Università degli Studi di Napoli Federico II

Dottorato di ricerca / PhD program in Information Technology and Electrical Engineering

Activities and Publications Report

PhD Student: Sergio Di Meglio

Student DR number: DR996632

PhD Cycle: XXXVIII
PhD Chairman: Prof. Stefano Russo

PhD program student's start date: 01/11/2022
PhD program student's end date: 31/10/2025

Supervisor: Sergio Di Martino

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Co-supervisor: Fabio Scippacercola

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PhD scholarship funding entity: PNRR- DM 352 with FERVENTO s.r.l as industrial partner.

General information

Sergio Di Meglio received in year 2022 the Master Science degree in Computer Science from the University of Napoli Federico II. Within the PhD program in Information Technology and Electrical Engineering, he attended a curriculum in Computer Science. He received a grant from Fervento srl.

Study activities

Attended Courses

Year	Course Title	Type	Credits	Lecturer	Organization
1st	Virtualization technologies and their applications	Ad hoc course	5	Luigi De Simone	ITEE
1st	How to boost your PhD	Ad hoc course	4	Antigone Marino	ITEE
1st	Big Data Architecture and Analytics	Ad hoc course	5	Giancarlo Sperlì	ITEE
1st	Artificial Intelligence and Natural Language Processing	Ad hoc course	3	Francesco Cutugno	ITEE
2nd	Using Deep Learning properly	Ad hoc course	4	Andrea Apicella	ITEE
2nd	Software Testing	MSc course	6	Porfirio Tramontana	SSD ING-INF/05

Attended PhD Schools

Year	School title	Location	Credits	Dates	Organization
1st	International Summer School on Software Engineering	Salerno,Italy	3	12/06/2023 - 15/06/2023	University of Salerno, Fisciano

Attended Seminars

Year	Seminar Title	Credits	Lecturer	Lecturer affiliation	Organization
1st	Connecting the dots: investigating an APT campaign using Splunk	0.4	Antonio Forzieri		ITEE
1st	Cybercrime and Information Warfare: National and International Actors	0.4	Pierluigi Pagani	Università Telematica Pegaso	ITEE
1st	Digital Forensics	0.4	Group-IB		ITEE
1st	Stabilizer Renyi Entropy and Qauntum Complexity	0.2	Alioscia Hamma	Unina	ITEE
1st	Analysis and control of	0.2	Fabio	University of	SSM

	functional brain networks		Pasqualetti	California, Irvine	
1st	Generation of Mobile EEG-System: Hands-on-Experience	0.2	Andrija Dakovic	Manager of mBrainTrain	ITEE
1st	Ricerca e formazione nella società della transizione digitale	1			Consorzio Interuniversitario nazionale per l'informatica (CINI)
2nd	Sustainable IT: strategies and best practices for a green engineering future	1	Capgemini		5G ACADEMY
2nd	Regolazione in tema intelligenza artificiale alla luce dell'AI act held	1	Elvira Raviele		5G ACADEMY

Research activities

Sergio Di Meglio has contributed to research advancing methodologies and empirical understanding of End-to-End (E2E) web testing, addressing both functional (GUI-level) and non-functional (performance) aspects. His work focuses on identifying key research gaps in the adoption, maintenance, and evolution of E2E testing practices within real-world web applications. To address the lack of publicly available datasets, he contributed to the creation of E2EGit, the first large-scale curated collection of repositories containing real-world GUI and performance tests. Building upon this dataset, he conducted empirical studies on the adoption and maintenance of GUI-level and performance testing practices, providing actionable insights into how these tests are developed and evolve over time. His further contributions include the identification and classification of bad practices in web performance testing and the development of E2E-Loader, a framework that automatically generates performance tests from existing GUI tests. This work was later extended into E2E-Loader++, which was evaluated in industrial contexts, demonstrating its applicability and effectiveness in real-world scenarios.

Tutoring and supplementary teaching activities

Sergio Di Meglio has actively contributed to academic teaching and student mentorship within the Bachelor's and Master's programs in Computer Science. He delivered over 15 seminar lectures across courses such as Software Project Management and Evolution, Software Engineering, and Object Orientation, covering topics including End-to-End (E2E) Testing, Performance Testing, REST API Testing, Static Code Analysis and SonarQube, Build Automation with Apache Maven, and practical sessions on software quality and testing methodologies.
In addition to teaching, he co-supervised 13 thesis projects at both the Bachelor's and Master's levels, focusing on areas such as web and performance testing, repository mining, REST API benchmarking, test code smells, large language models in the travel domain, and software quality analysis.

Credits summary

PhD Year	Courses	Seminars	Research	Tutoring / Supplementary Teaching
1st	20	2,8	42	1,6
2nd	10	2	39	4,8
3rd	0	0	56	1,8

During the PhD, 4.8 credits were obtained from seminars and 8.2 from tutorship activities. The minimum suggested amount for seminars is 10 credits; however, as a PNRR–DM 352 fellow, I was required to spend approximately half of each week at the company Fervento S.r.l., which made it difficult to attend seminars in person. Regarding tutorship activities, although the suggested maximum is 4.8 credits, tutorship represented a significant component of my PhD experience. Each year I delivered several lectures and supervised exercises in both Bachelor's and Master's degree courses. More importantly, I directly supervised around twelve student theses. This was possible thanks to my role as a bridge between academia and Fervento S.r.l., which allowed me to closely follow students during their internship periods at the company, providing continuous technical and research supervision.

Research periods in institutions abroad and/or in companies

PhD Year	Institution / Company	Hosting tutor	Period	Activities
2nd - 3rd	Vrije Universiteit Brussel, Belgium	Coen De Roover	1/10/2024 – 1/04/2025	During my research visit at SOFT-LAB, my work focused on investigating the adoption and maintenance of End-to-End (E2E) tests from both functional and non-functional perspectives. This research resulted in three published papers and a received a Distinguished Dataset Award at Mining and Software Repositories Conference (MSR).

PhD Thesis

Web applications are now widespread in modern society and support a wide range of activities. Failures in these systems can cause serious financial and reputational damage, making quality assurance a critical issue. End-to-end (E2E) testing is a key approach to assessing the quality of web applications, encompassing both functional testing, typically performed at the GUI level, and non-functional testing, such as performance testing. Both activities share the goal of reproducing realistic usage scenarios; while functional testing at the GUI level simulates individual user interactions with the browser, performance testing aims to replicate the simultaneous behaviours of users interacting with the system under test.

Despite the importance of these testing activities, several gaps still remain. Knowledge about their adoption, maintenance, and evolution in real-world projects is limited. While some studies have examined bad practices in GUI-level testing, practical guidance and support for performance testing are still largely missing, and automatic generation of realistic performance tests continues to face significant challenges.

This thesis aims to address these gaps and advance knowledge in the domain of E2E Web testing, with a particular focus on the adoption and maintenance of both GUI-level and performance tests. To this end, a large-scale mining of GitHub repositories led to the creation of E2EGit, the first curated dataset of real-world web applications containing both GUI-level and performance tests. This dataset enabled an empirical analysis of adoption, co-evolution, and maintenance from both functional (GUI-level) and non-functional (performance) perspectives. Building on this, a multi-perspective study on performance testing produced a validated taxonomy of recurring bad practices across the design, execution, and analysis phases. Finally, leveraging these insights, a methodology for automatically generating performance tests from existing GUI-level execution data was introduced and implemented in the E2E-Loader++ tool. Its effectiveness was evaluated through industrial experimentation, demonstrating high accuracy, significant productivity gains, and positive usability feedback.

Research products

Research results appear in *1* published paper, 2 paper currently in press, and 2 paper under review in international journals, 11 contributions to international conferences, *1* contributions to national conferences.

List of scientific publications

International journal papers

1. **Sergio Di Meglio**, Luigi Libero Lucio Starace, Valeria Pontillo, Ruben Opdebeeck, Coen De Roover, and Sergio Di Martino, Investigating the Adoption and Maintenance of Web GUI Testing: Insights from GitHub Repositories, Information and Software Technology Journal, **In press**, October 2025.

2. **Sergio Di Meglio**, Luigi Libero Lucio Starace, and Sergio Di Martino, Web App Performance Testing in Industrial Contexts: Supporting Workload Generation with E2E-Loader++, Journal of System and Software, **In press**, October 2025.

3. **Sergio Di Meglio**, Luigi Libero Lucio Starace, Valeria Pontillo, Luana Martins, Fabio Palomba, and Dario Di Nucci, Bad Practices in Performance Testing: Insights from a Multi-Perspective Empirical Study, ACM Transactions on Software Engineering and Methodology Journal, **Under 1st round of revision**, October 2025.

4. **Sergio Di Meglio**, Luigi Libero Lucio Starace, and Sergio Di Martino, Semi-automated Generation of Web App Performance Tests from End-to-End GUI-Level Tests with E2E-Loader, Science of Computer Programming Journal, **Under 1st round of revision**, August 2025.

5. **Sergio Di Meglio**, and Luigi Libero Lucio Starace, Evaluating Performance and Resource Consumption of REST Frameworks and Execution Environments: Insights and Guidelines for Developers and Companies, IEEE Access, vol. 12, pp. 161649-161669, 2024, doi: 10.1109/ACCESS.2024.3489892.

International conference papers

1. Ermanno Battista, Sergio Di Martino, **Sergio Di Meglio**, Fabio Scippacercola and Luigi Libero Lucio Starace, E2E-Loader: A Framework to Support Performance Testing of Web Applications, 2023 IEEE Conference on Software Testing, Verification and Validation (ICST), Dublin, Ireland, 2023, pp. 351-361, doi: 10.1109/ICST57152.2023.00040.

2. **Sergio Di Meglio**, Luigi Libero Lucio Starace, Valeria Pontillo, Ruben Opdebeeck, Coen De Roover, and Sergio Di Martino, Performance Testing in Open-Source Web Projects: Adoption, Maintenance, and a Change Taxonomy, 41st IEEE International Conference on Software Maintenance and Evolution (ICSME). IEEE. 2025, September 2025.

3. **Sergio Di Meglio,** Luigi Libero Lucio Starace, Valeria Pontillo, Ruben Opdebeeck, Coen De Roover and Sergio Di Martino, E2EGit: A Dataset of End-to-End Web Tests in Open Source Projects, 2025 IEEE/ACM 22nd International Conference on Mining Software Repositories (MSR), Ottawa, ON, Canada, 2025, pp. 836-840, doi: 10.1109/MSR66628.2025.00121.

4. **Sergio Di Meglio,** and Luigi Libero Lucio Starace, Towards Predicting Fragility in End-to-End Web Tests, 22th International Conference on Evaluation and Assessment in Software Engineering (EASE), Salerno, Italy, 2024, doi: 10.1145/3661167.3661179

5. **Sergio Di Meglio**, Luigi Libero Lucio Starace and Sergio Di Martino, E2E-Loader: A Tool to Generate Performance Tests from End-to-End GUI-Level Tests, 2025 IEEE Conference on Software Testing, Verification and Validation (ICST), Napoli, Italy, 2025, pp. 747-751, doi: 10.1109/ICST62969.2025.10989035.

6. **Sergio Di Meglio**, End-to-End Testing in Web Environments: Addressing Practical Challenges, Doctoral Symposium, 2025 IEEE Conference on Software Testing, Verification and Validation (ICST), Napoli, Italy, 2025, pp. 782-784, doi: 10.1109/ICST62969.2025.10988957.

7. Marco De Luca, Sergio Di Martino, **Sergio Di Meglio**, Anna Rita Fasolino, Luigi Libero Lucio Starace, and Porfirio Tramontana, Rookie Mistakes: Measuring Software Quality in Student Projects to Guide Educational Enhancement, Euromicro Conference on Software Engineering and Advanced Applications. Springer. 2025, pp. 137–154.

8. **Sergio Di Meglio**, Valeria Pontillo, and Luigi Libero Lucio Starace, REST in Pieces: RESTful Design Rule Violations in Student-Built Web Apps, Euromicro Conference on Software Engineering and Advanced Applications. Springer. 2025, pp. 191–200.

9. **Sergio Di Meglio**, Aniello Somma, Luigi Libero Lucio Starace, Fabio Scippacercola, Giancarlo Sperlì, and Sergio Di Martino, Large Language Models in the Travel Domain: An Industrial Experience, 37th International Conference on Software Engineering & Knowledge Engineering. **In press**, September 2025.

10. Marco De Luca, **Sergio Di Meglio**, Anna Rita Fasolino, Luigi Libero Lucio Starace, and Porfirio Tramontana, Automatic Assessment of Architectural Anti-patterns and Code Smells in Student Software Projects, 28th International Conference on Evaluation and Assessment in Software Engineering, Salerno, Italy, 2024 pp. 565–569, doi:10.1145/3661167.3661290

11. **Sergio Di Meglio**, Luigi Libero Lucio Starace, and Sergio Di Martino, Starting a New REST API Project? A Performance Benchmark of Frameworks and Execution Environments. IWSM-Mensura. 2023, vol-3543.

National conference papers

- Aniello Somma, **Sergio Di Meglio**, Fabio Scippacercola, Ermanno Battista, Sergio Di Martino, and Luigi Libero Lucio Starace, MYCAMPANIA.TRAVEL: Leveraging Generative AI to Enhance Digital Travel Experiences,Ital-IA Intelligenza Artificiale Thematic Workshops co-located with the 5th CINI National Lab AIIS Conference on Artificial Intelligence (Ital-IA 2025), Trieste, Italy. **In press**, September 2025.

Patents and/or spin offs

Awards and Prizes

- **Data/Tool Track Distinguished Dataset Award** at 22nd International Conference on Mining Software Repositories (MSR) for the paper: E2EGit: A Dataset of End-to-End Web Tests in Open Source Projects.
- **Best Paper Award -Testing Tools and Data Showcase at** IEEE Conference on Software Testing, Verification and Validation (ICST) for the paper: E2E-Loader: A Tool to Generate Performance Tests from End-to-End GUI-Level Tests.
- **Best Paper Award** at 37th Inter-national Conference on Software Engineering & Knowledge Engineering for the paper: Large Language Models in the Travel Domain: An Industrial Experience

Date: 24/10/2025

PhD student signature:

Supervisor signature: