

Emily Clement

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Postdoctoral researcher in
computer science at ISIR

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Nationality: French

Research interests

Thematics

- Symbolic optimization
- Model checking, formal verification
- Game theory on graphs
- Timed automata

Research experience

- 2022 – today **Postdoctoral researcher in computer science, ISIR (Sorbonne University), Syroco Team, Paris, France, Layered controller synthesis for dynamic multi-agent systems**
- Modelling the interaction of dynamic several agents with systems of initialized stopwatches timed automata
 - Characterization of collision-avoidance conditions between agents
 - Use of SMT solver to ensure the collision-avoidance conditions while refining the model of speed graph
 - Building of a SWA-SMT solver based of the two first approach to solve the problem.
 - Comparison of RL training with and without the help of the SWA-SMT solver
 - This works takes place in the ANR project and is accepted to FORMATS2023. [TickTac](#)
 - Supervisor: [Nicolas Perrin-Gilbert](#)
 - Joint work with Philipp Schlehuber
- 2018 – 2022 **PhD: Robustness of timed automata: computing the maximally-permissive strategies, INRIA center of Rennes & Mitsubishi Electric R&D Centre Europe (MERCE), SUMO Team**
- Goal: compute the maximally-permissive strategies and the permissiveness
 - Studying the delay perturbations of acyclic timed automata. Quantification of this perturbation
 - Modelling the perturbed semantics as a turn-based games with a function to optimize for the player and the opponent
 - Computation of a maximally-permissive strategy, using of convex geometry and linear programming
 - Use of a backtrack algorithm to compute a numerical approximated value of the permissiveness
 - Two of the three proposed algorithms are implemented (see Publication and projects section, p 2)
 - This works takes place in the ANR project [TickTac](#)
- January 2018 – June 2018 **Research internship: The problem of polynomial learning with Errors, IRISA Rennes - EMSEC Team, France**
- Cryptanalysis on post-quantum lattice-based problems
 - Supervisor: Adeline Roux-Langlois
- 2016 (2 months) **Research internship: Classification of random finite groups, University of Bristol, England**
- Classification of algebraic and geometric property for random finite groups
 - Supervisor: John Mackay
- 2015 (2 months) **Research internship: Error-correcting codes, INRIA Saclay - LIX, GRACE Team, France**
- Implementation of error-correcting codes and their decoding methods (in sagemath)
 - Supervisor: Alain Couvreur

Education

- 2018 – 2022 **University of Rennes 1**, *PhD in computer science*, Robustness of timed automata : computing the maximally-permissive strategies
- Supervisors: [Thierry Jéron](#), [Nicolas Markey](#) and [David Mentré](#)
 - Defended in March 2022: links to [manuscrit](#) & [slides](#)
 - Reviewer: [Franck Cassez](#) & [Catalin Dima](#)
- 2017 – 2018 **ENS Rennes - Univ Rennes 1**, *Master of computer science*
- Main courses (see page 4 for details): Optimization, AI, Cybersecurity
- 2015 – 2017 **ENS Rennes - Univ Rennes 1**, *Master of Mathematics*
- Specialization: Computer algebra
 - Successful application of the *agrégation*: a competitive examination for civil service in the french public education
- 2014 – 2015 **ENS Rennes - Univ Rennes 1**, *Bachelor of Mathematics*

Teaching experience

- 2018 – 2021 **Tutor, University of Rennes 1**
- Delivering 35 hours of practical sessions in Java for a group of 20 first year computer science undergraduate students. Co-creation of exams. Supervision and correction of student's projects.
 - Delivering 50 hours of practical sessions and lectures in Java for Bioinformatics master students. Creation of lectures. Correction of student's projects.
 - Delivering 18 hours of tutorial sessions for a formal language course for computer science bachelor students.
- 2019 – 2020 **Tutor, ENS Rennes**
- Organising and delivering 10 hours of mathematics lectures for 6 computer science master students, to prepare them to the *agrégation of mathematics*. Co-organizing the lectures with the three other presenters.
 - Delivering tutorial sessions on Algebraic computation (8 hours) to computer science bachelor students. Co-writing the exam of the other presenter.
- 2018 – 2019 **Tutor/Mentor, Junior high school, *L codent L Créent***
- Delivering practical sessions in Python and Processing to make junior high school students discover computer science.

Admin experience

- 2019 – 2022 **Center INRIA of Rennes**, *Member of INRIA centre committee*
- Representative of the non-permanent members
 - Member of the office center
 - Active member for the operation to help students during the COVID crisis
- 2017 – 2018 **University of Rennes 1**, *Representative of the mathematics students*
- Since 2019 **Member of the board of directors in a voluntary association**, *Académie de Danse 4Temps*, Paris
- Collaboration with the *Fédération française de danse*
 - Secretary of the association
 - Creation of resources for teachers

Publications and projects

- FORMATS2023 **Emily Clement, Nicolas Perrin-Gilbert, Philipp Schlehuber, 2023**, *Layered controller synthesis for dynamic multi-agent systems*
Accepted conference paper

- FORMATS2020 **Emily Clement, Thierry Jéron, Nicolas Markey, David Mentré, 2020**, *Computing maximally-permissive strategies in acyclic timed automata (link to paper)*, Formal Modeling and Analysis of Timed Systems - 18th International Conference
- Layered controller synthesis for dynamic multi-agent systems **Python project**, *GPL Licence*, The implementation of our controller synthesis of our FORMATS2023 paper
 ○ <https://gitlab.com/Milly/robotic-synthesis>
 ○ Videos of tests: <https://perso.eleves.ens-rennes.fr/people/Emily.Clement/Implementation/multi-agent.html>
- Numerical implementation **Python project**, *GPL Licence*, A python prototype numerically computing the robustness of timed automata
 ○ gitlab.inria.fr/emclemen/numpyrobustness
- Symbolic implementation **Python project**, *GPL Licence*, A symbolic PPL based implementation of FORMATS2020 algorithm
 ○ gitlab.inria.fr/emclemen/formats-symbolic-tools

IT skills

- Python **Advanced**
 ○ Projects during my master (Supervised machine learning, cryptanalysis)
 ○ PhD implementation projects, using pply and networkx, and verification tools for testing (pytest, mutmut, pytest-cov)
- Java **Advanced**
 ○ Three years of tutoring for bachelor and master students
 ○ Use of verification tools for testing (JTest, Pit test)
- Sagemath **Intermediate**
 ○ 2 months project in Bachelor research internship
 ○ Use during my bachelor and master of mathematics
- Rust **Beginner**
 ○ I have taken a week of tutorial with OcamlPro (level covered: beginner to advanced)
- Ocaml **Beginner**
- HTML **Beginner**
 ○ Basic creation of websites

Conference presentations

- FORMATS2020 **Computing maximally-permissive strategies in acyclic timed automata**, *Emily Clement, Thierry Jéron, Nicolas Markey, David Mentré*
 Presentation of a conference paper
- MOVEP2020 **Summer school MOVEP**, *Verimag, Grenoble*, Formal methods
 Presentation of a short paper

Referees

- Dr Thierry Jéron **Researcher director**, *IRISA/INRIA Rennes, FRANCE*, +33299847464, thierry.jeron@inria.fr
 PhD director
- Dr Nicolas Markey **Researcher director**, *IRISA/CNRS, Rennes FRANCE*, +33299842276, nicolas.markey@inria.fr
 PhD co-director
- Dr David Mentré **Research manager**, *Mitsubishi Electric R&D Centre Europe, Rennes, FRANCE*, d.mentre@fr.mercedes-mee.com
 PhD supervisor
- Dr Nicolas Perrin-Gilbert **CNRS researcher**, *ISIR, Campus Pierre et Marie Curie, Paris, FRANCE*, +33144279628, nicolas.perrin@sorbonne-universite.fr
 Postdoctoral supervisor

Languages

French **Native speaker**

Anglais **Good speaker, C1**

TOEIC : 855/990

Followed courses in Computer Science Master & in PhD

Formal methods

- Complex Systems verification (Nicolas Markey & Ocan Sankur)
- Introduction to model checking (Sophie Pinchinnat)

Optimization

- Solvers Principles and Architecture (Khalil Ghorbal)
- Game Theory and application (Patrick Maillé, Bruno Tuffin)

AI

- Data analysis and stochastic modeling (Guillaume Gravier)
- Supervised Machine Learning (François Coste, Ewa Kijak)
- High Dimension Learning (Remi Gribonval)

Cybersecurity

- Secured Cryptographic Implementations (Benoit Gerard)
- Lattice-based Cryptography (Christophe Ritzenthaler, Adeline Roux-Langlois)
- Security Protocols (Stephanie Delaune, Barbara Fila)
- Data security for intellectual property and privacy (Guillaume Piolle, Caroline Fontaine, Tristan Allard)