ALBERTO LARRAURI

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EMPLOYMENT AND EDUCATION

Senior Research Associate   *July 2023 -*
University of Oxford.
Funded by the UKRI (formelrly ERC) grant *New Approaches to Approximability of Satisfiable Problems.*

Junior Research Fellow   *October 2024 -*
Kellogg College, University of Oxford.

Research assistant   *October 2020 - December 2022*
Technical University of Graz.

PhD in Applied Mathematics   *September 2019 - March 2023*
Universitat Politècnica de Catalunya.
Funded by the ERC grant *A Unified Theory of Algorithmic Relaxations.*
Awarded the Excelent Cum Laude grade.

Master's degree in Advanced Mathematics and Mathematical Engineering
September 2018 - July 2019
Universitat Politècnica de Catalunya.

Bachelor's degree in Mathematics   *September 2014 - July 2018*
Universidad de Zaragoza.

RESEARCH INTERESTS

Constraint satisfaction problems, algorithms and complexity, finite model theory, random structures.

PEER-REVIEWED PUBLICATIONS

Synthesis of Controllers for Continuous Blackbox Systems, B. Maderbacher, F. Windisch, A. Larrauri, and R. Bloem. International Conference on Verification, Model Checking, and Abstract Interpretation, 2025.

Solving promise equations over monoids and groups , A. Larrauri, S. Živný. International Colloquium on Automata, Languages and Programming, 2024.

Limiting probabilities of first order properties of random sparse graphs and hypergraphs, A. Larrauri, T. Müller, M. Noy. Random Structures & Algorithms, 2022.

Industry Paper: Surrogate Models for Testing Analog Designs under Limited Budget a Bandgap Case Study, R. Bloem, A. Larrauri, R. Lengfeldner, C. Mateis, D. Ničković & B. Ziegler. Emebedded Systems Week (ESWEEK), 2022.

Probabilities of first order sentences on sparse random relational structures: An application to definability on random CNF formulas, A. Larrauri. Journal of Logic and Computation, 2021.

PREPRINTS AND ARTICLES IN PREPARATION

Optimal Inapproximability of Promise Equations over Finite Groups, S. Butti, A. Larrauri, S. Živný. Preprint availiable as arXiv:2411.01630. Under submission at STOC.

Limiting Probabilities of First Order Properties of Sparse Graphs with Given Degree Sequences, A. Larrauri, G. Perarnau. Preprint availiable as arXiv:2405.14836. Under submission at Random Structures and Algorithms.

Convergence Laws for Extensions of First-Order Logic with Averaging, S. Adam-Day, M. Benedikt, A. Larrauri. Under submission at LICS.

Minimization and Synthesis in Sequential Compositions of Mealy Machines: Revisited, A. Larrauri, R. Bloem. Preprint available as arXiv:2105.10292.

Conformance Testing of Mealy Machines Under Input Restrictions, A. Larrauri, R. Bloem. Preprint available as arXiv:2206.07441.

Efficient Decision Algorithms in Promise Constraint Satisfaction: Ineffectiveness for Search and Undecidability of Meta-Problems, A. Larrauri, in preparation.

Preservation Theorems on Random Graphs, A. Larrauri, in preparation.

THESES

First order logic of random sparse structures,
PhD Thesis, Universitat Politècnica de Catalunya, 2023.

First order logic of sparse hyper-graphs,
MSc Thesis, Universitat Politècnica de Catalunya, 2020.

TEACHING

Quantum Information, class tutor, Computer Science BSc (optional) / MSc in Advanced Computer Science (optional), University of Oxford, Hilary Term 2025.

Probabilistic Combinatorics, class tutor, Mathematics BSc (optional), University of Oxford, Hilary Term 2024.

Combinatorial Optimization, class tutor, Computer Science BSc (optional), University of Oxford, Michaelmas Term 2023.

Logic and Computability, supporting role. Computer Science BSc (mandatory), TU Graz. Summer Semester 2022.

Model Checking, supporting role. Computer Science MSc (optional), TU Graz. Summer Semester 2021.

Problem Workshop. 1st and 2nd Semester Mathematics BSc, Universitat Politècnica de Catalunya. Sep. 2019 - Jul. 2020.

PARTICIPATION IN RESEARCH PROJECTS

Currently supported by the UKRI (formerly ERC) project *New Approaches to Approximability of Satisfiable Problems* (EP/X024431/1).

Supported in the past by:

- The ERC project *A Unified Theory of Algorithmic Relaxations* (H2020-648276),

- The FFG project ADVANCED (874044), and

- The FFG project FATE (894789).

Contributed to:

- *Combinatorics: new trends and real-world applications*, (PID2020-113082GB-I00) funded by the Spanish Ministry for Science and Innovation

- *Geometric, algebraic and probabilistic combinatorics* (MTM2017-82166-P) funded by the Spanish Research Council.

ACTIVITY IN RESEARCH-RELATED EVENTS

Speaker at the CSP Wold Congress 2024.

Speaker at the International Colloquium on Automata, Languages and Programming, 2024.

Speaker at the Birmigham CSP Meeting, 2024.

Participant at the CSP Wold Congress 2023.

Participant at the EPIT 2023 summer school.

Speaker at the BYMAT 2022 Conference

Participant in the 1st and 3rd editions of the GAPCOMB Worshop.

Part of the organization of the CSL 2020 conference.

Speaker at the Theoretical Computer Science Seminar, University of Oxford.

Speaker at the LIMDA Seminar, Universitat Politècnica de Catalunya.

Speaker at the SCOS Seminar, Graz University of Technology.

PEER-REVIEW

ACM Transactions on Computation Theory.

European Conference On Combinatorics, Graph Theory And Applications.

International Colloquium on Automata, Languages and Programming.

Computer Science Logic.

Computer-Aided Verification.

Verification, Model Checking, and Abstract Interpretation.

Formal Methods in Computer-Aided Design.

AAAI Conference on Artificial Intelligence.

RESEARCH VISITS

Technical University of Hamburg   *23/10/2023 - 28/10/2023*
Hosted by Antoine Mottet.

SKILLS

Programming languages	C++, Phyton, Java
Software & Tools	LaTeX, SageMath
Languages	Spanish (native), English (level C1), German (level B1)