Fellow	Max **Hort**
Host Organisation	Simula Research Laboratory
Scientific coordinator	Leon **Moonen**

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my fellowship, I carried out research on sustainability and the reuse of large language models in software engineering, and I conducted an extensive literature review in this area [2].
In parallel, I explored data transformation techniques for source code, with the goal of enhancing defect detection processes. Currently, I am actively applying these techniques to real-world defect detection datasets, aiming to improve software quality assurance practices.
A significant part of my work involved a comprehensive study in collaboration with PhD candidate Anastasiia Grishina on the structure modification of CodeBERT, a large language model [3]. The results of this study demonstrated that pruning model layers can lead to more sustainable models without sacrificing performance.

In addition to my research, I contributed to the academic community by serving as a reviewer for prestigious journals, including JAIR, TSE, TOSEM, and EMSE. My dedication to scholarly engagement earned me a Distinguished Reviewer Award at MSR'23.
Moreover, I co-supervised two MSc students, Fernando Vallecillos Ruiz and Roman Macháček, providing guidance and mentorship to help shape their research projects [1].
Furthermore, I took on the role of Co-Chair for the RENE/NIER Track at SSBSE'23, actively fostering collaboration and knowledge exchange within the software engineering community.
Lastly, I pursued the MSCA Postdoctoral Fellowship, reflecting my commitment to advancing my academic and research career. For this purpose, I submitted a proposal in September 2023 to the call HORIZON-MSCA-2023-PF-01, with results expected to be shared in February 2024.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Publications under review

[1] Vallecillos Ruiz, F., Grishina, A., Hort, M., & Moonen, L. (2023). A Novel Approach for Automatic Program Repair using Round-Trip Translation with Large Language Models. Submitted to FSE'24

Accepted publications

[2] Hort, M., Grishina, A. and Moonen, L., 2023. An Exploratory Literature Study on Sharing and Energy Use of Language Models for Source Code. Preprint: https://arxiv.org/pdf/2305.04940.pdf
Accepted at ESEM2023

[3] Grishina, A., Hort, M., & Moonen, L. (2023). The EarlyBIRD Catches the Bug: On Exploiting Early Layers of Encoder Models for More Efficient Code Classification. Preprint: https://arxiv.org/pdf/2307.02443.pdf
Accepted at FSE2023

[4] Hort, M., Moussa, R. and Sarro, F., 2023, July. Multi-objective Search for Gender-fair and Semantically Correct Word Embeddings (HOP GECCO'23). In *Proceedings of the Companion Conference on Genetic and Evolutionary Computation* (pp. 23-24). DOI: https://doi.org/10.1145/3583133.3595847

Accepted publications, written before fellowship

[5] Hort, M., Chen, Z., Zhang, J. M., Sarro, F., & Harman, M. (2023). Bias Mitigation for Machine Learning Classifiers: A Comprehensive Survey. Preprint: https://arxiv.org/pdf/2207.07068.pdf Accepted at the Journal for Responsible Computing

[6] Hort, M., Moussa, R., & Sarro, F. (2023). Multi-objective Search for Gender-fair and Semantically Correct Word Embeddings. *Applied Soft Computing*, *133*, 109916. DOI: https://doi.org/10.1016/j.asoc.2022.109916

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

- 17 November - 18 November 2022: 14th Symposium on Search-Based Software Engineering, virtual attendance
- 21 February – CuttingEdgeAI: Large Language Models (https://www.nora.ai/events/cutting-edge-ai-large-language-models.html)
- 27 March – 28 March: 63rd CREST Open Workshop (invited speaker)
- 3 May – 4 May: MSCA Postdoctoral Fellowship Workshop

IV – RESEARCH EXCHANGE PROGRAMME (REP)

During the research exchange programme, I visited the SWAT team at CWI Amsterdam under the supervision of Jurgen Vinju (https://www.cwi.nl/en/groups/software-analysis-and-transformation/). The REP took place from the 10/07/2023 to the 14/07/2023.

I got welcomed to the SWAT team, met the team members and discussed our research.
The SWAT team is developing the meta programming language RASCAL, which can be used to process and analyse source code. During my REP, I had the chance to work with RASCAL for the purpose if analysing and comparing code snippets based on their abstract syntax trees (AST). I wrote functions to extract common patterns given two AST representations.