

Clara Lacroce

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Personal Profile

I am a Postdoctoral Researcher at McGill University and Mila. My current research focuses on knowledge distillation of black box models on sequential data. To make these models more interpretable, I use tools from functional and harmonic analysis, formal language theory and control theory.

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 Studi 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

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 Lizaie and Clara Lacroce and Guillaume Rabusseau

Under review at AISTATS 2024 (2023). 2023

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

Under review at AISTATS 2024 (2023). 2023

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

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

Selected Talks

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

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

Skills

Programming	Python, Pandas, NumPy, Scikit-learn.
Software/OS	Git, Matlab, Unix, \LaTeX , Microsoft Office.
Soft Skills	Deep Learning, Machine Learning, Problem-solving, Quantitative Research, Verbal and Written Communication Skills, Time Management, Team Leadership.

Languages

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