Khac-Hoang NGO

Postdoctoral Researcher

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Department of Electrical Engineering
Chalmers University of Technology
41296 Gothenburg, Sweden
+46 70 148 72 29 / +33 7 58 05 23 89
ngok@chalmers.se, khachoang1412@gmail.com
khachoang1412.github.io
linkedin.com/in/khachoangngo
Vietnamese

Research Interests

Wireless Communications, Information Theory

Topics: MIMO, noncoherent communications, massive random access, edge computing, coded caching, network coding

Education

CentraleSupélec, Paris-Saclay University, France

Ph.D. in Wireless Communications, July 2017– June 2020
Thesis: Noncoherent Wireless Communications: Fundamental Limits and System Design
Advisors: Prof. Sheng Yang, Dr. Maxime Guillaud

M.Sc. in Wireless Communications, Sept. 2015–Sept. 2016
GPA: 17.35/20, *Class rank*: **1/23**, *Grade*: Très Bien (High Distinction)
Thesis: Performance Analysis of Coded Caching
Advisors: Prof. Mari Kobayashi, Prof. Sheng Yang

Univ. of Engineering and Technology (UET), Vietnam National University - Hanoi (VNU), Vietnam

B.Eng. in Electronics and Telecommunications, Aug. 2010–June 2014
GPA: 3.75/4.0, *Class rank*: **1/68**, *Grade*: High Distinction
Thesis: Software-Defined-Radio Implementation of OFDM-based Physical Layer Network Coding
Advisors: Assoc. Prof. Nguyen Linh Trung, Assoc. Prof. Nguyen Quoc Tuan

Professional Experience

- **Communication System Group, Dept. Electrical Engineering, Chalmers Univ. of Technology, Sweden**
  Postdoctoral Researcher Sept. 2020–present
  Low-latency and private edge computing in random-access networks
- **Advanced Institute of Engineering and Technology (AVITECH), UET, VNU, Vietnam**
  Adjunct Lecturer Mar. 2021–present
- **Mathematical and Algorithmic Sciences Lab., Paris Research Center, Huawei Technologies France**
  Ph.D. Engineer Nov. 2016–June 2020
  Noncoherent wireless communications
- **Laboratory of Signals and Systems (L2S) - CentraleSupélec**, France
  Research Engineer Sept. 2016–Nov. 2016
  Research Student Feb. 2016–Sept. 2016
  Performance analysis of coded caching in practical scenarios; Content delivery with coded caching in MIMO fading broadcast channels
  Project: *Online Coded Caching: Fundamental Limits and Efficient Learning Algorithms*
- **Univ. of Engineering and Technology (UET), VNU**, Vietnam
  Research Assistant July 2014–Aug. 2015
  Research Student Nov. 2012–June 2014
  Software-defined radio implementation of network coding and cognitive radio
  Project: *Cross-layer cooperative communications for future wireless networks based on network coding*
- **VNPT Technology, Vietnam Posts and Telecommunications Group**, Vietnam
  Intern Dec. 2013–Mar. 2014
  Website interface programming
- **Dept. of Electrical and Computer Engineering, National University of Singapore (NUS)**, Singapore
  Intern July 2012–Aug. 2012
  Solar panel charge controller *Advisor:* Dr. Aaron Danner

Publications

Google Scholar Profile: scholar.google.fr/citations?user=RjcW6WwAAAAJ
Number of citations (until Oct. 01, 2021): **167** h-index: **6**

Journal papers

1. G. Gur, P. Porambage, P. Porambage, C. de Alwis, Q.-V. Pham, **Khac-Hoang Ngo**, and M. Liyanage, "A survey on integration of ICN and MEC for efficient B5G realization," *submitted to Elsevier Computer Science Review*, Jul. 2021.
2. **Khac-Hoang Ngo**, A. Decurninge, M. Guillaud, and S. Yang, "Cube-split: A structured Grassmannian constellation for non-coherent SIMO communications," *IEEE Trans. Wireless Commun.*, **19**, (3), 1948–1964, Mar. 2020.
3. **Khac-Hoang Ngo**, M. Guillaud, A. Decurninge, S. Yang, and P. Schniter, "Multi-user detection based on expectation propagation for the non-coherent SIMO multiple access channel," *IEEE Trans. Wireless Commun.*, **19**, (9), 6145–6161, Sep. 2020.
4. **Khac-Hoang Ngo**, S. Yang, M. Guillaud, and A. Decurninge, "Joint constellation design for non-coherent MIMO multiple-access channels," *submitted to IEEE Trans. Inf. Theory*, 2020, preprint: https://arxiv.org/pdf/2009.11548.pdf.
5. T.-T.-Q. Tran, L. V. Nguyen, **Khac-Hoang Ngo**, L.-T. Nguyen, Q.-T. Nguyen, N.-Q.-B. Vo, X.-N. Tran, E. Bastug, S. Azarian, M. Debbah, and P. Duhamel, "Network coding with multimedia transmission and cognitive networking: An implementation based on software-defined radio," *REV Journal on Electronics and Communications*, **10**, (3-4), 72–84, 2020, Invited Article.
6. F. Zhang, **Khac-Hoang Ngo**, S. Yang, and A. Nosratinia, "Transmit correlation diversity: Generalization, new techniques, and improved bounds," *submitted to IEEE Trans. Inf. Theory*, 2020, (Zhang and Ngo contributed equally to the technical content).
7. **Khac-Hoang Ngo**, S. Yang, and M. Kobayashi, "Scalable content delivery with coded caching in multi-antenna fading channels," *IEEE Trans. Wireless Commun.*, **17**, (1), 548–562, Jan. 2018.

Conference papers

1. **Khac-Hoang Ngo**, G. Durisi, and A. Graell i Amat, "Age of information in prioritized random access," in *55st Asilomar Conference on Signals, Systems, and Computers*, CA, USA, Oct. 2021.
2. **Khac-Hoang Ngo**, A. Lancho, G. Durisi, and A. Graell i Amat, "Massive uncoordinated access with random user activity," in *IEEE International Symposium on Information Theory (ISIT)*, 2021. https://arxiv.org/abs/2103.09721.
3. **Khac-Hoang Ngo**, N. T. Nguyen, T. Q. Dinh, T.-M. Hoang, and M. Juntti, "Low-latency and secure computation offloading assisted by hybrid relay-reflecting intelligent surface," in *International Conference on Advanced Technologies for Communications (ATC)*, Hanoi, Vietnam, Oct. 2021. https://arxiv.org/pdf/2109.01335.pdf.
4. **Khac-Hoang Ngo** and S. Yang, "A generalized Gaussian model for wireless communications," in *IEEE International Symposium on Information Theory (ISIT)*, 2021. https://research.chalmers.se/en/publication/522211.
5. ——, "A Riemannian metric for non-coherent constellation design and its application to multiple access channel," in *25th International ITG Workshop on Smart Antennas*, French Riviera, France, Nov. 2021.
6. **Khac-Hoang Ngo**, S. Yang, and M. Guillaud, "The optimal DoF for the noncoherent MIMO channel with generic block fading," in *2020 IEEE Information Theory Workshop (ITW)*, virtual conference, Apr. 2021. https://arxiv.org/pdf/2009.11556.pdf.
7. **Khac-Hoang Ngo**, S. Yang, M. Guillaud, and A. Decurninge, "Noncoherent MIMO multiple-access channels: A joint constellation design," in *2020 IEEE Information Theory Workshop (ITW)*, virtual conference, Apr. 2021.
8. **Khac-Hoang Ngo**, F. Zhang, S. Yang, and A. Nosratinia, "Two-user MIMO broadcast channel with transmit correlation diversity: Achievable rate regions," in *IEEE Information Theory Workshop (ITW)*, Apr. 2021.
9. **Khac-Hoang Ngo**, M. Guillaud, A. Decurninge, S. Yang, S. Sarkar, and P. Schniter, "Non-coherent multi-user detection based on expectation propagation," in *53rd Asilomar Conference on Signals, Systems, and Computers*, CA, USA, Nov. 2019.

10. **Khac-Hoang Ngo**, A. Decurninge, M. Guillaud, and S. Yang, "A multiple access scheme for non-coherent SIMO communications," in *52nd Asilomar Conference on Signals, Systems, and Computers*, Oct. 2018, pp.1846–1850.
11. **Khac-Hoang Ngo**, S. Yang, and M. Guillaud, "The optimal DoF region for the two-user non-coherent SIMO multiple-access channel," in *IEEE Information Theory Workshop (ITW)*, Guangzhou, China, Nov. 2018. https://arxiv.org/pdf/1806.04102.pdf.
12. A. Ghorbel, **Khac-Hoang Ngo**, R. Combes, M. Kobayashi, and S. Yang, "Opportunistic content delivery in fading broadcast channels," in *IEEE Global Communications Conference (GLOBECOM)*, Singapore, Dec. 2017, pp.1–6. https://arxiv.org/pdf/1702.02179.pdf.
13. **Khac-Hoang Ngo**, A. Decurninge, M. Guillaud, and S. Yang, "Design and analysis of a practical codebook for non-coherent communications," in *51st Asilomar Conference on Signals, Systems, and Computers*, CA, USA, Oct. 2017, pp.1237–1241.
14. **Khac-Hoang Ngo**, S. Yang, and M. Guillaud, "An achievable DoF region for the two-user non-coherent MIMO broadcast channel with statistical CSI," in *2017 IEEE Information Theory Workshop (ITW)*, Taiwan, Nov. 2017, pp.604–608.
15. **Khac-Hoang Ngo**, S. Yang, and M. Kobayashi, "Cache-aided content delivery in MIMO channels," in *54th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, IL, USA, Sep. 2016, pp.93–100.
16. **Khac-Hoang Ngo**, S. Yang, M. Kobayashi, and K. Huang, "On the complementary roles of massive MIMO and coded caching for content delivery," in *International Conference on Advanced Technologies for Communications (ATC)*, Hanoi, Vietnam, Oct. 2016, pp.237–242.
17. S. Yang, **Khac-Hoang Ngo**, and M. Kobayashi, "Content delivery with coded caching and massive MIMO in 5G," in *9th International Symposium on Turbo Codes and Iterative Information Processing (ISTC)*, Brest, France, Sep. 2016, pp.370–374.
18. **Khac-Hoang Ngo** and Quoc-Tuan Nguyen, "Implementation of network coding scheme in universal software radio peripheral," in *IEICE International Conference on Integrated Circuits, Design, and Verification (ICDV)*, Hanoi, Vietnam, Nov. 2014.
19. Thai-Mai Dinh Thi, Quoc-Tuan Nguyen, and **Khac-Hoang Ngo**, "Implementation of spectrum sensing scheme in software-defined radio testbed," in *IEICE International Conference on Integrated Circuits, Design, and Verification (ICDV)*, Hanoi, Vietnam, Nov. 2014.

Conference posters

1. **Khac-Hoang Ngo**, S. Yang, and M. Guillaud, "Generalized Gaussian model for data-driven learning in communications," in *International Zurich Seminar on Information and Communication (IZS)*, Zurich, Switzerland, Feb. 2020.
2. T. T. Q. Tran, V.-L. Nguyen, **Khac-Hoang Ngo**, L.-T. Nguyen, Q.-T. Nguyen, E. Bastug, S. Azarian, M. Debbah, and P. Duhamel, "Network coding and information security in industry 4.0," in *1st ASEAN IVO Workshop on Cybersecurity and Information Security in Industry 4.0*, Hanoi, Vietnam, Mar. 2019.

Technical reports

1. Khac-Hoang Ngo, "Solar panel charge controller," Dept. of Electrical and Computer Engineering, National University of Singapore, Singapore, Internship report, Aug. 2012.

Patents

1. **Khac-Hoang Ngo**, A. Decurninge, M. Guillaud, and S. Yang, "Transmitter and receiver communication apparatus for non-coherent communication," U.S. Patent Application 17/243,679, 2021.

Professional Activities

Organizing Committee

- Special session chair, 25th International ITG Workshop on Smart Antennas (WSA 2021), French Riviera, France Nov. 2021
- Special session chair, 2021 International Conference on Advanced Technologies For Communications (ATC), HCM City, Vietnam Oct. 2021

- 1st Junior Conference on Wireless and Optical Communications, Paris-Saclay Univ., France, 19 Feb. 2019
- 1st Young Engineers and Scientists Forum, Honda Foundation, Japan, 18 Nov. 2015

Membership

- **Member** of IEEE, IEEE Information Theory Society, IEEE Communications Society, and IEEE Signal Processing Society

Editorship

- **Copyeditor** for the ICT Research Journal, Vietnam Ministry of Information and Communications

Reviewer

International Journals

- IEEE Transactions on Information Theory
- IEEE Transactions on Vehicular Technology
- IEEE Transactions on Communications
- IEEE Transactions on Wireless Communications
- IEEE Transactions on Signal and Information Processing over Networks
- IEEE Transactions on Signal Processing
- IEEE Journal on Selected Areas in Communications
- IEEE Communications Letters
- IEEE Wireless Communications Letters
- IEEE Vehicular Technology Magazine

Domestic Journals

- ICT Research Journal, Vietnam Ministry of Information and Communications
- VNU Journal of Science: Computer Science and Communication Engineering, Vietnam

International Conferences

- 2017: IEEE GLOBECOM, IEEE ICC
- 2018: IEEE ICC, ISWCS, IEEE ITW, ISTC, NICS
- 2019: IEEE SPAWC, ISCIT
- 2020: IEEE ISIT
- 2021: ISWCS, IEEE ITW, ATC, WSA

Teaching

- Chalmers University of Technology: **Teaching Assistant**
  - 2021: Information theory (master/PhD course, spring semester, taught in English, 16 hours)
  - 2021: Statistics and machine learning in high dimensions (master/PhD course, fall semester, taught in English, 8 hours)

Supervision

- Master student research projects
  - Khodor SAFA and Shanglin YANG, "MIMO detection under generalized Gaussian model," CentraleSupélec, Paris-Saclay University, Mar. 2021.
  - Wassim KHELIL, Mohamed Idriss KHALEDI, and Anas OUALLOU, "Embracing non-linearities in future wireless systems via non-convex optimization," CentraleSupélec, Paris-Saclay University, Feb.-Mar. 2020

Talks

- "Massive Uncoordinated Random Access for the Internet of Things," *Advanced Institute of Engineering and Technology (AVITECH), UET, VNU*, Vietnam, 11 May 2021
- "Constellation Design for Noncoherent Communications in SIMO Block-Fading Channel," *Advanced Institute of Engineering and Technology (AVITECH), UET, VNU*, Vietnam, 27 Aug. 2019
- "Noncoherent Wireless Communications: Theoretical Limits and Signal Design," *Faculty of Electronics and Telecommunications, UET, VNU*, Vietnam, 11 Nov. 2017
- "An Achievable DoF Region for the Two-User Noncoherent MIMO Broadcast Channel with Statistical CSI," *Technical University of Munich*, Germany, 22 Sept. 2017

Summer Schools Attended

- IEEE ComSoc Summer School on 5G, IoT, and AI technologies Aug. 2020
- IEEE SPS - EURASIP Summer School on Signal Processing for 5G Sweden, May. 2017

- IEEE ITS European School of Information Theory — Spain, May. 2017

Events

- 2nd and 3rd Global Young Vietnamese Scholars Forum, Vietnam — Nov. 2019, Nov. 2020
- 7th Heidelberg Laureate Forum, Germany, — Sept. 2019
  Get interviewed in the **10-out-of-200 list** of participants
- Young Engineers and Scientists Tokyo Meeting, Tokyo, Japan, — Nov. 2014
- Volunteer for conferences: IEEE ICC 2017, IEEE ISIT 2019

Funding

- "LANTERN: Low-latency and private edge computing in random-access networks", Marie Skłodowska-Curie Individual Fellowship, 192 000 Euros, 2021-2022, responsibility: **Fellow**
- "Connecting the Unconnected: A Tool for Digital Inclusion", AlumNode Funding, 5000 Euros, 2021-2022, responsibility: **co-investigator**

Skills

Computer and Programming

- MATLAB/Simulink, C/C++
- GNU Radio framework for Software-Defined Radio
- LaTeX, Microsoft Office

Mathematics

- Linear Algebra, Probability and Statistics, Real and Complex Analysis, Optimization

Languages

Vietnamese: Native **English:** Fluent **French:** Elementary (A2)

Selected Honors, Awards, and Scholarships

- **Signal, Image & Vision Ph.D. Thesis Prize** by EEA, GRETSI and GdR-ISIS, France — 2021
- **Marie Skłodowska-Curie Actions** Individual Fellowship — 2021
- **Romberg Grant** for selected participants of the 7th Heidelberg Laureate Forum, Germany — Sept. 2019
- **Graduate with first-class honors** (Master level), CentraleSupélec — 2016
- **Université Paris-Saclay scholarship**, University of Paris-Saclay — 2015–2016
- **Graduate with first-class honors** (Bachelor level), UET, VNU — 2014
- **Excellent Undergraduate Thesis Award**, UET, VNU — 2014
- **Third Prize**, Undergraduate Scientific Research Contest, UET, VNU — April 2014
- **Honda Young Engineers and Scientists Award**, Honda Foundation, Japan — Nov. 2013
  Awarded to 10 selected students from top 6 Vietnamese universities in natural science, engineering and technology.
- **Undergraduate Research Attachment Programme Grant**, National University of Singapore, — 2012
- **Shinnyo scholarship**, Shinnyo-en Organization, Japan — 2010–2014 (annually)
- **Vallet scholarship**, Rencontres du Vietnam — 2011

Extra-curricular

- Vice-president of Student Association of UET, VNU, — April 2012–June 2015
- President of Student Club on Presentation of UET, VNU, — April 2011–June 2012
- JENESYS 2.0 culture exchange program, Japan, — July 2014
- Vietnam - China Youth Festival, Guangxi, China, — Nov. 2013

Hobbies

Music, reading book (favorite author: Haruki Murakami), football, running