
Andrew S. Bender

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Education

University of California, San Diego

Ph.D., Neurosciences Graduate Program, Computational Neuroscience Specialization, GPA: 3.911

La Jolla, CA
August 2019 – Present

University of California, San Diego

M.S., Neurosciences, GPA: 3.911

La Jolla, CA
August 2019 – June 2022

Vanderbilt University

B.A., Highest Honors in Neuroscience & Minor in Scientific Computing, *magna cum laude*, GPA: 3.914

Nashville, TN
August 2015 – May 2019

Research Experience

Cognitive and Computational Neuroscience Lab

Graduate Student Researcher; Advisor: Bradley Voytek, Ph.D.

La Jolla, CA
August 2019 – Present

- Designed signal processing pipeline to isolate neural rhythms from resting-state EEG data and identify biomarkers for autism and ADHD in dataset of 2500+ children.
- Developed novel, high-throughput spectral analysis technique to decode spatial location from neural alpha rhythms across multiple visual working memory tasks across 146 adults.
- Utilized sliding window spectral parameterization to disentangle the role of alpha oscillations from aperiodic activity in working memory (WM)

Perception and Cognition Lab

Graduate Student Researcher; Advisor: John Serences, Ph.D.

La Jolla, CA
January – May 2020

- Devised psychophysical experiment to allow participants to use decoding feedback to improve visual working memory performance in real-time.
- Trained inverted encoding models to decode spatial location from latent memory representations in early visual cortex during functional magnetic resonance imaging.
- Transformed lab-wide analysis pipeline into Python from MATLAB.

Vanderbilt Brain Institute

Undergraduate Researcher; Advisor: Mark Wallace, Ph.D.

Nashville, TN
August 2016 – May 2019

- Designed and implemented binocular rivalry paradigm to improve attentional deficits following stroke.
- Constructed GPU implementation of custom, deep 14-layer residual neural network in TensorFlow that decreased training time over 5000%.
- Published and defended Honors Thesis comparing diagnostic accuracy for autism of 4 different machine learning models from ensemble of multi-modal brain recordings.

Vanderbilt Center for Asthma Research

Infant Susceptibility to Pulmonary Infections and Asthma Following RSV Exposure (INSPIRE) Study

Nashville, TN
January 2016 – May 2019

Undergraduate Researcher, Work-Study Program; Advisor: Tina Hartert, MD, MPH

- Managed website for the Vanderbilt Center for Asthma Research.
- Assisted nurses in conducting study visits with the study's 1900+ participants.
- Spearheaded research newsletter sent to birth cohort families and the physicians and staff of collaborating pediatric practices.

Mayo Clinic Department of Neurosurgery Research

Undergraduate Fellow; Advisor: David Daniels, MD, Ph.D.

Rochester, MN
June – August 2017

- Executed project to investigate the efficacy of an Aurora kinase inhibitor in treating a lethal pediatric tumor.
- Developed proficiency in wet-lab and molecular biology techniques, such as Western blot and various cell culture assays.

Grants & Awards

Phi Beta Kappa Centennial Award

Phi Beta Kappa – Alpha of Tennessee, Vanderbilt University

Nashville, TN
May 2019

Advanced Computing Center for Research and Education (ACCRE) Summer Scholar
Vanderbilt University

Nashville, TN
June – August 2018

Voucher Award for Allocentric and Egocentric Neglect Study
Vanderbilt Institute for Clinical and Translational Research (VICTR)

Nashville, TN
September 2017 – May 2018

Summer Undergraduate Research Fellowship
Mayo Clinic

Rochester, MN
June – August 2017

Publications

Bender A., Voytek B.*, Schaworonkow N.* Resting-state is not enough: alpha and mu rhythms change shape across development, but lack diagnostic sensitivity. *bioRxiv*; under review at the *Journal of Neuroscience*. doi: <https://doi.org/10.1101/2023.10.13.562301>.

*These authors contributed equally to this work.

Presentations

Bender, A., Voytek, B. Decoding spatial location from aperiodic and alpha oscillatory activity in working memory. *Society for Neuroscience*; 2023, November 13; San Diego, CA.

Bender, A., Schaworonkow, N., Voytek, B. Age-related changes in alpha and mu oscillation amplitude and waveform asymmetry. *Society for Neuroscience*; 2022, November 16; San Diego, CA.

Bender, A., Schaworonkow, N., Voytek, B. Quantifying waveform shape of EEG alpha and mu oscillations across development. *Cognitive Neuroscience Society*; 2022, April 26; San Francisco, CA.

Bender, A., Schaworonkow, N., Voytek, B. Quantifying waveform shape of EEG alpha and mu oscillations across development. *Society for Neuroscience*; 2021, November 9; remote.

Bender, A., Tovar, D.A., Wallace, M.T. Classification of Autism Spectrum Disorder Using Machine Learning. *Honors Thesis Defense*; 2019, April 18; Nashville, TN.

Bender, A., Tovar, D.A., Ramachandran, R., Wallace, M.T. ASDNet: Classification of autism from MRI images using residual neural networks. *Vanderbilt Translational Research Forum*; 2018, October 26; Nashville, TN.

Bender, A., Tovar, D.A., Ramachandran, R., Wallace, M.T. ASDNet: Classification of autism from MRI images using residual neural networks. *Summer Student Poster Presentations: Vanderbilt Undergraduate Research Fair*; 2018, September 27; Nashville, TN.

Bender, A., Tovar, D.A., Wallace, M.T. Differentiation of allocentric and egocentric neglect using convolutional neural networks. *Neuroscience Undergraduate Research Presentations*; 2018, April 20; Nashville, TN.

Bender, A., Tovar, D.A., Blake, R., Wallace, M.T. Differentiation of allocentric and egocentric neglect using binocular rivalry. *Neuroscience Undergraduate Research Presentations*; 2017, December 7; Nashville, TN.

Bender, A., Zhang, L., Daniels, D. Aurora kinase inhibitor represents a novel approach in treating patients with diffuse intrinsic pontine glioma. *SURF Student Poster Presentations: Mayo Clinic Student Symposium*; 2017, August 4; Rochester, MN.

Professional Memberships

Member, **Cognitive Neuroscience Society**
Member, **Society for Neuroscience**
Member, **Phi Beta Kappa Honor Society**

January 2022 – Present
January 2019 – Present
May 2019 – Present

Teaching Experience & Mentorship

Veritas AI

Lead Teaching Mentor & Project Mentor

Remote
June 2022 – Present

- Led two-week AI Scholars crash course in machine learning and artificial intelligence for high school students, delivering lectures and working with students through problem sets.
- Mentored high school student through AI Fellowship program, providing guidance for the student as she developed a machine learning model to diagnose Down Syndrome from neural protein expression patterns in mice.

Polygence

Project Mentor

Remote

January 2022 – Present

- Guided four high school students to develop, execute, and report findings for independent research projects, ranging in topic from decoding inner speech for brain-computer interfaces to identifying genetic factors distinguishing normal aging from Alzheimer's Disease.

Neuromatch Academy Computational Neuroscience Course

Project Teaching Assistant; Supervisor: Marius Pachitariu, Ph.D.

Remote

Summer 2021

- Became expertise in eight specially curated and openly available functional magnetic resonance imaging (fMRI) datasets.
- Guided ten groups of students through independent research projects, starting with research question development, providing guidance throughout data analysis, and culminating with project presentations at the end of the course.

Neural Data Analysis

Teaching Assistant; Instructor: John Serences, Ph.D.

La Jolla, CA

Fall 2020

- Created problem sets in Python for each class to solidify understanding of programming concepts and analytic techniques for neural data introduced in lecture.
- Assisted students' progress on in-class problem sets and answered any questions students had about programming or analytic techniques.

Computational Neuroscience

Teaching Assistant; Instructors: Thomas Palmeri, Ph.D., and Sean Polyn, Ph.D.

Nashville, TN

Spring 2019

- Provided undergraduate and graduate students with feedback on problem sets using Keras to implement artificial neural networks and solve supervised learning problems.

Volunteerism

UCSD Neuroscience Outreach Program

Member of Outreach Program organized by students in UCSD Neuroscience Graduate Program

La Jolla, CA

August 2019 – Present

- Presented modules about neuroscience concepts to local elementary, middle, and high school students to inspire interest in neuroscience and exploration of scientific fields as students develop their educational and professional goals.
- Answered any questions students had about life as a graduate student or becoming a scientist.

Alzheimer's Buddies

Member of Vanderbilt Chapter

Nashville, TN

Spring 2016 – May 2019

- Engaged with woman who has Alzheimer's disease (my "buddy") during weekly visits to memory care facility.
- Wrote weekly journal entries to document what I did with my buddy and evaluate each visit.
- Met with other members to discuss techniques and strategies for interacting with our buddies.

Vanderbilt University Medical Center

Guest Services Ambassador

Nashville, TN

Spring 2016 – May 2019

- Assisted Guest Services staff in greeting visitors to the Vanderbilt University Hospital.
- Directed visitors to patients' rooms when rooms may be difficult to find.

Skills & Certifications

High Proficiency in Python

- NumPy; Pandas; Jupyter; machine learning with SciPy; neural networks in Keras and TensorFlow; neuroimaging processing with Nibabel, Nipype, and Nilearn; visual stimulus presentation with PsychoPy; neural digital signal processing with NeuroDSP, SpecParam, and bycycle; EEG analysis with MNE

High Proficiency in MATLAB

- Neural Networks Toolbox and PsychToolbox

High Proficiency in Shell Scripting

- Unix-based scripting (bash/zsh), cluster computing, SLURM

Proficiency in Web Development

- HTML, CSS

Proficiency in C

- Multithreaded programming, distributed memory programming, and GPU programming