

Education

The Johns Hopkins University: Ph.D. Candidate (Biomedical Engineering)	Jul. 2020 - Present
The Johns Hopkins University: M.S.E (Biomedical Engineering)	Sep.2018- May 2020
Tianjin University: B.Eng. (Biomedical Engineering) & B.A. (English)	Sep. 2014- Jul. 2018

Relevant Experience

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- In a BCI clinical trial with implanted electrodes, I designed decoding algorithms that translated neural signals into commands that can control devices such as lights and television in real time
 - Responsible for experiment environment setup, user software development, signal processing and

Publications

Journal publications

- 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*.
- 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. [IF: 4.0]
- 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. [IF: 4.6]
- **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. [IF: 15.1]
- **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. [IF: 5.7]
- 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. [IF: 3.8]
- 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. [IF: 3.0]
- **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. [IF: 3.5]
- 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. [IF: 3.8]
- 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. [IF: 3.4]

Preprints

- 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.

- Candrea, D., Shah, S., **Luo, S.**, Angrick, M., Rabbani, Q., ... & Crone, N. E. (2023). A click-based electrocorticographic brain-computer interface enables long-term high-performance switch-scan spelling. *Research Square*. 2023-09.

Conference Presentations

- **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 Meetings, Chicago, Illinois.
- **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 Meetings, Washington, D.C.
- **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 Electrocorticography. Poster presented at the 51st Annual Society for Neuroscience Meetings, San Diego, California.
- Rabbani, Q., **Luo, S.**, Richardson, M., Hermansky, H. & Crone, N.E. (2019). Online DNN-based Synthesis and Recognition of Isolated Syllables in Electrocorticography. Poster presented at the 49th Annual Society for Neuroscience Meetings, Chicago, Illinois.

Research Experience

Online Neural Speech Signal Decoding and Synthesis from Electrocorticography Mar. 2019- Present

Advisor: Dr. Nathan Crone

- Designed a speech BCI that allowed a clinical-trial participant with amyotrophic lateral sclerosis to control home devices and computer applications
- Demonstrated long-term use of electrocorticography (ECoG) signals for brain-computer interface without any decoder retraining or baseline recalibration
- Analyzed the signal and decoding stability of ECoG-based implanted BCI
- Engineered a speech BCI that translated the neural signals during speech into intelligible audio in real time

Secondary advisor: Dr. Hynek Hermansky

- Created a functioning real-time decoding framework based on deep neural networks to synthesize speech from ECoG signal via perceptual linear prediction features
- Designed a Python-based multiprocessing online system encompassing a data receiver, a speech decoding and synthesizing system, and an audio player for simultaneous processing of neural and audio data

Somatosensory Evoked Potential (SSEP) in Spinal Cord Injury (SCI) Monitoring Sep. 2018- Mar. 2019

Advisor: Dr. Angelo All

- Analyzed the correlation between SSEP, injury severity and time for different rodent SCI models
- Demonstrated the validity of adopting SSEP as a continuous monitoring alternative in post-SCI monitoring

Electrochemical Sintering of Bioresorbable Nanoparticles for Flexible Sensors

Oct. 2017- Jun. 2018

Advisor: Dr. Xian Huang

- Developed a novel conductive bioresorbable Zn nanoparticle ink formula applicable for screen printing
- Established a stable and consistent approach to sinter Zn nanoparticles with improved conductivity

Professional Associations

- Society for Neuroscience 2019, 2021-Present
- BCI Society 2024

Review Activities

- Reviewer for Cell Reports, Scientific Reports, Speech Communication, Journal of NeuroEngineering and Rehabilitation, Journal of Neuroscience Methods, Disability and Rehabilitation: Assistive Technology
- Poster judge for NSF Research Experience and Mentoring (REM) Grantees Meeting, 2024, Washington, D.C.

Honors and Awards

Tianjin University Outstanding Graduate Award	Jun. 2018
Peiyang Chunhui Scholarship	Oct. 2017
Tianjin University Merit Student with Honor	Oct. 2017
Israeli Council for Higher Education Scholarship for Summer Program	Jun. 2017
National Scholarship	Oct. 2016
Tianjin University Merit Student with Honor	Oct. 2016
Tianjin University North America Alumni Association Scholarship	Oct. 2015
Tianjin University Merit Student with Honor	Oct. 2015
Xinhudaoda Freshman Scholarship	Sep. 2014

Teaching & Leadership Experience

Teaching Assistant, Introduction to Data Science (Graduate Level), Johns Hopkins University

Teaching Assistant, Advanced Seminars in Medical Physics (Graduate Level), Tianjin University

- Assisted for the lectures, exams and logistics of the course held jointly by Tianjin University, University of Wisconsin–Madison and National Health Commission of China

Social/Media Chair, Translational Neuroengineering Networks, Johns Hopkins University

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

- Led more than 100 association members in organizing sci-tech contests and promoting research participation.

Councilor, Science & Technology Association, Tianjin University

- Served on the 15-member council planning and promoting undergraduate scientific participation
- Coordinated cross-school science participation

Skills

- Programming languages: Python, MATLAB, C++, R, LabVIEW
- Embedded system design: Arduino, Code Composer Studio
- Deep learning frameworks: Pytorch, Tensorflow
- Languages: Mandarin Chinese (Native), English (Full professional), German (Basic)