

# KIEN T. TRUONG

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## EDUCATION

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- Ph.D. degree (May 2012) and M.S. degree (May 2008) in Electrical Engineering, The University of Texas at Austin (UT Austin), Austin, TX, USA, advised by Prof. Robert W. Heath Jr.
- B.S. degree in Telecommunications & Electronics (Jul. 2002, ranked 2<sup>nd</sup> among 500 students), Hanoi University of Science and Technology, Hanoi, Vietnam.

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## ACADEMIA EXPERIENCE

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**Undergraduate Lecturer, Chair of Engineering**, Fulbright University Vietnam, Ho Chi Minh city, Vietnam, Aug. 2020-present

- Developing and delivering Engineering courses such as Design and Systems Thinking, Computer Organization, Computer Modeling and Simulation. For updated information on my courses, please visit <https://sites.google.com/site/truongkien/home/teaching>.

**Assistant Professor**, *Posts and Telecommunications Institute of Technology (PTIT)*, Hanoi, Vietnam, Aug. 2015-Jul. 2020.

- In August 2016, I was appointed as the chair of the Division of Signal Processing for Communication Systems. The Division has 10 lecturers and is responsible to teach courses related to this area of specification and to mentor about 100 students per academic year. Since then, I have been leading the lecturers of the division to innovate the content of the courses we have been teaching to incorporate up-to-date knowledge and to add more course projects to help improve the students' knowledge and skills. In 2019, I worked with some engineers from Viettel High Tech Industries Corporation (VHT) to develop and implement joint training courses, which are taught by our lecturers and VHT's experts, and student internship programs. The programs help students understand better how they may apply what they learn at PTIT in their future jobs. VHT have copied and expanded the models of joint collaboration to other universities in Vietnam such as Hanoi University of Science and Technology, Ho Chi Minh City University of Technology and Danang University of Science and Technology.
- Teaching courses on communication theory, information theory and signal processing, including basic courses for second-year students and specialized courses for final-year students. Over the semesters, I have been incorporating new teaching methods and approaches to the courses and keep the content up-to-date. For example, inspired by UT Austin course "Wireless Communications Lab", I have added software-based lab sessions using National Instruments' LabVIEW and Texas Instruments' Code Composer Studio and course projects to specialized courses for final-year students to provide them with intuitive insights and to improve their hands-on experience and their presentation, reporting and teamwork skills.

**Undergraduate Supervision**, *Department of Electrical and Computer Engineering (ECE), UT Austin, Austin, TX, USA, Spring 2011 semester.*

- Aided my advisor to supervise a group of four senior undergraduate students to implement a visible light communication prototype system. My tasks included holding weekly meetings to review progress, giving comments and advice on the reports and implementation, evaluating their performance individually and as a group. The project was submitted to 2011 National Instruments LabView Student Design Competition (<https://decibel.ni.com/content/docs/DOC-16435>).

**Research Assistant**, *Dept. of ECE, UT Austin, Austin, TX, USA, August 2006-May 2012.*

- Developed and implemented various transmission and reception strategies and analyzed their performance for wireless systems; integrated some proposed algorithms in a wireless prototype; and helped my advisor write project proposals to get outside fundings from US National Science Foundation (NSF) and Huawei.

**Teaching Assistant**, *Dept. of ECE, UT Austin, Austin, TX, USA, Fall 2009 semester.*

- Prepared homework sets and their solutions, graded homework assignments and had office hours to help students understand the materials better and to guide them to do homework.

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## INDUSTRY EXPERIENCE

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**Principle Investigator**, *Head of Wireless Systems and Applications Lab, PTIT, Sep. 2016-Jul. 2020.*

- Leading a group of 03 Ph.D. students, 02 Master students and several undergraduate students to conduct research on 5G cellular systems, including massive multi-input multi-output (MIMO) communications, millimeter Wave communications, and the Internet of Things (IoT).

**Technical Consultant**, *Viettel High Tech Industries Inc. (VHT), Viettel Group, Apr. 2017-Jul. 2020.*

- Conducting research on baseband signal processing algorithms related to 3GPP 5G New Radio (NR) standard for the development of 5G base station products; providing specialized knowledge on signal processing and communication theory to VHT engineers, who hold degrees in Electrical and Computer Engineering, and basic knowledge on telecommunications to those who hold degrees in other fields of study like Computer Science, Robotics and Automation.

**Technical Consultant**, *MIMO Wireless Inc., Austin, TX, USA, Jun. 2012-Dec. 2015.*

- Participated in a team to consult Huawei Technologies Inc. on potential benefits of massive MIMO communications in 5G cellular networks. My tasks included preparing a survey report on the literature of massive MIMO, doing analysis and simulations to investigate the effects of practical effects like channel aging and spatial correlation and the viability of distributed antennas in massive MIMO systems, developing strategies for compressed-sensing based channel estimation and feedback in frequency division duplex (FDD) massive MIMO systems. My tasks also included coming up with patentable ideas related to massive MIMO systems, preparing slides for presenting the ideas to Huawei Technologies' patent review board, and working with lawyers to edit and modify patent applications via conference calls and emails. Our results were submitted to Huawei Technologies in form of technical reports, tutorial presentations and patent applications.
- Worked as a technical advisor for 3GPP technology-related patent matters. My tasks included reviewing prior art like 3GPP standard and various technical documents, reviewing tutorials, working on non-infringement and providing input on technical questions of the lawyers.

**Research Engineer Intern**, *Wireless R&D Division, Huawei Technologies Co., USA*, Summer 2009-2011.

- Developed and implemented strategies for improving the performance of relay-aided cellular networks; surveyed and wrote reports on various topics per my mentors' requests; contributed to the filings of several provisional patents, two of which have been granted by USPTO as utility patents.

**Research Engineer**, *Research Institute of Posts and Telecommunications (RIPT), PTIT*, Jul. 2002-Jul. 2006 and Jun. 2012-Aug. 2015.

- Conducted research on wireless communications systems including 4G and 5G mobile networks; designed the software for setting up and managing satellite links for the Vietnam Telecom International (VTI), a member of the team working on the national project titled "KC.01.19 – Research and propose the architecture of the terrestrial networks for efficiently using VINASAT satellites"; worked on the implementation plan of 3G networks for Vietnam Posts and Telecommunications Group (VNPT).

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## AWARDS AND ACKNOWLEDGEMENTS

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- *Best Paper Award of IEEE/KICS Journal of Communication Networks (JCN) in 2014* (jointly with Robert W. Heath Jr.).
- *Best Paper Award of EURASIP Journal on Wireless Communications and Networking (JWCN) in 2013* (jointly with Steven Peters, Ali Panah, and Robert W. Heath Jr.).
- *Best Paper Award of International Conference on Advanced Technologies for Communications (ATC) in 2018* (jointly with Quy V. Dang and Bang T. Le). Quy V. Dang was one of my undergraduate students and has been working for VHT since his graduation in 2016. This work was done in collaboration with VHT.
- *Best Paper Award of the Radio and Electronics Association of Vietnam - National Conference on Electronics, Communications and Information Technology (REV-ECIT) in 2018* (jointly with Ngoc D. Nguyen, my Ph.D. student) and in 2015 (jointly with Bang D. Luong, who was my Master student, and Huong T. T. Nguyen).
- Elevated as *IEEE Senior Member* for contributions in Electrical Engineering & Telecommunications in 2014.
- *Exemplary Reviewer* recognized by the *IEEE Wireless Communications Letters (WCL)* Editorial Board in 2014. Only the top three percent of reviewers for this journal in 2014 receive this recognition.
- Selected by The Ministry of Science and Technology of Vietnam as one of the *67 Under-35 Outstanding Scientists in Vietnam in 2015* among all the fields of study.
- *Professional Development Award Fall 2011* and *David Bruton Jr. Fellowship 2007-2008* awarded by the Office of Graduate Studies of UT Austin, Austin, TX, USA.
- *Vietnam Education Foundation (VEF) Fellowship 2006-2011*. Each year, about 40 Vietnamese students are selected to pursue graduate studies in the US.

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## PUBLICATIONS

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### Published/Accepted Journal Papers

- [J10] S. H. Vu, **K. T. Truong** and T. M. Le, "Beam Division Multiple Access for mmWave Massive MIMO: Hybrid Zero-Forcing Beamforming with User Selection", *to appear in the International Journal of Electrical and Computer Engineering*, 2022.

- [J09] H.-V. Tran; G. Kaddoum and **K. T. Truong**, "Resource Allocation in SWIPT Networks Under a Nonlinear Energy Harvesting Model: Power Efficiency, User Fairness, and Channel Nonreciprocity," *IEEE Transactions on Vehicular Technology*, vol. 67, no. 9, pp. 8466 - 8480, Sept. 2018, [IEEExplore].
- [J08] **K. T. Truong** and R. W. Heath, Jr., "Effects of Channel Aging in Massive MIMO Systems," *IEEE/KICS Journal of Communications and Networks (JCN), Special Issue on Massive MIMO*, vol. 15, no. 4, pp. 338-351, Aug. 2013, [Arxiv] , [IEEExplore] , *2014 KICS JCN Best Paper Award* .
- [J07] **K. T. Truong** and R. W. Heath, Jr., "Joint Transmit Precoding for the Relay Interference Broadcast Channel", *IEEE Transactions on Vehicular Technology*, vol. 62, no. 3, pp. 1201-1215, Mar. 2013, [ Arxiv ], [IEEExplore].
- [J06] **K. T. Truong** and R. W. Heath, Jr., "A Distributed Algorithm using Interference Pricing for Relay Interference Channels", *EURASIP Journal on Advances in Signal Processing, Special Issues on Advanced Distributed Wireless Communication Techniques - Theory and Practice*, February 2013, DOI: 10.1186/1687-6180-2013-26.
- [J05] **K. T. Truong**, P. Sartori and R. W. Heath, Jr., "Cooperative Algorithms for MIMO Amplify-and-Forward Relay Networks", *IEEE Transactions on Signal Processing*, vol 61, no. 5, pp. 1272-1287, March 2013, [ Arxiv ], [IEEExplore].
- [J04] R. Vaze, **K. T. Truong**, S. Weber and R. W. Heath, Jr., "Two-Way Transmission Capacity of Wireless ad-hoc Networks", *IEEE Transactions on Wireless Communications*, vol. 10, no. 6, pp. 1966-1975, June 2011, [Arxiv] , [IEEExplore].
- [J03] **K. T. Truong** and R. W. Heath, Jr., "Multimode Antenna Selection for MIMO Amplify-and-Forward Relay Systems", *IEEE Transactions on Signal Processing*, vol. 58, no. 11, pp. 5845-5859, November 2010, [IEEExplore].
- [J02] A. Y. Panah, **K. T. Truong**, S. W. Peters and R. W. Heath, Jr., "Interference Management Schemes for the Shared Relay Concept ", *EURASIP Journal on Advances in Signal Processing, Special issue on Cooperative MIMO Multicell Networks*, vol. 2011, Article ID 269817, 14 pages, 2011, DOI:10.1155/2011/269817.
- [J01] S. W. Peters, A. Y. Panah, **K. T. Truong** and R. W. Heath, Jr., "Relaying Architectures for 3GPP LTE-Advanced", *EURASIP Journal on Wireless Communications and Networking (JWCN), Special issue on 3GPP-LTE and LTE-Advanced*, vol. 2009, Article ID 618787, 14 pages, 2009, DOI:10.1155/2009/618787, *2013 EURASIP JWCN Best Paper Award*.

### Published/Accepted Conference Papers

- [C15] G. Q. L. Vu, T. N. Le and **K. T. Truong**, "Physical Layer Security of Massive MIMO Spatially-uncorrelated Rician Channels", *to appear in Proceedings of IEEE International Conference on Advanced Technologies for Communications (ATC)*, Oct. 2021, Ho Chi Minh city, Vietnam.
- [C14] S. H. Vu, **K. T. Truong**, B. T. Le, Y. V. Vu and T. M. Le, "An Investigation of Adaptive Digital Beamforming Antenna for gNodeB 5G", *in Proceedings of IEEE International Conference on Advanced Technologies for Communications (ATC)*, pp. 221-224, Oct. 2019, Hanoi, Vietnam, [IEEExplore].
- [C13] Q. V. Dang, B. T. Le and **K. T. Truong**, "Internal Reciprocity Calibration for TDD Massive MIMO: An Algorithm and Experimental Results," *in Proceedings of IEEE International Conference on Advanced Technologies for Communications (ATC)*, pp. 270-275, Oct. 2018, Ho Chi Minh City, Vietnam, [IEEExplore].

- [C12] T. A. Nguyen, B. Q. N. Vo and **K. T. Truong**, "Performance Analysis of Energy Harvesting Two-Way Decode-and-Forward Relay Networks with Power Beacon over Nakagami-m Fading Channels", in *Proceedings of IEEE International Conference on Advanced Technologies for Communications (ATC)*, pp. 265-269, Oct. 2018, Ho Chi Minh City, Vietnam, [IEEEXplore].
- [C11] N. González- Prelcic, **K. T. Truong**, C. Rusu and R. W. Heath Jr., "Compressive channel estimation in FDD multi-cell massive MIMO systems with arbitrary arrays," in *Proceedings of the IEEE Global Communications Conference*, pp. 1-5, Dec. 2016, Washington DC, USA, [IEEEXplore].
- [C10] **K. T. Truong**, H. Nikopour and R. W. Heath Jr., "FDD Massive MIMO with Analog CSI Feedback," in *Proceedings of the IEEE Asilomar Conference on Signals, Systems, and Computers*, pp. 322-327, Nov. 2015, Pacific Grove, CA, USA [IEEEXplore].
- [C9] **K. T. Truong** , A. Lozano and R. W. Heath Jr., "Optimal Training in Continuous Flat-Fading Massive MIMO Systems," in *Proceedings of the European Wireless Conference*, pp. 219-224, May 2014, Barcelona, Spain, [IEEEXplore].
- [C8] **K. T. Truong** and R. W. Heath Jr., "The Viability of Distributed Antennas for Massive MIMO Systems," in *Proceedings of the IEEE Asilomar Conference on Signals, Systems, and Computers*, pp. 1318-1323, Nov. 2013, Pacific Grove, CA, USA, [IEEEXplore].
- [C7] **K. T. Truong** and R. W. Heath, Jr., "Relay Beamforming using Interference Pricing for the Two-hop Interference Channel", in *Proceedings of the IEEE Global Communications Conference (Globecom)*, pp. 1-5, December 2011, [IEEEXplore].
- [C6] **K. T. Truong** and R. W. Heath, Jr., "Interference Alignment for Multiple-Antenna Amplify-and-Forward Relay Interference Channels", in *Proceedings of the IEEE Asilomar Conference on Signals, Systems and Computers*, pp. 1288-1292, November 2011, Pacific Grove, CA, USA, ( invited paper ), [IEEEXplore].
- [C5] R. Vaze, **K. T. Truong** , R. W. Heath, Jr. and S. Weber, "Two-Way Transmission Capacity of Wireless Ad hoc Networks", in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, pp. 1688-1692, June 2010, Austin, TX, USA, [IEEEXplore].
- [C4] **K. T. Truong** and R. W. Heath, Jr., "Adaptive Transmit Antenna Selection in MIMO Amplify-and-Forward Relay Channels ", in *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pp. 3022-3025, March 2010, Dallas, TX, USA, [IEEEXplore].
- [C3] **K. T. Truong**, S. Weber and R. W. Heath, Jr., "Transmission Capacity of Two-way Communication in Wireless Ad hoc Networks ," in *Proceedings of the IEEE International Conference on Communication (ICC)*, pp. 1-5, June 2009, Dresden, Germany, [IEEEXplore].
- [C2] W. Kim, M. O. Khan, **K. T. Truong** , S.-H. Choi, R. Grant, H. K. Wright, K. Mandke, R. C. Daniels, R. W. Heath, Jr., and S. Nettles, "An Experimental Evaluation of Rate Adaptation for Multi-Antenna Systems", in *Proceedings of the IEEE Infocom 2009*, pp. 2313-2321, April 2009, Rio de Janeiro, Brazil, [IEEEXplore].
- [C1] R. C. Daniels, K. Mandke, **K. T. Truong** , S. Nettles, and R. W. Heath, Jr., "Throughput/Delay Measurements of Limited Feedback Beamforming in Indoor Wireless Networks ", in *Proceedings of the IEEE Global Communications Conference (Globecom)*, pp. 1-6, November 2008, New Orleans, LA, USA, [IEEEXplore].

## Patents

- [P5] **K. T. Truong**, R. W. Heath, Jr. and H. Nikopour, "Systems and Methods for Massive MIMO Adaptation," *US patent #10,686,498*, granted on June 16, 2020.
- [P4] **K. T. Truong**, R. W. Heath, Jr. and H. Nikopour, "Method and apparatus for downlink channel estimation in massive MIMO," *US patent #10,374,836*, granted on August 6, 2019.
- [P3] **K. T. Truong**, P. Zhu, J. Ma and R. W. Heath, Jr., "System and method for downlink channel estimation in massive multiple-input-multiple-output (MIMO)," *US patent #10,250,309*, granted on April 02, 2019 .
- [P2] **K. T. Truong**, Y.-H. Kwon, P. Sartori and A.-S. Mazin, "System and Method for Distributed Power Control in a Communication System", *US patent #8,706,026*, granted on April 22, 2014.
- [P1] **K. T. Truong**, Y.-H. Kwon and P. Sartori, "System and Method for Distributed Power Control in a Communication System", *US patent #8,588,840*, granted on November 19, 2013.

## Domestic journal papers

- [DJ3] N. D. Nguyen, G. V. Nguyen and **K. T. Truong**, "The performance of a hybrid beamforming mmWave MIMO system with non-ideal hardware", *Journal of Science and Technique (Tạp chí Khoa học & Kỹ thuật, Học viện Kỹ thuật Quân sự)*, no. 198, pp. 97-107, May 2019.
- [DJ2] G. Q. L. Vu and **K. T. Truong**, "Secret capacity of massive MIMO systems with a passive eavesdropper" (in Vietnamese: "Dung lượng bảo mật của hệ thống MIMO cỡ rất lớn khi có thiết bị nghe lén thụ động"), *Research and Development on Information and Communication Technology (in Vietnamese: Chuyên san các công trình nghiên cứu và phát triển về công nghệ thông tin và truyền thông, Bộ Thông tin và Truyền thông)*, vol. V-3, no. 40, Dec. 2018.
- [DJ1] H. T. T. Nguyen and **K. T. Truong**, "Energy efficiency of FD-MIMO systems in 5G networks" (in Vietnamese: "Hiệu quả sử dụng năng lượng của hệ thống FD-MIMO trong mạng 5G"), *Journal of Science & Technology in Information and Communications (in Vietnamese: Tạp chí Khoa học Công nghệ Thông tin và Truyền thông, Học viện Công nghệ Bưu chính Viễn thông)*, vol. 1, no. 3-4, 2016.

## Domestic conference/workshop papers

- [DC2] N. D. Nguyen and K. T. Truong, "Performance analysis of mmWave systems with hardware impairments", in *Proceedings of National Conference on Electronics, Communications and Information Technology (REV-ECIT)*, Hanoi, Vietnam, 14-15/12/2018 (Best paper award).
- [DC1] B. D. Luong, H. T. T. Nguyen and K. T. Truong, "Energy efficiency of downlink in massive MIMO systems," in *Proceedings of National Conference on Electronics, Communications and Information Technology (REV-ECIT)*, Ho Chi Minh city, Vietnam, 10-11/12/2015 (Best paper award).

## Thesis/Dissertation

- Ph.D. dissertation, "Transmission Strategies for Wireless Multiple-Antenna Relay-Assisted Networks", *The University of Texas at Austin*, May 2012, available in UT Austin online library.
- Master's report, "The Transmission Capacity of Two-way Communication in Wireless Ad-hoc Networks", *The University of Texas at Austin*, May 2008.