USA; University of Maryland, USA 3

Evaluating Source Code Summarization Techniques: Replication and Expansion
  Brian P. Eddy, Jeffrey A. Robinson, Nicholas A. Kraft, and Jeffrey C. Carver — University of Alabama, USA 13

Automatic Generation of Natural Language Summaries for Java Classes
  Laura Moreno, Jairo Aponte, Girirprasad Sridhara, Andrian Marcus, Lori Pollock, and K. Vijay-Shanker — Wayne State University, USA; Universidad Nacional de Colombia, Colombia; IBM Research, India; University of Delaware, USA 23

#### The Role of Visualization in Program Comprehension

An Empirical Study on the Efficiency of Graphical vs. Textual Representations in Requirements Comprehension
  Zohreh Sharafi, Alessandro Marchetto, Angelo Susi, Giuliano Antoniol, and Yann-Gaël Guéhéneuc — Polytechnique Montréal, Canada; Fondazione Bruno Kessler, Italy 33

SArF Map: Visualizing Software Architecture from Feature and Layer Viewpoints
  Kenichi Kobayashi, Manabu Kamimura, Keisuke Yano, Koki Kato, and Akihiko Matsuo — Fujitsu Labs, Japan 43

Multiscale Visual Comparison of Execution Traces
  Jonas Trümper, Jürgen Döllner, and Alexandru Telea — HPI, Germany; University of Groningen, Netherlands 53

In Situ Understanding of Performance Bottlenecks through Visually Augmented Code
  Fabian Beck, Oliver Moseler, Stephan Diehl, and Günter Daniel Rey — University of Stuttgart, Germany; University of Trier, Germany; Fernuniversität in Hagen, Germany 63

#### Software Quality

Monitoring User Interactions for Supporting Failure Reproduction
  Tobias Roehm, Nigar Gurbanova, Bernd Bruegge, Christophe Joubert, and Walid Maalej — TU Munich, Germany; Prodevelop, Spain; University of Hamburg, Germany 73

Quality Analysis of Source Code Comments
  Daniela Steidl, Benjamin Hummel, and Elmar Juergens — CQSE, Germany 83
Source Code Comprehension

Gapped Code Clone Detection with Lightweight Source Code Analysis
Hiroaki Murakami, Keisuke Hotta, Yoshiki Higo, Hiroshi Igaki, and Shinji Kusumoto — Osaka University, Japan

Insight into a Method Co-change Pattern to Identify Highly Coupled Methods: An Empirical Study
Manishankar Mondal, Chanchal K. Roy, and Kevin A. Schneider — University of Saskatchewan, Canada

Patterns of Cross-Language Linking in Java Frameworks
Philip Mayer and Andreas Schroeder — LMU Munich, Germany

Traceability and Feature Location

Using Code Ownership to Improve IR-Based Traceability Link Recovery
Diana Diaz, Gabriele Bavota, Andriyan Marcus, Rocco Oliveto, Silvia Takahashi, and Andrea De Lucia — Universidad de los Andes, Colombia; University of Sannio, Italy; Wayne State University, USA; University of Molise, Italy; University of Salerno, Italy

Structural Information Based Term Weighting in Text Retrieval for Feature Location
Blake Bassett and Nicholas A. Kraft — University of Alabama, USA

Comprehending API

Extracting Problematic API Features from Forum Discussions
Yingying Zhang and Daqing Hou — Clarkson University, USA

Multi-dimensional Exploration of API Usage
Coen De Roover, Ralf Lämmel, and Ekaterina Pek — Vrije Universiteit Brussel, Belgium; University of Koblenz-Landau, Germany

Comprehending Software Architectures

Evaluating Software Clustering Algorithms in the Context of Program Comprehension
Anas Mahmoud and Nan Niu — Mississippi State University, USA

On the Accuracy of Architecture Compliance Checking Support: Accuracy of Dependency Analysis and Violation Reporting
Leo Pruijt, Christian Köppe, and Sjaak Brinkkemper — Hogeschool Utrecht, Netherlands; Utrecht University, Netherlands

Building Extensions for Applications: Towards the Understanding of Extension Possibilities
Mohamed Aly, Anis Charfi, and Mira Mezini — SAP, Germany; TU Darmstadt, Germany

Industry Track

On the Understanding of Programs with Continuous Code Reviews
Mario Bernhart and Thomas Grechenig — TU Vienna, Austria

Applying Clone Change Notification System into an Industrial Development Process
Yuki Yamanaka, Eunjong Choi, Norihiro Yoshida, Katsuro Inoue, and Tateki Sano — Osaka University, Japan; Nara Institute of Science and Technology, Japan; NEC, Japan

Early Research Achievements Track

Manhattan: Supporting Real-Time Visual Team Activity Awareness
Michele Lanza, Marco D’Ambros, Alberto Bacchelli, Lile Hattori, and Francesco Rigotti — University of Lugano, Switzerland

Blogging Developer Knowledge: Motivations, Challenges, and Future Directions
Chris Parnin, Christoph Treude, and Margaret-Anne Storey — Georgia Tech, USA; McGill University, Canada; University of Victoria, Canada

Towards Generating Human-Oriented Summaries of Unit Test Cases
Manabu Kamimura and Gail C. Murphy — Fujitsu Labs, Japan; University of British Columbia, Canada

Towards a Unified Software Attack Model to Assess Software Protections
Cataldo Basile and Mariano Ceccato — Politecnico di Torino, Italy; Fondazione Bruno Kessler, Italy
Tool Demonstrations

Agec: An Execution-Semantic Clone Detection Tool
Toshihiro Kamiya — Future University Hakodate, Japan .......................... 227

JSummarizer: An Automatic Generator of Natural Language Summaries for Java Classes
Laura Moreno, Andrian Marcus, Lori Pollock, and K. Vijay-Shanker — Wayne State University, USA; University of Delaware, USA ............................... 230

OnionUML: An Eclipse Plug-In for Visualizing UML Class Diagrams in Onion Graph Notation
Michael Falcone and Bonita Sharif — Youngstown State University, USA ........................................... 233

SimCad: An Extensible and Faster Clone Detection Tool for Large Scale Software Systems
Md. Sharif Uddin, Chanchal K. Roy, and Kevin A. Schneider — University of Saskatchewan, Canada ............. 236

Author Index