Nam Nguyen

Ph.D. Student in Electrical and Computer Engineering

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EDUCATION

Oregon State University Corvallis, OR, US
Doctor of Philosophy in Electrical and Computer Engineering Expected Mar. 2027
Advisor: Prof. Thinh Nguyen and Prof. Bella Bose
Focus area: Information Theory, Machine Learning, Wireless Communications

Oregon State University Corvallis, OR, US
Master of Science in Electrical and Computer Engineering, GPA: 3.83/4.00 Jun. 2024
Focus area: Wireless Communications, Signal Processing, Information Theory
Thesis: *On Symbol Error Probability-based 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

Application of mathematical, signal processing, optimization theories, and machine learning to wireless communications and information theory.

Wireless communications and networks: Signal processing and optimization for advanced MIMO communication systems, physical layer security for MIMO, beamforming techniques, channel capacity, wireless networking and technology for 5G/6G RAN, PHY layer advancements, signal processing and machine learning for wireless communications.

Intersection of information theory and machine learning: Rate-distortion-perception tradeoff for lossy compression, neural data compression.

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: Wireless communications, beamforming and physical layer security for MIMO, statistical signal processing and Bayesian inference, non-convex optimization.
Project: *Design and Security Analysis of Symbol Error Probability-based Beamforming in MIMO Gaussian Wiretap Channels* [1] [2]

- Leading researcher and first author of **01** paper on low-complexity, high-performance symbol error probability minimization-based beamforming in Gaussian MIMO Wiretap Channels.
- Defined the research problem by identifying knowledge gaps in existing beamforming work.
- 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.

Research Assistant, Optical Communications Research Group Mar. 2019 - Mar. 2023
Posts and Telecommunications Institute of Technology Hanoi, Vietnam
Project: *Design and Security Analysis of Satellite-based Free-Space Quantum Key Distribution Systems for Wireless and Vehicular Networks* [3] [4] [5] [6]
Sponsor: National Foundation for Science and Technology Development (NAFOSTED, Vietnam)
Advisor: Prof. Vuong Mai and Prof. Ngoc Dang

- Lead 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.

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.
  - Utilized C, TCP/UDP libraries, and Linux, implementing functional programming for modularity and enhanced efficiency.
- **Tools/Technologies:** C, TCP/UDP Library, Linux, Functional Programming.

FPT Software Company Oct. 2019 - Dec. 2019
Linux Embedded Challenge Participant Hanoi, Vietnam

- Awarded First Prize for "Top Outstanding Achievement in Linux Embedded Challenge" by developing embedded C code to control a drone's movement, including flying up, navigating, and turning.
- **Tools/Technologies:** C Embedded Coding, 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 (1 quarter), 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.

PUBLICATIONS

[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 Communications*, 2024.
Available at: https://drive.google.com/file/d/1tPhOZCS9xMay5iz-5ClTKPgx88rVq8$_Y$/view

[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, D.C., US, Oct. 2024 **(Oral presentation)**.
Available at: https://drive.google.com/file/d/1f36dtzXvc16DLIrZiSQ1fTz7cg1ev16A/view

[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 **(Oral presentation)**.
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 **(Oral presentation)**.
Available at: https://ieeexplore-ieee-org.oregonstate.idm.oclc.org/document/9255472.

TECHNICAL SKILLS

Quantitative Research: Mathematical Modeling, Optimization, Statistics and Probability Theory.

Programming Skills: MATLAB, Python, C/C++, LaTeX.

Software Tools: Tensorflow, Pytorch, MATLAB Toolboxes, CVX.

Familiar Topics: Wireless communication, digital signal processing, DSP embedded coding, OFDM, 6G RAN, beamforming techniques and its performance evaluation for wireless communications, communication theory, information theory, coding theory, MIMO communications, machine learning, satellite-based quantum key distribution systems, free-space optical communications, optimization algorithms, applied mathematics.

Research Experience: Leading projects, teamwork, communication, problem-solving, programming, simulations, performance evaluation, presenting findings, and academic writing.

TRAINING COURSES

ECE 563 - Wireless Communications Networks, ECE 669 - Communications System Design, ECE 564 - Digital Signal Processing, ECE 560 - Stochastic Signals and Systems, ECE 569 - Convex Optimization, ECE 599 - Information Theory, AI 586 - Applied Matrix Analysis, AI 534 - Machine Learning, AI539 - Introduction to Online Learning, ECE 565 - Estimation, Filtering, and Detection, CS 527 - Error-Correcting Codes, ECE 550 - Linear Systems.

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

Posts and Telecommunications Institute of Technology Dean's List 2018 - 2021

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

Participation Scholarship, Duy Tan University Scientific Research Camp – Duy Tan University and Newton Fund 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 (ICC Workshops)
- IEEE Wireless Communications Magazine, 2024