

Sébastien Lachapelle

Curriculum Vitae



Education

- 2024 **Ph.D. in Computer Science**, *Université de Montréal*, QC, CA
Département d'informatique et de recherche opérationnelle
Specialization: Artificial Intelligence at Mila, Quebec Artificial Intelligence Institute
Dissertation title: Identifying Latent Structures in Data
Committee: Yoshua Bengio (President), Simon Lacoste-Julien (Advisor), Dhanya Sridhar (Member) and Aapo Hyvärinen (External examiner)
Dissertation rated **exceptional** and deemed worthy of the **Rector's honor list** and the **best dissertation competitions** by the committee
- 2014–2017 **B.Sc. in Mathematics and Economics**, *Université de Montréal*, QC, CA
GPA:4.27/4.3

Research Experience

- Since 2023 **Research Scientist**, *SAIT AI Lab (Samsung)*, Montreal
- On going project using text-to-segmentation and unsupervised segmentation models to learn robust image classifiers
 - Academic collaborations with researchers from, e.g., the University of Amsterdam, the Max Planck Institute for Intelligent Systems in Germany, the University of Copenhagen and ETH Zürich [4, 3, 14, 13]
- 2017-2024 **M.Sc./Ph.D. Student**, *Mila - Quebec Artificial Intelligence Institute*, Montreal
(Fast-tracked from M.Sc., under [Emma Frejinger](#) & [Yoshua Bengio](#), to Ph.D. in 2018)
- Identifiability of deep generative models [7, 16, 2, 5] and multi-task learning [6]
 - Identifiability in causal representation learning [7, 16, 2]
 - Collaboration with climate scientists to apply causal representation learning [15]
 - Extrapolation & compositional generalization [5]
 - Learning causal graphs via continuous constrained optimization [11, 10, 8]
 - Identifiability of causal graphs [10]
 - Worked at the intersection of Operations Research and Machine Learning [1]
- 2019 **Research Intern**, *Element AI (acquired by ServiceNow)*, Montreal
- Learning flexible causal models with interventions and "neural autoregressive flows" [10]
- 2016 **Intern**, *DAMÉCO*, Montreal
- Estimation of a demand system for Quebec consumers

Teaching & Mentoring Experience

- 2022 **Teaching Assistant**, *Université de Montréal*
Probabilistic Graphical Models - IFT6269
Graduate class taught by Prof. Simon Lacoste-Julien

- 2021 **Teaching Assistant**, *Université de Montréal*
 Probabilistic Graphical Models - IFT6269
 Graduate class taught by Prof. Simon Lacoste-Julien
- 2021 **Teaching Assistant**, *Université de Montréal*
 Representation Learning - IFT6135 (general deep learning)
 Graduate class taught by Prof. Aaron Courville
- 2021 **Academic supervisor of professional M.Sc. students**, *Mila*
 Étienne Boucher - Internship at Hydro-Québec (6 months - weekly meetings)
 Guillaume Laporte - Internship at Hydro-Québec (6 months - weekly meetings)

Academic Service

- Since 2021 **Reviewing articles**
 For venues including the Conference on Neural Information Processing Systems (NeurIPS), the International Conference on Learning Representations (ICLR) and the Journal of Machine Learning Research (JMLR).
- 2024 **Reporter for CIFAR Workshop on World Models**, *CIFAR*
 Producing a report summarizing the talks and discussions of the workshop.
- 2021-2022 **Grading professional M.Sc. students internship reports**, *Mila*
 Reading and evaluating final internship reports of seven Professional M.Sc. students
- 2021 **Member of the Mila Recruitment Committee**
 Evaluating applications of potential candidates to M.Sc. and Ph.D. research programs
- 2018 **Volunteer at Montreal AI Symposium**

Programming Experience

- 7 years experience in Python & PyTorch
- Basic R programming language and basic JAX

Honors & Awards

- 2024 **Invited participant to CIFAR workshop on World Models**, Tuebingen, Germany
 Invitation-only workshop on Causality, Neuroscience and AI safety attended almost exclusively by senior researchers
- 2022 **Best Paper Award at UAI 2022 Workshop on Causal Representation Learning**
 For "Partial Disentanglement via Mechanism Sparsity" [16]
- 2021 **NeurIPS 2021 Outstanding Reviewer Award**
 Given to top 8% of reviewers who were judged to be instrumental to the review process based on Area Chair and author feedback
- 2020-2024 **IVADO excellence scholarship for PhD**
 Four years scholarship awarded to PhD students based on grades and research proposal
- 2018-2019 **Bourse d'excellence du CIRRELT – Accueil au doctorat**
 Prize awarded to seven PhD students (before they completed one year and a half) based on their grades, research aptitudes and implication in CIRRELT

- 2017 **Prix d'excellence des anciens**, *University of Montreal*
Prize awarded to the student finishing his B.Sc. in Mathematics and Economics with the highest GPA in his cohort
- 2016 **Bourse de la doyenne**, *University of Montreal*
Excellence prize awarded to the top 13 students from the Faculté des arts et des sciences
- 2016 **Roger-Dehem award in microeconomics**, *University of Montreal*
Excellence prize awarded to the student with the highest grades in microeconomics
- 2016 **Robert-Lacroix award in macroeconomics**, *University of Montreal*
Excellence prize awarded to the student with the highest grades in macroeconomics

Selected Presentations

- 2024 **Valence Labs – Invited talk**, Virtual
Additive Decoders for Latent Variables Identification and Cartesian-Product Extrapolation
- 2024 **Bellairs Workshop on Causality – Invited talk**, Holetown, Barbados
A Means to an End: Identifiability for Downstream Performance
- 2023 **NeurIPS – Contributed oral**, New Orleans, USA
Additive Decoders for Latent Variables Identification and Cartesian-Product Extrapolation
- 2023 **Mila's GFlowNet Workshop**, Montreal, CA
Tutorial on probabilistic inference and variational methods
- 2023 **Workshop on Causal Representation Learning – Invited talk**, Tuebingen, Germany
Synergies between Disentanglement and Sparsity: Generalization and Identifiability in Multi-Task Learning
- 2022 **Workshop on Causal Representation Learning at UAI – Contributed oral**, Eindhoven, Netherlands
Partial Disentanglement via Mechanism Sparsity
- 2022 **ServiceNow Research – Invited talk**, Montreal, Canada
Disentanglement via Mechanism Sparsity Regularization: A new Principle for Nonlinear ICA
- 2020 **NeurIPS – Spotlight presentation**, Virtual
Differentiable Causal Discovery from Interventional Data
- 2020 **Element AI – Invited talk**, Montreal, Canada
Learning Causal Structures via Gradient-Based Optimization
- 2019 **Montreal AI Symposium – Contributed oral**, Montreal, Canada
Gradient-Based Neural DAG Learning
- 2018 **DIMACS – Poster**, Bethlehem, USA
Predicting solution summaries to integer linear programs under imperfect information with machine learning

Journal publications

- [1] E. Larsen, S. Lachapelle, Y. Bengio, E. Frejinger, S. Lacoste-Julien, and A. Lodi. "Predicting Tactical Solutions to Operational Planning Problems Under Imperfect Information". In: *INFORMS Journal on Computing* (2022). URL: <https://arxiv.org/abs/1807.11876>.

Journal articles under review

- [2] S. Lachapelle, P. R. López, Y. Sharma, K. Everett, R. Le Priol, A. Lacoste, and S. Lacoste-Julien. “Nonparametric Partial Disentanglement via Mechanism Sparsity: Sparse Actions, Interventions and Sparse Temporal Dependencies”. Under review at the Journal of Machine Learning Research. 2024. URL: <https://arxiv.org/abs/2401.04890>.

Conference publications

* indicates joint first authors

- [3] D. Xu, D. Yao, S. Lachapelle, P. Taslakian, J. von Kügelgen, F. Locatello, and S. Magliacane. “A Sparsity Principle for Partially Observable Causal Representation Learning”. In: *Proceedings of the 41st International Conference on Machine Learning*. 2024. URL: <https://arxiv.org/abs/2403.08335>.
- [4] D. Yao, D. Xu, S. Lachapelle, S. Magliacane, P. Taslakian, G. Martius, J. von Kügelgen, and F. Locatello. “Multi-View Causal Representation Learning with Partial Observability”. In: *The Twelfth International Conference on Learning Representations*. 2024. URL: <https://arxiv.org/abs/2311.04056>.
- [5] S. Lachapelle*, D. Mahajan*, I. Mitliagkas, and S. Lacoste-Julien. “Additive Decoders for Latent Variables Identification and Cartesian-Product Extrapolation”. In: *Advances in Neural Information Processing Systems*. 2023. URL: <https://arxiv.org/abs/2307.02598>.
- [6] S. Lachapelle*, T. Deleu*, D. Mahajan, I. Mitliagkas, Y. Bengio, S. Lacoste-Julien, and Q. Bertrand. “Synergies Between Disentanglement and Sparsity: a Multi-Task Learning Perspective”. In: *Proceedings of the 40th International Conference on Machine Learning*. 2022. URL: <https://arxiv.org/abs/2211.14666>.
- [7] S. Lachapelle, P. Rodriguez Lopez, Y. Sharma, K. E. Everett, R. Le Priol, A. Lacoste, and S. Lacoste-Julien. “Disentanglement via Mechanism Sparsity Regularization: A New Principle for Nonlinear ICA”. In: *First Conference on Causal Learning and Reasoning*. 2022. URL: <https://arxiv.org/abs/2107.10098>.
- [8] I. Ng, S. Lachapelle, N. R. Ke, S. Lacoste-Julien, and K. Zhang. “On the Convergence of Continuous Constrained Optimization for Structure Learning”. In: *Proceedings of The 25th International Conference on Artificial Intelligence and Statistics*. 2022. URL: <https://arxiv.org/abs/2011.11150>.
- [9] P. Brouillard, P. Taslakian, A. Lacoste, S. Lachapelle, and A. Drouin. “Typing assumptions improve identification in causal discovery”. In: *First Conference on Causal Learning and Reasoning*. 2022. URL: <https://arxiv.org/abs/2107.10703>.
- [10] P. Brouillard*, S. Lachapelle*, A. Lacoste, S. Lacoste-Julien, and A. Drouin. “Differentiable Causal Discovery from Interventional Data”. In: *Advances in Neural Information Processing Systems*. 2020. URL: <https://arxiv.org/abs/2007.01754>.
- [11] S. Lachapelle, P. Brouillard, T. Deleu, and S. Lacoste-Julien. “Gradient-Based Neural DAG Learning”. In: *Proceedings of the 8th International Conference on Learning Representations*. 2020. URL: <https://arxiv.org/abs/1906.02226>.
- [12] Y. Bengio, T. Deleu, N. Rahaman, N. R. Ke, S. Lachapelle, O. Bilaniuk, A. Goyal, and C. Pal. “A Meta-Transfer Objective for Learning to Disentangle Causal Mechanisms”. In: *International Conference on Learning Representations*. 2020. URL: <https://arxiv.org/abs/1901.10912>.

Preprints & workshop papers

- [13] E. Marconato, S. Lachapelle, S. Weichwald, and L. Gresele. “All or None: Identifiable Linear Properties of Next-Token Predictors in Language Modeling”. Under review (URL coming soon). 2024.
- [14] J. Brady, J. von Kügelgen, S. Lachapelle, S. Buchholz, T. Kipf, and W. Brendel. “Interaction Asymmetry: A General Principle for Learning Composable Abstractions”. Under review (URL coming soon). 2024.
- [15] P. Brouillard, S. Lachapelle, J. Kaltenborn, Y. Gurwicz, D. Sridhar, A. Drouin, P. Nowack, J. Runge, and D. Rolnick. “Causal Representation Learning in Temporal Data via Single-Parent Decoding”. To be submitted. 2024. URL: <https://arxiv.org/abs/2410.07013>.
- [16] S. Lachapelle and S. Lacoste-Julien. “Partial Disentanglement via Mechanism Sparsity”. In: *UAI 2022 Workshop on Causal Representation Learning*. 2022. URL: <https://arxiv.org/abs/2207.07732>.