Jithendaraa Subramanian

Github ◆ LinkedIn ◆ Scholar ◆ Webpage ◆ Email ◆ Citizenship: USA

Education

McGill University, Mila Quebec AI Institute *Sep 2021 – present*
M.Sc. (Thesis), Computer Science *GPA: 4.0 / 4.0*
★ Advisors: Derek Nowrouzezahrai, Samira Ebrahimi Kahou
Courses: Applied ML, Matrix Computations, Causal Inference and ML, Mathematical Tools for Computer Science

National Institute of Technology, Tiruchirappalli *Sep 2017 – May 2021*
B.Tech, Production Engineering with minor in Computer Science *GPA: 8.3 / 10.0, CS GPA: 9.67 / 10.0*

Skills

Deep learning frameworks: JAX, PyTorch, TensorFlow, Flax, dm-haiku
Programming Languages: Python, C++
Other: Git, Shell scripting, WandB, SQL, Distributed Training, Large-scale data processing

Research Experience

Amazon *Jun 2023 – Sep 2023*
Research scientist intern *San Diego, California*
▶ Lead on developing long-term revenue forecasting models for Amazon Fresh and Amazon Go. The proposed transformer-based solution resulted in **44% lower error rate** over the best baselines.
▶ **Scaled** the approach to train the model on a billion transactions, with **distributed, multi-GPU training**.
▶ Model to be **deployed** internally for use in basket recommendation and to quickly iterate over business strategies.

Centralized Codebase for Benchmarking Bayesian Causal Discovery algorithms *Code*
▶ Co-led the effort on building a central codebase for running Bayesian Causal Discovery algorithms. The repository currently supports synthetic **data generation**, running **over 10 algorithms** off-the-shelf, and contains numerous metrics for **evaluating model performance** in a systematic manner.

BIOLS: Bayesian Inference over Latent Structural Causal Models
▶ Led research on developing BIOLS, an approximate inference method to learn a joint distribution over structural causal models from low-level data like pixels, for linear Gaussian models. Scales upto atleast 50 causal variables.
▶ Accepted at **ICML 2022** Workshop on Spurious Correlations, Invariance and Stability. Under review at **ICLR 2024**.

Joint Structure and Parameters GFlowNets
▶ Extension of VB-DAG-GFN to JSP-GFN, an alternate framework to infer structure and parameters using a *single* GFlowNet instead of Variational Bayes. The proposed approach is applicable even in the challenging case of nonlinear models.
▶ Accepted at **NeurIPS 2023** and at the **ICML 2023** Workshop on Structured Probabilistic Inference & Generative Modeling.

Variational Bayes DAG GFlowNets
▶ Worked on VB-DAG-GFN, an extension of DAG-GFlowNets, to obtain a posterior over causal structures and mechanisms of linear Gaussian causal models. The proposed method uses variational Bayes and the probabilistic inference framework of Generative Flow Networks. Responsible for running all the causal discovery baselines.
▶ Accepted at **ICML 2023** Workshop on Graphs and more Complex structures for Learning and Reasoning. Submitted to **AISTATS 2024**.

Latent DAG GFlowNets and Expectation Maximization
▶ Extending DAG-GFlowNets to learn an approximate joint posterior over latent variables and causal structures from low-level data. Currently exploring GFlowNet-EM to alternatingly learn the reward of the GFlowNet and the joint posterior. Useful for applications to active learning and causal representations. Under preparation for **ICML 2024**.

Mila Quebec AI Institute, École de Technologie Supérieure Montreal *Nov 2020 – Sep 2021*
▶ Benchmarked physical reasoning task performance (PHYRE), video prediction using Neural ODEs, disentangled representations for videos.

Carnegie Mellon University *Apr 2020 – Feb 2021*
Research intern, RoboTutor Team *Code*
Advisor: Jack Mostow

▶ Designed a Reinforcement Learning framework for personalizing Intelligent Tutoring Systems (ITS) for underprivileged students in Africa. Proposed algorithm was instantiated in the context of the RoboTutor app, one of the five **$1M Finalists in the $15M Global Learning XPRIZE competition**, and deployed in Tanzania.

▶ Developed student models using Bayesian Knowledge Tracing, proposed a novel architecture and reward to optimize instructional sequencing.

▶ **Spotlight presentation** at the Educational Data Mining 2021 Workshop on RL for Education.

University of California, Berkeley *Sep 2019 – May 2020*
Research intern
Advisor: Dawn Song

▶ Secure architectures for Machine Learning programs: Created stub libraries for commonly used ML libraries like TensorFlow, PyTorch, scikit-learn, XGBoost, and pandas to perform static analysis of programs.

▶ Generated and enforced arbitrary privacy policies on DataFrames to make them compliant with privacy regulations like GDPR. Performed case studies on around 60 Kaggle programs to ensure privacy policies were enforced.

▶ Presented findings at the **NeurIPS** 2020 Workshop on Dataset Curation and Security, and at **USENIX Security**, 2022.

Publications

Joint Bayesian Inference of Graphical Structure and Parameters with a Single Generative Flow Network Paper
Tristan Deleu, Mizu Nishikawa-Toomey, Jithendaraa Subramanian, Nikolay Malkin, Laurent Charlin, Yoshua Bengio
*Accepted at **NeurIPS 2023***

Learning Latent Structural Causal Models Paper
Jithendaraa Subramanian, Yashas Annadani, Ivaxi Sheth, Nan Rosemary Ke, Tristan Deleu, Stefan Bauer, Derek Nowrouzezahrai, Samira Ebrahimi Kahou
*Under review at **ICLR 2024***

Bayesian Learning of Causal Structure and Mechanisms with GFlowNets and Variational Bayes Paper
Mizu Nishikawa-Toomey*, Tristan Deleu*, Jithendaraa Subramanian, Yoshua Bengio, Laurent Charlin
*GCLR Workshop at **AAAI 2023** | Under review at **AISTATS 2024***

Latent Variable Models for Bayesian Causal Discovery Paper
Jithendaraa Subramanian, Yashas Annadani, Ivaxi Sheth, Stefan Bauer, Derek Nowrouzezahrai, Samira Ebrahimi Kahou
***ICML 2022** Workshop on Spurious Correlations, Invariance, and Stability*

PrivGuard: Privacy Regulation Compliance Made Easier Paper
Lun Wang, Usmann Khan, Joseph Near, Qi Pang, Jithendaraa Subramanian, Neel Somani, Peng Gao, Andrew Low, Dawn Song
USENIX Security 2022

Deep Reinforcement Learning to Simulate, Train, and Evaluate Instructional Sequencing Policies Paper
Jithendaraa Subramanian, Jack Mostow
***Spotlight at Educational Data Mining 2021** Workshop on Reinforcement Learning for Education*

PrivFramework: a system for configurable and automated privacy policy compliance Paper
Usmann Khan, Lun Wang, Jithendaraa Subramanian, Joseph P. Near, Dawn Song
***NeurIPS 2020** Workshop on Dataset Security and Curation*

Awards & Honours

▶ McGill graduate student award worth **1500$** 2023

▶ Awarded an AI Talent Bursary of **1500$** for the AI Week at the Alberta Machine Intelligence Institute (Amii) 2022, 2023

▶ Awarded a grant worth **2000$** to attend ICML 2022

▶ **Finalist** at the Smart India Hackathon Software Edition: **Top 1%** among **0.5 million** participants 2020

▶ **Winner** of TransfiNITTe Hackathon v2, intra-university hackathon at NIT Trichy. Awarded **200$**. 2019

Volunteering & Responsibilities

- Lead TA for ECSE 343 Numerical Methods in Engineering, McGill University — Winter 2022
- Head of the web operations team at E-Cell, NIT Trichy — 2018 – 2021
- Core member of Delta Force, NIT Trichy's programming club. Mentored several students and helped them take their first steps into Machine Learning.