HABILITATION THESIS REVIEWER'S REPORT

Masaryk University

Applicant	Dr. Bruno Rossi
Habilitation thesis	Experimental Research Towards Software Systems Quality
Reviewer	Prof. Dr. Mauro Pezzè
Reviewer's home unit, institution	USI Università della Svizzera Italiana

The work of Dr. Rossi has focused on the quality and reliability of cyber-physical systems. Dr Rossi has studied mutation testing, code reviewers recommendation, technical debt identification, severity recommendation and triaging to improve the quality of software and cyber-physical systems. Dr. Rossi has adopted various empirical approaches, including quasi experimental design, mining software repositories, prediction models and systematic literature review. Dr. Rossi has extensively studied the impact of software process on the quality of the software systems. Dr. Rossi's work on agile and open source software processes has attracted the attention of the research community.

Dr. Rossi's work on code review automated recommendation and technical debt identification explores important issues in the context of the quality of software processes.

The work on Software Reliability Growth Models has produced a very good set of results. Dr. Rossi's work on smart grids has produced several interesting results that are published in several venues.

The habilitation thesis clearly frames the many results in a coherent framework in the introduction, where it motivates the overall research with the quality of software and cyberphysical systems, highlights the empirical approach as the main research methodology, and frames the overall work in a coherent plan (Figure 1.1). The thesis indicates a research that spans from software development to quality of software systems within the application domain of smart grid systems. The main focus is on software development, with research on techniques to improve the quality (mutation testing), approaches to support both the software process (scalable agile software process) and human activities within the process (recommendation systems for code review, identification of technical debts, bug severity recommendation and triaging, and code quality and teaching). The work on quality of software systems is in the direction of data analysis and anomaly detection. The study on the application domain of smart grids has involved data analysis, anomaly detection, testing and co-simulation.

Chapters 2 and 3 discuss the two main areas of the research of Dr. Rossi, software system quality and smart grids. The two chapters well summarize the results produced so far, with links to the main publications, and indicate the main research plans.

Chapter 2 presents Dr. Rossi's main contribution on software system quality: an empirical study on the scalability of agile software processes, approaches to automatic recommendation systems for code review, mutation testing, identification of technical debts, classification of bug severity, software reliability growth models, and software engineering education. The results are published in venues that differ from importance and quality and span from Euromicro SEAA to the journal of system and software. The chapter summarizes the ongoing research activities that are in line with the past results. Chapter 3 presents the results on smart grids: anomaly detection and co-simulation, with publications in venues

related to the application domain. The section confirms that both research direction are currently active.

The publications included in the habilitation thesis are of good quality, and are published in a variety of venues with few excellent spots: a 2019 MSR paper, and a 2020 IEEE Transactions on Industrial Informatics.

The work of Dr. Rossi has been very productive especially in the last five years. The publications of dr. Rossi are well cited and appreciated. The habilitation thesis offers a coherent framework of the results obtained so far. The list of coauthors indicates a large network of collaborations. The publication venues are very diverse, and it is difficult to identify a strong belonging to a community. The focus on software system quality, software processes, empirical software engineering and software reliability does not reflect in regular publications in top venues of software engineering, software quality and empirical software engineering, as expected.

Overall, the habilitation thesis offers a coherent vision of a good research activity over several years, with a constant growth in the last decade.

Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)

1. The paper collected in the habilitation thesis and more generally the publication record in DBLP indicate a highly heterogeneous set of venues. Can you comment on the choice of the venues, and indicate the research community you refer to?
2. Machine learning occurs quite frequently in your publications. Can you summarize your vision about future applications of machine learning in your research plans?
3. The habilitation thesis classifies the results as software system quality and smart grids, with a summary (Figure 1.1) that suggests a cascade of activities from software development process quality to smart grid systems through software system quality. Can you elaborate a bit more on the level of integration of these different areas within your research plans?

Conclusion

The habilitation thesis entitled Experimental Research Towards Software Systems Quality by Dr. Bruno Rossi **fulfils** requirements expected of a habilitation thesis in the field of Software Engineering.

Date: Signature:

7 february 2024