NHAN H. PHAM

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RESEARCH INTERESTS

- ◇ Stochastic methods for machine learning, deep learning, reinforcement learning, and federated learning
- ◇ LLM-based solutions for enterprise data management applications

EDUCATION

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

Staff Research Scientist *2024–Present*
IBM Research, Thomas J. Watson Research Center · Yorktown Heights, NY

Research Scientist *2022–2024*
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

Automation for Enterprise Data Management *Dec. 2023–Present*
Building an end-to-end system for text-to-SQL using Large Language Models (LLMs).

- ◇ Experiments with both in-context learning and finetuning LLMs for individual tasks such as schema linking and SQL generation.
- ◇ Curate training and evaluation datasets from open-source and enterprise usecases.
- ◇ Develop reasoning capability for text-to-SQL models.
- ◇ Achieved top rannking on BIRD leaderboard.
- ◇ Core developer of NL2Insights: an automated pipeline for text2SQL.
- ◇ Enable Text2SQL service in IBM watsonx.data intelligence.

Table metadata to business glossaries mapping *Mar. 2023–Jan. 2024*
Leveraging LLMs to design generic methods for matching table metadata with business glossaries.

- ◇ Leverage LLMs to design generic matching methods that do not require manual tuning and can identify complex relations between column names and glossaries.
- ◇ Propose methods that utilize LLMs in two ways: generating additional context for column names that can aid with matching and using LLMs to directly infer if there is a relation between column names and glossary description.
- ◇ 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*
An end-to-end automated system to solve sequential decision-making problems.

- ◇ 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., 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), 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.

PUBLICATIONS

1. W. Ma, D. Bhattacharjya, J. Lee, **N. H. Pham**, H. Kokel, Q. Ji. Black-Box Uncertainty Quantification for Large Language Models via Ensemble-of-Ensembles. *AAAI 2026 Workshop on Assessing and Improving Reliability of Foundation Models in the Real World*, 2026.
2. W. Chen, **N. H. Pham**, M. Glass, L. Vu, G. Rossiello, D. Subramanian, S. Paternain. ConstrainedSQL: Training LLMs for Text2SQL via Constrained Reinforcement Learning. *NeurIPS 2025 Workshop on Efficient Reasoning*, 2025.
3. G. Rossiello, **N. H. Pham**, M. Glass, J. Lee, D. Subramanian. Rationalization Models for Text-to-SQL. *ICLR 2025 Workshop on Reasoning and Planning for LLMs*, 2025.
4. Q. Xiao, D. Bhattacharjya, B. Ganesan, R. Marinescu, K. Mirylenka, **N. H. Pham**, M. Glass, and J. Lee. The Consistency Hypothesis in Uncertainty Quantification for Large Language Models. *Proceedings of the Forty-First Conference on Uncertainty in Artificial Intelligence*, 2025.
5. **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.
6. 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.
7. 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.
8. 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.
9. 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.
10. **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.
11. **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.
12. 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.
13. 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.
14. **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.
15. **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.

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.

PATENT APPLICATIONS

1. 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. Granted on Mar, 3th, 2026*.
2. 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. Granted on Jan 6th, 2026*.
3. M. Eyceoz, G. Rossiello, A. M. Gliozzo, M. R. Glass, N. Mihindukulasooriya, **N. H. Pham**, L. H. Vu, D. Subramanian, F. M. Chowdhury. Generating structured query language queries from natural language inputs with schema enrichment. *Filed on Aug 19, 2025*.
4. T. R. Dinger, A. M. Gliozzo, **N. H. Pham**, O. Hassanzadeh, D. Subramanian, L. Amini, G. Rossiello, M. F. M. Chowdhury, L. VU, T. Kaple, M. Glass. Database Querying Using Natural Language Processing. *Filed on March 26, 2025*.
5. 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. *Filed on August 22, 2024*.
6. 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*.
7. 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*.
8. 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*.
9. **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*.

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

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

HONORS & AWARDS

IBM Outstanding Technical Achievement Award *2026*
NL2Insights Impacting Products and Clients

IBM Growth Award *2025*
Advancing Text2SQL service within watsonx.data intelligence

IBM Research Accomplishments *2025*
NL2Insights: Product and Client-0 Adoption & Impact (A-level)

IBM Outstanding Technical Achievement Award *2025*
IBM Granite Text-to-SQL: BIRD Leaderboard First Place

IBM Research Accomplishments *2024*
IBM Granite Fine-tuned Text-to-SQL Models Sweep Top Spots in BIRD Leaderboard (A-level)

IBM Research Pat Goldberg Memorial Best Paper *2022*
IBM Research

PROFESSIONAL SERVICES

REVIEWER (PEER-REVIEWED CONFERENCES)

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

REVIEWER (PEER-REVIEWED JOURNALS)

SIAM Journal on Optimization	*2026*
Automatica	*2024*
Applied Intelligence	*2023–2024*
Transactions on Machine Learning Research (TMLR)	*2023–2024*
IEEE Transactions on Neural Networks and Learning Systems (IEEE TNNLS)	*2022–2023*
Machine Learning	*2021–2023*
Journal of Machine Learning Research (JMLR)	*2022–2023*
IEEE Transactions on Automatic Control (IEEE TAC)	*2022–2023*
IMA Journal of Numerical Analysis (IMAJNA)	*2022–2023*
Journal of Scientific Computing (JOMP)	*2022*
Neural Networks (NEUNET)	*2022*
Computational Optimization and Applications (COAP)	*2021–2022*