Gaël Gendron

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About me

I am passionate about building robust and trustworthy AI systems that can learn to solve complex problems efficiently. Holding two master's degrees in software engineering and machine learning, I worked as a C++ software engineer in a team at Amadeus IT Group before starting a doctoral program on deep learning for reasoning. I am working on inducing causality theory into neural networks and large language models to improve their reliability in out-of-distribution and counterfactual scenarios. I have several first-author publications in CORE A* Artificial Intelligence conferences (IJCAI, AAMAS, EMNLP) and workshops (CaLM@NeurIPS, CRL@NeurIPS, AGI@ICLR).

Skills

- Causal Inference
- Computer Vision
- Natural Language Processing
- Large Language Models
- Graph Neural Networks
- Reinforcement Learning

- Python
- C++
- Pytorch (Lightning, PyG)
- Transformers
- Scikitlearn
- Langchain
- Smolagents
- Tensorflow
- DoWhy

Languages

French	Native speaker
English	Proficient, Fluent (C2)
Spanish	Intermediate (B1)
Chinese	Basic (A2)

Work Experience

since 2024 — Research Assistant — University of Auckland, New Zealand
Led the research and development of an open-source project building the first interpretable neural-causal network for behaviour discovery in multi-agent systems with Pytorch, PyG and Tigramite

2022-2023 — Teaching Assistant — University of Auckland, New Zealand
Wrote and taught tutorials in complexity, algorithms, graph theory and advanced machine learning for M.Sc. and B.Sc. levels

2021-2022 — Software Engineer — Alten; Amadeus (contractor), France
Developed C++ software for a key component of Amadeus' Global Distribution System, enhancing scalability of the retrieval pipeline; handled support during code, test and integration phases; management with Scrum; was responsible as a PO (Project Owner)

Feb - Jul 2020 — Research Intern — NAOInstitute, University of Auckland, New Zealand
Designed and implemented an open-source project for knowledge graph reasoning using graph neural networks, with Tensorflow

May - Aug 2019 — Research Intern — Institute of Electronics and Numerical Technologies, France
Developed a resource-efficient embedded serial communication API and reinforcement learning based control module for robotic arms with Keras, Tensorflow, and Dataflow graphs

Education

2021-2024 — Ph.D candidate in Computer Science — University of Auckland, New Zealand
Deep Causal Modelling Approach to Reasoning and Generalisation

2019-2020 — M.Sc. in Computer Science — University of Rennes 1, France
Dual degree while pursuing a *Diplôme d'Ingénieur*

2018-2020 — *Diplôme d'Ingénieur* - equivalent M.Sc. — INSA, France
Software engineering

2015-2018 — B.Sc. in Computer Science — INSA, France
Foundations of engineering fields and computer science

Jan - Apr 2019 — International Student Mobility Program — University of Ottawa, Canada
Computer science

Jun 2018 — Chinese General Study — Shandong University, China
Chinese language

Research Projects

Counterfactual Inference in Natural Language Built the first end-to-end framework for causal extraction and inference with large language model agents, using Structural Causal Models and teaching from interventions and counterfactuals

Abstract Reasoning Evaluation Conducted the first evaluation of large language models in abstract reasoning and the learning of abstract representations

Independent Causal Language Models Built and fine-tuned a novel modular language model architecture based on causal principles for efficient and domain-invariant out-of-distribution reasoning

Latent Space Quantization Created a novel variational auto-encoder based on latent space quantization and causal mechanisms for robust and efficient representation learning

Awards and Fellowships

Recipient of the 2024 DAAD AInet fellowship - AI for Science

The University of Auckland Best Student Published Paper in Computer Science for "Disentanglement of Latent Representations via Causal Interventions" [Gendron, Witbrock, and Dobbie 2023]

Conference Presentations

Dec 2024 — Neural Information Processing Systems (NeurIPS)
Poster presentation at the CaLM@NeurIPS and CRL@NeurIPS workshops [Gendron, Rožanec, et al. 2024] and [Gendron, Witbrock, et al. 2024]

Nov 2024 — Empirical Methods in Natural Language Processing (EMNLP)
Oral presentation at the main conference [Gendron, Nguyen, et al. 2024]

Aug 2024 — NAOI Symposium on exploring creativity and intelligence
Speaker on the topic of causality and robust reasoning in deep learning

Aug 2024 — International Joint Conference on Artificial Intelligence (IJCAI)
Oral and poster presentation at the main conference [Gendron, Bao, et al. 2024]

Jun 2024 — Global Sustainable Development Congress (GSDC)
Panelist on the topic of AI, Sustainability and Education with Profs. Siah Hwee Ang (Chair at VUW), Low Teck Seng (Senior Vice President at NUS) and President Banchong Mahaisavariya (Mahidol University)

May 2024 — International Conference on Learning Representations (ICLR)
Poster presentation at the AGI@ICLR workshop [Gendron, Bao, et al. 2024]

May 2024 — International Conference on Autonomous Agents and Multiagent Systems (AAMAS)
Poster presentation at the main conference [Gendron, Chen, et al. 2023]

Aug 2023 — International Joint Conference on Artificial Intelligence (IJCAI)
Oral and poster presentation at the main conference [Gendron, Witbrock, and Dobbie 2023]

Selected Publications

Gendron, Gaël. 2024. "Causal Graph Modeling with Deep Neural Engines for Strong Abstract Reasoning in Language and Vision". *Proceedings of the Thirty-Third International Joint Conference on Artificial Intelligence, IJCAI-24*, ijcai.org. doi: 10.24963/ijcai.2024/960. — 2024

Gendron, Gaël, Qiming Bao, Michael Witbrock, et al. 2024a. "Large Language Models Are Not Strong Abstract Reasoners". *Proceedings of the Thirty-Third International Joint Conference on Artificial Intelligence, IJCAI-24*, ijcai.org. doi: 10.24963/ijcai.2024/693. — 2024

Gendron, Gaël, Qiming Bao, Michael Witbrock, et al. 2024b. "Large Language Models Are Not Strong Abstract Reasoners Yet". *How Far Are We From AGI @ICLR 2024*. — 2024

Gendron, Gaël, Yang Chen, Mitchell Rogers, et al. 2024. "Behaviour Modelling of Social Animals via Causal Structure Discovery and Graph Neural Networks". *Proceedings of the 23rd International Conference on Autonomous Agents and Multiagent Systems, AAMAS-24*, IFAAMAS. doi: 10.5555/3635637.3663132. — 2024

Gendron, Gaël, Bao Trung Nguyen, Alex Yuxuan Peng, et al. 2024. "Can Large Language Models Learn Independent Causal Mechanisms?" *Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing, EMNLP 2024*. doi: 10.18653/v1/2024.emnlp-main.381. — 2024

Gendron, Gaël, Joze M. Rozanec, Michael Witbrock, et al. 2024. "Counterfactual Causal Inference in Natural Language with Large Language Models". *Causality and Large Models @NeurIPS 2024*. — 2024

Gendron, Gaël, Michael Witbrock, and Gillian Dobbie. 2024. "Robust Domain Generalisation with Causal Invariant Bayesian Neural Networks". *Causal Representation Learning @NeurIPS 2024*. — 2024

Gendron, Gaël, Michael Witbrock, and Gillian Dobbie. 2023. "A Survey of Methods, Challenges and Perspectives in Causality". *CoRR*. doi: 10.48550/arXiv.2302.00293. — 2023

Gendron, Gaël, Michael Witbrock, and Gillian Dobbie. 2023b. "Disentanglement of Latent Representations via Causal Interventions". *Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence, IJCAI-23*, ijcai.org. doi: 10.24963/IJCAI.2023/361. — 2023