

# Clara Lacroce

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## Personal Profile

I am a passionate and fast-learning scientist with over eight years of experience in AI and machine learning and a strong background in mathematics. Currently pursuing opportunities in data science and consulting.

## Education

### McGill University

Montréal, Canada

#### PhD in Computer Science

2016 - 2022

- Specialization: Machine learning, automata theory, Hankel operators.
- Thesis: *The approximate minimization problem of weighted finite automata and applications to language modelling: an approach based on Adamyman-Arov-Krein theory*
- Supervisors: Prakash Panangaden, Doina Precup.

### Concordia University

Montréal, Canada

#### MSc in Mathematics, ALGANT Erasmus Mundus

2015 - 2016

- Specialization: Number theory.
- Thesis: *Deformations of Galois Representations.*
- Supervisor: Adrian Iovita.

### Università degli Study di Padova

Padova, Italy

#### Master in Mathematics, ALGANT Erasmus Mundus

2014 - 2016

- Specialization: Algebra, Geometry

#### BSc in Mathematics

2010 - 2014

- Specialization: Group Theory

## Work Experience

### McGill University

Montréal, Canada

#### Postdoctoral Researcher

Oct 2022 - Current

- Investigated the learning capabilities of deep sequence models and connections with models from formal language theory.
- Co-led the efforts and mentored the work of 3 graduate student.
- Invited to present my work at international venues.

#### Teaching Assistant

2017 - 2020

- Led tutorials and Q&A sessions with 50 students.

#### Invigilator

2017 - 2019

- Provided a safe environment to allow each student to perform to the best of their abilities on the exam.

### Université Jean Monnet

Saint-Étienne, France

#### Invited Visiting Researcher

2023

- Funded to work for a month at Laboratoire Hubert Curien

### Boulangerie Arte & Farina

Montréal, Canada

#### Baker and Cashier

2018 - 2019

- Multitasked front and customer service in English, French and Italian.

### Concordia University

Montréal, Canada

#### Teaching Assistant

2016 - 2027

- Graded assignments and provided feedback to students.

### University of Padova, Board of Directors

Padova, Italy

#### Student Representative, BofD

2015 - 2015

- Advocated for students needs, elected to represent ~60K students.

## Selected Publications

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### Optimal Approximate Minimization of One-Letter Irredundant WFAs

Clara Lacroce\*, Borja Balle, Prakash Panangaden and Guillaume Rabusseau

*Under review in the Journal Mathematical Structure in Computer Science (2023). 2023*

### Simulating weighted automata over sequences and trees with transformers

Michael Rizvi\* and Maude Lizaire and Clara Lacroce and Guillaume Rabusseau

*To appear in Proceedings of the Twentyseventh International Conference on Artificial Intelligence and Statistics, AISTATS 2024, 2024*

### Length independent PAC-Bayes bound for saturated Simple RNNs

Volodimir Mitarchuck\* and Clara Lacroce and Remi Emonet and Remi Eyraud and Amaury Habrard and Guillaume Rabusseau

*To appear in Proceedings of the Twentyseventh International Conference on Artificial Intelligence and Statistics, AISTATS 2024, 2024*

### The approximate minimization problem of weighted finite automata and applications to language modelling: an approach based on Adamyan-Arov-Krein theory

Clara Lacroce

*McGill University (2022). 2022*

### Towards an AAK Theory Approach to Approximate Minimization in the Multi-Letter Case

Clara Lacroce\*, Prakash Panangaden and Guillaume Rabusseau

*CoRR abs/2206.00172 (2022). 2022*

### Extracting Weighted Automata for Approximate Minimization in Language Modelling

Clara Lacroce\*, Prakash Panangaden and Guillaume Rabusseau

*Proceedings of the Fifteenth International Conference on Grammatical Inference, 2021*

### Optimal Spectral-Norm Approximate Minimization of Weighted Finite Automata

Borja Balle and Clara Lacroce\* and Prakash Panangaden and Doina Precup and Guillaume Rabusseau

*48th International Colloquium on Automata, Languages, and Programming, ICALP 2021, July 12-16, 2021, Glasgow, Scotland (Virtual Conference), 2021*

\* Corresponding author.

## Awards

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<b>Outstanding Teaching Assistant Award</b>	McGill University	2019
<b>Graduate Excellence Award</b>	McGill University	2017 - 2018
<b>Cryptoworks21 Scholarship</b>	NSERC (Declined)	2016 - 2017
<b>Armand C. Archambault Fellowship</b>	Concordia University	2016
<b>International ALGANT Award</b>	Algant Consortium	2015 - 2016

## Selected Talks

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### The approximate minimization problem of weighted finite automata and applications to language modelling: an approach based on Adamyan-Arov-Krein theory

- Laboratoire Hubert Curien, Université Jean Monnet, Saint-Étienne 2023
- Workshop Algorithmic aspects of dynamical systems, Barbados 2023
- Seminar on Formal Languages and Neural Networks (FLaNN), online 2022

### Optimal Spectral-Norm Approximate Minimization

- QUALOG 2023, Boston 2023
- ICALP 2021, online 2021
- Online Worldwide Seminar on Logic and Semantics, Cambridge 2021
- Reasoning and Learning Lab at McGill Montréal 2021

### Towards an AAK Theory Approach to Approximate Minimization in the Multi-Letter Case

- LEARNAUT 2022, Paris 2022

### Extracting Weighted Automata for Approximate Minimization in Language Modelling

- ICGI 2020-2021, online 2021

### An Introduction to Algebraic Geometry

- Graduate Seminar at McGill, Montréal 2017

### Deformations of Galois Representations

- ALGANT Seminar, Bordeaux 2016

### An Introduction to Modular Forms

- McGill Graduate Seminar, Montréal 2016

## Community Service

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<b>Reviewer</b>	Mathematical Structures in Computer Science, AISTATS2023, ICGI2023	2022 - Current
<b>Surgical Floor Volunteer</b>	Montréal Children Hospital. Provided relief for babies post surgery.	2019 - 2022
<b>Student Representative</b>	University of Padova. Advocated for students in the Math Department.	2012 - 2015
<b>Mentor</b>	Collegio Mazza, Padova. Advised a group of women in their freshman year.	2013 - 2015
<b>Librarian</b>	Collegio Mazza, Padova. Supervised a University Library on weekly shifts.	2013 - 2015
<b>Promoter</b>	AVIS (Italian Blood Donors Association).	2008 - 2011

## Skills

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<b>Programming</b>	Python, Pandas, NumPy, Scikit-learn, PyTorch, SQL.
<b>Software/OS</b>	Git, Matlab, Unix, $\text{\LaTeX}$ , Microsoft Office.
<b>Technical Skills</b>	Deep Learning, Machine Learning, Problem-solving, Quantitative Research.

## Languages

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<b>English</b>	Full professional proficiency.
<b>French</b>	Professional working proficiency (TEFAQ: Listening C2, Speaking C1)
<b>Italian</b>	Native proficiency.