



Boreom Lee, M.D., Ph.D.

Associate Professor

leebr@gist.ac.kr

fulmoon73@gmail.com

Work Address:

123 Cheomdan-gwagi-ro, Buk-gu
Gwangju, Korea

Mobile: +82-10-8748-2595

Office: +82-62-715-3272

Website: <http://bmssa.gist.ac.kr>

Education

- Mar 2001 ~ Feb 2007 **Ph.D. in Biomedical Engineering at Seoul National University, Seoul, Korea,**
Research – Biomedical/Neural Signal Processing, Neuroimaging
Supervisor – Prof. Kwang Suk Park
(Ph.D. Thesis Title: Source localization of gamma-band activities during the auditory oddball paradigm)
- Mar 1999 ~ Feb 2001 **M.S. in Biomedical Engineering at Seoul National University, Seoul, Korea,**
Research – Biomedical/Neural Signal Processing, Neuroimaging
Supervisor – Prof. Kwang Suk Park
(M.S. Thesis Title: A study on the recognition memory using LORETA algorithm of high resolution electroencephalography)
- Mar 1991 ~ Feb 1998 **M.D. in Medicine at Seoul National University College of Medicine, Seoul, Korea**

Professional Experience

- Mar 2018 ~ Now **Visiting Scholar in Machine Learning Department at Carnegie Mellon University (CMU), Pittsburgh, USA**
- Jan 2016 ~ Dec 2017 **Department Chair in BMSE at GIST, Gwangju**
- Mar 2011 ~ Now **Assistant & Associate Professor in Department of Biomedical Science and Engineering (BMSE) at GIST, Gwangju**
- Jan 2010 ~ Feb 2011 **Contract Professor in Department of Medical System Engineering (DMSE) at Gwangju Institute of Science and Technology (GIST), Gwangju**
- Sept 2009 ~ Dec 2009 **Senior Research Fellow in Institute for Biomedical Engineering at Seoul National University College of Medicine, Seoul, Korea**
- Sept 2007 ~ Dec 2009 **General Physician in Opo Clinic, Gyeonggi-do, Korea**
- Feb 2007 ~ Aug 2007 **Post-doctoral Researcher in Department of Biomedical Engineering at Hanyang University, Seoul, Korea**
- Mar 2006 ~ Feb 2007 **Teaching Assistant in Department of Biomedical Engineering at Seoul National University College of Medicine, Seoul, Korea**
- April 2003 ~ Mar 2006 **Public Health Doctor (Military Service) in Korean National Institute of Health (KNIH), Seoul, Korea**
- Mar 1999 ~ Feb 2003 **Research Doctor (Residency) in Department of Biomedical Engineering at Seoul National University Hospital, Seoul, Korea**
- Mar 1998 ~ Feb 1999 **Clinical Internship Training at Asan Medical Center (AMC), Seoul, Korea**

Peer-review activities

Journal Editing

- Editorial Board Member of Korean Journal of Biological Psychiatry (Jan 2016 ~ Now)

Journal Review

- IEEE Transactions on Neural Systems & Rehabilitation Engineering
- IEEE Transactions on Biomedical Engineering
- IEEE Transactions on Audio, Speech and Language Processing
- IEEE Journal of Biomedical and Health Informatics
- IEEE Signal Processing Letters
- IEIE Transactions on Smart Processing and Computing
- International Journal of Control, Automation and Systems
- Journal of Electrical Engineering & Technology
- Computer Methods and Programs in Biomedicine
- Biomedical Signal Processing and Control
- Biomedical Engineering Online
- Biomedical Engineering Letters
- Computers & Electrical Engineering
- Journal of Neurosurgical Anesthesiology
- Journal of Neural Engineering
- Progress in Neuropharmacology & Biological Psychiatry
- Behavioral and Brain Functions
- Schizophrenia Research
- Physiological Measurement
- Bioinformatics
- PLoS One
- Sensors

Research Interests

- Biomedical Signal & Image Processing: PPG, ECG, EMG, EEG, Retina/Chest Imaging
- Multimodal Brain Imaging & Mapping: Structural/Functional MRI, DTI, PET, EEG/MEG Source Imaging, Brain Connectivity/Connectomics, Stereotaxic Neurosurgery Planning
- Neuromodulation, Rehabilitation, Translational & Systems Neuroscience
- Machine Learning & Deep Learning Application for Biomedical Science
- Biomedical Instrumentation & Ubiquitous Healthcare System

Professional Memberships & Services

Jan 2014 ~ Now	Council Member of the Korean Society of Medical & Biological Engineering (KOSOMBE)
Jan 2016 ~ Dec 2017	Local Committee Member for the 39 th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC'17)
Jan 2014 ~ Dec 2014	Committee Member of International Biomedical Engineering Conference (IBEC) 2014
Jan 2014 ~ Dec 2014	Committee Member of International Conference on Ubiquitous Healthcare 2014
Jan 2012 ~ Dec 2012	Committee Member of International Conference on Ubiquitous Healthcare 2012
	Member of IEEE Engineering in Medicine & Biology Society (IEEE EMBS)
	Member of Organization for Human Brain Mapping (OHBM)
	Member of the International Society for Optics and Photonics (SPIE)
	Member of Society for Neuroscience (SfN)
	Member of the Korean Society of Medical & Biological Engineering (KOSOMBE)
	Member of Korean Society of Human Brain Mapping (KHBM)
	Member of the Korean Physical Society (KPS)

Awards, Scholarships & Prizes

April 2017	Secretary Award from the Ministry of Science, ICT and Future Planning of Korea
Nov 2016	Achievement Award from the GIST President
April 2016	Ju-Geol Lee Investigator Award from the Korean Neurosurgical Society
Nov 2010	Best Paper Award from the Korean Society for Human Brain Mapping (KHBM)

Languages

Korean (Mother tongue), English

Journal Publications

International

- Jayyoung Bae, Teo Jeon Shin, Seonghyun Kim, Dong-Hyuk Choi, Dongrae Cho, Jinsil Ham, Marco Manca, Seongwook Jeong, **Boreom Lee**, and Jae Gwan Kim, "The changes of cerebral hemodynamics during ketamine induced anesthesia in a rat model," *Journal of Biophotonics* (2018), online published.
- Muhammad Naveed Iqbal Qureshi, Beomjun Min, Hyeong-jun Park, Dongrae Cho, Woosu Choi, and **Boreom Lee***, "Multiclass classification of word imagination speech with hybrid connectivity features," *IEEE Transactions on Biomedical Engineering* (2018), vol. 65(10), pp. 2168-2177.
- Byung-Moon Choi[†], Chanki Park[†], Yong-Hun Lee, Hangsik Shin, Soo-Han Lee, Seongwook Jeong, Gyu-Jeong Noh, and **Boreom Lee***, "Development of a new analgesic index using nasal photoplethysmography," *Anaesthesia* (2018), vol. 73(9), pp. 1123-1130.
- Jongin Kim, and **Boreom Lee***, "Identification of Alzheimer's disease and mild cognitive impairment using multi-modal sparse hierarchical extreme learning machine," *Human Brain Mapping* (2018), vol. 39(9), pp. 3728-3741.
- Jooyoung Oh[†], Dongrae Cho[†], Jaesub Park, Se Hee Na, Jongin Kim, Jaeseok Heo, Cheung Soo Shin, Jae-Jin Kim, Jin Young Park*, and **Boreom Lee***, "Prediction and early detection of delirium in the intensive care unit by using heart rate variability and machine learning," *Physiological Measurement* (2018), vol. 39(3), 035004.
- Jongryun Roh[†], Hyeong-jun Park[†], Kwang Jin Lee, Joonho Hyeong, Sayup Kim, and **Boreom Lee***, "Sitting posture monitoring system based on low-cost load cell using machine learning," *Sensors* (2018), vol. 18(1), 208.
- Dongrae Cho, Jinsil Ham, Jooyoung Oh, Jeanho Park, Sayup Kim, Nak-Kyu Lee, and **Boreom Lee***, "Detection of stress levels from biosignals measured in virtual reality environments using kernel-based extreme learning machine," *Sensors* (2017), vol. 17, 2435.
- Muhammad Naveed Iqbal Qureshi[†], Jooyoung Oh[†], Dongrae Cho, Hang Joon Jo and **Boreom Lee***, "Multimodal discrimination of schizophrenia using hybrid weighted feature concatenation of brain functional connectivity and anatomical features with an extreme learning machine," *Frontiers in Neuroinformatics* (2017), vol. 11, 59.
- Dongrae Cho[†], Beomjun Min[†], Jongin Kim and **Boreom Lee***, "EEG-based prediction of epileptic seizures using phase synchronization elicited from noise-assisted multivariate empirical mode decomposition," *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (2017), vol. 25(8), pp. 1309-1318.
- Won-Ho Kim[†], Dongrae Cho[†], **Boreom Lee***, Jae-Jin Song, and Teo Jeon Shin*, "Changes in brain activation during sedation induced by dexmedetomidine," *Journal of International Medical Research* (2017), vol. 45(3), pp. 1158-1167.
- Chanki Park, Hyunsoon Shin and **Boreom Lee***, "Blockwise PPG enhancement based on time-variant zero-phase harmonic notch filtering," *Sensors* (2017), vol. 17(4), 860.
- Dongrae Cho[†], Teo Jeon Shin[†], Jinsil Ham, Dong-Hyuk Choi, Seonghyun Kim, Seongwook Jeong, Hyung-Ihl Kim, Jae Gwan Kim*, and **Boreom Lee***, "Differential modulation of thalamo-parietal interaction by varying depths of isoflurane anesthesia," *PLoS One* (2017), vol.12(4), e0175191.
- Muhammad Naveed Iqbal Qureshi, Jooyoung Oh, Beomjun Min, Hang Joon Jo, and **Boreom Lee***, "Multi-modal, multi-measure, and multi-class discrimination of ADHD with hierarchical feature extraction and

extreme learning machine using structural and functional brain MRI," *Frontiers in Human Neuroscience* (2017), vol.11, article 157.

- Jooyoung Oh, Ji-Won Chun, Eunseong Kim, Hae-Jeong Park, **Boreom Lee*** and Jae-Jin Kim*, "Aberrant neural networks for recognition memory of socially relevant information in patients with schizophrenia," *Brain and Behavior* (2017), vol.7, e00602.
- Beomjun Min[†], Jongin Kim[†], Hyeong-jun Park, and **Boreom Lee***, "Vowel imagery decoding toward silent speech BCI using extreme learning machine with electroencephalogram," *Biomed Research International* (2016), vol. 2016, article ID 2618265.
- Sewoong Kim, Dongrae Cho, Jihun Kim, Manjae Kim, Sangyeon Youn, Jae Eun Jang, Minkyu Je, Dong Hun Lee, **Boreom Lee**, Daniel L. Farkas, and Jae Youn Hwang*, "Smartphone-based multispectral imaging: system development and potential for mobile skin diagnosis," *Biomedical Optics Express* (2016), vol. 7, pp. 5294-5307.
- Dong-Hyuk Choi[†], Teo Jeon Shin[†], Seonghyun Kim, Jayyoung Bae, Dongrae Cho, Jinsil Ham, Ji-Young Park, Hyung-Ihl Kim, Seongwook Jeong, **Boreom Lee*** and Jae Gwan Kim*, "Monitoring cerebral oxygenation and local field potential with a variation of isoflurane concentration in a rat model," *Biomedical Optics Express* (2016), vol. 7, pp. 4114-4124.
- Muhammad Naveed Iqbal Qureshi, Beomjun Min, Hang Joon Jo, and **Boreom Lee***, "Multiclass classification for the differential diagnosis on the ADHD subtypes using recursive feature elimination and hierarchical extreme learning machine: structural MRI study," *PLoS One* (2016), vol. 11(8), e0160697.
- Kwang Jin Lee and **Boreom Lee***, "Sequential total variation denoising for the extraction of fetal ECG from single-channel maternal abdominal ECG," *Sensors* (2016), vol. 16, 1020.
- Teo Jeon Shin[†], Dongrae Cho[†], Jinsil Ham, Dong-Hyuk Choi, Seonghyun Kim, Seongwook Jeong, Hyung-Ihl Kim, Jae Gwan Kim*, and **Boreom Lee***, "Changes in thalamo-frontal interaction under different levels of anesthesia in rats," *Neuroscience Letters* (2016), vol. 627, pp. 18-23.
- Taegyun Jeon, Jongmin Yu, Witold Pedrycz, Moongu Jeon, **Boreom Lee** and Byeongcheol Lee*, "Robust detection of heartbeats using association models from blood pressure and EEG signals," *BioMedical Engineering Online* (2016), vol. 15, 17.
- Jooyoung Oh, Ji-Won Chun, Hang Joon Jo, Eunseong Kim, Hae-Jeong Park, **Boreom Lee*** and Jae-Jin Kim*, "The neural basis of a deficit in abstract thinking in patients with schizophrenia," *Psychiatry Research-Neuroimaging* (2015), vol. 234, pp. 66-73.
- Kwang Jin Lee[†], Chanki Park[†], Jooyoung Oh and **Boreom Lee***, "Non-invasive detection of intracranial hypertension using a simplified intracranial hemo- and hydro-dynamics model," *BioMedical Engineering Online* (2015), vol. 14, 51.
- Sangsu Park[†], Myonglae Chu[†], Jongin Kim, Jinwoo Noh, Moongu Jeon, Byoung Hun Lee, Hyunsang Hwang, **Boreom Lee*** and Byung-geun Lee*, "Electronic system with memristive synapses for pattern recognition," *Scientific Reports* (2015), vol. 5, 10123.
- Donghyeon Kim, Ra Gyung Kim, Hyung-Sun Kim, Jin-Myung Kim, Sung Chan Jun, **Boreom Lee**, Hang Joon Jo, Pedro R Neto, Min-Cheol Lee, and Hyung-Ihl Kim*, "Longitudinal changes in resting-state brain activity in a capsular infarct model," *Journal of Cerebral Blood Flow and Metabolism* (2015), vol. 35, pp. 11-19.
- Jongin Kim, Dongrae Cho, Kwang Jin Lee, and **Boreom Lee***, "A real-time pinch-to-zoom motion detection by means of a surface EMG-based human-computer interface," *Sensors* (2015), vol. 15, pp. 394-407.
- Chanki Park and **Boreom Lee***, "Real-time estimation of respiratory rate from a photoplethysmogram using an adaptive lattice notch filter," *BioMedical Engineering Online* (2014), vol. 13, 170.
- Jongin Kim, Suh-Kyung Lee, and **Boreom Lee***, "EEG classification in a single-trial basis for vowel speech perception using multivariate empirical mode decomposition," *Journal of Neural Engineering* (2014), vol. 11, 036010(12pp).
- Kwang Jin Lee, Eue Keun Choi, Seung Min Lee, Seil Oh, and **Boreom Lee***, "A modified algorithm of the combined ensemble empirical mode decomposition and independent component analysis for the removal of cardiac artifacts from neuromuscular electrical signals," *Physiological Measurement* (2014), vol. 35, pp. 657-675.
- Jae Hyuk Shin, **Boreom Lee**, and Kwang Suk Park*, "Detection of abnormal living patterns for elderly living alone using support vector data description," *IEEE Transactions on Information Technology in Biomedicine* (2011), vol. 15, pp. 438-448.
- **Boreom Lee**, Jonghee Han, Hyun Jae Baek, Jae Hyuk Shin, Kwang Suk Park, and Won Jin Yi, "Improved elimination of motion artifacts from a photoplethysmographic (PPG) signal using a Kalman smoother with simultaneous accelerometry," *Physiological Measurement* (2010), vol. 31, pp. 1585-1603.
- Sangjo Shim, Man Geun Kim, Kyoungwoo Jo, Yong Seok Kang, **Boreom Lee**, Sung Yang, Sang-Mo Shin,

and Jong-Hyun Lee*, "Dynamic characterization of human cancer cells using a piezoresistive microcantilever," *Journal of Biomechanical Engineering* (2010), vol. 132, 104501.

- **Boreom Lee**, Ji-Young Park, Wi Hoon Jung, Hee Sun Kim, Jungsu S. Oh, Chi-Hoon Choi, Joon Hwan Jang, Do-Hyung Kang, and Jun Soo Kwon*, "White matter neuroplastic changes in the long-term trained players of "Baduk"(GO) game: a voxel-based diffusion-tensor imaging study," *Neuroimage* (2010), vol. 52, pp. 9-19.
- Hyun Jae Baek, Ko Keun Kim, Jung Soo Kim, **Boreom Lee**, and Kwang Suk Park*, "Enhancing the estimation of blood pressure using pulse arrival time and two confounding factors," *Physiological Measurement* (2010), vol. 31, pp. 145-157.
- **Boreom Lee**, Kwang Suk Park*, Do-Hyung Kang, Kyung Whun Kang, Young Youn Kim, and Jun Soo Kwon*, "Generators of the gamma-band activities in response to rare and novel stimuli during the auditory oddball paradigm," *Neuroscience Letters* (2007), vol. 413, pp. 210-215.
- Young Youn Kim, **Boreom Lee**, Yong Wook Shin, Jun Soo Kwon, and Myung-Sun Kim*, "Activity of left inferior frontal gyrus related to word repetition effects: LORETA imaging with 128-channel EEG and individual MRI," *Neuroimage* (2006), vol. 29, pp. 712-720.
- Ji Soo Pae, Jun Soo Kwon, Tak Youn, Hae-Jeong Park, Myung Sun Kim, **Boreom Lee**, and Kwang Suk Park*, "LORETA imaging of P300 in schizophrenia with individual MRI and 128-channel EEG," *Neuroimage* (2003), vol. 20, pp. 1552-1560.

Domestic (Korean)

- J. Oh, D. Cho, J. Kim, J. Park, J. Heo, J. Kim, S. Ra, J. Shin, **B. Lee*** and J. Park*, "A preliminary study for the circadian rhythm of autonomic nervous system in patients admitted to intensive care unit using the heart rate variability," *Korean Journal of Biological Psychiatry* (2017), vol. 24(1), pp. 26-31.

International Conference

Proceedings

- Chanki Park, and **Boreom Lee**, "Compressed Estimation of Heart and Respiratory Rate from a Photoplethysmogram," 2017 IEEE Biomedical Circuits and Systems Conference (BioCAS 2017), Politecnico di Torino (Polytechnical University of Turin), Torino, Italy, Oct. 19-21, 2017.
- Jinsil Ham, Dongrae Cho, Jooyoung Oh, and **Boreom Lee**, "Discrimination of multiple stress levels in virtual reality environments using heart rate variability," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Hyeong-jun Park, Jongin Kim, Beomjun Min, and **Boreom Lee**, "Motor imagery EEG classification with optimal subset of wavelet based common spatial pattern and kernel extreme learning machine," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Joonyoung Song, and **Boreom Lee**, "Development of automatic retinal vessel segmentation method in fundus images via convolutional neural networks," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Jooyoung Oh, Dongrae Cho, Jongin Kim, Jaeseok Heo, Jaesub Park, Se Hee Na, Cheung Soo Shin, Jae-Jin Kim, Jin Young Park, and **Boreom Lee**, "Changes in heart rate variability of patients with delirium in intensive care unit," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Dongrae Cho, and **Boreom Lee**, "Optimized automatic sleep stage classification using the normalized mutual information feature selection (NMIFS) method," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Jongin Kim, and **Boreom Lee**, "Automated discrimination of dementia spectrum disorders using extreme learning machine and structured T1 MRI features," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Muhammad Naveed Iqbal Qureshi, Dongrae Cho, and **Boreom Lee**, "EEG classification for motor imagery BCI using phase-only features extracted by independent component analysis," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.

- Muhammad Naveed Iqbal Qureshi, Hang Joon Jo, and **Boreom Lee**, "ADHD subgroup discrimination with global connectivity features using hierarchical extreme learning machine: resting-state fMRI study," IEEE International Symposium on Biomedical Imaging (ISBI 2017), Melbourne Convention and Exhibition Centre, Melbourne, Australia, April 18-21, 2017.
- Kwang Jin Lee, Chanki Park, and **Boreom Lee**, "Tracking driver's heart rate by continuous-wave Doppler radar," 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2016), Disney's Contemporary Resort, Orlando, Florida, USA.
- Muhammad Naveed Iqbal Qureshi, and **Boreom Lee**, "Classification of ADHD subgroup with recursive feature elimination for structural brain MRI," 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2016), Disney's Contemporary Resort, Orlando, Florida, USA.
- Dongrae Cho, and **Boreom Lee**, "Non-contact heart rate estimation using HSV color model and matrix-based IIR filter in the face video imaging," 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2016), Disney's Contemporary Resort, Orlando, Florida, USA.
- Daeseok Lee, Jaesung Park, Kibong Moon, Junwoo Jang, Sangsu Park, Myounglae Chu, Jongin Kim, Jinwoo Noh, Moongu Jeon, Byoung Hun Lee, **Boreom Lee**, Byoung-Geun Lee, and Hyunsang Hwang, "Oxide based nanoscale analog synapse device for neural signal recognition system," 2015 IEEE International Electron Devices Meeting (IEDM), pp. 4.7.1-4.7.4, Washington Hilton Hotel, Washington DC, Dec. 7-9, 2015.
- Dongrae Cho, Jinsil Ham, and **Boreom Lee**, "Changes in granger causality for brain connectivity depending on the concentration levels of isoflurane in rat study," 2015 15th International Conference on Control, Automation and Systems (ICCAS 2015), pp. 366-369, BEXCO, Busan, Korea, Oct. 13-16, 2015.
- Kwang Jin Lee, Chanki Park and **Boreom Lee**, "Elimination of ECG artifacts from a single-channel EEG using sparse derivative method," 2015 IEEE International Conference on Systems, Man, and Cybernetics (SMC 2015), pp. 2384-2389, Hong Kong, Oct. 9-12, 2015.
- Woosu Choi, Jongin Kim and **Boreom Lee**, "EEG classification of word perception using common spatial pattern filter," The 3rd IEEE International Winter Conference on Brain-Computer Interface, pp. 10-13, High1 Resort, Korea, Jan. 12-14, 2015.
- S. Park, A. Sheri, J. Kim, J. Noh, J. Jang, M. Jeon, **B. Lee**, B. Lee, B.H. Lee and H. Hwang, "Neuromorphic speech systems using advanced ReRAM-based synapse," 2013 IEEE International Electron Devices Meeting (IEDM), pp. 25.6.1-25.6.4, Dec. 9-11, 2013, Washington Hilton Hotel, Washington DC, USA.
- Kwang Jin Lee and **Boreom Lee**, "Removing ECG artifacts from the EMG: a comparison between combining empirical-mode decomposition and independent component analysis," 2013 13th International Conference on Control, Automation and Systems (ICCAS 2013), pp. 181-184, Oct. 20-23, Kimdaejeung Convention Center, Gwangju, Korea.
- Kwang Jin Lee, Eue Keun Choi, Seung Min Lee, and **Boreom Lee**, "Eliminating cardiac electrical artifacts from cardiac autonomic nervous signals using a combination of empirical mode decomposition and independent component analysis," 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2013), pp. 5841-5844, July 3-7, 2013, Osaka International Convention Center, Osaka, Japan.
- Jongin Kim, Suh-Kyung Lee and **Boreom Lee**, "Classifying the speech response of the brain using Gaussian hidden markov model (HMM) with independent component analysis (ICA)," 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2013), pp. 5841-5844, July 3-7, 2013, Osaka International Convention Center, Osaka, Japan.
- **Boreom Lee**, Youngwook Kee, Jong-Hee Han and Won Jin Yi, "Adaptive comb filtering for motion artifact reduction from PPG with a structure of adaptive lattice IIR notch filter," 33th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2011), pp. 7937-7940, Aug.30-Sept.3, 2011, Boston Marriot Copley Place Hotel, Boston, MA, USA.
- Jihun Hamm, Jooman Han, InBum Lee, Yoojung Kim, **Boreom Lee**, and Kwang Suk Park, "intra and intersubject registration in multimodal brain utility for source analysis," 23th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2001), pp. 2426-2428, Oct. 25-28, 2001, Istanbul, Turkey.

Abstracts

- Kyungwon Kim, Jinsil Ham, Jooyoung Oh, Dongrae Cho, and **Boreom Lee**, "The effect of transcranial direct current stimulation (tDCS) in a rodent postoperative delirium," 48th Society for Neuroscience Annual Meeting 2018 (SfN 2018), San Diego Convention Center, San Diego, CA, USA, Nov. 03-07, 2018.

- Seungjun Ryu, Thanh Duc Nguyen, Muhammad Naveed Iqbal Qureshi, Joonyoung Song, and **Boreom Lee**, "Dementia progression assessment with multimodal imaging biomarker data," The 2018 Alzheimer's Association International Conference (AAIC 2018), McCormick Place, Chicago, Illinois, USA, July 22-25, 2018
- Hyun-Joon Yoo, Hyeong-jun Park and **Boreom Lee**, "Optimized method for surface electromyography classification regarding channel reduction in hand prosthesis: a pilot study," 12th International Society of Physical and Rehabilitation Medicine World Congress (ISPRM 2018), Palais des Congrès de Paris, France, July 8-12, 2018.
- Muhammad Naveed Iqbal Qureshi, Seungjun Ryu, Joonyoung Song, and **Boreom Lee**, "PET β -amyloid biomarkers based discrimination of normal aging from mild cognitive impairment and dementia," 3rd International Conference on Educational Neuroscience, Bab Al Qasr Hotel, Abu Dhabi, United Arab Emirates, Mar. 11-12, 2018.
- Hyeong-jun Park, Jongin Kim, and **Boreom Lee**, "Silent speech electroencephalogram classification and frequency band analysis using covariance based feature extraction," The 2017 International Conference on Brain Informatics (BI 2017) – The 10th Anniversary of Brain Informatics (BI), The Grand Gongda Jianguo Hotel, Beijing, China, Nov. 16-18, 2017.
- Jongin Kim, Hyun-Joon Yoo, Hyeong-jun Park, and **Boreom Lee**, "Epidural EEG discrimination in a single-trial basis for speech perception of rat using machine learning techniques," The 2017 International Conference on Brain Informatics (BI 2017) – The 10th Anniversary of Brain Informatics (BI), The Grand Gongda Jianguo Hotel, Beijing, China, Nov. 16-18, 2017.
- Thanh Duc Nguyen and **Boreom Lee**, "Dynamic functional connectivity in electroencephalographic data: microstate segmentation approach," The 2017 International Conference on Brain Informatics (BI 2017) – The 10th Anniversary of Brain Informatics (BI), The Grand Gongda Jianguo Hotel, Beijing, China, Nov. 16-18, 2017.
- Jinsil Ham, Jooyoung Oh, Dongrae Cho, and **Boreom Lee**, "The effect of transcranial direct current stimulation (tDCS) in a rodent model of postoperative delirium," The 2017 International Conference on Brain Informatics (BI 2017) – The 10th Anniversary of Brain Informatics (BI), The Grand Gongda Jianguo Hotel, Beijing, China, Nov. 16-18, 2017.
- Thanh Duc Nguyen, and **Boreom Lee**, "Functional connectomes using Kalman-filter beamforming and phase locking value," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Chanki Park, and **Boreom Lee**, "Heart rate estimation from compressed photoplethysmogram," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Kwang Jin Lee, and **Boreom Lee**, "Heart rate estimation from PPG using dictionary learning," 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2017), International Convention Center, Jeju Island, Korea, July 11-15, 2017.
- Hyeong-jun Park, Beomjun Min and **Boreom Lee**, "Source-level EEG analysis for vowel speech perception using sLORETA," The 20th International Conference on Biomagnetism (Biomag 2016), Coex, Seoul, Korea, Oct. 1-6, 2016.
- Muhammad Naveed Iqbal Qureshi, and **Boreom Lee**, "EEG classification for motor imagery BCI using hierarchical features extraction," The 20th International Conference on Biomagnetism (Biomag 2016), Coex, Seoul, Korea, Oct. 1-6, 2016.
- Duc Thanh Nguyen and **Boreom Lee**, "Kalman filter based dynamic source reconstruction for EEG and MEG data," The 20th International Conference on Biomagnetism (Biomag 2016), Coex, Seoul, Korea, Oct. 1-6, 2016.
- B. Min, J. Kim, H. Park, and **B. Lee**, "Difference between speech perception and imagination: functional connectivity analysis," Fifth Biennial Conference on Resting State and Brain Connectivity, University of Vienna, Vienna, Austria, Sept. 19-23, 2016.
- J. Oh, J.W. Chun, E. Kim, H.J. Park, **B. Lee**, and J.J. Kim, "Altered brain connectivity for recognition memory of socially relevant information in patients with schizophrenia: a group independent component analysis (ICA)," Fifth Biennial Conference on Resting State and Brain Connectivity, University of Vienna, Vienna, Austria, Sept. 19-23, 2016.
- Chanki Park and **Boreom Lee**, "Simultaneous estimation of heart and respiratory rate from a photoplethysmogram using two adaptive notch filters," 12th International Conference on Ubiquitous Healthcare (u-Healthcare 2015), Kinki University, Osaka, Japan, Nov.30-Dec.2, 2015. (Poster Award)
- Dongrae Cho and **Boreom Lee**, "Real-time heart rate measurement based on the matrix type temporal filtering using a webcam system," 12th International Conference on Ubiquitous Healthcare (u-Healthcare 2015), Kinki University, Osaka, Japan, Nov.30-Dec.2, 2015.
- Woosu Choi and **Boreom Lee**, "Speech-induced EEG classification using the minimum distance to

Riemannian mean," International Biomedical Engineering Conference 2015 (IBEC 2015), Hotel Hyundai, Gyeongju, Korea, Nov. 12-14, 2015.

- J. Ham, D. Cho, D.H. Choi, S.H. Kim, J.G. Kim, H.I. Kim and **B. Lee**, "A brain connectivity analysis under anesthesia using transfer entropy," International Biomedical Engineering Conference 2015 (IBEC 2015), Hotel Hyundai, Gyeongju, Korea, Nov. 12-14, 2015.
- Dongrae Cho, Beomjun Min, Jongin Kim and **Boreom Lee**, "Epileptic seizure prediction based on EEG phase synchronization," 2015 International Conference on Brain Informatics and Health, London, United Kingdom, Aug.30-Sept.2, 2015.
- Sewoong Kim, Dongrae Cho, Jin Man Park, **Boreom Lee**, and Jae Youn Hwang, "Smartphone-based multispectral imaging system for mobile skin care," 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2015), MiCo (Milano Conference Center), Milan, Italy, Aug.25-29, 2015.
- Jooyoung Oh, Ji-Won Chun, Hang Joon Jo, Hae-Jeong Park, **Boreom Lee**, and Jae-Jin Kim, "The neural correlates of impaired abstract thinking in patients with schizophrenia," 21th Annual Meeting of the Organization for Human Brain Mapping (HBM 2015), Honolulu, Hawaii, USA, June 14-18, 2015.
- J. Kim, D. Cho, K.J. Lee and **B. Lee**, "The recognition of pinch-to-zoom gesture based on surface EMG," World Congress on Medical Physics & Biomedical Engineering (WC 2015), Metro Toronto convention Centre, Toronto, Canada, June 7-12, 2015.
- Sewoong Kim, Dongrae Cho, Jinman Park, Sehyo Youn, **Boreom Lee** and Jae Youn Hwang, "Development of a smartphone-attached multispectral imaging system," The 2nd SPIE's International Conference on Nano-Bio Sensing, Imaging and Spectroscopy 2015, International Convention Center, Jeju, Republic of Korea, Feb. 25-27, 2015.
- Dongrae Cho, Jongin Kim, and **Boreom Lee**, "EEG phase locking analysis for epilepsy patients using a variety of signal processing algorithms," The First International Biomedical Engineering Conference (IBEC) 2014, pp. 260, Kimdaejung Convention Center, Gwangju, Korea, Nov. 20-22, 2014.
- S.W. Kim, J.M. Park, D. Cho, **B. Lee** and J.Y. Hwang, "Development of a smartphone-based spectral imaging system for detection of skin disease," The First International Biomedical Engineering Conference (IBEC) 2014, pp. 260, Kimdaejung Convention Center, Gwangju, Korea, Nov. 20-22, 2014.
- Dong-Hyuk Choi, Dongrae Cho, Jinsil Ham, Ji-Young Park, Hyoung-Ihl Kim, **Boreom Lee** and Jae Gwan Kim, "The change of cerebral oxygenation and EEG signals with variation of isoflurane concentration in rat model," The First International Biomedical Engineering Conference (IBEC) 2014, pp. 260, Kimdaejung Convention Center, Gwangju, Korea, Nov. 20-22, 2014.
- Chanki Park, Kwang Jin Lee and **Boreom Lee**, "Noninvasive intracranial pressure tracking based on cerebral hemodynamics model," The First International Biomedical Engineering Conference (IBEC) 2014, pp. 260, Kimdaejung Convention Center, Gwangju, Korea, Nov. 20-22, 2014.
- Jongin Kim, Dongrae Cho, Kwang Jin Lee, and **Boreom Lee**, "Extracting the EMG activities for individual finger movements using independent component analysis (ICA)," 11th International Conference on Ubiquitous Healthcare (u-Healthcare 2014), pp. 24, Kimdaejung Convention Center, Gwangju, Korea, Nov. 20-22, 2014.
- Kwang Jin Lee, Chanki Park, Hyunsang Kim, Singu Kim, and **Boreom Lee**, "Reducing motion artifacts from driver's PPG using online empirical mode decomposition (EMD)," 2014 BMES Annual Meeting, Oct. 22-25, 2014, Henry B. Gonzalez Convention Center, San Antonio, Texas, USA.
- Dongrae Cho, Jongin Kim, and **Boreom Lee**, "Efficient implementation for the real-time estimation of heart rate variability using FIR filter system," 10th International Conference on Ubiquitous Healthcare (u-Healthcare 2013), pp. 13, Sept. 12-14, 2013, Hiyoshi Campus, Keio University, Yokohama, Japan.
- Chanki Park, Hyun Soon Shin, Won Jin Yi and **Boreom Lee**, "Motion artifact reduction from PPG using adaptive comb filter with optimal IIR notch filter," 9th International Conference on Ubiquitous Healthcare (u-Healthcare 2012), pp. 202-205, Oct. 25-27, 2012, Gyeongju Hyundai Hotel, Gyeongju, Korea.
- **Boreom Lee**, "Neural synchronization analysis of the MEG auditory steady-state response (ASSR) to evaluate high-risk subjects for schizophrenia," 18th International Conference on Biomagnetism (Biomag 2012), pp. 150-151, Aug. 26, 2012, Maison de la Chimie, Paris, France.
- **Boreom Lee**, Jong-Hee Han, and Won Jin Yi, "Real-time removal of motion artifacts from photoplethysmographic signal using a Kalman filter with accelerometry," 7th International Conference on Ubiquitous Healthcare (u-Healthcare 2010), pp. 43-44, Oct. 28-30, Jeju Grand Hotel, Jeju, Korea.
- **Boreom Lee**, Jong-Hee Han, and Won Jin Yi, "Motion artifact reduction from photoplethysmographic signal using Kalman smoother with simultaneous accelerometry," First AMA-IEEE Medical Technology Conference on Individual Healthcare, pp. 12, Mar. 21-23, 2010, Mayflower Renaissance Hotel, Washington DC, USA.
- **Boreom Lee**, and Kwang Suk Park, "Generators of gamma-band activities in response to rare and novel stimuli during auditory oddball study," 15th International Conference on Biomagnetism (Biomag 2006),

Aug 2006, Vancouver, Canada.

- Jihun Hamm, InBum Lee, **Boreom Lee**, Kwang Suk Park, Myung Sun Kim, and Jun Soo Kwon, "Effects of using different head models of brain tumor on accuracy of EEG source localization," 7th Annual Meeting of the Organization for Human Brain Mapping (HBM 2001), June 2001, Brighton, UK.
- **Boreom Lee**, Hae-Jeong Park, Sang Soo Cho, Seok Won Kong, Myung Sun Kim, Jun Soo Kwon, and Kwang Suk Park, "Analysis of brain activation pattern during continuous recognition memory tasks using low resolution brain electromagnetic tomography algorithm," 7th Annual Meeting of the Organization for Human Brain Mapping (HBM 2001), June 2001, Brighton, UK.

Patents

- US 14556716, Sang Su Park, Hyun Sang Hwang, Byoung Hun Lee, Byung Geun Lee, **Boreom Lee** and Moon Gu Jeon, "Pattern Recognition Method and Apparatus for the Same", Dec. 01, 2014.
- KR 10-1742664, Chanki Park, Kwang Jin Lee, and **Boreom Lee**, "A non-invasive intracranial pressure monitoring apparatus using a simplified intracranial blood flow dynamics model," May 26, 2017.
- KR 10-1723076, Jongin Kim, **Boreom Lee**, and Kwang Jin Lee, "Apparatus and method for contact free interfacing between user and smart device using electromyogram signal," Mar. 29, 2017.
- KR 10-1670433, Jae Youn Hwang, **Boreom Lee**, Sewoong Kim, Jinman Park, and Dongrae Cho, "Portable spectral imaging device, user mobile terminal, server, method and software program for diagnosis and management of skin," Oct. 24, 2016.
- KR 10-1660036, Dongrae Cho, and **Boreom Lee**, "Method for detecting arrhythmia using tachogram," Sept. 20, 2016.
- KR 10-1504487, Euiheon Cheong, Kwang Jin Lee, Hoon Sup Kim, **Boreom Lee**, and Jae Gwan Kim, "Real time system for measuring fetal heart rate," Mar. 16, 2015.