

Gabriel Bathie

9 Rue d'Odessa

75014, Paris

+33 6 27 82 70 56

gabriel.bathie@gmail.com

perso.ens-lyon.fr/gabriel.bathie/

Ph.D. Student,

LaBRI, Université de Bordeaux, and DI, ENS Ulm, PSL Research University

I am a Ph.D. student in computer science, advised by Nathanaël Fijalkow at LaBRI (Bordeaux) and Tatiana Starikovskaya at DI ENS (Paris). I have broad interests in computer science. My research is focused on the theory of algorithms, with an emphasis on search algorithms, for *approximate pattern matching* and *program synthesis*. I enjoy programming: through programming competitions, both as a participant and an organizer, or by writing programs, for fun or for open source software. My favorite programming languages are C++, Python, and since more recently, Rust. In my free time, I enjoy reading (mostly fiction) and playing sports or videogames with friends.

Currently: since Sept 2022 **Graduate Researcher**, supervised by *Nathanël Fijalkow and Tatiana Starikovskaya*, LaBRI, Université de Bordeaux, and DI ENS, Paris, France.
Title: Efficient algorithms for search problems.

Research Experience

- Spring 2022 **Visiting Researcher**, hosted by *Ryan Williams*, CSAIL, Massachusetts Institute of Technology (MIT), Cambridge MA, USA, 5 months.
 - Title: Uniform formula lower bounds for the satisfiability problem.
- Fall 2021 **Research Internship**, supervised by *Claire Mathieu and Adrian Vladu*, IRIF, Université Paris Cité, France, 5 months.
 - Title: Networks, Percolation and Algorithms: applications to epidemics control.
- Spring 2021 **Research Internship**, supervised by *Nicolas Bousquet and Théo Pierron*, LIRIS, Université de Lyon, France, 5 months.
 - Title: Efficient kernels for various graph edition problems.
- Spring 2020 **Research Internship**, supervised by *Tatiana Starikovskaya*, DI, ENS Paris, France, 4 months.
 - Title: Property testing of regular languages and applications.
- Summer 2019 **Research Internship**, supervised by *Loris Marchal and Yves Robert*, Laboratoire de l'Informatique du Parallélisme (LIP), ENS de Lyon, France, 6 weeks.
 - Title: Dynamic scheduling of DAGs under memory constraints.
- Summer 2018 **Research Internship**, supervised by *Pierre Weiss*, Institut des Technologies Avancées en sciences du Vivant (ITAV), Toulouse, France, 1 month.
 - Title: Contrast invariant SNR and isotonic regressions.

Education

- 2019–2022 **M.Sc. in Theoretical Computer Science**, *École Normale Supérieure de Lyon*, France, with Highest Honors, ranked first.
- 2018–2019 **B.Sc. in Theoretical Computer Science**, *École Normale Supérieure de Lyon*, France, with Highest Honors, ranked first.
- Fall 2017 **Exchange semester, Mathematics**, *University of Texas at Austin*, Austin, TX.
- 2015–2018 **B.Sc. in Applied Mathematics**, *INSA Toulouse*, France.

Selected publications

Property testing of regular languages with applications to streaming property testing of visibly pushdown languages G. Bathie and Tatiana Starikovskaya, published in *ICALP 2021*, CORE rank A.

In this article, we give an extremely fast algorithm that tells whether a string is very far from the language of a given regular expression. We then use this result to design an improved algorithm for the related problem of recognizing visibly pushdown languages in streaming. This class of languages is a subclass of context-free languages which captures nested definitions, and is namely used for program analysis.

Revisiting dynamic DAG scheduling under memory constraints for shared-memory platforms G. Bathie, Loris Marchal, Yves Robert and Samuel Thibault, published in *IPDPS 2020*, CORE rank A.

This article received the **Outstanding Paper Award**, and was invited for publication in a special issue of the *IJNC*.

In this work, we study the problem of scheduling tasks on a multi-processor, shared-memory computer, without exceeding the available memory. We show that the problem is NP-complete and hard to approximate. We propose a solution based on Integer Linear Programming to solve it, and show that it performs well in experiments.

Contrast invariant SNR and isotonic regressions Pierre Weiss, Paul Escande, G. Bathie and Yiqiu Dong, published in *IJCV* vol. 127, 2019, impact factor 19.5.

In this article, we focus a computer vision problem in which the goal is to tell whether two images represent the same scene under illumination (i.e. contrast) changes. We design a new algorithm based on monotone regression that computes a similarity measure of two images up to contrast change, and provide an open-source MatLab implementation.

Courses Taught

- Fall 2023 Algorithms, 2nd year undergrad (CPES), PSL University
- Spring 2023 Algorithms, 2nd year CS undergrad, Université Paris Cité
- Fall 2022 Introduction to Operating Systems, 1st year CS undergrad, Université Paris Cité
- Fall 2021 Automata and Lexical Analysis, 1st year CS undergrad, Université Paris Cité

Conferences, Workshops and Events

Community Service:

- Reviewer: I have been a reviewer for the following conferences: WADS'23, ESA'23
- Organizer: I have been a co-organizer for the following events: DI ENS Young Researchers Seminar, pre-CPM'23 Summer School, SWERC'23-24 Programming competition, New Horizons in Stringology Workshop (Marseille, July 2024)

You might have seen me at...

- Conferences: ICALP'21, ITCS'21, IPEC'22, CPM'23, ISAAC'23,
- Workshops and Summer schools: Sequences'23, EPIT'23, ADFOCS'23,

Skills

Programming Languages

- **Advanced:** Rust, Python, C/C++, LaTeX
- **Bases:** OCaml, Haskell, Java, Kotlin, R, C#, Bash, Javascript

Programming contests results

- 2023 **Shaker Coding Battle**, *french algorithms contest*, 21st place, (2000+ participants).
- 2023 **Code on Time by Meritis**, *french optimization contest*, 2nd place, (300+ participants).
- 2023 **Meilleur Dev de France**, *french algorithms contest*, 14th place, (600+ participants).
- 2022 **PACE Challenge**, *international research optimization contest*, 2nd place, (15 participating teams).
- 2022 **Shaker Coding Battle**, *french algorithms contest*, 7th place, (3000+ participants).
- 2021 **Google Hashcode**, *international optimization contest*, 68th place, (6500+ participating teams).
- 2021 **ICPC SWERC Finals**, *international algorithms contest*, 33rd place, (107 participating teams).
- 2021 **PACE Challenge**, *international research optimization contest*, 3rd place, (11 participating teams).
- 2020 **ICPC SWERC Finals**, *international algorithms contest*, 41st place, (95 participating teams).
- 2019 **Prologin national finals**, *french algorithms and AI contest*, 22nd place, (500+ participants).
- 2018 **Shaker Coding Battle**, *french algorithms contest*, 5th place, (3000+ participants).

Open-source contributions

- Salaires.dev Open database of salaries in tech companies. I contributed by adding a data visualization page to the website, which previously only contained a table. The back-end is implemented in Rust, the frontend uses D3.js. (PR currently under review.)

Languages

- French: Mother Tongue
- English: Fluent (Cambridge Advanced Exam - C2)

References

- Research advisor **Tatiana Starikovskaya**, *Associate Professor of Computer Science*, TALGO, DI ENS, École Normale Supérieure de Paris, France.
E-mail: tat.starikovskaya@gmail.com
- Research mentor **Ryan Williams**, *Professor of Electrical Engineering and Computer Science*, CSAIL, Massachusetts Institute of Technology (MIT), Cambridge MA, USA.
E-mail: rrwilliams@gmail.com

Complete list of Publications

Conference articles

- [1] Gabriel Bathie and Ryan Williams. Towards stronger depth lower bounds. In *ITCS'24*, 2024.
- [2] Gabriel Bathie, Tomasz Kociumaka, and Tatiana Starikovskaya. Small-space algorithms for the online language distance problem for palindromes and squares. In *ISAAC'23*, 2023.
- [3] Gabriel Bathie, Gaétan Berthe, Yoann Coudert-Osmont, David Desobry, Amadeus Reinald, and Mathis Rocton. Pace solver description: Dreyfvs. In *IPEC'22*, 2022.
- [4] Valentin Bartier, Gabriel Bathie, Nicolas Bousquet, Marc Heinrich, Théo Pierron, and Ulysse Prieto. PACE Solver Description: μ Solver-Heuristic Track. In *IPEC'21*, 2021.
- [5] Valentin Bartier, Gabriel Bathie, Nicolas Bousquet, Marc Heinrich, Théo Pierron, and Ulysse Prieto. PACE Solver Description: PaSTEC-PATHs, Stars and Twins to Edit Towards Clusters. In *IPEC'21*, 2021.
- [6] Gabriel Bathie, Nicolas Bousquet, and Théo Pierron. (Sub)linear kernels for edge modification problems towards structured graph classes. In *IPEC'21*, 2021.
- [7] Gabriel Bathie and Tatiana Starikovskaya. Property testing of regular languages with applications to streaming property testing of visibly pushdown languages. In *ICALP'21*, 2021.
- [8] Gabriel Bathie, Loris Marchal, Yves Robert, and Samuel Thibault. Revisiting dynamic DAG scheduling under memory constraints for shared-memory platforms. In *IPDPS'20*, pages 597–606. IEEE, 2020. Received the Outstanding Paper Award, invited for publication in a special issue of *IJNC*.

Journal articles

- [9] Gabriel Bathie, Nicolas Bousquet, Yixin Cao, Yuping Ke, and Théo Pierron. (Sub)linear Kernels for Edge Modification Problems Toward Structured Graph Classes. *Algorithmica*, 85(8):1–27, 2022.
- [10] Gabriel Bathie, Loris Marchal, Yves Robert, and Samuel Thibault. Dynamic DAG Scheduling Under Memory Constraints for Shared-Memory Platforms. *IJNC*, 11:27–49, 2021.
- [11] Pierre Weiss, Paul Escande, Gabriel Bathie, and Yiqiu Dong. Contrast invariant SNR and isotonic regressions. *IJCV*, 127(8):1144–1161, 2019.