Julien A. Bloch

CONTACT
INFORMATION

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EDUCATION

University of Washington, Seattle, WA

Ph.D. Student in Bioengineering (Neural Engineering Track), exp. grad. August 2023
Advisor: Prof. Azadeh Yazdan-Shahmorad

University of California, Berkeley, CA

B.A., Physics, December 2017
B.A., Cognitive Science (Computational Modeling Concentration), December 2017

RESEARCH
EXPERIENCE

Graduate Research Assistant, Neural Engineering Research and Design Lab - UW

Seattle, WA   September 2018 - Present

- Leading projects involving interdisciplinary teams of researchers and Professors in Bioengineering, Electrical Engineering, Applied Math, Statistics, Computer Science, Machine Learning, and Signal Processing
- Used nonparametric regression and graph theory techniques to construct a model which accurately and interpretably predicts large-scale functional reorganization in non-human primate cortex in response to optogenetic stimulation. Paper currently under review and patent pending
- Trained non-human primates on behavioral tasks, designed and implanted a large-scale optogenetic μECoG interface over the posterior parietal cortex, then disrupted reaching behavior with optogenetic inhibition for the first time. Paper in preparation
- Decoded reaching direction from the μECoG interface and now working on relating stimulation-perturbed neural dynamics to disruption of reach
- Developed a Monte-Carlo simulation of photon transport in brain tissue to predict controlled lesion sizes induced by photothrombosis. Paper currently under review
- Used a large-scale biophysically realistic computational model of neurons to investigate relationship between anatomical and functional connectivity at the single-neuron and LFP level. Paper in preparation
- Developing a novel graph signal processing technique for uncovering current and information flow in the brain in response to stimulation

Undergraduate Research Assistant, Engineers for Exploration - UC San Diego

San Diego, CA   June 2017 - August 2017

- Used Geographical Information Systems (GIS) techniques and statistical models in ArcGIS and Python to construct a model which identified mangrove land-area and species from images obtained via drone and satellite
- Tested various convolutional neural network architectures for segmentation and classification of coral reef image data
- Models were used by Scripps Oceanography Institute for conservation purposes

Undergraduate Research Assistant, Theoretical and Applied Fluid Mechanics Lab,

and Swarm Lab - UC Berkeley

Berkeley, CA   August 2014 - December 2014

- Developed an ultrasound-based transducer approach to noninvasively guide light into biological tissue, for noninvasive optogenetic and endoscopic purposes. Paper published in *Nature Communications*
- Evaluated the ability of a bouncing droplet on Faraday waves (hydrodynamic pilot-wave system) to mimic dynamics of a quantum particle in a 2-D well
- Manufactured parts in a machine shop to be used for an underwater electricity generator which harnessed wave energy

INDUSTRY EXPERIENCE

Algorithm Engineer Intern, Cadence Neuroscience

Bellevue, WA   July 2023 - October 2023

- Lead the development of AI models and supporting pipeline for a deep-brain stimulation platform to prevent seizures in epileptic patients
- Worked closely with in-house engineers, neurologists at Mayo Clinic, and the CEO, to guide algorithm development towards effective therapy and preparation for a successful clinical trial
- Developed and optimized a human-in-the-loop AI system for quantifying risk of seizure from incracranial recordings
- Designed and built a data generation and ranking pipeline for new incracranial recordings
- Developed novel stimulation artifact rejection approaches, ultimately arriving at a highly accurate model (removed over 99% of artifact) with minimal free parameters

Co-founder and Technical Lead, Nucli.ai

Palo Alto, CA   August 2018 - February 2019

- Co-founded Nucli.ai to use machine learning for vision-based blood analyses such as complete blood counts
- Used the RetinaNet object detection model with a ResNet-101 NN architecture to construct a model which detected and classified white blood cell types with 99% accuracy – higher than ever reported
- Classification model was developed in Python on Keras using the Tensorflow library, on a self-built dual-GPU dedicated desktop
- Used OpenCV to transform videos of blood smears under a microscope to stitched images for classification
- Partnered with Medical Doctors in India to obtain and label data, and for future deployment and testing

Machine Learning Engineer Intern, Elementum

Palo Alto, CA   June 2018 - August 2018

- Developed machine learning models for supply chain analytics and forecasting
- Used XGBoost to construct a supply chain forecasting model for shipment ETA which had 50% lower error than their pre-existing production model
- Used TF-IDF, Doc2Vec, and clustering to construct a news recommendation system for industry clients
- Used Bayesian models and fuzzy matching to create a pipeline for automatic data cleaning and sorting

- Models were developed in Python using PySpark and Sklearn on Apache Spark compute clusters, AWS Sagemaker, and AWS Lambda
- Deployed an internal system for Bayesian hyperparameter optimization and result tracking for the ML team
- Models and visualizations were presented to the Board of Directors as key advances

Business Analyst Intern, Everwise

San Francisco, CA   August 2013 - December 2013

- Conducted market research to identify potential competitors and clients
- Conducted sales outreach campaigns and lead nurture cycles in Salesforce
- Reported directly to the CEO

HONORS	UW College of Engineering Student Research Award (awarded to one graduate student in UW College of Engineering per year), 2023
	Center for Neurotechnology Best Paper Award for Neurotechnology Advancement, 2022
	UC Berkeley Dean's Honors, 2014
	Riverside County Citizenship Award, 2012
AWARDED FELLOWSHIPS	NIH National Institute for Neurological Disorders and Stroke Diversity Supplement, 2021 - 2023
	Big Data in Genomics and Neuroscience Training Grant, 2019 - 2021
	Graduate Education for Minorities Fellowship, 2018 - 2019
	UW College of Engineering Dean's Fellowship, 2018 - 2022
	Donald W. and Joan P. Baker Endowed Fellowship, 2018
AWARDED TRAVEL GRANTS	GRC Carl Storm Underrepresented Minority Fellowship, 2022
	Society for Neuroscience Trainee Professional Development Award, 2021
	NSF Center for Neurotechnology Travel Grant, 2020
JOURNAL PAPERS	**J. Bloch**, A. Greaves-Tunnell, et al., "Network-Level Modeling of Stimulation-Induced Functional Connectivity Change: An Optogenetic Study in Non-Human Primate Cortex," *iScience*, Apr. 2022.
	K. Khateeb, **J. Bloch**, et al., "A Versatile Toolbox for Studying Cortical Physiology in Primates," *Cell Reports Methods*, Mar. 2023.
	D. Griggs, **J. Bloch**, et al., "Autonomous Cage-Side System for Remote Training of Non-Human Primates," *Journal of Neuroscience Methods*, Jan. 2021.
	M. Chamanzar, M. Scopelliti, **J. Bloch**, et al., "Ultrasonic Sculpting of Virtual Optical Waveguides in Tissue," *Nature Communications*, Jan. 2019.
CONFERENCE PAPERS	F. Schwock, **J. Bloch**, et al., "Estimating and Analyzing Neural Flow Using Signal Processing on Graphs," *IEEE ICASSP 2023*, Rhodes, Greece, Jun. 2023.

D. Griggs, **J. Bloch**, et al., "Demonstration of an Optimized Large-scale Optogenetic Cortical Interface for Non-human Primates," *IEEE EMBC 2022*, Glasgow, Scotland, Jul. 2022.

J. Bloch, K. Khateeb, D. Silversmith, et al., "Cortical Stimulation Induces Network-Wide Coherence Change Across Non-Human Primate Cortex," *IEEE EMBC 2019*, Berlin, Germany, Jul. 2019.

POPULAR PRESS

A. Yazdan-Shahmorad, A. Greaves-Tunnell, **J. Bloch**, "Brain stimulation can rewire and heal damaged neural connections, but it isn't clear how – research suggests personalization may be key to more effective therapies ," *The Conversation* (reprinted in *Inverse* online magazine), Jul. 2022.

TALKS

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "Network-level modeling of stimulation-induced functional connectivity change: An optogenetic study in non-human primate cortex," *Gordon Research Seminar - Neuroelectronic Interfaces*, Ventura, CA, March. 2022.

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "Stimulation-induced connectivity change in brain networks is mediated by existing structure: An optogenetic study in non-human primate cortex," *NSF Center for Neurotechnology Industry Symposium*, Seattle, WA, Oct. 2020.

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "A data-driven model of neural connectivity dynamics in response to optogenetic stimulation of non-human primate sensorimotor cortex," *NSF Center for Neurotechnology Research Extravaganza*, Seattle, WA, Nov. 2019.

J. Bloch, K. Khateeb, D. Silversmith, et al., "Cortical Stimulation Induces Network-Wide Coherence Change Across Non-Human Primate Cortex," *IEEE EMBC 2019*, Berlin, Germany, Jul. 2019.

CONFERENCE ABSTRACTS

F. Schwock, **J. Bloch**, et al., "A novel graph diffusion framework for estimating neural communication," *Graph Signal Processing Workshop 2023*, Oxford, UK, Jun. 2023.

F. Schwock, **J. Bloch**, et al., "Graph diffusion modeling to estimate neural communication with high temporal resolution," *Neural Computation and Engineering Connection*, Seattle, WA, May 2023.

F. Schwock, **J. Bloch**, et al., "A novel graph diffusion framework for estimating neural communication towards personalized neurorehabilitation," *NFS DARE Conference: transformative Opportunities for Modeling in Neurorehabilitation*, Los Angeles, CA, Mar. 2023.

J. Bloch, P. Zhou, D. Lewis, et al., "How to infer large-scale anatomical connectivity from LFP-level functional connectivity: a simulation study," *Neuroscience 2022 Conference*, San Diego, CA, Nov. 2022.

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "Network-level modeling of stimulation-induced functional connectivity change: An optogenetic study in non-human primate cortex," *Gordon Research Conference - Neuroelectronic Interfaces*, Ventura, CA, March. 2022.

D. Griggs, **J. Bloch**, et al., "Optimized Large-scale Optogenetic Cortical Interface for Non-human Primates," *Gordon Research Conference - Neuroelectronic Interfaces*, Ventura, CA, March. 2022.

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "Network-level modelling of stimulation-induced functional connectivity change: An optogenetic study in non-human primate cortex," *Neuroscience 2021 Conference*, Virtual, Oct. 2021.

J. Bloch, A. Greaves-Tunnell, Z. Harchaoui, et al., "Stimulation-Induced Functional Connectivity Change in Brain Networks is Mediated by the Existing Structure: An Optogenetic Study in Non-Human Primate Cortex," *SfN Global Connectome Conference*, Virtual, Jan. 2021.

K. Khateeb, S. Chavan, K Coubrough, **J. Bloch**, et al,. "Acute Neurophysiological Dynamics During Focal Ischemic Lesioning in Non-Human Primate Sensorimotor Cortex," *SfN Global Connectome Conference*, Virtual, Jan. 2021.

K. Khateeb, **J. Bloch**, et al., "A Lesion-Based Toolbox to Study Ischemic Stroke in Primates," *International Stroke Conference*, Virtual, Mar. 2021.

P. Zhang, **J. Bloch**, E. Shea-Brown, A. Yazdan-Shahmorad, "Does functional connectivity reflect anatomical connectivity? A simulation study," *12th International Joint Conference on Computational Intelligence*, Virtual, Nov. 2020.

J. Bloch, E. Shea-Brown, A. Yazdan-Shahmorad, "A Computational Model of Neural Connectivity Dynamics in Response to Stimulation of Non-Human Primate Sensorimotor Cortex," *SfN 2019 Conference*, Chicago, Il, Oct. 2019.

PATENTS **J. Bloch**, A. Greaves-Tunnell, Z. Harchaoui, et al., "Cortical network structure mediates response to brain stimulation," Patent US20230080414A1, filed Sep. 2021.

TEACHING Teaching Assistant for Bioengineering 561, Neural Engineering Technology Studio, under Prof. Azadeh Yazdan-Shahmored and Prof. Chet Moritz, Spring 2021, UW

MENTORING Mentor of three industry-side research assistants in the Yazdan Neuroengineering lab: Warren Han (Allen Institute for Brain Science, 2018 - Present), Patrick Zhang (Facebook, 2019 - 2021), David Lewis (Synchron, 2021 - 2022).

Mentor of one Master's student in the Yazdan Neuroengineering lab: Maxwell Weil (Data Science, 2019-2020).

Mentor of six undergraduates in the Yazdan Neuroengineering lab: Kelly Yeh (Bioengineering, 2021 - 2022), Mariam Benazouz (Bioengineering, 2020 - 2022), William Ojemann (Bioengineering, 2020 - 2021), Shivalika Chavan (Bioengineering, 2019 - 2020), Kelly Coughbrough (Bioengineering, 2019 - 2020), Megana Boddam (Bioengineering, 2019).

My roles include:
- Teaching handling and training of non-human primate animals
- Teaching how to perform *in vivo* electrophysiology and optogenetic experiments
- Teaching the data analysis pipeline from signal processing and featurization to machine learning models and cross validation
- Teaching good coding practices such as modular programming and unit and integration testing
- Developing and assisting personalized research projects for the researchers by providing continuous guidance through weekly meetings
- Assisting with successful graduate school, job, and scholarship applications

- Assisting with career planning and strategy

LEADERSHIP Vice President of NSF Center for Neurotechnology SLC, 2020 - 2021

Industry Liaison of NSF Center for Neurotechnology SLC, 2019 - 2020

Member of UW Biomedical Diversity Committee, 2019 - 2022

Co-Chair of Neural Stimulation Session at IEEE EMBC Berlin, 2019

Officer of Neurotech@Berkeley, 2016 - 2017

Member of Alpha Tau Omega Leadership Fraternity, 2014 - 2017

Co-Founder and Officer of Berkeley Barbell Club, 2015 - 2016

AFFILIATIONS Computational Neuroscience Center, Seattle, Washington USA, 2019 - Present

National Science Foundation Center for Neurotechnology, Seattle, Washington USA, 2018 - Present

University of Washington Institute for Neuroengineering, Seattle, Washington USA, 2018 - 2022

Washington National Primate Research Center, Seattle, Washington USA, 2018 - Present

MEMBERSHIPS Institute of Electrical and Electronics Engineers, 2019 - 2021

Society for Neuroscience, 2018 - Present

OUTREACH Volunteer ski instructor for UW BIPOC Outdoors Club, 2022

Volunteer at Berkeley Youth Engagement and Advocacy Housing Program, 2015 - 2017