

Shiyu (Steve) Luo

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PROFESSIONAL SUMMARY

PhD biomedical engineer with a focus on applied machine learning for speech brain-computer interface. Background in neural signal processing, deep learning, and human-computer interaction.

EDUCATION

Johns Hopkins University - Ph.D. in Biomedical Engineering, 2026 (expected)

Advisor: Nathan Crone, Secondary advisor: Hynek Hermansky

Johns Hopkins University - M.S.E. in Biomedical Engineering, 2020

Tianjin University - B.Eng. in Biomedical Engineering, 2018 & B.S. in English, 2018

EXPERIENCE

2025	Meta Reality Labs Research Scientist Intern
2019-Present	Johns Hopkins University Crone Lab Graduate Research Assistant
2021-2022	Johns Hopkins University Center for Language and Speech Processing Graduate Research Assistant
2017-2018	Tianjin University Laboratory of Biomedical Flexible Electronics Undergraduate Research Assistant

PROJECTS

Select projects

Online speech decoding and synthesis from intracranial neural signals

Johns Hopkins University

- Engineered deep learning algorithms for the real-time translation of electrocorticography (ECoG) signals from human motor cortex into speech commands
- Developed decoding pipelines that allowed a clinical-trial participant with amyotrophic lateral sclerosis (ALS) to control Internet of Things (IoT) devices using only neural signals associated with silent speech

Signal and performance stability from a chronically implanted brain-computer interface

Johns Hopkins University

- Led projects characterizing long-term signal patterns in chronically implanted ECoG arrays over 2 years
- Designed a speech BCI that achieved 90.59% speech decoding accuracy enabling first-ever 3-month stable BCI control for an ALS participant without recalibration

Other projects

- Intraoperative decoding of speech neural signals from the Layer 7 cortical interface
- Synthesis and classification of syllable-level speech based on ECoG recordings from the epilepsy monitoring units (EMU)
- Spinal cord injury progression characterization through longitudinal somatosensory evoked potential analysis and motor behavioral assessments

PUBLICATIONS

Journal publications

1. Candrea, D. N., Shah, S., **Luo, S.**, Angrick, M., Rabbani, Q., Coogan, C., ... & Crone, N. E. (2024). A click-based electrocorticographic brain-computer interface enables long-term high-performance switch scan spelling. ***Communications medicine***, 4(1), 207.
2. Peterson, V., Vissani, M., **Luo, S.**, Rabbani, Q., Crone, N. E., Bush, A., & Richardson, R. M. (2024). A supervised data-driven spatial filter denoising method for speech artifacts in intracranial electrophysiological recordings. ***Imaging Neuroscience***, 2, 1-22.
3. Wyse-Sookoo, K., **Luo, S.**, Candrea, D., Schippers, A., Tippet, D. C., Wester, B., ... & Crone, N. E. (2024). Stability of ECoG high gamma signals during speech and implications for a speech BCI system in an individual with ALS: a year-long longitudinal study. ***Journal of neural engineering***, 21(4), 046016.
4. Angrick, M., **Luo, S.**, Rabbani, Q., Candrea, D. N., Shah, S., Milsap, G. W., ... & Crone, N. E. (2023). Online speech synthesis using a chronically implanted brain-computer interface in an individual with ALS. ***Scientific reports***, 14(1), 9617.
5. **Luo, S.**, Angrick, M., Coogan, C., Candrea, D. N., Wyse-Sookoo, K., Shah, S., Rabbani, Q., Milsap, G. W., Weiss, A. R., Anderson, W. S., Tippet, D. C., Maragakis, N. J., Clawson, L. L.,

- Vansteensel, M. J., Wester, B. A., Tenore, F. V., Hermansky, H., Fifer, M. S., Ramsey, N. F., & Crone, N. E. (2023). Stable decoding from a speech BCI enables control for an individual with ALS without recalibration for three months. **Advanced Science**, 10(35), 2304853.
6. **Luo, S.**, Rabbani, Q., & Crone, N. E. (2022). Brain-Computer Interface: Applications to Speech Decoding and Synthesis to Augment Communication. **Neurotherapeutics**, 19(1), 263-273.
 7. All, A. H., **Luo, S.**, Liu, X., & Al-Nashash, H. (2021). Effect of thoracic spinal cord injury on forelimb somatosensory evoked potential. **Brain Research Bulletin**, 173, 22-27.
 8. Al-Nashash, H., **Luo, S.**, Liu, X., & All, A. H. (2020). Trading baseline with forelimbs somatosensory evoked potential for longitudinal analysis in thoracic transection spinal cord injury. **Journal of Neuroscience Methods**, 343, 108858.
 9. **Luo, S.**, Xu, H., Zuo, Y., Liu, X., & All, A. H. (2020). A review of functional electrical stimulation treatment in spinal cord injury. **Neuromolecular medicine**, 22(4), 447-463.
 10. All, A. H., Al Nashash, H., Mir, H., **Luo, S.**, & Liu, X. (2020). Characterization of transection spinal cord injuries by monitoring somatosensory evoked potentials and motor behavior. **Brain Research Bulletin**, 156, 150-163.
 11. Li, J., **Luo, S.**, Liu, J., Xu, H., & Huang, X. (2018). Processing Techniques for Bioresorbable Nanoparticles in Fabricating Flexible Conductive Interconnects. **Materials**, 11(7), 1102.

Book chapter

1. Prakash, P. R., **Luo, S.**, Crone, N. E., & Slutzky, M. W. (2025). Restoring communication with speech brain–computer interfaces. In D. Valeriani & T. Vaughan (Eds.), **Neural interfaces** (1st ed., pp. 229-241). Academic Press.

Preprints

1. Chaichanasittikarn, O., Diaz, L., Thomas, N., Candrea, D., **Luo, S.**, Nathan, K., ... & Osborn, L. E. (2025). High-gamma electrocorticography activity represents perceived vibration intensity in human somatosensory cortex. **medRxiv**, 2025-07.
2. **Luo, S.**, Angrick, M., Coogan, C., Candrea, D. N., Wyse-Sookoo, K., Schippers, A., ... & Crone, N. E. (2025). Self-paced silent speech brain-computer interface for device control. **medRxiv**, 2025-04.
3. Angrick, M., **Luo, S.**, Rabbani, Q., Joshi, S., Candrea, D. N., Milsap, G. W., ... & Crone, N. E. (2024). Real-time detection of spoken speech from unlabeled ECoG signals: A pilot study with an ALS participant. **medRxiv**, 2024-09

Conference presentations

1. **Luo, S.**, Angrick, M., Coogan, C., Candrea, D. N., Wyse-Sookoo, K., Schippers, A., Milsap, G. W., Tippet, D. C., Maragakis, N. J., Clawson, L. L., Uchil, A., Vansteensel, M. J., Wester, B. A., Tenore, F. V., Hermansky, H., Fifer, M. S., Ramsey, N. F., & Crone, N. E. (2024). A self-paced speech BCI for device control. *Poster presented at the 53rd Annual Society for Neuroscience Meeting (SfN)*, Chicago, Illinois.
2. **Luo, S.**, Angrick, M., Coogan, C., Candrea, D. N., Wyse-Sookoo, K., Shah, S., Rabbani, Q., Milsap, G. W., Weiss, A. R., Anderson, W. S., Tippet, D. C., Maragakis, N. J., Clawson, L. L., Uchil, A., Vansteensel, M. J., Wester, B. A., Tenore, F. V., Hermansky, H., Fifer, M. S., Ramsey, N. F., & Crone, N. E. (2023). Decoding from a speech BCI enables control for an individual with ALS without recalibration. *Poster presented at the 52nd Annual Society for*

Neuroscience Meeting (SfN), Washington, D.C.

3. **Luo, S.**, Rabbani, Q., Bush, A., Peterson, V., Coogan, C., Angrick, M., Richardson, R.M., Hermansky, H. & Crone, N.E (2022). Towards Online DNN-based Classification of Syllable-level Speech from Sensorimotor Electrocoricography. *Poster presented at the 51st Annual Society for Neuroscience Meeting (SfN)*, San Diego, California.

PEER REVIEW

Ad-hoc journal reviewer

- Cell Reports
- Scientific Reports
- Scientific Data
- Journal of Neural Engineering
- Journal of NeuroEngineering and Rehabilitation
- Disability and Rehabilitation: Assistive Technology
- Journal of Neuroscience Methods
- Speech Communication
- Expert Review of Medical Devices

Conference reviewer

- IEEE Engineering in Medicine and Biology Society (EMBC), 2024-2025
- IEEE EMBS Conference on Neural Engineering (NER), 2025

Poster panel

- NSF Research Experience and Mentoring (REM) Grantees Meeting, 2024, Washington, D.C.

Grant review

- Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grants

TEACHING

Introduction to Data Science (Graduate Level) – Teaching Assistant

Johns Hopkins University - Fall 2023, Spring 2024

Advanced Seminars in Medical Physics (Graduate Level) – Teaching Assistant

Tianjin University - Fall 2017

SERVICE

Brain-Computer Interface Society (BCI Society)

Student and Postdoc Committee Member

Translational Neuroengineering Networks at Johns Hopkins University

Social/Media Chair

Science & Technology Association at School of Precision Instruments, Tianjin University

President

HONORS AND AWARDS

2018 Tianjin University Outstanding Graduate Award

2017 Peiyang Chunhui Scholarship

2017 Tianjin University Merit Student with Honor

2017 Israeli Council for Higher Education Scholarship for Summer Program

2016 National Scholarship (China)

2016 Tianjin University Merit Student with Honor

2015 Tianjin University North America Alumni Association Scholarship

2015 Tianjin University Merit Student with Honor

2014 Xinhudaoda Freshman Scholarship

PROFESSIONAL ASSOCIATIONS

Society for Neuroscience

Brain-Computer Interface (BCI) Society

SKILLS

Programming languages: Python, C++, MATLAB, JavaScript

Deep learning frameworks: PyTorch, Tensorflow

Embedded system design: Arduino, Code Composer Studio

Languages: Mandarin Chinese (Native), English (Full professional)