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

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| CURRENT POSITION |
| Postdoctoral Research Scientist studying Brain-Machine Interfacing in Human Participants since 2024  California Institute of Technology (Caltech), Dept. of Biology and Biological Engineering  Principal Investigator: Dr. Richard Andersen     * Scientific goals: increasing sophistication of feedback that can be delivered to the brain with electrical stimulation and characterizing 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 600%. * Human clinical trial responsibilities: maintenance of stimulation safety protocols, experimental design, mentoring students.   This work has resulted in two first-author manuscripts in preparation, one invited talk (Neuroscience MeetUp at MIT) and three conference posters. |
| 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  **Dissertation:** Interfacing with the Cortical Reach-To-Grasp Network using Low-Amplitude Intracortical Microstimulation  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 where intracortical microstimulation can, or cannot, be used to deliver information. * Revealed that low-amplitude stimulation in one cortical region powerfully modulates neurons in distant cortical regions. * Leveraged probabilistic modeling and machine learning to characterize the effects of cortical stimulation on single neurons. * Awarded the National Institutes of Health Ruth L. Kirschstein Predoctoral Fellowship (F31, 17th percentile).   This work resulted in two first-author publications (1, 2 in publications section) plus an additional third in preparation (3). Funded by ….  Predicting EEG responses to audio-speech waveforms via machine learning2020  University of Rochester, Dept. of Biomedical Engineering  Principal Investigator: Dr. Ross Maddox   * Programmed a deep neural net using Tensorflow (Python) that predicted EEG responses from EEG audio-speech waveforms.   Understanding neural representations of working memory via moving-dot stimuli2019  University of Rochester, Dept. of Biomedical Engineering  Principal Investigator: Dr. Tatiana Pasternak   * Identified neural processing in the middle temporal area may be critical in committing moving-dot stimuli to memory.   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   * Integrated existing toolboxes and other software in MATLAB to simulate cerebellar transcranial direct current stimulation. * Simulated electric fields produced by various stimulation montages, showing each targeted unique cerebellar lobules. * Presented podium talk and poster at International Conference on Rehabilitation Robotics (ICORR) in Toronto, CA.   This work led to  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.   This work resulted in  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 (in MATLAB). * 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 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 |
| **LEADERSHIP and OUTREACH** |
| Fellowship Writing Club Mentor (University of Rochester)  * Mentored 20 graduate students preparing to submit applications for the NIH F31 Predoctoral Fellowship.  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  Teaching Assistant for Intro to Neuroengineering Course and Biosystems and Circuits Course (University of Rochester)  * Taught course materials in office hours, graded assignments, and assisted with managing course schedule and labs |
| **HONORS and AWARDS** |
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