Nam Nguyen

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EDUCATION

Oregon State University Corvallis, OR, US
Doctor of Philosophy in Electrical and Computer Engineering Expected Mar. 2027
Minor in Artificial Intelligence
Focus area: Information Theory, Machine Learning, Perceptual Lossy Compression

Oregon State University Corvallis, OR, US
Master of Science in Electrical and Computer Engineering Dec. 2024
Thesis: *On Minimizing Symbol Error Probability using Beamforming in MIMO Gaussian Wiretap Channels*

Posts and Telecommunications Institute of Technology Hanoi, Vietnam
Bachelor of Engineering in Electronics and Communications Engineering Mar. 2021
Graduated in top 10 of Telecommunications Engineering Department
Thesis: *Performance Enhancement of Satellite-based Free-Space Quantum Key Distribution Systems using Key Retransmission and Relaying Techniques*, Grade: 10/10

RESEARCH INTERESTS

Intersection of information theory and machine learning: Rate-distortion-perception-classification representation for lossy compression, neural data compression, representation learning.
Wireless communications and networks: Channel capacity, signal processing, optimization, and machine learning for advanced MIMO communication systems, physical layer security for MIMO, beamforming techniques, wireless networking and technology for 5G/6G.
Free-space quantum key distribution networks: Design, analysis, and optimization of link-layer retransmissions and relaying techniques.

RESEARCH EXPERIENCE

Research Assistant, Communications and Signal Processing Group Dec. 2022 - Present
Oregon State University Corvallis, OR, US
Advisor: Prof. Thinh Nguyen and Prof. Bella Bose
Topics: Representation learning, neural data compression, statistical signal processing and Bayesian inference, non-convex optimization, wireless communications, physical layer security.
Project: *Universal rate-distortion-classification representations for lossy compression*

- Develop a universal representation framework in lossy compression to handle multiple distortion-classification tradeoffs with a single encoder.
- Prove the approximate achievability of the universal rate-distortion-classification function using theoretical information-theoretic methods.
- Implement and evaluate novel deep learning algorithms for classification-enhanced neural image compression models (using Autoencoder + GAN + CNN Classifier) on MNIST/ SVHN datasets with PyTorch, showcasing minimal performance loss compared to designing separate encoders for each objective.
- **Outputs:** 1 conference paper submission + 1 journal paper manuscript.

Project: *Design and Security Analysis of Symbol Error Probability-based Beamforming in MIMO Gaussian Wiretap Channels*

- Leading researcher and first author of **01** paper on low-complexity, high-performance symbol error probability minimization-based beamforming in Gaussian MIMO Wiretap Channels.
- Formulated a mathematical model and PHY signal design (binary antipodal signals and M-ary detection schemes) 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, analyzed results, and authored the paper.
- **Outputs:** 1 published conference paper and 1 journal paper submission [1], [2].

Research Assistant, Optical Communications Research Group Mar. 2019 - Mar. 2023
Posts and Telecommunications Institute of Technology Hanoi, Vietnam
Advisor: Prof. Vuong Mai and Prof. Ngoc Dang

Topics: Free-space quantum key distribution network, optical communication systems.
Project: *Design and Security Analysis of Satellite-based Free-Space Quantum Key Distribution Systems for Wireless and Vehicular Networks*
Sponsor: National Foundation for Science and Technology Development (NAFOSTED, Vietnam)

- Leading researcher and first author of **04** papers on satellite-based free-space quantum key distribution (QKD) systems for wireless networks.
- Innovated project ideas by expanding terrestrial binary phase shift keying (BPSK) modulation/direct-detection/QKD systems to satellite-based quadrature phase shift keying (QPSK) modulation/QKD systems.
- Designed and analyzed satellite-based QKD systems, including link-layer retransmissions, relaying techniques, and performance evaluations under atmospheric turbulence-induced phase fluctuations.
- Executed numerical experiments in MATLAB to assess system performance, analyzed results, and authored research papers.
- **Outputs:** 2 published conference papers and 2 published journal papers [3], [4], [5], [6].

PUBLICATIONS
Google Scholar

[1] **Nam Nguyen**, An Vuong, Thuan Nguyen, and Thinh Nguyen, "On Symbol Error Probability-based Beamforming in MIMO Gaussian Wiretap Channels," *submitted to IEEE Transactions on Vehicular Technology*, 2024.
Available at: https://arxiv.org/abs/2504.03960

[2] **Nam Nguyen**, An Vuong, Thuan Nguyen, and Thinh Nguyen, "On Minimizing Symbol Error Probability for Antipodal Beamforming in Gaussian MIMO Wiretap Channels," *2024 IEEE Vehicular Technology Conference*, Washington, DC, USA, 2024, pp. 1-5.
Available at: https://ieeexplore-ieee-org.oregonstate.idm.oclc.org/document/10757455

[3] **Nam Nguyen**, Thang V. Nguyen, Ngoc T. Dang, and Vuong Mai, "Performance of Satellite Quantum Key Distribution under Atmospheric Turbulence-Induced Phase Fluctuations," *International Communications Satellite Systems Conference*, Bradford, UK, Oct. 2023.
Available at: https://ieeexplore-ieee-org.oregonstate.idm.oclc.org/document/10572249

[4] **Nam D. Nguyen**, Hang T. T. Phan, Hien T. T. Pham, Vuong V. Mai, and Ngoc T. Dang, "Reliability Improvement of Satellite-based Quantum Key Distribution Systems using Retransmission Scheme," *Photonic Network Communications*, 42, 27–39, 2021.
Available at: https://link.springer.com/article/10.1007/s11107-021-00934-y

[5] **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*, Vol. 59, No. 12, pp. 126102-1-25, Dec. 2020.
Available at: https://doi.org/10.1117/1.OE.59.12.126102

[6] **Nam D. Nguyen**, Hien T. T. Pham, Vuong V. Mai, and Ngoc T. Dang, "Performance Enhancement of Satellite FSO/QKD Systems using HAP-based Relaying and ARQ," *2020 International Conference on Advanced Technologies for Communications*, Nha Trang, Vietnam, pp. 12-17, 2020. *Available at: https://ieeexplore.ieee.org/document/9255472*

INDUSTRY EXPERIENCE

Mobifone Telecommunications Corporation Sept. 2020 - Dec. 2020
Networking and Communication Engineer Intern Hanoi, Vietnam

- Conducted an in-depth study of technical documents to gain expertise in the 4G/LTE protocol and its applications in the telecommunications industry.
- Investigated and analyzed system and network operations, gaining valuable insights into network management and monitoring systems.

Viettel High Technology Industries Corporation Jun. 2019 - Sept. 2019
Research and Development Intern Hanoi, Vietnam

- Completed a competitive summer course on 4G/LTE Protocol Development, awarded a certificate for the top-performing project.
- Developed a multi-client TCP user client-server system to handle login, score retrieval, and logout requests over multi-threaded processes:

- Designed a TCP server to authenticate clients and respond with scores, using unique threads for each client to handle simultaneous requests.
- *Available at: https://github.com/DinhNamHMU/ScoreSchoolSystem.*

- **Tools/Technologies:** C, TCP/UDP Library, Linux, Functional Programming.

TEACHING EXPERIENCE

Teaching Assistant, Electrical Engineering and Computer Science Mar. 2022 - Present
Oregon State University Corvallis, OR, US

- **Courses:** ECE 353 - Introduction To Probability and Random Signals (3 quarters), ECE 351 - Signals and Systems I (2 quarters), ECE 352 - Signals and Systems II (3 quarters), CS 372 - Introduction to Computer Networks (1 quarter), ENGR 201 - Electrical Fundamentals I (4 quarters), ECE 271 - Digital Logic Design (1 quarter).
- **Responsibilities:** Grading assignments and exams, holding office hours and review sessions, and improving course materials.

TRAINING COURSES

AI 531 - Artificial Intelligence, AI 539 - Introduction to Online Learning, AI 534 - Machine Learning, AI 535 - Deep Learning, AI 539 - Information Theory, AI 586 - Applied Matrix Analysis, AI 539 - Convex Optimization, ECE 565 - Estimation, Filtering, and Detection, CS 527 - Error-Correcting Codes, ECE 563 - Wireless Communications Networks, ECE 669 - Communications System Design, ECE 564 - Digital Signal Processing, ECE 560 - Stochastic Signals and Systems, ECE 550 - Linear Systems.

TECHNICAL SKILLS

Quantitative Research: Mathematical Modeling, Optimization, Statistics and Probability Theory.
Programming Skills: Python, MATLAB, C/C++, LaTeX.
Software Tools: Pytorch, Tensorflow, NumPy, Pandas, SciPy, MATLAB Toolboxes, CVX.
Research: Leading projects, teamwork, communication, problem-solving, programming, simulations, performance evaluation, presenting findings, and academic writing.

AWARDS & HONORS

Graduate School's Scholarly Presentation Award – Oregon State University 2024

SVTECH Scholarship – SV Technologies JSC 2021
Awarded to 5 outstanding students at the Posts and Telecommunications Institute of Technology

Participation Scholarship, 8th Vietnam School of Science – International Centre for Interdisciplinary Science and Education 2020

Second Prize, National Scientific Research Contest – Vietnam Ministry of Education and Training 2020

First Prize, Scientific Research Contest – Posts and Telecommunications Institute of Technology 2019

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

- 2023 IEEE International Conference on Communications Workshops: 1 paper.
- IEEE Wireless Communications Magazine, 2024: 1 paper.
- IEEE Access, 2024: 1 paper.
- 2025 IEEE International Symposium on Information Theory: 4 papers.

REFERENCES

Prof. Thinh Nguyen
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