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Ross Lawrence

Data Scientist

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Education

Master of Science in Biomedical Engineering, *Johns Hopkins University* Dec 2021
Biomedical Data Science Concentration
Bachelor of Science in BioEngineering, *University of Pittsburgh* Apr 2017
Major: BioEngineering with a Biomechanics Concentration
Minor: Mechanical Engineering

Skills

Programming	Python, MATLAB, Docker, R, aws, Swift, GitHub, git, LaTeX, HTML, C#
ML Techniques	Neural Networks (CNN, MLP, RBF, MNN), Deep Learning, Decision Trees, SVM
Technical Skills	Philips 3T MRI, Phasespace Motion Capture, Light Microscopy Imaging, Cell Culture, Mouse dissection, Mouse and Macaque handling, Cryo-sectioning, Histology

Technical Experience

Research/Teaching Assistant **Jul 2019 — Jan 2022**
Joshua Vogelstein, PhD *Johns Hopkins University*

- Led the development of m2g, an open-source python-based diffusion and functional MRI analysis pipeline designed to generate structural and functional connectomes. First author on corresponding manuscript currently under review.
- Developed and maintained the neuroparc repository, an open-source centralized collection of brain parcellation files. First author on the published manuscript.
- Mentored and supervised Johns Hopkins Biomedical Engineering students as a Teaching Assistant for NeuroData Design I & II. Oversaw student projects related to MRI and medical image analysis.
- Collaborated with DIPY group to add functionality from m2g into their open-source, dMRI analysis library
- Assisted in development of dMRIPrep through my attendance at a coding "sprint" event

Research Assistant **Jan 2019 — Dec 2022**
Barry Gordon, MD, PhD *Johns Hopkins University*

- Researched physiological responses (heart rate, PNS, verbal) to changes in affect in adults with ASD-3
- Developed custom iOS and Windows apps for the collection of heart rate and ECG data transmitted through Bluetooth from a Polar H10 device
- Maintained and modified technology used for data collection, including the software present on both iPhones and Polar H10, as well as the Physio16 hardware
- Created software using both MATLAB and Python which performed frequency and time domain analyses on collected physiological signals
- Provided instruction to peers on software and hardware including the creation of written guides/videos

Research Assistant **Feb 2018 — Jul 2019**
Xioaqian Chai, PhD *Johns Hopkins University*

- Researched the effect of self-referential encoding on long term memory in children. First author on published manuscript.
- Conducted testing of research subjects aged 5-40 years old, and was responsible for recruitment, screening, and payment of participants
- Programmed stimulus presentation software compatible with Philips 3T MRI machine, as well as software to analyze behavioral data using common statistical measurements
- Created protocols for researcher-participant interaction, data organization, and analysis. This included the creation of IRB-approved practice material
- Received certification to run a Philips 3T MRI machine with child and adult participants

Student Researcher **May 2016 — Aug 2017**
Omar A. Gharbawie, PhD *Center for Neural Basis of Cognition*

- Provided technical support for research that studied the relationships between premotor cortex stimulation and fine hand movement
- Improved upon existing neural image analysis software by streamlining the user interface, reworking statistical calculation, and better organizing results
- Implemented a *PhaseSpace* motion capture system using self-made protocols and customized software to convert captured data into meaningful anatomical relationships
- Assisted in the handling of macaque monkeys during training and motion capture data collections

Student Researcher/Project Co-Leader **Jan 2015 — May 2016**
Fabrisia Ambrosio, PhD *McGowan Institute for Regenerative Medicine*

Collagen Production in Response to Injury *Jan 2016 — May 2016*
- Studied the effect of injury on collagen production in mouse bicep tissue after an acute injury
- Oversaw the injury, dissection, and histology of mouse skeletal-muscle for collagen production
- Trained several colleagues on histology and use of specialized equipment and image analysis programs

Effect of Arsenic Exposure on Damaged Muscle Regeneration *Nov 2015 — May 2016*
- Researched the effect of arsenic exposure on mouse bicep regeneration after an acute injury
- Performed sectioning histology, and light microscopy-based imaging on muscle tissue
- Analyzed images to identify myofiber surface area and nuclei location as a metric for regeneration
- Trained M.S. students on cryo-sectioning and histology of frozen muscle tissue

Rehabilitation of Damaged Muscle Treated with Stem Cells *Jan 2015 — Dec 2015*
- Injected LacZ transfect muscle stem cells into the T.A. of control and injured mice to monitor response
- Used specialized equipment for mouse training, dissection, and histology of harvested muscle samples
- Imaged sectioned muscles using light microscopy and analyzed images for nuclei location and myofiber cross-sectional area and quantity
- Optimized existing mice muscle cryo-sectioning protocols by improving physical technique and acceptable cryo-sectioning settings Developed image analysis protocol and custom analysis programs using python and ITK toolkit

Publications

Peer-Reviewed

[1] Ross Lawrence and Xiaoqian J. Chai. "Self-referential encoding of source information in recollection memory". In: *PLOS ONE* 16.4 (Apr. 2021), pp. 1–15. DOI: 10.1371/journal.pone.0248044. URL: https://doi.org/10.1371/journal.pone.0248044.

[2] Ross Lawrence et al. "Standardizing human brain parcellations". In: *Scientific Data* 9 (1 Mar. 2021). DOI: 10.1038/s41597-021-00849-3.

[3] Stefano Lai et al. "A Murine Model of Robotic Training to Evaluate Skeletal Muscle Recovery after Injury". In: *Medicine Science in Sports Exercise* 49 (4 Apr. 2017). DOI: 10.1249/MSS.0000000000001160. URL: https://journals.lww.com/acsm-msse/Fulltext/2017/04000/A_Murine_Model_of_Robotic_Training_to_Evaluate.26.aspx.

Submitted/Under Review

[1] Eric W. Bridgeford et al. "Batch Effects are Causal Effects: Applications in Human Connectomics". In: *bioRxiv* (2021). DOI: 10.1101/2021.09.03.458920. URL: https://www.biorxiv.org/content/early/2021/09/06/2021.09.03.458920.

[2] Ross Lawrence et al. "A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis". In: *bioRxiv* (2021). Ed. by Jeffrey S. Anderson et al. DOI: 10.1101/2021.11.01.466686. URL: https://www.biorxiv.org/content/early/2021/11/03/2021.11.01.466686.

Coding Projects and Contributions

neuroparc **May 2020 – Present**
- Created protocols for adding new parcellation files to the repository
- Coordinated with other teams whose software depended on neuroparc about potential improvements
- Addressed bugs related to file distribution and open access

m2g **Aug 2019 — Present**
- Led development in adding fMRI support to an originally dMRI-only pipeline
- Contributed to documentation of the pipeline and creation of tutorials
- Addressed bugs that resulted from edge-case parameters and input data

dipy **Dec 2019 — Mar 2020**
- Added functionality which allowed dMRI streamlines to register intersections with multiple ROI's
- Updated internal quality assurance testing on generated connectomes

Product Development

Catheter Injection Port Lock **Aug 2016 — Apr 2017**
- Developed and tested a catheter injection port lock designed to prohibit patient tampering
- Followed DHF documentation specified by FDA Regulation 21 CFR 820.30. including the creation of verification and validation protocols
- Won second place among fellow senior Bioengineers at the University of Pittsburgh's Design Expo

Engineering Application for Society **Jan 2014 – Apr 2014**
- Created and interactive inventory database for the staff of the West Pennsylvania School for Blind Children using HTML and Microsoft SQL