Alexis Ghyselen

Doctor in computer science

Main Research Interests

Effect	Probabilistic programs, Concurrency, Monads, Algebraic Effects, Handlers
Types	Sized Types, Refinement Types, Intersection Types
Logic	Linear logic, Lambda calculus, Logical Relations
Semantic	Models, Game semantics, Category Theory
Others	Automatic Differentiation, Reinforcement Learning

Education

2018-2021	**PhD Thesis with Patrick Baillot**, *ENS Lyon*, France.
2017-2018	**Long Internship with Ugo Dal Lago**, *University of Bologna*, Italy.
2015-2017	**Master's degree in computer science : MPRI**, *ENS Cachan*, France.
2014-2015	**Bachelor's degree in computer science**, *ENS Cachan*, France.

Experience

2021– **Post-Doc**, *University of Bologna*.
Post-Doc that should last two years, within the DIAPASoN project. The main thematics are algebraic effects and logical relations.

2018-2021 **PhD Thesis**, *ENS Lyon*.
3 year PhD thesis with Patrick Baillot. The thesis is focused on the use of sized types to analyse parallel complexity in the pi-calculus. We gave two main notions of time complexity on the Pi-calculus and described tree different type systems to obtain complexity bounds. During the thesis, I also gave some computer science tutorials to college students, on programming theory, logic, proof assistants, probabilities and formal languages.

2017-2018 **Internship**, *University of Bologna*.
Ten-months internship with Ugo dal Lago. We worked mainly on how to extend the methodology of linear dependent types and refinement types to the probabilistic case, in order to have a type-based complexity analysis of probabilistic higher-order programs.

2017 **Internship**, *ENS Lyon*.
Five-months internship with Patrick Baillot. The goal was to combine ideas from two approaches in implicit complexity to lessen their drawbacks: the use of modalities like in linear logic to control iteration, and the use of indexes to keep track of the sizes of values in programs.

2016 **Internship**, *University of Oxford*.
Two-months and an half internship with Luke Ong. We worked on how to express the links between differential lambda-calculus and plays in some game semantics, using previous work on resource lambda-calculus and non-idempotent intersection types by Tsukada-Ong.

2015 **Internship**, *IRCCyN*, Nantes.

Two-months internship in bioinformatics with Olivier Roux. We aimed to design an algorithm for finding sets of stable states in large graphs by using small hypergraph representations.

Publications

International Conference Proceedings with Peer-Reviews

○ Patrick Baillot and Alexis Ghyselen. Combining Linear Logic and Size Types for Implicit Complexity. In *27th EACSL Annual Conference on Computer Science Logic (CSL 2018)*, volume 119 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 9:1–9:21, 2018

○ Martin Avanzini, Ugo Dal Lago, and Alexis Ghyselen. Type-based complexity analysis of probabilistic functional programs. In *34th Annual ACM/IEEE Symposium on Logic in Computer Science, LICS 2019, Vancouver, BC, Canada, June 24-27, 2019*, pages 1–13. IEEE, 2019

○ Patrick Baillot and Alexis Ghyselen. Types for complexity of parallel computation in pi-calculus. In *Programming Languages and Systems - 30th European Symposium on Programming, ESOP 2021*, volume 12648 of *Lecture Notes in Computer Science*, pages 59–86. Springer, 2021

○ Patrick Baillot, Alexis Ghyselen, and Naoki Kobayashi. Sized types with usages for parallel complexity of pi-calculus processes. In *32nd International Conference on Concurrency Theory, CONCUR 2021, August 24-27, 2021, Virtual Conference*, volume 203 of *LIPIcs*, pages 34:1–34:22, 2021

Peer-Reviewed Scientific Journal

○ Patrick Baillot and Alexis Ghyselen. Combining linear logic and size types for implicit complexity. *Theor. Comput. Sci.*, 813:70–99, 2020

○ Patrick Baillot and Alexis Ghyselen. Types for complexity of parallel computation in pi-calculus. Long Version (50p). *Transactions on Programming Languages and Systems 2022 (TOPLAS 2022)*.

Reviews

I did some reviews for ESOP 2019, PPDP 2020, LICS 2020, CSL 2021, LICS 2021, PPDP 2022.