

Guillaume Rabusseau

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Current Position

2018-present Since September 2018 I am an assistant professor at *Université de Montréal* and at the *Mila* research institute. Since March 2019, I am the holder of a CIFAR AI research chair.

Education

2016-2018 **IVADO post-doctoral scholar**, *McGill University, School of Computer Science*, Reasoning and Learning Lab (working with Professors Joelle Pineau, Doina Precup and Prakash Panangaden).

2013-2016 **PhD in Computer Science**, *Aix-Marseille Université, Laboratoire d'Informatique Fondamentale*, Qarma team (Machine Learning and Multimedia).

- Title: *A Tensor Perspective on Weighted Automata, Low-Rank Regression and Algebraic Mixtures*.
- Main contributions: introduction of a new computational model on graphs generalizing weighted automata over strings and trees; design and theoretical analysis of an algorithm for approximate minimization of weighted tree automata; design and theoretical analysis of a novel algorithm for regression with tensor-structured outputs under multilinear rank constraints; extension of the tensor method of moments to algebraic mixtures (mixtures of distributions with negative weights).
- Supervisors: François Denis and Hachem Kadri.
- Defense date: October 20, 2016.

2012-2013 **MSc in Theoretical Computer Science**, *Aix-Marseille Université*, (grade: 18.4/20, rank: 1/13).
Master Thesis: *Using a Linear Representation of Trees in the context of Structured Data Learning: A First Approach* (published in the international conference ICGI 2014)

2011-2012 **MSc in Computer Science, 1st year**, *Université de Franche-Comté*, (grade: 17.2/20, rank: 1/103).

2008-2011 **BSc in Computer Science**, *Université de Provence*, (grade: 17.3/20).

2003-2005 **DEM of Classical Guitar**, *ENMD de Châtellerauld*.

2000-2005 **MSc in Musicology**, *UFR de Tours*, (grade: 16.9/20).

Master Thesis: *Conlon Nanncarrow's Language: Compositional Method and Structure of Study #2a for Player Piano*

Teaching and Professional Experience

2018-2019 **Matrix and Tensor Factorization for Machine Learning**, *grad seminar course*.

2018-2019 **Foundations of Machine Learning**, *undergrad course*.

2018 **IVADO summer school**, *Introduction to machine learning*, first day of the summer school.

Lecturer at McGill University

2017 **COMP-652/ECSE-608: Machine Learning course for graduate students**, *co-teaching with Prof. Doina Precup in Winter 2017 and with Riashat Islam (PhD student) in Fall 2017*.

Teaching Assistant at École Centrale Marseille (graduate school of engineering)

- 2013-2016
- **Big Data and Data Science**, Lecturer (3rd year students, 40h)
 - **Databases**, Teaching Assistant (2nd year students, 65h)
 - **Algorithmic**, Teaching Assistant (1st year students, 85h)

Professional Experience

- 2002-2010 **Experimental Music Performer**, based in Tours (FR) from 2002 to 2005 - Brussels (BE) from 2005 to 2008 - Berlin (GE) from 2008 to 2010.
My work focused on developing a live-oriented computer interface (with the programming environment Pure Data) to incorporate sound synthesis in free improvisation.
- 2000-2010 **Guitar and Music Theory Teacher**.

Publications

Articles in Peer-Reviewed Journals

Borja Balle and Guillaume Rabusseau. Approximate minimization of weighted tree automata. *Information and Computation*, 2019 (in press).

Raphaël Bailly, Guillaume Rabusseau, and François Denis. Recognizable series on graphs and hypergraphs. *Journal of Computer and System Sciences*, 104:58 – 81, 2019.

Vincent François-Lavet, Guillaume Rabusseau, Joelle Pineau, Damien Ernst, and Raphael Fonteneau. On overfitting and asymptotic bias in batch reinforcement learning with partial observability. *Journal of Artificial Intelligence Research*, 65:1–30, 2019.

Articles in Peer-Reviewed International Conferences

Shenyang Huang, Yasmeeen Hitti, Guillaume Rabusseau, and Reihaneh Rabbany. Laplacian change point detection for dynamic graphs. In *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, pages 349–358, 2020.

Tianyu Li, Bogdan Mazouze, Doina Precup, and Guillaume Rabusseau. Efficient planning under partial observability with unnormalized Q functions and spectral learning. *AISTATS*, 2020.

Beheshteh Rakhshan and Guillaume Rabusseau. Tensorized random projections. *AISTATS*, 2020.

Guillaume Rabusseau, Tianyu Li, and Doina Precup. Connecting weighted automata and recurrent neural networks through spectral learning. In *The 22nd International Conference on Artificial Intelligence and Statistics*, pages 1630–1639, 2019.

Philip Amortila and Guillaume Rabusseau. Learning graph weighted models on pictures. In *International Conference on Grammatical Inference*, pages 104–117, 2018.

Tianyu Li, Guillaume Rabusseau, and Doina Precup. Nonlinear weighted finite automata. In *International Conference on Artificial Intelligence and Statistics*, pages 679–688. 2018.

Guillaume Rabusseau. Minimization of graph weighted models over circular strings. In *International Conference on Foundations of Software Science and Computation Structures*, pages 513–529. 2018.

Guillaume Rabusseau, Borja Balle, and Joelle Pineau. Multitask spectral learning of weighted automata. In *Advances in Neural Information Processing Systems 30*, pages 2585–2594. 2017.

Matteo Ruffini, Guillaume Rabusseau, and Borja Balle. Hierarchical methods of moments. In *Advances in Neural Information Processing Systems 30*, pages 1899–1908. 2017.

Guillaume Rabusseau, Borja Balle, and Shay B. Cohen. Low-Rank Approximation of Weighted Tree Automata. In *Proceedings of the 19th International Conference on Artificial Intelligence and Statistics*, pages 839–847, 2016.

Guillaume Rabusseau and Hachem Kadri. Low-rank regression with tensor responses. In *Advances In Neural Information Processing Systems 29*, pages 1867–1875. 2016.

Raphaël Bailly, François Denis, and Guillaume Rabusseau. Recognizable Series on Hypergraphs. In *Proceedings of the 9th International Conference on Language and Automata Theory and Applications*, pages 639–651, 2015.

Guillaume Rabusseau and François Denis. Maximizing a Tree Series in the Representation Space. In *Proceedings of the 12th International Conference on Grammatical Inference*, pages 124–138, 2014.

Technical Reports / Preprints

Meraj Hashemizadeh, Michelle Liu, Jacob Miller, and Guillaume Rabusseau. Adaptive tensor learning with tensor networks. *arXiv preprint arXiv:2008.05437*, 2020.

Bogdan Mazoure, Thang Doan, Tianyu Li, Vladimir Makarek, Joelle Pineau, Doina Precup, and Guillaume Rabusseau. Provably efficient reconstruction of policy networks. *arXiv preprint arXiv:2002.02863*, 2020.

Jacob Miller, Guillaume Rabusseau, and John Terilla. Tensor networks for language modeling. *arXiv preprint arXiv:2003.01039*, 2020.

Shenyang Huang, Vincent François-Lavet, and Guillaume Rabusseau. Neural architecture search for class-incremental learning. *arXiv preprint arXiv:1909.06686*, 2019.

Eric Crawford, Guillaume Rabusseau, and Joelle Pineau. Sequential coordination of deep models for learning visual arithmetic. 2018.

Xingwei Cao and Guillaume Rabusseau. Tensor regression networks with various low-rank tensor approximations. *arXiv preprint arXiv:1712.09520*, 2017.

Guillaume Rabusseau and François Denis. Learning Negative Mixture Models by Tensor Decompositions. *CoRR*, abs/1403.4224, 2014.

Workshop Contributions

Philip Amortila and Guillaume Rabusseau. Learning graph weighted models on pictures. *2nd workshop on Learning and Automata (LearnAut at FLoC 2018)*, 2018.

Shenyang Huang, Vincent François-Lavet, Guillaume Rabusseau, and Joelle Pineau. Exploring continual learning using incremental architecture search. *NIPS 2018 Workshop on Continual Learning*, 2018.

Di Wu, Guillaume Rabusseau, Vincent François-lavet, Doina Precup, and Benoit Boulet. Optimizing home energy management and electric vehicle charging with reinforcement learning. *Adaptive Learning Agents (ALA) workshop at the Federated AI Meeting*, 2018.

Tianyu Li, Guillaume Rabusseau, and Doina Precup. Neural network based nonlinear weighted finite automata. *LICS workshop on Learning and Automata*, 2017.

Guillaume Rabusseau and Joelle Pineau. Multitask spectral learning of weighted automata. *LICS workshop on Learning and Automata*, 2017.

Raphaël Bailly and Guillaume Rabusseau. Graph learning as a tensor factorization problem. *NIPS workshop on Learning with Tensors*, 2016.

Guillaume Rabusseau and François Denis. Learning Negative Mixture Models by Tensor Decompositions. *Workshop on Method of Moments and Spectral Learning (ICML 2014)*, 2014.

Articles in Peer-Reviewed French Conferences

Guillaume Rabusseau. Régression de faible rang pour réponses tensorielles. *Conférence sur l'Apprentissage Automatique*, 2016.

Guillaume Rabusseau, Borja Balle, and Shay B. Cohen. Minimisation approximée d'automates pondérés d'arbres. *Conférence sur l'Apprentissage Automatique*, 2016.

Guillaume Rabusseau, Hachem Kadri, and François Denis. Régression de faible rang non-paramétrique pour réponses tensorielles. *Colloque International Francophone de Traitement du Signal et de l'Image*, 2015.

Guillaume Rabusseau and François Denis. Décompositions Tensorielles pour l'Apprentissage de Modèles de Mélanges Négatifs. *Conférence sur l'Apprentissage Automatique*, 2014. **Best paper award.**

Thesis

Guillaume Rabusseau. *A Tensor Perspective on Weighted Automata, Low-Rank Regression and Algebraic Mixtures*. PhD thesis, Aix-Marseille Université, 2016.

Invited Talks

Connecting Weighted Automata and Recurrent Neural Networks through Spectral Learning.

August 2020 *ICGI conference*, New-York, USA.

April 2019 *IACS Seminar*, Stony Brook University, New-York, USA.

Multitask Spectral Learning of Weighted Automata.

July 2018 *MAGNET team seminar*, INRIA Lille, France.

Machine Learning with Tensors for Structured Data.

June 2018 *RIKEN Center for Advanced Intelligence Project*, AIP, Japan.

March 2018 *Séminaires de doctorat en informatique cognitive*, UQAM, Canada.

Feb. 2018 *Colloque du DIRO*, Université de Montréal, Canada.

Higher-Order Low-Rank Regression.

May 2016 *Mathematics and Statistics Seminar*, Lancaster University, UK.

Nov. 2015 *Workshop on Tensor Decompositions and Covariance Matrix Estimation*, Aix-Marseille University, France.

Grants

2019-2024 **Canada CIFAR AI (CCAI) research chair.**

2019-2024 **NSERC Discovery grant**, Machine Learning with Tensor Networks.

April 2017 **IVADO postdoctoral fellowship**, two year funding for a postdoctoral position at McGill.

2017 **NVIDIA GPU grant**, donation of one NVIDIA TITAN Xp GPU.

Other Research Activities

- Supervision
- Current students: Jacob Miller (postdoc), Tianyu Li (PhD, co-supervised with Doina Precup), Michelle Liu (PhD), Marie-Ève Malette-Campeau (MSc, co-supervised with Georges Dionne and Fabian Bastin), Behnoush Khavari (MSc), Meraj Hashemizadeh (MSc), Andy Huang (MSc, co-supervised with Reihane Rabbany), Beheshteh Tolouei Rakhshan (PhD intern), Maude Lizaire (PhD intern, co-supervised with Simon Verret)
 - Past students at UdeM: Lionel Tondji (intern, summer 2019)
 - I worked with the following students at the Reasoning and Learning Lab (2016-2018): Philip Amortila (MSc), Xingwei Cao (BSc), Eric Crawford (PhD), Andy Huang (BSc), Tianyu Li (PhD) and Di Wu (PhD)
 - Co-supervisor of 2nd year student Claire Béhue's internship on *Artificial Intelligence for the Game of Gomoku* (LIF, 2014).
 - Co-supervisor of 1st year student Yoan Chaillan's internship on *Computer Vision for Gender Recognition* (LIF, 2013).

- Organization
- Co-organizer of the ACL 2019 workshop *Deep Learning and Formal Languages: Building Bridges*.
 - Co-organizer of two editions of the *Learning and Automata workshop* at FLoC 2018 and at LICS 2019.
 - Co-organizer of the UAI 2018 workshop on *Safety, Risk and Uncertainty in Reinforcement Learning*.
 - Co-organizer of the *Hackday* (24 hours machine learning hackathon) for the machine learning french conference CAP 2016.
- Reviewer
- Conferences: area chair for NIPS 2019, senior PC member for IJCAI 2020, reviewer for ICLR 2019, AISTATS 2019-2020, ICML 2019, UAI 2019, NIPS 2018, ALT 2018, IJCAI 2018
 - Journals: Machine Learning, IEEE Access, IEEE transactions
 - Grants: Mitacs Accelerate research project (2), NSERC discovery grant (1)

Responsibilities

- 2018- **Steering committee of the International Conference on Grammatical Inference**, *Committee Member*.
- 2018- **Comité d'éthique de la recherche en sciences et en santé - CERSES (ethics committee for research in healthcare)**, *Committee Member*, Université de Montréal.
- 2018,2019 **Jury de bourse d'excellence en sciences humaines et sociales (Excellence Award in Human and Social Sciences)**, *Committee Member*, Université de Montréal.
- 2014-2016 **Doctoral School Counsel**, *Elected representative of LIF PhD students*.

Languages

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| French | mother tongue |
| English | fluent |
| Spanish/German | notions |