Scott Ensel

Ph.D. - Postdoctoral Researcher

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Biomedical engineering PhD with 8+ years of experience in medical devices, sensorimotor control, neuromodulation, fMRI, and machine learning based neural decoding across human and non-human primate research. Leads first-in-human spinal cord stimulation clinical trials to restore movement after neurodegenerative diseases and stroke and contributed to multiple high-impact publications. Proven ability to collect and analyze behavioral and electrophysiological data, interface with clinical surgeons, researchers, and collaborate cross-functionally. An experienced scientific communicator with multiple conference presentations. Driven to translate complex neuroscience into practical, user-centered technologies that improve quality of life.

EDUCATION

University of Pittsburgh — Pittsburgh, PA
Ph.D. Student – Bioengineering (Neural Engineering) — 2020 - 2025

University of Michigan — Ann Arbor, MI
M.S in Electrical & Computer Engineering (Signal and Image Processing and Machine Learning) — 2017 - 2019
M.S in Biomedical Engineering (Bioelectric and Neural Engineering) — 2017 - 2019

University of Maryland — College Park, MD
B.S in Bioengineering — 2013 - 2017

RESEARCH EXPERIENCE

Rehabilitation and Neural Engineering Laboratory — Pittsburgh, PA
Postdoctoral Researcher — October 2025 - Present
Project: "Targeted deep brain stimulation of the motor thalamus improves speech and swallowing motor functions after cerebral lesions"

- Piloted execution of a clinical trial using deep brain stimulation in three stroke participants to restore speech, swallowing, and movement

Rehabilitation and Neural Engineering Laboratory — Pittsburgh, PA
Doctoral Researcher — September 2020 - September 2025
Project: "Decoding Spinal Cord Function: Capturing Altered Motor Functional Connectivity Through fMRI Biomarkers in Neurological Disorders"

- Piloted design and execution of first in-human study using spinal cord stimulation to reverse maladaptive motor and neurodegenerative effects in six spinal muscular atrophy (SMA) participants, quantified through clinical exams, kinematics, electrophysiological, and neuroimaging analyses
- Lead and designed imaging data collection pipeline for a pilot clinical trial of spinal cord stimulation in eight participants with stroke to regain motor function of upper limbs using spinal cord stimulation
- Created a novel cortico-spinal fMRI sequence for single subject assessment to sense and characterize novel biomarkers of functional brain changes in neurological disorders

Cortical Neural Prosthetics Laboratory — Ann Arbor, MI
Research Assistant — September 2018 - July 2020

- Implemented a real-time convolutional neural network in PyTorch to decode continuous individual finger positions from non-human primate neural spiking data that achieved a 36% increase in throughput over ReFIT Kalman Filter
- Implemented a real-time neural network in PyTorch to classify hand movement and then decode individual finger position from regenerative peripheral nerve interfaces in upper-limb amputees to control myoelectric prosthetic
- Designed a computer network and built computer hardware that integrated into current data collection pipeline to optimize neural network decoder development

Children's National Health System - Sheikh Zayed Institute — Washington D.C
Research Intern — June 2016 - June 2017

- Lead collection and segmentation of radiology data in preparation for multiple research projects that applied machine learning to achieve pediatric surgical innovation

WORK EXPERIENCE

Terumo Heart, Inc – Optical Engineering Team — Ann Arbor, Michigan
Optical Engineering Intern — May 2018 - January 2019

- Created a functional pipeline integrating advanced image segmentation techniques to automate testing of OCT and IVUS catheter imaging performance across thirteen metrics

RELEVANT SKILLS

BCI | SCS | DBS | Neuromodulation | Medical Devices | Electrophysiology | Electromyography | Biosensors | Kinematic & Neural Analysis | Non-human primate training and neural recordings | Clinical human-subject research (Stroke, SMA, SCI) | Experimental Design | Cross-disciplinary collaboration | User-Centered Research | Adobe Illustrator | Microsoft Office (Word, Excel) | Technical Writing | Grant Writing | Oral presentations

TECHNICAL SKILLS

Python (PyTorch, scikit-learn) | MATLAB | Bash Scripting | Julia | R | Machine Learning | Statistics | Signal and Image Processing | fMRI | FSL | Spinal Cord Toolbox

JOURNAL ARTICLES

Brain - 2025
Simon, C. *et al.* Proprioceptive synaptic dysfunction is a key feature in mice and humans with spinal muscular atrophy, *Brain*, 2025, https://doi.org/10.1093/brain/awaf074

Nature Medicine - 2025
Prat-Ortega, G., Ensel, S., Donadio, S. *et al.* "First-in-human study of epidural spinal cord stimulation in individuals with spinal muscular atrophy". *Nat Med* (2025). https://doi.org/10.1038/s41591-024-03484-8

Neuron - 2025
Balaguer, J. et al., Neural mechanisms underlying the recovery of voluntary control of motoneurons after paralysis with spinal cord stimulation, Neuron, (2025)

Communications Biology- 2024
Ensel, S., Uhrig, L., Ozkirli, A. et al. Transient brain activity dynamics discriminate levels of consciousness during anesthesia. Commun Biol 7, 716 (2024).

Nature Medicine - 2023
Powell, M., Verma, N., Sorensen, E., **Carranza, E.**, Boos, A., Fields, D., Roy, S., Ensel, S., Barra, B., Balzer, J., Goldsmith, J., Friedlander, R., Wittenberg, G., Fisher, L., Krakauer, J., Gerszten, P., Pirondini, E., Weber, D. and Capogrosso, M. "Epidural stimulation of the cervical spinal cord for post-stroke upper-limb paresis. Nature Medicine 29, 689-699 (2023). https://doi.org/10.1038/s41591- 022-02202-6

Nature Communications - 2022
Willsey, M.S., Nason-Tomaszewski, S.R., Ensel, S.R. et al. Real-time brain-machine interface in non-human primates achieves high-velocity prosthetic finger movements using a shallow feedforward neural network decoder. Nat Commun 13, 6899 (2022).

IEEE Transactions on Medical Imaging - 2018
A. R. Porras et al., "Locally Affine Diffeomorphic Surface Registration and Its Application to Surgical Planning of Fronto-Orbital Advancement," in IEEE Transactions on Medical Imaging, vol. 37, no. 7, pp. 1690-1700, July 2018.

CONFERENCE PRESENTATIONS

Organization for Human Brain Mapping, Seoul, South Korea, June 2024
Lumbar Spine fMRI to Quantify Efficacy of Spinal Cord Stimulation Therapy in Spinal Muscular Atrophy, Ensel, S., et al

Organization for Human Brain Mapping, Montreal, Canada, July 2023
Signature of Consciousness in the Transient Dynamics of fMRI Brain Activity, Ensel, S., et al

University of Pittsburgh BIOE day Spotlight Presentation, Pittsburgh, PA, 2022
Resting State Dynamics as a Cortical Signature of Consciousness, Ensel, S., et al

HONORS AND AWARDS

CMU-Pitt BRIDGE Center seed funding • 2025
Awarded to conduct a collaborative research project at BRIDGE Center.
Decoding Spinal Cord Function: Advancing Clinical Impact through fMRI Biomarkers in Neurological Disorders

Big Idea Competition • 2025
Awarded third place prize to support student driven innovation
Lexi Medical is developing a novel deep brain stimulation (DBS) system to restore swallowing to individuals with post-stroke muscle weakness or paralysis.

CMU-Pitt BRIDGE Center seed funding • 2024
Awarded to conduct a collaborative research project at BRIDGE Center.
Decoding Spinal Cord Function: Advancing Clinical Impact through fMRI Biomarkers in Neurological Disorders

SCIENTIFIC SERVICE

Reviewed for APL Bioengineering 2025

Reviewed for IEEE Transactions on Neural Systems and Rehabilitations Engineering 2025

Reviewed for Journal of Neural Engineering and Rehabilitation 2024

PROFESSIONAL DEVELOPMENT

2025 Neurotech Course Workshop

TEACHING

University of Pittsburgh – Spring 2022
BIOENG 1580: Biomedical Applications of Signal Processing

University of Pittsburgh – Fall 2021
BIOENG 2167: Managing Medical Product Innovation

University of Michigan – Fall 2018
ASTRO 142: Big Bang, Fall 2018

University of Maryland – Fall 2017
BIOE 437 (Formerly BIOE 698V): Computer-Aided Design in Bioengineering

University of Maryland – Fall 2015
CHEM 132 General Chemistry I Laboratory