

Xavier Bouthillier

MACHINE LEARNING RESEARCHER · RESEARCH DEVELOPER

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Summary

I am a sixth-year PhD student in computer science at Mila, Université de Montréal. I am studying under the supervision of Pascal Vincent, specializing in machine learning, specifically deep learning. I am strongly interested in both research and software development.

During my Master's and PhD, I have done research on a wide array of subjects ranging from NLP, computer vision, and optimization to theoretical deep learning. I am now concentrating on studying the methodology for deep learning research, designing methods to improve reproducibility.

Beside research, I have been an important contributor to tools developed at LISA/Mila such as Theano and Pylearn2 and a mentor for students contributing to these projects. I am now the lead developer of the project Oríon, a platform for hyper-parameter optimization, supported by the Mila IDT team and for which we are currently signing collaboration agreements with the industry.

Education

Mila, Université de Montréal

PhD in Computer Science, Machine Learning

2014 - 2021

Master in Computer Science, Machine Learning

2013 - 2014

Bachelor in Computer Science

2009 - 2012

Freiburg Albert-Ludwigs Universität (Germany)

Exchange program during Bachelor's degree

2011-2012

CÉGEP Saint-Laurent

Natural Science

2008 - 2009

Music, Composition Profile

2005 - 2008

Experience

Mila, Université de Montréal

Montréal, Canada

Research Developer

Oct. 2017 - Present

- Lead developer of Oríon (See description for Oríon in Open Source Projects)

Nuance Communications

Montréal, Canada

Research Intern

Sep. 2016 - Dec. 2016

- Improved the attention mechanism in the paper Hierarchical Attention Networks for Document Classification

Nuance Communications

Montréal, Canada

Research Intern

May. 2016 - Aug. 2016

- Developed an algorithm to generate fake examples based on large medical documents.
- Reproduced the paper Hierarchical Attention Networks for Document Classification.
- Implemented a pipeline to convert large medical documents in deep hierarchical structures.

Nuance Communications

Montréal, Canada

Research Intern

Sep. 2014 - Jan. 2015

- Applied deep learning models to a classification problem in natural language processing.
- Developed a new convolutional model inspired by n-grams using PyLearn2.

LISA (Mila), Université de Montréal

Montreal, Canada

Research Assistant

2010 - 2012

- Learned website development from scratch.
- Implemented jQuery plugins.
- Maintained website and applied modifications on request.

Teaching Experience

IFT6390 Foundations of machine learning, *Teaching Assistant, Université de Montréal*

Fall 2014

IFT6390 Foundations of machine learning, *Teaching Assistant, Université de Montréal*

Fall 2013

Publications

JOURNAL ARTICLES

Emonets: Multimodal Deep Learning Approaches for Emotion Recognition in Video

Samira Ebrahimi Kahou, Xavier Bouthillier, Pascal Lamblin, Caglar Gulcehre, Vincent Michalski, Kishore Konda, Sébastien Jean, Pierre Froumenty, Yann Dauphin, Nicolas Boulanger-Lewandowski

Journal on Multimodal User Interfaces 10.2 (2016) pp. 99–111. Springer, 2016

CONFERENCE PROCEEDINGS

Accounting for variance in machine learning benchmarks

Xavier Bouthillier, Pierre Delaunay, Mirko Bronzi, Assya Trofimov, Brennan Nichyporuk, Justin Szeto, Nazanin Mohammadi Sepahvand, Edward Raff, Kanika Madan, Vikram Voleti, Samira Ebrahimi Kahou, Vincent Michalski, Tal Arbel, Chris Pal, Gael Varoquaux, Pascal Vincent

Proceedings of Machine Learning and Systems 3 (2021). 2021

Unreproducible Research is Reproducible

Xavier Bouthillier, César Laurent, Pascal Vincent

International Conference on Machine Learning, 2019

Fast Approximate Natural Gradient Descent in a Kronecker Factored Eigenbasis

Thomas George, César Laurent, Xavier Bouthillier, Nicolas Ballas, Pascal Vincent

Advances in Neural Information Processing Systems, 2018

Efficient Exact Gradient Update for Training Deep Networks with Very Large Sparse Targets

Pascal Vincent, Alexandre De Brébisson, Xavier Bouthillier

Advances in Neural Information Processing Systems, 2015

Combining Modality Specific Deep Neural Networks for Emotion Recognition in Video

Samira Ebrahimi Kahou, Christopher Pal, Xavier Bouthillier, Pierre Froumenty, Çağlar Gülçehre, Roland Memisevic, Pascal Vincent, Aaron Courville, Yoshua Bengio, Raul Chandias Ferrari

Proceedings of the 15th ACM on International conference on multimodal interaction, 2013

WORKSHOPS

Improving Reproducibility of Benchmarks

Xavier Bouthillier

CiML Workshop at Advances in Neural Information Processing Systems, 2019

An Evaluation of Fisher Approximations Beyond Kronecker Factorization

César Laurent, Thomas George, Xavier Bouthillier, Nicolas Ballas, Pascal Vincent

Workshop at International Conference on Learning Representations, 2018

Orion: Experiment Version Control for Efficient Hyperparameter Optimization

Christos Tsirigotis, Xavier Bouthillier, François Corneau-Tremblay, Peter Henderson, Reyhane Askari, Samuel Lavoie-Marchildon, Tristan Deleu, Dendi Suhubdy, Michael Noukhovitch, Frédéric Bastien

AutoML Workshop at the International Conference on Machine Learning, 2018

REPORTS

Survey of machine-learning experimental methods at NeurIPS2019 and ICLR2020

Xavier Bouthillier, Gaël Varoquaux

Research Report hal-02447823, 2020

Theano: A Python Framework for Fast Computation of Mathematical Expressions

The Theano Development Team, Rami Al-Rfou, Guillaume Alain, Amjad Almahairi, Christof Angermueller, Dzmitry Bahdanau, Nicolas Ballas, Frédéric Bastien, Justin Bayer, Anatoly Belikov, ...

arXiv preprint arXiv:1605.02688 (2016). 2016

Exact Gradient Updates in Time Independent of Output Size for the Spherical Loss Family

Pascal Vincent, Alexandre Brébisson, Xavier Bouthillier

arXiv preprint arXiv:1606.08061 (2016). 2016

Dropout as Data Augmentation

Xavier Bouthillier, Kishore Konda, Pascal Vincent, Roland Memisevic

arXiv preprint arXiv:1506.08700 (2015). 2015

Presentations

18 Nov 2021	Reliability of benchmarks and why HPO is important	youtu.be/ZRQF72IXiDc	AutoML Seminar, remote
21 Sep 2021	Accounting for Variance and HPO in Machine Learning Benchmarks	tinyurl.com/m5t26u35	Microsoft Research, remote
14 Jul 2021	Practical approaches for efficient HPO with Oríon	youtu.be/H1jQBQlbQmA	SciPy 2021, remote
9 Jun 2021	Oríon - Librairie pour l'optimisation d'hyperparamètres	tinyurl.com/ycku5vhv	Mila, remote
19 May 2021	Black-Box Optimization using Dask with Oríon	youtu.be/W5oWdRiSSr8	Dask Summit 2021, remote
7 Apr 2021	Accounting for Variance in Machine Learning Benchmarks	youtu.be/-bukIBTkQiM	MLSys 2021, remote
16 Mar 2021	Practical Approaches for Efficient Hyperparameter Optimization	youtu.be/qq69vxF3LTI	AlCamp, remote
12 Jan 2021	Oríon - A framework for distributed hyperparameter optimisation	tinyurl.com/yuy5w6ta	Mila & Vector, remote
12 Jan 2021	On a quest for more trustworthy scientific conclusions in ML	tinyurl.com/2hv27p5m	Parietal, INRIA, remote
5 Nov 2020	L'intelligence artificielle dans les bibliothèques	Table ronde	CBPQ, remote
17 Feb 2020	Reproducibility & Hyperparameter Optimization with Oríon	tinyurl.com/43zt5wej	Ai4Sim, Atos, remote
4 Dec 2019	Unreproducible Research is Reproducible	tinyurl.com/t7rpaaa	CHAI, Berkeley, USA
28 Nov 2019	Oríon: A Framework for Distributed Hyperparameter Optimisation	tinyurl.com/t4ubtb4	Mila, Montreal, Canada
21 Nov 2019	Reproducibility in ML, or why benchmarks are lotteries	tinyurl.com/u54a7o6	Mila, Montreal, Canada
21 Nov 2019	Oríon: A Framework for Distributed Hyperparameter Optimisation	tinyurl.com/scxq63b	Mila, Montreal, Canada
15 Nov 2019	Unreproducible Research is Reproducible	tinyurl.com/rkgp55k	Mila, Montreal, Canada
31 Jul 2019	Reproducibility in AI	tinyurl.com/roue8js	Stradigi AI, Montreal, Canada
13 Jun 2019	Unreproducible Research is Reproducible	tinyurl.com/w52vjys	ICML, Long Beach, USA
10 Apr 2019	Introduction à l'intelligence artificielle	For a specialized school for gifted children	UdeM, Montreal, Canada
14 Nov 2018	Intelligence artificielle: Une fabrique à outils	tinyurl.com/yx6thyjd	CPI, Montreal, Canada
12 Nov 2018	Introduction à l'intelligence artificielle	For high school <i>Forum des jeunes en science</i>	CEGEP Montmo., Laval, Canada
30 Aug 2018	Tutorial on Oríon	tinyurl.com/u4pjkjy	Mila, Montreal, Canada
14 Jul 2018	Oríon: Experiment Version Control for Efficient Hyperparameter Optimization		ICML, Stockholm, Sweden
26 Apr 2014	Introduction au langage de programmation Python		Google, Montreal, Canada

Open Source Projects

Oríon (github.com/Epistimio/orion)

Lead developer

Oríon is an open-source framework developed at Mila for distributed black-box optimization.

2017-Present

- Lead project directions and main goals
- Design architecture of the framework
- Recruit and interview potential candidates for Mila IDT team
- Mentor interns for software engineering
- Mentor students for research projects
- Design governance rules
- Provide support to users
- Give presentations and tutorials
- Write extensive documentation in reStructuredText
- Setup and maintain CI with Travis, github-actions and codecov
- Implemented an experiment version control system

Mahler (bouthilx.github.io/projects/2-mahler)

Developer - Prototype stage

Mahler is a framework to provide more control over workflow, better resiliency and better automation in HPC

2019-2020

- Implemented an automated remote installations using Fabrik for multi-cluster setups.
- Implemented a singularity-based workflow to easily deploy experiments on different clusters.
- Implemented a Dispatcher that monitors GPU usage and oversubscribe them with additional workers if possible.
- Implemented a dashboard using Dash to provide visualization and control over the pool of workers and registered tasks.

Kleió (bouthilx.github.io/projects/4-kleio)

Developer - Prototype stage

Kleió is an experiment manager that provides full traceability.

2018-2019

- Implemented a new data architecture based on the concept of events sourcing.
- Implemented remote commands (cat, tail, head, ...) for logs of experiments.

Theano (github.com/Theano/Theano)

Supervisor

2015-2017

Theano is a Python library that allows you to define, optimize, and evaluate mathematical expressions efficiently

- Mentored students contributing for the Common-Code-Workflow

Extracurricular Activity

Reviewer

NeurIPS, ICML, ICLR, AISTATS, MLSys, Neural Computation, AutoML Workshop,
NAS Workshop, Reproducibility Challenges, MLSys'20 Artifact Evaluation,
Rethinking ML Papers workshop @ ICLR 2021

2015 - Present

Workshop Organizer

Retrospectives Workshop

Dec. 2019

Streaming Designer and Organizer

Mila, Université de Montréal

Mar. 2018 - Oct. 2018

- Designed from scratch the setup, procedure and guidelines for recording and streaming at Mila.
- Trained dozen of volunteers to record and stream about a dozen different reading groups at Mila.
- Recorded and streamed weekly talks and PhD defenses.
- * Received a price of 6000\$ to reward the quality and importance of the initiative and the work done.