

# MaLTeSQuE: Machine Learning Techniques for Software Quality Evaluation

A workshop proposal for ESEC/FSE 2018

<https://maltesque.github.io/>

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## I. MOTIVATION

The assessment of software quality is one of the most multifaceted (e.g., structural quality, product quality, process quality, etc.) and subjective aspects of software engineering (since in many cases it is substantially based on expert judgement). Such assessments can be performed at almost all phases of software development (from project inception to maintenance) and at different levels of granularity (from source code to architecture). However, human judgement is: (a) inherently biased by implicit, subjective criteria applied in the evaluation process, and (b) its economical effectiveness is limited

compared to automated or semi-automated approaches. To this end, researchers are still looking for new, more effective methods of assessing various qualitative characteristics of software systems and the related processes.

In recent years we have been observing a rising interest in adopting various approaches to exploiting machine learning (ML) and automated decision-making processes in several areas of software engineering. These models and algorithms help to reduce effort and risk related to human judgment in favor of automated systems, which are able to make informed decisions based on available data and evaluated with objective criteria. Thus, the adoption

of machine learning techniques seems to be one of the most promising ways to improve software quality evaluation.

Conversely, learning capabilities are increasingly often embedded within software, including in critical domains such as automotive and health. This calls for the application of quality assurance techniques to ensure the reliable engineering of ML-based software systems.

After the successful editions of the workshop on Machine Learning Techniques for Software Quality Evaluation (MaLTeSQuE), that have been held in Klagenfurt (Austria) on February 21<sup>st</sup>, 2017, collocated with SANER 2017 and in Campobasso (Italy) on March 23<sup>st</sup>, 2018, collocated with SANER 2018, we propose a novel edition of the workshop.

## II. OBJECTIVE AND TOPICS

### A. Objective

The aim of the workshop is to provide a forum for researchers and practitioners to present and discuss new ideas, trends and results concerning the application of ML methods to software quality evaluation and the application of software engineering techniques to self-learning systems. We expect that the workshop will help in (1) the validation of existing ML methods for software quality evaluation as well as their application to novel contexts, (2) the effectiveness evaluation of ML methods, both compared to other automated approaches and the human judgement, (3) the adaptation of ML approaches already used in other areas of science in the context of software quality, (4) the design of new techniques to validate ML-based software, inspired by traditional software engineering techniques.

### B. Topics TO BE EXTENDED

Topics of interest include, but are not limited to:

- Application of machine-learning in software quality evaluation,
- Analysis of multi-source data,
- Knowledge acquisition from software repositories,
- Adoption and validation of machine learning models and algorithms in software quality,
- Decision support and analysis in software quality,

- Prediction models to support software quality evaluation,
- Validation and verification of learning systems,
- Automated machine learning,
- Design of safety-critical learning software,
- Integration of learning systems in software ecosystems.

## III. WORKSHOP FORMATTING

The workshop will follow a one-day format, consisting of 3 to 4 sessions, depending on the number of papers accepted for publication. The workshop is intended to be highly interactive: for this reason, each accepted paper will have a maximum of 15/20 minutes for presentation, followed by 10/15 minutes for questions and discussion. We hope that the workshop will foster and promote collaboration, and there will be time set aside to support this.

We also plan to support a wide dissemination of the accepted contributions as well as the participants' discussion. To this purpose, we aim at being highly present on social networks such as Facebook and Twitter, and we plan to have a person responsible for publicity and dissemination of the contents during the entire workshop.

## IV. SUBMISSIONS

We are looking for original research (even at early stages of evaluation) on how machine learning and software quality assurance can support each other. The maximum length of workshop papers is 6 pages. They will be part of the ESEC/FSE proceedings and available for participants in advance through a workshop webpage. All papers should be submitted in PDF format (conforming to the IEEE conferences template) through EasyChair.

To attract participants for this workshop, we will distribute its CfP in mailing lists related to the communities of software engineering and machine learning. The desired number of participants ranges from 15-20 participants.

Selected papers will be invited to be extended in a special issue of a well-established journal in the field of software engineering.

### A. Review process

The process for paper submission and evaluation will be similar to the ESEC/FSE one. Therefore, all submitted papers will undergo a rigorous peer review process, with emphasis on their originality, quality, soundness and relevance. Like ESEC/FSE, the workshop will follow a double-blind review process, where three PC members will review the submitted papers. Afterwards, the Program Committee will jointly make the final decision concerning acceptance of individual papers, based on the reviews.

### B. Program Committee (not yet definitive)

The Program Committee members are selected among both senior and junior researchers working on the topics of the workshop with the aim of (a) ensuring a high review quality, (b) supporting the emergence of junior researchers in the community and (c) attract established researchers from communities related to artificial intelligence and ML. The Program Committee members are:

- Mathieu Acher, University of Rennes I
- Francesca Arcelli Fontana, Univ. Milano Bicocca
- Apostolos Ampatzoglou, University of Macedonia
- Elvira-Maria Arvanitou, University of Macedonia
- Earl T. Barr, University College London
- Stamatia Bibi, University of Western Macedonia
- Jordi Cabot, Open University of Catalonia
- Alexander Chatzigeorgiou, University of Macedonia
- Jürgen Cito, Massachusetts Institute of Technology
- Eleni Constantinou, University of Mons
- Maxime Cordy, University of Luxembourg
- Steve Counsell, Brunell University
- Jesse Davis, Katholieke Universiteit Leuven
- Xavier Devroey, Delft University of Technology
- Dario Di Nucci, Vrij Universiteit Brussel
- Rémi Emonet, Laboratoire Hubert Curien
- Daniel Feitosa, University of Groningen
- Benoit Frenay, University of Namur

- Suman Jana, Columbia University
- George Kakarontzas, Tech. Educ. Inst. of Thessaly
- Marta Kwiatkowska, University of Oxford
- Lech Madeyski, Wroclaw University of Technology
- Karl Meinke, KTH Royal Institute of Technology
- Tim Menzies, NC State University
- Mirosław Ochodek, Poznan University
- Haidar Osman, University of Bern
- Fabio Palomba, University of Zurich
- Annibale Panichella, Delft University of Technology
- Sebastiano Panichella, University of Zurich
- Gilles Perrouin, University of Namur
- Jean-François Raskin, Université Libre de Bruxelles
- Koushik Sen, University of California – Berkeley
- Alyson Smith, Decisive Analytics Corporation
- Davide Taibi, Free University of Bozen
- Damian A. Tamburri, Politecnico of Milan
- Paolo Tonella, Università della Svizzera Italiana
- Yves Le Traon, University of Luxembourg
- Bartosz Walter, Poznan University of Technology
- Aiko Yamashita, Oslo University

## V. ORGANISERS

### A. Mathieu Acher

Dr. Mathieu Acher is Associate Professor at University of Rennes I / Inria (DiverSE team). His main research interests are related to the reverse engineering, modeling, automated reasoning, and learning of software variability spaces. He's leading the VaryVary ANR project about variability and machine learning. He's given tutorials at SPLC, MODELS, ECSA, and ASE. He's co-created and co-organized REVE and SPLTea workshops since 2014, as well as MASES held at ASE'18.

### B. Apostolos Ampatzoglou

Dr. Apostolos Ampatzoglou is a Senior Researcher at the Department of Applied Informatics in the

University of Macedonia, where he carries out research in the area of software engineering. His current research interests are focused on technical debt, reverse engineering, software maintainability, software quality management, open source software engineering and software design. He has published more than 70 articles in international journals and conferences. He serves as a reviewer in numerous leading journals of the software engineering domain, as part of the organizing committee of five prestigious conferences, and as a member of various international conference program committees.

*C. Francesca Arcelli Fontana*

Francesca Arcelli Fontana has her degree and Ph.D. in Computer Science taken at the University of Milano (Italy). She is currently in the position of Associate Professor at University of Milano Bicocca. The actual research activity principally concerns the software engineering field, in particular software evolution and reverse engineering, code smell and design pattern detection through machine learning techniques, architectural smell detection and managing technical debt. She is the head of the Software Evolution and Reverse Engineering Lab at University of Milano Bicocca and member of IEEE Computer Society.

*D. Maxime Cordy*

Dr. Maxime Cordy is a Research Scientist at the University of Luxembourg. His main research interests are: quality assurance for variability-intensive and intelligent systems, AI-aided configuration, and the application of machine learning to software analysis. He authored 39 peer-reviewed publications on related topics. From 2015 to 2018, he was a co-founder of SKALUP, a spin-off company of the University of Namur, which is engineering AI software for the retail industry. Maxime Cordy animated a tutorial at ICSE'13 and another at SPLC'17. Recently, he co-created and co-organized the MASES workshop, colocated with ASE'18.

*E. Xavier Devroey*

Dr. Xavier Devroey is a post-doctoral researcher at the TU Delft, where he is involved in the EU Software Testing AMplification (STAMP) and the

3TU Big Software on the Run (BSR) projects. His main research interests are in software testing and variability-intensive systems. He co-animates a tutorial on testing variability-intensive systems at SPLC 2017. Co-organized the Advances in Model-based Testing (A-MOST) workshops, held at ICST'17 and ICST'18. And the 1st Int'l Workshop on Machine Learning and Software Engineering in Symbiosis (MASES), held at ASE'18.

*F. Fabio Palomba*

Dr. Fabio Palomba is a Senior Research Associate at the University of Zurich, Switzerland. His research interests include software maintenance and evolution, empirical software engineering, source code quality, and mining software repositories. He was also the recipient of Distinguished and Best Paper Awards at ASE'13, ICSE'15, ICSME'17, SANER'18, and CSCW'18. He serves and has served as a program committee member of various international conferences and as referee for flagship journals in the fields of software engineering. Since 2016 he is Review Board Member of EMSE. He was the recipient of several Distinguished Reviewer Awards.

*G. Gilles Perrouin*

Dr. Gilles Perrouin is an FNRS research associate at the University of Namur, Belgium. He is a member of the PRECISE research center and the Namur Digital Institute (NaDI), in which he explores modeling and model-based testing for software product lines and intelligent systems. He co-organized several workshops at ICST, or SPLC on variability-intensive systems analysis and testing, co-organized MASES, held at ASE'18 and is program co-chair of the 13th VAMOS workshop, an European workshop dedicated to variability modelling of software-intensive systems.

*H. Bartosz Walter*

Dr. Bartosz Walter works at Poznan University of Technology, Poland. He focuses on software maintenance and evolution, with particular interest in code smells and code quality indicators. He has been serving as a reviewer for several conferences and journals. Additionally, he was a co-organizer for the previous editions of the MaLTesQuE workshop.