

# NHAN H. PHAM

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## RESEARCH INTERESTS

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

## EDUCATION

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**Ph.D. in Operations Research** 2017–2021

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

**Graduate Study in Computer Engineering** 2015–2017

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

**Bachelor of Engineering (Honor Program) in Computer Engineering** 2008–2013

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

## INDUSTRY EXPERIENCES

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**Research Scientist** 2022–Present

IBM Research, Thomas J. Watson Research Center · Yorktown Heights, NY

**Summer Machine Learning Intern** 2021

Blue River Technology Inc. · Sunnyvale, CA

**Summer Research Intern** 2020

IBM Research, Thomas J. Watson Research Center · Yorktown Heights, NY

## RESEARCH EXPERIENCES

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**Automation for Enterprise Data Management** Dec. 2023–Present

- ◇ Build an end-to-end system for text-to-SQL using Large Language Models (LLMs).
- ◇ Conduct experiments using enterprise dataset as well as public Text2SQL dataset.

**An Automated System for Tuning and Alignment of Foundation Models with Applications in Data Management**

Mar. 2022–Mar. 2023

- ◇ Build a configurable search system that allows automated rapid experimentation for tuning foundation models on data management tasks.
- ◇ Experimenting with different reward functions for reinforcement learning (RL) fine-tuning for Column-to-Concept mapping use-case.

**Automated Decision Optimization** Jan. 2022–Mar. 2023

- ◇ Design the application framework and system architecture for data and knowledge-driven Automated Decision Optimization ((AutoDO)).
- ◇ Demonstrate, benchmark, and experiment for effectiveness and solution quality from AutoDO.
- ◇ AutoDO is available on IBM API Hub portal.

**Evaluating Robustness of Cooperative MARL: A Model-based approach** Jul. 2021–May 2023

Joint work with: Dr. Lam M. Nguyen, Dr. Jie Chen, Dr. Hoang Thanh Lam, Dr. Subhro Das, and Dr. Tsui-Wei Weng.  
Accepted for the 2023 IEEE International Conference on Data Mining (ICDM), [eprint](#).

- ◇ Propose the first model-based adversarial attacks, called cMBA, for cooperative multi-agent reinforcement learning by solving a constrained nonconvex optimization problem at every timestep.
- ◇ Propose a new victim agent selection strategy which has not been considered in previous works.
- ◇ Conduct experiments on multi-agent MuJoCo environments.

**Federated Learning with Randomized Douglas-Rachford Splitting Methods** Aug. 2020–Jun. 2021

Graduate Research Assistant, Supervisor: Dr. Quoc Tran-Dinh, Dr. Lam M. Nguyen.  
Accepted for the 35th Conference on Neural Information Processing Systems, [eprint](#).

- ◇ Propose two new algorithms, FedDR and asyncFedDR, to solve finite-sum nonconvex problems in federated learning by combining Douglas-Rachford splitting, randomized strategy, and asynchronous update.
- ◇ Achieve best-known communication complexity and handle data heterogeneity.

- ◇ Conduct experiments on federated learning examples using synthetic and real datasets.

### **Regression Optimization for System-level Production Control**

Jun. 2020–Aug. 2020

IBM Research Intern, Supervisor: Dr. Roman Vaculin, Dr. Dzung T. Phan, Dr. Lam M. Nguyen.

Accepted for the 2021 American Control Conference (ACC).

### **Stochastic Gauss-Newton Algorithms for Nonconvex Compositional Optimization**

Sept. 2019–Feb. 2020

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

Accepted for the 37th International Conference on Machine Learning, [eprint](#).

- ◇ Propose two new Stochastic Gauss-Newton algorithms to solve stochastic nonconvex compositional problems that use both classical stochastic and SARAH estimators for function values and Jacobian estimators.
- ◇ Give 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.

- ◇ Study 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.,  $\ell_2$ -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), [eprint](#).

- ◇ Propose new biased policy gradient estimator from REINFORCE/GPOMDP and adopted SARAH estimators and use it to derive first algorithm that has convergence guarantee to solve a composite policy optimization problem in reinforcement learning.
- ◇ Prove proposed algorithm achieves 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.

Accepted for Mathematical Programming, [eprint](#).

- ◇ 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 for Journal of Machine Learning Research (JMLR), [eprint](#).

- ◇ Develop new stochastic algorithm for composite nonconvex optimization problems which utilizes existing SARAH estimator and achieves the best-known convergence rate.
- ◇ Conduct numerical experiments to illustrate advantage of 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, [eprint](#).

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

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

- ◇ Propose 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 controller unit with minicomputer (Intel NUC) running Robot Operating System communicating with low-level controller (Arduino-based) for sensory data collection, implement sensor fusion and mapping algorithms.

## **PREPRINTS**

1. 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.
2. T. T. Doan, L. M. Nguyen, **N. H. Pham**, and J. Romberg. Finite-Time Analysis of Stochastic Gradient Descent under Markov Randomness. *arXiv:2003.10973*, 2020.

## PUBLICATIONS

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1. **N. H. Pham**, L. M. Nguyen, J. Chen, H. T. Lam, S. Das, T. W. Weng. Evaluating Robustness of Cooperative MARL: A Model-based Approach. 2023 IEEE International Conference on Data Mining (ICDM), pp. 1271-1276, Shanghai, China, 2023.
2. **N. H. Pham**, L. M. Nguyen, J. Chen, H. T. Lam, S. Das, T. W. Weng. Evaluating Robustness of Cooperative MARL: A Model-based Approach. 2023 IEEE International Conference on Data Mining (ICDM), pp. 1271-1276, Shanghai, China, 2023.
3. Q. Tran-Dinh, **N. H. Pham**, D. T. Phan, and L. M. Nguyen. FedDR–Randomized Douglas-Rachford Splitting Algorithms for Nonconvex Federated Composite Optimization. *The 35th Conference on Neural Information Processing Systems*, 2021.
4. D. T. Phan, L. M. Nguyen, P. Murali, **N. H. Pham**, H. Liu, and J. R. Kalagnanam. Regression Optimization for System-level Production Control. *American Control Conference (ACC)*, 2021.
5. Q. Tran-Dinh, **N. H. Pham**, D. T. Phan, and L. M. Nguyen. A Hybrid Stochastic Optimization Framework for Composite Nonconvex Optimization. *Mathematical Programming*, 2021.
6. Q. Tran-Dinh, **N. H. Pham**, and L. M. Nguyen. Stochastic Gauss-Newton Algorithms for Nonconvex Compositional Optimization. *Proceedings of the 37th International Conference on Machine Learning*, PMLR 119:9572-9582, 2020.
7. **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.
8. **N. H. Pham**, L. M. Nguyen, D. T. Phan, 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.
9. 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.
10. 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.
11. **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.
12. **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.

## PATENT APPLICATIONS

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1. E. Lobo, **N. H. Pham**, L. Vu, T. Mummert, and D. Subramanian. A novel system for metadata to glossary matching in data lakes using generative models. *To be filed*.
2. L. Vu, **N. H. Pham**, D. Subramanian, T. Mummert. System and Method for Combining Data Selection and Reward Function for Tuning LLMs using Reinforcement Learning. *Filed on Jan. 11, 2024*.
3. T. L. Hoang, M. M. Galindo, G. Picco, M. Zayats, **N. H. Pham**, L. M. Nguyen, M. L. Sbodio, D. T. Phan, and V. L. Garcia. Evolution and regression generative models and sequence representation learning from multi sequence alignment and phylogenetic trees data. *Filed on Jun. 30, 2023*.
4. L. Vu, P. Kirchner, R. Marinescu, D. Subramanian, and **N. H. Pham**. A novel meta-hyperparameter tuning system for RL using sequence model. *Filed on Jun. 26, 2023*.
5. E. Lobo, **N. H. Pham**, D. Subramanian, and T. Pedapati. A novel meta-hyperparameter tuning system for RL using sequence model. *Filed on Jun. 23, 2023*.
6. **N. H. Pham**, L. M. Nguyen, J. Chen, T. L. Hoang, S. Das. A systematic approach for evaluating robustness of cooperative multi-agent reinforcement learning. *Filed on Sep. 28, 2022*.
7. D. T. Phan, **N. H. Pham**, L. M. Nguyen. Site-Wide Optimization for Mixed Regression Models and Mixed Control Variables. *Filed on May 25, 2021*.

## TUTORIALS/LAB

### AAAI 2023 Tutorial and Lab Organizer

Feb. 2023

**Title:** *Automated AI For Decision Optimization with Reinforcement Learning.*

## INVITED TALKS

### MIT-IBM Guest Seminar

Jul. 2021

**Title:** *Stochastic Recursive Gradient Algorithms for Stochastic Composite Nonconvex Optimization and Policy Optimization.*

### INFORMS Annual Meeting 2020 Virtual

Nov. 2020

**Title:** *A Hybrid Stochastic Policy Gradient Algorithm for Reinforcement Learning.*

### INFORMS Annual Meeting 2019 Seattle

Oct. 2019

**Title:** *ProxSARAH: An Efficient Algorithmic Framework for Stochastic Composite Nonconvex Optimization.*

## SKILLS & QUALIFICATIONS

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

## PROFESSIONAL SERVICES

### REVIEWER (PEER-REVIEWED CONFERENCES)

<i>International Conference on Machine Learning (ICML)</i>	2020–2024
<i>Conference on Neural Information Processing Systems (NIPS/NeurIPS)</i>	2020–2024
<i>International Conference on Artificial Intelligence and Statistics (AISTATS)</i>	2021–2024
<i>International Conference on Learning Representations (ICLR)</i>	2021–2024
<i>AAAI Conference on Artificial Intelligence</i>	2022–2024
<i>Conference on Uncertainty in Artificial Intelligence</i>	2022

### REVIEWER (PEER-REVIEWED JOURNALS)

<i>Automatica</i>	2024
<i>Applied Intelligence</i>	2023–2024
<i>Transactions on Machine Learning Research (TMLR)</i>	2023–2024
<i>IEEE Transactions on Neural Networks and Learning Systems (IEEE TNNLS)</i>	2022–2023
<i>Machine Learning</i>	2021–2023
<i>Journal of Machine Learning Research (JMLR)</i>	2022–2023
<i>IEEE Transactions on Automatic Control (IEEE TAC)</i>	2022–2023
<i>IMA Journal of Numerical Analysis (IMAJNA)</i>	2022–2023
<i>Journal of Scientific Computing (JOMP)</i>	2022
<i>Neural Networks (NEUNET)</i>	2022
<i>Computational Optimization and Applications (COAP)</i>	2021–2022

## OTHER EXPERIENCES

### Graduate Teaching Assistant

2020–2021

STOR 455: Methods of Data Analysis

STOR 155: Introduction to Data Models and Inference

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

### Graduate Teaching Fellow

2019

STOR 113: Decision Models for Business and Economics

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

### Graduate Teaching Assistant

2017–2018

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*

**Graduate Teaching Assistant**

2015–2017

*CPE 301: Embedded Systems Design*

*CS 302: Data Structures*

*Department of Computer Science and Engineering · University of Nevada, Reno*

**HONORS & AWARDS**

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**Graduate Access Grant**

2016—2017

**Regents' Higher Education Opportunity Award**

*University of Nevada, Reno · Reno, NV*

**International Graduate Student Award**

2016–2017

**Regents' Higher Education Opportunity Award**

*University of Nevada, Reno · Reno, NV*

**Poster Exhibition–1st Place Winner**

2016

*CSE Graduate Club–Department of Computer Science and Engineering*

*University of Nevada, Reno · Reno, NV*