



Inria Associate Teams programme
Intermediate report (Year 1)

Associate Team acronym: TC(Pro)³

Title: Termination and Complexity Properties of Probabilistic Programs.

Principal investigator (Inria): Romain Péchoux, Inria project team Mocqua, Inria Nancy Grand Est

Principal investigator (Main team): Georg Moser, University of Innsbruck, Austria

Other participants: Martin, Avanzini, Inria project team Focus, Inria Sophia

1 Future of the Associate Team

Would you like to pursue this Associate Team for one more year? Yes No

2 Website of the Associate Team

<https://members.loria.fr/RPechoux/ea-tcpro%c2%b3/>

3 List of participants

Vladimir Zamdzhiev, who has been hired on an Inria ISFP position, starting the 1st of October 2020, is joining the Associate team. He will bring his expertise on the semantics of quantum programming languages to the project. The permanent members of the project are listed below.

- **Martin Avanzini**, Focus, CR Inria, two weeks visit to Innsbruck and one week visit to Nancy, www-sop.inria.fr/members/Martin.Avanzini/.
- **Ugo Dal Lago**, Focus, PR, www.cs.unibo.it/~dallago/.
- **Gemma De las Cuevas**, Innsbruck, MCF, www.gemmadelascuevas.com/.
- **Emmanuel Hainry**, Mocqua, MCF, members.loria.fr/EHainry/.
- **Emmanuel Jeandel**, Mocqua, PR, members.loria.fr/EJeandel/.
- **Georg Moser (PI)**, Innsbruck, PR, cl-informatik.uibk.ac.at/users/georg/.
- **Romain Péchoux (PI)**, Mocqua, MCF HDR, members.loria.fr/RPechoux/.
- **Simon Perdrix**, Mocqua, CR HDR CNRS, members.loria.fr/SPerdrix/.
- **Florian Zuleger**, Innsbruck, MCF, informatics.tuwien.ac.at/florian-zuleger.
- **Vladimir Zamdzhiev**, Mocqua, CR Inria, members.loria.fr/VZamdzhiev/.

4 Achievements and Planned activities

Achievements (2020): Due to the COVID-19 pandemic, most of the planned activities in the initial proposal have been cancelled, delayed, or rescheduled.

The initial kick-off meeting, that was initially planned to be held in Nancy in June 2020, has been rescheduled and was held online the 24th of September 2020.

Martin Avanzini has visited Innsbruck in October 2020 and Nancy in November 2020. These 2 visits will contribute to help the project's achievements.

Finally, Ugo Dal Lago has been member of the HDR committee of Romain Péchoux, whose defense was held online the 19th of October 2020.

2 publications of interest have been obtained by the members of the associate team in 2020: [2] introduces a quantum PL with inductive datatypes and [1] performs an average case complexity analysis of an imperative PL with non-determinism and probabilistic sampling.

- [1] Martin Avanzini, Georg Moser, and Michael Schaper. “A Modular Cost Analysis for Probabilistic Programs”. In: *OOPSLA 2020*. 2020.
- [2] Romain Péchoux et al. “Quantum Programming with Inductive Datatypes: Causality and Affine Type Theory”. In: *FOSSACS 2020*. 2020, pp. 562–581.

We aim at combining these works into an average case resource analysis of the PL of [2].

Planned activities and visits (2021): Subject to the evolution of the COVID-19 pandemic, the participants will visit their partner during one or two weeks in 2021:

- Avanzini (Focus) will visit Innsbruck for two weeks, during summer and Nancy for two weeks, during autumn.
- Péchoux (Mocqua) will visit Innsbruck for two weeks, during summer.
- Perdrix (Mocqua) will visit Innsbruck for two week, during summer.
- Moser (Innsbruck) will visit Mocqua for one week, during autumn.
- Zamdzhiev (permanent, Mocqua) will visit Innsbruck for two week, during summer.

5 Budget requested for the coming year

The budget for 2021 will finance journeys of participants. More specifically:

- There will be one trip of two weeks from Sophia to Nancy, with an expected cost of 2000€.
- There will be one trip of one week from Innsbruck to Nancy, with an expected cost of 1380€.
- There will also be four trips, each of two weeks, of French members (Mocqua and Focus) to Austrian sites. Each trip Nancy-Innsbruck has an expected cost of 2 860€ and each trip Sophia-Innsbruck has an expected cost of 3320€ for two weeks, summing to 11 900€.

Hence the total budget for 2021 will be of 15 280€, of which 9 000€ will be provided by this associate team, and 2 950€ consists in co-funding from the ANR Project SoftQPro, (“Solutions logicielles pour l’optimisation des programmes et ressources quantiques”), 2018-2022, leded by Simon Perdrix, and to which Mocqua participates (secured). Co-funding on the Austrian side will be applied by the University of Innsbruck for a total amount of 3 330€ (secured).