

Heung-No Lee, Ph.D.

Professor

GIST (Gwangju Inst. of Sci. and Tech.)
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Professional Interest

The candidate is seeking a professional opportunity for teaching and research. Primary teaching interests include machine learning, communications, information theory, and signal processing, and research interests include *machine learning*, signal processing, computational intelligence, computational imaging, communications and networks.

Education

Ph.D. in Electrical Eng., University of California, Los Angeles, Nov. 1999
Title of Dissertation: Adaptive Diversity Combining, Equalization and Sequence Decoding for Time-Varying Dispersive Channels
Advisor: Gregory J. Pottie, Ph.D.
M.S. in Electrical Eng., University of California, Los Angeles, Dec. 1994
B.S. in Electrical Eng., University of California, Los Angeles, June 1993

Professional Positions Held

Director of GIST Research Institute, 2016.9--Present

Dean of Research, GIST, Korea, 2015. 2 – Present

Director of Research Policy Center, GIST, Korea, 2016.9--Present

Professor, GIST, Korea

School of Electrical Engineering and Computer Science, 2009.1--Present.

Review Board of National Research Foundation of Korea, 2012 – 2016

Visiting Professor, Cheon-Nam National University Hospital, 2012 – 2016

Assistant Professor, the University of Pittsburgh, Pittsburgh, U.S.A.

Electrical and Computer Eng. Department 2002 – 2008.

Research Staff Member, HRL Laboratories, L.L.C., (Formerly Hughes Research Laboratories)
Information Science Laboratory, 1999.3 – 2002.1

Awards and Honors

- Top 11 Research Outcomes of GIST, 2016.
- GIST Research Award 2016 (for Contribution to Industrialization)
- National Research Foundation, **This Month Science/Engineer Award**, January 2014.
- **Top 50 Achievements of National Research and Development**, awarded by *National Research Foundation of Korea*, Oct. 15th, 2013.
- **Top 100 Achievements of National Research and Development**, awarded by *Korean Ministry of Science, ICT and Planning*, August, 28th, 2013.
- Best Poster Award at the 6th International Symposium for Aging, Gwangju, Korea, Oct. 20th, 2012.
- National Research Laboratory of Korea, 2010, National Research Foundation.
- University of Pittsburgh Central Research Development Grant Awards: 2002, 2005
- Pittsburgh Digital Greenhouse Research Grant Award 2002
- Who's who in America, nominated in 2001 and 2005.
- Departmental Scholar awarded upon graduation of UCLA, 1993
- Graduated UCLA as an Honor Student (Cum Laude)
- Member of Tau Beta Phi honor society

International Journal Editorship/Special Interest Group Membership

- Elected Member of IEEE Computational Imaging Special Interest Group, Jan. 2017 - Dec. 2019.
- Area Editor for AEU--International Journal of Electronics and Communications. Areas include channel coding, information theory, signal processing, communications theories. January 2013 - 2016.
- Lead Guest Editor for EURASIP Journal on Wireless Communications and Networking. Special Issue on Networking Coding for Wireless Networks, Other Guest Editors: Sae-Young Chung (KAIST), Christina Fragouli (EPFL), and Zhi-Hong Mao (University of Pittsburgh). **On-Line Publication:** <http://www.hindawi.com/journals/wcn/2010/si.nwc.html> (Link taken on Jan. 8th, 2011).

Professional Society Activities

IEEE Senior Member

- since March 2013

International Technical Program Committees

- IEEE WCNC 2013, IEEE Globecom 2013 (Wireless Network), IEEE International Conference on Communications 2013 (Wireless Network)
- IEEE PIMRC 2012, 2013: Wireless Networks and Cross-Layer Tracks
- IEEE International Conference on Communications 2012: Wireless Network Symposium.
- IEEE International Conference on Communications 2012: Ad-hoc and Sensor Networking Symposium.
- IEEE Globecom 2009, Nov.30th-Dec. 4th, Honolulu, Hawaii, USA
- IEEE/CME International Conference on Complex Medical Engineering 2009: April 9-11 at Tempe, AZ, USA
- IEEE International Conference on Communications 2008: Communication Theory Symposium, Beijing, China.
- International Wireless Communications & Mobile Computing Conference, MIMO Systems Symposium, August 12-16, 2007, Turtle Bay Resort, Honolulu, Hawaii.
- IEEE International Conference on Communications 2007: Communication Theory Symposium, Scotland.
- IEEE International Conference on Communications 2005: Communication Theory Symposium, Seoul, Korea

IEEE Chapters

- Gwangju Section Chair, Jan. 2013 – Present
- Gwangju Section Secretary, Jan. 2010 – Dec. 2012
- Pittsburgh Chapter Chair for IEEE Signal Processing Society, June 2005 -- Dec. 2008.

IEEE Conference Session Chairs

- IEEE Wireless Communications and Network Conference, Las Vegas, Nevada, USA
- IEEE International Conference on Communications 2005: Communication Theory Symposium

Panels for Competitive National Science Foundation Programs (U.S.A.)

- SBIR/STTR: Wireless Sensor Networks, program director: Dr. Murali Nair, Date July 31st, 2007.
- CISE Networking Division, NeTS: Service Date: June 1-2, 2006, Program Director: Du David.
- CISE Networking Division, NeTS: NOSS-Panel, Service Date: April 20-21, 2006, Program director: Guru Parulkar.
- SBIR/STTR, program director: Dr. Murali Nair, date: August 26, 2005.
- CISE Networking Division, Service Date: May 9-10th, 2005. Program Director: Dr. Joseph Evans.
- SBIR, program director: Dr. Murali Nair, date: September 15, 2003.

Publications

Books/Book Chapters

- Soogil Woo, Seungchan Lee, Younghak Shin, Heung-No Lee, Review of Applications for Wireless Brain-Computer Interface systems, Emerging Theory and Practice in Neuroprosthetics , Chapter 8, IGI Global, Pennsylvania, U.S.A., 2014.
- Seungchan Lee, Younghak Shin, Soogil Woo, and Heung-No Lee, A Review of Wireless Brain-Computer Interface systems, Brain-Computer Interface, Chapter 11, InTech, June, 2013
- Jae-Gun Choi, Sang-Jun Park, and Heung-No Lee, Intelligent Sensor Networks: Across Sensing, Signal Processing, and Machine Learning, Chapter 15, Taylor & Francis LLC, CRC Press, 2012.
- Heung-No Lee, Adaptive Wireless Transceivers, Lambert Academic Publishing, ISBN 978-3-8383-1889-9, Saarbrücken, Germany, 2010.
- Heung-No Lee, Adaptive Diversity Combining, Equalization, and Sequence Decoding, Ph.D. Dissertation, UCLA, 1999.

Refereed Journals

[+ Students, Postdoc++, * Corr]

Published (Accepted)

1. Sangjun Park, Nam Yul Yu, Heung-No Lee, “An Information-Theoretic Study for Joint Sparsity Pattern Recovery with Different Sensing Matrices,” Accepted for publication in *IEEE Transactions on Information Theory*, (Impact Factor: 1.737, Do-Yak Project)
2. I. Sharma, A. Kumar, and G. K. Singh, H.-N. Lee “Design of Multiplier Less Prototype Filter for Two-channel Filter Bank using Hybrid Method in FCSD Space”, *IET Circuits, Devices & Systems*, (ISI-Cited Publication) (in press) (Impact factor: 0.590, Acknowledgement – None)
3. Zafar Iqbal, Kiseon Kim, and Heung-No Lee, “A cooperative wireless sensor network for indoor industrial monitoring,” Accepted for publication in *IEEE Transactions on Industrial Informatics*, (Impact Factor: 4.708, Do-Yak Project)
4. Bandna Bharti, Santosh Kumar, Heung-No Lee, and Rajesh Kumar, “Formation of oxygen vacancies and Ti³⁺ state in TiO₂ thin film and enhanced optical

- properties by air plasma treatment,” Accepted for publication in *Scientific Reports-Nature*, (PDF) (Impact Factor: 5.228, Do-Yak Project)
5. Zafar Iqbal and Heung-No Lee, “Spatially concatenated channel-network code for underwater wireless sensor networks,” *IEEE Transactions on Communications*, Vol. 64, No. 9, pp. 3901-3914, Sep. 2016. (Impact Factor: 2.298, Do-Yak Project)
 6. Hwanchol Jang, Saeid Nooshabadi, Kiseon Kim, and Heung-No Lee*, “Circular Sphere Decoding: A Low Complexity Detection for MIMO Systems with General Two-dimensional Signal Constellations,” *IEEE Trans. on Vehicular Technology* (Early Access). <http://dx.doi.org/10.1109/TVT.2016.2570942> (pdf) (Impact Factor: 1.978, Do-Yak)
 7. Woong-Bi Lee, Hwanchol Jang, Sangjun Park, Yong Min Song, and Heung-No Lee* “COMPU-EYE: a high resolution computational compound eye,” *Optics Express*, Vol. 24, No. 3, pp. 2013-2026, Feb. 8, 2016. (Impact Factor: 3.587; Do-Yak Project)
 8. Pawan Kumar, Rajesh Kumar* and Heung-No Lee* “Magnetic field induced one-dimensional nano/micro structures growth on the surface of iron oxide thin film,” *Thin Solid Films*, Vol.592, pp.155-161, Oct. 2015. (Impact Factor: 1.759, Do-yak project)
 9. Younghak Shin, Seungchan Lee, Minkyu Ahn, Hohyun Cho, Sung Chan Jun and Heung-No Lee* “Simple Adaptive Sparse Representation based Classification Schemes for EEG based Brain-Computer Interface Applications,” *Computers in Biology and Medicine*, Vol.66, pp.29-38, Nov. 2015. (Impact Factor: 1.240, Do-yak project)
 10. Younghak Shin, Seungchan Lee, Minkyu Ahn, Hohyun Cho Sung Chan Jun and Heung-No Lee*, “Noise Robustness Analysis of Sparse Representation based Classification Method for Non-stationary EEG Signal Classification,” *Biomedical Signal Processing and Control*, Vol.21, pp. 8-18, Aug. 2015. (Impact Factor: 1.532; Do-Yak Project) (PDF).
 11. Hwanchol Jang, Changhyeong Yoon, Euiheon Chung, Wonshik Choi, and Heung-No Lee*, “Holistic random encoding for imaging through multimode fibers,” *Optics Express*, Vol. 23, No. 5, March 2015. (Impact Factor: 3.587; Do-Yak Project)
 12. Jaewook Kang, Heung-No Lee and Kiseon Kim, “Bayesian Hypothesis Test using Nonparametric Belief Propagation for Noisy Sparse Recovery,” *IEEE Transactions on Signal Processing*, vol. 63, Iss. 4, Jan. 2015 (Impact Factor: 3.198; Do-Yak Project)
 13. Pawan Kumar, Nitin Rawat, Da-Ren Hang, Heung-No Lee and Rajesh Kumar, “Controlling band gap and refractive index in dopant free α -Fe₂O₃ films,” Accepted for Publication in *Electron Material Letters*.

14. Pawan Kumar, Heung-No Lee, Rajesh Kumar, "Synthesis of phase pure iron oxide polymorphs thin films and their enhanced magnetic properties," *J Mater Sci: Mater Electron*, (2014) 25:4553–4561.
15. Hwanchol Jang, Changhyeong Yoon, Euiheon Chung, Wonshik Choi, and Heung-No Lee, "Speckle suppression via sparse representation for wide-field imaging through turbid media," *Optics Express*, Vol. 22, No. 13, pp. 16619–16628, June 2014.
16. 36. Jin-Taek Seong and Heung-No Lee, "Predicting the Performance of Cooperative Wireless Networking Schemes with Random Network Coding," *IEEE Transactions on Communications*, vol. 62, no. 8, pp. 2951-2964, Aug. 2014.
17. Richa Khokhra, Nitin Rawat, Partha Barman, Hwan-Chol Jang, Rajesh Kumar, Heung-No Lee, "Enhancing the numerical aperture of lenses using ZnO nanostructures-based turbid media," *Journal of Optics*, Oct. 2013.
18. Jin-Taek Seong and Heung-No Lee*, "Necessary and Sufficient Conditions for Recovery Performance of Sparse Signals over Finite Fields," *IEEE Communications Letters*, vol. 17, no. 10, pp. 1976-1979, Oct. 2013.
19. Sang-Seon Byun, Ilanko Balasingham, and Heung-No Lee "An Inventory Model-based Spectrum Pooling for Wireless Service Provider and Unlicensed Users," *Computer Communications*, Vol. 36, issues. 10-11, pp. 1186–1191, April 4th, 2013.
20. Pawan Kumar, Raj Kumar Singh, Nitin Rawat, Partha Bir Barman, Subhash Chander Katyal, Hwanchol Jang, Heung-No Lee*, and Rajesh Kumar*, "A novel method for controlled synthesis of nanosize hematite (α -Fe₂O₃) thin film on liquid vapor interface" *Journal of Nano Particle Research*, March, 2013.
21. Junil Ahn, Heung-No Lee, Kiseon Kim, "Expected complexity analysis of increasing radii algorithm by considering multiple radius schedules," *IET Communications*, Vol. 7, Iss. 3, pp. 229-235, Feb, 2013.
22. J. Oliver, WoongBi Lee, and Heung-No Lee*, "Filters with random transmittance for improving resolution in filter array based spectrometers," *Optics Express*, vol. 21, No. 4, pp. 3969–3989, Feb. 2013.
23. Wooyeol Choi+, Taewoon Kim+, Daeyoung Park+, Heung-No Lee and Hyuk Lim*, Coordinating Transmit Power and Carrier Phase for Wireless Networks with Multi-Packet Reception Capability, *EURASIP Wireless Communications and Networking*, 2nd, Jan. 2013.

24. Jin-Taek Seong+ and Heung-No Lee*, "4-ary Network Coding for Two Nodes in Cooperative Wireless Networks: Exact Outage Probability and Coverage Expansion," *EURASIP Wireless Communications and Networking*, Accepted.
25. Zafar Iqbal+, Saeid Nooshabadi, and Heung-No Lee*, "Analysis and Design of Coding and Interleaving in a MIMO-OFDM Communication System," to appear in *IEEE Transactions on Consumer Electronics*, August 2012 Issue.
26. Sang-Seon Byun++, Ilangko Balasingham, Athanasios V. Vasilakos, and Heung-No Lee*, "Computation of an Equilibrium in Spectrum Markets for Cognitive Radio Networks," to appear *IEEE Transactions on Computers*.
27. Younghak Shin+, Seungchan Lee+, Junho Lee+ and Heung-No Lee*, "Sparse representation-based classification (SRC) scheme for motor imagery-based brain-computer interface systems," *Journal of Neural Engineering*, no. 9, Aug. 2012.
28. J. Oliver++, WoongBi Lee+, SangJun Park+, and Heung-No Lee*, "Improving resolution of miniature spectrometers by exploiting sparse nature of signals," *Optics Express*, vol. 20, no. 3, pp. 2613-2625, Jan. 2012.
29. H. Kim+, D. Har, Z.-H. Mao, M. Sun, and Heung-No Lee*, "Efficient Joint Source-Channel Decoding of Multi-State Markov Sequences," *IET Communications*, vol 6. issue 9, no. 3, pp. 2613-2625, Jan. 2012.
30. Cheng-Chung Chang+*, T.-Y. Kuo, Y.-C. Lo, Heung-No Lee, D. Askey, Zhi-Hong Mao, "User-satisfaction based bandwidth allocation for transmission of multiple sources of human perceptual data," *Journal of the Franklin Institute*, vol. 249, issue 3, pp. 879-890, April 2012.
31. Junil Ahn+, Heung-No Lee, Kiseon Kim*, "A Near-ML Decoding with Improved Complexity over Wider Ranges of SNR and System Dimension in MIMO Systems," *IEEE Trans. on Wireless Communications*, vol. 11, issue 1, pp. 33-37, Jan. 2012.
32. Heung-No Lee*, Seyoung Chung, Christian Fragouli, and Zhi-Hong Mao, "Editorial: Special Issue on Network Coding for Wireless Networks," *EURASIP Journal on Wireless Communications and Networking*, 2011.
33. R. Vinjamuri+, M. Sun, C.-C. Chang+, Heung-No Lee, R. J. Scabassi, and Z.-H. Mao*. Dimensionality reduction in control and coordination of the human hand. *IEEE Transactions on Biomedical Engineering*, 57(2), pp. 284-295, Feb. 2010.
34. Cheng-Chun Chang+, Zhi-Hong Mao, and Heung-No Lee*, "Majority Rule Based Iterative Decoding Algorithm for LDGM Codes," vol. 90, Issue 1, pp. 373-377, *Signal Processing*, Jan. 2010.

35. R. Vinjamuri+, M. Sun, C.C. Chang+, Heung-No Lee, R. Sciabassi, and Z.-H. Mao*, "Temporal Postural Synergies of the Hand in Rapid Grasping Tasks," *IEEE Trans. on Information Technology in Biomedicine*, vol. 14, no. 4, pp. 986-994, Jul. 2010.
36. Heung-No Lee*, J. Zhang+, and C.W. Choi, "General random coding bounds: AWGN channels to MIMO channels," *Annals of Telecommunication*, vol. 65, issue. 1, pp. 87-99, 2010.
37. Cheng-Chun Chang+ and Heung-No Lee*, "A Fast Simulation Method for LDGM Codes," *Journal of the Franklin Institute*, vol. 347, issue. 7, pp. 1368-1373, 2010
38. Mir H. Mahmood+, C.C. Chang+, D. Jung+, Z.H. Mao, H. Lim, and Heung-No Lee*, "Throughput Behavior of Link Adaptive 802.11 DCF with MUD Capable Access Node," *AEU International Journal of Electronics and Communications*, vol. 64, pp. 1031-1041, 2010.
39. J. Zhang+ and Heung-No Lee*, "Energy-Efficient Utility Maximization for Wireless Networks with/without Multipath Routing," *International Journal of Electronics and Communications*, Volume 64, Issue 2, February 2010, Pages 99-111.
40. Z.-H. Mao*, Heung-No Lee, R. Sciabassi, and M. Sun, "Information Capacity of the Thumb and Index Finger in Communication," *IEEE Trans. Biomedical Engineering*, Vol. 56, No. 5, pp. 1535-1546, May. 2009.
41. R. Vinjamuri+, D.J. Crammond, D. Kondziolka, Heung-No Lee, and Zhi-Hong Mao*, "Extraction of Sources of Tremor in Hand Movements of Patients with Movement Disorders," vol. 13, no.1, pp. 49-56, *IEEE Trans. on Information Technology in Biomedicine*, Jan. 2009.
42. J. Zhang+ and Heung-No Lee*, "Performance Analyses on LDPC Coded System over Quasi-Static (MIMO) Fading System," *IEEE Trans. on Communications*, vol. 56, issue 12, pp. 2080-2093, Dec. 2008.
43. X. Song+ and Heung-No Lee*, "Multimode Precoding for MIMO Systems Performance Bounds and Limited Feedback Codebook Design," *IEEE Trans. on Signal Processing*, vol. 56, no. 10, pp. 5296-5301, Oct. 2008.
44. J. Zhang+ and Heung-No Lee*, "Throughput Enhancement with a Modified 802.11 MAC Protocol with Multi-User Detection Support," *International Journal of Electronics and Communications*, vol. 62, issue 5, pp. 365-373, May, 2008.

45. C.C. Chang+ and Heung-No Lee*, "On the Estimation of Target Spectrum for Filter-Array Based Spectrometers," *Optics Express*, vol. 16, no. 2, pp. 1056-61, Jan. 2008.
46. J. Wu+ and Heung-No Lee*, "Performance Analysis for LDPC Coded Modulation in MIMO Multi-Access Systems," *IEEE Trans. on Communications*, vol. 55, no. 7, pp.1417-1426, July, 2007.
47. J. Zhang+ and Heung-No Lee*, "Performance Analysis of LDPC-Coded Space-Time Modulation over MIMO Fading Channels," *IEEE Communications Letters*, vol. 11, Issue 3, pp. 234 – 236, March 2007.
48. J. Zhang+ and Heung-No Lee*, "A Performance Bound on Random-Coded MIMO Systems," *IEEE Communications Letters*, vol.10, no.3, pp.168-170, March, 2006.
49. J. Zhang+ and Heung-No Lee*, "Union Bounds on LDPC Coded Modulation Systems over Fast Fading MIMO Channels," vol. 9, no.9, pp. 796-798, *IEEE Communications Letters*, Sept. 2005.
50. Heung-No Lee* and X. Hu+, "Robust Iterative Tree-Pruning Detection and LDPC Decoding," *IEEE Journal of Selected Areas on Communications*, vol. 23, no.5, pp. 1013-1025, May 2005.
51. Heung-No Lee* and G. J. Pottie, "Fast Adaptive Equalization/Diversity Combining for Time Varying Dispersive Channels", *IEEE Transactions on Communications*, vol. 46, no. 9, pp. 1146-1162, Sept. 1998.

Refereed International Conference/Workshop Presentations

52. Zafar Iqbal and Heung-No Lee, "Dual-hop cooperation protocol for spectrum sensing in cognitive radio networks," 16th Int. Conf. on Electron. Inf. and Commun. (ICEIC 2017), pp. 409-410, Phuket, Thailand, Jan. 11-14, 2017.
53. Jehyuk Jang, Nam Yul Yu, and Heung-No Lee, "A Study on Mixing Sequences in Modulated Wideband Converters", 2016 IEEE Conference on Signal and Information Processing (Global SIP), Washington DC, USA, December 7-9, 2016.
54. I . Sharma, A. Kumar and G. K. Singh, H.-N. Lee, "Design of Multiplierless Cosine Modulated Filterbank using Hybrid Technique in Sub-Expression Space", 21th IEEE International Conference on Digital Signal Processing (DSP), Beijing, China, October16-18, 2016.
55. H. Singh, A. Kumar G. K. Singh, H.-N. Lee, " A novel gamma correction approach using optimally clipped sub-equalization for dark image enhancement " 21th IEEE International Conference on Digital Signal Processing (DSP), Beijing, China, October16-18, 2016.

56. N. Agrawal, A. Kumar, V. Bajaj, and H.-N. Lee, "Controlled Ripple Based Design of Digital IIR Filter", 21th IEEE International Conference on Digital Signal Processing (DSP), Beijing, China, October 16-18, 2016.
57. Zafar Iqbal and Heung-No Lee, "A self-organizing wireless sensor network for industrial monitoring," 31st Int. Conf. on Circuits/Systems, Computers, and Communications (ITC-CSCC 2016), Okinawa, Japan, pp. 351-354, Jul. 10-13, 2016.
58. Woong-Bi Lee, Cheolsun Kim, Gun Wu Ju, Yong Tak Lee, and Heung-No Lee, "Design of thin-film filters for resolution improvements in filter-array based spectrometers using DSP", SPIE Defense + Commercial Sensing 2016, Baltimore, USA, Apr. 17-21, 2016.
59. Seungchan Lee, Younghak Shin and Heung-No Lee, "Design of Active Dry Electrodes and its Evaluation for EEG acquisition", International Conference on ICT Convergence 2015 (ICTC 2015), Jeju, Korea, Oct. 28-30, 2015.
60. Zafar Iqbal and Heung-No Lee, "Deployment Strategy Analysis for Underwater Cooperative Wireless Sensor Networks," International Conference on ICT Convergence, pp. 699-703, Jeju, Korea, Oct. 28-30, 2015.
61. Younghak Shin, Seungchan Lee and Heung-No Lee, "Dictionary Update based Adaptive EEG Classification for Real Time Brain-Computer Interface Applications", International Conference on ICT Convergence 2015, Jeju island, Korea, Oct. 28-30, 2015.
62. Zafar Iqbal and Heung-No Lee, "Underwater Acoustic Channel Model and Variations due to Changes in Node and Buoy Positions," 5th Pacific Rim Underwater Acoustics Conference, ASA POMA vol. 24 070001, Vladivostok, Russia, Sep. 23-26, 2015.(Do-Yak Project).
63. Younghak Shin, Seungchan Lee, and Heung-No Lee, "Evaluation of Sparse Representation based Classification method for Online Brain – Computer Interface Systems", 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Milan, Italy, August 24-29, 2015.
64. Pavel S. Ni, Sangjun Park, and Heung-No Lee, "Design of Unfocused Ultrasound Imaging System using Compressive Sensing", 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Milan, Italy, August 24-29, 2015. Poster.
65. Seungchan Lee, Younghak Shin and Heung-No Lee, "Design of Active Dry Electrodes for EEG based BCI systems", 6th International Brain-Computer Interface Conference, Graz University of Technology, Austria, September 16-19, 2014.
66. Jaewook Kang, Heung-No Lee, and Kiseon Kim, "Noisy Behavior of MAP-based Sparse Support Detection", SPARS 2013, Lausanne in Switzerland, July 8-11, 2013, (Do-Yak, Haek-Sim Project) (pdf)
67. J. Oliver, WoongBi Lee and Heung-No Lee, "Random Transmittance Based Filter Array Spectrometers: Sparse Spectrum Recovery And Resolution Improvement", IEEE Global Conference on Signal and Information Processing (GlobalSIP), Austin, Texas, U.S.A, December 3-5, 2013, (Do Yak Project)

68. Asad Mahmood, Jaewook and Heung-No Lee, "Sparse or Dense-Message Passing (MP) or Approximate Message Passing (AMP) for Compressed Sensing Signal Recovery", 2013 IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, University of Victoria, Victoria, B.C., Canada, Aug 27~29, 2013, (Do Yak Project)
69. Jin-Taek Seong and Heung-No Lee, "Exact Outage Probability of Two Nodes for Cooperative Networking using GF(4)", 14th IEEE International Workshop Signal Processing Advances in Wireless Communications, Darmstadt, Germany, June 16~19, 2013, (Hae-Sim, MT-IT Project), Poster (pdf)
70. Seungchan Lee, Younghak Shin, Soogil Woo, Kiseon Kim and Heung-No Lee, "Design of Dry Electrode for Wireless BCI systems", 35th IEEE EMBC 2013, SaD02.25, Osaka, Japan, July 3~7, 2013, (Do-Yak Project), Poster (pdf)
71. Woong-Bi Lee, J. Oliver, Seung-Chul Kim, and Heung-No Lee, "Random optical scatter filters for spectrometers: Implementation and Estimation", Optics and photonics congresses: Applied Industrial Optics – Spectroscopy, Imaging, & Metrology, Arlington, Virginia, USA, June 23-27, 2013, JTU4A.33 (Do-Yak Project), Poster (pdf)
72. Seungchan Lee, Younghak Shin, Soogil Woo, Kiseon Kim and Heung-No Lee, "Design of Dry Electrode for EEG based BCI systems", 5th International BCI Meeting, Article ID: 91, Asilomar Conference Grounds, Monterey, USA, June 3~7, 2013, (Do-Yak Project), Poster (pdf)
73. Younghak Shin, Seungchan Lee, Soogil Woo and Heung-No Lee, "Performance Increase by using a EEG Sparse Representation based Classification Method", 2013 IEEE ICCE, pp. 201~203 Las Vegas, USA, Jan 11~14, 2013.
74. Sangjun Park and Heung-No Lee, "Number of Compressed Measurements Needed for Noisy Distributed Compressed Sensing", 2012 IEEE International Symposium on Information Theory Proceedings, pp. 1653 – 1656, Boston, USA, 2012.
75. Jaewook Kang, Heung-No Lee and Kiseon Kim, "Bayesian Hypothesis Test for Sparse Support Recovery using Belief Propagation", IEEE Statistical Signal Processing Workshop 2012, pp45~48 Ann Arbor, USA, Aug 5~8, 2012.
76. Zafar Iqbal, Saeid Nooshabadi, and Heung-No Lee, "Efficient Interleaver Design for MIMO-OFDM Based Communication Systems on FPGA", 2012 IEEE 16th International Symposium on Consumer Electronics (2012 ISCE), pp. 1-5, Harrisburg, PA, USA, June 2012.

77. Hyeong-Won Jeon, Jeong-Min Ryu and Heung-No Lee, "Fast multiplath generation method for underwater acoustic communications networking system simulation", 2012 International Conference on Electronics, Information and Communication(ICEIC2012), pp. 247 – 248, Jeongseon, Korea, Feb. 1 – 3, 2012.
78. Sangjun Park and Heung-No Lee, "On the Derivation of RIP for Random Gaussian Matrices and Binary Sparse Signals," International Conference on ICT Convergence, Seoul, Korea, September 28 ~ 30, 2011.
79. Hyeong-Won Jeon, Su-Je Lee and Heung-No Lee, "LDPC Coded OFDM System Design and Performance Verification on a Realistic Underwater Acoustic Channel Model", The 30th anniversary of the premier international conference for military communications(MILCOM 2011), Baltimore, USA, Nov. 7 - 10, 2011.
80. Hyeong-Won Jeon, Su-Je Lee and Heung-No Lee, "Performance Verification of LDPC coded OFDM System in Underwater Acoustic", The 26th International Technical Conference on Circuits/Systems (ITC-CSCC2011), Gyeongju, Korea, Jun. 19 - 22, 2011.
81. Sangjun Park, Hwanchol Jang and Heung-No Lee, "Study on Performance Behavior of the Compressive Sensing Measurements for Multiple Sensor System", 45th *Asilomar Conference on Signals, Systems and Computers*, Asilomar, Asilomar Hotel & Conference Grounds Pacific Grove, CA, Nov 07-10, 2011.
82. Hwanchol Jang, Saeid Nooshabadi and Heung-No Lee, "Predicting the Pruning Potential on the Sphere Decoding for Multiple-Input Multiple-Output Detection", 45th *Asilomar Conference on Signals, Systems and Computers*, Asilomar, Asilomar Hotel & Conference Grounds Pacific Grove, CA, Nov 07-10, 2011.
83. Younghak Shin, Seungchan Lee, Minkyu Ahn, Sung Chan Jun and Heung-No Lee, " A New BCI Classification Method based on EEG Sparse Representation," 5th International Conference Brain Computer Interface 2011, Graz, Austria, September 22-24, 2011.
84. Hwanchol Jang, Saeid Nooshabadi, Sangjun Park and Heung-No Lee, "Sorted Orthotope Sphere Decoding for MIMO Detection," The 5th Joint Conference on Information and Communication Technology & the 1st Yellow Sea International Conference on ubiquitous Computing (JCITCT & YES-ICuC), Shandong University at Weihai, China, Aug 17-20, 2011.
85. Younghak Shin, Seungchan Lee and Heung-No Lee, "A New BCI Classification Method based on EEG Sparse Representation", *Signal Processing with Adaptive Sparse Structured Representation*, Edinburgh, Scotland, June 27-30, 2011.
86. J. Oliver and Heung-No Lee, "A Realistic Distributed Compressed Sensing Framework for multiple Wireless Sensor Networks", *Signal Processing with*

- Adaptive Sparse Structured Representation*, Edinburgh, Scotland, June 27-30, 2011.
87. Sangjun Park, Hwanchol Jang and Heung-No Lee, "Performance Limits of the Measurements on Compressive Sensing for Multiple Sensor System", *Signal Processing with Adaptive Sparse Structured Representation*, Edinburgh, Scotland, June 27-30, 2011.
 88. J. Kang, Heung-No Lee, K. Kim, "Message Passing Aided Least Square Recovery for Compressed Sensing," *Signal Processing with Adaptive Sparse Structured Representation*, Edinburgh, Scotland, June 27-30, 2011.
 89. Younghak Shin, Seungchan Lee, Minkyu Ahn, Sung Chan Jun and Heung-No Lee, "Motor Imagery based BCI Classification via Sparse Representation of EEG Signals," *8th International Symposium on Noninvasive Functional Source Imaging of the Brain and Heart and the 8th International Conference on Bioelectromagnetism*, Banff, Canada, May 13-16, 2011.
 90. Jin-Taek Seong, Heung-No Lee, "Concatenation of LDPC codes with Golden Space-Time Block Codes over the Block Fading MIMO Channels: System Design and Performance Analysis," *45th Annual Conference on Information Science and Systems*, Johns Hopkins Univ., Mar. 23-25, 2011.
 91. J.I. Ahn, Heung-No Lee, K.-S. Kim, "Intelligent Implementation of Schnorr-Euchnor Sphere Decoding for MIMO Systems," *ITC-CSCC*, pp. 700-701, 2010.
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8. Heung-No Lee and V. Gulati, "Method and Apparatus for Iterative Equalization/Decoding MIMO Transmission Over MIMO Channels Utilizing a Per-Antenna Equalization Architecture, Attorney Docket No. 1044-409-01, application date: Dec. 28th, 2001.
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2. Heung-No Lee, J. Oliver, Woongbi Lee, “분광장치 및 분광방법 (Apparatus for Improving Spectral Resolution using Random Transmittance in Optical Spectrometers)”, application number :PCT/KR2013/009014, application date: Oct. 8th, 2013.
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Korean Patents Filed/Registered

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3. 이흥노, Zafar Iqbal, “센싱 데이터 처리장치 및 데이터 처리방법, Sensed data processing apparatus and method,” Application number: 10-2016-0066621, May 30th, 2016.
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5. 이흥노, 장환철, 이용비, “다수의 렌즈를 이용한 촬상장치”, Patent number:10-1638022, Registration date: July 4th, 2016.
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11. 이흥노, 제임스올리버, 이용비, “분광장치 및 분광방법 (Apparatus for Improving Spectral resolution using Random Transmittances in Optical Spectrometers)”, application number: 10-2012-0112453, application date: Oct. 10th, 2012.
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21. 이홍노, 이준호, 박상준, “분산적 압축 센싱 및 협력 복구를 수행하는 신호취득 장치 및 그 방법”, application number: 10-2010-0096128, application date: Oct. 1st, 2010 / registration number: 10-1112746, registered date: Jan. 30th, 2012.

Research Projects

Funded Projects at GIST

- KARI (Korea Aerospace Research Institute)
 Project Title: Development of integrated sensor module for 3D detection by combining 3D image sensor and MEMs-based LiDAR
 Total Funding Amt: 370,000,000KRW
 Project Period: 2016.09 ~ 2019.07
 Role: The co-PI
- National Research Foundation of Korea, NRF
 Project Title: 다중생체정보 기반 치매 중증도 모니터링 기술 개발
 Total Funding Amt: 65,000,000KRW
 Project Period: 2016.06 ~ 2021.02
 Role: The co-PI
- 한화탈레스

Project Title: Research and RTL development of compressed sensing algorithms for Multi-channel digital receiver (MCDR)
Total Funding Amt: 300,000,000KRW
Project Period: 2016.01~2017.12
Role: The co-PI

- GIST

Project Title: 디지털 신호 처리 기반의 저비용 휴대용 초분광 영상 장치 개발
Total Funding Amt: 50,000,000KRW
Project Period: 2016.08~2016.12
Role: The sole PI

- Ministry of Science, ICT and Future Planning

Project Title: 해상도 향상 DSP 알고리즘을 이용한 초소형 고해상도 분광기 모듈 개발
Total Funding Amt: 1,293,336,000KRW
Project Period: 2016-05-01 ~ 2017-04-30
Role: The co-PI

- National Research Foundation of Korea, NRF

Project Title: CODing theoretic compressive sensing for multiple sensor systems
Total Funding Amt: 2,400,000,000KRW
Project Period: 2010.05 ~ 2018.04
Role: The sole PI

- Agency for Defense Development, Korea (<http://www.add.re.kr>),

Title of Center: Electronic Warfare Systems
Center Period: 2013 – 2021 (9 years)
The Director of the Center is Prof. Kiseon Kim, GIST

Role: A PI, leading two projects
The period of 1st project: 2013 – 2015
Funding Amt: 0.36 Million US Dollars
Co-PI: Prof. Hyuk Lim, GIST

The period of 2nd project: 2016 – 2021
Funding Amt: 0.85 Million US Dollars
Co-PI: Prof. Seungyoung Ahn, KAIST

- GIST Technology Institute, Prototype Development Program.

Project Title: Miniature Spectrometers using Filters with Random Transmittance Functions
Total Funding Amt: 30,000,000KRW (30K US Dollars)
Project Period: Oct. 2012 – Jan. 2013.
Role: The sole PI

- Electronics and Telecommunications Research Institute (ETRI), Korea.
Project Title: Developing optimized algorithm to allocate resources fairly among different TVBD
Total Funding Amt: 30,000,000KRW (30K US Dollars)
Project Period: June 2012 – Dec. 2012.
Role: The sole PI
- Korean National Research Foundation, *Heak Sim* Program
Title: Network Coding based Wireless Resource Optimization
Total Funding Amt: 600,000,000KRW (about 0.6 Million US Dollars).
Funding Period: Sept. 1st, 2010 – Aug. 30th, 2013.
Role: The sole PI
Co-PIs (Prof. Kiseon Kim, GIST, Korea; Prof. Hokyung Lee, Hongik University, Korea)
- Korean National Research Foundation, *National Research Lab* Program
Project Title: CODing theoretic compRESSive sensing for multiple sensor systems (CODPRESS),
Total Funding Amt: 1,500,000,000KRW (about 1.5Million US Dollars).
Funding Period: May 1st, 2010 – April 30th, 2015.
Role: The sole PI
- Korean National Research Foundation: Korea-Russia Cooperative Marine and Information Technology Research Center “Robust and Spectrum Efficient Underwater Acoustic Networking,” Period: Oct. 1st, 2009 – Sept. 30th, 2015
Role: A co-PI: 30,000,000KRW/year (Allocated)
The sole PI: Kiseon Kim (Total Center Funding 600,000,000 KRW each year for six years) (K20901000004-09E0100-00410)

Funded Projects at the University of Pittsburgh

- US Army SBIR Phase II: "Smart Codec with Telesurgery Capabilities," Period: Jan. 1st, 2008 – Dec. 30th, 2010, Pitt Funding Amount: \$40,000.00, (Army 06-161, PI: Energid Technologies, Pitt PI: Zhi-Hong Mao, Pitt co-PI: Heung-No Lee)

Telesurgery systems using wireless networks and the Internet can play a critical role in many life saving medical operations in remote areas and battle fields. One barrier to the wide application of telesurgery operations today is lack of proper coding and decoding techniques to mitigate the network latency problem. Due to long network delays and variable link qualities along the route, steady bandwidth allotment required for real-time telesurgery traffic such as video, haptic feedback control, and audio is very difficult to maintain. The aim of this project is therefore to develop a new codec technology which will enable robust and reliable telesurgery operations over the public Internet and wireless networks.
- National Science Foundation: Dimensionality Reduction in the Control of the Human Hand, \$195,000.00. Sept.1, 2007 -- Aug.31, 2010. (The PI: Zhi-Hong Mao, co-PIs: Heung-No Lee, and Mingui Sun) (Award Id : CMMI-0727256)

A hand is a chief organ of human. A mute can utilize it to represent one's thought. In this project, our aim is to develop a systematic approach to understanding on the control of human's hand. Eventually, this will lead to better understanding of motor control of human brain. We want to identify movement primitives and use them to quantify the information theoretic capacity of human hand. Effort in this direction will enable the design of brain-like circuits and brain-machine interfaces that can be used in prosthetics, aiding stroke victims, handicapped individuals, and those with brain or spinal cord damages.

- Spectral Resolution Enhancement Apparatus for Nano Scale Filter Array, Sponsor: NanoLambda, Funded Amount: \$36,920, Project Period: May 1st, 2007 – May. 1 2008. Role: The PI.

The aim of this project is to develop a software module and drastically enhance the resolution of primitive low cost nano scale filter array via sophisticated signal processing algorithms. For example, the software module employs a singular value decomposition based spectral enhancement algorithm.

- “MIMO-OFDM System Development,” Funded Amount: \$40,000.00, Period: Feb. 2005 -Feb. 2007, Sponsor: ADCUS, Inc. Role: The PI.

The aim of this project is to develop a baseband communications system capable of spectrum efficient and agile waveform transmission for wireless fading channels. Multiple transmit and multiple receive antennas are assumed. Orthogonal frequency division multiplexing transmission is used for spectrum agile waveform generation. Some frequency bins can be turned on or turned off based on the level of established signaling activity. Low density parity-check coded space-time modulation is then used to combine all signals dispersed in different frequency bins. It is also to obtain huge frequency diversity gain over a frequency selective fading channel. The designed system has been implemented into FPGA based software radio units. This project has been a collaborative project with ADCUS, Information Communications University in Korea, and University of Pittsburgh. ADCUS and ICU did the implementation work while UPitt provided the necessary system design and simulation work.

- “Capacity of Wireless Ad Hoc Networks with MIMO nodes,” University of Pittsburgh CRDF, Funded Amount: \$16,000, Project Period: July 1, 2005 – June 30, 2007. Role: The PI.

The aim of this project is to develop a theoretical capacity limit of wireless ad hoc networks where each node is capable of transmitting and receiving information with multiple transmit and receive antenna arrays. The approach is to develop union bound based performance abstraction tools for various channels at the physical layer. For the routing and media access control layers, utility maximization based optimization framework is utilized to overlay the physical layer abstractions which leads to distributive medium access control, routing, and source traffic control.

- “SPECTrum efficient modEM technology for harsh channel environment,” Funded Amount : \$297,830.00, Sponsor: The Technology Collaborative, Project Period: Jan. 2002 - Oct. 2003. Role: The PI

The aim of this project is to design a highly spectrum efficient data modem technology for harsh channel environment. Harsh here means that the channel is highly delay dispersive as well as time-selective. Frequency-selective and time-selective channels have high order of time and frequency diversity available. Training based channel estimation is assumed. Interpolation is

used to track the channel between training segments. To take the advantage of spatial diversity, we also make use of multiple transmit and receive antenna array and use linear dispersion space-time codes. Then, we design a transmitter which is based on the low-density parity-check code (LDPC), and a receiver which implements a novel tree-pruning based iterative equalizer-decoder. A sphere-list detection and threshold detection are combined to generate a pruned tree. From a pruned tree, a soft output message is computed which is passed to the iterative LDPC decoder. A number of iterations between the detection and the decoder can be done to produce final decoded output. We then build a prototype system based on a software radio module which is capable of four independent transmitting and receiving channels. The software radio module is equipped with DSP and FPGA chips on to which we can download our algorithms. We implement the designed transceiver algorithms onto the board and successfully demonstrated the transmission and reception operation in real-time.

- “Impulse Radio,” University of Pittsburgh CRDF, Funded Amount: \$16,000, Project Period: Sept. 2002 - Sept. 2004. Role: The PI.

We investigate system design issues for impulse radios which utilize an ultra wideband (UWB) pulses for communicating messages. It is well known that the impulse radio is suitable for short range communication in which case the power spectral density of impulse radio communication can be suppressed under the noise floor. Thus, the spectrum of impulse radio communication can be hidden to outsiders and it can be overlapped with any other established and licensed spectrum usages. In this project, our aim has been to the issues such as how to design a transceiver system which can combat multi-path induced delay dispersion problem and establish a high rate and robust communication link over the wireless channel. We use parity-check code based block transmission scheme at the transmitter (LDPC codes) and a turbo-iterative base band receiver which iterates soft log-likelihood ratio messages between equalizer-like signal detection unit and the channel decoder.

Projects completed at HRL Laboratory, USA (All as the PI)

- X-Laboratories, L.L.C. “Broadband Wireless Modem,” Amount: \$200,000, Project Period: April 2001~Oct. 2001.
- HRL Shared Research Project, “Future Tactical Networking Systems,” Amount \$300,000, Project Period: Jan. 2001- Dec. 2001
- HRL Shared Research Project, “Variable rate (Variable Power) sequence-decoding transceiver for multi-transmit and multi-receive fading channels,” Amount \$150,000, Project period: Jan. 2000 - Dec. 2000.
- The United States Defense Advanced Research Project Agency/ATO Adaptive Signal ProcEssing and Networks (ASPEN) project (Raytheon Sub-contract), "*Traffic Modeling for the Tactical Internet*," Amount: \$350,000, March 1999 - Aug. 2000.
- Hughes Space & Comm. Directed Research Project, "*Capacity Analysis for Satellite Network using Realistic Input Traffic*," Amount: \$450,000, March 1999-Dec. 2001.

Recent Selected Invited Talks and Presentations

- 25th Korean Signal Processing Conference, invited talk and publicity chair, 2012.
- Keynote Speaker, on the topic of Overview of Compressed Sensing Theory, Pacific-Rim Symposium on Image and Video Technology 2011, 20-23rd, November, 2011, Gwangju, Korea.
- Plenary Speaker, on the topic of Cooperative Underwater Networking System for Ocean Monitoring System, presented at the Korean Association of the Global R&D Centers (GRDC) Symposium 2011 on the Green Science and Engineering for Health and Environment, November 15-16, 2011, Seoul Korea.
- Talk, on the topic of Compressed Sensing over Galois Field: Sensing Bounds and Recovery Algorithms,” Korean Mathematical Society: Applied Harmonic Analysis, Fall Meeting, GyeongBuk National University, Oct. 22nd, 2011.
- Talk on the topic of Compressed Sensing over Galios Field: Sensing Bounds and Recovery Algorithms,” Signal Processing Symposium of Korea (신호처리 합동 학술 대회), Special Session on Compressed Sensing, Fall Meeting, GIST, Korea, Oct. 22nd, 2011.
- Talk on “Coding Theoretic Compressive Sensing Research at GIST,” 2010 Workshop on Compressive Sensing, at KAIST, Organized by National Institute of Mathematical Sciences, Korea, Date: August 18-20, 2010.
- Talk on “Network coding for wireless networks,” 2010 Workshop on Mathematical Approaches to Future Internet, April 23th, 2010. KAIST ICC(KAIST Moonji Campus), Organized by National Institute of Mathematical Sciences, KOERA.
- National Institute for Mathematical Sciences, Talk on “Network Coding for Multiple Access Channels,” Dec. 29th, 2009. Organized by Prof. Jun Sang Park at Hongik University.
- Korea Computer Congress 2009, “Network Codes for Wireless Networks,” Information and Communications Young Investigator Workshop, July 1st, 2009. University of Jeju, Korean Information/Communications Society.
- ECE Department of the University of Delaware, “Random coding bounds for MIMO multiple access channel,” Nov. 12th, 2007.
- *IEEE Milcom* 2007, “Attack Resilient Network Channel Code for the Wireless Multiple Access Relay Network,” *IEEE Milcom* 2007, Oct. 29-31, 2007, Orlando Florida.
- US-Korea Conference 2007, “Random Coding Bounds for LDPC coded modulation for MIMO Multiple Access channels,” *Wireless Networking Symposium of*

International Conference on Global Challenge in Science and Technology, Aug. 8-11, 2007, Washington D.C.

- Communications Society Lecture Telecom Department at the University of Pittsburgh, “Random coding bounds for concatenated space-time coding over MIMO fading channel,” (Chair Dr. Krishnamurthy), Feb. 2006.
- DIST Colloquium Lecture at the School of Information Science, University of Pittsburgh, “Random coding bounds for MIMO fading channels,” March, 2006.
- Lehigh University, ECE Department, “Cross-layer design and optimization for wireless networks and union bounds for MIMO channels,” Bethlehem, Pennsylvania, USA, Nov. 2005.
- Ajou University, ECE Department, Suwon, Korea, “Cross-layer designs of wireless networks and union bounds for MIMO channels,” May 20th, 2005.
- Information and Communication University, Daejeon, Korea, “MIMO-OFDM Transceiver Design,” Jan. 22- 25, 2005.
- ADCUS, INC, “NETcapacity attaining code and Multi-User Detection, at Wexford, PA, April 5th, 2004.
- 3 ETI, “Generalized Transceiver Design and Wireless Ad Hoc Networks, at Corporate Headquarters, 700 King Farm Blvd. Suite 600, Rockville, Maryland U.S.A. 20850, Dec. 12, 2003.
- ADCUS, INC, “Generalized Transceiver Design and Wireless Ad Hoc Networks, at Wexford, PA, Dec. 22, 2003.
- 3 ETI, “SPECTEM projects and beyond,” Blairsville Office, PA, on July 2003.
- Neuralware, “SPECTEM technology and Neural Network,” Dec. 5th, 2003 at NeuralWare, 230 East Main Street Ste 200 Carnegie PA 15106 USA.
- PDG research quarterly SPECTEM project reviews from Jan. 2002 – Dec. 2003
- Soong Sil University, Seoul Korea, “MIMO OFDM Transceivers and Wireless Networks,” April, 2003.
- Electronics and Telecommunications Research Institute (ETRI) in Daejeon, South Korea, “MIMO OFDM Transceivers and Wireless Networks,” April, 2003.
- University of Notre Dame, EE Dept, “MIMO Systems for Wireless Networks,” June 2001.

- University of Delaware, EE Dept, “MIMO systems for wireless networks,” June 2001.
- Massachusetts Institute of Technology (MIT), MIT Laboratory for Information and Decision Systems (LIDS), AA and EECS Departments, “Wireless Transceivers and Fractal Internet Traffic,” April 2001.
- Wayne State University, EE Dept, “Design and Analysis of MIMO systems,” April, 2001.

Courses Developed/Taught at GIST, Korea

Graduate Courses

- Introduction to Compressed Sensing (Spring 2011)
- Channel Coding Theory (Fall 2010)
- Wireless Communications (Spring 2010, Spring 2009)
- Information Theory (Fall 2011, Fall 2009)

Undergraduate Courses

- Communication Engineering (Fall 2012)

Courses Developed/Taught at the University of Pittsburgh

Graduate Courses Developed

- ECE 2595: Digital Communication Theory (Spring 2004; Spring 2006; Spring 2008): Graduate-level course in digital signal processing and communications system theory.
- ECE 2522: Information Theory (Fall 2003; Fall 2005; Spring 2007; Fall 2008): Graduate level course in information theory.
- ECE3995: Advanced Topics in Wireless Communications and Networking (Spring 2003). Recent advances in wireless communication and networking.
- ECE 3431: Channel Coding Theory & Practice (Fall 2002; Fall 2004; Fall 2006): Graduate level course in channel coding theory.

Graduate Courses Taught

- EE 2646: Linear Systems Theory (Fall 2004): Graduate course on control theory and linear systems
- ECE 2521: Analysis of Stochastic Processes (Fall 2007)

Undergraduate Courses Taught:

- EE1473: Digital Communications Systems
- ECE-COE 0031: Linear Circuits I
- ECE-COE 0041: Linear Circuits II
- ECE1150: Computer Networks
- ENGR 1869: EEs for Non EEs

Student Supervision at GIST, KOREA

As the primary advisor

- Ph.D. program students:
 - Jin Taek Seong,
 - Hwan Chul Jang,
 - Sangjun Park
 - Asif Raza
 - Woong Bi Lee
 - Yong Hak Shin
 - Seung-Chan Lee
- Ph.D./M.S. combined program students:
 - Jeong Min Ryu
- M.S. program students:
 - Jeagun Choi
 - Pavel Ni
 - Soogil Woo
 - Hyeongho Baek
- Global intern students:
 - 2011 Summer
 - ◆ Pavel Ni
 - ◆ Eevgeni
 - 2010 Summer:
 - ◆ Lin Lin Bi: Harbin Institute of Tech (GIST Global Intern Program)
 - ◆ Le Wang: Harbin Institute of Tech (GIST Global Intern Program)
 - ◆ Subhro Das: Indian Institute of Technology, Khargpur
- M.S. students graduated
 - Suje Lee (Spring 2012)
 - HyeongWon Jeon (Spring 2012)

Student Supervision at the University of Pittsburgh

As the primary thesis advisor

- **Ph.D. Graduates:**
 - Cheng-Chun Chang (Ph.D. degree: Defense date: Oct. 2008, postdoc at UPMC)
Dissertation Title: Low density graph codes and novel optimization strategies for information transfer over impaired medium
 - Xiaofei Song (Ph.D. degree: Defense date: 7-23-2007, Ericsson, USA)
Dissertation Title: SIGNAL DESIGN FOR MULTIPLE-ANTENNA SYSTEMS AND WIRELESS NETWORKS
 - Jianming Wu (Ph.D. degree: Defense date: 7-10-2006, Lucent-Alcatel, Beijing China)
Dissertation Title: DESIGN AND PERFORMANCE ANALYSIS FOR LDPC CODED MODULATION IN MULTIUSER MIMO SYSTEMS
 - Jingqiao Zhang (Moved and Graduated from RPI)

- **M.S. Graduates Advised:**
 - Hamja Mahmood (MS 2008)
Thesis: PERFORMANCE ANALYSIS OF LINK ADAPTIVE 802.11 WLANS WITH MULTIUSER DETECTION CAPABLE RECEIVERS
 - Gayatri Mehta (MS 2004)
 - Xinde Hu (MS 2004)
 - Aykut Kalaycioglu (MS 2004)

As a committee member

- **Ph.D. students**
 - Ramana Vinjamuri (Proposal Aug. 2008)
 - Joe Hines (Defense April 2008)
 - Jian Xu (Proposal: 12/8/06)
 - Seda Senay (Prelim: 12/1/06)
 - Charturong Tantibundhit, (Defense Jan 2006)
 - Sungyup Yoo (Defense June 2005)
 - WonChul No (Defense Dec. 2005)
 - Jong-Chih Chen (Graduated Spring 2005)
 - Hakki A Ilgin (Graduated Spring 2005)
 - Peter Hawrylak (Defense Nov. 2006)

- **MS students:**
 - Christopher Sprague (Thesis Presentation on Nov. 19th, 2007)
 - Title: System Identification of Wrist Stiffness in Parkinson's Disease Patients)
 - Brenno (Thesis Presentation on July 27th, 2006)
 - Tim Carey (Thesis Presentation on April 26th, 2006)

As the primary advisor for undergraduate senior design projects

- Jake Denne, Ryan Sloan, Tewodros Tesfaye
(2007 Fall Senior Design: Thought Decoder Design)

The objective of this project is to design, build, and implement a thought decoding system which reproduces simple human motor functions. EEG signal is acquired from the scalp of a brain using an array of electrodes and analyzed. Various signal processing techniques will be used to decode the thought.

- Mark Szymecki (2007 Spr. Senior Design: Developing signal processing algorithms aiming to enhance primitive nano filter arrays for spectrophotometric devices)
- Amy Gromen (2007 Spr. Senior Design: Developing signal processing algorithms aiming to enhance primitive nano filter arrays for spectrophotometric devices)
- Kevin Marnik (2007 Spr. Senior Design: Developing signal processing algorithms aiming to enhance primitive nano filter arrays for spectrophotometric devices)
- Adam Balawegder (2007 Spr. Senior Design: Developing signal processing algorithms aiming to enhance primitive nano filter arrays for spectrophotometric devices)
- Christopher Bosse (2004 Senior Design: Design and implementation of software radio)
- Samuel Dickerson (2003 Senior Design: FPGA implementation of LDPC encoder and decoder)
- Johnny Ng (2003 Senior Design: Implantation of MIMO transmitter and receiver on a software radio platform)
- Matthew Bucek (2002 Senior Design: OFDM transmission and receiver design)

Service for National Research Foundation of Korea

- Member of Research Review Board (July, 2012 ~ July 2014)

Professional Society Activities

IEEE Conference Session Chairs

- IEEE Wireless Communications and Network Conference, Las Vegas, Nevada, USA
- IEEE International Conference on Communications 2005: Communication Theory Symposium

IEEE Chapters

- Gwangju Section Secretary, Jan. 2010 – Present.
- Pittsburgh chapter chair for IEEE Signal Processing society, June 2005 ~ Dec. 2008.

International Technical Program Committee

- International Conference on Ubiquitous and Future Networks 2013.
- International Conference on Ubiquitous and Future Networks 2012, Phuket, Thailand.

- IEEE PIMRC 2012 (MAC and Cross-layer Track), 9-12, Sept. 2012, Sydney, Australia
- IEEE PIMRC 2012 (Mobile and Wireless Networks Track), 9-12, Sept. 2012, Sydney, Australia
- IEEE International Conference on Communications 2012 (AHSN Track), June 10-15, Ottawa, Canada.
- IEEE International Conference on Communications 2012 (WN Track)), June 10-15, Ottawa, Canada.
- IEEE Globecom 2009, Nov.30th-Dec. 4th, Honolulu, Hawaii, USA
- IEEE/CME International Conference on Complex Medical Engineering 2009: April 9-11 at Tempe, AZ, USA
- IEEE International Conference on Communications 2008: Communication Theory Symposium, Beijing, China.
- International Wireless Communications & Mobile Computing Conference, MIMO Systems Symposium, August 12-16, 2007, Turtle Bay Resort, Honolulu, Hawaii.
- IEEE International Conference on Communications 2007: Communication Theory Symposium, Scotland.
- IEEE International Conference on Communications 2005: Communication Theory Symposium, Seoul, Korea

Panels for Competitive National Science Foundation Programs

- SBIR/STTR: Wireless Sensor Networks, program director: Dr. Murali Nair, Date July 31st, 2007.
- CISE Networking Division, NeTS: Service Date: June 1-2, 2006, Program Director: Du David.
- CISE Networking Division, NeTS: NOSS-Panel, Service Date: April 20-21, 2006, Program director: Guru Parulkar.
- SBIR/STTR, program director: Dr. Murali Nair, date: August 26, 2005.
- CISE Networking Division, Service Date: May 9-10th, 2005. Program Director: Dr. Joseph Evans.
- SBIR, program director: Dr. Murali Nair, date: September 15, 2003.

Other services and activities

- Reviewer for IEEE Communications Letters, IEEE Transactions on Vehicular Technology, IEEE Transactions on Signal Processing, IEEE Trans. on Commun., IEEE Trans. Wireless Comm., IEEE Trans. VLSI, etc.
- Member of IEEE Information Theory Society, Communications Society, Vehicular Technology Society, Computer Network Society, Signal Processing Society

List of researchers visited the Communications Research Lab

- Lee Jin, ICU, Deajeon, Korea, Trips; Feb., April, Sept. 2005
- Lee Geongsu, ICU, Deajeon, Korea; Trips: Feb., April, Sept. 2005
- Lee Seung-bum, ICU, Deajeon, Korea; Trips: Feb., April, Sept. 2005
- Park Sungchung, KAIST, Deajeon, Korea; Trips: Feb., April, Sept. 2005

- Professor Park Seung-kwon, Hanyang University, Korea, Sabbatical Period: Jan. 2003-Jan. 2004.

Services at the ECE department in the University of Pittsburgh

- The departmental seminar series: Organized it as the chair (August 2005 ~August. 2006)
- Creation of MSEE program with Telecom specialization, as a member of the committee (Feb. 2002 ~ April 2003)
- Review of Ph.D. program in Telecom department (2003/2004)
- Graduate Student Recruiting Committee: (Fall 2004, Spr 2005)
- Graduate Student Recruiting Committee: (Fall 2005, Spr 2006)
 - Made recruiting visits to universities:
 - Drexel University (Host: Prof. Kapil Dandekar), 10/28/2004.
 - La Roche College (Host: Prof. Jane Arnold), 1/16/2005.

Consulting Activities

- HRL Laboratories, from May 1 ~ Sept. 30, 2002.
- HRL Laboratories, from May 1 ~ July 30, 2003.
- ADCUS, Inc. from Feb. 1 ~ Dec. 1 2005.

External Referees

- Prof. Yoram Bresler, Professor, Fellow of IEEE and AIMBE, University of Illinois, Urbana Champaign, E-mail: ybresler@uiuc.edu
- Prof. Lajos Hanzo, Professor, Follow of IEEE, IEE/IET, RAEng, University of Southampton, UK, E-mail: lh@ecs.soton.ac.uk
- Prof. Gwangbok Lee, Professor, Fellow of IEEE, Seoul National University, Email: klee@snu.ac.kr
- Prof. Iickho Song, Professor, Follow of IEEE, KAIST, Korea, E-mail: isong@ee.kaist.kr
- Prof. Mingui Sun, Professor, University of Pittsburgh, USA, E-mail: drsun@pitt.edu
- Prof. Jalel Ben-Othman, Professor, University of Paris, France, E-mail: jalel.ben-othman@univ-paris13.fr
- Prof. Inkyu Lee, Professor, Korea University, Korea, E-mail: inkyu@korea.ac.kr