

Jihye Bae

Curriculum Vitae

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Contact Information

Address:

University of Kentucky
Department of Electrical and Computer Engineering
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Lexington, KY 40506, USA

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Education

Doctor of Philosophy 5 Jan. 2010 ~ 13 Aug. 2013

Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL, USA.

Dissertation: Kernel Temporal Differences for Reinforcement Learning with Applications to Brain Machine Interfaces.

Advisor: Dr. Jose C. Principe

Master of Science 25 Aug. 2008 ~ 22 Dec. 2009

Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL, USA.

Class Projects: Monkey Motion Classification by Liquid State Machine.

Pattern Recognition of Features in Wavelet Maps for Classification.

Delineation of Watersheds in Low-relief Terrains by Using Watershed Transform.

Bachelor of Engineering 3 Mar. 2003 ~ 23 Feb. 2007

School of Electrical Engineering and Computer Science, Kyungpook National University, Daegu, South Korea.

GPA: 4.18/4.5 (95.20/100)

Experience

Assistant Professor 1 Aug. 2019 ~ Present

Department of Electrical and Computer Engineering, University of Kentucky, Lexington, KY, USA.

Postdoctoral Associate 9 Apr. 2018 ~ 31 Jul. 2019

Applied Neural Interfaces (ANI) Laboratory, Department of Biomedical Engineering, Florida International University, Miami, FL, USA.

Supervisor: Dr. Zachary Danziger

Analyzing Biological Signals Including Intracortical Neural Signals and Hand Kinematics.

Applying Machine Learning Algorithms to Develop Human Computer Interfaces.

Setting and Conducting Experiments on Both Open and Closed Loop Human Computer Interfaces.

Guiding Undergraduate and Graduate Students on Signal Processing and Machine Learning Applied to Brain Machine Interfaces.

Teaching Numerical Integration Methods to Undergraduate Students as a Substitute Lecturer.

Postdoctoral Associate 6 Jul. 2015 ~ 14 Jan. 2016

The Miami Project to Cure Paralysis, University of Miami, Miami, FL, USA.

Supervisor: Dr. Monica A. Perez

Conducting Experiments and Analysis on Sensory Function on Spinal Cord Injured Participants.
 Recording and Analyzing Electromyography (EMG) on Healthy and Spinal Cord Injured Participants.
 Setting and Conducting Experiments for Human Motion Analysis.
 Conducting Gait Analysis on Healthy and Spinal Cord Injured Participants.
 Guiding Graduate Students for EMG and 3D Motion Capture Data Recording.

Postdoctoral Associate 12 Nov. 2013 ~ 2 Jul. 2015
 Neuronal Mass Dynamics (NMD) Laboratory, Department of Biomedical Engineering, Florida International University, Miami, FL, USA.

Supervisor: Dr. Jorge J. Riera
 Recording and Analyzing Electroencephalogram (EEG) on Both Rodents and Human.
 Applying Machine Learning Algorithms and Signal Processing Techniques to EEG Analysis.
 Mentoring Undergraduate and Graduate Students in EEG Analysis and Brain Source Localization.
 Leading Neuro-Circuit Group.

Research Assistant 16 Aug. 2010 ~ 15 May 2013
 Computational Neuro-Engineering Laboratory (CNEL), Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL, USA.

PI: Dr. Jose C. Principe
 Supporting Agency: The Defense Advanced Research Projects Agency (DARPA).
 Developing Nonlinear Systems for Neural Decoding in Reinforcement Learning Brain Machine Interfaces.

Research Assistant May ~ Jun. 2009
 Water Resources Engineering Laboratory, Department of Civil Engineering, Keimyung University, Daegu, South Korea.

Rainfall Recharge Analysis using Shannon's Entropy.

Volunteer Teaching Assistant Apr. ~ May 2007
 Tates Creek High School, Lexington, KY, USA.

Teaching Subjects: Geometry and Computer Applications 1.

Undergraduate Trainee Jun. ~ Aug. 2005
 Biomedical Electronics Laboratory, Kyungpook National University, Daegu, South Korea.

Observing Research and Getting Overall Knowledge of Bioelectronics.

Volunteer Tutor Nov. 2004 ~ Jan. 2006
 Wolseong Catholic Church, Daegu, South Korea.

Teaching Subject: Middle School Mathematics.

Research Assistant Apr. 2004 ~ Jan. 2007
 Water Resources Engineering Laboratory, Keimyung University, Daegu, South Korea.

Typesetting and Preparing Presentation Slides.

Overseas Volunteer Teacher Jan. ~ Feb. 2004
 Overseas Volunteer Program of Kyungpook National University, Naujan, Mindoro, Philippines.

Teaching Computer Applications to Naujan Technical College and Naujan Municipal High School Students.

Assistant Leader of the Computer Education Team.

Personal Tutor Nov. 2003 ~ Feb. 2004

Teaching Subject: High School Mathematics.

Distinctions and Awards

- Conference and Workshop Grants** 2020
Office of the Vice President for Research, University of Kentucky, Lexington, KY, USA.
- CESL STAR Award** Oct. 2019
Center for English as a Second Language (CESL), University of Kentucky, Lexington, KY, USA.
- ADVANCE Florida Network Women in STEM Scholars (AFN-WISS) Award** 2019 Spring
Florida International University, Miami, FL, USA.
- Achievement Award for New Engineering Graduate Students** 2008 Fall ~ 2009 Fall
Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL, USA.
- Brain Korea (BK) 21 Scholarship** 2005 Fall
Brain Korea (BK) 21, South Korea.
- Outstanding Student Scholarship** 2005 Spring
Kyungpook National University, Daegu, South Korea.
- Engineering Incentive Scholarship** 2004 Fall
Department of Engineering, Kyungpook National University, Daegu, South Korea.
- Brain Korea (BK) 21 Scholarship** 2004 Spring
Brain Korea (BK) 21, South Korea.
- Outstanding Student Scholarship** 2003 Fall
Kyungpook National University, Daegu, South Korea.

Computer Skills

- Operating Systems: Windows.
- Text Processors: \LaTeX .
- Software Tools: MS Word, MS PowerPoint, MS Excel, Adobe Photoshop.
- Programming Languages: C/C++, Python.
- Scientific Computation and Simulation Packages: MATLAB, P-SPICE.
- Data Acquisition and Analysis Software: LabVIEW, Cambridge Electronic Design Limited (CED) SPIKE2, Motion Capture System VICON.
- Data Analysis Software for EEG and fMRI: Brainstorm, EEGLAB, Statistical Parametric Mapping (SPM), Brain Electrical Source Analysis (BESA), EEG/MEG Analysis, Source Estimation, Visualization, and Multimodal Neuroimaging Software (EMSE), EEG and MEG Analysis and MRI Integration Software (*asa*TM).

Academic Activities

- Organizer of Neuro-Engineering Workshop with EEG-focused Brainstorm Training, 2020.
Workshop Web-page: <http://neuroengworkshop.engr.uky.edu/>
- Selected Participant at NSF ENG CAREER Proposal Writing Workshop, 2020.

- Participant in the Graduate Society of Women Engineer (GradSWE) Female Faculty-Student Mixer, University of Kentucky, Spring 2020.
- Exhibitor of Scientific Demonstration to Public at E-day, College of Engineering, University of Kentucky, 2020.
Title: Intelligent Machines and Brain.
- Judge of ECE Senior Design Projects, University of Kentucky, Fall 2019.
- Exhibitor of Scientific Demonstration to Public at Curiosity Fair, University of Kentucky Libraries, 2019.
Title: Intelligent Machines: Can Machines Be Smart?
- Judge of Poster Presentations at The McNair Scholars Research Conference, Florida International University, 2018.
- Judge of Poster Presentations at The Annual Biomedical Engineering (BME) Undergraduate Research Day, Department of Biomedical Engineering, Florida International University, 2018.
- Judge of Poster Presentations at The 4th Annual Biomedical Engineering (BME) Graduate Research Day, Department of Biomedical Engineering, Florida International University, 2014.
- Organizer of Brainstorm Workshop in Miami, 2014.
Workshop Web-page: <https://neuroimage.usc.edu/brainstorm/WorkshopMiami2014>
- Selected Participant at the Professional Development Workshop (ProDeW) Held by Korean-American Scientists and Engineers Association (KSEA) Chicagoland, 2014.
- Judge of Poster Presentations at the Advanced Research and Creativity in Honors (ARCH) Program, Florida International University, 2014.
- Conference Volunteer at the 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2011.

Professional Membership

- Member of IEEE, 2020.
- Member of Society for Neuroscience (SfN), 2014, 2019, 2020.
- Member of Korean-American Scientists and Engineers Association (KSEA), 2014, 2020.
- Student Member of IEEE, 2011.

Reviewer

- Brain Informatics, 2020.
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS), 2015, 2016, 2017, 2018, 2019, 2020.
- American Society for Engineering Education (ASEE), 2018.
- IEEE - International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2018.
- IEEE Transactions on Cybernetics, 2016.

- Computer Vision and Image Understanding (CVIU), 2015.
- Organization for Human Brain Mapping (OHBM), 2015.
- International Symposium on BIOMEDICAL IMAGING (ISBI), 2014.
- Frontiers in Neuroscience, Brain Imaging Methods, 2014.
- Journal of Magnetics (JOM), 2012.

Invited Talks

- Seminar Series in Korean Student Association Feb. 2020
Korean Student Association, University of Kentucky, Lexington, KY, USA.
Title: Introduction to Brain Machine Interfaces.
- Seminar Series in the Department of Biomedical Engineering Nov. 2019
Department of Biomedical Engineering, University of Kentucky, Lexington, KY, USA.
Title: Neural Signal Emulation for Developing Brain Computer Interfaces.
- Seminar Series in the Institute for Biomedical Informatics Oct. 2019
Institute for Biomedical Informatics, University of Kentucky, Lexington, KY, USA.
Title: Reinforcement Learning for Brain Machine Interfaces.
- Department of Computer Science Pizza Seminar Series Nov. 2018
Department of Computer Science, University of Miami, Miami, FL, USA.
Title: Development of Neural Decoders and Neural State Emulators Towards Practical Brain Machine Interfaces.
- Biomedical Engineering Research Seminar Mar. 2017
Institute of Biomedical Engineering Research, Kyungpook National University, Daegu, South Korea.
Title: Kernel Temporal Differences for Neural Decoding.
- Brain Korea (BK) 21 Seminar Jan. 2012
School of Electrical Engineering and Computer Science, Kyungpook National University, Daegu, South Korea.
Title: Reinforcement Learning via Kernel Temporal Difference.

Publications

Journal

- A. Deshmukh, J. Leichner, **J. Bae**, Y. Song, P. A. Valdes-Hernandez, W. C. Lin, and J. J. Riera. "Histological Characterization of the Irritative Zones in Focal Cortical Dysplasia Using a Preclinical Rat Model." *Frontiers Cellular Neuroscience*, eCollection 2018, doi: 10.3389/fncel.2018.00052, 2018.
- R. A. Macklin, **J. Bae**, M. Orell, K. D. Anderson, P. H. Ellaway, and M. A. Perez. "Time-Dependent Discrepancies between Assessments of Sensory Function after Incomplete Cervical Spinal Cord Injury." *Journal of Neurotrauma*, 34, pp. 1778-1786, doi: 10.1089/neu.2016.4433, 2017.
- P. A. Valdes-Hernandez, **J. Bae**, Y. Song, A. Sumiyoshi, E. Aubert-Vazquez, and J. J. Riera. "Validating Non-invasive EEG Source Imaging Using Optimal Electrode Configurations on a Representative Rat Head Model." *Brain topography*, pp. 1-26, 2016.

- Y. Song, R. A. Torres, S. Garcia, Y. Frometa, **J. Bae**, A. Deshmukh, W. Lin, Y. Zheng, and J. J. Riera. "Dysfunction of Neurovascular/Metabolic Coupling in Chronic Focal Epilepsy." *IEEE Transactions on Biomedical Engineering*, 63(1), pp. 97-110, 2016.
- **J. Bae**, A. Deshmukh, Y. Song, and J. Riera. "Brain Source Imaging in Preclinical Rat Models of Focal Epilepsy using High-Resolution EEG Recordings." *Journal of Visualized Experiments*, (100), e52700, doi:10.3791/52700, 2015.
- **J. Bae**, L. G. Sanchez Giraldo, E. A. Pohlmeier, J. T. Francis, J. C. Sanchez, and J. C. Principe. "Kernel Temporal Differences for Neural Decoding." *Computational Intelligence and Neuroscience*, 2015, Article ID 481375, pp. 1-17, 2015.

Conference Proceedings

- **J. Bae**, L. G. Sanchez Giraldo, J. T. Francis, and J. C. Principe. "Correntropy Kernel Temporal Differences for Reinforcement Learning Brain Machine Interfaces." *The International Joint Conference on Neural Networks (IJCNN)*, 2014, pp. 2713-2717.
- **J. Bae**, L. G. Sanchez Giraldo, E. A. Pohlmeier, J. C. Sanchez, and J. C. Principe. "A New Method of Concurrently Visualizing States, Values, and Actions in Reinforcement based Brain Machine Interfaces." *The 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)*, 2013, pp. 5402-5405.
- A. J. Brockmeier, L. G. Sanchez Giraldo, M. S. Emigh, **J. Bae**, J. S. Choi, J. T. Francis, and J. C. Principe. "Information-Theoretic Metric Learning: 2-D Linear Projections of Neural Data for Visualization." *The 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)*, 2013, pp. 5586-5589.
- **J. Bae**, L. Sanchez Giraldo, P. Chhatbar, J. Francis, J. Sanchez, and J. Principe. "Stochastic Kernel Temporal Difference for Reinforcement Learning." *IEEE International Workshop on Machine Learning for Signal Processing (MLSP)*, 2011, pp. 1-6.
- **J. Bae**, P. Chhatbar, J. T. Francis, J. C. Sanchez, and J. C. Principe. "Reinforcement Learning via Kernel Temporal Difference." *The 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)*, 2011, pp. 5662-5665.

Abstracts

- J. Fugal and **J. Bae**. "A Comparative Analysis of Reinforcement Learning Applied to Point-to-Point Control of the Panda Robotic Arm Using Torque Control with and without Gravity Compensation." *University of Kentucky ECE Research Symposium*, 2020.
- B. Girdler and **J. Bae**. "Quickly Adapting Reinforcement Learning Brain Machine Interfaces using Model Agnostic Meta Learning." *University of Kentucky ECE Research Symposium*, 2020.
- A. Muhury and **J. Bae**. "Real Time Cursor Control in EEG-based Brain Computer Interfaces." *University of Kentucky ECE Research Symposium*, 2020.
- D. Restrepo Tangarife and **J. Bae**. "Classification of Sequential Arm and Hand Movements in Brain Machine Interfaces." *University of Kentucky ECE Research Symposium*, 2020.
- **J. Bae**, M. G. Perich, L. E. Miller, and Z. C. Danziger. "Neural signal emulation for closed-loop intracortical brain computer interface decoder design." *Society for Neuroscience (SfN)*, 2019.
- **J. Bae**, P. Valdes-Hernandez, Y. Song, and J. Riera. "Electroencephalographic Source Imaging in Rats: Methodological Aspects and Validation." *Biomedical Engineering Society (BMES)*, 2015.

- **J. Bae**, L. G. Sanchez Giraldo, E. A. Pohlmeier, J. T. Francis, J. C. Sanchez, and J. C. Principe. "Neural Decoding Using Kernel Temporal Difference Learning." *IEEE EMBS BRAIN Grand Challenges*, 2014.
- Y. Song, R. A. Torres, **J. Bae**, A. Deshmukh, W. Lin, and J. J. Riera. "Electrophysiological and Hemodynamic Signatures of Epileptic Neocortex in Rats with Focal Cortical Dysplasia: Implications on Epilepsy Surgery." *IEEE EMBS BRAIN Grand Challenges*, 2014 (**YOUNG INVESTIGATOR AWARD**).
- **J. Bae**, Y. Song, A. Deshmukh, and J. J. Riera. "An EEG Methodology to Localize the Irritative Cortices in a Preclinical Model of Focal Epilepsy." *Society for Neuroscience (SfN)*, 2014.
- **J. Bae**, A. Deshmukh, Y. Song, and J. Riera Diaz. "Brain Source Analysis of Interictal Epileptiform Discharges Using a Rat Model of Focal Epilepsy." *The 20th Annual Meeting of the Organization for Human Brain Mapping (OHBM)*, 2014.
- Y. Song, **J. Bae**, A. Deshmukh, B. G. Sanganahalli, F. Hyder, W. Lin, and J. J. Riera. "A Concurrent fMRI and EEG Study of Epileptogenesis in a Rat Model of Focal Cortical Dysplasia." *The 20th Annual Meeting of the Organization for Human Brain Mapping (OHBM)*, 2014.
- W. Medina, V. Sagar, H. Ding, J. Leichner, **J. Bae**, K. M. Caamano, M. Nair, and J. J. Riera. "Cognitive and Metabolic Effects of Nanoparticles on Deep Brain Activity." *The 2nd Annual BME Undergraduate Research Day*, 2014.
- A. Deshmukh, **J. Bae**, Y. Song, and J. J. Riera. "A Methodology to Perform Brain Source Imaging in Rats with Focal Epilepsy." *The 22nd Annual Neuroscience Research Day*, 2013.
- **J. Bae**, L. G. Sanchez Giraldo, J. T. Francis, and J. C. Principe. "Correntropy Kernel Temporal Difference for Reinforcement Learning." *The 8th Annual Workshop for Women in Machine Learning*, 2013.
- **J. Bae**, and J. C. Principe. "Kernel Temporal Differences in Reinforcement Learning Brain Machine Interfaces." *The 1st Annual Pruitt Research Day*, 2012.