Monica Liu

EDUCATION

University of Pittsburgh — Pittsburgh, Pennsylvania, USA
PhD in Bioengineering with a focus in neural engineering — August 2016 – Present
Advisors: Dr. Douglas Weber, Dr. Aaron Batista
Research focus: Population analysis of neural mechanisms of sensorimotor integration in the dorsal root ganglia and in motor cortex.

University of Virginia — Charlottesville, Virginia, USA
B.S. in Biology — August 2011 – May 2015
B.A. in Computer Science

HONORS AND SCHOLARSHIPS

Graduate Research Fellowship Program, **National Science Foundation** 2018
Best Presentation, **Computational Sensorimotor Neuroscience Summer School** 2017
Bevier Award, **University of Pittsburgh Bioengineering Department** 2016

PUBLICATIONS

Liu, M.F., Batista, A.P., Bensmaia, S.J., Weber, D.J. (2020). Information about contact force and surface texture is mixed in the firing rates of cutaneous afferent neurons. *Journal of Neurophysiology*. https://doi.org/10.1152/jn.00725.2019

Urbin, M.A., **Liu, M.F.**, Bottorff, E.C., Gaunt, R.A., Fisher, L.E., Weber, D.J. (2019). Hindlimb motor responses evoked by microstimulation of the lumbar dorsal root ganglia during quiet standing. *Journal of Neural Engineering*. https://doi.org/10.1088/1741-2552/ab4c6c

Pokrass, M.J. **Liu, M.F.**, Lindorfer, M.A., Taylor, R.P. (2013). Monoclonal Antibodies that Target cell-associated HLA or β2-microglobulin exhibit differential complement activity: Implications for cancer immunotherapy. *Molecular Immunology*. https://doi.org/10.1016/j.molimm.2013.05.242

Manuscript in preparation, submission expected August 2021: November 2020 – Present
Proprioceptive encoding in primary motor cortex during BCI control
We examine how visual and proprioceptive feedback are incorporated into BCI control in a person who was completely paralyzed below the neck but retained intact somatosensation.

RESEARCH EXPERIENCE

Center for Diabetes Technology, University of Virginia
Mentor: Dr. Marc Breton — May 2014 – June 2015
Assisted in clinical trials that tested a closed-loop artificial pancreas system in people with type I diabetes and built an algorithm to estimate insulin sensitivity over time.

Automated detection of axon blebbing, University of Virginia
Mentor: Dr. Karsten Siller — June 2014 – May 2015
Built a MATLAB script to automate axon bleb counting, distinguishing between axon blebs and axon crossings in a fluorescent microscopy image with 85% accuracy.

Biochemistry and Molecular Genetics, University of Virginia
Mentor: Dr. Ronald Taylor — March 2011 – May 2014
Assisted in the development and testing of a monoclonal antibody therapy to recruit the innate immune system to target cancerous B-cells and quantified off-target effects on platelets.

RESEARCH TOOLS

Messaging framework for data collection and syncing September 2020
A messaging framework that can be used to sync timing across multiple independent data streams with frequencies of 30kHz or more.

Code: https://github.com/mfliu/networkedMessaging

Graphic and haptic interface for Force Dimensions robots November 2019
A framework for building behavioral experiments using a haptic robot. Provides physics simulations of object interactions in complex tasks, such as fluid in a cup.
Code: https://github.com/mfliu/hapticEnvironment

TEACHING

Lecturer, Teaching Assistant, Quantitative Systems Neuroscience Spring 2017-Spring 2021
Gave lectures on quantitative methods such as principal components analysis and K-means in the context of building a BCI decoder.
Lecture Notes: http://mfliu.github.io/files/BCI_Theory.pdf

Teaching Assistant, Signals and Systems Fall 2017
Graded homeworks and quizzes, held office hours, and tutored students individually.

Curriculum Creation, Methods Lab April 2018
Created a myoeletric-controlled Tetris game to teach undergraduate students about processing of EMG signals and basic classification.
Code: https://github.com/mfliu/Myoelectric_Tetris

SERVICE AND OUTREACH

Obama Academy, Life Skills and College Prep Class February 2021 – April 2021
Collaboratively built a 7-session introduction to STEM for 9th graders that focused on the range and application of STEM careers, as well as the social and ethical responsibility of scientists and engineers.

Neuroscience Activities Website November 2020
Built a website focused on giving students hands-on experience with well-known neuroscience behavioral tasks and analyses.
Link: https://mfliu.github.io/neuroActivities/

Training and Discussion, Rehab Neural Engineering Labs March 2020 – Present
Organized a series of lectures and seminars focused on the history of racism in academia and healthcare in America, how this history has contributed to racial inequity in STEM today, and steps to take to begin to remedy these inequities moving forward.

Center for the Neural Basis of Cognition, Retreat Committee Fall 2019 – Present
Planned the annual retreat and helped other student committees organize and run events for the CNBC as a whole.

Letters to a Pre-Scientist 2018 – 2020
Served as a pen pal to an elementary student each year to introduce students to STEM careers and to build writing skills.

Covestro Pittsburgh Regional Science and Engineering Fair March 2017 – March 2021
Interviewed students participating in the regional science fair and provided feedback, and helped other judges determine awards for students.

Carnegie SciTech Days, Pittsburgh, PA, USA November 2016 – November 2018
Organized and taught bioengineering activities for middle- and high school students at Carnegie Science Center's SciTech Days.

TALKS

How S1 spiking activity encodes sensory feedback for goal-directed movements in a grasping task November 2017
Liu, M.F., Arbuckle, S.A., Okorokova, E., Herrera, A.J., Kaiser, A.
Motor Learning and Motor Control (MLMC)
Our group won "Best Student Presentation" at the Computational Sensorimotor Neuroscience summer school and were awarded with a time slot to give this talk during MLMC.

POSTERS

Liu, M.F., Dekleva, B., Chowdhury, R., Batista, A.P., Boninger, M., Collinger, J., Gaunt, R., Weber, D.J. "The effect of visual and proprioceptive feedback on brain-computer interface control of a robotic arm". *Neural Control of Movement, 2020.* (Cancelled due to Covid-19)

Liu, M.F., Winberry, J.E., Versteeg, C., Simpson, T., Oby, E.R., Degenhard, A.D., Urbin, M.A., Batista, A.P., Gaunt, R.A., Miller, L.E., Bensmaia, S.J. Weber, D.J. "Effect of surface texture on the encoding of touch, pressure, and shear in the glabrous skin of a rhesus macaque". *Society for Neuroscience, 2018.*

Liu, M.F., Winberry, J.E., Versteeg, C., Simpson, T., Oby, E.R., Degenhard, A.D., Urbin, M.A., Batista, A.P., Gaunt, R.A., Miller, L.E., Bensmaia, S.J. Weber, D.J. "Dorsal root ganglion neuronal population responses to tactile stimuli in rhesus monkey hand". *Society for Neuroscience, 2017*

INDUSTRY EXPERIENCE

Novartis, Institute for Biomedical Research Boston, Massachusetts, USA
Data Engineer August 2015 – August 2016
Developed software to support large-scale genomics research by implementing infrastructure to support processing and analysis of large datasets and building a distributed processing system using Apache Spark.

SKILLS

Programming Languages:
Python, MATLAB, C++, Java, Javascript, Scala, OCaml, Haskell, HTML

Technical Skills:
Neural recording systems (Ripple, Plexon, Intan), EMG recording systems (Delsys Trigno), Kinematic recording systems (Optitrack, DeepLabCut), MongoDB, Linux, Git, Jupyter

Languages:
English (fluent), Cantonese (advanced), Mandarin (advanced), Spanish (intermediate)