Douglas R. Ollerenshaw, Ph.D.

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Summary

I'm a versatile computational scientist and data expert with extensive experience solving complex problems at the interface of life sciences, engineering and computer science. My background spans neuroscience, engineering, data science, and software development, leveraging advanced methods in machine learning, data analysis, and experimental techniques. I'm proficient in Python, scientific computing, and experimental design with a strong background in signal processing and modern data analysis and visualization tools. I thrive in multidisciplinary teams, collaborating with other hardware, ML, and data experts to drive projects from concept to completion, including product development in fast-paced startup environments. With a focus on leadership, innovation, and adaptability, I deliver impactful results on challenging, data-driven projects.

Education

Ph.D. in Biomedical Engineering at Georgia Tech and Emory University, Atlanta, GA (2013)
M.S. in Mechanical Engineering at Oregon State University, Corvallis, OR (2004)
B.S. in Mechanical Engineering at Oregon State University, Corvallis, OR (2002)

Certificates (Coursera/DeepLearning.ai): Deep Learning Specialization (Sequence Models; Convolutional Neural Nets; Hyperparameter Tuning, Regularization and Optimization); SQL for Data Science; Algorithmic Toolbox; Applied Machine Learning in Python; Applied Plotting, Charting and Data Representation in Python; Machine Learning.

Key Technical Skills

- Data Science & Machine Learning: Python (Pandas, NumPy, SciPy, Scikit-Learn, PyTorch, TensorFlow), statistical analysis, natural language processing, ML experimentation.
- Software Development: Git, API development, Unix command line, cloud computing (AWS, Google Cloud).
- Data Visualization: Matplotlib, Bokeh, Plotly, automated dashboards.
- Database Management: Practical application of SQL, NoSQL (MongoDB, DynamoDB), and GraphQL for research data management, including query writing, basic administration, and API integration.
- Neuroscience: Calcium imaging (single and two photon), electrophysiology, timeseries analysis.
- Image Processing: OpenCV, ImageJ.
- Hardware Integration: Arduino programming, electronics design, hardware/software interfacing.
- Mechanical Engineering: CAD, 3D printing, machine shop experience.

Experience

Wispr AI, San Francisco, CA (remote from Seattle with monthly office visits)
Computational Neuroscientist/Data Scientist *December 2022 – July 2024*

- The goal at Wispr was to build a noninvasive neural interface to decode speech from peripheral signals with electromyography (EMG). I was one of the senior neuroscientists/data scientists driving this project forward.
- Collaborated across multiple core operations, functioning as a versatile contributor in a fast-paced startup environment. Tightly integrated with ML, software, hardware and human data collection groups.
- Contributed significantly to core research and machine learning codebase, improving data loading efficiency and enhancing ML pipeline.
- Implemented data quality control measures, designing metrics and creating automated visualization dashboards for tracking and raw data viewing.
- Conducted extensive ML experimentation, optimizing model performance through data subset analysis and cleaning approaches.
- Led calculation/tracking of ML data scaling laws to estimate data requirements for target model error thresholds.
- Performed in-depth data science analyses, identifying key factors influencing model performance including subject variability and text corpus statistics.
- Managed database operations, including schema updates and permission management.

Inscopix Inc, Mountain View, CA (remote from Seattle with quarterly office visits)
Computational Neuroscientist/Data Scientist *September 2021 – November 2022*

- Worked on products and applications team, developing and testing new data processing and analysis algorithms for miniature fluorescence microscopes for neuroscience research applications.

- Worked closely with the data products and analytics group on API development for customer-facing software.
- Managed a small team of scientists and interns as part of the internal science research and development group.
- Developed data processing and analysis tools and pipelines to demonstrate neural circuit level differences in in-vivo disease models in collaboration with external pharmaceutical companies.
- Validated and improved a new application for measuring red blood cell velocity and vessel dilation changes and worked directly with early adopting academic and pharma customers to meet their scientific needs.

Allen Institute for Brain Science, Seattle, WA

Scientific Data Engineer III *February 2021 – August 2021*
Scientist II *January 2016 – January 2021*
Scientist I *September 2013 – December 2015*

- Developed machine learning models to identify sensory encoding properties of neurons recorded with two-photon microscopy and automatically label stereotyped motor behaviors in video streams.
- Managed a software engineer tasked with building/maintaining a data visualization and quality control application to monitor newly acquired optical/electrical neural recording and behavior data.
- Worked as part of a three-member leadership team to oversee development and implementation of a large-scale visual pyschophysics and neural recording experimental pipeline within the Allen Brain Observatory (https://portal.brain-map.org/explore/circuits/visual-behavior-2p).
- Contributed to the design of multiple experimental platforms involving instrumentation, software control and temporal registration of simultaneously acquired data streams.
- Co-developed and taught the University of Washington/Allen Institute 'Python Bootcamp', as part of the Summer Workshop on the Dynamic Brain course (25 grad/postdoc students per year).
- Contributed to multiple Python codebases for experimental control, statistical analysis, visualization and modeling of behavioral and neural data.

Georgia Institute of Technology & Emory University, Atlanta, GA

Graduate Research and Teaching Assistant *August 2008 –August 2013*

- Conducted research in sensory neuroscience in the Department of Biomedical Engineering.
- Led introduction of behavioral experiments and electrophysiological recordings in a lab with prior experience in acute recording techniques.
- Performed data analysis and neural circuit modeling in Matlab programming language.
- Received independent funding through the NIH National Research Service Award program.
- Taught recitation sections for two semesters in Conservation Principles in Biomedical Engineering.
- Mentored and supervised the research of six undergraduate research students.

Earthly Dynamics, Atlanta, GA

Aerospace Engineering Consultant *November 2004 – July 2008*

- Provided contract engineering services to aerospace engineering corporations.
- Designed and analyzed autonomous flight control systems through dynamic simulation.
- Performed off-site design and analysis, followed by on-site delivery and presentation of results.

Professional Road Cyclist

Jelly Belly/Aramark Professional Cycling Team, Carlsbad, CA *January 2004 – December 2004*
Health Net Professional Cycling Team, Oakland, CA *January 2005– December 2007*
Rock Racing Professional Cycling Team, Los Angeles, CA *January 2008 – August 2008*

- Competed in professional road cycling events in North and South America, Europe, Asia and Australia.
- Represented corporate sponsors in press conferences, media interviews, and sponsor events.

Oregon State University, Corvallis, OR

Graduate Research and Teaching Assistant *March 2002 – September 2004*

- Performed research in dynamics and control systems in the Department of Mechanical Engineering.
- Project involved design and simulation of a novel flight control algorithm for autonous flight.
- Completed coursework in embedded control, robotics, electronics, and mechanical design.
- Worked as a TA for the following Mechanical Engineering courses: Computer Aided Design in Pro/E, Numerical Methods, and Computer Aided Design/Computer Aided Manufacturing.

NEC Eluminant Technologies Inc., Hillsboro, OR

Mechanical Engineering Intern *March 2001 – September 2001*

- Worked as a member of the Mechanical Design Team.
- Designed enclosures for fiber optic communication devices using computer aided design (CAD) software.

- Created computational fluid dynamic (CFD) models to evaluate thermal properties of devices/enclosures.
- Coordinated off-site manufacture.

Tyco Printed Circuit Group, Dallas, OR

Mechanical Engineering Intern *March 2000 – September 2000*

- Worked as a member of the Systems Engineering Team.
- Led project to purchase, install, and oversee the use of two new pieces automated assembly line equipment.
- Assisted the quality control department in locating sources of systematic manufacturing defects.
- Assisted in the design of an expanded manufacturing facility.

Honors/Awards

2013 Cosyne Presenter Travel Grant
2011 NIH Ruth L. Kirchstein National Research Service Award
2010 NSF Integrative Graduate Education and Research Traineeship (IGERT) Travel Grant (Tübingen, Germany)
2003 Division 1 Collegiate Road Cycling Champion
2003 Eric R. Smith Graduate Engineering Fellowship, Oregon State University
2000 Alpha Tau Omega National Undergraduate Scholarship

Publications and Presentations

Peer Reviewed Publications and Preprints:

Piet, A., Ponvert, N., **Ollerenshaw, DR**., Garrett, ME., Groblewski, PA., Olsen, S., ... & Arkhipov, A. *"Behavioral strategy shapes activation of the Vip-Sst disinhibitory circuit in visual cortex."* Neuron, 112(11), 1876-1890. June 2024

Garrett, ME, Groblewski, PA Piet, A, **Ollerenshaw, DR**, Najafi, F, Yavorska, I Amster A, et al. *"Stimulus novelty uncovers coding diversity in visual cortical circuits."* bioRxiv 2023.

McBride, EG, Gandhi, SR, Kuyat, JR, **Ollerenshaw, DR**, Arkhipov, A, Koch, C, Olsen, SR, *"Influence of claustrum on cortex varies by area, layer, and cell type"*. Neuron, 111(2), 275-290. January 2023

Hu B, Garrett ME, Groblewski PA, **Ollerenshaw DR**, Shang J, Roll K, Manavi S, Koch C, Olsen SR, Mihalis S, *Adaptation supports short-term memory in a visual change detection task*, PLOS Computational Biology, September 2021,

Ollerenshaw, DR., Davis, J, McBride, EG, Shelton, A, Koch, C, & Olsen, SR, *"Anterior claustrum cells are responsive during behavior but not passive sensory stimulation." bioRxiv*, March 2021,

Siegle JH, Jia X, … **Ollerenshaw DR**, … Olsen SR, Koch C *"A survey of spiking activity reveals a functional hierarchy of mouse corticothalamic visual areas"* Nature. January 2021

Groblewski PA*, **Ollerenshaw DR***, Kiggins J, Garrett, M, Mochizuki, C, Casal L, Cross S, Mace K, Swapp, J, Manavi, S, Williams, D, Mihalas, S, Olsen, SR (*co-first authors)*"Similar visual perception in GCaMP6 transgenic mice despite differences in learning and motivation"* Frontiers in Behavioral Neuroscience. June 2020

Garrett M, Manavi S, Roll K, **Ollerenshaw DR**, Groblewski PA, Kiggins J, Casal, L Mace, K, Mihalas S, Olsen SR *"Experience shapes activity dynamics and stimulus coding of VIP inhibitory cells."* eLife 9, February 2020.

de Abril, IM, Garrett, ME, **Ollerenshaw, DR**, Groblewski, PA, Olsen, S, & Mihalas, S *"Quantifying and Modelling Transfer Learning in Mice Between Consecutive Training Stages of a Change Detection Task."* bioRxiv. December, 2019,

Daigle, TL, Madisen, L, … **Ollerenshaw, DR**, … Zeng, H. "*A suite of transgenic driver and reporter mouse lines with enhanced brain-cell-type targeting and functionality."* Cell, July 2018.

Denman, DJ, Luviano, JA, **Ollerenshaw, DR,** Cross, S, Williams, D, Buice, MA, Olsen, SR, Reid, R. C.. *"Mouse hue and wavelength-specific luminance contrast sensitivity are non-uniform across visual space".* eLife. January 2018

Steinmetz, NA, Buetfering, C, Lecoq, J, Lee, CR, Peters, AJ, Jacobs, EAK, Coen, P, **Ollerenshaw, DR,** Valley, MT, de Vries, SEJ, Garrett, M, Zhuang, J, Groblewski, PA, Manavi, S, Miles, J, White, C, Lee, E, Griffin F, Larkin, JD, Roll, K, Cross, S, Nguyen, TV, Larsen, R, Pendergraft, J, Daigle, T, Tasic,, B, Thompson, CL,

Waters, J, Olsen, SR, Margolis, DJ, Zeng, H, Hausser, Carandini, M, Harris, KD *"Aberrant Cortical Activity in Multiple GCaMP6-Expressing Transgenic Mouse Lines"* eNeuro, September, 2017; ENEURO.0207-17.2017

Hedrick, T, Danskin, B, Larsen, R, **Ollerenshaw, DR**, Groblewski, P, Valley, M, Olsen, S, Waters, J, *"Characterization of channelrhodopsin and archaerhodopsin in cholinergic neurons of Cre-lox 2 transgenic mice"* PloS one 11.5: e0156596. May 2016

Danskin B, Denman D, Valley M, **Ollerenshaw DR,** Williams D, Groblewski P, Reid C, Olsen S, Waters J. *"Optogenetics in Mice Performing a Visual Discrimination Task: Measurement and Suppression of Retinal Activation and the Resulting Behavioral Artifact."* PloS one. 11;10(12):e0144760. December 2015

Ollerenshaw, DR, Zheng, HJV, Wang, Q, Stanley, GB, *"The adaptive trade-off between discriminability and detectability in the vibrissa system"*, Neuron, 81.5 1152-1164. March, 2014 **(Cover Article)**

Bari, BA, **Ollerenshaw, DR,** Millard, DC, Wang, Q., & Stanley, GB *"Behavioral and electrophysiological effects of cortical microstimulation parameters."* PloS one 8.12: e82170. December, 2013

Ollerenshaw, DR, Bari, BA, Millard, DC, Orr, LE, Wang, Q, Stanley, GB, *"Detection of Tactile Inputs in the Rat Vibrissa Pathway"*, Journal of Neurophysiology, Vol 108, No. 2, pp. 479-490, July 2012

Ollerenshaw, DR, Costello, MF, *"Model Predictive Control of a Direct Fire Projectile Equipped with Canards"* ASME Journal of Dynamic Systems, Measurement and Control. Vol. 130, September, 2008.

Ollerenshaw, DR, Costello, MF, *"Simplified Projectile Swerve Solution for General Control Inputs"* AIAA Journal of Guidance, Control and Dynamics. Vol. 31 No. 5, pp. 1259-1265, 2008

Conference Publications and Presentations (first author only):

Ollerenshaw, DR, Zitelli, K, Gulati, S, Adil, N, Ford, JB, Chang, AH, Paz, JT, Neufeld, SQ, Stamatakis, AM, *"Tools for acquisition and analysis of simultaneous neural activity and vascular dynamics in freely behaving animals"* Abstract for Poster Presentation, Society for Neuroscience, San Diego, CA, November 2022

Ollerenshaw, DR, Gulati, S, Adil, N, Ford, JB, Chang, AH, Paz, JT, Neufeld, SQ, Stamatakis, AM, *"Acquisition and analysis of simultaneous neural activity and bloodflow in freely behaving animals"* Federation of European Neuroscience Societies (FENS) meeting, Paris, July 2022

Ollerenshaw, DR, Shelton, AM, Davis, J, Wang, Y, Zeng, H, Olsen SR, Koch C.
"Functional interrogation of claustrum involvement in a visual change detection task"
Invited talk at the Society for Claustrum Research annual meeting, Salk Institute, November 2018
Abstract for Poster Presentation, Society for Neuroscience, San Diego, CA, November 2018

Ollerenshaw, DR, Garrett, ME, Groblewski, PA, Kiggins, JT, Williams, D, Manavi S, Mihalis, S, Olsen SR, *"Behavioral discrimination of natural images correlates with average neural activity in higher visual areas"*
Abstract for Poster Presentation, Computational and Systems Neuroscience (Cosyne) meeting, Salt Lake City, UT, February 2017

Ollerenshaw, DR, Valley, MT, Zhuang, J, Cain, NH, Groblewski, PA, Garrett, ME, Danskin, B, Waters, J, Olsen, SR, *"Mesoscale cortical dynamics measured with wide-field calcium imaging during a visual detection task in mice",* Abstract for Poster Presentation, Society for Neuroscience, San Diego, CA, November 2016

Ollerenshaw, DR, Groblewski, PA, Garrett, ME, Zhuang, J, Waters, J, Olsen, SR, *"Dynamics of neural activity in mouse cortex during visual behavior"*Abstract for Poster Presentation, Society for Neuroscience, Washington, DC, November 2014

Ollerenshaw, DR, Zheng, HV, Wang, Q, Stanley, GB *"Adaptive shaping of feature selectivity in the rodent vibrissa system"*
Abstract for Poster Presentation, Computational and Systems Neuroscience (Cosyne) meeting, Salt Lake City, UT, February 2013

Ollerenshaw, DR, Bari, BA, Pace, CP, Millard, DC, Zheng, HV, Wang, Q, Stanley, GB, *"Detection and classification performance in the whisker system of awake, behaving rats"* Abstract for Poster Presentation, Society for Neuroscience, New Orleans, LA, October 2012

Ollerenshaw, DR, Bari, BA, Millard, DC, Orr, LE, Zheng, HV, Wang, Q, Stanley, GB, *"Sensory adaptation*

increases discriminability at the expense of detectability in the whisker system of awake, behaving rats" Abstract for Poster Presentation, Society for Neuroscience, Washington DC, November 2011

Ollerenshaw, DR, Wang, Q, Bari, BA, Millard, DC, Orr, LE, Zheng, HV, Stanley, GB, *"Tactile detection and discrimination: behavioral predictions from VSD imaging of cortex"* Abstract for Poster Presentation, Computational and Systems Neuroscience (Cosyne) meeting, Salt Lake City, UT, February 2011

Ollerenshaw, DR, Bari, BA, Millard, DC, Orr, LE, Wang, Q, Zheng, HV, Stanley, GB, *"Linking Evoked Cortical Activity to Detection Psychophysics in the Vibrissa System"* Abstract for Poster Presentation, The Neural Basis of Vibrissa-Based Tactile Sensation, HHMI Janelia Farm Research Campus, Ashburn, VA, April 2010

Ollerenshaw, DR, Bari, BA, Millard, DC, Orr, LE, Wang, Q, Zheng, HV, Stanley, GB, *"Detection of Whisker Deflections in Awake Behaving Rats",* Abstract for Poster Presentation, Joint South East Nerve Net and Georgia/South Carolina Neuroscience Consortium Conference, Emory University, Atlanta, GA, March 2010

Ollerenshaw, DR., Costello, MF., *"Model Predictive Control of a Direct Fire Projectile Equipped with Canards"* Conference Paper - AIAA Atmospheric Flight Mechanics Conference, San Francisco, California, August 2005