Short-Term Scientific Mission Grant
- APPLICATION FORM[1] -

Action number: CA20111

Applicant name: Temur Kutsia

Details of the STSM

Title: Generalization in typed languages and quantitative theories

Start and end date: 23.02.2025-2.03.2025

Detail of the cost in EUROS:

As reference, you can use the daily allowances by country for ITCGs (https://europroofnet.github.io/itcg-daily-allowance/) and the associated Excel sheet (https://europroofnet.github.io/_pages/grant.xlsx).

- Transport (upload screen capture): 160 (train + local transport)

- Hotel/day (upload screen capture): 15 (accommodation provided by the host institute)

- Food/day: 40

TOTAL: 600 EUR

Goals of the STSM

Purpose and summary of the STSM.

(max.200 word)

This STSM focuses on generalization methods in typed languages and quantitative theories. Generalization computation, in one form or another, is a very important ingredient for various applications in reasoning, learning, information extraction, data compression, software development and analysis, etc. In this STSM, we aim at

(a) investigating anti-unification techniques for solving generalization problems in languages with polymorphic (such as system F) or dependent types (such as Lambda-P) in the frame of the methodology developed by us in [Cerna & Kutsia, 2019], and

(b) considering generalization problems in quantitative first-order theories, aiming at extending the framework introduced in [Kutsia & Pau, 2022] to Lawvereian quantales.

Besides, we plan to brainstorm about future work on generalization problem in the presence of both types and quantitative information, and on an extended version of the survey of generalization techniques [Cerna & Kutsia, 2023].

[1] This form is part of the application for a grant to visit a host organisation located in a different country than the country of affiliation. It is submitted to the COST Action MC via e-COST. The Grant Awarding Coordinator coordinates the evaluation on behalf of the Action MC and informs the Grant Holder of the result of the evaluation for issuing the Grant Letter.

Working Plan

Description of the work to be carried out by the applicant.

(max.500 word)

We plan to follow a couple of directions of investigation, building on what we have already achieved during David Cerna's visit to Linz as a part of a previous STSM. Namely, we will finalize the study of generalization properties for polymorphic systems, examine details specific to dependently typed languages, and look into systems where polymorphism and dependent types are combined. Another direction will be an investigation of an extension of the quantitative anti-unification framework from [Kutsia & Pau, 2022] to Lawvereian quantales. Besides, we plan to devote one afternoon to a discussion on possible ways of generalizations in the presence of combined types and quantitative information, as well as challenges associated to them. There will be also a discussion and planning an extended version of our survey on generalization [Cerna & Kutsia, 2023]. We will hold daily meetings with David, and maintain online contact (Zoom meetings twice a week) with our other collaborators in Brazil (Mauricio Ayala Rincon, Gabriela Ferreira) and Austria (Georg Ehling, Cleo Pau).

References:

[Cerna & Kutsia, 2019] David M. Cerna and Temur Kutsia. A Generic Framework for Higher-Order Generalizations. In: Herman Geuvers, editor. Proceedings of the 4th International Conference on Formal Structures for Computation and Deduction, FSCD 2019. June 25–29, 2019, Dortmund, Germany. Vol. 131 of the Leibniz International Proceedings in Informatics (LIPIcs). Schloss Dagstuhl, 2019, 10:1–10:19.

[Cerna & Kutsia, 2023] David M. Cerna and Temur Kutsia. Anti-unification and Generalization: a Survey. In: Edith Elkind, editor. Proceedings of IJCAI 2023 - 32nd International Joint Conference on Artificial Intelligence. ijcai.org, 2023. 6563–6573.

[Kutsia & Pau, 2022] Temur Kutsia and Cleo Pau. A Framework for Approximate Generalization in Quantitative Theories. In: Jasmin Blanchette, Laura Kovács, and Dirk Pattinson, editors. Proceedings of IJCAR 2022 - 11th International Joint Conference on Automated Reasoning. Volume 13385 of Lecture Notes in Artificial Intelligence. Springer, 2022. 578–596.

Expected outputs and contribution to the Action MoU objectives and deliverables.

Main expected results and their contribution to the progress towards the Action objectives (either research coordination and/or capacity building objectives) and deliverables.

Working groups to which this mission contributes:

(max.500 words)

Ultimately, we plan to disseminate the results achieved during this STSM in the form of conference or journal papers. As for contributions to the Action MoU objectives and deliverables, generalization techniques we plan to work on in this STSM are relevant for WG6 (Type Theory), WG4 (Libraries of Formal Proofs), and WG2 (Automated Theorem Provers), with possible applications in, e.g., proof similarity detection, compression, lemma extraction, etc.