Antoine ALLIOUX

Software Engineer

Experience

Industrial

June 2016 – January 2018

Scala backend developer, *MFG Labs*, Paris, France

MFG Labs is a consultancy and development company with a strong expertise in data and AI co-founded by Fields medalist Pierre-Louis Lions.

- Spearheaded the development of chatbot projects automating customer relations for our clients based on a concurrent and resilient design using the Akka Streams library.
- Participated in the development of ad campaigns creation subsystems of a meta Demand-Side Platform (DSP) for Havas Group. DSPs are advertiser campaign management products used in AdTech that provide advertisers features for buying ad placements online in real time.
- Tech stack: Scala (Typelevel ecosystem), Play framework, Akka Streams, PostgreSQL, Git, Linux.

Research

2018-2023

PhD in Computer Science, *Institut de recherche en informatique fondamentale (Université Paris Cité), Inria team Picube*, Paris, France

Developed a library of mathematical results [4] in Agda, a dependently-typed functional language, as part of my PhD. This library formalises the theoretical results established in my thesis.

2018–2022

Teaching, *Université Paris Cité*, Paris, France

- Lectured the course on mathematical logic to second year students.
- Teaching assistant for the following courses: algorithms and data structures, Java, C, programming project, and web technologies.

January 2016 - April 2016

4-month research internship, *Institut de recherche en informatique fondamentale (Université Paris Cité)*, Paris, France

- Extended an abstract machine computing Taylor expansion of λ-terms to the case of the algebraic λ-calculus allowing for the linear combination of λ-terms under the supervision of Prof. Michele Pagani.
- Implemented this new machine in OCaml.
- Work published and presented at the LINEARITY'16 workshop (affiliated with FSCD) [3].

Summer 2013

3-month internship, *Institut français des sciences et technologies des transports, de l'aménagement et des réseaux (IFSTTAR)*, Villeneuve-d'Ascq, France

Developed a UI in C++/Qt in order to centralise and process data from the CAPLOC experiment. This experiment aimed at improving GPS precision using video data from the environment in order to distinguish the satellites which are masked by buildings from the ones which are in sight.

Technical skills

- Professional experience in **Scala** with the **Akka Streams** library and the **Typelevel** ecosystem on projects using **PostgreSQL**, **Git**, and **Linux**.
- Expert in **Agda**, a dependently-typed functional language inspired from Haskell and comparable to **Coq** or **Lean**.
- Fluent in other statically-typed functional languages such as **Haskell** and **OCaml**.
- Currently using **Python** on personal machine learning projects.
- Using **Rust** on a personal 3D rendering engine project.
- Notions of **C++**.

Education

2018–2023

PhD in Computer Science, *Institut de recherche en informatique fondamentale (Université Paris Cité), Inria team Picube*, Paris, France

On the open problem of defining higher algebraic structures in homotopy type theory (HoTT) under the supervision of Dr. Matthieu Sozeau and in collaboration with Dr. Eric Finster. [2] My results are formalised in Agda, a functional programming language with dependent types. Part of my work was published with my co-authors at LICS21 [5].

2014–2015

MSc in Computer Science (*Distinction*), *University of Oxford*, Oxford, United Kingdom

Studied theoretical computer science: lambda calculus, principles of programming languages, computational complexity, and categorical semantics of quantum mechanics. Master's thesis on the use of string diagrams in categorical quantum mechanics under the supervision of Dr. Jamie Vicary. [1]

2012–2015

Diplôme d'Ingénieur, *École nationale supérieure d'informatique pour l'industrie et l'entreprise (ENSIIE)*, Évry, France

Grande école d'ingénieur whose curriculum focuses on computer science and applied mathematics.

2012–2013

Bachelor's degree in Mathematics, *Université d'Évry Val-d'Essonne*, Évry, France

2009–2012

Classes Préparatoires aux Grandes Écoles, *MPSI/MP*, *Lycée Henri Wallon*, Valenciennes, France

Languages

French	Native language
English	Proficient, *Lived one year in England*

Talks (selected)

- "Opetopic Methods in Homotopy Type Theory". Second International Conference on Homotopy Type Theory, Carnegie Mellon University, USA. 2023
- "Types are internal ∞-groupoids". 27th International Conference on Types for Proofs and Programs, held online due to the pandemic. 2021
- "Higher Structures in Homotopy Type Theory". Seminar CHoCoLa, École Normale Supérieure de Lyon, France. 2023
- "Higher Structures in Homotopy Type Theory". Seminar on logic and interactions, Institut de Mathématiques de Marseille, France. 2023
- "Structures supérieures cohérentes en théorie des types homotopiques". Seminar on higher categories, polygraphs, and homotopy, Institut de Recherche en Informatique Fondamentale, Paris, France. 2021

References

[1] Antoine ALLIOUX. "Formalizing Geometrical Proofs". MA thesis. Oxford, United Kingdom: University of Oxford, 2015. URL: https://github.com/allioux/master-thesis-public.

[2] Antoine ALLIOUX. "Higher Structures in Homotopy Type Theory". PhD thesis. Université Paris Cité, 2023. URL: https://github.com/allioux/thesis-public.

[3] Antoine ALLIOUX. "Krivine Machine and Taylor Expansion in a Non-uniform Setting". In: *Proceedings Fourth International Workshop on Linearity, LINEARITY 2016, Porto, Portugal, 25 June 2016.* 2016, pp. 24–32. DOI: 10.4204/EPTCS.238.3. URL: https://doi.org/10.4204/EPTCS.238.3.

[4] Antoine ALLIOUX and Eric FINSTER. *Formalisation of Higher Structures in Homotopy Type Theory.* URL: https://github.com/allioux/thesis-formalisation.

[5] Eric FINSTER, Antoine ALLIOUX and Matthieu SOZEAU. "Types are internal ∞-groupoids". In: *2021 36th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS).* IEEE. 2021, pp. 1–13.