Nam Nguyen

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EDUCATION

Oregon State University Mar 2022 - Mar 2027 (Expected)
Ph.D. in Electrical & Computer Engineering/Artificial Intelligence Corvallis, OR, US
Focus area: Information Theory, Machine Learning, Neural Data Compression

Oregon State University Corvallis, OR, US
M.S. in Electrical & Computer Engineering Dec. 2024
Thesis: *On Minimizing Symbol Error Probability using Beamforming in MIMO Wiretap Channels*

TECHNICAL SKILLS

- **ML/AI:** Image/Video Compression, Computer Vision, Generative Models, Large Language Models, Multi-Agent AI
- **Quantitative Research:** Mathematical Modeling, Optimization, Statistics & Probability Theory
- **Programming:** Python, MATLAB, C/C++
- **Frameworks/Tools:** PyTorch, TensorFlow, CompressAI, CVX

RESEARCH INTEREST

- **Information theory & machine learning:** Lossy compression, rate-distortion-perception theory, neural data compression, representation learning.
- **Wireless communications & networks:** Signal processing, optimization, and machine learning for advanced MIMO communication systems, beamforming techniques.

WORK EXPERIENCE

Research Assistant | Oregon State University Mar 2022 - Present
Cross-Domain Lossy Compression via Rate- and Classification-constrained Optimal Transport (OT)
- Developed a novel compression framework integrating bit-rate, distortion, classification, and perception constraints to improve robustness across domains.
- Implemented deep learning models (VAE, W-GAN, CNN) with differentiable quantization and entropy-constrained losses for image super-resolution, denoising, and inpainting.
- Validated on MNIST, SVHN, CIFAR-10, ImageNet, and KODAK datasets, achieving strong alignment between theoretical tradeoffs and real-world performance.

Universal Rate-Distortion-Classification (RDC) Representations for Lossy Compression
- Designed a trainable RDC objective that couples bit-rate, distortion, and task accuracy to learn semantic representations useful for compression and downstream inference.
- Built PyTorch training compression models (VAE, W-GAN, CNN) with differentiable quantization and entropy-constrained losses; produced RDC curves.
- Demonstrated that the learned latent acts as a compact feature codec supporting classification with minimal loss versus specialized encoders.

Perception-enhanced Zero-Shot Denoising via Neural Compression
- Developed a patch-based, data-free denoiser in PyTorch that optimizes a compression-style objective on a single noisy image, balancing rate, distortion, and perceptual quality.
- Incorporated perception terms and an adversarial critic (W-GAN on clean patches) to trace rate-distortion-perception curves on natural images with Gaussian/Poisson noise.

Design and security analysis of symbol error probability-based beamforming in Gaussian MIMO wiretap
- Formulated a mathematical model and signal design, and proposed a novel low-complexity algorithm utilizing KKT conditions, generalized eigen-decomposition, and projected gradient descent.

- Conducted numerical experiments in MATLAB to evaluate the proposed beamforming scheme and analyzed results.

Machine Learning Research Intern | Deakin University   Jul 2025 - Sep 2025
AI agentic negotiation
- Extended a multi-agent negotiation evaluation framework; automated experiments, logging, and reproducibility across local models (e.g., LLaMA/Qwen families).
- Implemented belief updates and offer-counteroffer dynamics; designed metrics and dashboards for comparative analysis.

Research Assistant | Posts and Telecommunications Institute of Technology   Mar 2019 - Mar 2023
Design and Security Analysis of Satellite-based Free-Space Quantum Key Distribution (QKD) Systems for Wireless and Vehicular Networks
- Designed and evaluated satellite-based QKD architectures, incorporating link-layer retransmissions, relaying schemes, and security performance metrics.
- Conducted MATLAB-based simulations to quantify performance and validate analytical results.

SELECTED PUBLICATIONS (GOOGLE SCHOLAR)

[1] **Nam Nguyen**, Thinh Nguyen, and Bella Bose. *Cross-Domain Lossy Compression via Rate- and Classification-constrained Optimal Transport.* Submitted to ICLR 2026.

[2] **Nam Nguyen**, Thuan Nguyen, Thinh Nguyen, and Bella Bose. *A Theory of Universal Rate-Distortion-Classification Representations for Lossy Compression.* Submitted to IEEE Transactions on Signal Processing 2025. [PDF]

[3] **Nam Nguyen**, Thuan Nguyen, Thinh Nguyen, and Bella Bose. *Universal Rate-Distortion-Classification Representations for Lossy Compression.* IEEE Information Theory Workshop, 2025. [PDF]

[4] **Nam Nguyen**, An Vuong, Thuan Nguyen, and Thinh Nguyen. *On Minimizing Symbol Error Probability for Antipodal Beamforming in Gaussian MIMO Wiretap Channels.* IEEE Vehicular Technology Conference, 2024. [PDF]

[5] **Nam Nguyen**, Ngoc T. Dang, and Vuong Mai. *Performance of Satellite Quantum Key Distribution under Atmospheric Turbulence-Induced Phase Fluctuations.* International Communications Satellite Systems Conference, 2023. [PDF]

[6] **Nam D. Nguyen**, Vuong V. Mai, and Ngoc T. Dang, *Reliability Improvement of Satellite-based Quantum Key Distribution Systems using Retransmission Scheme.* Photonic Network Communications, 2021. [PDF]

[7] **Nam D. Nguyen**, Hien T. T. Pham, Vuong V. Mai, and Ngoc T. Dang, *Comprehensive Performance Analysis of Satellite-to-Ground FSO/QKD Systems using Key Retransmission.* Optical Engineering, 2020. [PDF]

AWARDS & HONORS

- IEEE Signal Processing Society Scholarship   2025
- NSF Student Travel Grant, AERPAW Spring Workshop – North Carolina State University   2025
- Graduate School's Scholarly Presentation Award – Oregon State University   2024, 2025
- Second Prize, National Scientific Research Contest   2020
- Second Prize in Physics – Provincial Excellent Student Competition, Vietnam   2012
- First Prize in Physics – School-Level Excellent Student Competition, Vietnam   2011, 2012, 2013

REVIEWER SERVICE

2025 IEEE Wireless Communications Magazine (2 papers), NeurIPS 2025 (5 papers), 2025 IEEE International Symposium on Information Theory (4 papers), 2024 IEEE Access (1 paper), 2024 IEEE Wireless Communications Magazine (1 paper), 2023 IEEE International Conference on Communications Workshops (1 paper).