

Viet Nguyen

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EDUCATION

Vector Institute, University of Toronto

2023 – 2027

Doctor of Philosophy, Computer Science

Toronto, ON

- **Supervisor:** Prof. Rahul Krishnan
- **Interests:** Large language models, learning theory, causal learning, continual learning, consciousness, intelligence.
- **Expected completion date:** May 2027

Montreal Institute of Learning Algorithms (Mila), McGill University

2021 – 2023

Master of Science, Computer Science

Montreal, QC

- **Supervisor:** Prof. Doina Precup
- **Thesis:** “Efficiency of Posterior-Sampling-based Hierarchical Reinforcement Learning methods on Pseudo-Hierarchical Structures”
- **Interests:** reinforcement learning, learning theory, continual learning, consciousness, intelligence.
- **Completion date:** August 2023

McGill University

2018 – 2021

Bachelor of Science, Honors Probability and Statistics, Minors Computer Science

Montreal, QC

RESEARCH

Reinforcement Learning Theory - prof. Doina Precup

Spring 2020 – Summer 2023

Mila, McGill University - Research Assistant, Master's Student

Montreal, QC

- **Hierarchical Reinforcement Learning:** Efficiency and sample complexity of learning MDPs when there are repeated structures. Constructed guarantees on learning efficiency based on similarities among substructures, as well as explored novel metrics in quantifying substructure similarity. (2022-2023)
- **Efficient representations in reinforcement learning:** model-based sampling of representations in the continuous state space setting for block-MDPs and low-rank MDPs for faster and more efficient learning. (2021-2022)
- **Deep exploration in reinforcement learning:** high-probability regret bounds for novel posterior sampling-based algorithms, conclusive experimental results (2020-2021)
- Developed and maintained a deep reinforcement learning api written in pytorch for quick and easy algorithm prototyping, testing, and interpretation.

Learning Theory, Neural Networks, applied PDEs - prof. Abbas Khalili

Winter 2020

McGill University, Research Student

Montreal, QC

- Researched the landscape geometry of the neural network optimization objective from the perspective of gradient flow in the space of probability measures endowed with the Kantorovich metric.
- Employed various concentration inequalities, functional analysis, and propagation of chaos type arguments to prove convergence of stochastic gradient descent to a limiting PDE.

Human Activity and Localization Classification - prof. Long Le

Summer 2019

NeCPhyLab - Institut National de la Recherche Scientifique (INRS), Research Assistant

Montreal, QC

- Built, reproduced, and improved frontier models in domain-independent joint activity/localization using channel-state information from Wi-Fi transmitter-receiver pairs.
- Propose and explored deep regressive models to build a novel continuous human localization algorithm in a controlled setting.

PUBLICATIONS

- Ishfaq, H., Cui, Q., **Nguyen, V.**, Ayoub, A., Yang, Z., Wang, Z., R. Precup, D., Yang, L.F. *Randomized Exploration for Reinforcement Learning with General Value Function Approximation*. ICML 2021.
- Ishfaq, H., Yang, Z., Lupu, A., **Nguyen, V.**, Liu, M., Islam, R. Precup, D., Wang, Z. *Provably Efficient Policy Optimization via Thompson Sampling*. Deep Reinforcement Learning Workshop at NeurIPS 2020, BayLearn 2020 Workshop.

SELECTED EXPERIENCES

Research and Development Engineer Intern

Summer 2020

FPT Canada Inc.

Montreal, QC

- Researched reinforcement learning-based solutions and optimizations to the Vehicle Routing Problem (VRP), a generalization of the Traveling Salesman Problem (TSP).
- Created sampling environment for randomized VRPs, designed the reinforcement learning optimization objectives.
- Tested common neural network-based Q-learning algorithms as well as policy gradient-based methods, assessed and evaluated their performances against each other.
- Reproduced linear programming-based solvers from the literature and achieved similar results.

Research Project - prof. Prakash Panangaden

Fall 2019

McGill University

Montreal, QC

- Researched continuous neural networks: formulation and equivalence to regular neural networks.
- Studied convergence to Gaussian processes in the infinite width limit, gradient flow in function space w.r.t. the Neural Tangent Kernel (NTK), and universal approximation of operators and functionals by function machines.
- Proved universal approximation of functional continuous neural networks.
- **Delivered presentation at the Seminary on Undergraduate Mathematics in Montreal (SUMM).**

McGill NeurotechX 2019, ML team

Winter 2019

Self-Driving Wheelchair

Montreal, QC

- Researched state-of-the-art models and feature construction pipelines in classification of motorimagery signals.
- Used numpy, scipy, matplotlib, seaborn for the analysis and interpretation of EEG time series signals and spectrograms of frequency distributions over time.
- Re-implemented milestone works from the literature in PyTorch, ran benchmarks on different EEG datasets, both simulated and real.
- **Placed First in the NeurotechX Competition, 2019.**

OTHER WORKS AND PRESENTATIONS

- **Nguyen, V.**, Hu, E. *Value Iteration-based Provably Efficient Exploration*. January, 2021
- Hu, E., **Nguyen, V.** *Provable Efficiency: Finding Regret Bounds in Reinforcement Learning*. December, 2020
- **Nguyen, V.** *On the Analysis of Stochastic Gradient Descent in Neural Networks via Gradient Flows*. May, 2020
- **Nguyen, V.**, *On the Concentration of Measure in Orlicz spaces of exponential type*. April, 2020
- Hu, E., Huang, L., **Nguyen, V.** *Neural Networks: A Continuum of Potential*. December, 2019
- Zelaya, M.C., Leech, M., **Nguyen, V.** *Fader Networks: A Heuristic Approach*. April, 2019

TEACHING

Basic Reinforcement Learning, SUMS, McGill University | *Instructor*

Winter 21

Foundations of Machine Learning, University of Montreal | *Teaching Assistant*

Fall 20, Winter 21, Fall 21

Math. Foundations for Machine Learning | *Teaching Assistant*

Fall 21

Theory of Machine Learning | *Teaching Assistant*

Winter 22

Theory of Machine Learning | *Teaching Assistant*

Winter 23

AI4Good | *Teaching Assistant*

Summer 23

AWARDS

School Of Computer Science Teaching Assistant Award

Winter 22

SKILLS

- **Toolkit and platforms:** python, java, C, bash, UNIX, R, OCaml, MATLAB; slurm, GCP, AWS, Watson, Dialogflow
- **MLAI frameworks/libraries:** pytorch, gym, bsuite, tensorflow, opencv, scikit-learn

Probabilistic Analysis of Algorithms

Concentration Inequalities and Applications

Mathematical Techniques for Machine Learning

Statistical Learning Theory

Advanced Probability Theory

Random Matrix Theory

Advanced Real Analysis

Functional Analysis

Regression, ANOVA

Generalized Linear Models

Sampling Theory, Applications

Applied Machine Learning

Cryptography and Data Security

Random Matrix Theory

General Relativity