Song Noh

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EXPERIENCE

Incheon National University Incheon, South Korea
Assistant/Associate Professor Sep. 2018 - Present

- Signal processing algorithm for human-type and machine-type communications
- Design of intelligent wireless communication systems

Intel Corporation Oregon, USA
Wireless Standards Research Engineer Dec. 2015 - Jul. 2018

- Investigation of the dynamic blockage effects on performance in mmWave
- Development of PHY and MAC algorithm for self-contained and flexible duplex transmission
- Performance analysis of wireless backhaul solution in sub-6GHz and mmWave bands
- Technical contributions to Integrated Access and Backhaul for NR study item

EDUCATION

Purdue University Indiana, USA
Ph.D. in Electrical and Computer Engineering Dec. 2015
Advisors: Professors Michael Zoltowski and David J. Love

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
Master of Science in Electrical Engineering Feb. 2010
Advisor: Professor Youngchul Sung

Soongsil University Seoul, South Korea
Bachelor of Engineering in Electrical Engineering Feb. 2008

PUBLICATIONS

Journal Articles (Submitted/In preparation)

[J1] Jeongwon Jeon, Jinho Kwon, Jihyeok Jung, Jiho Song, and **Song Noh**, "Deep alternating direction networks for UAV-RIS-assisted channel estimation," submitted to *IEEE Trans. Veh. Technol.*, Oct. 2024.

[J2] Kyungsik Seo, Jeongwon Jeon, Gilwon Lee, Jaekoo Lee, and **Song Noh**, "Deep sequential feature learning for phase noise compensation in sub-THz systems," submitted to *IEEE Trans. Commun.*, Jul. 2024.

[J3] Junse Lee, **Song Noh**, Sooyeob Jeong, and Namyoon Lee, "Coverage analysis of LEO satellite downlink networks: Orbit geometry dependent approach," submitted to *IEEE Trans. Veh. Technol.*, Oct. 2024.

Journal Articles (Published/Accepted)

[J1] Daehee Kim, Sungmin Lee, Junghyeon Seo, **Song Noh**, and Jaekoo Lee, "Compatibility review for object detection enhancement through super-resolution," *Sensors*, vol. 24, no. 11, May 2024.

[J2] Kyungsik Seo, Jeongwon Jeon, Gaeun Choi, Hyunchae Chun, and **Song Noh**, "Aerial RIS-assisted direction finding under Doppler effect based on atomic norm minimization," *IEEE Trans. Veh. Technol.*, vol. 73, no. 3, pp. 4482 – 4486, Mar. 2024.

[J3] Jungsook Bae, Waqas Khalid, Anseok Lee, Heesoo Lee, **Song Noh**, and Heejung Yu, "Overview of RIS-enabled secure transmission in 6G wireless networks," to be published in *Digital Commun. Netw.*, Mar. 2024.

[J4] Jiho Song, Jong-Ho Lee, and **Song Noh**, "Position-based adaptive beamforming and roadside unit sectorization for V2I communications," *IEEE Trans. Veh. Technol.*, vol. 73, no. 2, pp. 2960 - 2965, Feb. 2024.

[J5] **Song Noh**, Kyungsik Seo, Youngchul Sung, David J. Love, Junse Lee, and Heejung Yu, "Joint direct and indirect channel estimation for RIS-assisted millimeter-wave systems based on array signal processing," *IEEE Trans. Wireless Commun.*, vol. 22, no. 11, pp. 8378 - 8391, Nov. 2023.

[J6] Waqas Khalid, Zeeshan Kaleem, Rehmat Ullah, Trinh Van Chien, **Song Noh**, and Heejung Yu, "Simultaneous transmitting and reflecting-reconfigurable intelligent surface in 6G: Design guidelines and future perspectives," *IEEE Netw.*, vol. 37, no. 5, Sep. 2023.

[J7] Kyungsik Seo, Jaekoo Lee, and **Song Noh**, "Deep learning-based direction finding in the presence of direction-dependent mutual coupling," *ICT Express*, vol. 9, no. 4, Aug. 2023.

[J8] **Song Noh**, Junse Lee, Gilwon Lee, Kyungsik Seo, Youngchul Sung, and Heejung Yu, "Channel estimation techniques for RIS-assisted communication: Millimeter-wave and sub-THz systems," *IEEE Veh. Technol. Mag.*, vol. 17, no. 2, pp. 64 – 73, Jun. 2022.

[J9] Jiho Song, Jong-Ho Lee, **Song Noh**, and Jeongsik Choi, "Millimeter wave reflection pattern codebook design for RIS-assisted V2V communications," *IEEE Trans. Veh. Technol.*, vol. 71, no. 6, pp. 6819 – 6824, Jun. 2022.

[J10] **Song Noh**, Jaekoo Lee, Heejung Yu, and Jiho Song, "Design of channel estimation for hybrid beamforming millimeter wave systems in the presence of beam squint," *IEEE Syst. J.*, vol. 16, no. 2, pp. 2834 – 2843, Jun. 2023.

[J11] Seoyeon Oh, Minseok Yu, Seonghyeon Cho, **Song Noh**, and Hyunchae Chun, "Bi-LSTM augmented deep neural network for multi-Gbps VCSEL based visible light communication link," *Sensors*, vol. 22, no. 11, May 2022.

[J12] **Song Noh**, Jiho Song, Junse Lee, and Heejung Yu, "High-resolution and low-complexity direction of arrival estimation for hybrid array of subarrays," *IEEE Access*, vol. 10, pp. 54922 – 54935, May 2022.

[J13] Ji Min Park, Juphil Cho, **Song Noh**, and Heejung Yu, "Optimal pilot and data power allocation for joint communication-radar air-to-ground networks," *IEEE Access*, vol. 10, pp. 52336 – 52342, May 2022.

[J14] **Song Noh**, Heejung Yu, and Youngchul Sung, "Training signal design for sparse channel estimation in intelligent reflecting surface-assisted millimeter-wave communication," *IEEE Trans. Wireless Commun.*, vol. 21, no. 4, pp. 2399 – 2413, Apr. 2022.

[J15] Waqas Khalid, Heejung Yu, Dinh Thuan Do, Zeeshan Kaleem, and **Song Noh**, "RIS-aided physical layer security with full-duplex jamming in underlay D2D networks," *IEEE Access*, vol. 9, pp. 99667 – 99679, Jul. 2021.

[J16] Jaekoo Lee, Myungkeun Yoon and **Song Noh**, "Advanced Network Sampling with Heterogeneous Multiple Chains," *Sensors*, vol. 21, no. 5, pp. 6737 – 6751, Mar. 2021.

[J17] **Song Noh** and Hyunchae Chun, "Beamforming algorithms," *J. Korean Inst. Electromagn. Eng. Sci.*, vol. 31, no. 8, pp. 701 – 712, Aug. 2020.

[J18] **Song Noh**, Jiho Song, Youngchul Sung, and Heejung Yu, "Fast beam search and refinement for millimeter-wave massive MIMO based on two-level phased arrays," *IEEE Trans. Wireless Commun.*, vol. 19, no. 10, pp. 6737 – 6751, Jul. 2020.

[J19] Waqas Khalid, Heejung Yu, and **Song Noh**, "Residual energy analysis in cognitive radios with energy harvesting UAV under reliability and secrecy constraints," *Sensors*, vol. 20, no. 10, May 2020.

[J20] Jiho Song, Byungju Lee, **Song Noh**, and Jong-Ho Lee, "Adaptive multiuser transmission using millimeter wave beam alignment with user selection," *IEEE Trans. Veh. Technol.*, vol. 69, no. 8, pp. 9140 – 9145, May 2020.

[J21] Byounghak Kim, Heejung Yu, and **Song Noh**, "Cognitive interference cancellation with digital channelizer for satellite communication," *Sensors*, vol. 20, no. 2, Jan. 2020.

[J22] Jiho Song, Byungju Lee, **Song Noh**, and Jong-Ho Lee, "Limited feedback designs for machine-type communications exploiting user cooperation," *IEEE Access*, vol. 7, pp. 95154 - 95169, Sep. 2019.

[J23] **Song Noh**, Michael Zoltowski, and David J. Love, "Multi-resolution codebook and adaptive beamforming sequence design for millimeter wave beam alignment," *IEEE Trans. Wireless Commun.,* vol. 16, no. 9, pp. 5689 – 5701, Sep. 2017.

[J24] Il Y. Chun, **Song Noh**, David J. Love, Thomas M. Talavage, Stephen Beckley, and Sherman J. Kisner, "Mean square error (MSE)-based excitation pattern design for parallel transmit and receive SENSE MRI image reconstruction," *IEEE Trans. Comput. Imag.,* vol. 2, no. 4, pp. 424 – 439, Dec. 2016.

[J25] **Song Noh**, Michael Zoltowski, and David J. Love, "Training sequence design for feedback assisted hybrid beamforming in massive MIMO systems," *IEEE Trans. Commun.,* vol. 61, no. 1, pp 187 – 200, Jan. 2016.

[J26] **Song Noh**, Michael Zoltowski, Youngchul Sung, and David J. Love, "Pilot beam pattern design for channel estimation in massive MIMO systems," *IEEE J. Sel. Topics Signal Process.,* vol. 8, no. 5, pp. 787 – 801, Oct. 2014.

[J27] **Song Noh**, Youngchul Sung, and Michael Zoltowski, "A new precoder design for blind channel estimation in MIMO-OFDM systems," *IEEE Trans. Wireless Commun.,* vol. 13, no. 12, pp. 7011 – 7024, Dec. 2014.

Conference Papers

[C1] **Song Noh**, Heejung Yu, and Youngchul Sung, "Training signal design for sparse channel estimation in millimeter-wave communication with intelligent reflecting surfaces," in *Proc. IEEE ICC,* Montreal, Canada, Jun. 2021.

[C2] Kyungsik Seo and **Song Noh**, "A study on the use of deep learning technique for nonlinear system identification," in *Proc. KICS,* Yongpyong, Korea, Feb. 2021.

[C3] Kyungsik Seo, Jeongwon Jeon, Gaeun Choi, and **Song Noh**, "Analysis of DNN-based data detection with phase noise for Teraherz OFDM systems," in *Proc. KICS* (Online), Korea, Nov. 2020.

[C4] Hyeong Sook Park, Eun-Young Choi, Young Seog Song, **Song Noh**, and Kyungsik Seo, "DNN-based phase noise compensation for sub-THz communications," in *Proc. ICTC,* Jeju, Korea, Oct. 2020.

[C5] Kyungsik Seo and **Song Noh**, "Evaluation of DNN-based channel estimation techniques in millimeter wave systems," in *Proc. KICS,* Yongpyong, Korea, Aug. 2020. (Student Paper Award)

[C6] Kyungsik Seo and **Song Noh**, "Performance analysis of beam search techniques in millimeter wave systems," in *Proc. KICS,* Yongpyong, Korea, Feb. 2020.

[C7] **Song Noh**, Kyungsik Seo, Mirae Kim, and Junghwan Im, "Beam misalignment-aware beamforming system design," in *Proc. KICS,* Seoul, Korea, Nov. 2019.

[C8] **Song Noh**, Junghwan Im, Mirae Kim, and Kyungsik Seo, "Beamformed signal classification based on multiple hypothetical testing," in *Proc. KICS,* Jeju, Korea, Jun. 2019.

[C9] **Song Noh**, Dawei Ying, Qian (Clara) Li, Hassan Ghozlan, Apostolos (Tolis) Papathanassiou, and Geng Wu, "System evaluation for millimeter-wave radio access network," in *Proc. IEEE ICC,* Kansas City, MO, May 2018.

[C10] **Song Noh**, Michael Zoltowski, and David Love, "Multi-resolution codebook based beamforming sequence design in millimeter-wave systems," in *Proc. IEEE Globecom,* San Diego, CA, Dec. 2015.

[C11] **Song Noh**, Michael Zoltowski, and David Love, "Downlink training codebook design and hybrid precoding in FDD massive MIMO systems," in *Proc. IEEE Globecom,* Austin, TX, Dec. 2014. (**Best Paper Award**)

[C12] **Song Noh**, Michael Zoltowski, Youngchul Sung, and David Love, "Training signal design for channel estimation in massive MIMO systems," in *Proc. IEEE ICASSP,* Florence, Italy, May 2014.

[C13] **Song Noh** and Michael Zoltowski, "A new precoder design for precoding-based blind channel estimation for MIMO-OFDM systems," in *Proc. IEEE Globecom,* Atlanta, GA, Dec. 2013.

[C14] **Song Noh** and Michael Zoltowski, "Blind separation for precoding-based blind channel estimation for MIMO-OFDM systems," in *Proc. Asilomar,* Pacific Grove, CA, Nov. 2013.

[C15] **Song Noh**, Michael Zoltowski, Youngchul Sung, and David Love, "Optimal pilot beam pattern design for massive MIMO systems," in *Proc. Asilomar,* Pacific Grove, CA, Nov. 2013.

EXTERNAL ACTIVITIES

Technical Committee Activities

- Member, Wireless World Research Form (WWRF), Steering Board Oct. 2017 - Jul. 2018

Reviewer of Journal and Conference Papers

- IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology
- IEEE Communications Letters, IEEE Wireless Communications Letters, IEEE Signal Processing Letters
- IEEE Globecom, IEEE ICC, IEEE WCNC

Invited Talks

- Signal processing for sub-terahertz communications: Phase noise compensation and reconfigurable intelligent surface, at Emerging Researchers Special Session (KICS) Feb. 2023
- Beamforming tutorial: Algorithms, at The Korean Institute of Electromagnetic Engineering and Science (KIEES) Jul. 2020
- Array signal processing for enhanced beam management, at The Korean Institute of Communications and Information Sciences (KICS) Jun. 2019

AWARDS AND HONORS

- Academic Research Award, Incheon National University 2020/2021/2022/2023
- Next Generation and Standards (NGS) Division Recognition Award, Intel Q3 2017
- Wireless Communication Research (WCR) Division Recognition Award, Intel Q1 2017
- IEEE Transactions on Communications Exemplary Reviewer Apr. 2015
- Silver Prize in the 21st HumanTech Paper Contest sponsored by Samsung Feb. 2015
- IEEE Global Communications Conference (Globecom) Best Paper Award Dec. 2014