Alexandre Fernandez

PhD in Computer Science

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WORK EXPERIENCE

SEPT 2022 – AUG 2023 (FT)

École normale supérieure (ENS) de Lyon
Research associate and professor (ATER)

In this position, I joined the **PLUME** research team of the "Laboratoire de l'Informatique du Parallélisme (**LIP**)". This team focuses on program **correctness and validation** through **Ocaml** and **Coq** proof assistants and formal tools such as linear types. I was able to deepen my knowledge of these topics, while studying **graph rewriting** systems and category theory, publishing my **thesis** [1] and a **journal article** [2]. I was also responsible for teaching the ENS L3 students **Algorithmic**, Logic, and **Functional Programming** and typing in Ocaml.

SEPT 2021 – AUG 2022 (FT)

Université Paris-Est Créteil
Research associate and professor (ATER)

As an associate professor, I was responsible for various teachings such as **Formal Languages**, Combinatorics, **Graph Theory**, Cryptography, and both Functional and Web Programming. I was also concluding my doctoral research in the Laboratory of Algorithmic, Complexity, and Logic (**Lacl**), and I published a **scientific conference article**. [3] .

SEPT 2018 – AUG 2021 (FT)

Université Paris-Est Créteil
Doctoral research

As a research student, I studied **parallel and spatialized computing** of rewriting systems using **category theory**. During those three years, I published multiple conference articles on this topic [4, 5, 6]. I also worked on a **Python implementation** of this work [7], to expose the practical aspects of this formal study.

EDUCATION

2018 – 2023 **PhD in Computer Science**
Spatialized and parallel computing.
Paris-Est Créteil University.

2016-2018 **Master of Computer Science**
Software reliability and algorithmic.
Pierre et Marie Curie University (Sorbonne).

2013 – 2016 **Double Bachelor: Computer Science, Mathematics**
Paris-Est Créteil University.

COMMUNICATION

I **presented** my research at the following scientific events:

- GReTA Seminar 2023 (**Video available** [8])), Online.
- MFCS 2022 [3], Vienna, Austria.
- RAMiCS 2021 [4], Tokyo, Japan.
- Automata 2021 [5], Marseille, France.
- UCNC 2019 [6], Tokyo, Japan.

These experiences were in **English** and significantly developed my **oral communication skills**.

SKILLS

Software development

With my background in **algorithmic** and **graph theory** as well as my knowledge of **program proofs, typing, tests** and **interpretation**, I am qualified to work on **efficient and reliable implementations**. I am also fluent in most common programming languages such as **Python**, **C++**, **Ocaml**, **JavaScript**, **C**, **PhP** and **Java**. Being passionate about languages, I have practiced more specific languages such as **Rust** and **Haskell**.

Problem solving

I wish to use my knowledge in **algorithmic** and **languages** to design solutions to given problems. Moreover, during my years as an academic researcher, I learned to **apply the scientific literature** to model and solve problems.

Team work

I particularly enjoy **working in a team** and exchange with colleagues about a topic. Through my previous positions, the many meetings, reports, presentations, and teachings experiences made me develop skills in **oral presentation**, writing **presentations** and **reports** in LaTeX.

DOCTORAL RESEARCH

"Theory and practice of global transormations" [1]

Global transformations is a mathematical framework to describe local and synchronous spatialized dynamical systems such as Cellular Automata and Lindenmayer systems. It originated from the goal of extending such systems to dynamical graphs. This thesis provides a way to express these systems over a wide variety of structures such as words [6] or graphs [4]. Category theory is used to relate the local specification of a system and its global behavior. The extension of this formalism to non-deterministic computations is finally considered [3]. I also implemented a generic engine for defining and computing these systems. The program and examples can be found on my **GitHub** [7].

PRODUCTIONS

[1] Theory and practice of Global Transformations. PhD thesis. 2023. `https://alexandre-fernandez-dev.github.io/thesis.pdf`.

[2] Cellular automata and Kan extensions. *Natural Computing* 22 (2023).

[3] Non-Determinism in Lindenmayer Systems and Global Transformations. *MFCS 2022*.

[4] Accretive Computation of Global Transformations. *RAMiCS 2021*.

[5] Cellular Automata and Kan Extensions. *AUTOMATA 2021*.

[6] Lindenmayer Systems and Global Transformations. *UCNC 2019*.

[7] `https://github.com/Alexandre-Fernandez-dev/Global-Transformations`.

[8] `https://www.irif.fr/~greta/event/2023-feb-24`.