

Clara Lacroce

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Personal Profile

I am a mathematician with a PhD in Machine Learning. In my research, I investigated the learning capabilities of deep sequence models using formal language theory and functional analysis. In particular, I focused on improving the interpretability of deep learning models for language modelling. I am a fast learner with strong quantitative skills and experience in problem solving, data science and project management.

Education

McGill University

Montréal, Canada

PhD in Computer Science

2016 - 2022

- 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

- 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, Number Theory

BSc in Mathematics

2010 - 2014

Work Experience

McGill University

Montréal, Canada

Postdoctoral Researcher

2022 - 2023

- Investigated the learning capabilities of transformers and their connections with models from formal language theory.
- Co-led the efforts and mentored the work of 3 graduate students.

Teaching Assistant

2017 - 2020

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

Université Jean Monnet

Saint-Étienne, France

Invited Visiting Researcher

2023

- Funded to work for a month at Laboratoire Hubert Curien

University of Padova, Board of Directors

Padova, Italy

Student Representative, BofD

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 Lizaire 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 Invited Talks

Approximate minimization for WFAs and language modelling: an approach based on AAK 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

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

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
Mentor	Collegio Mazza, Padova. Advised a group of women in their freshman year.	2013 - 2015

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.