# PROCEEDINGS



34th Brazilian Symposium on Software Engineering



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PROCEEDINGS

# 34th Brazilian Symposium on Software Engineering

## - SBES 2020 -

October 21-23, 2020 Natal, Rio Grande do Norte, Brazil

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# Foreword

The Brazilian Symposium on Software Engineering (SBES), annually promoted by the Brazilian Computer Society (SBC), is the premier Software Engineering event in Latin America. SBES is held in conjunction with the Brazilian Conference on Software: Theory and Practice (CBSoft) since 2010. The CBSoft program includes sessions from several co-located events. It traditionally puts together academics, practitioners and students. This year, for the first time since its creation in 1987, SBES will be held virtually, due to the COVID-19 pandemic. In spite of this, we have a record number of papers in the four tracks of the event.

The technical program of SBES 2020 includes papers from the Research, Insightful Ideas and Emerging Results, Education, and Tools tracks. The program also includes three keynote speakers: (i) Alexander Serebrenik (Eindhoven University of Technology, Netherlands); (ii) Ana Regina Rocha (Federal University of Rio de Janeiro, Brazil); and (iii) Paulo Borba (Federal University of Pernambuco, Brazil). All the accepted papers are presented in technical sessions that include papers from all tracks.

The SBES 2020 *Research Track* focuses on solid results with a strong contribution to the Software Engineering community. Papers on this track are reviewed based on their originality, relevance, technical soundness, and clarity of presentation, and can be analytical, experimental (primary study), literature review (secondary study), technological, or methodological.

The SBES 2020 *Insightful Ideas and Emerging Results Track* focuses on new and inspiring ideas with promising future results, as well as on research work in progress with preliminary and interesting results. The track welcomes innovative Software Engineering approaches (methods, techniques, and tools) in the early stages of research. It has been organized at SBES since 2015.

The SBES 2020 *Education Track* publishes high-quality papers that address challenges, innovations, and best practices in Software Engineering education. The track focuses on curriculum development, empirical studies, personal or institutional experiences, and conceptual or theoretical work about Software Engineering education. The Education Track aims to be a space in which, through publications, presentations, and discussions of research and reports of experiences, we advance the teaching-learning process of Software Engineering. This track has been organized since 2017.

The SBES 2020 *Tools Track* focuses on original tools that provide contributions to the Software Engineering community, supporting either the development and management of software systems or empirical studies in Software Engineering. For the first time, the Tools Track was organized as a track of SBES.

The technical program of the SBES 2020 - Research Track includes a record 43 full research papers and 5 short research papers selected from 116 valid submissions. The acceptance rate was about 37% for the full research papers. They were selected after a rigorous double-blind review process in which each paper was reviewed by at least three members of the Program Committee. The review process also included a rebuttal phase in which authors had the opportunity to provide clarifications and responses to points raised by the reviewers. We thank the very active participation of the 102 Program Committee members and the 40 additional reviewers.

The technical program of the Insightful Ideas and Emerging Results Track is composed of 22 research papers selected from 47 valid submissions, a record number of accepted papers for this track. The acceptance rate was about 46%. Each submitted paper was reviewed by three members of the program committee regarding its novelty, relevance, technical soundness, and clarity of presentation. We thank the 39 Program Committee members for the great dedication to provide detailed feedback to the authors of the submitted papers.

The Education Track selected 19 papers from 53 submissions, also a record number of papers. The acceptance rate was 36%. Each submitted paper was reviewed by at least three members of the Program

Committee regarding its originality, relevance, technical soundness, and clarity of presentation. A rebuttal phase was part of the process, so authors had the opportunity to answer reviewers' questions about the manuscripts. We are very grateful to all the 65 Program Committee members and the external reviewers for their valuable and timely contribution to the reviewing process.

The technical program of the Tools Track includes 15 full papers selected from 38 valid submissions. The acceptance rate was about 39%. Each submitted tool paper and its accompanying demo video were reviewed by at least three members of the Program Committee regarding their relevance, technical soundness, and clarity of presentation. We thank the 45 members of the program committee for their effort and dedication to review the papers and actively interact during the pos-rebuttal discussions as well.

Since SBES 2019, we also acknowledge the generosity of the reviewers who give their time and best effort to referee submitted papers. A certificate of Outstanding Reviewer was awarded to three reviewers who submitted outstanding quality reviews to the SBES Research Track. After a careful evaluation based on two criteria (quality and usefulness of reviews, and reviewer active participation during the rebuttal and discussion phases), we are delighted to give the certificate of Outstanding Reviewer to Rodrigo Santos (UNIRIO, Brazil), Miguel Goulão (UNL, Portugal), Márcio Ribeiro (UFAL, Brazil), Igor Wiese (UTFPR, Brazil), Alessandro Garcia (PUC-Rio, Brazil), Gleison Santos (UNIRIO, Brazil), Igor Steinmacher (UTFPR, Brazil and Northern Arizona University, USA), and Sabrina Marckzak (PUCRS, Brazil).

We would like to thank all who contributed to this event. The quality of the technical program is a result of the dedication of the members of the Program Committee together with the additional reviewers. We also express our gratitude to the SBES Steering Committee for their great support. Finally, we thank the great and hard work of the CBSoft 2020 organization team led by Everton Cavalcante (UFRN, Brazil).

We hope you enjoy the technical program of SBES 2020.



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# **Table of Contents**

### Keynotes

### Agile

On the Influence of Different Perspectives on Evaluating the Quality of Teamwork in the Context of Agile Software Development [Research Track]	
Manuel Silva, Arthur Freire, Mirko Perkusich, Kyller Gorgônio, Hyggo Almeida, and Angelo Perkusich	1
Challenges in Agile Transformation Journey - A Qualitative Study [Research Track] Fabio Reginaldo and Gleison Santos	11
Agile Accelerator Program: From Industry-Academia Collaboration to Effective Agile Training [Ed- ucation Track]	
Caio Steglich, Anielle Lisboa, Rafael Prikladnicki, Sabrina Marczak, Michael da Costa Móra, Alejandro Olchik, Nelice Heck, Yasser Rachid, and Guilherme Ghidorsi	21
Agile Global Software Development: A Systematic Literature Review [Research Track] Rafael Camara, Iury Monte, Annelyelthon Alves, and Marcelo Marinho	31
Behavior-Driven Development: An Expert Panel to Evaluate Benefits and Challenges [Insightful Ideas and Emerging Results Track]	
Nicolas Nascimento, Alan R. Santos, Afonso Sales, and Rafael Chanin	41
Adaptations of Scrum roles in Software Projects: Survey and Representation Tentative with Feature Models [Research Track, Short Paper] Luciano A. Garcia, Edson OliveiraJr, Gislaine Camila L. Leal, Marcelo Morandini, and Shayne Urbanowski 47	
Code and Test Smells	
Are Code Smell Co-occurrences Harmful to Internal Quality Attributes? A Mixed-Method Study [Research Track]	
Júlio Martins, Carla Bezerra, Anderson Uchôa, and Alessandro Garcia	52
Oracles of Bad Smells - A Systematic Literature Review [Research Track] Rafael Prates Ferreira Trindade, Mariza Andrade da Silva Bigonha, and Kecia Aline Marques Ferreira	62
Recommending Composite Refactorings for Smell Removal: Heuristics and Evaluation [Research Track]	
Willian Oizumi, Diego Cedrim, Leonardo Sousa, Ana C. Bibiano, Anderson Oliveira, Alessandro Garcia, and Daniel Oliveira	72
A Catalog of Object-Relational Mapping Code Smells for Java [Research Track] Samuel Loli, Leopoldo Teixeira, and Bruno Cartaxo	82
An Empirical Study of Automatically-Generated Tests from the Perspective of Test Smells [Research Track, Short Paper]	
Tássio Virgínio, Luana Martins, Larissa Soares, Railana Santana, Heitor Costa, and Ivan Machado	92

xxv

Analyzing the Impact of Refactoring on Bad Smells [Research Track, Short Paper]	
Cleiton Tavares, Mariza Bigonha, and Eduardo Figueiredo	

### Software Quality and Modeling

Toward a Metamodel Quality Evaluation Framework: Requirements, Model, Measures, and Process	
[Insightful Ideas and Emerging Results Track]	
Taciana Novo Kudo, Renato F. Bulcão-Neto, and Auri Marcelo Rizzo Vincenzi	102
Software Product Quality Evaluation Guide for Electronic Health Record Systems [Insightful Ideas and Emerging Results Track]	
Luis Felipe de Lima, Cristiane Aparecida Gonçalves Huve, and Leticia Mara Peres	108
A Possibilistic Simulation Model for Multiplayer Game Scenarios Using CPN Tools [Insightful Ideas and Emerging Results Track]	
Stéphane Julia and Franciny Barreto	114
Generating Adaptation Plans Based on Quality Models for Cloud Platforms [Insightful Ideas and Emerging Results Track]	
Jorge Luiz Machado da Silva, Breno Bernard Nicolau de França, and Cecília Mary Fischer Rubira	120
Software Quality is Multidimensional: Let's Play with Tensors [Insightful Ideas and Emerging Re- sults Track]	
Hilmer Rodrigues Neri	126
Probabilistic Model-Based Analysis to Improve Software Energy Efficiency [Research Track, Short Paper]	
Danilo da Silva Alves, Oseias Ayres Ferreira, Lucio Mauro Duarte, and Paulo Henrique Maia	132

### **Exploratory Studies with Developers or Researchers**

An Exploratory Study on Developers Opinions about Influence in Open Source Software Ecosystems [Research Track]	
Vinicius Condina, Paulo Malcher, Victor Farias, Rodrigo Santos, Awdren Fontão, Igor Wiese, and Davi Viana	137
Sentiment Polarity of Programmers in an Open Source Software Project: An Exploratory Study [Research Track] <i>Rui Carigé and Glauco Carneiro</i>	147
MDE in the Wild: An Exploratory Analysis on What Developers are Discussing from Q&A Platforms [Research Track]	
Carlos Alberto Medeiros, Alan Bandeira, Paulo Henrique M. Maia, and Matheus Paixao	157
Developers eXperience (DX) in ALM Tools: An Investigation on Virtual Kanban Boards [Insightful Ideas and Emerging Results Track]	
Jullia Saad, Priscila Portela Costa, Alexandre Alvaro, and Luciana A. M. Zaina	167
How Office Layouts Influence Software Development? [Research Track] Victor Costa and César França	173
On the Use of Grey Literature: A Survey with the Brazilian Software Engineering Research Com- munity [Research Track]	
Fernando Kamei, Igor Wiese, Gustavo Pinto, Márcio Ribeiro, and Sérgio Soares	183

### **Code Quality and Configuration Management**

An Empirical Study on Configuration-Related Code Weaknesses [Research Track] Flávio Medeiros, Márcio Ribeiro, Rohit Gheyi, Larissa Braz, Christian Kästner, Sven Apel, and Kleber Santos	193
What Causes Merge Conflicts? [Research Track] José William Menezes, Bruno Trindade, João Felipe Pimentel, Tayane Moura, Alexandre Plastino, Leonard Murta, and Catarina Costa	lo 203
An Approach for Updating forks Against the Original Project [Research Track] Arthur Roberto Marcondes and Ricardo Terra	213
Understanding and Detecting Harmful Code [Research Track] Rodrigo Lima, Jairo Souza, Baldoino Fonseca, Leopoldo Teixeira, Rohit Greyi, Márcio Ribeiro, Alessan- dro Garcia, and Rafael de Mello	223
Applying Machine Learning to Customized Smell Detection: A Multi-Project Study [Research Track] Daniel Oliveira, Wesley K. G. Assunção, Leonardo Souza, Willian Oizumi, Alessandro Garcia, and Bal- doino Fonseca	233
Atoms of Confusion: The Eyes Do Not Lie [Research Track] Benedito de Oliveira, Márcio Ribeiro, José Aldo Silva da Costa, Rohit Gheyi, Guilherme Amaral, Rafael de Mello, Anderson Oliveira, Alessandro Garcia, Rodrigo Bonifácio, and Baldoino Fonseca	243
Verification, Validation, and Testing	
A Large Scale Study On the Effectiveness of Manual and Automatic Unit Test Generation [Research Track]	
Beatriz Souza and Patrícia Machado	253
Predicting Prime Path Coverage Using Regression Analysis [Research Track] Keslley Silva and Erika Cota	263
Manually Written or Generated Tests? A Study with Developers and Maintenance Tasks [Research Track]	
Wesley B. R. Herculano, Melina Mongiovi, and Everton L. G. Alves	273
Context-aware Android Applications Testing [Research Track] Diego Rodrigues de Almeida, Patricia D. L. Machado, and Wilkerson L. Andrade	283
Improving Traceability Recovery Between Bug Reports and Manual Test Cases [Research Track] Lucas Raniére Juvino Santos, Guilherme Gadelha, Franklin Ramalho, and Tiago Massoni	293
Unveiling Practitioners Awareness of Android Apps Regression Testing through an Expert Survey [Insightful Ideas and Emerging Results Track] Sara Lima, Denivan Campos, Larissa Soares, and Ivan Machado	303

#### **Software Process and Management**

Am I going to Heaven? First step Climbing the Stairway to Heaven Model: Results from a CaseStudy in Industry [Research Track]Paulo Sérgio dos Santos Júnior, Monalessa P. Barcellos, and Rodrigo Fernandes Calhau309

Clouds are Heavy! A Storm of Relevant Project-Related Terms to Support Newcomers' Onboarding [Insightful Ideas and Emerging Results Track]	010
Marcia Lima, Edson Oliveira, Tayana Conte, and Bruno Gadelha	319
Towards a Model for Managing Diversity and Inclusion in Software Development Teams [Insightful Ideas and Emerging Results Track] <i>Michelle Miranda and Rafael Prikladnicki</i>	325
Pah Pum: A Project Management Tool based on TAKT PM [Tools Track] Deyvson Silva, Adriano Gomes, Rafael Macieira, Emanoel Silva, and Sergio Soares	332
PSAS: A Framework for Peer Assessment of an Individuals Skills in a Software Projects Team [Tools Track]	
Tiago da Rosa Santos and Avanilde Kemczinski	338
Understanding Legacy Systems in the Light of Grounded Theory [Research Track] Alex Severo Chervenski and Andréa Sabedra Bordin	344
Development #1	
Improving Mobile App Development using Transpilers with Maintainable Outputs [Research Track] Vinícius Jorge Vendramini, Alfredo Goldman, and Grégory Mounié	354
Revealing the Social Aspects of Design Decay - A Retrospective Study of Pull Requests [Research Track]	
Caio Barbosa, Anderson Uchôa, Daniel Coutinho, Filipe Falcão, Hyago Brito, Guilherme Amaral, Vini- cius Soares, Alessandro Garcia, Baldoino Fonseca, Marcio Ribeiro, and Leonardo Sousa	364
RAIDE: A Tool for Assertion Roulette and Duplicate Assert Identification and Refactoring [Tools Track]	
Railana Santana, Luana Martins, Larissa Rocha, Tássio Virgínio, Adriana Cruz, Heitor Costa, and Ivan Machado	374
A Tool for Product Derivation and Semi-Automatic Deployment of Web-Based Systems [Tools Track] Jackson Meires Dantas Canuto, Uirá Kulesza, and Frederico Lopes	380
JExpert: A Tool for Library Expert Identification [Tools Track] Johnatan Oliveira, Denis Pinheiro, and Eduardo Figueiredo	386
CognIDE: A Psychophysiological Data Integrator Approach for Visual Studio Code [Insightful Ideas and Emerging Results Track] Roger Denis Vieira and Kleinner Farias	393

### Software Ecosystems, User Experience, and Usability

Death of a Software Ecosystem: a Developer Relations (DevRel) Perspective [Insightful Ideas and	
Emerging Results Track]	
Daniel Massanori, Bruno B. P. Cafeo, Igor Wiese, and Awdren Fontão	399
A Tool for Software Ecosystem Models: An Analysis on their Implications in Education [Education Track]	
Igor R. Alencar, Emanuel F. Coutinho, Leonardo O. Moreira, and Carla I. M. Bezerra	405
T2-UXT: A Tool to Support Transparency Evaluation in Software Ecosystems Portals [Tools Track] Kennedy Edson Silva de Souza, Rodrigo Oliveira Zacarias, Marcos César da Rocha Seruffo, and Rodrigo	
Pereira dos Santos	415

Software Testing Ecosystems Insights and Research Opportunities [Insightful Ideas and Emerging Results Track] Italo Santos, Emanuel F. Coutinho, and Simone R. S. Souza	421
Usability and User eXperience Evaluation of Conversational Systems: A Systematic Mapping Study [Research Track] <i>Guilherme Corredato Guerino and Natasha Malveira Costa Valentim</i>	427
USARP method: eliciting and describing USAbility Requirements with Personas and user stories [Research Track] <i>Gabriel F. de Oliveira Júnior, Bruna Ferreira, and Anna Beatriz Marques</i>	437

### **Open-Source Projects and Education**

Turnover in Open-Source Projects: The Case of Core Developers [Research Track] Fabio Ferreira, Luciana Lourdes Silva, and Marco Tulio Valente	447
What to Expect from Code Review Bots on GitHub? A Survey with OSS Maintainers [Insightful Ideas and Emerging Results Track]	
Mairieli Wessel, Alexander Serebrenik, Igor Wiese, Igor Steinmacher, and Marco A. Gerosa	457
An Approach for Selecting FLOSS Projects for Education [Education Track] Moara Sousa Brito Lesa and Christina von Flach G. Chavez	463
Do we use FLOSS in Software Engineering Education? Mapping the Profiles and Practices of Higher Education Teachers from Brazil [Education Track] <i>Fernanda Gomes Silva, Paulo Ezequiel Dias dos Santos, and Christina von Flach G. Chavez</i>	473
Teaching UML Models with FLOSS Projects: A Study carried out During the Period of Social Isola- tion Imposed by the COVID-19 Pandemic [Education Track] <i>Fernanda Gomes Silva, Moara Sousa Brito Lessa, Nádia da Luz Lopes, and Christina von Flach G.</i>	
Chavez	483
A Portal for Cataloging Worked Examples Extracted from Open Source Software [Insightful Ideas and Emerging Results Track]	
Simone de França Tonhão, Thelma Elita Colanzi, and Igor Steinmacher	493

### Development #2

A Metadata Handling API for Framework Development: a Comparative Study [Research Track] Eduardo Guerra, Phyllipe Lima, Joelma Choma, Tiago Silva, Marco Nardes, Michele Lanza, and Paulo Meirelles	499
A Conceptual Framework for Conversational APIs [Research Track. Short Paper]	
João Antonio D. M. Bastos, Rafael Maiani de Mello, and Alessandro Fabricio Garcia	509
Colloquy: A Method for Conversational API Design [Insightful Ideas and Emerging Results Track] João Antonio D. M. Bastos, Rafael Maiani de Mello, and Alessandro Fabricio Garcia	514
DataQI.NET: A Framework for Specifying Query Criteria Using the Repository Pattern [Tools Track] Carlos Henrique G. Carneiro and Paulo Henrique M. Maia	520
CoNCRA: A Convolutional Neural Networks Code Retrieval Approach [Insightful Ideas and Emerg- ing Results Track]	
Marcelo de Rezende Martins and Marco Aurélio Gerosa	526

ENVIAR - ENVIronment dAta simulatoR [Tools Track]	
Diego Rodrigues de Almeida, Patrícia D. L. Machado, and Wilkerson L. Andrade	532

#### Safety Cases, Testing Tools, and Learning

Incremental Development of Safety Cases: a Mapping Study [Research Track] Camilo Almendra, Carla Silva, and Jéssyka Vilela	538
PLATOOL: A Functional Test Generation Tool for Mobile Applications [Tools Track] Euler Horta Marinho and Eduardo Figueiredo	548
Testing Education: A Survey on a Global Scale [Education Track] Silvana M. Melo, Verônica X. S. Moreira, Leo Natan Paschoal, and Simone do R. S. Souza	554
JNose: Java Test Smell Detector [Tools Track] Tássio Virgínio, Luana Almeida Martins, Larissa Rocha Soares, Railana Santana, Adriana Priscila San- tos Cruz, Heitor Costa, and Ivan Machado	564
Evaluating the Impact of Software Testing Education through the Flipped Classroom Model in De- riving Test Requirements [Education Track] Leo Natan Paschoal, Myke Morais de Oliveira, Silvana Morita Melo, Ellen Francine Barbosa, and Simone do Rocio Senger de Souza	570
Managing Assurance Information: A Solution Based on Issue Tracking Systems [Insightful Ideas and Emerging Results Track] <i>Camilo Almendra and Carla Silva</i>	580

#### COVID-19, Quarantine, and Software Engineering

Surveying the Impacts of COVID-19 on the Perceived Productivity of Brazilian Software Developers [Research Track] Edson OliveiraJr, Gislaine Leal, Marco Túlio Valente, Marcelo Morandini, Rafael Prikladnicki, Leandro Pompermaier, Rafael Chanin, Clara Caldeira, Letícia Machado, and Cleidson de Souza	586
From Duck till Down. Deflections on the Immediat of COVID 10 on the Development Prestices of a	000
R&D Project [Research Track]	
Walter Lucas Monteiro de Mendonça, Pedro Henrique Teixeira Costa, Emille Catarine Rodrigues Cançado,	
Fernanda Lima, Edna Dias Canedo, Rodrigo Bonifácio, and Luis Henrique Vieira Amaral	596
How Human and Organizational Factors Influence Software Teams Productivity in COVID-19 Pan- demic: A Brazilian Survey [Research Track]	
Carla I. M. Bezerra, José Cezar de Souza Filho, Emanuel F. Coutinho, Alice Gama, Ana Lívia Ferreira,	
Gabriel Leitão, and Carlos Eduardo Feitosa	606
Teaching Development of Distributed Software during COVID-19: An Experience Report in Brazil [Education Track]	
Fernando Trinta, Paulo A. L. Rêgo, and Windson Viana	616

#### **Continuous Software Engineering and Systems Engineering**

Towards a Framework for Continuous Software Engineering [Insightful Ideas and Emerging Results Track] Monalessa Perini Barcellos

How Software Organizations are using the ISO/IEC 29110 Standard's Processes: A Survey of the State of the Art and Practice [Research Track] <i>Jean C. R. Hauck and Stéphanie da Silva Leal</i>	632
Analyzing Continuous Integration Bad Practices in Closed-Source Projects: An Initial Study [In- sightful Ideas and Emerging Results Track] <i>Ruben Silva and Carla I. M. Bezerra</i>	642
Challenges and Recommendations in DevOps Education: A Systematic Literature Review [Educa- tion Track] Marcelo Romulo Fernandes, Samuel Ferino, Uirá Kulesza, and Eduardo Aranha	648
Data Mining Tool to Discover DevOps Trends from Public Repositories: Predicting Release Candi- dates with gthbmining.rc [Tools Track] Daniel D. R. Barros, Flávio Horita, and Denis G. Fantinato	658
Mining Software Repositories for the Characterization of Continuous Integration and Delivery [Tools Track] <i>Gabriel Augusto Destro and Breno Bernard Nicolau de França</i>	664

#### Software Engineering Education Approaches and Methdologies

Competencies Development based on Thinking-based Learning in Software Engineering: An Action- Research [Education Track] Andres Paul Moya Flores and Fernanda Maria Ribeiro de Alencar680Stimulating the Development of Soft Skills in Software Engineering Education through Design Thinking [Education Track] Anna B. Marques, Bruna Ferreira, Adriana Lopes, and Williamson Silva690Assessing a Multidisciplinary Group of Undergraduate Students Applying the Challenge Based Learning Methodology to Learn Mobile Development [Education Track] Andrew Diniz da Costa, Hendi Lemos Coelho, Ricardo Almeida Venieris, Carlos José Pereira de Lucena, Gustavo Robichez Carvalho, and Marcelo Fernandes Pereira700Achieving Scalability in Project Based Learning through a Low-Code Platform [Education Track] João Paulo Fernandes, Ricardo Araújo, and Mário Zenha-Rela710Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track] Necio L. Veras, Lincoln S. Rocha, and Windson Viana720	Hackathons as a Pedagogical Strategy to Engage Students to Learn and to Adopt Software Engi- neering Practices [Education Track] Caio Steglich, Larissa Salerno, Thaís Fernandes, Sabrina Marczak, Alessandra Dutra, Ana Bacelo, and Cassio Trindade	670
Stimulating the Development of Soft Skills in Software Engineering Education through Design Thinking [Education Track] Anna B. Marques, Bruna Ferreira, Adriana Lopes, and Williamson Silva690Assessing a Multidisciplinary Group of Undergraduate Students Applying the Challenge Based Learning Methodology to Learn Mobile Development [Education Track] Andrew Diniz da Costa, Hendi Lemos Coelho, Ricardo Almeida Venieris, Carlos José Pereira de Lucena, Gustavo Robichez Carvalho, and Marcelo Fernandes Pereira700Achieving Scalability in Project Based Learning through a Low-Code Platform [Education Track] João Paulo Fernandes, Ricardo Araújo, and Mário Zenha-Rela710Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track] Necio L. Veras, Lincoln S. Rocha, and Windson Viana720	Competencies Development based on Thinking-based Learning in Software Engineering: An Action- Research [Education Track] Andres Paul Moya Flores and Fernanda Maria Ribeiro de Alencar	680
Assessing a Multidisciplinary Group of Undergraduate Students Applying the Challenge Based Learning Methodology to Learn Mobile Development [Education Track]   Andrew Diniz da Costa, Hendi Lemos Coelho, Ricardo Almeida Venieris, Carlos José Pereira de Lucena, Gustavo Robichez Carvalho, and Marcelo Fernandes Pereira   Achieving Scalability in Project Based Learning through a Low-Code Platform [Education Track] 700   João Paulo Fernandes, Ricardo Araújo, and Mário Zenha-Rela 710   Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track] 720   Necio L. Veras, Lincoln S. Rocha, and Windson Viana 720	Stimulating the Development of Soft Skills in Software Engineering Education through Design Thinking [Education Track] Anna B. Marques, Bruna Ferreira, Adriana Lopes, and Williamson Silva	690
Achieving Scalability in Project Based Learning through a Low-Code Platform [Education Track]710João Paulo Fernandes, Ricardo Araújo, and Mário Zenha-Rela710Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track] Necio L. Veras, Lincoln S. Rocha, and Windson Viana720	Assessing a Multidisciplinary Group of Undergraduate Students Applying the Challenge Based Learning Methodology to Learn Mobile Development [Education Track] Andrew Diniz da Costa, Hendi Lemos Coelho, Ricardo Almeida Venieris, Carlos José Pereira de Lucena, Gustavo Robichez Carvalho, and Marcelo Fernandes Pereira	700
Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track]Necio L. Veras, Lincoln S. Rocha, and Windson Viana720	Achieving Scalability in Project Based Learning through a Low-Code Platform [Education Track] João Paulo Fernandes, Ricardo Araújo, and Mário Zenha-Rela	710
	Flipped Classroom in Software Engineering: A Systematic Mapping Study [Education Track] Necio L. Veras, Lincoln S. Rocha, and Windson Viana	720

#### **Technical Debt and Architecture**

Using Stack Overflow to Assess Technical Debt Identification on Software Projects [Research Track] Eliakim Gama, Sávio Freire, Manoel Mendonça, Rodrigo O. Spínola, Matheus Paixao, and Mariela I. Cortés 730 Anticipating Identification of Technical Debt Items in Model-Driven Software Projects [Research

Track] Ramon Araújo Gomes, Larissa Barbosa Leôncio Pinheiro, and Rita Suzana Pitangueira Maciel

740

Using Surveys to Build-up Empirical Evidence on Test-Related Technical Debt [Research Track] Lucinéia Souza, Sávio Freire, Verusca Rocha, Nicolli Alves, Rodrigo O. Spínola, and Manoel Mendonça	750
InSet: A Tool to Identify Architecture Smells Using Machine Learning [Tools Track] Warteruzannan Soyer Cunha, Guisella Angulo Armijo, and Valter Vieira de Camargo	760
From Safety Requirements to Just-Enough Safety-Centered Architectural Solutions in Agile Con- texts [Insightful Ideas and Emerging Results Track] Ana Isabella Muniz Leite, Pablo Oliveira Antonino, and Elisa Yumi Nakagawa	766
ArchPython: Architecture Conformance Checking for Python Systems [Tools Track] Eduardo F. de Lima and Ricardo Terra	772
Product Lines and Concerns	
A Semi-Automated Iterative Process for Detecting Feature Interactions [Research Track] Larissa Rocha, Ivan Machado, Eduardo Almeida, Christian Kästner, and Sarah Nadi	778
On the Relation between Complexity, Explicitness, Effectiveness of Refactorings and Non-Functional Concerns [Research Track]	
Vinícius Soares, Anderson Oliveira, Juliana Alves Pereira, Ana Carla Bibiano, Alessandro Garcia, Paulo Roberto Farah, Silvia Regina Vergilio, Marcelo Schots, Caio Silva, Daniel Coutinho, Daniel Oliveira, and Anderson Uchoa	788
Evaluating Usefulness, Ease of Use and Usability of an UML-based Software Product Line Tool [Re- search Track] Leandro F. Silva and Edson Oliveira Tr	798
Recovering Architectural Variability from Source Code [Research Track]	,,,,
Crescencio Lima, Ivan Machado, Matthias Galster, and Christina von Flach G. Chavez	808

OPLA-Tool v2.0: A Tool for Product Line Architecture Design Optimization [Tools Track] Willian Marques Freire, Mamoru Massago, Arthur Cattaneo Zavadski, Aline Maria Malachini Miotto Amaral, and Thelma Elita Colanzi 818

# Software Engineering Education Research and Experience Reports

An Experience Report About Challenges of Software Engineering as a Second Cycle Course [Education Track] Felipe Leite, Jarbele S. Coutinho, and Reudismam de Sousa 824 LEARN Board Game: A Game for Teaching Software Architecture Created through Design Science Research [Education Track] Tamires Ariane Silva Sousa and Anna Beatriz dos Santos Marques 834 Gamification in Remote Teaching of SE Courses: Experience Report [Education Track] Valéria Lelli, Rossana M. C. Andrade, Lavinia M. Freitas, Rubens A. S. Silva, Francisco Gutenberg S. Filho, Renata Faria Gomes, and Jan Sousa de Oliveira Severo 844 Analyzing App Store Comments and Quality Attributes for Defining an Inspection Checklist for Mobile Educational Games [Insightful Ideas and Emerging Results Track] Kastney Frazão, Jessica Costa, Davi Viana, and Luis Rivero 854

Identifying Improvement Opportunities in Software Engineering Education at the Maranhão State:Listening to Voices from Academy and Industry [Education Track]Yandson Costa, Dayanne Gomes, Sebastião Santos, Nathasha Pinto, Davi Viana, Geraldo Braz Júnior,and Luis Rivero860

#### Author Index

870

# **Keynotes**

#### Gender in Open-Source Software Development



Alexander Serebrenik Eindhoven University of Technology, The Netherlands

Abstract. This talk provides a brief overview of several recent studies of gender and gender diversity in software development teams. The main findings are: (1) more gender-diverse GitHub teams are not only more productive than less gender-diverse ones (Vasilescu et al., CHI 2015), but they are also less likely to exhibit suboptimal communication patterns (Catolino et al., ICSE-SEIS 2019) known to lead to suboptimal code patterns (Palomba et al., TSE 2019); and (2) social capital obtained by collaboration in GitHub open source projects is beneficial for duration of engagement in an open source project; diversity of information ties, i.e., involvement in very different projects, is beneficial for people of all genders, more so for women than for men (Qiu et al., ICSE 2019). It also touches on the ongoing work related to going beyond gender binary. In this preliminary study that has been based on interviews of three transgender women working in software development, it has been observed that remote work, facilitated by technological solutions, reduces barriers for participation in software development projects. It is conjectured that remote work can benefit other underrepresented minorities as well (Ford et al., ICSE-SEIS 2019).

**Short bio.** Alexander Serebrenik is a Full Professor of Social Software Engineering at Eindhoven University of Technology. His research goal is to facilitate evolution of software by taking into account social aspects of software development. He has co-authored a book Evolving Software Systems (Springer Verlag, 2014) and more than 100 scientific papers and articles. He has won several distinguished paper and distinguished review awards.

#### **Return on Investment in Software Quality**



Ana Regina Rocha Federal University of Rio de Janeiro, Brazil

**Abstract.** This talk discusses the benefits of process improvement for software product quality and the success of organizations. In this context, two software process improvement models (CMMI-DEV v2.0 and MR-MPS-SW:2020) and a software product quality model (QPS) are presented. Finally, an approach for guiding improvement programs to the needs of each organization and the return on investment is presented.

**Short bio.** Ana Regina Rocha is a Full Professor at COPPE/UFRJ, Brazil. She holds PhD and Master degrees from PUC-Rio, Brazil. She supervised 30 PhD theses and 101 Master theses. She was a Board Member of the International Institute for Software Technology of the United Nations University (1994-1997). She was distinguished researcher of the Brazilian Computer Society's Special Committee on Software Engineering in 2009. In 2010, she was recipient of the Anita Borg Institute's Change Agent Awards. She participated in the definition of the *TI Maior* Program of the Brazilian Ministry of Science, Technology, and Innovations (2012). She led the team that defined the MPS-SW model, which has had more than 700 evaluations in Brazilian and Latin American companies. More recently, she led the team that defined the QPS model for software product quality. She participated in software quality projects in many companies, such as CERN, TSE, Central Bank of Brazil, Petrobras, Brazilian Aeronautics Computing Center, Casnav, PREVI, and Fiocruz. Her main areas of interest are software processes, software product quality, and Software Engineering for start-ups.

#### In Search of Greater Simplicity and Reliability for the Code Integration Process



Paulo Borba Federal University of Pernambuco, Brazil

Abstract. The code integration process should be simpler and more reliable. When integrating code contributions, developers should not waste time resolving irrelevant merge conflicts. They should also not compromise system quality by integrating code contributions that unexpectedly interfere and cause defects that are difficult to detect during code review and testing activities. This talk summarizes recent studies that try to better understand and solve these problems. In particular, advanced merge tools that offer better support to developers who often integrate code have been developed. These tools explore the syntax and semantics of programming languages to achieve better accuracy in the integration process. The developed semi-structured merge tool focuses on reducing irrelevant conflicts commonly reported by tools such as git merge, while semantic merge tools focus on detecting conflicts that are not normally detected by git merge and that cause failures that affect end-users. The main obtained results, the lessons learned, and the history of this journey to reduce frustrations and unnecessary effort in code integration activities are presented.

**Short bio.** Paulo Borba is Professor of Software Engineering at the Informatics Center of the Federal University of Pernambuco, Brazil, where he leads the Software Productivity Group. He investigates and develops tools and techniques for improving software development quality and productivity levels, especially by reducing unnecessary effort and frustration in software developers work activities. He pursues a mix of academic excellence with industrial relevance. His main research interests are in the following topics and their integration: code integration conflicts and tools, continuous integration and deployment, software modularity, software product lines, and refactoring. Paulo holds a DPhil in Computing from the University of Oxford, and Master and Bachelor degrees in Computer Science from the Federal University of Pernambuco, Brazil. He was a founder of Qualiti Software Processes.