Emily CLEMENT

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Nationality: French
Date of Birth: 03/07/1994

Research Interests

- **Timed Automata, Concurrency, Higher Dimensional (Timed) Automata, Robustness**
- **Symbolic Optimisation, Computational Geometry, Polyhedra**
- **Model checking, Formal Verification, Games Theory on Graphs**
- **Well quasi-orders, Complexity**

Research experience

September 2023 – now
A.T.E.R, *IRIF (Paris Cité University), Paris*, Verification Team
- One-year contract of teaching & research.
- 166 heqTD of teaching for bachelor students (L1, L2, L3) in algorithmics, formal languages, objects-oriented programming
- Supervision and organization of students project.

April 2022 – May 2023
Postdoctoral researcher, *ISIR (Sorbonne University), Paris*, SYROCO Team
Layered controller synthesis for dynamic multi-agent systems, using Timed Automata with stopwatches, SMT solver and Reinforcement Learning.
Work published in FORMATS 2023 conference.
- Advisor: Nicolas PERRIN-GILBERT (CNRS researcher, ISIR).
- In collaboration with Philipp SCHLEHUBER, associate professor at EPITA/LRE.

2018 – 2022
PhD in Computer Science, *INRIA Rennes (Rennes-I University), SUMO Team & Mitsubishi Electric R&D Centre Europe*, Robustness of timed automata: computing the maximally-permissive strategies,
- Study of the robustness of Timed Automata, modeled as temporal perturbations of delays, for reachability properties.
- Quantification of the enabled perturbation into a symbolic function called permissiveness.
- Computation of the maximally-permissiveness with the optimisation of a two-players game
- Defended in March 2022
- Directors/Supervisors: Thierry JÉRON, Nicolas MARKEY and David MENTRÉ
- Reviewer: Catalin DIMA & Franck CASSEZ. Commitee: Béatrice BÉRARD, Thomas CHATAIN, Pierre-Alain REYNIER, Catalin DIMA, Franck CASSEZ.

2018 (6 months)
Research internship: Cryptanalysis of post-quantum lattice-based problem (Polynomial learning with Errors), *IRISA Rennes - EMSEC Team*, France
Supervisor: Adeline ROUX-LANGLOIS.

2016 (2 months)
Research internship: Some geometric and algebraic properties of some random groups, *University of Bristol*, England
Supervisor: John MACKAY.

2015 (2 months)
Research internship: Gabidulin Codes, *INRIA Saclay - LIX, GRACE Team*, France
Supervisor: Alain COUVREUR.

Education

2018 – 2022
PhD in computer science, *Rennes-I University*, Robustness of timed automata: computing the maximally-permissive strategies

2017 – 2018
Master of computer science, *ENS Rennes - Rennes-I University*

2015 – 2017	**Master of Mathematics**, *ENS Rennes - Rennes-I University* ○ Successful *agrégation de mathématiques*, option C (computer algebra) (a competitive examination for civil service in the French public education)
2014 – 2015	**Bachelor (L3) of Mathematics**, *ENS Rennes - Rennes-I University*
2011 – 2014	**CPGE (Higher school preparatory classes) in Mathematics-Physics**, *Lycée Chateaubriand, Rennes*

Publications

FORMATS 2023	**Layered controller synthesis for dynamic multi-agent systems**, *Emily* CLEMENT, *Nicolas* PERRIN-GILBERT, *Philipp* SCHLEHUBER-CAISSIER Long version: https://arxiv.org/pdf/2307.06758.pdf
FORMATS 2020	**Computing maximally-permissive strategies in acyclic timed automata**, *Emily* CLEMENT, *Thierry* JÉRON, *Nicolas* MARKEY, *David* MENTRÉ Long version: https://arxiv.org/pdf/2007.01815.pdf

Implementations

Robustness of timed automata	**Numerical approximate implementation**, *Python project*, Constructs an algorithm that computes an approximation of the robustness of timed automata, for a fixed valuation, with a backward algorithm (details in Chapter 6.1 of my thesis) ○ GPL Licence. ○ **git**: https://gitlab.inria.fr/emclemen/numpyrobustness.
Robustness of timed automata	**Symbolic exact implementation**, *Python project*, Implements an algorithm that computes the robustness of timed automata, for any valuation (details in Chapter 5 and 6.2 of my thesis and in FORMATS 2020 article). This implementation uses PPLPY library to manipulate polyhedra and construct piecewise-affine functions in arbitrary finite dimensions ○ GPL Licence, docker available. ○ **git**: https://gitlab.inria.fr/emclemen/formats-symbolic-tools.
Control synthesis	**Layered controller synthesis for dynamic multi-agent systems** , *Python project*, Implements an algorithm that models the behaviour of several agents with parametric timed automata augmented with stopwatches. We implemented a three-layer method based on timed automata, smt solvers and reinforcment learning. ○ GPL Licence, docker available. ○ **git**: https://gitlab.com/Millly/robotic-synthesis. ○ Videos of the results: https://perso.eleves.ens-rennes.fr/people/Emily.Clement/Implementation/multi-agent.html.
Multivariate Polynomials	**Buchberger algorithm**, *Ocaml project*, Library providing multivariate polynomials, with lexicographic and gradlex order. Implementation of Buchberger algorithm. ○ GPL Licence ○ **git**: https://gaufre.informatique.univ-paris-diderot.fr/clemente/grobner-chains

Projects

Research project	**Member of TickTac ANR Project**, $2018 - 2022$ *(PhD)* and $2022 - 2023$ *(post-doctoral researcher)* http://www.irisa.fr/sumo/ticktac/

Scientific talks

Seminars	**Automata Team Seminar (IRIF 2023), Verification Team Seminar (IRIF, 2023),Amac Team Seminar (ISIR, 2023), ELSE seminar (IRISA, 2022), SUMO Team Seminar, Syroco Team Seminar (ISIR, 2022), ENS Rennes (2018)**
International Conferences	**FORMATS 2023, FORMATS 2020**

GT and GDR	**Talk at National Day of GT-Verif (IRIF, 2023), poster at National Day of GDR-IM (IRIF, 2023), talk at National Day of MT2V (2023)**
Summer schools	**MOVEP 2020**
ANR Meetings	**MaveriQ Meeting (2023), TickTac Meeting (2023 & 2018)**

Scientific popularisation

Fête de la Science	**2023, IRIF**, *Computer Science Unplugged sessions*
	4 sessions during a week of tutorials where we introduce computer science with board games to different type of young childrens
JPPJAI	**2019, IRISA**, *Computer Science Unplugged sessions*
	Introduction with board games of computer science to junior school students

Teaching experience

2023 – 2024 — Java tutorials
- 48 hours
- **Students**: second year computer science bachelor degree.
- **Responsibilities**: tutoring of tutorial sessions, organization of the implementation projects of students

2023 – 2024 — Formal Language and Lexical Analysis tutorial and practical sessions
- 36 hours
- **Students**: second year computer science bachelor degree.
- **Responsibilities**: tutoring tutorial and practical sessions, exam surveillance, correction of students' exam

2023 – 2024 — Algorithmic tutorial sessions
- 24 hours
- **Students**: third year computer science bachelor degree.
- **Responsibilities**: tutoring tutorial sessions, exam surveillance, Creation and correction of mid-term exam.

2019 – 2021 — Java practical sessions
- 34 hours
- **Students**: first year computer science bachelor degree.
- **Responsibilities**: tutoring of practical sessions, exam surveillance, correction of students' projects and co-creation of a mid-term exam subject.

2018 – 2020 — Java practical sessions & a lecture class
- 50 hours
- **Students**: first year of a bio-computer science master degree.
- **Responsibilities**: supervision of practical sessions, exam surveillance, correction of students' projects and creation and delivery of a two hours lecture.

2019 – 2020 — Mathematics tutorials and lectures
- 10 hours
- **Students**: first year computer science master degree.
- **Responsibilities**: co-organisation of the course with three other teachers, creation and delivery of ten hours of tutorials and lectures.
- **Goal**: training these students to prepare for the following year's "agrégation de mathématiques".

2019 – 2020 — Formal language tutorials
- 18 hours
- **Students**: third year computer science bachelor degree
- **Responsabilities**: tutoring the tutorials sessions.

2018 – 2019 — Computer algebra tutorials, *computer science bachelor students*
- 8 hours
- **Students**: third year computer science bachelor degree.
- **Responsabilities**: creating the tutorials subjects and corrections, tutoring the tutorials sessions, co-creation of the exam subject and of its correction, exam surveillance

2018 – 2019 **Python/Processing practical sessions**
- 10 hours
- **Students**: junior high school.
- **Responsabilities**: tutoring the practical sessions, creation of a sheet used to explain key geometric and algorithmic notions

Programming skills

Python **Advanced**
- PhD and post-doctoral implementation projects (see section "Publications & projects")
- Projects during my master (Supervised machine learning, cryptanalysis)
- Use of test tools (pytest, mutmut, pytest-cov)

Ocaml **Advanced**
- Post-doctoral implementation project (see section "Publications & projects")

Java **Advanced**
- Teaching for bachelor and master students
- Use of test tools (JTest, Pit test)

Sagemath **Intermediate**
- 2 months project in Bachelor research internship
- Used during my bachelor and master of mathematics

Rust **Beginner**
- Attended a one week tutorial at OcamlPro (level covered: beginner to advanced)

Languages

French **Native speaker**

Anglais **Fluent**

Administrative responsibilities

2019 – 2022 **Center INRIA of Rennes**, *Member of INRIA comité de centre*
- Representative of the non-permanent members (engineers, doctoral students, post-doctoral researchers)
- Member of the office center (*i.e.* preparation of meetings agendas...) form May 2021 to March 2022
- Active member for the actions to support PhD students during the COVID crisis, for instance:
  - setting up and managing a discord server for non-permanent members
  - participation in the organisation of several virtual seminars of one to two hours, where several speakers talk (staff, former PhD students...) and PhD students can ask questions.
  - participation as a speaker seminars: "How to get started with your PhD?", "How to teach during your PhD?"

2017 – 2018 **University of Rennes**, *Representative of the mathematics students*

Referees

PhD directors
- Nicolas Markey: nicolas.markey@cnrs.fr
- Thierry Jéron: thierry.jeron@inria.fr
- David Mentré: D.Mentre@fr.merce.mee.com

Post-doctoral Directors
- Nicolas Perrin-Gilbert: nicolas.perrin@sorbonne-universite.fr

Collaborators
- Sylvain Schmitz: sylvain.schmitz@irif.fr
- Uli Fahrenberg: uli.fahrenberg@epita.fr

Interests

2020 - now **Slackline, Dance (Waltz, West Coast Swing, 4Time)**
Secretary of a voluntary dance association (Académie de Danse 4Temps) collaborating with *Fédération Française de Danse*.