

RESEARCH EXPERIENCE

- 2019-present **Postdoctoral Associate** | University of Pittsburgh
Aaron Batista Lab
- Studying the neural basis of skilled, feedback-driven movement
 - Analyzed behavioral data and neural data from monkey motor cortex as they performed a virtual pole-balancing task
 - Developed experimental plan to study neural activity in monkeys as they perform a task to move a virtual cup of coffee (postponed due to pandemic-related delays)
- 2012-2019 **PhD student** | Northwestern University
Lee Miller Limb Lab
- Performed experiments to study how the neural activity in the brains of monkeys processes proprioception (the sense of body movement) during reaching
 - Developed and used a motion capture system along with a musculoskeletal model to estimate monkeys' arm muscle lengths while reaching
 - Surgically implanted and analyzed data from intramuscular electromyogram (EMG) electrodes in monkeys' arm muscles during reaching behaviors
- 2011-2012 **Research intern** | University of Illinois at Urbana-Champaign
Prashant Mehta Research Group
- Worked on implementation of novel Feedback Particle Filter, a neural network-like filter for use in estimating quantities given noisy measurements
- 2010-2011 **Undergraduate researcher** | University of Illinois at Urbana-Champaign
Todd Coleman Research Group
- Developed techniques to improve quality of electroencephalography (EEG) recording
 - Developed applications for novel epidermal electronic tattoos, including subvocal speech recognition using throat electromyography (EMG) (in collaboration with John Rogers Research Group)

EDUCATION

- 2019 **PhD** | Biomedical Engineering | Northwestern University
Advised by Prof. Lee E. Miller
Dissertation: *The contribution of whole-limb kinematics to proprioceptive representations in the central nervous system*
- 2018 **MS** | Biomedical Engineering | Northwestern University
- 2011 **BS** | Electrical Engineering | University of Illinois at Urbana-Champaign (GPA 3.91)

SKILLS

- Areas of expertise Experimental design, data collection, data analysis/modeling, machine learning, linear algebra, statistics, technical writing
- Programming languages MATLAB, C/C++, Python
- General tools Linux (Arch, Debian, Ubuntu), version control systems (git, subversion, mercurial), figure design software (Adobe Illustrator)

LEAD AUTHOR PUBLICATIONS

Chowdhury, R. H., Glaser, J. I., & Miller, L. E. (2020). Area 2 of primary somatosensory cortex encodes kinematics of the whole arm. *eLife*, 9; DOI: [10.7554/elife.48198](https://doi.org/10.7554/elife.48198)

Scientific contribution: showed how the neural activity in an area of the brain in monkeys represents feedback about arm movement during reaching and passive perturbations

Author contribution: Experimental design, data collection (neural data, motion capture), data analysis (signal processing, musculoskeletal modeling, fitting models of neural activity to behavior), writing and editing manuscript.

Chowdhury, R. H., Tresch, M. C., & Miller, L. E. (2017). Musculoskeletal geometry accounts for apparent endpoint representation in dorsal spinocerebellar tract. *Journal of Neurophysiology* Apr 2017, jn.00695.2016; DOI: [10.1152/jn.00695.2016](https://doi.org/10.1152/jn.00695.2016)

Scientific contribution: Used computational model simulation to show that some key results from a classic spinal cord study were a direct consequence of muscle arrangement.

Author contribution: Computational modeling, data analysis, writing and editing manuscript.

SELECTED COLLABORATIVE PUBLICATIONS

4 of 16 since 2009

Pei, F., Ye, J., Zoltowski, D., Wu, A., **Chowdhury, R. H.**, Sohn, H., O'Doherty, J. E., Shenoy, K. V., Kaufman, M. T., Churchland, M., Jazayeri, M., Miller, L. E., Pillow, J., Park, I. M., Dyer, E. L. & Pandarinath, C. (2022). Neural Latents Benchmark '21: Evaluating latent variable models of neural population activity. *arXiv*. DOI: [10.48550/arXiv.2109.04463](https://doi.org/10.48550/arXiv.2109.04463)

Scientific contribution: Introduced a Kaggle-style competition to develop computational models and improve the understanding of neural signals from various areas of the brain.

Author contribution: Data collection, planning, and editing manuscript.

Keshtkaran, M. R., Sedler, A. R., **Chowdhury, R. H.**, Tandon, R., Basrai, D., Nguyen, S. L., Sohn, H., Jazayeri, M., Miller, L. E. & Pandarinath, C. (2021). A large-scale neural network training framework for generalized estimation of single-trial population dynamics *bioRxiv*. DOI: [10.1101/2021.01.13.426570](https://doi.org/10.1101/2021.01.13.426570)

Scientific contribution: Introduced an improvement over the state-of-the-art modeling technique for neural data, allowing for application to a wide variety of brain regions.

Author contribution: Data collection, data analysis, writing and editing manuscript.

Gallego, J. A., Perich, M. G., **Chowdhury, R. H.**, Solla, S. A., Miller, L. E. (2020). Long-term stability of cortical population dynamics underlying consistent behavior. *Nature Neuroscience*, 23, 260-270; DOI: [10.1038/s41593-019-0555-4](https://doi.org/10.1038/s41593-019-0555-4)

Scientific contribution: Showed a stability in the neural activity of several brain regions over a period of months to years that may be related to consistently executed behaviors.

Author contribution: Data collection, writing and editing manuscript.

Glaser, J. I., **Chowdhury, R. H.**, Perich, M. G., Miller, L. E. & Kording, K. P. (2017). Machine learning for neural decoding. *arXiv*. DOI: [10.48550/arXiv.1708.00909](https://doi.org/10.48550/arXiv.1708.00909)

Scientific contribution: Compared state-of-the-art to classical machine learning in their application to modeling the relationship between neural activity and behavior.

Author contribution: Data collection and editing manuscript.

SCIENCE COMMUNICATION

Chowdhury, RH. "Our hidden sixth sense." Presented at *Seven Minutes of Science*, March 2017. <https://www.youtube.com/watch?v=mBa2i6-h9IU>

Chowdhury, RH. "Nature's Mysteries: the sixth sense that coordinates our movements." *Helix Magazine* Jan 2017. <https://www.helix.northwestern.edu/2017/01/25/natures-mysteries-the-sixth-sense-that-coordinates-our-movements/>