

# Raphaël Monat

Birthdate: 28/07/1995

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## Publications

- FMCAD'18 **A Verified Certificate Checker for Finite-Precision Error Bounds in Coq and HOL4**, Heiko Becker, Nikita Zyuzin, **Raphaël Monat**, Eva Darulova, Magnus O. Myreen and Anthony Fox.
- VMCAI'17 **Precise Thread-Modular Abstract Interpretation of Concurrent Programs using Relational Interference Abstractions**, **Raphaël Monat**, Antoine Miné.

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## Research-related Activities

- POPL'17 **Student volunteer at Principles Of Programming Languages (POPL), and related conferences**, 1 week, Paris, France.

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## Research Experience

- September 2018 – currently **PhD on Static Analysis by Abstract Interpretation of Dynamic Programming Languages**, Under the supervision of Antoine Miné, at LIP6, Sorbonne Université, France.  
The goal of this PhD is to develop new static analyses of dynamic programming languages (such as Python), and experimentally evaluate their implementations.
- March – August 2018 **Research Internship in Abstract Interpretation**, Under the supervision of Antoine Miné, at LIP6, Sorbonne Université, France, 23 weeks, Grade: 16/20.  
I created a static analysis collecting types for Python, and integrated it in the MOPSA static analyzer.
- February – June 2017 **Research Internship in Formal Verification**, Under the supervision of Eva Darulová, at the Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken, Germany, 19 weeks, Grade: 17.33/20.  
I worked on a static analyser of floating-point programs called *Daisy*, and written in Scala. I extended the formal verification of Daisy, to provide support for mixed-precision floating-point arithmetic. This formal verification consisted in a certificate checker, written in Coq and HOL4.
- May – July 2016 **Research Internship in Probabilistic Programming**, Under the supervision of Hongseok Yang, at the Department of Computer Science, University of Oxford, United Kingdom, 12 weeks, Grade: 18/20.  
During this internship, we expressed probabilistic programming languages into probabilistic transition systems. Then, we developed a new variational inference algorithm working on a probabilistic transition system.
- June – July 2015 **Research Internship in Abstract Interpretation**, Under the supervision of Antoine Miné, at the Ecole Normale Supérieure, France, 8 weeks, Grade: 18/20.  
I learned how to use the Abstract Interpretation framework to develop, implement and test new methods to analyze concurrent programs more precisely. I implemented a prototype in OCaml, using the Apron library, and compared the results obtained with this approach to an academic analyzer called *Concurinterproc*.

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## Education

- 2017–2018 **Master 2 Recherche en Informatique**, Université Paris Diderot, France.  
Parisian Master of Research in Computer Science. Grade point average: 16.41/20.
- 2016–2017 **Master 2 Informatique Fondamentale**, ENS de Lyon, France.  
Second year of Master in Computer Science. Grade point average: 16.49/20.
- 2015–2016 **Master 1 Informatique Fondamentale**, ENS de Lyon, France.  
First year of Master in Computer Science. Grade point average: 16.05/20.

- 2014–2015 **Licence 3 Informatique Fondamentale**, *ENS de Lyon*, France.  
BSc. in Computer Science. Grade point average: 16.43/20.
- 2014 **Entrance to the ENS de Lyon over a competitive exam.**  
Award of four-year scholarship. The ENS de Lyon is a “grande école”, i.e a leading institution of higher education, entrance to which is based on a highly competitive examination.
- 2012–2014 **Classes préparatoires MPSI/MP\***, *Lycée Louis le Grand*, Paris.  
Two-year intensive course preparing for the entrance exam to French “grandes écoles”.
- 2012 **Baccalauréat scientifique, mention Très Bien.**  
High-school diploma with a scientific major, obtained with highest honors.

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## Relevant coursework

- 2018 **Implementation, formalization and proofs about regular expressions and regexp-matching in Coq.**
- 2018 **Proof of correctness of dfs, topological sort and computation of graph dominators in Why3.**
- 2018 **Implementation of a compiler from lambda-calculus down to C in OCaml, performing CPS and defunctionalization.**
- 2017 **Formalization and proofs about Hoare Logic in Coq.**
- 2017 **Implementation of a compiler from a subset of Lustre to Rust in OCaml.**
- 2016 **Implementation of a static analyzer of Java code in OCaml.**
- 2015 **Implementation of a distributed stencil application in C/MPI.**
- 2015 **Implementation of a SAT/SMT solver in C++.**
- 2015 **Implementation of a simple BitTorrent client in C.**
- 2014 **Design of a simple CPU with logic gates using *Logisim*.**

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## Computer skills

- Programming Python, OCaml (proficient); C++, Scala (average); Java (beginner).  
 Proofs Coq, HOL4.  
 Misc L<sup>A</sup>T<sub>E</sub>X, Beamer (proficient).

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## Languages

- English Qualified B2 level (equivalent to proficiency).  
 French Mother tongue.  
 German Basic level.

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## Misc

- 2015–2016 *Student representative for the first year of Master in Computer Science.*
- 27 April 2017 *I helped prepare and organise activities related to research in computer science for high-school girls, during the “Girl’s day”, a national event in Germany.*