

Expression of Interest (EoI)

MSCA Postdoctoral Fellowships 2026

Host Institution: University of L'Aquila, Italy — Department of Engineering, Computer Science and Mathematics, Software Engineering Group, FrAmeLab laboratory

Project

Green Software Engineering of Agentic Systems through Small Language Models.

Hosting Information: University of L'Aquila (UnivAQ), Italy

Offer Deadline: July 10th, 2026

EU Research Framework: Horizon Europe - MSCA Postdoctoral Fellowships 2026

Country: Italy

City: L'Aquila

Organisation/Institute

Organisation: Software Engineering Research Group, University of L'Aquila, Italy

Department: DISIM - Department of Engineering, Computer Science and Mathematics.

Secondment: Åbo Akademi University, Finland.

Contact Information

Organisation / Company Type: Higher Education Institution Website: www.univaq.it

Email: henry.muccini@univaq.it

State/Province: Italy

Postal code: 67100

Street: Via Vetoio, L'Aquila

Description

Project Title: Green Software Engineering of Agentic Systems through Small Language Models

Research Context & Motivation

Agentic systems increasingly rely on Large Language Models (LLMs) as reasoning, planning, tool-use, and coordination components [9, 8]. Recent work shows that LLM-based agents are rapidly expanding in Software Engineering (SE), including requirements engineering, code generation, testing, maintenance, and autonomous decision-making [4]. However, they also expose unresolved challenges in evaluation, standardisation, operational cost, and trustworthy deployment. At the same time, the computational and environmental cost of large models is becoming a critical concern: Green AI research argues for efficiency-aware AI evaluation [6], while energy-aware NLP studies show that large-scale training and tuning may impose substantial financial, energy, and carbon costs [7].

This creates a timely research opportunity: replacing or complementing LLMs with Small Language Models (SLMs) in agentic architectures, where smaller and specialised models may

provide sufficient capability with lower latency, cost, energy demand, and stronger deployability on local or edge infrastructures. Recent SLM literature highlights their potential for efficient deployment under constraints such as hardware, bandwidth, privacy, and generation time [5]. This direction aligns with the European Green Deal, the Digital Decade, and the Apply AI Strategy, which promote resource-efficient innovation, sustainable digital infrastructures, AI adoption, technological sovereignty, and open-source European AI solutions [1, 2, 3].

Goal & Objectives

The primary goal of this research is to define scientific and engineering foundations for **SLM-based agentic systems** that are sustainable, dependable, and cost-effective alternatives to LLM-centric agents.

The project will pursue the following specific objectives:

1. **Architectural objective:** define reference architectures and design tactics for integrating SLMs into agentic workflows, including planning, tool calling, memory access, task delegation, and fallback to larger models when needed.
2. **Empirical objective:** quantify the trade-offs between SLMs and LLMs in terms of task success, energy consumption, latency, cost, privacy, and maintainability across representative software engineering tasks.
3. **Optimization objective:** develop adaptive model-selection and fine-tuning strategies that assign each agentic task to the smallest model able to satisfy functional and quality requirements.

Research Method

The project will follow an experimental and computational software engineering method. We will design SLM-based agent prototypes, compare them against LLM-based baselines, and evaluate them on controlled benchmarks and realistic software engineering scenarios. The study will combine architecture modelling, prompt and workflow engineering, lightweight fine-tuning, tool-use evaluation, and energy measurement.

Open Science practices will be adopted by releasing datasets, prompts, configurations, measurement protocols, scripts, and anonymised experimental results, enabling reproducibility and independent validation. Early evidence on SLMs suggests that task-specific optimisation, fine-tuning, compression, pruning, and quantisation can make smaller models viable under resource constraints [5], motivating a systematic investigation at architecture and system level.

Technology & Infrastructure

The fellow will have full access to:

- The FrAmeLab and UnivAq equipment (workstations, Caliban High-Performance Computing Cluster)
- ACM/IEEE library archives
- Office space within the Information Engineering, Computer Science, and Mathematics Department (DISM).

Expected Output

As per our team policy, we will work together to publish on top journals (such as IEEE TSE, ACM TOSEM, JSS, IST) and in top conferences (such as ICSE, ICSE, ECA, FSE, ASE, MODELS). The MSCA fellow will work in collaboration with the FrAmeLab team members. He/She will be mentioned as the first author in all those publications he/she will lead.

Proposing Research Group

The Software Engineering Research Group (SWEN) is recognized as one of the worldwide leaders in software engineering. Its members have been organizing and co-leading international conferences such as ICSA, ASE, ICPE, MODELS, and being active members of the organizing committee of conferences such as ICSE, ASE, FSE, MODELS, ICSE, ECSA, and others.

We ensure a supportive environment for career development.

- **Global Network:** Active participation in over ten Horizon Europe projects.
- **Infrastructure:** State-of-the-art facilities located in L'Aquila.
- **Mentorship:** Our supervisors have supervised tens of Ph.D. students and PostDocs, most of them holding a professorship or a practitioner position worldwide.

Our Support for Your Proposal

We don't just host you; we help you win. Candidates selected for this topic will receive:

- **MSCA Master Class:** A 1-day intensive workshop (July 2026) on proposal writing.
- **Expert Review:** One-to-one feedback from our scientists.

Candidate Requirements

- **Degree:** PhD in Computer Science, Software Engineering, or related disciplines. It must be obtained by Sept 9, 2026, and not earlier than Sept. 2018.
- **Publications:** A strong publication track record (e.g., high-impact journals and conferences)
- **Prior Knowledge:** Research focus on (Software Engineering or Software Architecture) and (Agentic AI or LLM) and (Sustainability or Energy consumption).
- **Language Proficiency:** Excellent command of spoken and written English, strong interpersonal skills, and the ability to work both independently and in a team.
- **Mobility Rule:** Compliance with the MSCA mobility rule. Among them, candidates must not have resided in Italy for more than 12 months in the 3 years before the deadline.

Interested?

Interested candidates should send the following to henry.muccini@univaq.it by **July 01, 2026**, with subject "MSCA Postdoctoral Fellowships 2026":

1. A brief CV (max 2 pages).
2. A motivation letter (1 page) outlining research alignment.
3. A 1-page summary of your proposed research idea.

We look forward to building a winning proposal with you!

References

- [1] European Commission: The european green deal. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en (2019), accessed: 2026-05-05
- [2] European Commission: Digital decade policy programme 2030. <https://digital-strategy.ec.europa.eu/en/policies/digital-decade-policy-programme> (2023), accessed: 2026-05-05
- [3] European Commission: Apply ai strategy. <https://digital-strategy.ec.europa.eu/en/policies/apply-ai> (2026), accessed: 2026-05-05
- [4] Liu, J., Wang, K., Chen, Y., Peng, X., Chen, Z., Zhang, L., Lou, Y.: Large language model-based agents for software engineering: A survey. *ACM Transactions on Software Engineering and Methodology* (2026). <https://doi.org/10.1145/3796507>
- [5] Nguyen, C.V., Shen, X., Aponte, R., Xia, Y., Basu, S., Hu, Z., Chen, J., Parmar, M., Kunapuli, S., Barrow, J., et al.: A survey of small language models (2024). <https://doi.org/10.48550/arXiv.2410.20011>
- [6] Schwartz, R., Dodge, J., Smith, N.A., Etzioni, O.: Green ai. *Communications of the ACM* **63**(12), 54–63 (2020). <https://doi.org/10.1145/3381831>
- [7] Strubell, E., Ganesh, A., McCallum, A.: Energy and policy considerations for deep learning in nlp. In: *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics*. pp. 3645–3650 (2019). <https://doi.org/10.18653/v1/P19-1355>
- [8] Wang, L., Ma, C., Feng, X., Zhang, Z., Yang, H., Zhang, J., Chen, Z., Tang, J., Chen, X., Lin, Y., Zhao, W.X., Wei, Z., Wen, J.R.: A survey on large language model based autonomous agents. *Frontiers of Computer Science* **18**(6), 186345 (2024). <https://doi.org/10.1007/s11704-024-40231-1>
- [9] Yao, S., Zhao, J., Yu, D., Du, N., Shafran, I., Narasimhan, K., Cao, Y.: React: Synergizing reasoning and acting in language models. In: *Proceedings of the 11th International Conference on Learning Representations (ICLR)* (2023), https://openreview.net/forum?id=WE_vluYUL-X