

Sébastien Michelland

Postgraduate computer scientist

☎ +33 7 80 51 26 33 • ✉ sebastien.michelland@protonmail.com • Nov. 1999

Education

École Normale Supérieure de Lyon

Computer Science MSc

Graduated BSc in 2018 and MSc in 2020 (both *summa cum laude*). The curriculum covers general computer science theory along with research experience; I focused on languages, semantics and compilers.

Lyon, France

2017–ongoing

Lycée du Parc

Classe préparatoire

A two-year intensive training preparing students for the entrance exams to competitive French universities.

Lyon, France

2015–2017

Experience

Research

Basic analysis of heap allocation algorithms

2016–2017

I implemented and tested several linked-list-based heap allocation algorithms to compare their memory usage and fragmentation to theoretical expectations [2].

Design of a memory-light CPU architecture

2018

In architecture class, we experimented with an ISA design that keeps memory bandwidth to a minimum [1]. I also wrote an interactive emulator/debugger and a CHIP-8 emulator in its assembler ([repository](#)).

Coq formalization of the dancing links algorithm

June–July 2018 (Paris, France)

I proved the dancing links algorithm in Coq and partially proved an accompanying OCaml version [3].

Study of interactions between LLVM passes

April–June 2019 (Montreal, Canada)

I collected a database of LLVM optimization passes and dependencies, and sketched software engineering tools that study how they interact to guide empirical phase ordering [4].

Extensions of the congruence closure algorithm

February–June 2020 (Grenoble, France)

I developed extensions to the congruence closure algorithm and implemented the resulting decision procedure in OCaml, to be used in an updated version of the Coq tactic congruence [5].

Abstract semantics for monadic interpreters

October–December 2021 (Lyon, France)

I designed and implemented in Coq a basic framework for deriving and proving abstract semantics on *interaction trees*. This works makes it possible to extract abstract interpreters for languages defined by interaction trees.

Projects

Unikernel development on embedded calculators

2015–ongoing

I wrote a unikernel for CASIO calculator applications, which features device drivers, interrupt-based asynchronous I/O, basic USB 2.0 support, and a custom C99 libc. Undocumented hardware modules were reverse-engineered from the official OS binary. The kernel includes a basic hypervisor to transparently take and yield control of the hardware. ([repository](#))

Languages and main skills

French: Native speaker

English: CEFR level C2

CAE 203/210 (2018), TOEFL 116/120 (2021)

C and low-level programming: Advanced

Assemblers, Linker, Loaders, Dynamic linking

Functional programming and type theory: Very comfortable

Also: some experience with C++, Linux administration, LaTeX

References

- [1] Florent de Dinechin, Maxime Darrin, Antonin Dudermel, Sébastien Michelland, and Alban Reynaud. Une architecture minimisant les échanges entre processeur et mémoire. In *ComPAS 2018 - Conférence d'informatique en Parallélisme, Architecture et Système*, pages 1–8, Toulouse, France, July 2018.
- [2] Sébastien Michelland. Rapport TIPE : Gestion de mémoire informatique. https://perso.ens-lyon.fr/sebastien.michelland/bib/tipe_heap_allocation.pdf, Jun 2017.
- [3] Sébastien Michelland. Rapport de stage : Permutations et liens dansants vérifiés en cfml. https://perso.ens-lyon.fr/sebastien.michelland/bib/internship_dancing_links.pdf, Jul 2018.
- [4] Sébastien Michelland. Rapport de stage : exploration et cartographie des passes de llvm. https://perso.ens-lyon.fr/sebastien.michelland/bib/internship_llvm_passes.pdf, Jul 2019.
- [5] Sébastien Michelland. Rapport de stage : Une procédure de décision pour relations d'équivalence. https://perso.ens-lyon.fr/sebastien.michelland/bib/internship_congruence_closure.pdf, Jun 2020.

Updated February 27th, 2022