

# Curriculum Vitae

**Name: Chang-Hwan Im**

**Academic Degree: Ph.D. (in Engineering)**

**Current Position: Associate Professor**

**Affiliation: Department of Biomedical Engineering**

**Hanyang University, Korea**



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Google Scholar Citations:

<https://scholar.google.com/citations?user=6jqDL6AAAAAJ&hl=en>

## Education

- 1999.2 : **B.S.** Electrical Engineering, Seoul National University
- 2001.2 : **M.S.** Electrical Engineering, Seoul National University
- 2005.2: **Ph. D.**, Electrical Engineering and Computer Science, Seoul National University, Korea.

## Career

- 2005.3-2006.2: Post-doctoral Associate in the Department of Biomedical Engineering, University of Minnesota, MN, USA. (Advisor: Prof. Bin He)
- 2006.3 - 2010.2: Assistant Professor, Department of Biomedical Engineering, Yonsei University, Wonju, Korea.
- 2010.3 - 2011.2: Associate Professor, Department of Biomedical Engineering, Yonsei University, Wonju, Korea.
- 2011.3 - Present: Associate Professor, Department of Biomedical Engineering, Hanyang University, Seoul, Korea.
- 2014.7 – Present: Department Chair, Department of Biomedical Engineering, Hanyang University, Seoul, Korea

## Miscellaneous academic activities

- 2002.3 – 2003.1: Entrusted Researcher in Korea Electrotechnology Research Institute (KERI), Changwon, Korea.
- 2004.1 – 2004.2: Visiting Researcher in Brain Information Group, National Institute of Information and Communications Technology (NICT), Kobe, Japan
- 2005.2 - 2006.2: Associate Researcher in Korea Electrical Engineering & Science Research Institute (KESRI), Seoul, Korea.

- 2006.3 - 2008.2: Research Committee Member in Korea Society of Medical and Biological Engineering (KOSOMBE)
- 2007.2 - 2009.2: Research Committee Member in Korea Human Brain Mapping (KHBM) Society
- 2011.4 – 2013.12 : Entrusted Researcher in Institute of Epilepsy Research, Yonsei University
- 2008.3 - Present: Editorial Committee Member in Korea Society of Medical and Biological Engineering (KOSOMBE)
- 2009.5 – 2014.12: Editorial Board Member, The Open Medical Imaging Journal
- 2012.3– Present: Technical Committee Member, Asia-Pacific Signal Processing Association (APSIPA)
- 2013.2 – 2013.8: Scientific Program Committee Member, The 7<sup>th</sup> Asia-Pacific Conference on Biomechanics
- 2011.7 – 2013.6: Academic Committee Member in Korea Epilepsy Society (KES)
- 2011.1 – Present: Director, Korean Bioelectromagnetics Society
- 2011.1 – 2012.12: Secretary of General Affairs, Korea Human Brain Mapping (KHBM) Society
- 2013.1 – 2014.12: Director of Information Division, Korea Human Brain Mapping (KHBM) Society
- 2015.1 – Present: Director of Education Division, Korea Human Brain Mapping (KHBM) Society
- 2013.1 – 2013.12: Assistant Administrator, The Korean Society for Brain and Neural Science
- 2015.12 – Present: Local Organizing Committee Member, The 39<sup>th</sup> Annual International Conference of the IEEE EMBS (EMBC 2017)
- 2014.5 – Present: Local Organizing Committee Member, The 20th International Conference on Biomagnetism (BIOMAG 2016)
- 2015.4 – 2015.11: Scientific Program Committee Member, International Biomedical Engineering Conference 2015 (Nov. 12-14)
- 2015.5 – 2015.11: International Program Committee Member, NEUROTECHNIX 2015 (Nov. 16-17, 2015, Lisbon, Portugal)
- 2014.8 – Present: Director, Korea Society for Computational Neuroscience
- 2014.1 – 2015.12: Chair of Academic Committee, Korea Society of Medical and Biological Engineering (KOSOMBE)

### **Research Interests**

- **Computational Neuroengineering and Bioelectromagnetics** – neural signal processing and analysis, modeling and analysis of brain electrical activities, diagnosis of neuropsychiatric diseases, noninvasive brain stimulation (TMS, tDCS)
- **Brain-Computer Interface (BCI) with EEG and NIRS**
- **Functional dynamic neuroimaging** with MEG, EEG, fMRI, NIRS and its clinical applications
- Computational neural network and evolutionary computation
- Numerical analysis of bioelectromagnetic fields and optimal design of biomedical instruments
- Neurophotonics, Neuromarketing, and Human-Computer Interaction

### **Awards and Honors**

- 1. Young Investigator Award**, The 14th Intl. Conf. Biomagnetism – BIOMAG2004, Boston, USA, Aug. 2004.
- 2. Best Poster Paper Award**, Annual Conference on Korean Human Brain Mapping (KHBM), Seoul, Oct. 2004.
- 3. Best Research Professor Award**, Yonsei University, May 2007.
- 4. Excellent Research Achievement Award**, Yonsei University, Oct. 2007.
- 5. SolCo Young Biomedical Engineer Award**, Korean Society of Medical & Biological Engineering,

2007.

6. **Best Research Professor Award**, Yonsei University, May 2008.
7. **Best Research Professor Award**, Yonsei University, July 2009.
8. **Best Paper Award**, Korean Society of Medical & Biological Engineering, Nov. 2010.
9. **Biomedical Engineering Letters Award**, Korean Society of Medical & Biological Engineering, Nov. 2012.
10. **Best Teacher Award**, Hanyang University, July 2013.
11. **Outstanding Young Researcher Award**, Hanyang University, June 2014.
12. **Excellent Teacher Award**, Hanyang University, Nov. 2015.
13. Students' Awards - Han-Jeong Hwang (KOSOMBE Student Paper Competition, 2nd place award, May 2008); Jong-Ho Choi (KHBM Best Poster Paper Award, Nov. 2009), Han-Jeong Hwang (International BCI Meeting 2010, Student Scholarship, May, 2010), Jeong-Hwan Lim (Best Poster Paper Award, KOSOMBE spring conference, May, 2011), Young-Jin Jung (Best Paper Award, KOSOMBE fall conference, Nov. 2011), Han-Jeong Hwang (Best Paper Award, KOSOMBE spring conference, May. 2012), Han-Jeong Hwang (Best Paper Award, KSCN Annual conference, Aug., 2012), Jeong-Hwan Lim (Best Paper Award, KOSOMBE spring conference, May, 2013), Chang-Hee Han (Best Poster Paper Award, KOSOMBE fall conference, Nov., 2013), Jeong-Hwan Lim (Best Poster Paper Award, KHBM fall conference, Nov., 2013), Chang-Hee Han (Best Poster Paper Award, KHBM fall conference, Nov., 2013), Jun-Hak Lee (Best Poster Paper Award, KOSOMBE fall conference, Nov., 2014), Do-Won Kim (Best Poster Paper Award, Korea Schizophrenia Society Conference, Nov., 2014), Miseon Shim (Best Poster Paper Award, Korea Society for Anxiety Disorders, Nov., 2014), Do-Won Kim (Best Poster Paper Award, Korea Society for Neuropsychiatry, Nov., 2014), Jeong-Youn Kim (Student Paper Award, International Biomedical Engineering Conference, Nov. 2014), Ho-Seung Cha (Best Poster Paper Award, KOSOMBE spring conference, May, 2015), Won-Du Chang (Best Oral Presentation Award, International Biomedical Engineering Conference, Nov. 2015), Jeong-Youn Kim (Merit Abstract Award, Organization for Human Brain Mapping Annual Meeting, Jun. 2016), etc.

### **Editorial Activities**

- Lead Guest Editor - Journal of Applied Mathematics, Special Issue on Applied Mathematics in Biomedical Sciences and Engineering (2011-2013)
- Editorial Advisory Member - The Open Medical Imaging Journal (2008-2014)
- Editorial Board Member - Journal of Biomedical Engineering Research (2008-2010)
- Lead Guest Editor – Computational & Mathematical Methods in Medicine, Special Issue on Computational Methods in Neuroengineering (2012-2013)
- Guest Editor of Biomedical Engineering Letters (Scopus Indexed), Special Issue on Neural Engineering (Feb. 2012)
- Editorial Board Member – Brain-Computer Interfaces (from 2013)
- Editorial Board Member - Biomedical Engineering Letters (from 2010)

## **Selected Publication List**

\* Full list of publications can be found at <http://cone.hanyang.ac.kr/BioEST/Kor/publications.html>

### **Peer-Reviewed International Journal Papers Only**

83. Chany Lee, **Chang-Hwan Im**, Yong Seo Koo, Jung-Ah Lim, Tae-Joon Kim, Jung-Ick Byun, Jun-Sang Sunwoo, Jangsup Moon, Dong Wook Kim, Soon-Tae Lee, Keun-Hwa Jung, Kon Chu, Sang-Kun Lee, Ki-Young Jung, "Altered network characteristics of spike-wave discharges in juvenile myoclonic epilepsy," *Clinical EEG and Neuroscience*, in press.
82. Kwang-Ryeol Lee, Won-Du Chang, Sungkean Kim, and **Chang-Hwan Im**, "Real-time 'eye-writing' recognition using electrooculogram (EOG)," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, in press.
81. Seung-Hwan Lee, Sangrae Kim, Mi-Seon Shim, Do-Won Kim, and **Chang-Hwan Im**, "Dysfunctional Patterns of Gamma-band Activity in Response to Human Faces compared to Non-facial Stimuli in Patients with Schizophrenia," *Psychiatry Investigation*, in press.
80. Han-Jeong Hwang, Han Choi, Jeong-Youn Kim, Won-Du Chang, Do-Won Kim, Kiwoong Kim, Sungho Jo, and **Chang-Hwan Im**, "Toward More Intuitive Brain-Computer Interfacing: Classification of Binary Covert Intentions Using Functional Near-Infrared Spectroscopy," *Journal of Biomedical Optics*, vol. 21, no. 9, Art.No. 091303, 2016.
79. Won-Du Chang, Ho-Seung Cha, and **Chang-Hwan Im**, "Removing Interdependency between Horizontal and Vertical Eye-Movement Components in Electrooculograms" *Sensors*, vol. 16, no. 2, Art.No. 227, 2016.
78. Miseon Shim, Do-Won Kim, Sunkyung Yoon, Gwunhi Park, **Chang-Hwan Im**, and Seung-Hwan Lee, "Influence of spatial frequency and emotion expression on face processing in patients with panic disorder," *Journal of Affective Disorders*, vol. 197, pp. 159-166, 2016.
77. Won-Du Chang, Jeong-Hwan Lim, and **Chang-Hwan Im**, "An unsupervised eye blink artifact detection method for real-time electroencephalogram processing" *Physiological Measurement*, vol. 37, pp. 401-417, 2016.

76. Won-Du Chang, Ho-Seung Cha, Kiwoong Kim, and **Chang-Hwan Im**, "Detection of Eye Blink Artifacts from Single Prefrontal Channel Electroencephalogram," *Computer Methods and Programs in Biomedicine*, vol. 124, pp. 19-30, 2016.
75. Young Ho Park, Han-Yeong Jeong, Jae-Won Jang, So Young Park, Jae-Sung Lim, Jeong-Youn Kim, **Chang-Hwan Im**, Soyeon Ahn, Seong-Ho Park, and SangYun Kim, "Disruption of the Posterior Medial Network during the Acute Stage of Transient Global Amnesia: A Preliminary Study," *Clinical EEG and Neuroscience*, vol. 47, no. 1, pp. 69-74, 2016.
74. Young Seok Shin, Won-Du Chang, Jinsick Park, **Chang-Hwan Im**, Sang In Lee, In Young Kim, Dong Pyo Jang, "Correlation between Inter Blink Interval and Episodic Encoding during Movie Watching," *PLoS ONE*, vol. 10, no. 11, Art.ID. e0141242, 2015.
73. Suk Yun Kang\*, **Chang-Hwan Im\***, Fatta B. Nahab, Mi-Seon Shim, Jihye Park, Do-Won Kim, John Kakareka, Nathaniel Miletta, and Mark Hallett, "Brain Networks Responsible for Sense of Agency: An EEG Study," *PLoS ONE*, vol. 10, no. 8, Art.ID. e0135261, 2015. (\*co-first authors)
72. Jeong-Hwan Lim, Jun-Hak Lee, Han-Jeong Hwang, Dong Hwan Kim, and **Chang-Hwan Im**, "Development of a hybrid mental spelling system combining SSVEP-based brain-computer interface and webcam-based eyetracking," *Biomedical Signal Processing & Control*, vol. 21, pp. 99-104, 2015
71. Yong Seo Koo, Sung Min Kim, Chany Lee, Byeong Uk Lee, Ye Ji Moon, Yong Won Cho, **Chang-Hwan Im**, Jeong Woo Choi, Kyung Hwan Kim, Ki-Young Jung, "Transcranial direct current stimulation on primary sensorimotor area has no effect in patients with drug-naïve restless legs syndrome: a proof-of-concept clinical trial," *Sleep Medicine*, vol. 16, no. 2, pp. 280-287, 2015.
70. Do-Won Kim, Miseon Kim, Myeong Ju Song, **Chang-Hwan Im**, and Seung-Hwan Lee, "Early visual processing deficits in patients with schizophrenia during spatial frequency-dependent facial affect processing," *Schizophrenia Research*, vol. 161, pp. 314-321, 2015.
69. Jeong-Youn Kim, Hoon-Chul Kang, Kiwoong Kim, Heung Dong Kim, and **Chang-Hwan Im**, "Localization of epileptogenic zones in Lennox-Gastaut syndrome (LGS) using graph theoretical analysis of ictal intracranial EEG: a preliminary investigation," *Brain & Development*, vol. 37, pp.

29-36, 2015.

68. Minji Lee, Yun-Hee Kim, **Chang-Hwan Im**, Jung-Hoon Kim, Chang-hyun Park, Won Hyuk Chang, and Ahee Lee, "What is the optimal anodal electrode position for inducing corticomotor excitability changes in transcranial direct current stimulation?," *Neuroscience Letters*, vol. 584, pp. 347-350, 2015.
67. Han-Jeong Hwang, Jeong-Hwan Lim, Do-Won Kim, and **Chang-Hwan Im**, "Evaluation of Various Mental Task Combinations for Near-Infrared Spectroscopy-based Brain-Computer Interfaces," *Journal of Biomedical Optics*, vol. 19, no. 7, art. ID. 077005, 2014.
66. Miseon Shim, Do-Won Kim, Seung-Hwan Lee, and **Chang-Hwan Im**, "Disruptions in small-world cortical functional connectivity network during an auditory oddball paradigm task in patients with schizophrenia," *Schizophrenia Research*, vol. 156, pp. 197-203, 2014.
65. Chang-Hee Han, Hyuna Song, Yong-Guk Kang, Beop-Min Kim, and **Chang-Hwan Im**, "Hemodynamic responses in rat brain during transcranial direct current stimulation: a functional near-infrared spectroscopy study," *Biomedical Optics Express*, vol. 5, no. 6, pp. 1812-1821, 2014.
64. Jeong-Youn Kim, Hoon-Chul Kang, Jae-Hyun Cho, Ji Hyun Lee, Heung Dong Kim, and **Chang-Hwan Im**, "Combined use of multiple computational intracranial EEG(iEEG) analysis techniques for the localization of epileptogenic zones in Lennox-Gastaut Syndrome (LGS)," *Clinical EEG and Neuroscience*, vol. 45, no. 3, pp. 169-178, 2014.
63. Chany Lee, Sung-Min Kim, Young-Jin Jung, **Chang-Hwan Im**, Dong Wook Kim, and Ki-Young Jung, "Causal influence of epileptic network during spike-and-wave discharge in juvenile myoclonic epilepsy," *Epilepsy Research*, vol. 108, pp. 257-266, 2014.
62. Jung-Hoon Kim, Do-Won Kim, Won Hyuk Chang, Yun-Hee Kim, Kiwoong Kim, and **Chang-Hwan Im**, "Inconsistent outcomes of transcranial direct current stimulation may originate from anatomical differences among individuals: Electric field simulation using individual MRI data," *Neuroscience Letters*, vol. 564, pp. 6-10, 2014.
61. Young-Jin Jung, Jung-Hoon Kim, Daejeong Kim, and **Chang-Hwan Im**, "An image-guided

- transcranial direct current stimulation (tDCS) system: A pilot phantom study," *Physiological Measurement*, vol. 34, pp. 937-950, 2013..
60. Do-Won Kim, Han-Sung Kim, Seung-Hwan Lee, and **Chang-Hwan Im**, "Positive and negative symptom scores are correlated with activation in different brain regions during facial emotion perception in schizophrenia patients: A voxel-based sLORETA source activity study," *Schizophrenia Research*, vol. 151, pp. 165-174, 2013.
59. Han-Jeong Hwang, Soyoun Kim, Soobeom Choi, and **Chang-Hwan Im**, "EEG-based Brain-Computer Interfaces (BCIs): A Thorough Literature Survey," *International Journal of Human-Computer Interaction*, vol. 29, pp. 814-826, 2013.
58. Han-Jeong Hwang, Dong Hwan Kim, Chang-Hee Han, and **Chang-Hwan Im**, "A new dual-frequency stimulation method to increase the number of visual stimuli for multi-class SSVEP-based brain-computer interface (BCI)," *Brain Research*, vol. 1515, pp. 66-77, 2013.
57. Sun-Ae Park, Han-Jeong Hwang, Jeong-Hwan Lim, Jong-Ho Choi, Hyun-Kyo Jung, and **Chang-Hwan Im**, "Evaluation of feature extraction methods for EEG-based brain-computer interfaces in terms of robustness to slight changes in electrode locations," *Medical & Biological Engineering & Computing*, vol. 51, pp. 571-579, 2013.
56. Jeong-Hwan Lim, Han-Jeong Hwang, Chang-Hee Han, Ki-Young Jung, and **Chang-Hwan Im**, "Classification of binary intentions for individuals with impaired oculomotor function: "Eyes-closed" SSVEP-based brain-computer interface (BCI)," *Journal of Neural Engineering*, vol. 10, no. 2, Art.No. 026021, 2013.
55. Jae-Hyun Cho, Hoon-Chul Kang, Young-Jin Jung, Jeong-Youn Kim, Heung Dong Kim, Dae Sung Yoon, Yong-Ho Lee, and **Chang-Hwan Im**, "Localization of epileptogenic zones in Lennox-Gastaut Syndrome (LGS) using frequency domain source imaging of intracranial electroencephalography (iEEG): A preliminary investigation," *Physiological Measurement*, vol. 34, pp. 247-263, 2013.
54. Pyoung Won Kim, Seo Young Kim, Miseon Shim, **Chang-Hwan Im**, and Young-Min Shon, "The influence of an educational course on language expression and treatment of gaming

- addiction for massive multiplayer online role-playing game (MMORPG) players," *Computers & Education*, vol. 63, pp. 208-217, 2013.
53. Yong-Seo Koo, Deokwon Ko, Gwan-Taek Lee, Kyungmi Oh, Myung-Sun Kim, Kyung Hwan Kim, **Chang-Hwan Im**, and Ki-Young Jung, "Reduced Frontal P3a Amplitude in Migraine Patients as during the Pain-Free Period," *Journal of Clinical Neurology*, vol. 9, pp. 43-50, 2013.
52. Yoon Kyum Shin, Dong Ryul Lee, Seung Guk Kang, Han Jeong Hwang, Sung (Joshua) Hyun You, and **Chang-Hwan Im**, "A Novel EEG-based Brain Mapping to Determine Cortical Activation Patterns in Normal Children and Children with Cerebral Palsy during Motor Imagery Tasks," *NeuroRehabilitation*, vol. 31, no. 4, 349-355, 2012.
51. Myung-Sun Kim, Kyoung Mi Jang, Huije Che, Do-Won Kim, and **Chang-Hwan Im**, "Electrophysiological correlates of object-repetition effects: sLORETA imaging with 64-channel EEG and individual MRI," *BMC Neuroscience*, vol. 13, art.no. 124, 2012.
50. Dong-Hyun Baek, Chang-Hee Han, Ha-Chul Jung, Seon Min Kim, **Chang-Hwan Im**, Hyun-Jik Oh, James Jungho Pak, and Sang-Hoon Lee, "Soldering-based easy packaging of thin polyimide multichannel electrodes for neuro signal recording," *Journal of Micromechanics and Microengineering*, vol. 22, art.no. 115017, 2012.
49. Ji-Sun Kim, Seung-Hwan Lee, Gewnhi Park, Sangrae Kim, Sung-Man Bae, Do-Won Kim, and **Chang-Hwan Im**, "Clinical implications of quantitative electroencephalography and current source density in patients with Alzheimer's disease," *Brain Topography*, vol. 25, pp. 461-474, 2012.
48. Han-Jeong Hwang, Jeong-Hwan Lim, Young-Jin Jung, Han Choi, Sang Woo Lee, and **Chang-Hwan Im**, "Development of an SSVEP-based BCI Spelling System Adopting a QWERTY-Style LED Keyboard," *Journal of Neuroscience Methods*, vol. 208, pp. 59-65, 2012.
47. **Chang-Hwan Im**, Ji-Hye Park, Miseon Shim, Won Hyuk Chang, and Yun-Hee Kim, "Evaluation of local electric fields generated by transcranial direct current stimulation (tDCS) with an extracephalic reference electrode based on realistic 3D body modeling," *Physics in Medicine and Biology*, vol. 57, pp. 2137-2150, 2012.



46. Ki-Young Jung, Jae-Hyun Cho, Deokwon Ko, Hung Youl Seok, Ho-Kyoung Yoon, Heon-Jeong Lee, Leen Kim, and **Chang-Hwan Im**, "Increased corticomuscular coherence in idiopathic REM sleep behavior disorder," *Frontiers in Neurology*, vol. 3, art. No. 60, 2012.
45. Deokwon Ko, Soyoun Kwon, Gwan-Taek Lee, **Chang Hwan Im**, Kyung Hwan Kim, Ki-Young Jung, "Theta Oscillation Related to the Auditory Discrimination Process in Mismatch Negativity: Oddball versus Control Paradigm," *Journal of Clinical Neurology*, vol. 8, pp. 35-42, 2012.
44. Nam G. Lee, Sung K. Kang, Dong R. Lee, Han J. Hwang, Ji H. Jung, Joshua H. You, **Chang Hwan Im**, Dong A. Kim, Jung A. Lee, and Ki S. Kim, "Feasibility and Test-retest Reliability of an Electroencephalography-based Brain Mapping System in Children with Cerebral Palsy: A Preliminary Investigation," *Archives of Physical Medicine and Rehabilitation*, vol. 93, no. 5, pp. 882-888, 2012.
43. Seungduk Lee, Dalkwon Koh, Areum Jo, Hae Young Lim, Young-Jin Jung, Choong-Ki Kim, Youngwook Seo, **Chang-Hwan Im**, Beop-Min Kim, and Minah Suh, "Depth-dependent cerebral hemodynamic responses following Direct Cortical Electrical Stimulation (DCES) revealed by in vivo dual-optical imaging techniques," *Optics Express*, vol. 20, no. 7, pp. 6932-6943, 2012.
42. Hyung-Tae Jung, Do-Won Kim, Sangrae Kim, **Chang-Hwan Im**, and Seung-Hwan Lee, "Reduced Source Activity of Event-Related Potentials for Affective Facial Pictures in Schizophrenia Patients," *Schizophrenia Research*, vol. 136, pp. 150-159, 2012.
41. Jae-Hyun Cho, Hoon-Chul Kang, Young-Jin Jung, Yong-Ho Lee, Ki-Young Jung, Heung Dong Kim, and **Chang-Hwan Im**, "Localization of ictal onset zones in Lennox-Gastaut syndrome (LGS) based on information theoretical time delay analysis of intracranial electroencephalography (iEEG)," *Epilepsy Research.*, vol. 99, pp. 78-86, 2012.
40. Young-Jin Jung, Kyung Hwan Kim, and **Chang-Hwan Im**, "Mathematical Issues in the Inference of Causal Interactions among Multichannel Neural Signals," *Journal of Applied Mathematics*, vol. 2012, No. 472036 (14 pages), 2012 (invited review paper).
39. Do-Won Kim, Jun-Chang Lee, Young-Min Park, In-Young Kim, and **Chang-Hwan Im**,

- "Auditory brain-computer interfaces (BCIs) and their practical applications," *Biomedical Engineering Letters*, vol. 2, no. 1, pp. 13-17, 2012.
38. Kyung-Yeol Bae, Do-Won Kim, **Chang-Hwan Im**, and Seung-Hwan Lee, "Source Imaging of P300 Auditory Evoked Potentials and Clinical Correlations in Patients with Posttraumatic Stress Disorder," *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, vol. 35, no. 8, pp. 1908-1917, 2011.
37. Han-Jeong Hwang, Young-Jin Jung, Do-Won Kim, Ji Hye Park, Yong-Ho Lee, and **Chang-Hwan Im**, "An EEG-Based Real-time Cortical Functional Connectivity Imaging System: A Pilot Study," *Medical & Biological Engineering & Computing*, vol. 49, pp. 985-995, 2011.
36. Young-Jin Jung, Hoon-Chul Kang, Keom-Ok Choi, Joon Soo Lee, Dong-Seok Kim, Jae-Hyun Cho, **Chang-Hwan Im\***, and Heung Dong Kim\*, "Localization of ictal onset zones in Lennox-Gastaut syndrome using directional connectivity analysis of intracranial electroencephalography," *Seizure-European Journal of Epilepsy*, vol. 20, pp. 449-457, 2011. (\* co-corresponding authors)
35. Jae-Hyun Cho, Seung Bong Hong, Yung-Jin Jung, Hoon-Chul Kang, Heung Dong Kim, Minah Suh, Ki-Young Jung, and **Chang-Hwan Im**, "Evaluation of algorithms for intracranial EEG (iEEG) source imaging of extended sources: feasibility of using iEEG source imaging for localizing epileptogenic zones in secondary generalized epilepsy," *Brain Topography*, vol. 24, pp. 91-104, 2011.
34. Ji-Hye Park, Seung-Bong Hong, Do-Won Kim, Minah Suh, and **Chang-Hwan Im**, "A Novel Array-type Transcranial Direct Current Stimulation (tDCS) System for Accurate Focusing on Targeted Brain Areas," *IEEE Transactions on Magnetics*, vol. 47, no. 5, pp. 882-885, 2011.
33. Ki-Young Jung, Yong-Seo Koo, Byung-Jo Kim, Deokwon Ko, Gwan-Taek Lee, Kyung Hwan Kim, and **Chang-Hwan Im**, "Electrophysiological disturbances during daytime in patients with restless legs syndrome: Further evidences of cognitive dysfunction?" *Sleep Medicine*, vol. 12, pp. 416-421, 2011.
32. Do-Won Kim, Han-Jeong Hwang, Jeong-Hwan Lim, Yong-Ho Lee, Ki-Young Jung, and **Chang-Hwan Im**, "Classification of Selective Attention to Auditory Stimuli: Toward Vision-free

- Brain-Computer Interfacing," *Journal of Neuroscience Methods*, vol. 197, pp. 180-185, 2011.
31. Seung Ho Choi, Sung June Kim, **Chang-Hwan Im**, Shin Ae Kim, and Daejoong Kim, "Quantitative model for the change of optical resonance in neural activity detection systems based on surface plasmon resonance," *Optics & Laser Technology*, vol. 43, no. 5, pp. 938-948, 2011.
30. Young-Min Park, Do-Won Kim, Sangrae Kim, **Chang-Hwan Im**, and Seung-Hwan Lee, "The loudness dependence of the auditory evoked potential (LDAEP) as a predictor of the response to escitalopram in patients with generalized anxiety disorder," *Psychopharmacology*, vol. 213, pp. 625-632, 2011.
29. Jun Sic Kim, **Chang Hwan Im**, Young Jin Jung, Eun Young Kim, Sang Kun Lee, and Chun Kee Chung, "Localization and propagation analysis for ictal source rhythm by electrocorticography," *NeuroImage*, vol. 52, pp. 1279-1288, 2010.
28. Seung-Hwan Lee, Do-Won Kim, Eun-Young Kim, Sangrae Kim, and **Chang-Hwan Im**, "Dysfunctional Gamma Band Activity during Face Structural Processing in Schizophrenia Patients," *Schizophrenia Research*, vol. 119, pp. 191-197, 2010.
27. **Chang-Hwan Im**, Young-Jin Jung, Seungduk Lee, Dalkwon Koh, Do-Won Kim, and Beop-Min Kim, "Estimation of Directional Coupling between Cortical Areas Using Near Infrared Spectroscopy (NIRS)," *Optics Express*, vol. 18, no. 6, pp. 5730-5739, 2010.
26. Seung-Hwan Lee, Young-Min Park, Do-Won Kim, and **Chang-Hwan Im**, "Global Synchronization Index as a Biological Correlate of Cognitive Decline in Alzheimer's Disease," *Neuroscience Research*, vol. 66, pp. 333-339, 2010.
25. Ki-Young Jung, Joong-Koo Kang, Ji Hyun Kim, **Chang-Hwan Im**, Kyung Hwan Kim, Hyun-Kyo Jung, "Spatiotemporal characteristics of scalp ictal EEG in mesial temporal lobe epilepsy with hippocampal sclerosis," *Brain Research*, vol. 1287, pp. 206-219, 2009.
24. Han-Jeong Hwang, Kiwoon Kwon, and **Chang-Hwan Im**, "Neurofeedback-Based Motor Imagery Training for Brain-Computer Interface (BCI)," *Journal of Neuroscience Methods*, vol.

- 179, no. 1, pp. 150-156, 2009.
23. Jongil Ju, Jung-Moon Ko, Hyeon-Cheol Cha, Joong Yull Park, **Chang-Hwan Im**, and Sang-Hoon Lee, "An electrofusion chip with a cell delivery system driven by surface tension," *Journal of Micromechanics and Microengineering*, vol. 19, pp. 015004(10pp), 2009.
22. Young-Min Park, Hee-Jae Chae, **Chang-Hwan Im**, Hyung-Tae Jung, Sung-Man Bae, Seung-Hwan Lee, "Decreased EEG Synchronization and Its Correlation with Symptom Severity in Alzheimer's disease," *Neuroscience Research*, vol. 62, pp. 112-117, 2008.
21. **Chang-Hwan Im**, Hui-Hun Jung, Jung-Do Choi, Ki-Young Jung, and Soo Yeol Lee, "Determination of Optimal Electrode Positions for Transcranial Direct Current Stimulation (tDCS)," *Physics in Medicine and Biology*, vol. 53, pp. N219-N225, 2008.
20. Jang-Ho Seo, **Chang-Hwan Im**, Sang-Yeop Kwak, Cheol-Gyun Lee, and Hyun-Kyo Jung, "An Improved Particle Swarm Optimization Algorithm Mimicking Territorial Dispute between Groups for Multimodal Function Optimization Problems," *IEEE Transactions on Magnetics*, vol. 44, no. 6, pp. 1046-1049, 2008.
19. Jong Seok Rho, Chang Hwan Lee, Tae-Kyung Chung, **Chang-Hwan Im**, and Hyun Kyo Jung, "Analysis of a Nano Positioning Actuator Using Numerical and Analytic Methods," *Smart Materials and Structures*, vol. 17, pp. 025025(9pp), 2008.
18. **Chang-Hwan Im**, Han-Jeong Hwang, Huije Che, and Seunghwan Lee, "An EEG-based Real-time Cortical Rhythmic Activity Monitoring System," *Physiological Measurement*, vol. 28, pp. 1101-1113, 2007.
17. Ki-Young Jung, Dae Won Seo, Duk Lyul Na, Chin-Sang Chung, Il-Keun Lee, Kyungmi Oh, **Chang-Hwan Im**, and Hyun-Kyo Jung, "Source localization of periodic sharp wave complexes using independent component analysis in sporadic Creutzfeldt-Jakob disease," *Brain Research*, vol. 1143, pp. 228-237, 2007.
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