VADEN MASRANI

vadmas@cs.ubc.ca ~ vmasrani.github.io ~ github.com/vmasrani ~ shorturl.at/bqZ04 (Google Scholar)

EDUCATION

PhD, Machine Learning, University of British Columbia — January 2018 - May 2023
MSc, Computer Science, University of British Columbia — Sept 2015 - December 2017
BSc, Combined Physics/Computer Science, University of British Columbia — Sept 2010 - May 2014

RESEARCH EXPERIENCE

Senior Research Scientist — **May 2023 - Current**
Huawei Technologies Canada

- Currently working on a bunch of cool LLM projects blocked by NDA
- **Tools:** Python, PyTorch, Pandas, VSCode, ChatGPT, Weights and Biases

PLAI Lab, Probabilistic Programming — **January 2018 – May 2023**
Supervisor: Frank Wood

- **Currently pursuing my doctorate** with a focus on novel algorithms for training deep generative models
- Worked on a variety of machine learning projects in the areas of deep generative modeling, few-shot learning for visual classification, diffusion modeling for long video generation, and Bayesian inference
- **Extensive hands-on experience developing and implementing probabilistic deep learning models** in Python using PyTorch including Variational AutoEncoders, Sigmoid Belief Networks, Bayesian Neural Networks, Variational Graph AutoEncoders, and CNNs
- **Keywords:** variational inference, computer vision, probabilistic programming, deep generative models
- **Tools:** Python, PyTorch, Pandas, Slurm, Pyro, Jupyter, VSCode, Weights and Biases

Data Scientist, Think Tank Team — **April 2018 – September 2018**
Samsung Research America, Mountain View, CA

- https://thinktankteam.info/
- **Implemented end-to-end parallelized data pipeline** capable of processing > 100m rows of data
- Wrote deep models in Keras and TensorFlow, trained on GPU's, optimized hyperparameters, performed model selection.
- Was granted award for "exceptional contributions" and flown to Korea to meet members of Global Think Tank Team
- **Keywords:** End-to-end pipeline, big data, deep learning, signal processing, feature selection, supervised learning
- **Tools:** Python, Kera, Tensorflow, Pandas

RIKEN, Approximate Bayesian Inference — **April 2017 – October 2017**
Supervisor: Emtiyaz Khan

- **Variational Inference for Linear Dynamical Systems** with non-Gaussian likelihoods
- **Developed Kalman Filter Toolkit in Python** with filtering, smoothing, and parameter learning w/ EM
- **Keywords:** Bayesian inference, graphical models, time series models, variational inference, optimization, autograd, tensorflow
- **Tools:** Python, Matlab, Autograd, Scipy, Numpy, Seaborn

UBC LCI Lab, Laboratory for Computational Intelligence — **January 2016 – April 2017**
Supervisor: Giuseppe Carenini

- **Developed a model to predict Alzheimer's Disease from speech samples** which became my masters thesis
- **Developed system to perform extractive summarization of partial email threads** using graph-based centrality metrics and topic segmentation
- **Keywords:** natural language processing, topic modeling, summarization, medical applications, signal processing
- **Tools:** Python, NLTK, Scikit-Learn, Pandas

UBC SPL Lab, Software Practices Lab — **September 2014 – September 2015**
Supervisor: Gail Murphy

- **Data visualization using D3 + Django** to visualize relationships between Issues in General Motors' internal database
- **Keywords:** data visualization, frontend/backend development
- **Tools:** Javascript, D3, Django, Python

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UBC ATLAS Experiment, Particle Physics **May 2013 – September 2014**
Supervisor: Colin Gay

- **Member of the Particle & Nuclear Physics** group searching for evidence of Beyond Standard Model physics (Supersymmetry)
- Trained random forests and multilayer perceptrons to detect rare particle decay using monte carlo data from the Large Hadron Collider
- **Keywords:** particle physics, deep learning, supervised learning
- **Tools:** C++ , ROOT

PUBLICATIONS

Vaden Masrani "Advancing Variational Inference via Thermodynamic Integration" Ph.D Thesis, University of British Columbia (2023). https://open.library.ubc.ca/soa/cIRcle/collections/ubctheses/24/items/1.0430543

William Harvey, Saeid Naderiparizi, **Vaden Masrani**, Christian Weilbach, Frank Wood, **"Flexible Diffusion Modeling of Long Videos"** Neural Information Processing Systems (2022). https://arxiv.org/abs/2205.11495

Frank Wood, Andrew Warrington, Saeid Naderiparizi, Christian Weilbach, **Vaden Masrani**, William Harvey, Adam Ścibior, Boyan Beronov, John Grefenstette, Duncan Campbell, and Ali S. Nasseri, **"Planning as Inference in Epidemiological Dynamics Models",** Frontiers in Artificial Intelligence (2022). https://www.frontiersin.org/articles/10.3389/frai.2021.550603/full

Vaden Masrani*, Rob Brekelmans*, Thang Bui, Frank Nielsen, Aram Galstyan, Greg Ver Steeg, Frank Wood, **"q-Paths: Generalizing the Geometric Annealing Path using Power Means"** Uncertainty in Artificial Intelligence (2021). https://arxiv.org/abs/2107.00745

Rob Brekelmans*, **Vaden Masrani*,** Thang Bui, Frank Wood, Aram Galstyan, Greg Ver Steeg, Frank Nielsen, **"Annealed Importance Sampling with q-Paths"** NeurIPS Workshop on Deep Learning through Information Geometry (Best Paper Award) (2020). https://arxiv.org/abs/2012.07823

Vu Nguyen, **Vaden Masrani**, Rob Brekelmans, Michael A. Osborne, Frank Wood, **"Gaussian Process Bandit Optimization of the Thermodynamic Variational Objective"** Neural Information Processing Systems (2020). https://arxiv.org/abs/2010.15750

Rob Brekelmans*, **Vaden Masrani***, Frank Wood, Greg Ver Steeg, Aram Galstyan, **"All in the Exponential Family: Bregman Duality in Thermodynamic Variational Inference"** International Conference on Machine Learning (2020). https://arxiv.org/abs/2007.00642

Peyman Bateni, Raghav Goyal, **Vaden Masrani**, Frank Wood, Leonid Sigal **"Improved Few-Shot Visual Classification."** Conference on Computer Vision and Pattern Recognition (2020). https://arxiv.org/pdf/1912.03432.pdf

Vaden Masrani, Tuan Anh Le, Frank Wood **"The Thermodynamic Variational Objective."** Neural Information Processing Systems (2019). https://papers.nips.cc/paper/9328-the-thermodynamic-variational-objective.pdf

Vaden Masrani, Gabriel Murray, Thalia Shoshana Field, Giuseppe Carenini **"Domain Adaptation for Detecting Mild Cognitive Impairment."** Canadian Conference on Artificial Intelligence (2017). https://link.springer.com/chapter/10.1007/978-3-319-57351-9_29

Vaden Masrani, Gabriel Murray, Thalia Shoshana Field, Giuseppe Carenini. **"Detecting Dementia through Retrospective Analysis of Routine Blog Posts by Bloggers with Dementia."** BioNLP (2017). http://www.aclweb.org/anthology/W17-2329

Thalia Shoshana Field, **Vaden Masrani**, Gabriel Murray, Giuseppe Carenini. **"Improving Diagnostic Accuracy Of Alzheimer's Disease From Speech Analysis Using Markers Of Hemispatial Neglect."** Alzheimer's & Dementia: The Journal of the Alzheimer's Association 13.7 (2017) https://www.alzheimersanddementia.com/article/S1552-5260(17)32851-0/abstract

Jordon Johnson, **Vaden Masrani**, Giuseppe Carenini, Raymond Ng. **"Generating and Evaluating Summaries for Partial Email Threads: Conversational Bayesian Surprise and Silver Standards."** Proceedings of the 18th Annual SIGdial Meeting on Discourse and Dialogue. (2017). http://aclweb.org/anthology/W17-5532

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Marc Palyart, Gail C. Murphy, **Vaden Masrani**. **"A Study of Social Interactions in Open Source Component Use."** IEEE Transactions on Software Engineering (2017). https://ieeexplore.ieee.org/document/8049385/

INDUSTRY PROJECTS

Legends of Learning **July 2021 – September 2021**
https://www.legendsoflearning.com/

- **Designed method for determining "efficacy rating" for K-12 educational games.**
- Worked with client to leverage existing data to produce efficacy scores for K-12 educational games based on distribution shift of students grades pre/post gameplay.
- Wrote parallelized pandas pipeline to preprocess 250m rows of data and built internal visualization tool in python to visualize student grades.
- Communicated results to technical and non-technical team members during bi-weekly meetings.

CurbFlow **March 2020 – April 2020**
https://www.curbflow.com/

- **Designed bespoke fisheye lens calibration tool** to be used for image rectification in already-deployed cameras
- Developed a novel supervised learning approach for fisheye lens calibration using human annotations and compared against baseline methods
- Wrote performant code that operated directly on sparse matrices, avoiding unnecessary matrix multiplications
- Communicated finding to team members in weekly meetings, implemented rectification models from papers

VodaSafe **February 2020 - May 2020**
https://vodasafe.ca/

- **Helped develop a handheld scanner for underwater search and rescue.**
- **Built an object detection model** using PyTorch and Detectron2 on ultrasound data and compared against a random forest classifier.
- Developed full end to end pipeline, including feature engineering, model selection, hyper-parameter tuning, evaluation (ROC, AUC, F1), and visualization using a custom tool to distinguish between people/objects/background.

CodeExcellence **June 2016 - September 2016**
https://www.codeexcellence.com/

- **Participated in National Research Council project to predict SAP code performance** from code/data/user features
- **Data exploration with large datasets** including feature engineering, outlier detection, multivariate feature analysis, data visualizations, trained and evaluated regression models to predict failure rates

AWARDS AND RECOGNITION

UBC MDS TA Award	2021
British Columbia Graduate Scholarship	2019
NSERC Postgraduate Scholarship-Doctoral	2019 - 2021
Four Year Doctoral Fellowship	2018 - 2022
NSERC Undergrad Student Research Award	2013 - 2014
Jason Lang Scholarship	2009
Dean's Merit Admission Awards	2008
University of Calgary Admission Award	2008
Alexander Rutherford Scholarship	2008