

Adam Willats

Researcher completing a Ph.D in Biomedical Engineering focused at the intersection of neuroscience and closed-loop control.

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Objective

Data scientist experienced in analysis and visualization of complex neural data. Successful **engineer and innovator of responsive technologies** for understanding and regulating the nervous system. Looking to expand the efficacy of neurostimulation therapies through design and development of closed-loop algorithms and individualized data-driven models of the nervous system. Eager to apply expertise within a **collaborative research and development team** to improve quality of life for those experiencing neurological disorders.

Experience

Graduate Research Assistant, Georgia Institute of Technology & Emory University, SIPLAB 2014-present

- Developed dynamical systems models of neural responses to optogenetic stimulation
- Characterized algorithms for decoding and controlling brain states *in silico*
- Implemented real-time closed-loop control algorithms to regulate neural firing *in vivo* 🎧
- Actively participated in both neuro-engineering and machine learning communities

Undergraduate Researcher, Purdue University, Center for implantable Devices Jan 2014-Jun 2014

- Developed technology and signal processing algorithms for a novel approach to control intraocular pressure (IOP) to treat glaucoma
- Conducted surgeries and data analysis to verify prototype performance

Intern - R&D, Cyberonics (now LivaNova) May 2013-Aug 2013

- Characterized, and tested radio frequency programming system for vagus nerve stimulator
- Streamlined analysis of oscilloscope data by developing a MATLAB GUI
- Researched security concerns associated with wireless-enabled implantable medical devices

Undergraduate Researcher, Purdue University, e-Lab May 2012-Aug 2012

- Integrated computer vision systems with mobile robotics platforms as part of the Purdue Summer Undergraduate Research Fellowship (SURF) program 📺
- Programmed in C++ and Lua using Robot Operating System (ROS) and torch7

Education

Ph.D. in Biomedical Engineering, Georgia Institute of Technology & Emory University 2014-2021

B.Sc. in Biomedical Engineering, Purdue University 2010-2014

Select Courses

Data science and scientific computing, Institute for Data Engineering and Science (IDEaS), Georgia Institute of Technology 2017

Mining and modeling neuroscience data, UC Berkeley 2015

- The goal of this summer course is to help researchers find new exciting research areas and at the same time to strengthen quantitative expertise in the field of neuroscience.
- The course integrated lectures from prominent researchers in computational neuroscience, with hands-on analysis of a variety of neuroscience data sets.

Machine Learning for Control Systems, Georgia Institute of Technology 2015

Honors & Awards

Computational Neuroscience Training Grant - NIH, Emory University, Georgia Institute of Technology 2014 - 2018



- This program supports cross-institute and interdisciplinary training in computational neuroscience, machine learning, and neural engineering.
- As a trainee in this program I participated in research across multiple laboratories, led journal clubs, organized retreats, and attended training at UC Berkeley.


President's Fellowship - Georgia Institute of Technology


2015


Publications


Journal Articles

 [ORCID](#)  [Google Scholar](#)

K. Fallah, **A. Willats**, N. Liu, C. Rozell, "**Learning sparse codes from compressed representations with biologically plausible local wiring constraints**", *Neural Information Processing Systems (NeurIPS)*, (2020) 



M. Bolus, **A. Willats**, C. Rozell, G. Stanley, "**State-space optimal feedback control of optogenetically driven neural activity**", *Journal of Neural Engineering*, (2020) 


A. Cakmak, G. Poian, **A. Willats**, A. Haffar, R. Abdalbaki, Y. Ko, A. Shah, V. Vaccarino, D. Bliwise, C. Rozell, G. Clifford, "**An unbiased, efficient sleep-wake detection algorithm for a population with sleep disorders: change point decoder**", *Sleep*, (2020) 


M. Bolus, **A. Willats**, C. Whitmire, C. Rozell, G. Stanley, "**Design strategies for dynamic closed-loop optogenetic neurocontrol in vivo**", *Journal of Neural Engineering*, (2018) 

E. Chow, H. Joshi, **A. Willats**, D. Thompson, K. Cotton, S. Nair, C. Warren, B. Tomayko, A. Adkins, A. Shen, M. Morris, B. Byerman, "**Commercial development of RF medical implantable devices**", *2013 IEEE MTT-S International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications (IMWS-BIO)*, (2013) 

Conference Presentations

When are open- and closed-loop control necessary for causal inference in neural circuits? *Neuromatch.io*   2020

State-aware control of neural activity: design & analysis - COSYNE II-38 in  2018

Closed loop optogenetic control of neural circuits: Tracking dynamic trajectories of neural activity - COSYNE II-42 in  2016

Understanding optogenetic stimulation strategies: a study of opsin-neuron models and their spiking behaviors - *Society for Neuroscience (SfN)*  2016

Patents

G. Clifford, A. Cakmak, **A. Willats**, C. Rozell, "**System for Automated Analysis of Sleep and Wake States**", *PCT/US2020/049392*, (2020) 

P. Irazoqui, S. John, A. Kokini, **A. Willats**, A. Chelminski, M. Matuscak, G. Simon, "**Optical Pressure Treatment through Electrical Stimulation**", *US20190001134A1*, (2020) 

Outreach

Lab Training Guide

2020-2021

- Initiated and developed document for helping graduate students succeed at research

Georgia Intern Fellowship for Teachers (GIFT) program, Center for Education Integrating Science, Mathematics, and Computing (CEISMC)

2018

- Mentored teacher in developing curriculum centered around digital signal processing

Kids Interested In Technology, Engineering, and Science (KITES) festival [2018 ] [2016 

2016-2018

- Built Arduino-based recording unit for real-time signal measurement and display based on [Backyard Brains EMG kit](#)

- Helped develop activity plan for 4th grade students to plot and analyze data