JESSIE R. LIU

San Francisco, California.
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EDUCATION

Ph.D., Bioengineering August 2017 - June 2023
Advisor: Edward F. Chang, M.D.
Course focus: Machine learning for neuroprosthetics
UC Berkeley - UCSF Graduate Program in Bioengineering
Berkeley & San Francisco, CA, USA.

B.S., Bioengineering 2013 - 2017
Minors: Chemistry, Korean *Summa cum laude*
University of Pittsburgh
Pittsburgh, PA, USA.

RESEARCH

Postdoctoral scholar July 2023 - Present
Chang Lab, UCSF. *San Francisco, CA*
Advisor: Edward F. Chang, M.D.

· Research the neural basis of speech production and speech-motor control.
· Develop real-time computational algorithms for naturalistic speech neuroprostheses.

Graduate student researcher May 2018 - June 2023
Chang Lab, UCSF. *San Francisco, CA*
Advisor: Edward F. Chang, M.D.

· Developed real-time computational algorithms for speech neuroprostheses using signal processing and machine learning.
· Developed deep neural network models to detect audible and silent speech attempts from human cortical activity to volitionally engage and disengage speech decoding systems.
· Researched the neural basis of speech-motor sequencing during speech production using human cortical activity recordings and direct electrocortical stimulation, revealing a novel role of the middle precentral gyrus.

Research assistant Jan 2014 - July 2017
Modo Lab, University of Pittsburgh. *Pittsburgh, PA*
Advisor: Michel Modo, Ph.D.

· Characterized the distribution of thrombospondin in the extracellular matrix of healthy cortical tissue.
· Developed pipelines for automated histology analyses.

AWARDS AND HONORS

2024 Society for the Neurobiology of Language Travel Award
2023 Society for the Neurobiology of Language Travel Award
2023 Boston Speech Motor Control Symposium Best Poster Award
2023 Boston Speech Motor Control Symposium Travel Scholarship
2022 The Annual BCI Award, 3rd place
2021 The Annual BCI Award, 2nd place
2016 Swanson School of Engineering Undergraduate Summer Research Internship
2015 Swanson School of Engineering Undergraduate Summer Research Internship

TEACHING

Fall 2024 **Guest Lecturer**
Speech and Language Processing in the Brain, School of Medicine
University of California, San Francisco, CA.

Winter 2021 **Teaching Assistant**
Neural and Behavioral Data Analysis, Dept. of Neuroscience
University of California, San Francisco, CA.

Fall 2016 & Spring 2017 **Teaching Assistant**
Cell Biology I & II, Dept. of Bioengineering
University of Pittsburgh, PA.

OUTREACH

2021 - Present **Code tutorial leader**
Lead Chang Lab coding tutorials with ENVISION Interns
https://github.com/ChangLabUcsf/changlabXenvision
ENVISION Internship Program
UCSF Dept. of Neurological Surgery

2018 - 2021 **Peer Advisor**
Bioengineering Student Association
UC Berkeley - UCSF Graduate Program in Bioengineering
Berkeley & San Francisco, CA.

2018 **Internal Networking Committee**
Bioengineering Student Association
UC Berkeley - UCSF Graduate Program in Bioengineering
Berkeley & San Francisco, CA.

TECHNICAL SKILLS

Programming
Expert in Python 3 with PyTorch, Tensorflow, Pandas, and other common scientific computing packages. Proficient in Bash and Matlab.

PUBLICATIONS

Peer reviewed articles

* indicates equal contribution

Littlejohn*, K. T., C. J. Cho*, **J. R. Liu**, A. B. Silva, B. Yu, V. R. Anderson, C. M. Kurtz-Miott, S. Brosler, A. P. Kashyap, I. P. Hallinan, A. Shah, A. Tu-Chan, K. Ganguly, D. A. Moses, E. F. Chang, and G. K. Anumanchipalli. "A streaming brain-to-voice neuroprosthesis to restore naturalistic communication". en. In: *Nat. Neurosci.* 28.4 (Apr. 2025), pp. 902–912.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "Speech sequencing in the human precentral gyrus". en. In: *Nat. Hum. Behav.* (July 2025).

Silva*, A. B., **J. R. Liu***, V. R. Anderson, C. M. Kurtz-Miott, I. P. Hallinan, K. T. Littlejohn, S. C. Brosler, A. Tu-Chan, K. Ganguly, D. A. Moses, and E. F. Chang. "Implications of shared motor and perceptual activations on the sensorimotor cortex for neuroprosthetic decoding". en. In: *J. Neural Eng.* 22.4 (Aug. 2025), p. 046039.

Silva, A. B., K. T. Littlejohn, **J. R. Liu**, D. A. Moses, and E. F. Chang. "The speech neuroprosthesis". In: *Nat. Rev. Neurosci.* (May 2024). DOI: 10.1038/s41583-024-00819-9.

Silva, A. B., **J. R. Liu**, S. L. Metzger, I. Bhaya-Grossman, M. E. Dougherty, M. P. Seaton, K. T. Littlejohn, A. Tu-Chan, K. Ganguly, D. A. Moses, and E. F. Chang. "A bilingual speech neuroprosthesis driven by cortical articulatory representations shared between languages". In: *Nat. Biomed. Eng.* (May 2024). DOI: 10.1038/s41551-024-01207-5.

Levy, D. F., A. B. Silva, T. L. Scott, **J. R. Liu**, S. Harper, L. Zhao, P. W. Hullett, G. Kurteff, S. M. Wilson, M. K. Leonard, and E. F. Chang. "Apraxia of speech with phonological alexia and agraphia following resection of the left middle precentral gyrus: An illustrative case". In: *Journal of Neurosurgery: Case Lessons* 5.13 (Mar. 2023). DOI: 10.3171/CASE22504.

Metzger*, S. L., K. T. Littlejohn*, A. B. Silva*, D. A. Moses*, M. P. Seaton*, R. Wang, M. E. Dougherty, **J. R. Liu**, P. Wu, M. A. Berger, I. Zhuravleva, A. Tu-Chan, K. Ganguly, G. K. Anumanchipalli, and E. F. Chang. "A high-performance neuroprosthesis for speech decoding and avatar control". In: *Nature* 620.7976 (Aug. 2023), pp. 1037–1046. DOI: 10.1038/s41586-023-06443-4.

Metzger*, S. L., **J. R. Liu***, D. A. Moses*, M. E. Dougherty, M. P. Seaton, K. T. Littlejohn, J. Chartier, G. K. Anumanchipalli, A. Tu-Chan, K. Ganguly, and E. F. Chang. "Generalizable spelling using a speech neuroprosthesis in an individual with severe limb and vocal paralysis". In: *Nature Communications* 13.6510 (Nov. 2022). DOI: 10.1038/s41467-022-33611-3.

Silva, A. B., **J. R. Liu**, L. Zhao, D. F. Levy, T. L. Scott, and E. F. Chang. "A Neurosurgical Functional Dissection of the Middle Precentral Gyrus during Speech Production". In: *Journal of Neuroscience* 42.45 (Nov. 2022), pp. 8416–8426. DOI: 10.1523/JNEUROSCI.1614-22.2022.

Moses*, D. A., S. L. Metzger*, **J. R. Liu***, G. K. Anumanchipalli, J. G. Makin, P. F. Sun, J. Chartier, M. E. Dougherty, P. M. Liu, G. M. Abrams, A. Tu-Chan, K. Ganguly, and E. F. Chang. "Neuroprosthesis for Decoding Speech in a Paralyzed Person with Anarthria". In: *New England Journal of Medicine* 385.3 (July 2021), pp. 217–227. DOI: 10.1056/nejmoa2027540.

Liu, **J. R.** and M. Modo. "Quantification of the Extracellular Matrix Molecule Thrombospondin 1 and Its Pericellular Association in the Brain Using a Semiautomated Computerized Approach". In: *Journal of Histochemistry & Cytochemistry* 66.9 (Apr. 2018), pp. 643–662. DOI: 10.1369/0022155418771677.

Wahlberg, B., H. Ghuman, **J. R. Liu**, and M. Modo. "Ex vivo biomechanical characterization of syringe-needle ejections for intracerebral cell delivery". In: *Scientific Reports* 8.1 (June 2018). DOI: 10.1038/s41598-018-27568-x.

Ghuman, H., M. Gerwig, F. J. Nicholls, **J. R. Liu**, J. Donnelly, S. F. Badylak, and M. Modo. "Long-term retention of ECM hydrogel after implantation into a sub-acute stroke cavity reduces lesion volume". In: *Acta Biomaterialia* 63 (Nov. 2017), pp. 50–63. DOI: 10.1016/j.actbio.2017.09.011.

Nicholls, F. J., **J. R. Liu**, and M. Modo. "A Comparison of Exogenous Labels for the Histological Identification of Transplanted Neural Stem Cells". In: *Cell Transplantation* 26.4 (Apr. 2017), pp. 625–645. DOI: 10.3727/096368916x693680.

Modo, M., T. K. Hitchens, **J. R. Liu**, and R. M. Richardson. "Detection of aberrant hippocampal mossy fiber connections: Ex vivo mesoscale diffusion MRI and microtractography with histological validation in a patient with uncontrolled temporal lobe epilepsy". In: *Human Brain Mapping* 37.2 (Nov. 2015), pp. 780–795. DOI: 10.1002/hbm.23066.

Conference poster presentations

* indicates equal contribution

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The causal role of the middle precentral gyrus in speech-motor sequencing". In: Society for the Neurobiology of Language Annual Meeting. Brisbane, Australia, Oct. 2024.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The causal role of the middle precentral gyrus in speech-motor sequencing". In: Society for Neuroscience Annual Meeting. Chicago, Illinois, Oct. 2024.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The cortical dynamics of planning spoken syllable sequences". In: Society for Neuroscience Annual Meeting. Washington, D.C., Nov. 2023.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The cortical dynamics of planning spoken syllable sequences". In: Society for the Neurobiology of Language Annual Meeting. Marseille, France, Oct. 2023.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The cortical dynamics of planning spoken syllable sequences". In: Boston Speech Motor Control Symposium. Boston, Massachusetts, June 2023.

Liu*, **J. R.**, L. Zhao*, P. W. Hullett, and E. F. Chang. "The cortical dynamics of planning spoken syllable sequences". In: Sensation and Action. Lake Thun, Switzerland, May 2023.

Metzger*, S. L., **J. R. Liu***, D. A. Moses*, M. E. Dougherty, M. P. Seaton, K. T. Littlejohn, J. Chartier, G. K. Anumanchipalli, A. Tu-Chan, K. Ganguly, and E. F. Chang. "A speech neuroprosthesis for generalizable spelling in a person with severe paralysis and anarthria". In: GG14. Society for Neuroscience. San Diego, California, Nov. 2022.

Moses*, D. A., S. L. Metzger*, **J. R. Liu***, G. K. Anumanchipalli, J. G. Makin, P. F. Sun, J. Chartier, M. E. Dougherty, P. M. Liu, G. M. Abrams, A. Tu-Chan, K. Ganguly, and E. F. Chang. "Speech neuroprosthetic technology in a person with severe paralysis and anarthria". In: P558.05. Society for Neuroscience. Nov. 2021.

Invited talks

Liu, **J. R.** *Considerations for personalizing speech and avatar neuroprostheses.* Banff, Canada: 11th International BCI Meeting "Personalization of communication BCIs" Workshop, June 2025.

Liu, **J. R.** *ECoG speech BCIs for streaming synthesis and high fidelity decoding.* Chicago, Illinois: Society for Neuroscience Minisymposium "Speech Neuroprostheses", Oct. 2024.

Liu, **J. R.** *Developing a speech neuroprosthesis for assisted communication.* Stanford University "Modern Ethical Challenges in Neuroscience and Organ Transplantation", May 2022.

Liu, **J. R.** *Developing a speech neuroprosthesis for assisted communication.* University of Minnesota "The Talking Brain", Mar. 2022.

Liu, **J. R.**, D. A. Moses, and S. L. Metzger. *Neuroprosthesis for decoding speech in a paralyzed person with anarthria.* L.A.S.E.R. Talks, Oct. 2021. URL: https://www.youtube.com/watch?v=AwUgTI56BmQ&ab_channel=PieroScaruffi.

Liu, **J. R.**, D. A. Moses, and S. M. Wilson. *Neuroprosthesis for decoding speech in a paralyzed person with anarthria with David Moses and Jessie Liu.* The Language Neuroscience Podcast, Aug. 2021. URL: https://langneurosci.org/podcast/#ep13.