JOHN F. SUNWOO

www.johnsunwoo.com/aim-high

WORK:

Athinoula A. Martinos Center for Biomedical Imaging
Harvard Medical School, Massachusetts General Hospital
Boston, MA 02129
jsunwoo@mgh.harvard.edu

PERMANENT:

50 Causeway St. #3012
Boston, MA 02114
johnfsunwoo@gmail.com

PERSONAL STATEMENT:

My goal is to lead cutting-edge projects in brain monitoring using non-invasive imagining techniques for cerebral blood flow measurements. I aim to collaborate with clinicians and scientists, using my expertise in biomedical optics, engineering, and signal and systems theories. My long-term career goals include advancing brain monitoring techniques in both academia and clinics, providing user-friendly biomedical engineering tools, and promoting future scientists. My journey through digital electronics, wearable computing, and patient studies has driven me to become a motivated and inventive neuro-engineer. As a postdoc at MGH, I am leading projects in diffuse correlation spectroscopy and near infrared spectroscopy for patients with traumatic brain injury at BWH's Neuro-ICU and extremely premature infants at both BWH and MGH's NICUs.

RESEARCH HIGHLIGHTS:

Harvard Medical School, Massachusetts General Hospital, Boston, Massachusetts **Aug/2019 – Current**
Post-doctoral research fellow at The Optics Lab led by Dr. Maria Angela Franceschini

- **Assessment of cerebral autoregulation in extremely low gestational age newborns** using Diffuse Correlation Spectroscopy (**DCS**) and signal cross-correlation. DCS cerebral blood flow derived metrics may be able to indicate the onset and severity of germinal matrix and intraventricular hemorrhage that impacts neurodevelopment in preterm infants (Collaboration: Dept. Neonatal care at Brigham and Women's Hospital).
- **Estimation of intracranial pressure (ICP)** using non-invasive cerebral blood flow via DCS that can help avoid currently golden-standard method that is invasive and prone to complications (Collab. w/ Neuro-ICU at BWH).
- **Reactivity across vitals, cerebral oxygenation NIRS, and transcutaneous CO_2 in cooling infants at risk of hydrocephalus** investigating the changes and the comparisons of the reactivity indices and measurements over the times courses of cooling and rewarming-recovery using signal cross-correlation.
- **Music to reduce stress in the hospitalized preterm infant** showing different types of music/notes can affect and soothe vital indicators including heart rate, respiration rate, cerebral oxygenation, arterial saturation of O_2.

University of Southern California, Los Angeles, California **Aug/2011 – Jul/2019**

- **Multi-channel functional near infrared spectroscopy (fNIRS)** in sickle cell disease to discover biomarkers of neurological and blood flow abnormalities. Acquired prefrontal cortex oxygenation, coupled with physiological recordings such as electrocardiogram, from patients and control subjects who are experiencing different stimuli (e.g. pain, mental load). Analyses include signal pre-processing, artifact removal, cross-correlation analysis, and statistical analysis. (Collab. w/ Hematology/Oncology at Children's Hospital Los Angeles)
- **Modeling of inter-neuronal circuitry** in the spinal cord: Understand how the brain learns to make movements, by solving for unknown parameters (e.g. interconnection weights) in the Spinal-Like Regulator (SLR) model. Parameter optimization techniques, including Simulated Annealing, have done in parallel MATLAB on the High-Performance Computing Clusters (USC Medical Device Development Facility, 2011 – 2013).

Cornell University, Ithaca, New York **Aug/2010 – Jul/2011**

- **Modeling of blood flow** in the cortical vasculature: Development of algorithms and software tools for simulating blood flows and that after vascular occlusions in the cortical. Brain vasculature is analyzed in a simple resistor network to find the behavior of the blood flow. The least squares method was used to solve for the unmeasured flows. Monte Carlo simulation was done over different configurations of occlusion.

Auburn University, Auburn, Alabama **Jun/1999 – May/2005**

- **Built-In Self-Test (BIST)** of Programmable Resources in Microcontroller Based SoCs: BIST for FPGA cores using partial dynamic reconfiguration from the embedded processor. As a result, all external configuration downloads were eliminated and replaced by one single processor program. Total testing time was improved by factor of 45 and a configuration memory storage requirement by factor of 83. (2003 - 2005).

PROFESSIONAL RESEARCH EXPERIENCES:

Electronics and Telecommunications Research Institute (ETRI), Daejeon, Korea **Aug/2005 – Jul/2010**
Member of Engineering Staff, Wearable Computing Research Team.

- **Gesture recognition engine**: Development of wearable gesture band equipped with an accelerometer for recognizing intuitive forearm gestures. A customized, knowledge-based gesture recognition algorithm was developed and achieved a recognition rate of 96.7% on 12 gesture commands. The gesture band equipped with I.MX21-266MHz microprocessor and achieved 6 times faster in recognition and 16 times smaller in program size compared to Hidden Markov Model (HMM) based engine (2005 – 2008).
- **Fabric Area Network ('FAN') controller**: Research and development of a custom communication protocol for conductive yarn network. The protocol included custom design of auto-baud-detection, MAC (Medium access control), and signal delay analyzer. The controller was implemented in a FPGA on a small-sized flexible PCB that can be mounted on cloth. Capable of 1Mbps-10Mbps communication, achieving 99.44% (read) and 99.58% (write) success rates (2008 - 2010).

EDUCATION:

Doctor of Philosophy in Biomedical Engineering, Aug/2011 – Jul/2019
University of Southern California, Los Angeles, CA. Advisor: **Michael C.K. Khoo, Ph.D.**

Master of Engineering in Biomedical Engineering, Aug/2010 - Jul/2011
Cornell University, Ithaca, NY. Advisor: **Peter C. Doerschuk, M.D., Ph.D.**

Master of Science in Electrical Engineering, Aug/2003 - May/2005,
Bachelor of Science in Electrical and Computer Engineering, Jun/1999 - Jul/2003
Auburn University, Auburn, AL. Advisor: **Charles E. Stroud, Ph.D.**

PUBLICATION HIGHLIGHTS:

- J. **Sunwoo**, A.I. Zavriyev, K. Kaya, A. Martin, C. Munster, T. Steele, D. Cuddyer, Y. Sheldon, F. Orihuela-Espina, E.M. Herzberg, T. Inder, M.A. Franceschini & M. El-Dib, *"Diffuse correlation spectroscopy blood flow monitoring for intraventricular hemorrhage vulnerability in extremely low gestational age newborns,"* Sci. Rep. 12, 12798 (2022). https://doi.org/10.1038/s41598-022-16499-3
- J. **Sunwoo**, P. Chalacheva, M. Khaleel, P. Shah, R. Sposto, R. M. Kato, J. Detterich, L. K. Zeltzer, J. C. Wood, T. D. Coates, M. C.K. Khoo (2018). "*A novel cross-correlation methodology for assessing biophysical responses associated with pain*," *Journal of pain research*, 11, 2207-2219. doi:10.2147/JPR.S142582
- J. **Sunwoo**, P. Shah, W. Thuptimdang, M. Khaleel, T.D. Coates and M.C. Khoo, *"Estimation of cognitive brain activity in sickle cell disease using functional near-infrared spectroscopy and dynamic systems modeling*," Front. Hum. Neurosci. Conference Abstract: 2nd International Neuroergonomics Conference, 2018
- J. **Sunwoo**, J. Goodner, and G. E. Loeb, *"An improved motor efficiency after the dimensionality reduction on the Spinal-Like Regulator model," Program No. 471.09. 2013 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2013. Online.*
- J. **Sunwoo**, N. Cornelius, P. Doerschuk, and C. Schaffer, *"Estimating Brain Microvascular Blood Flows From Partial Two-Photon Microscopy Data by Computation with a Circuit Model," IEEE International Engineering in Medicine and Biology Society (EMBS) Conference, Aug,* 2011
- J. **Sunwoo**, K.J. Noh, H.S. Lee, and I.Y. Cho, "Context-Awareness on a Hoodie: Knowing when the Hood is Taken Off the Head," *IEEE International Symposium on Wearable Computing,* 2010
- J. **Sunwoo**, S. Garimella, C. Stroud, *"On Embedded Processor Reconfiguration of Logic Built-In Self-Test for FPGA Cores in SoCs," IEEE North Atlantic Test Workshop*, 2005

PUBLICATIONS:

(SELECTED CONFERENCE ABSTRACTS)

- J. **Sunwoo**, V. Nair, T. Steele, N. Lawrence, A. Zavriyev, A. Peruch, Z. Starkweather, K. Wu, F. Orihuela-Espina, T. Inder, M.A. Franceschini, M. El-Dib, "*Assessment of Cerebral Autoregulation in Extremely Low Gestational Age Newborns using Diffuse Correlation Spectroscopy,"* The Optical Society of America (OSA) Biophotonics Congress: Biomedical Optics, OSA Technical Digest, paper JTu3A.28., 2020
- J. **Sunwoo**, T. Wu, S. Snider, M.A. Franceschini, *"Non-invasive estimation of intracranial pressure via diffuse correlation spectroscopy,"* US-Korea Conference (UKC 2021) by Korean-American Scientists and Engineers Association (KSEA), Ref # U21BME-26-1 Dec, 2021. Online
- J. **Sunwoo**, P. Shah, W. Thuptimdang, M. Khaleel, T.D. Coates and M.C. Khoo, *"Estimation of cognitive brain activity in sickle cell disease using functional near-infrared spectroscopy and dynamic systems modeling*," Front. Hum. Neurosci. Conference Abstract: 2nd International Neuroergonomics Conference, 2018
- J. **Sunwoo**, M. Khaleel, T. D. Coates, and M. C.K. Khoo, *"Prefrontal Cortex Response to Painful Heat Stimuli in Sickle Cell Disease using fNIRS," IEEE International Engineering in Medicine and Biology Society (EMBS) Conference, Aug,* 2016
- J. **Sunwoo**, M. Khaleel, P. Shah, R. Kato, P. Chalacheva, W. Thuptimdang, J. A. Detterich, H. J. Meiselman, J. Tsao, J. C. Wood, L. Zeltzer, T. D. Coates, and M. C.K. Khoo, *"Use of functional near infrared spectroscopy as an objective measure of brain response to painful stimuli in sickle cell disease," Biorheology, vol.52, DOI 10.3233, pp.56-57,* 2015
- J. **Sunwoo**, J. Goodner, and G. E. Loeb, *"An improved motor efficiency after the dimensionality reduction on the Spinal-Like Regulator model," Program No. 471.09. 2013 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2013. Online.*
- A. Martin, A.I. Zavriyev, K. Kaya, Z. Starkweather, C. Munster, T. Steele, D. Cuddyer, Y. Sheldon, T. Inder, E.M. Herzberg, M. El-Dib, M.A. Franceschini & J. **Sunwoo**, *"Influence of Hemodynamically Significant Patent Ductus Arteriosus on Cerebral Hemodynamics for Intraventricular Hemorrhage Susceptibility in Extremely Premature Infants,"* Optica (formerly OSA) 2022 Biophotonics Congress, April 2022 (Podium presentation)
- N. Otic, J. **Sunwoo**, Y. Huang, A. Martin, B. Zimmermann, S. Carp, M. A. Franceschini, and M. Renna, *"Multi-Wavelength Multi-Distance Diffuse Correlation Spectroscopy System for assessment of premature infants cerebral hemodynamic,"* in Biophotonics Congress: Biomedical Optics 2022, paper JM3A.70.
- C. Erdei, M. Forde, J. **Sunwoo,** M. El-Dib, T. Inder, *"A Music-Based Intervention to Reduce Stress in the Hospitalized Preterm Infant,"* Pediatric Academic Societies Meeting (PAS), May, 2021

(PEER-REVIEWED JOURNAL PAPERS)

- J. **Sunwoo**, A.I. Zavriyev, K. Kaya, A. Martin, C. Munster, T. Steele, D. Cuddyer, Y. Sheldon, F. Orihuela-Espina, E.M. Herzberg, T. Inder, M.A. Franceschini & M. El-Dib, *"Diffuse correlation spectroscopy blood flow monitoring for intraventricular hemorrhage vulnerability in extremely low gestational age newborns,"* Sci. Rep. 12, 12798 (2022). https://doi.org/10.1038/s41598-022-16499-3
- J. **Sunwoo**, P. Chalacheva, M. Khaleel, P. Shah, R. Sposto, R. M. Kato, J. Detterich, L. K. Zeltzer, J. C. Wood, T. D. Coates, M. C.K. Khoo (2018). "*A novel cross-correlation methodology for assessing biophysical responses associated with pain*," *Journal of pain research*, 11, 2207-2219. doi:10.2147/JPR.S142582
- K.-C. Wu, J. **Sunwoo**, et al, "Validation of diffuse correlation spectroscopy measures of critical closing pressure against transcranial Doppler ultrasound in stroke patients," Accepted to *J Biomedical Optics.* Mar 2021
- K. Kaya, A.I. Zavriyev, F. Orihuela-Espina, M.V. Simon, G.M. LaMuraglia, E.T. Pierce, M.A. Franceschini & J. **Sunwoo** *(co-corresponding), "Intraoperative Cerebral Hemodynamic Monitoring during Carotid Endarterectomy via Diffuse Correlation Spectroscopy and Near-Infrared Spectroscopy,"* Brain Sci. 2022, 12, 1025. https://doi.org/10.3390/brainsci12081025
- M. El-Dib, C. Munster, J. **Sunwoo**, et al. *"Association of early cerebral oxygen saturation and brain injury in extremely preterm infants,"* J Perinatol (2022). https://doi.org/10.1038/s41372-022-01447-w
- M. Renna, P. Adriano, J. **Sunwoo**, Z. Starkweather, A. Martin, M.A. Franceschini. *"A Contact-Sensitive Probe for Biomedical Optics,"* Sensors 22, no. 6: 2361. 2022, https://doi.org/10.3390/s22062361
- T. Bollu, N.R. Cornelius, J. **Sunwoo**, N. Nishimura, C.B. Schaffer, and P. Doerschuk, *"Experimentally constrained circuit model of cortical arteriole networks for understanding flow redistribution due to occlusion and neural activation," J Cereb Blood Flow Metab.* November 2017:0271678X1774108. doi:10.1177/0271678X17741086.
- M. Khaleel, M. Puliyel, P. Shah, J. **Sunwoo**, et al. "*Individuals with sickle cell disease have a significantly greater vasoconstriction response to thermal pain than controls and have significant vasoconstriction in response to anticipation of pain," Am J Hematol.* 2017;92(11):1137-1145. doi:10.1002/ajh.24858.

PUBLICATIONS: *(CONTINUED)*

- P. Chalacheva, M. Khaleel, J. **Sunwoo**, et al. "*Biophysical markers of the peripheral vasoconstriction response to pain in sickle cell disease,"* P. Connes, ed. *PLoS One.* 2017;12(5):e0178353. doi:10.1371/journal.pone.0178353.
- H.S. Lee, C.B.Park, K.J. Noh, J. **Sunwoo**, H. Choi, and I.Y. Cho, *"Wearable Personal Network Based on Fabric Serial Bus Using Electrically Conductive Yarn," ETRI Journal, vol.32, no.5, Oct.* 2010
- D.W. Lee, J.M. Lim, J. **Sunwoo**, I.Y. Cho, and C.H. Lee, *"Actual Remote Control: A Universal Remote Control using Hand Motions on a Virtual Menu," IEEE Transactions on Consumer Electronics,* Vol. 55, No. 3, 2009
- P. Shah, M. Khaleel, W. Thuptimdang, J. **Sunwoo**, S. Veluswamy, P. Chalacheva, R.M. Kato, J. Detterich, J.C. Wood, L. Zeltzer, R. Sposto, M. C.K. Khoo, and T.D. Coates, "*Mental stress causes vasoconstriction in subjects with sickle cell disease and in normal controls.*" Haematologica. 2020 Jan;105(1):83-90. doi: 10.3324/haematol.2018.211391. Epub 2019 Apr 11. PMID: 30975906; PMCID: PMC6939522.
- A.I. Zavriyev, K. Kaya, P. Farzam, P.Y. Farzam, J. **Sunwoo**, et al, "The role of diffuse correlation spectroscopy and frequency-domain near infrared spectroscopy in monitoring cerebral hemodynamics during hypothermic circulatory arrests", *J Thoracic and Cardiovascular Surgery Techniques*, 2021, doi: https://doi.org/10.1016/j.xjtc.2021.01.023
- P. Chalacheva, R.M. Kato, P. Shah, S. Veluswamy, C.C. Denton, J. **Sunwoo**, W. Thuptimdang, J.C. Wood, J.A. Detterich, T.D. Coates, and M. C.K. Khoo (2019) *"Sickle Cell Disease Subjects Have a Distinct Abnormal Autonomic Phenotype Characterized by Peripheral Vasoconstriction With Blunted Cardiac Response to Head-Up Tilt."* Front. Physiol. 10:381. doi: 10.3389/fphys.2019.00381
- C.C. Denton, P. Shah, S. Suriany, H. Liu, W. Thuptimdang, J. **Sunwoo**, P. Chalacheva, S. Veluswamy, R.M. Kato, J.C. Wood, J.A Detterich, M. C.K. Khoo, and T.D. Coates, "*Loss of alpha-globin genes in human subjects is associated with improved nitric oxide-mediated vascular perfusion*." Am J Hematol. 2021 Mar 1;96(3):277-281. doi: 10.1002/ajh.26058. Epub 2020 Dec 12. PMID: 33247606.
- S. Veluswamy, P. Shah, M. Khaleel, W. Thuptimdang, P. Chalacheva, J. **Sunwoo**, C.C. Denton, R. Kato, J. Detterich, J.C. Wood, R. Sposto, M. C.K. Khoo, L. Zeltzer, & T.D. Coates (2020). *"Progressive vasoconstriction with sequential thermal stimulation indicates vascular dysautonomia in sickle cell disease"*. Blood, 136(10), 1191–1200. https://doi.org/10.1182/blood.2020005045

(PEER-REVIEWED CONFERENCE PROCEEDINGS)

- J. **Sunwoo**, J. Goodner, and G. E. Loeb, *"Dimensionality Reduction of the Spinal-Like Regulator Model Improves Motor Learning," 20th Joint Symposium on Neural Computation, June,* 2013
- J. **Sunwoo**, N. Cornelius, P. Doerschuk, and C. Schaffer, *"Estimating Brain Microvascular Blood Flows From Partial Two-Photon Microscopy Data by Computation with a Circuit Model," IEEE International Engineering in Medicine and Biology Society (EMBS) Conference, Aug,* 2011
- J. **Sunwoo**, K.J. Noh, H.S. Lee, and I.Y. Cho, "Context-Awareness on a Hoodie: Knowing when the Hood is Taken Off the Head," *IEEE International Symposium on Wearable Computing,* 2010
- I.Y. Cho, J. **Sunwoo** (*corresponding*), Y.K. Son, M.H. Oh, C.H. Lee, *"Development of a Single 3-axis Accelerometer Sensor Based Wearable Gesture Recognition Band," International Conference on Ubiquitous Intelligence and Computing, UIC,* 2007
- J. **Sunwoo** and C. Stroud, "Built-In Self-Test of Configurable Cores in SoCs Using Embedded Processor Dynamic Reconfiguration," *IEEK International SoC Design Conference,* 2005
- J. **Sunwoo**, S. Garimella, C. Stroud, *"On Embedded Processor Reconfiguration of Logic Built-In Self-Test for FPGA Cores in SoCs," IEEE North Atlantic Test Workshop*, 2005
- B. Dutton, M. Ali, C. Stroud, J. **Sunwoo**, *"Embedded Processor Based Fault Injection and SEU Emulation for FPGAs," International Conference on Embedded Systems and Applications, ESA,* 2009
- D.W. Lee, J.M. Lim, J. **Sunwoo**, B.S Kim, I.Y. Cho, *"Actual Remote Control: A Wearable Remote Control on Wrist," IEEE International Conference on Consumer Electronics*, 2009
- H.S. Lee, J. **Sunwoo**, D.W. Han, *"Fabric Serial Bus: A Serial Bus Network for E-Textile Platform," Korean Institute of Next Generation Computing, KING Computing Autumn Conference, pp. 238-241,* 2009
- I. Oakley, J. **Sunwoo**, I.Y. Cho, *"Pointing with Fingers, Hands and Arms for Wearable Computing," ACM CHI,* 2008
- Y. Son, J. **Sunwoo**, B.S. Kim, I.Y. Cho, *"A Hand Gesture Segmentation Technique for a Wrist-wear Device," IeMeK (Institute of Embedded Engineering of Korea) autumn conference,* 2008
- H.S. Lee, J. **Sunwoo**, B.S. Kim, I.Y. Cho, *"Printed Electronics on Textiles: A Case Study," IeMeK (Institute of Embedded Engineering of Korea) Autumn Conference,* 2008
- D.W. Lee, J. **Sunwoo**, I.Y. Cho, *"Wearable Multi-modal Remote Control," IEEE International Conference on Consumer Electronics,* 2008

PUBLICATIONS: *(CONTINUED)*

- I.Y. Cho, J. **Sunwoo**, H.T. Jeong, Y.K. Son, et. Al., *"A Distributed Wearable System based on Multimodal Fusion," International Conference on Embedded Software and System, ICESS,* 2007
- J.E. Kim, J. **Sunwoo**, et. Al., *"A Gestural Input through Finger Writing on a Textured Pad," ACM CHI,* 2007
- C. Stroud, S. Garimella, and J. **Sunwoo**, *"On-Chip BIST-Based Diagnosis of Embedded Programmable Logic Cores in System-on-Chip Devices," ISCA International Conference on Computers and their Applications,* 2005
- C. Stroud, J. Harris, S. Garimella, and J. **Sunwoo**, *"Built-In Self-Test configurations for Atmel Field Programmable Gate Arrays Using Macro Generation Language," IEEE North Atlantic Test Workshop,* 2004
- C.Stroud, J. **Sunwoo**, S. Garimella, and J. Harris, *"Built-In Self-Test for System-on-Chip Devices: A Case Study," IEEE International Test Conference,* 2004

TALKS:

- (Invited) J. **Sunwoo**, A.I. Zavriyev, K. Kaya, T. Steele, D. Cuddyer, T. Inder, M.A. Franceschini & M. El-Dib, "*Non-invasive assessment of cerebral autoregulation using diffuse correlation spectroscopy in extremely preterm infants,"* Deep Tissue Imaging and Quantum Sensing II, IEEE Photonics Conference (IPC), Oct, 2021
- (Webinar) J. **Sunwoo**, V. Nair, T. Steele, N. Lawrence, A. Zavriyev, A. Peruch, Z. Starkweather, K. Wu, F. Orihuela-Espina, T. Inder, M.A. Franceschini, M. El-Dib, "*Assessment of Cerebral Autoregulation in Extremely Low Gestational Age Newborns using Diffuse Correlation Spectroscopy and Signal Cross-Correlation,"* Pediatric Academic Societies Meeting (PAS), July, 2020

PATENTS:

(FIRST/CORRESPONDING)

- Wearable Computer System and Method Controlling Information/Service in Wearable Computer System (2008, PCT WO2008026878A1, 2009 US Patent US20090241171A1)
- Method of Dynamic Communication among Nodes and Apparatus therefor (2012, Granted, KR10-1208633)

(SECOND/COLLABORATING)

- Velcro connector (2010, U.S Patent No. 7,753,686, Korea Patent No. 10-0981303)
- Wrist-worn user input apparatus and methods (2008, Korea Patent No. 10-0793079)
- Remote control system and method by using virtual menu map (2009, Korea Patent No. 10-0901482)
- Multimodal fusion apparatus capable of remotely controlling electronic devices and method thereof (2010, Korea Patent No. 10-0955316)
- Method of serial bus communication and bus interface device for the same (2013, Korea Patent No. 10-1256942)
- Apparatus for inputting key using multi touch point and method thereof (2013, Korea Patent No. 10-1307345)
- Textile touchpad and method for sensing touch using the same (2013, Korea Patent No. 10-1219733)
- Electrical connector for power exchanging and network connecting for E-textile network, and method thereof (2013, Korea Patent No. 10-1249738)

ACADEMIC EXPERIENCES:

- **Study Partners Program Tutor in Mathematics**, Pre-Algebra, Algebra, Pre-Calculus, Calculus I, II, III, Differential Equations, Linear Algebra, Academic Support Department, Dafni Greene, Study Partners Program Director (1999 - 2003), Auburn Univ.
- **Lab Instructor / Teaching Assistant**, ELEC2020 (Electrical and Computer Engineering Laboratory), ELEC2220 (Computer Systems), Directed by Dr. Thaddeus Roppel, Dr. Scottedward Hodel, and Dr. Soo-Young Lee (2003 - 2004), Auburn Univ. CS1112 (Intro to Computing using MATLAB), Directed by Dr. K.-Y. Daisy Fan, Cornell Univ. BME502 (Advanced Studies of the Nervous System), Directed by Dr. Bartlett Mel (2013), Univ. of Southern California.
- **Ph.D. Student Mentor**, Alec Fields, "Assessment of reproducibility, biofeedback, and motion artifact in functional near-infrared spectroscopy," Summer High School Intensive in Next-Generation Engineering (SHINE), Directed by Dr. Katie Mills (2016), Univ. of Southern California.

HONORS:

- **Post-doctoral Fellowship** – Harvard Medical School, Massachusetts General Hospital, MA (2019-Current)
- **Fellowship** - Provost's Ph.D. Student, University of Southern California, CA (2011 – 2016)
- Eta Kappa Nu, Honor society of IEEE
- **Certificate of Achievement**- Office of Multicultural Affairs, Auburn University, AL (May, 2000, and April, 2002)

PROFESSIONAL ACTIVITIES:

- Technical Advisor, **Wearable Computing Fashion Show**, Korea Ministry of Information Communication Technology, ETRI, Seoul National University, UD4M Incorp., Seoul COEX/Goyang KINTEX, 2006-2009
- Exhibitor**, International Consumer Electronics Show**, ETRI Gesture Recognition Wristwatch, ETRI – Ubridge Incorporated, Las Vegas, 2007
- Coordinator, **International Research** Collaboration, ETRI - Georgia Tech, GVU Center, Dr. Thad Starner, Atlanta, 2006-2007
- Member, Association of Next Generation Computing Industry, Korea (ANCI), IEEE, Computer Society, EMBS (Engineering in Medicine & Biology Society), BMES (Biomedical Engineering Society), ISCA (International Society for Computers & their Applications)

EXTRACURRICULAR ACTIVITIES:

- Member, Korean-American Scientists and Engineers Association, KSEA (2018-)
- Member, Trojan Judo Club, University of Southern California; Judo Club "Sang-Moo-Gwan", Daejeon, Korea
- Chair, Event Affair Committee, Auburn University Korean Student Association (2004)
- Member, Bowling Club, ETRI, Korea (2005 - 2010)
- Member, Auburn University TaeKwonDo Club
- Staff Writer, Auburn University Plainsman
- Staff, Auburn University Program Council, Special Event Committee (1999-2001)
- Member, Auburn University Asian Association

End of CV Last updated 2023-05-04