

MARGOT WAGNER

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EDUCATION

University of California, San Diego

Expected: May 2023

Ph.D. in Bioengineering

La Jolla, CA

- Thesis Advisors: Terrence J. Sejnowski, Gert Cauwenberghs
- Working Thesis Title: “Human and Artificial Intelligence: Bidirectional Inspiration Provides Insights”
- Relevant Coursework: Deep Learning, Principles of AI, Web Mining & Recommender Systems
- Awarded: **NSF Graduate Research Fellowship Program Award** (2018 – 2023)

University of Delaware

2014 – 2018

B.Ch.E in Chemical and Biomolecular Engineering (Honors with Distinction)

Newark, DE

- Exchange program in Chemical Engineering at National University of Singapore, 1 of 2 selected students
- Awards: **Telkes Distinguished Scholar Award** (4-year full tuition scholarship)

RESEARCH AND PROFESSIONAL EXPERIENCE

Graduate Student Researcher

June 2019 – Present

The Computational Neurobiology Lab and Integrated Systems Neuroengineering Lab, UCSD

La Jolla, CA

- Building forward probabilistic graphical model for fMRI data representation using a 11,500 subject **longitudinal** dataset
- Discovering **main predictors** of mental illness using machine/deep learning in the **large-scale multimodal** and longitudinal **ABCD dataset** utilizing behavioral, demographic, clinical measurement, imaging, and biological data
- Working to create a next generation **biologically inspired AI** neural network with biophysically meaningful parameters tunable for specific learning tasks utilizing **probabilistic graphical models**
- Built a biophysically realistic stochastic 3D reaction-diffusion model for synaptic transmission using MCell software and Python scripts containing 120 molecular states
- Developed equivalent stochastic **Markov chain** synapse abstraction in Python with biologically tunable parameters, decreasing runtime by 93% and FLOPs by an order of magnitude for use in artificial neural networks models
- Optimized parameters to match biological conditions using **parameter sweep** techniques by running models on **supercomputer** clusters and analyzed subsequent large-scale datasets

AI NLP Research Scientist Intern, OPTT Health

July 2022 – Present

- Built data preprocessing, augmentation, and **classification** pipeline for psychotherapy text data

Google Computer Science Research Program Mentee, Google

Feb 2021 – June 2021

- Collaborated with a Google researcher to design a research project utilizing large-scale psychiatric healthcare data

Consulting Analyst, Mindful Care

Feb 2021 – May 2021

- Worked collaboratively with a team of 6 analysts to explore market fit for Mindful Care’s talk therapy AI technology

Simula Computational Physiology Summer School

June 2019, Aug 2019

Simula Research Laboratory, University of Oslo and UCSD

Oslo, Norway and La Jolla, CA

- Selected as one of twenty researchers to attend and participate in this fully funded summer school
- Collaborated with a team of international researchers on a project modeling Hodgkin-Huxley type neurons

Graduate Research Rotations, UCSD

Sept 2018 – June 2019

- Developed patient-specific MATLAB **machine learning** models to classify **attention states** using **EEG** data for 27 patients achieving 70% accuracy for use in ADHD diagnostics
- Classified oddball responses in Parkinson’s patients using **nonlinear dynamical system embeddings**

- Designed and ran pilot study with a single participant for an EEG reading comprehension experiment and created data analysis pipeline including **ICA** to locate biomarkers for use in classroom applications

SELECT PROJECTS

- Wrote the **backend** and basic features for an application tracking and monitoring medication usage in polypharmacy patients including reminders and warnings for potential drug interactions (MedHacks Hackathon, 2nd place)
- Implemented **NLP** sentence generator for 3 conditions and classified generated sentences using BERT classifier
- Analyzed 7k gene RNA-seq dataset from Allen Brain Atlas using **ICA, PCA, clustering, and classification** to predict brain regions (98.7% accuracy for 3 regions, 67.1% accuracy for 10 regions)
- Predicted collision severity (66.25% acc) using 5.78 GB traffic records with ~100 features from 2001-2020

LEADERSHIP AND MENTORING EXPERIENCE

Research Project Manager, UCSD Aug 2022 – Present

- **Recruited and mentored** 6 undergraduate researchers on machine learning projects related to the ABCD dataset
- Create and maintain workspaces and workflows for project-related tasks

Co-Director and Co-Founder of Science in Society Seminar Series Sept 2019 – June 2020

The Collaboratory, Institute of Neural Computation, UCSD

- Organized with Roger Bingham, hosting expert speakers to discuss topics, such as loneliness, with the general public, obtaining attendance of >200 people. Ran student roundtable discussions. Analyzed feedback to optimize attendance.

High School Outreach Co-Chair and Student Mentor Sept 2019 – Mar 2020

Bioengineering Graduate Society, UCSD

- Created and ran curriculum for 30 high school students, with topics such as EEG/ECG collection and data analysis.
- Mentored 4 first-year graduate students with monthly one-on-one meetings

Teaching Assistant, UCSD Jan 2019 – Mar 2020

- Ran a lab and discussion section with 30 undergraduate students (BENG 1) and 50 graduate students (BENG 260) various modules including 3D printing, wearable sensors, biomechanics, and neurodynamics programming

Student Research Mentor June 2018

Science Department, Maine South High School

Park Ridge, IL

- Helped 12 high school students design and execute their own 4-week projects and experiments to compete at the Illinois Junior Academy of Science and the Intel Science Fair in May 2019.

SELECT PUBLICATIONS AND PRESENTATIONS

Publications

- **M Wagner**, T Bartol, T Sejnowski, G Cauwenberghs, "Markov Abstractions of Electrochemical Reaction-Diffusion in Synaptic Transmission for Neuromorphic Computing," *Front Neurosci*, in review.
- J Forder, M Smith, **M Wagner**, R Schaefer, J Gorky, K van Golen, A Nohe, and P Dhurjati, "A Physiologically-Based Pharmacokinetic Model for Targeting Calcitriol-Conjugated Quantum Dots to Inflammatory Breast Cancer Cells," *Clin Transl Sci*, 12: 617-624, July 2019.

Poster Presentations

- **M Wagner**, T Bartol, T Sejnowski, G Cauwenberghs, "Towards Biophysically-Based Neuromorphic Computing at Scale: Markov Abstractions of Electrochemical Reaction-Diffusion in Synaptic Transmission." *IBM IEEE AI Compute Symposium* Oct. 2020.

SKILLS

Programming Languages	Python	·	Java	·	C++	·	MATLAB	·	SQL	·	Bash
Software Tools	Git	·	Linux/Unix	·	PyTorch	·	HuggingFace	·	Weights & Biases	·	MLFlow