

Van Tien Nguyen

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Research Profile

Doctoral candidate developing structure-aware and resource-efficient methods for quantum, hybrid quantum–classical, and deep-learning systems. My work preserves tensor, low-rank, temporal, and measurement structure across model design, optimization, evaluation, and deployment to reduce parameter, data-processing, qubit, and finite-shot costs while retaining predictive performance. I evaluate methods through theory, reproducible simulation, finite-shot studies, and experiments on IBM Quantum hardware using PyTorch, Qiskit, and PennyLane.

Research Interests

My research starts from a simple frustration: most hybrid quantum–classical models discard structure already present in their data, flattening images, sequences, and quantum measurements before learning begins and then spending scarce qubits, shots, or classical parameters rediscovering it. In *Quantum-Based Tensor Contraction Layers* (QTCL, SPIE 2026), I placed a small trainable quantum circuit inside a compressed tensor bottleneck rather than on the full image, tying its cost to the bottleneck width instead of the raw input. The design outperformed its classical counterpart on VGG-19/CIFAR-100 but not on AlexNet, a regime-dependent result that turns the broad question “does quantum help?” into the more useful question of *when* it helps. This structure-first view also motivates *Quantum Tensor-Bit*, a collision-aware encoding for QNN classification under limited input-qubit budgets.

The same principle carries into classical multilinear learning and quantum optimization. In *Depth- and Rank-Selective Multilinear Transformation Layers* (MTL, Asilomar 2026) and its adaptive-rank extension *LR-MTL* (under review, IEEE TAI), late convolutional blocks are replaced by mode-wise transformations and the effective rank is learned rather than fixed by hand. In *QALR-CPD*, I formulated adaptive CP-rank selection as an interaction-aware QUBO so that a quantum optimizer selects tensor components jointly instead of pruning them by magnitude alone. These projects study when tensor structure can lower memory and computation without hiding the accuracy costs of compression.

A well-placed quantum circuit is still only as useful as what is measured from it. In *Parameter-Efficient Multilinear Readout for Quantum Reservoir Computing* (ML-QRC, QML@QCE 2026), I preserved the time–qubit–observable structure of reservoir measurements instead of flattening them, reducing readout parameters by approximately $12.1\times$ without sacrificing predictive quality. In *Variational Quantum Bayesian Regression* (VQBR, IEEE QCE 2026), I separated a regression vector into a direction recovered by a shallow circuit and a scale solved analytically, recovering the true MAP direction with 0.998 cosine similarity under finite-shot noise. My current *AdaRO-Q* work extends this measurement-aware view by adapting readout observables across task-incremental quantum continual-learning settings.

The connecting question is where these methods should run once compilation, queueing, shots, mitigation, and classical processing are counted honestly. I am developing end-to-end execution cost and quality analyses, together with resource- and outcome-prediction models for quantum–classical workloads. Across these lines, the goal is not to make more systems quantum, but to identify with reproducible evidence when structured quantum or hybrid methods are worth their complete cost.

Education

The University of Texas at San Antonio (UT San Antonio)

Doctoral Candidate, Electrical Engineering

Aug. 2023–Present
San Antonio, TX, USA

- Advisor: Prof. Panagiotis P. Markopoulos; GPA: 3.95/4.00.
- Dissertation: *Structure-Aware and Resource-Efficient Quantum–Classical Learning*.

Vietnam National University HCMC–University of Information Technology

B.S. (Honors), Computer Science

Aug. 2018–Jan. 2022
Ho Chi Minh City, Vietnam

- Graduated with Excellence; ranked 1st of 26 students; final grade: 9.05/10.
- Thesis: *Evaluating Deep Learning Methods for Vietnamese Infographic Visual Question Answering*.
- Advisors: Tien Do Van, M.Sc., and Thanh Duc Ngo, Ph.D.

Publications and Manuscripts

Accepted / To Appear

1. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “VQBR: Variational Quantum Bayesian Regression via Measurement-Based MAP Direction Recovery,” *2026 IEEE International Conference on Quantum Computing and Engineering (QCE)*, Quantum Machine Learning Technical Papers Track, Toronto, Canada, Sept. 2026. [Accepted](#).
2. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “Parameter-Efficient Multilinear Readout for Quantum Reservoir Computing,” *Workshop on Quantum Machine Learning at IEEE Quantum Week 2026 (QML@QCE)*, Toronto, Canada, Sept. 2026. [Accepted for speed presentation and poster; to appear in workshop proceedings](#).
3. **Van Tien Nguyen**, Mayur Dhanaraj, and Panagiotis P. Markopoulos, “Depth- and Rank-Selective Multilinear Transformation Layers for Compact CNNs,” *60th Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Oct. 2026. [Accepted](#).

Peer-Reviewed Publications

4. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “Quantum-Based Tensor Contraction Layers,” in *Machine Learning from Challenging Data 2026*, Proc. SPIE, vol. 14030, paper 140300I, 2026. [doi:10.1117/12.3098024](#).
5. M. Tran, T. Pham, **V. T. Nguyen**, T. Do, and T. N. Duc, “A Robust Framework for Mathematical Formula Detection,” in *2021 International Conference on Multimedia Analysis and Pattern Recognition (MAPR)*, pp. 1–6, 2021. [doi:10.1109/MAPR53640.2021.9585197](#).

Submitted / Under Review

6. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “Quantum Computing for Tensor Decomposition: A Review of Foundations, Algorithms, Challenges, and Future Directions,” *ACM Transactions on Quantum Computing*, submitted Aug. 2026. [Manuscript TQC-2026-0189](#).
7. Mayur Dhanaraj*, **Van Tien Nguyen***, and Panagiotis P. Markopoulos, “Adaptive Low-Rank Multilinear Transformations for Compact Convolutional Neural Networks,” *IEEE Transactions on Artificial Intelligence*, under review; resubmitted Aug. 2026. [*Equal contribution; supported by NSF Award 2332744](#).
8. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “Quantum Optimization for Adaptive Low-Rank CP Decomposition,” *Quantum Machine Intelligence*, submitted Sept. 1, 2026.

Manuscripts in Preparation

9. **Van Tien Nguyen** and Panagiotis P. Markopoulos, “AdaRO-Q: Adaptive Readout Observables for Task-Incremental Quantum Continual Learning,” manuscript in preparation; venue TBD.
10. **Van Tien Nguyen**, “Quantum Tensor-Bit: Structure-Preserving, Collision-Aware Encoding for QNN Classification,” manuscript in preparation; venue TBD.

Selected Research Contributions

- **Measurement-based quantum regression:** Reframed Bayesian linear regression around quantities accessible to a shallow variational circuit, separating coefficient direction from analytically recovered scale and avoiding explicit Gram-matrix construction.
- **Structured quantum-reservoir readout:** Preserved time-qubit-observable organization with a Tucker-factored readout, reducing trainable parameters by approximately $12.1\times$ relative to an MLP readout and reaching compression ratios up to $52.24\times$ across tested reservoir sizes.
- **Adaptive observables for continual learning:** Developed task-specific readout observables and evaluated sequential performance, forgetting, ablations, and finite-shot robustness across three task-incremental benchmarks.
- **Compact tensor and hybrid architectures:** Designed or co-developed QTCL, MTL, LR-MTL, and Tensor-Bit methods to preserve multidimensional structure while studying parameter, computation, qubit, and predictive-performance tradeoffs.
- **Quantum-assisted tensor optimization and recovery:** Formulated interaction-aware adaptive CP-rank selection as a QUBO and investigated objective-aligned recovery of deployable classical predictors from quantum-encoded states.
- **Resource and outcome modeling:** Study complete CPU, GPU, simulator, and QPU workflows to predict execution resource demand, end-to-end cost, and output quality for quantum-classical workloads.

Research Experience

Doctoral Researcher, Machine Learning Optimization and Systems (MILOS) Laboratory

Aug. 2023–Present

The University of Texas at San Antonio

San Antonio, TX

- Develop structure-aware and measurement-efficient methods for quantum and hybrid learning under limited qubits, finite shots, noisy hardware, and low-data regimes.
- Lead the design, analysis, implementation, and technical writing for VQBR, ML-QRC, AdaRO-Q, Tensor-Bit, QALR-CPD, and quantum-HPC resource-modeling projects.
- Co-develop compact multilinear neural-network layers and evaluate parameter, computation, memory, and predictive-performance tradeoffs on CIFAR-10, CIFAR-100, DOTA-v1.0, and ImageNet-1K.
- Validate quantum and hybrid methods with analytic derivations, reproducible simulation, finite-shot and noise studies, ablation experiments, and IBM Quantum hardware runs.
- Build reproducible research workflows in PyTorch, Qiskit, and PennyLane; maintain shared GPU/CPU infrastructure, software environments, experiment tracking, and remote laboratory workflows.
- Contribute to research-grant proposal development with faculty advisor through literature synthesis, problem formulation, project planning, technical writing, and preparation of project objectives and supporting preliminary evidence.
- Prepare manuscripts, technical presentations, posters, and research software for peer-reviewed conferences, journals, workshops, and invention disclosure.

Research Assistant, AI Club

2020–2022

VNUHCMC–University of Information Technology

Ho Chi Minh City, Vietnam

- Conducted deep-learning research in computer vision and NLP, including infographic visual question answering, instance retrieval, mathematical-formula detection, and reinforcement-learning game agents.
- Contributed to dataset construction, model training, evaluation, technical writing, and research presentations.

Industry Experience

Research Engineer

Mar. 2022–Mar. 2023

Viettel High Technology Industries Corporation

Vietnam

- Developed NLP systems for named-entity recognition, entity linking, summarization, and timeline generation using internally constructed news and social-media datasets.
- Packaged models as containerized microservices and integrated them into production workflows using version control, CI/CD, and reproducible model-serving practices.

Teaching Experience

Graduate Teaching Assistant, Department of Electrical Engineering

Aug. 2026–Present

The University of Texas at San Antonio

San Antonio, TX

- Support EE 3233: System Programming for Engineers through recitation and laboratory instruction, in-class examples, office hours, grading, student support, and preparation of instructional materials.
- Help students develop and debug systems-programming assignments while reinforcing reproducible compilation, testing, and documentation practices.

Teaching Assistant

Sep. 2021–Jan. 2022

VNUHCMC–University of Information Technology

Ho Chi Minh City, Vietnam

- Supported tutorials, grading, office hours, and programming exercises for Introduction to Programming in C++ and Python.

Patents and Inventions

- **Confidential Quantum-Computing Invention Disclosure**, UT San Antonio, 2026. Under institutional review.
- **Detecting Ships in Distress Based on Optical Satellite Images and Automatic Identification System Signals**, Vietnamese patent filing, Jan. 2023.

Honors and Awards

- **NSF Student Travel Grant, IEEE Quantum Week 2026**, awarded July 2026; up to \$1,250 in reimbursable travel support to present accepted work at QCE 2026 in Toronto, Canada, Sept. 2026.
- **Selected for Phase III**, qBraid–MITRE–JonesTrading Quantum Challenge / Global Industry Challenge 2026, June 2026.
- **UT San Antonio Institutional Nominee, 2026 Google PhD Fellowship–Quantum Computing**, selected as one of four university nominees, Apr. 2026.
- **Quantum Rising Star Award**, inaugural Quantum Student Success Summit (QS3), Rice University, Mar. 2026.
- **Graduate School Academic Travel Fund**, UT San Antonio, \$750 to support presentation at SPIE Machine Learning from Challenging Data 2026, Spring 2026.
- **Earlier distinctions**: Student of 5 Merits, University of Information Technology, 2019–2021 (three consecutive years); Consolation Prize, AI Camera Inspection Challenge, 2020; Consolation Prize, National Mathematical Olympiad Competition, 2019.

Professional Leadership and Certification

- **Qiskit Advocate**, IBM Quantum / Qiskit community, Aug. 2025–Present; advanced to Tier 1 in July 2026.
- **Organizer**, UT San Antonio Qiskit Fall Fest 2026, a two-day hybrid quantum-computing workshop.
- **IBM Certified Quantum Computation using Qiskit v2.X Developer–Associate**, June 2026. [Credential](#).
- **Mentor-in-Training**, Qiskit Global Summer School 2026, IBM Quantum.

Presentations and Professional Service

- **Oral Presenter**, “VQBR: Variational Quantum Bayesian Regression via Measurement-Based MAP Direction Recovery,” Quantum Machine Learning Technical Papers Track, IEEE QCE 2026, Toronto, Canada, Friday, Sept. 18, 2026.
- **Lightning-Talk and Poster Presenter**, “Parameter-Efficient Multilinear Readout for Quantum Reservoir Computing” (ML-QRC), QML@QCE Workshop, IEEE Quantum Week 2026, Toronto, Canada, Sunday, Sept. 13, 2026.
- **Conference Attendee**, IEEE Quantum Week 2026 (IEEE International Conference on Quantum Computing and Engineering, QCE), Toronto, Canada, Sept. 13–18, 2026.
- **Presenter**, SPIE Defense + Commercial Sensing, Machine Learning from Challenging Data, National Harbor, MD, Apr. 2026.
- **Poster presenter and lightning-talk speaker**, inaugural Quantum Student Success Summit, Rice University, Mar. 2026.
- **Participant**, Qiskit Global Summer School, 2024 and 2025; earned Quantum Excellence completion badges.
- **Participant**, NSF Spring AI School, San Antonio, TX, 2024–2026.
- **Scribe**, EXAIL Workshop, Pittsburgh, PA, Oct. 2024.

Selected Additional Technical Projects

- **Transformer-Based Quantum Error Mitigation**: Benchmarked unmitigated estimation, zero-noise extrapolation, a histogram MLP, and a Transformer encoder on raw shot sequences; a shuffle ablation showed permutation-invariant behavior. [Code and report](#).
- **NV-Center Quantum Sensing for Biomedicine**: Simulated nanodiamond NV-center T_1 relaxometry for mitochondrial free-radical conditions using amplitude damping, inversion recovery, T_1 fitting, and standard-quantum-limit ensemble scaling. [Code and report](#).
- **Quantum Neural Networks Benchmark Study**: Implemented variational quantum classifiers and compared them with classical baselines across multiple benchmark datasets. [Code and report](#).
- **HHL for Linear Regression**: Implemented and analyzed HHL-based linear regression on quantum simulators, including numerical stability, conditioning, data-loading assumptions, and resource requirements. [Code and report](#).

Technical Skills

Programming and ML	Python, C/C++, PyTorch, TensorFlow, scikit-learn, NumPy, SciPy, snnTorch
Quantum Computing	Qiskit, PennyLane, Cirq, CUDA-Q, IBM Quantum Runtime; variational algorithms, quantum simulation, finite-shot analysis
Tensor Methods	Tensor decomposition, multilinear algebra, low-rank modeling, structured neural networks
Research Computing	Linux, Git, GitHub, Docker, CUDA/GPU workflows, Jupyter, LaTeX, CI/CD