

NHAN H. PHAM

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RESEARCH INTERESTS

Stochastic optimization methods for machine learning, deep learning, and reinforcement learning.

EDUCATION

Ph.D. in Operations Research

Aug. 2017–2022 (Expected)

Department of Statistics and Operations Research
University of North Carolina at Chapel Hill · Chapel Hill, NC, USA

Graduate Study in Computer Engineering

Aug. 2015–May 2017

Department of Computer Science and Engineering
University of Nevada, Reno · Reno, NV, USA

Bachelor of Engineering (Honor Program) in Computer Engineering

Aug. 2008–May 2013

Department of Computer Science and Engineering
Ho Chi Minh City University of Technology · Ho Chi Minh City, Vietnam

RESEARCH EXPERIENCES

Stochastic Gauss-Newton Algorithms for Nonconvex Compositional Optimization

Sept. 2019–Feb. 2020

Graduate Research Assistant, Supervisor: Dr. Quoc Tran-Dinh, Dr. Lam M. Nguyen.

Under review, [preprint](#).

- ◇ Propose two new Stochastic Gauss-Newton algorithms to solve stochastic nonconvex compositional problems.
- ◇ Use both classical stochastic and SARAH estimators for function values and Jacobian estimators.
- ◇ Be the first stochastic Gauss-Newton algorithm with global complexity analysis.
- ◇ Conduct numerical experiments on two examples: stochastic nonlinear equations and asset allocation problem.

Regularization Techniques on Deep Learning

Sept. 2019–Dec. 2019

SAMSI Research Fellow, Supervisor: Dr. Quoc Tran-Dinh.

- ◇ Work under Regularization Techniques subgroup studying the principle of different regularization techniques on training Deep Neural Networks (DNNs).
- ◇ Conduct numerical experiments on different DNN models consisting two or more regularizers on both model parameters (e.g. ℓ_2 -norm, max-norm constraint, etc.) and training process (dropout, batch normalization, etc.).

Hybrid Stochastic Policy Gradient Algorithm for Reinforcement Learning

Jul. 2019–Dec. 2019

Graduate Research Assistant, Supervisors: Dr. Quoc Tran-Dinh, Dr. Lam M. Nguyen.

Accepted for the 23rd International Conference on Artificial Intelligence and Statistics (AISTATS 2020), [preprint](#).

- ◇ Propose a new biased policy gradient estimator from REINFORCE/GPOMDP and adopted SARAH estimators.
- ◇ Develop a new algorithm utilizing the new estimator which is the first algorithm that has convergence guarantee to solve a composite policy optimization problem in reinforcement learning.
- ◇ Prove that the proposed algorithm achieves the best-known convergence rate over existing methods and conduct experiments to verify the advantage using OpenAI gym environments.

Hybrid Optimization Framework for Composite Nonconvex Optimization

Feb. 2019–Aug. 2019

Graduate Research Assistant, Supervisors: Dr. Quoc Tran-Dinh, Dr. Lam M. Nguyen.

Under review for *Mathematical Programming*, [preprint](#).

- ◇ Introduce a new stochastic gradient estimator that combines SGD and SARAH estimators and use it to develop a new algorithm for composite nonconvex optimization problems which achieves best-known convergence rate.
- ◇ Verify the effectiveness of the proposed algorithm via numerical experiments using Python and Tensorflow.

ProxSARAH: A Framework for Stochastic Composite Nonconvex Optimization

Aug. 2018–Feb. 2019

Graduate Research Assistant, Supervisors: Dr. Quoc Tran-Dinh, Dr. Lam M. Nguyen.

Accepted with minor revision for *Journal of Machine Learning Research (JMLR)*, [preprint](#).

- ◇ Develop a new stochastic algorithm that solves composite nonconvex optimization problems which utilizes existing SARAH estimator and achieve the best-known convergence rate.
- ◇ Conduct numerical experiments to illustrate the advantage of the proposed algorithms on three examples: Non-negative PCA, classification with 3 nonconvex losses, and neural network training using Python and Tensorflow.

Autonomous Robots for Bridge Inspection

Aug. 2015–Feb. 2017

Graduate Research Assistant, Supervisor: Dr. Hung M. La.

In *Proceedings of the 54th Annual Allerton Conference on Communication, Control, and Computing*, [preprint](#).

In *Proceedings of the 2017 IEEE International Conference on Robotics and Automation (ICRA)*, [preprint](#).

The 33rd International Symposium on Automation and Robotics in Construction and Mining (ISARC), [preprint](#).

- ◇ Propose a four-wheeled robot for steel bridge inspection with permanent magnets embedded inside each wheel equipped with different type of sensors: visual camera, 3D sensor, IMU for localization and mapping purposes.
- ◇ Build a controller unit with minicomputer (Intel NUC) running Robot Operating System communicating with a low-level controller (Arduino-based) for sensory data collection, implement sensor fusion and mapping algorithms.

PREPRINTS

1. Q. Tran-Dinh, **N. H. Pham**, and L. M. Nguyen. Stochastic Gauss-Newton Algorithms for Nonconvex Compositional Optimization. *arXiv:2002.07290*, 2020.
2. T. T. Doan, L. M. Nguyen, **N. H. Pham**, and J. Romberg. *Convergence Rates of Accelerated Markov Gradient Descent with Applications in Reinforcement Learning*. *arXiv:2002.02873*, 2020.
3. Q. Tran-Dinh, **N. H. Pham**, D. T. Phan, and L. M. Nguyen. *A Hybrid Stochastic Optimization Framework for Composite Nonconvex Optimization*. *arXiv:1907.03793*, 2019. (Under review for Mathematical Programming)

PUBLICATIONS

1. **N. H. Pham**, L. M. Nguyen, D. T. Phan, and Q. Tran-Dinh. ProxSARAH: An efficient algorithmic framework for stochastic composite nonconvex optimization. *Journal of Machine Learning Research*, 2020. (in press)
2. **N. H. Pham**, L. M. Nguyen, P. H. Nguyen, M. van Dijk, and Q. Tran-Dinh. A Hybrid Stochastic Policy Gradient Algorithm for Reinforcement Learning. *The 23rd International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2020, Palermo, Italy.
3. H. M. La, T. H. Dinh, **N. H. Pham**, Q. P. Ha, and A. Q. Pham. Automated robotic monitoring and inspection of steel structures and bridges. *Robotica*, Cambridge University Press, 1-21, 2018.
4. T. D. Le, S. Gibb, **N. H. Pham**, H. M. La, L. Falk, and T. Berendsen. Autonomous Robotic System using Non-Destructive Evaluation methods for Bridge Deck Inspection. In *Proceedings of the 2017 IEEE International Conference on Robotics and Automation (ICRA)*, May 29-June 3, 2017, Singapore.
5. **N. H. Pham** and H. M. La. Design and Implementation of an Autonomous Robot for Steel Bridge Inspection. In *Proceedings of the 54th Annual Allerton Conference on Communication, Control, and Computing*, pages 1-8, Sept. 27-30, 2016, Urbana-Champaign, Illinois, USA.
6. **N. H. Pham**, H. M. La, Q. P. Ha, S. N. Dang, A. H. Vo, and Q. H. Dinh. Visual and 3D Mapping for Steel Bridge Inspection Using a Climbing Robot. *The 33rd International Symposium on Automation and Robotics in Construction and Mining (ISARC)*, pages 1-8, July 18-21, 2016, Auburn, Alabama, USA.
7. T.-D. D. Phan, **N. H. Pham**, K.-N. Le-Huu, and A.-V. D. Dinh. Quadrotor Helicopter: A Practical Design Approach. *IEICE International Conference on Integrated Circuits, Design and Verification*, pp.156-163, 2013, Ho Chi Minh, Vietnam.

SKILLS & QUALIFICATIONS

Technical	Python, Tensorflow, Keras, Scikit-learn, C/C++, Matlab, Data Structures & Algorithms
Other skills	Linux Development Environment, Robotics, Embedded Systems

OTHER EXPERIENCES

Graduate Teaching Assistant

STOR 155: Introduction to Data Models and Inference

Department of Statistics and Operations Research · University of North Carolina at Chapel Hill

Spring 2020

Graduate Teaching Fellow

STOR 113: Decision Models for Business and Economics

Department of Statistics and Operations Research · University of North Carolina at Chapel Hill

Spring 2019–Summer 2019

Graduate Teaching Assistant

STOR 113: Decision Models for Business and Economics

STOR 155: Introduction to Data Models and Inference

Department of Statistics and Operations Research · University of North Carolina at Chapel Hill

Fall 2017–Fall 2018

Graduate Teaching Assistant CPE 301: Embedded Systems Design CS 302: Data Structures Department of Computer Science and Engineering · University of Nevada, Reno	Fall 2015–Spring 2017
Lab Assistant Renesas SuperH Lab Department of Computer Science and Engineering · Ho Chi Minh City University of Technology	Jun. 2013–Apr. 2015
Organizing Assistant BKIT Car Rally Department of Computer Science and Engineering · Ho Chi Minh City University of Technology	2014
Robot Control Software Developer BK4 aka BKIT Number One Team · Vietnam National Robot Contest Department of Computer Science and Engineering · Ho Chi Minh City University of Technology	2013
Embedded Software Developer ChipFC Team · Texas Instruments National MCU Design Contest— 1st Place Winner	2012

HONORS & AWARDS

Graduate Access Grant Regents' Higher Education Opportunity Award University of Nevada, Reno · Reno, NV	Spring 2016–Spring 2017
International Graduate Student Award Regents' Higher Education Opportunity Award University of Nevada, Reno · Reno, NV	Spring 2016–Spring 2017
Poster Exhibition—1st Place Winner CSE Graduate Club—Department of Computer Science and Engineering University of Nevada, Reno · Reno, NV	2016
Outstanding Academic Student Scholarship Department of Computer Science and Engineering Ho Chi Minh City University of Technology · Ho Chi Minh City, Vietnam	2008–2013