Brandon M. Ruszala, Ph.D**.**

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| CURRENT POSITION |
| Postdoctoral Research Scientist studying Brain-Machine Interfacing in Human Participants 2024 – Present  California Institute of Technology (Caltech), Dept. of Biology and Biological Engineering  Principal Investigator: Dr. Richard Andersen     * Scientific goals are increasing sophistication of feedback that can be delivered to the brain with electrical stimulation and characterize functional connectivity of fronto-parietal cortical networks for improving control of brain-machine interfaces. * First to discover multiple cortical regions in which stimulation can be appreciated. * Quantified neural modulation time-locked to stimulation pulses and modeled time-varying properties of the modulation. * Developed signal processing pipeline that improved extraction of neuron spikes from neural recordings by 6x on average. * Managed human clinical trial by supervising stimulation safety protocols, experimental design, and mentoring students. |
| EDUCATION |
| University of Rochester (UR) Hajim School of Engineering and Applied Sciences 2019 –2024  Ph.D. | Doctor of Philosophy in Biomedical Engineering (May 2024)  M.S. | Master of Science in Biomedical Engineering (Jan 2021)  GPA of 3.97/4.0  SUNY University at Buffalo (UB) School of Engineering and Applied Sciences 2015 – 2019  B.S. | Bachelor of Science in Biomedical Engineering (May 2019)  Honors College and Tau Beta Pi Engineering Honors Society  GPA: 3.96/4.0  University of Technology of Troyes (Troyes, France) 2016  Engineering Study Abroad Program  GPA: 3.85/4.0 |
| RESEARCH and ENGINEERING EXPERIENCE |
| Interfacing with the Cortical Reach-to-Grasp Network using Low-Amplitude Intracortical Microstimulation 2020 – 2024  University of Rochester, Dept. of Biomedical Engineering  Principal Investigator: Dr. Marc H. Schieber   * Implanted several rhesus monkeys with up to 512 neural electrodes in 8 different cortical areas per subject. * Discovered novel cortical regions in which intracortical microstimulation can, or cannot, be used to deliver information. * Revealed that low-amplitude stimulation in one cortical region can substantially modulate neurons in many distant regions. * Leveraged probabilistic modeling and machine learning to characterize the effects of cortical stimulation on single neurons. * Designed experiments successfully funded by the NIH Ruth L. Kirschstein Predoctoral Fellowship (F31, 17th percentile).   Predicting EEG responses to audio-speech waveforms via machine learning2020  University of Rochester, Dept. of Biomedical Engineering  Principal Investigator: Dr. Ross Maddox   * Programmed deep neural nets using Tensorflow (Python) for predicting EEG responses to audio-speech waveforms. * Predicted multiple hallmark components of the auditory brainstem response to sound impulses with those models.   Understanding neural representations of working memory and motion discrimination in the cortical visual system2019  University of Rochester, Dept. of Biomedical Engineering  Principal Investigator: Dr. Tatiana Pasternak   * Revealed that direction-selective neurons in the middle temporal area show lower trial-to-trial variability in their firing rates. * Showed that in the visual system, trial-to-trial variability is important for encoding information about motion processing.   Building a Pipeline to Model Electric Field Distribution during Non-invasive Cerebellar Stimulation2019  University at Buffalo, Dept. of Biomedical Engineering  Principal Investigator: Dr. Anirban Dutta   * Simulated electric fields produced by various stimulation montages, showing each targeted unique cerebellar lobules. * Integrated existing toolboxes and other software in MATLAB to simulate cerebellar transcranial direct current stimulation. * Presented podium talk and poster at International Conference on Rehabilitation Robotics (ICORR) in Toronto, CA.   UB | Generating Hydrogen Peroxide (HP) on Orthopedic Implant Biomaterials to Combat Biofilm Growth 2017 – 2019  University at Buffalo, Dept. of Biomedical Engineering  Principal Investigator: Dr. Mark Ehresnberger   * Improved sensitivity of microelectrodes for detecting hydrogen peroxide by 10x, from 10 µM to 1 micromolar changes. * Designed new microelectrode fabrication procedure that improved electrode durability (needed to replace them ~15x less). * Converted microelectrode to be biocompatible for in-vivo experimentation while preserving improved sensitivity. * Characterized redox chemistry of orthopedic-implant alloys to identify stimulation parameters that will produce HP.   UB | Analyzing EEG-NIRS Data for Developing an Autoregressive Transfer Function Model 2017 – 2018  University at Buffalo, Dept. of Biomedical Engineering  Principal Investigator: Dr. Anirban Dutta   * Analyzed auto- and cross-correlations of joint EEG/NIRS imaging to troubleshoot the autoregressive model. * Identified persistent noise in NIRS dataset hindering model performance. |
| **PUBLICATIONS** |
| 1. **B.M. Ruszala** and M.H. Schieber, *Injecting information in the cortical reach-to-grasp network is effective in ventral but not dorsal nodes,* Cell Reports (2025). 2. **B.M. Ruszala,** K.A. Mazurek,and M.H. Schieber, *Disentangling indirect versus direct effects of somatosensory cortex microstimulation on neurons in primary motor and ventral premotor cortex.* J. Neural Engineering (2025). 3. **B.M. Ruszala,** K.A. Mazurek,and M.H. Schieber, *Somatosensory cortex microstimulation modulates primary motor and ventral premotor cortex neurons with extensive spatial convergence and divergence.* bioRxiv (2023). 4. **B.M. Ruszala** and M.H. Schieber, *The effects of low-amplitude intracortical microstimulation in one cortical area don’t stay in that cortical area.* (In Prep). 5. Clark, C.M., **B.M. Ruszala**, et al., *Electrochemical generation of hydrogen peroxide during cathodic polarization of metallic orthopedic biomaterials,* Journal of Applied Electrochemistry (2023) **53**(6): 1147-1156. 6. Clark, C.M., **B.M. Ruszala**, and M.T. Ehrensberger, *Development of durable microelectrodes for the detection of hydrogen peroxide and pH.* Medical Devices & Sensors (2020). **3**(5): p. e10074. 7. Rezaee, Z., **B. Ruszala,** and A. Dutta, *A computational pipeline to find lobule-specific electric field distribution during non-invasive cerebellar stimulation*, Abstract: p. 1191-1196, IEEE Conference on Rehabilitation Robotics (2019), Toronto, ON, Canada. |
| FELLOWSHIPS and AWARDS |
| F31: National Institutes of Health Ruth L. Kirschstein Predoctoral Fellow 2022 – 2024  Award: $130,000  University of Rochester 3-Minute Thesis Competition 2023  Finalist (in top 3)  University of Rochester Graduate Research Symposium 2022  1st Place for Best Research and Poster  University at Buffalo Provost Scholarship 2015 – 2019  Award: $20,000  New York State STEM Scholarship 2015 – 2019  Award: $26,000  Tau Beta Pi Honor’s Society Scholarship 2018 – 2019  Award: $2,000  University at Buffalo Grace W. Capen Memorial Academic Award 2018  Award: $500  University at Buffalo Melvin H. Baker Scholarship Fund 2017 – 2018  Award: $4,000  University at Buffalo William, Frances and Marion Tallman Scholarship Fund 2017  Award: $1,000  University at Buffalo Jack and Barbara Davis Scholarship 2016 – 2017  Award: $4,000  James E. Casey Scholarship 2015  Award: $2,000  UFCW Local District Union Scholarship 2015  Award: $2,000 |
| **PRESENTATIONS** |
| Talks Invitation: Polonium Foundation Neuroscience MeetUp at MIT (Boston, MA, United Staes) 2025  International Conference on Rehabilitation Robotics (Toronto, ON, Canada) 2019 Posters Human Single Neuron (Pasadena, CA, Unites States) 2025  Society for Neuroscience x2 Posters (San Diego, CA, United States) 2025  BRIDGE Stimulation Workship (Pittsburgh, PA, United States) 2025  Neural Control of Movement (Dubrovnik, Croatia) 2024  Society for Neuroscience (Chicago, IL, United States) 2024  Neural Control of Movement (Victoria, BC, Canada) 2023  Society for Neuroscience x2 Posters (Washington DC, United States) 2023  Society for Neuroscience (San Diego, CA, United States) 2022  Biomedical Engineering Society (Atlanta, GA, United States) 2018 |
| **TEACHING and MENTORING EXPERIENCE** |
| Teaching Assistant for Introduction to Neuroengineering (BME 418) University of Rochester, Dept. of Biomedical Engineering   * Taught course materials in office hours, graded assignments, and assisted with managing course schedule * Assisted with labs including single-unit recordings of cricket auditory nerve fibers and coding Hodkin-Huxley model  Teaching Assistant for Biosystems and Circuits (BME 210) University of Rochester, Dept. of Biomedical Engineering   * Taught course materials in office hours, graded assignments, and assisted with managing course schedule. * Assisted with labs including breadboarding practices and custom circuit design.  Fellowship Writing Club Mentor (University of Rochester)  * Mentored 20 graduate students preparing NIH F31 Predoctoral Fellowship applications on a weekly basis.  Research Mentor, New York State Academic Science and Technology Entry Program (Strong Memorial Hospital)  * Mentored underrepresented high school students on formulating and answering STEM research questions. |