Luca Traini

Assistant Professor (RTDa) at the University of L'Aquila

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Luca Traini is an Assistant Professor (RTDa) at the Department of Engineering and Information and Mathematical Sciences at the University of L'Aquila. His research interests centre around AI for software engineering, and software performance. His work has been published at top-tier software engineering journals like IEEE Transactions on Software Engineering (TSE), ACM Transactions on Software Engineering and Methodology (TOSEM), and Empirical Software Engineering (EMSE).

Research Experience

University of L'Aquila — *L'Aquila, Italy*

Assistant Professor (RTDa) [SSD INF/01] — *Jan 2024 - now*

- Research topics: AI for software engineering, software performance

University of L'Aquila — *L'Aquila, Italy*

Research Fellow [SSD INF/01] — *Jan 2021 - Dec 2023*

- Research topics: AI for software engineering, visual analytics, software performance

Università della Svizzera italiana - Software Institute — *Lugano, Switzerland*

Visiting Scholar — *Jan 2020 - March 2020*

- Research topics: software performance, software maintenance, empirical software engineering
- Supervisor: Gabriele Bavota

Siemens AG — *Genoa, Italy*

Industry Research Intern — *Jan 2019 - Jun 2019*

- Research topics: software performance, agile software development, human aspects of software engineering
- Supervisor: Peter Balzer

University of L'Aquila — *L'Aquila, Italy*

Early-Stage Researcher — *Apr 2017 - Sept 2017*

- Research topics: smart tourism, operations research
- Supervisors: Henry Muccini, Fabrizio Rossi

Research Collaborations

Collaboration with REVEAL Lab (USI) and STAKE Lab (Unimol) — *Oct 2019 - Sept 2021*

Collaboration with the Reverse Engineering, Visualization, Evolution Analysis Lab (REVEAL) at the Università della Svizzera Italiana (USI), led by Prof. Michele Lanza, and the Software Engineering and Knowledge Engineering Lab (STAKE) at the University of Molise (Unimol), led by Prof. Rocco Oliveto. The collaboration involved 3 doctoral students (2 from Univaq, 1 from USI), 2 research fellows (1 from Univaq, 1 from Unimol), 1 associate professor (USI), and 3 full professors (1 from Univaq, 1 from Unimol, 1 from USI). The aim of the collaboration was to investigate the impact of software maintenance actions on its efficiency. This joint work led to a publication in an international journal for which I am the lead author. Publication: "*How Software Refactoring Impacts Execution Time*" (ACM Transactions on Software Engineering and Methodology).

Collaboration with SPEC RG DevOps Performance Working Group — *Mar 2021 - present*

The collaboration with the SPEC Research Group "DevOps Performance Working Group" began in early 2021 and is still ongoing. The research goal is to identify methods for detecting software performance regressions that are more effective and robust than current ones. The collaboration involves three different international academic institutions and 3 industrial partners. The universities involved (besides the University of L'Aquila) are Charles University (Prague, Czech Republic), Concordia University (Montreal, Canada), and the University of Hamburg (Hamburg, Germany). On the industrial side, the companies involved are MongoDB Inc. (USA), Oracle Corporation (USA), and SAP SE (Germany).

Collaboration with Micron Technology — *Oct 2021 - present*

The collaboration with Micron Technology (USA) began within the context of the master's thesis work of the student Federico Di Menna, for which I was the co-advisor. This collaboration then continued in Federico Di Menna's PhD research project, which was co-funded by Micron. I am currently co-advising his PhD work. The objective of this collaboration is to adopt Artificial Intelligence algorithms for the identification, prediction, and resolution of problems in digital devices utilized by Micron employees.

Collaboration with SEART (USI) — *Nov 2023 - now*

Collaboration with the SoftwarE Analytics Research Team (SEART) at the Università della Svizzera Italiana (USI), led by Prof. Gabriele Bavota. The goal of the collaboration was to explore how Large Language Models can be used to enhance software efficiency.

Awards

- Best Industrial Paper Award at IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER) "RADig-X: a Tool for Regressions Analysis of User Digital Experience".
- Winner of the research start-up grant from the University of L'Aquila. The proposal titled "Enhancing Software Performance Testing using Artificial Intelligence" received a grant of €2,000.

Service

- Reviewer for IEEE Transactions on Software Engineering (TSE).
- Reviewer for ACM Transactions on Software Engineering and Methodology (TOSEM).
- Reviewer for Empirical Software Engineering (EMSE).
- Reviewer for Journal of Systems and Software (JSS).
- Reviewer for ACM Transactions on Modeling and Performance Evaluation of Computing Systems (TOMPECS).
- Reviewer for Performance Evaluation (PEVA).
- Co-organizer of 9th Workshop on Challenges in Performance Methods for Software Development (WOSP-C 2024)).
- Data Challenge Track Co-chair of 15th International Conference on Performance Engineering (ICPE 2024).
- Program Committee member of 28th International Conference on Evaluation and Assessment in Software Engineering (EASE 2024) - Short Papers, Vision, and Emerging Results Track.
- Program Committee member of 31st IEEE International Conference on Software Analysis, Evolution, and Reengineering (SANER 2024) - Tools Demo Track.
- Program Committee member of 14th International Conference on Performance Engineering (ICPE 2023) - Research track.
- Program Committee member of 14th International Conference on Performance Engineering (ICPE 2023) - Data Challenge track.
- Session chair at 14th International Conference on Performance Engineering (ICPE 2023) - Research track.
- Session chair at the 18th International Conference on Predictive Models and Data Analytics in Software Engineering (PROMISE 2022).
- Sub-reviewer at 18th IEEE International Conference on Software Architecture (ICSA 2021).
- Sub-reviewer at 11th ACM/SPEC International Conference on Performance Engineering (ICPE 2020).
- Virtualization Co-Chair, 14th European Conference on Software Architecture (ECSA 2020).

Publications

Journals

- **Luca Traini**, and Vittorio Cortellessa. 2023. *DeLag: Using Multi-Objective Optimization to Enhance the Detection of Latency Degradation Patterns in Service-Based Systems*. IEEE Transactions on Software Engineering 49, 6 (2023). https://doi.org/10.1109/TSE.2023.3266041.
- **Luca Traini**, Vittorio Cortellessa, Daniele Di Pompeo, and Michele Tucci. 2022. *Towards effective assessment of steady state performance in Java software: Are we there yet?* Empirical Software Engineering 28, 13 (2023). https://doi.org/10.1007/s10664-022-10247-x.
- **Luca Traini**. 2022. *Exploring Performance Assurance Practices and Challenges in Agile Software Development: An Ethnographic Study*. Empirical Software Engineering 27, 74 (2022). https://doi.org/10.1007/s10664-021-10069-3.
- **Luca Traini**, Daniele Di Pompeo, Michele Tucci, Bin Lin, Simone Scalabrino, Gabriele Bavota, Michele Lanza, Rocco Oliveto, and Vittorio Cortellessa. 2022. *How Software Refactoring Impacts Execution Time*. ACM Transactions on Software Engineering and Methodology 31, 2, Article 25 (April 2022), 23 pages. https://doi.org/10.1145/3485136.

Conferences

- Muhammad Imran, Vittorio Cortellessa, Davide Di Ruscio, Riccardo Rubei, and **Luca Traini**. 2024. An Empirical Study on Code Coverage of Performance Testing. To appear in the Proceedings of the International Conference on Evaluation and Assessment in Software Engineering (EASE '24).
- Federico Di Menna, **Luca Traini**, and Vittorio Cortellessa. 2024. Time Series Forecasting of Runtime Software Metrics: An Empirical Study. In Proceedings of the 15th ACM/SPEC International Conference on Performance Engineering (ICPE '24). Association for Computing Machinery, New York, NY, USA, 48–59. https://doi.org/10.1145/3629526.3645049
- Federico Di Menna, Vittorio Cortellessa, Maurizio Lucianelli, Luca Sardo, and **Luca Traini**. 2024. RADig-X: a Tool for Regressions Analysis of User Digital Experience. To appear in the Proceedings of the IEEE International Conference on Software Analysis, Evolution and Reengineering - Industrial Track (SANER '24)).
- **Luca Traini**, Jessica Leone, Giovanni Stilo, and Antinisca Di Marco. 2024. VAMP: Visual Analytics for Microservices Performance. In Proceedings of the 39th ACM/SIGAPP Symposium on Applied Computing (SAC '24). Association for Computing Machinery, New York, NY, USA, 1209–1218. https://doi.org/10.1145/3605098.3636069
- Jessica Leone and **Luca Traini**. 2023. Enhancing Trace Visualizations for Microservices Performance Analysis. In Companion of the 2023 ACM/SPEC International Conference on Performance Engineering (ICPE '23 Companion). Association for Computing Machinery, New York, NY, USA, 283–287. https://doi.org/10.1145/3578245.3584729.
- Andrea Bianchi, Giordano D'Aloisio, Andrea D'Angelo, Antinisca Di Marco, Alessandro Di Matteo, Microservices Leone, Giulia Scoccia, Giovanni Stilo, and **Luca Traini** (2022). DIORAMA: Digital twIn fOR sustAinable territorial MAnagement. In CEUR Workshop Proceedings (Vol. 3340, pp. 144-155)
- Vittorio Cortellessa and **Luca Traini**. 2020. *Detecting Latency Degradation Patterns in Service-based Systems*. In Proceedings of the ACM/SPEC International Conference on Performance Engineering (ICPE 2020). Association for Computing Machinery, New York, NY, USA, 161–172. https://doi.org/10.1145/3358960.3379126.
- **Luca Traini**. 2018. *A multi-objective framework for effective performance fault injection in distributed systems*. In Proceedings of the 33rd ACM/IEEE International Conference on Automated Software Engineering (ASE 2018). Association for Computing Machinery, New York, NY, USA, 936–939. https://doi.org/10.1145/3238147.3241535.
- Henry Muccini, Fabrizio Rossi and **Luca Traini**. 2017. *A smart city run-time planner for multi-site congestion management*. In Proceedings of the International Conference on Smart Systems and Technologies (SST 2017), pp. 175-179. https://doi.org/10.1109/SST.2017.8188691.

Bibliometrics

- Scopus: `https://www.scopus.com/authid/detail.uri?authorId=57201399696`.
- Google Scholar: `https://scholar.google.com/citations?user=znoyJd0AAAAJ`.
- DBLP: `https://dblp.org/pid/225/0294.html`.
- ORCID: `https://orcid.org/0000-0003-3676-0645`.

Talks

Invited talks

- Speaker at the "SPEC RG monthly talk" on May 9, 2023 (virtual format).
  Presentation title: "Towards effective assessment of steady state performance in Java software: are we there yet?"
- Speaker at the "63rd CREST Open Workshop - Genetic Improvement and Software Specialisation" (COW) held at University College London (UCL) (London, United Kingdom) from March 27 to 28, 2023.
  Presentation title: "Towards Effective Java Performance Evaluation: Are we there yet?"
- Speaker at the "SPEC RG monthly talk" on January 17, 2023 (virtual format).
  Presentation title: "How Software Refactoring Impacts Execution Time"

Speaker at Conferences

- Speaker at the "ACM/SIGAPP Symposium On Applied Computing" (SAC) held in Avila (Spain) from December 8 to 12, 2024.
  Presentation of the paper titled: "VAMP: Visual Analytics for Microservices Performance"
- Speaker at the "ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering" (ESEC/FSE) held in San Francisco (USA) from December 3 to 9, 2023.
  Presentation of the Journal First paper published in Empirical Software Engineering titled: "Towards effective assessment of steady state performance in Java software: Are we there yet?".
- Speaker at the "2nd Conference on System and Service Quality" (QualITA 2023) held in Florence (Italy) from June 19 to 20, 2023.
  Presentation of the abstract: "Towards effective assessment of steady state performance in Java software: Are we there yet?"
- Speaker at the "6th Workshop on Hot Topics in Cloud Computing Performance" (HotCloudPerf 2023). The workshop is part of the "14th ACM/SPEC International Conference on Performance Engineering" (ICPE 2023) held from April 15 to 19, 2023, in Coimbra (Portugal).
  Presentation of the paper titled: "Enhancing Trace Visualizations for Microservices Performance Analysis".
- Speaker at the "1st Conference on System and Service Quality" (QualITA 2022) held in Milan (Italy) on November 25, 2022.
  Presentation of the abstract: "Holistic Software Performance Engineering".
- Speaker at the "ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering" (ESEC/FSE) held in Singapore from November 14 to 16, 2022.
  Presentation of the Journal First paper published in Empirical Software Engineering titled: "Exploring Performance Assurance Practices and Challenges in Agile Software Development: An Ethnographic Study".
- Speaker at the 37th "IEEE/ACM International Conference on Automated Software Engineering" (ASE 2022) held at the Oakland Center (Michigan, USA) from October 10 to 14, 2022.
  Presentation of the Journal First paper published in ACM Transactions on Software Engineering and Methodology titled: "How Software Refactoring Impacts Execution Time".
- Speaker at the "11th ACM/SPEC International Conference on Performance Engineering" (ICPE 2020) held virtually from April 20 to 24, 2020.
  Presentation of the paper: "Detecting Latency Degradation Patterns in Service-based Systems".
- Speaker at the Doctoral Symposium of the "33rd IEEE/ACM International Conference on Automated Software Engineering" (ASE 2018) held in Montpellier (France) from September 3 to 7, 2018.
  Presentation of the abstract: "A multi-objective framework for effective performance fault injection in distributed systems".
- Speaker at the "International Conference on Smart Systems and Technologies" (SST 2017) held in Osijek (Croatia) from October 18 to 20, 2017.
  Presentation of the paper: "A Smart City Run-Time Planner for Multi-Site Congestion Management".
- Speaker at the "3rd Italian Conference ICT for Smart Cities and Communities" (I-CiTies 2017) held in Bari (Italy) from September 17 to 29, 2017.
  Presentation of the abstract: "A Smart City run-time planner for multi-site Congestion Management".

Teaching and Supervision

Courses *University of L'Aquila, Italy*

- Programming for Data Science A.Y. 2021-2022, Master Course, Applied Data Science (24 hours - 3 CFU), Department of Information Engineering, Computer Science and Mathematics.
- Programming for Data Science A.Y. 2022-2023, Master Course, Applied Data Science (24 hours - 3 CFU), Department of Information Engineering, Computer Science and Mathematics.

PhD Student Supervision *University of L'Aquila, Italy*

- [2022-present] Co-Advisor of the PhD Student Federico Di Menna. Doctoral Cycle XXXVIII.
- [2022-present] Co-Advisor of the PhD Student Muhammad Imran. Doctoral Cycle XXXVII.

Master Thesis Supervision *University of L'Aquila, Italy*

- [2023] Vaan Amuthu Elango. *Automated classification of steady state in time series of performance measurements.* (Co-Advisor).
- [2023] Jessica Leone. *Enhancing Trace Visualizations for Microservices Performance Analysis.* (Co-Advisor).
- [2022] Federico Di Menna. *Application of Machine Learning techniques for regression analysis on software/hardware systems in an industrial environment*. (Co-Advisor).

Education

University of L'Aquila *L'Aquila, Italy*

PhD in Computer Science [SSD INF/01] *Nov 2017 - Jun 2021*

- Graduated with distinction "*cum laude*"
- Thesis title: "Performance Engineering in Agile/DevOps Development Processes: Ensuring Software Performance While Moving Fast"
- Research topics: software performance, agile software development, AIOps, software maintenance, human aspects of software engineering
- Supervisor: Vittorio Cortellessa
- Co-supervisor: Henry Muccini

University of L'Aquila *L'Aquila, Italy*

Master Degree in Computer Science *Oct 2015 - Mar 2017*

- Graduated with distinction "110/110 *cum laude*"
- Research topics: smart tourism, operations research
- Advisor: Fabrizio Rossi
- Co-Advisor: Henry Muccini

University of L'Aquila *L'Aquila, Italy*

First level professional master - Web Technology *Jan 2015 - Jan 2016*

University of L'Aquila *L'Aquila, Italy*

Bachelor Degree in Computer Science *Oct 2008 - Dec 2014*

- Final mark: "110/110"
- Research topics: mobile software development, eHealth
- Advisor: Ivano Malavolta

Languages

Italian Mother tongue
English Good working knowledge