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WON JOON SOHN, PHD

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EDUCATION

Los Angeles, CA **University of Southern California** **Aug 2009-Aug 2015**

- **Doctor of Philosophy (PhD)**, Biomedical Engineering, 2015.
  - Dissertation Title: Understanding the Pathology of Dystonia by Hardware Emulation.
- **Master of Science (MSEE)**, Electrical Engineering, 2014.

Berkeley, CA **University of California Berkeley** **Aug2003-Dec2008**

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

EMPLOYMENT

Sr. R&D Engineer **Abbott Laboratories (Plano, TX)** **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)

Project Scientist & **UCI Brain Computer Interface Lab** **Mar. 2019 – July 2021**

Postdoctoral Research Assoc.

- Implemented ***Bi-directional Brain-Computer Interface (BD-BCI) system***: reads brain signals from and elicit artificial electrical stimulation to the sensori-brain for re-walking of persons with spinal cord injury (SCI).

Postdoctoral Research Fellow **Northeastern University** **May 2017 – Feb 2019**

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

Postdoctoral Research Fellow **Emory Univ. / Georgia Tech** **Sep. 2015 – Apr 2017**

- Performed analysis of the kinematics of the overground walking in persons with incomplete spinal cord injury.

PROJECTS

Personal Website: https://wonjoonsohn.weebly.com

Wearable Closed-loop Neuromodulation System with Edge Computing / Tensorflow Lite.

- Developed a prototype of Kin-adaptive (Kinematic) closed-loop feedback-based neuromodulation system.

Bi-directional Brain Computer Interface (BD-BCI) (Video: https://youtu.be/nQFM7RUGpaw)

- Developed a prototype of a ***fully-implantable charge-balanced artificial sensory stimulator for bi-directional brain-computer interface embedded system*** for re-walking of the neuro-injured.
- Designed and implemented experimental strategies to investigate the perception of electrocortical stimulation to ***elicit artificial leg sensation*** and efficacy of ***Virtual Reality BCI (VR-BCI)*** training.
- 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.
- Investigated novel online-decoding, feature extraction / ML algorithm from neurosignal for prosthetics control.

Portable Motion-Analysis device for Upper-limb Assessment and Rehabilitation

- Developed portable ***low-cost research and rehabilitation tools*** for children with upper extremity impairments (MAGIC table) to collect and analyze kinematic data from patients with movement disorder.
- Designed and implemented ***python-based optical tracking system*** to assess upper-limb movement.

Wearable sensors for biofeedback for walking

- 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.

Understanding the Pathology of Dystonia by Hardware Emulation

- 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
- 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 movement disorder in Sarcos robotic arm: Applied machine learning algorithm in the robot to emulate behavioral response of dystonia patients and validated against dystonia model.

Publications

17 publications including 12 peer-reviewed papers: Full CV can be accessed with at **https://wonjoonsohn.weebly.com**

Research Mentorship

Mentored 2 graduate and 4 undergraduate students in engineering in their research projects over extended period (average 1+ year).

AWARDS

- Won **2nd 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.

SKILLS AND TOOLS

SOFTWARE ENGINEERING	HARDWARE ENGINEERING	DATA SCIENCE
Proficient in R programming ggplot, data analysis with statistical tests. (5+ years)	**Embedded programming** ARM Cortex-M0+, Arduino. (3+ years). C++	**Neural signal analysis** brain signal decoding
Proficient in python dataframe, pandas, scikit-learn, Keras, opencv, etc. (8+ years)	**Hardware programming** Verilog, VHDL. (5+ years)	**Machine learning** Regression, classification, deep learning experience.
Traditional programming C++, C, Java, MIPS. (15+ years)	**Circuit Design** Autodesk Eagle.	**Trained statistician** lead authors in multiple peer-reviewed clinical studies.
Expert in Matlab (10+ years)		R statistical packages for advanced statistical analyses.
Data Engineering, SQL, R.		
Mobile programming (2+ year)		

ADDITIONAL INFORMATION

Eligible to work in the US as Green Card holder

Linkedin Profile URL: https://www.linkedin.com/in/won-joon-eric-sohn-2163713a/