

# WON JOON (ERIC) SOHN PH.D.

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## EDUCATION

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### Postdoctoral Research Fellowship

- Department of Neurology and Electrical Engineering, UC Irvine, Irvine CA. 2019-2021.07.
- Departments of Biology, Electrical & Computer Engineering, and Physics. Northeastern University, Boston MA, 2017-2019.
- Department of Rehabilitation Medicine, Emory University and Georgia Tech, Atlanta GA. 2015-2017.

### Doctor of Philosophy, Biomedical Engineering, 2015.

University of Southern California, Los Angeles CA.

Advisor: Terence D. Sanger, M.D./Ph.D.

Dissertation Title: Understanding the Pathology of Dystonia by Hardware Emulation.

### Master of Science, Electrical Engineering, 2014.

University of Southern California, Los Angeles CA.

### Bachelor of Science, Electrical Engineering and Computer Science (EECS), 2007.

University of California at Berkeley, Berkeley CA.

## CURRENT JOB TITLES

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### Sr. Clinical R&D Engineer, Abbott Laboratory. Plano, TX, USA. Jan. 2022 – Present.

- Developed / prototyped gesture and sleep-state-detecting wearable closed-loop neuromodulation system (Advanced Development in Science and Technology top-10 Awardee in Neuromodulation, 2022)
- Clinical Data Science: Physiological signal driven body-state detection for closed-loop neuromodulation.
- Served as a clinical engineer in FDA-labeling expansion for Diabetic Peripheral Neuropathy (DPN)
- Identify design and project risks, evaluate the risk / benefit of the design features in implantable medical devices. Be the advocate for the end-user.
- New product development: Design and develop medical devices for the neuromodulation industry.

## RESEARCH INTERESTS

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- Brain-computer interface (BCI) – closed loop system development.
- To understand how brain works, how it breaks, in the framework of sensorimotor control, memory and learning, to develop rehab strategies.
- Machine Learning application to neural data
- Neural signal processing and decoding
- Assessment of artificial neural stimulation to elicit artificial sensation
- Neuromorphic engineering for advanced robotics
- Locomotive movement science (kinematics / kinetics)
- Myoelectric control of prosthetics (EMG/EEG control)
- Multi-scale modeling and simulation of biological system

## **R&D EXPERIENCE**

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**Sr. Clinical R&D Engineer**, Abbott Laboratory. Plano, TX, USA. Jan. 2022 – Present

- Developed / prototyped gesture and sleep-state-detecting **wearable closed-loop neuromodulation system** (Advanced Development in Science and Technology top-10 Awardee in Neuromodulation, 2022)
- **Clinical Data Science**: Physiological signal driven body-state detection for closed-loop neuromodulation.
- Served as a clinical engineer in FDA-labeling expansion for Diabetic Peripheral Neuropathy (DPN)
- New product development: Design and develop medical devices for the neuromodulation industry.

**Project Scientist / Postdoctoral Research Associate, UCI Brain-Computer Interface Lab**, Department of Neurology, University of California, Irvine, Mar. 2019-present.

- Developed a prototype of a fully-implantable charge-balanced artificial sensory stimulator for bi-directional brain-computer interface system for the restoration of motor function after neurological injuries after spinal cord injury (SCI).
- Designed and performed experimental strategies to investigate the perception of electrocortical stimulation to elicit artificial leg sensation in human.
- Designed and implemented a bi-directional brain-computer interface that converts sensory kinematics of walking into electrical pulses to be delivered to the brain to elicit artificial leg sensation.
- Investigating the efficacy of Virtual Reality-BCI: training and testing in immersive VR environment.
- Investigating novel online-decoding, feature extraction and machine learning algorithm from the brain signal to control prosthetics or walking-aids.

**Postdoctoral Research Fellow, Action Lab**, Department of Biology, Northeastern University, May 2017-Feb. 2019.

- Developed portable low-cost research and rehabilitation tools for children with upper

extremity impairments (MAGIC table) which was used to collect and analyze kinematic data from patients with movement disorder. The study was published in IEEE Journal of translational engineering in health and medicine.

- Investigated how human manipulate objects with chaotic internal dynamics (using robotic manipulandum).

**Postdoctoral Research Fellow, INSPIRE Lab**, Rehabilitation Medicine, Emory School of Medicine / Georgia Tech Bioengineering. Sept. 2015- April. 2017.

- Performed analysis of the kinematics of the overground walking in persons with incomplete spinal cord injury which led to a first author publication in Journal of Neurotrauma.
- Developed novel method of quantifying multi-joint kinematic variability.
- Developed wearable technologies for biofeedback (Visual and proprioceptive) in rehabilitation in Spinal cord injury (SCI) and Stroke.

**PhD Program, Sanger Lab**, University of Southern California (<http://sangerlab.org>)

Doctoral thesis research conducted with Dr. Terence D Sanger, Dr. Francisco Velero-Cuevas titled “*Understanding the Pathology of Dystonia by Hardware Emulation.*” 2011-2015.

- Established hardware-enabled emulation of sensorimotor system which enabled investigating the mechanisms of movement disorder and healthy neuromechanical system resulted in 7 journal publications.
- Developed a closed loop human reflex system for emulating movement disorders in hyper-real-time in scalable hardware (FPGA). [Video Abstract: http://bcove.me/n20a3ykj](http://bcove.me/n20a3ykj)
- Simulated the mechanism of motor overflow in dystonia patients.
- Established a plausible mechanism of synaptic competition in diseases using spike-timing dependent plasticity (STDP) model with realistic spiking neuron model.
- Validation of neuromorphic emulation of hypertonic dystonia in Sarcos master robotic arm: applied machine learning algorithm in the robot to emulate the behavioral response of the dystonia patients and validated against dystonia model.
- Collected clinical data (kinematics, EMG) from patients with movement disorder.

**Lab Rotation Researcher**, Ophthalmic Optical Coherence Tomography (OCT) research, BME Dept. University of Southern California. 2009-2010.

- Worked on hardware interfacing of OCT machines, imaging processing.

**Research Intern**, Center for Neural Science, Korea Institute of Science and Technology, Seoul, Korea. 2009.

- Developed Infrared-emitting, interfaced circuit board.
- Developed neural signal receivers for mice in brain stimulation studies.

**Research Assistant**, Conolly Lab, Dept. of Bioengineering, UC Berkeley 2007.

- Assisted a design of a low noise amplifier in magnetic particle imaging system (MPI) to reduce the noise figure.

**Research Assistant**, Surbeck Laboratory, Dept. of Radiology and Biomedical Imaging, UCSF. 2007.

- Analyzed novel phase correction algorithm in Magnetic Resonance Spectroscopic Image (MRSI) Reconstruction.
- Automated the analysis process with scripting language.

## **TEACHING AND SUPERVISORY EXPERIENCE**

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### **Teaching Experience**

#### **Class Lectures**

- 1) Guest Lecturer, Computer Engineering Departmental Seminar. Kyung-Hee University, Yong-in, Korea, Fall 2018.
- 2) Invited Speaker, Departmental Seminar. Physical Therapy, Seoul National University (SNU), Seoul, Korea, Fall 2018.
- 3) Guest Lecturer, Mechanical Engineering Departmental Seminar. Korean Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, Fall 2018.
- 4) Guest Lecturer, Electrical Engineering Departmental Seminar, Hanyang University, Seoul, Korea, Fall 2014.
- 5) Guest Lecturer, Medical Electronics (BME302L) Lecture, Biomedical Engineering, University of Southern California, Los Angeles CA, Fall 2011.

#### **Teaching Assistant (semester long)**

- 1) Biomedical Engineering Dept., University of Southern California
  - First year biomedical engineering course: Introduction to Biomedical Engineering (BME101).
  - Third and fourth year biomedical engineering undergraduate course with heavy emphasis on laboratory projects: Medical Electronics (BME302L).
  - First year graduate course in biomedical engineering: Physiological control systems (BME511).
- 2) Lab Teaching Assistant, Electrical Engineering and Computer Science, UC Berkeley.
  - Taught Integrated Circuits for Communication Class (EE142).
  - Guided graduate students to build high frequency filters, amplifiers.

#### **Training in Teaching**

- Course Design Certification Program, University of California, Irvine. Apr.-May 2020.
  - Covered foundation of successful course design, a draft syllabus for a course that a participant may teach in the future, and strategies for teaching that course.

#### **Research Mentorship**

- 1) Biomedical Engineering Dept. Georgia Institute of Technology / Emory University.
  - Mentored / served as a research advisor for Aksal Vashi (avashi3@gatech.edu), an BME/CS major undergraduate student at Georgia Institute of Technology (Aug.2016-Apr.2017).
- 2) Computer Science / Mechanical Engineering Dept. Northeastern University
  - Mentored Daniel Silver (silver.da@husky.neu.edu), an undergraduate student in electrical and computer engineering at Northeastern University in developing python software for MAGIC table experiments. (Aug.2017-Apr.2018)
  - Mentored Eric Penschansky (penschansky.e@husky.neu.edu), a student in Master's program in mechanical engineering at Northeastern University to design mechanical parts of MAGIC table for rehabilitation device. (Aug.2017-Feb.2018)
  - Mentored Hao Li (li.hao2@husky.neu.edu), a student in Master's program in

mechanical engineering at Northeastern University to design mechanical parts for rehabilitation device for children with dystonia (May 2017-Sept. 2017)

- 3) Biomedical Engineering / Computer Science. University of California, Irvine.
  - Supervising Ryan Baxtor (rhbaxter@hs.uci.edu), undergraduate student in biomedical engineering at Georgia Tech University, Zahir Chaudhry (zahirc@uci.edu), undergraduate student in Bioengineering, University of California at Berkeley, to develop Virtual Reality Brain-Computer-Interface project and conduct experiments. (Sept 2019 - present)

## CLINIICAL EXPERIENCE

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### Human experiments

Performed experiment with human participants both healthy and persons with movement disorder

- EMG, kinematic data collection, Sangerlab, University of Southern California, 2012-2017.
- EMG, force, kinematic data collection, INSPIRE Lab, Emory University, 2015-2017.
- EMG, kinematic data collection, Action Lab, Northeastern University, 2017-2018.
- EEG data collection, University of California, Irvine, 2019-2020.

### Institutional review board (IRB) writing experience

- Title: Human control of complex objects on a table, Northeastern University, 2018.

## OTHER PROFESSIONAL EXPERIENCE

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Mobile Game Marketing Manager, ZIO Interactive, Inc. Seoul, Korea. 2005-2006.

- Overseas Marketing, License Review.

Software Engineer, QA Team, Korea WISENut. Inc.: Daechi-Dong, Seoul, Korea, 2004-2005

- Authored automated compiling and testing codes for search engine.

## PUBLICATIONS

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### Journal Publications (Peer-reviewed)

- 1) **Sohn, W. J.**, Lim, J., Wang, P. T., Pu, H., Malekzadeh-Arasteh, O., Shaw, S. J., ... & Do, A. H. (2023). Benchtop and bedside validation of a low-cost programmable cortical stimulator in a testbed for bi-directional brain-computer-interface research. *Frontiers in Neuroscience*, 16, Art-No. 2023.
- 2) R. Nayeem, **W. J. Sohn**, J. A. DiCarlo, P. Gochyyev, D. J. Lin and D. Sternad, "Novel Platform for Quantitative Assessment of Functional Object Interactions After Stroke," in *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 31, pp. 426-436, 2023, doi: 10.1109/TNSRE.2022.3226067.
- 3) Jeffrey Lim, Derrick Lin, **Won Joon Sohn**, Colin M McCrimmon, Po T Wang, Zoran Nenadic, An H Do(2022). BCI-Based Neuroprostheses and Physiotherapies for Stroke Motor Rehabilitation. In: Reinkensmeyer, D.J., Marchal-Crespo, L., Dietz, V. (eds) *Neurorehabilitation Technology*. Springer, Cham. <https://doi.org/10.1007/978-3-031->

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- 4) **Sohn W J**, Sloop G D, Pop G, et al. PurUUpurU: An Oligonucleotide Virulence Factor in RNA Viruses. *Cureus* 14(9): e29340. doi:10.7759/cureus.29340, 2022.
- 5) A.Q. Tan, **W.J. Sohn**, A. Naidu, R.D. Trumbower. Daily acute intermittent hypoxia combined with walking practice enhances walking performance but not intralimb motor coordination in persons with chronic incomplete spinal cord injury. *Exp. Neurol.*, 340 (2021), Article 113669, 10.1016/j.expneurol.2021.113669
- 6) Haoran Pu, Ahmad Reza Danesh, Omid Malekzadeh-Arasteh, **Won Joon Sohn**, An H. Do, Zoran Nenadic, and Payam Heydari, "A 40V Voltage-Compliance 12.75mA Maximum-Current Multipolar Neural Stimulator Using Time-Based Charge Balancing Technique Achieving 2mV Precision," IEEE Custom Integrated Circuits Conf. (CICC), April 2021.
- 7) **Sohn WJ**, Sanger TD "Constraint-induced intervention as an emergent phenomenon from synaptic competition in biological systems." (*Journal of Computational Neuroscience*, Mar. 2021.)
- 8) Tan, AQ, **Sohn WJ** (Equal contributor), Trumbower RD. Effects of Acute intermittent Hypoxia treatment on kinematic variability during overground walking. (*Experimental Neurology*, Feb. 2021.)
- 9) **Sohn WJ**, Sipahi R, Sanger TD, Sternad D. "Portable motion-analysis device for upper-limb research, assessment and rehabilitation in non-laboratory settings", *IEEE Journal of translational engineering in health and medicine*. Nov. 2019. <https://doi.org/10.1109/JTEHM.2019.2953257>.
- 10) **Sohn WJ**, et al. "Variability of leg kinematic during overground walking in persons with chronic incomplete spinal cord injury". *Journal of Neurotrauma*. 20 Mar 2018 <https://doi.org/10.1089/neu.2017.5538>. (IF: 5.002, SCI)
- 11) Jalaledini, K., Minos Niu, C., Chakravarthi Raja, S., **Sohn WJ**, Loeb, G. E., Sanger, T. D., & Valero-Cuevas, F. J. (2017). Neuromorphic meets neuromechanics, part II: the role of fusimotor drive. *J Neural Eng*, 14(2), 025002. <https://doi.org/10.1088/1741-2552/aa59bd> (IF:3.92, SCIE)
- 12) Niu, C. M., Jalaledini, K., **Sohn, W. J.**, Rocamora, J., Sanger, T. D., & Valero-Cuevas, F. J. (2017). Neuromorphic meets neuromechanics, part I: the methodology and implementation. *J Neural Eng*, 14(2), 025001. <https://doi.org/10.1088/1741-2552/aa593c> (IF:3.92, SCIE)
- 13) **Sohn, W. J.**, Niu, C. M., & Sanger, T. D. (2016). A neuromorphic model of motor overflow in focal hand dystonia due to correlated sensory input. *J Neural Eng*, 13(5), 055001. <https://doi.org/10.1088/1741-2560/13/5/055001> (IF:3.92, SCIE)
- 14) **Sohn, W. J.**, Niu, C. M., & Sanger, T. D. (2015). Increased long-latency reflex activity as a sufficient explanation for childhood hypertonic dystonia: a neuromorphic emulation study. *J Neural Eng*, 12(3), 036010. <https://doi.org/10.1088/1741-2560/12/3/036010> (IF:3.92, SCIE)
- 15) Niu, C. M., Nandyala, S., **Sohn WJ**, & Sanger, T. D. (2012). Multi-scale Hyper-time Hardware Emulation of Human Motor Nervous System Based on Spiking Neurons using FPGA. *Advances in Neural Information Processing Systems (NIPS)*, 25, 37-45.

#### **Journal Manuscripts Submitted or in Preparation**

- 16) **Sohn WJ**, et al. "A Case for Artificial Sensory Stimulation of Walking with a Prototype Fully-Implantable Artificial Sensory Stimulator" (in preparation)
- 17) **Sohn WJ**, et al. "Characteristics of Surface Brain Signal during Urination" (in preparation)

### Conference Papers (peer-reviewed)

- 1) Haoran Pu, Ahmad Reza Danesh, Omid Malekzadeh-Arasteh, **Won Joon Sohn**, An H. Do, Zoran Nenadic, and Payam Heydari, "A 40V Voltage-Compliance 12.75mA Maximum-Current Multipolar Neural Stimulator Using Time-Based Charge Balancing Technique Achieving 2mV Precision," IEEE Custom Integrated Circuits Conf. (CICC), April 2021.
- 2) **Sohn, W-J.**, Nayeem, R., Zuzarte, I., Hogan, N. & Sternad, D. (2020). Control of complex objects: challenges of linear internal dynamics. BioRob 2020, New York, November 29-December 2.
- 3) **Sohn WJ**, Po. T. Wang, Spencer Kellis, Richard A. Andersen, Charles Y. Liu, Payam Heydari, Zoran Nenadic, and An H. Do. A Prototype of a Fully-Implantable Charge-Balanced Artificial Sensory Stimulator for Bi-directional Brain-Computer-Interface (BD-BCI). IEEE/EMBC Montreal, Jul. 20-24, 2020.
- 4) Niu CM, Rocamora JM, **Sohn WJ**, Valero-Cuevas FJ, Sanger TD. "Force-velocity property of muscle is critical for stabilizing a tendon-driven robotic joint controlled by neuromorphic hardware." Proceedings of the 6<sup>th</sup> International IEEE/EMBS Conference of Neural Engineering, San Diego, CA, Nov 6-8, 2013.
- 5) W. Bian, J. C. Crane, **W. Sohn**, I. Park, E. Ozturk-Isik, S. J. Nelson. "A Comparison of Two Phase Correction Strategies in Multi-Channel MRSI Reconstruction" *Proceeding of the 17<sup>th</sup> Annual Meeting of ISMRM Honolulu*, 2009.

### Conference Abstracts / Posters

- 1) **Sohn WJ**, Po. T. Wang, Spencer Kellis, Richard A. Andersen, Charles Y. Liu, Payam Heydari, Zoran Nenadic, and An H. Do. A Prototype of a Fully-Implantable Charge-Balanced Artificial Sensory Stimulator for Bi-directional Brain-Computer-Interface (BD-BCI). Video Presentation. IEEE/EMBC Montreal, Jul. 20-24, 2020.
- 2) A. Q. Tan, **W. Sohn**, L. Wan, R, Trumbower. Gains in overground walking performance following low oxygen therapy are not accompanied by reductions in intralimb kinematic variability in persons with iSCI. *Abstract*, Society of Neuroscience (SFN), San Diego, CA, Nov 3-7, 2018.
- 3) **Sohn WJ**, Zuzarte I, Sternad, D. "Rhythmic Manipulation of Complex Objects with Nonlinear and Linearized Dynamics." *Abstract*, Society for the Neural Control of Movement (NCM), Santa Fe, NM. Apr. 30-May.4, 2018
- 4) **Sohn WJ**, Sanger TD, Sternad D. "Portable, interactive motion-capture device for upper-limb movement rehabilitation: A feasibility study" *Abstract*, Society for the Neural Control of Movement (NCM), Santa Fe, NM. Apr. 30-May.4, 2018
- 5) Jalaleddini Kian, Niu CM, Raja CR, **Sohn WJ**, Loeb Gerald, Sanger Terence, Valero-Cuevas Francisco. "Neuromorphic Implementation of the Human Spinal Cord for Finger Control". *Abstract*. 50th Meeting of Winter Conference on Brain Research. Big Sky, MT. Jan 28-Feb 2. 2017.
- 6) **Sohn WJ**, et. al. "Endpoint variability during overground walking in persons with chronic incomplete spinal cord injury" *Abstract* accepted to Society of Neuroscience (SFN), San Diego, CA, Nov 12-16, 2016.
- 7) **Sohn WJ**, Niu CM, Sanger TD "Motor overflow in focal hand dystonia develops and perpetuates under correlated sensory inputs in neuromorphic simulatnoi," *Abstract* accepted

- to Society for the Neural Control of Movement (NCM), Charleston, SC. Apr. 20-25, 2015.
- 8) Barradas-Patino VR, Niu CM, **Sohn WJ**, Sanger TD, Loeb GE, Valero-Cuevas FJ “Adjustment of gamma motor neuron firing rates in neuromorphic hardware elicits physiological behavior while controlling a cadaveric human finger under kinematic constraints” *Abstract* accepted to Society for the Neural Control of Movement (NCM), Charleston, SC. Apr. 20-25, 2015.
  - 9) **Sohn WJ**, Niu CM, Sanger TD. “Increased long-latency reflex activity as a sufficient explanation for childhood hypertonic dystonia: a hardware emulation study.” US-Korea Conference on Science, Technology and Entrepreneurship, San Francisco, CA, Aug 6-9, 2014.
  - 10) **Sohn WJ**, Sanger TD “Modeling activity-dependent constraint-induced therapy by spike timing dependent plasticity (STDP)”, Computational and System Neuroscience (COSYNE), Salt Lake City, Mar. 5-8, 2015.
  - 11) **Sohn WJ**, Sanger TD “Emulating development of focal hand dystonia due to plasticity,” *Abstract* accepted to Society for the Neural Control of Movement (NCM), Amsterdam. Apr. 21-25, 2014.
  - 12) **Sohn WJ**, Niu CM, Sanger TD. “VLSI emulation of motor overflow in focal hand dystonia” *Abstract* accepted to Society of Neuroscience (SFN), San Diego, CA, Nov 9-13, 2013.
  - 13) **Sohn WJ**, Niu CM, Sanger TD. “Recreating involuntary dystonic posture using model-based simulation in virtual environment” *Abstract* accepted to Society of Neuroscience (SFN), New Orleans. 2012.
  - 14) Choi IH, **Sohn WJ**, et al. “Wireless Deep Brain Stimulation in Freely Behaving Mice” *Abstract* accepted to Neuroscience Chicago, 2009
  - 15) Grodins Research Symposium, Annual presentation, USC Biomedical Engineering, 2009 to 2014.

## INVITED TALKS / PRESENTATION

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- 1) Sohn WJ. “Toward an Intelligent Bi-directional Brain-Computer Interface (BD-BCI)”. **Special Lecture** at Han Yang University, Seoul, Korea. Nov. 22. 2022.
- 2) **Sohn WJ**. “Understanding human motor control and how it fails in movement disorder: From haptic robotics to multi-scale neural modeling” **Oral presentation** at Computer engineering departmental seminar. Kyung-Hee University, Yong-in, Korea, Nov. 30. 2018.
- 3) **Sohn WJ**. “Understanding human motor control and how it fails in movement disorder: From haptic robotics to multi-scale neural modeling” **Oral presentation** at Departmental seminar. Seoul national university (SNU), Seoul, Korea, Nov. 29. 2018.
- 4) **Sohn WJ**. “Apprehending human motor control and how it fails in movement disorder: From haptic robotics to multi-scale neural modeling” **Oral presentation** at Biomedical engineering departmental seminar. SKKU, Suwon, Korea, Nov. 28. 2018.
- 5) **Sohn WJ**. “Understanding human motor control and how it fails in movement disorder: From haptic robotics to multi-scale neural modeling” **Oral presentation** at Mechanical engineering departmental seminar. Korean Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, Nov. 27. 2018.
- 6) **Sohn WJ**. “Portable motion-analysis device for upper-limb motor assessment and therapy” **Oral presentation and device demo** at weekly meeting of Stroke Motor Neurorecovery Clinic. Massachusetts General Hospital (MGH), Boston, MA Oct. 24. 2018.



- 7) **Sohn WJ.** " Understanding the pathology of dystonia by hardware emulation", Invited speaker, Special topic seminar, Emory University, Jul 28, 2015.
- 8) **Sohn WJ.** " Understanding the pathology of dystonia by hardware emulation", Invited speaker, Special topic seminar, Rehabilitation Institute of Chicago, Jul 21, 2015.
- 9) **Sohn WJ.** "Frankenstein Project", Invited speaker, Special topic seminar, University of Seoul, Dec 9, 2014.
- 10) **Sohn WJ.** "Frankenstein Project", Guest lecturer, Biomedical engineering seminar, Han Yang University, Dec. 8, 2014.
- 11) **Sohn WJ.** "Emulating development of focal hand dystonia due to plasticity," **Oral presentation**, USC Spring 2014 Scholars Research Symposium, USC Davidson Conference Center. April 14, 2014.
- 12) **Sohn WJ.** "Understanding the pathology of movement disorder in hardware emulation", **Oral presentation** P3Challenge at US-Korea Conference on Science, Technology and Entrepreneurship, Los Angeles, CA, SWRC, Mar 8, 2014.
- 13) **Sohn WJ.** "Emulating the development of hyperkinetic movement disorder 365 times faster than real-time in scalable hardware". **Oral presentation** at US-Korea Conference on Science, Technology and Entrepreneurship, Los Angeles, CA, Aug 8-11, 2012.

## REVIEWER FOR JOURNALS

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- PLOS ONE
- *Nature Scientific Reports*
- *IEEE Engineer in Medicine and Biology Society (EMBS)*
- *International Conference on Intelligent Robots and Systems (IROS)*
- *Journal of NeuroEngineering and Rehabilitation (JNER)*

## GRANTS / GRANT WRITING EXPERIENCE

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**Note:** Only recently (2019) became a Green Card holder to meet eligibility for many federal grants.

- **Grant writing subsection:** Institute for Robotic and Intelligent Machines (IRIM) Seed Grant, Georgia Tech. "**SMART (SensoriMotor Augmented Reality Training) environments to enhance robot-assisted gait rehabilitation in children with spinal cord injury**" Sep. 2016. A Runner-up Equipment award amount: \$3,000. Contributed to the writing of the methodological preparation section which is developed by myself.
- **Grant writing for NIH R01 subsection.** With Professor Dagmar Sternad at Northeastern University, I contributed to writing a section regarding experimental strategies to assess predictive capacity in children with autism using custom-developed (by myself) kinematic data acquisition system, MAGIC Table.
- **[Submitted] Co-investigator for ICTS Pilot Studies grant,** University of California at Irvine. Full proposal submitted. Jan.2020. I was the lead writer for the grant. The grant proposed the benchtop and bedside validation of the Bi-directional Brain Computer Interface. All three reviewers were *favorable* to the proposal but the primary reason for a no-award was *that the proposed work was extremely ambitious for a 1-year seed project* (Verbatim statement). The submission to the same grant in 2021 was unavailable

due to the COVID-19 and heightened requirement for the human studies, however, the proposed studies in the 2020 grant is now completed and is being ready for publication.

## COMMUNITY ACTIVITIES

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- **Outreach program:** Volunteer presenter in the outreach program for local middle school students at UC Irvine. Feb 12<sup>th</sup>, 2020.
- **Outreach program:** Volunteer presenter in the outreach program for K-12 high school students. California State Summer School for Math & Science (COSMOS) at UC Irvine. July 29<sup>th</sup>, 2019.
- **Outreach program:** Volunteer presenter in the outreach program for local high school students. Emory University, May, 2016.
- **Outreach program:** Volunteer presenter in the outreach program for local middle school students. Emory University, Feb, 2016.

## AWARDS

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- Won **2<sup>nd</sup> Place** in the student **SRAM Hardware Design Contest** sponsored by **Advanced Micro Devices (AMD)**. 2007.
- Teaching and Research fellowship. University of Southern California, 2009~2015.

## OTHER COMPETENT AREAS

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- **Rapid Prototyping Hardware design:** custom printed circuit board design and fabrication.
  - Custom built electrocortical brain-stimulator with safe charge-balancing features.
  - Arduino programming – low-level bare-metal coding skills.
- **Mobile programming** using android devices to use embedded sensors for gait event detection wirelessly.
- **Computer vision** OpenCV for object tracking using cameras (MAGIC table project)

## MEMBERSHIPS

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- Society for Neuroscience (SFN), Member. (2011~present)
- US-Korea Conference on Science, Technology and Entrepreneurship (KSEA), Member. (2012~present)
- UCI Postdoctoral Association, Member (2019~present)

## SKILLS

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<b>FIELD</b>	<b>SKILLS &amp; KNOWLEDGE</b>
<b>Computer Science</b>	C, C++, MATLAB, Java, Shells, python, LabView, SIMULINK LaTeX, etc
<b>Medicine</b>	Movement Disorder Disease Modeling, Clinical experience with human subjects.
<b>Neuroscience</b>	Knowledge in Human Brain, Nervous System, Sensorimotor System, Physiology.
<b>Hardware Circuit Design</b>	Circuit Simulation, HDL, Verilog, SPICE, Cadence, MultiSim, Autodesk EAGLE.
<b>Electrical Engineering</b>	Control theory, Robotics, Computer Networks, Optics.
<b>Multi-Language</b>	English / Korean / Japanese / reading Chinese Characters.
<b>Statistical Tool</b>	R, SPSS, Excel, SQL
<b>Game development</b>	Pygame (python package), Unity.
<b>Graphic design</b>	Illustrator, Photoshop, Blender.
<b>Science and philosophy</b>	Interest in Philosophy of Science, Philosophy of Mind.

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## **ADDITIONAL INFORMATION**

Eligible to work in the US as Green Card holder

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## **ADDITIONAL ONLINE INFORMATION**

Personal Webpage with video CV : [www.wonjoonsohn.weebly.com](http://www.wonjoonsohn.weebly.com)

Previous labs:

- SangerLab Webpage (Alumni): <http://sangerlab.com>
- InspireLab Webpage (Alumni):  
[http://www.rehabmed.emory.edu/pt/research/Trumbower\\_Lab/Homepage.html](http://www.rehabmed.emory.edu/pt/research/Trumbower_Lab/Homepage.html)
- ActionLab Webpage (Alumni): <https://web.northeastern.edu/actionlab/>

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## **REFERENCES**

### **Terence D. Sanger, Ph.D / M.D.**

Professor, University of California, Irvine, Department of Neurology, Electrical Engineering and Computer Science.

Vice President for Research and Chief Scientific Officer, Pediatric Movement Disorders Program at CHOC Children's.

Email: [terry@sangerlab.net](mailto:terry@sangerlab.net), 323-361-2471 (Office)

### **An H. Do, M.D.**

Associate Professor, University of California, Irvine, Department of Neurology.

Email: [and@hs.uci.edu](mailto:and@hs.uci.edu), 714-456-6011

### **Zoran Nenadic, D.Sc.**

William J. Link Chair and Professor, University of California, Irvine, Department of Biomedical Engineering, Electrical Engineering and Computer Science.

Email: [znenadic@uci.edu](mailto:znenadic@uci.edu), (949) 824-1548

### **Payam Heydari, Ph.D.**

*Won Joon Sohn, Ph.D.*

Professor, University of California, Irvine, Department of Electrical Engineering and Computer Science.  
Email: [payam@uci.edu](mailto:payam@uci.edu), (949) 824-9324

**Dagmar Sternad, Ph.D.**

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