

# Aaron Broukhim

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## Education

### University of California San Diego

2022 - Present

#### Ph.D. in Computer Science

Relevant Coursework:

Deep Learning, Unsupervised Learning, Generative Models, Information Visualization, Recommender Systems, Human-Robot Interaction, Computational Photography, Neural Networks for Pattern Recognition, Biomedical Informatics

### University of California San Diego

2019 - 2021

#### B.S. in Cognitive Science: Machine Learning & Neural Computation

#### Minor in Computer Science & Engineering

Relevant Coursework:

Supervised/Unsupervised/Reinforcement/Deep Learning, Genetic Algorithms, ML in Music, ML in Brain Computer Interfaces, Human-AI interaction

### Santa Monica College

2015 - 2019

#### Computer Science & Visual Communications

Relevant Coursework:

Physics, Data Structures, Assembly, 3D Animation, Typography, Photography, Color Theory, Art

## Research

### Contestability

Addressed inaccessibility in content moderation for everyday users by creating an intuitive web page that enables non-technical users to find biases in an intentionally faulty model.

### Community Based Content Moderation

Explored the benefits and drawbacks of community based labeling over the traditional approach of top down labeling in the context of content moderation.

### Explainability

Created consistency in the XAI space with a survey on papers that conducted user studies which categorized quantitative metrics for experts to reference when choosing a metric for their studies.

### Privacy

Introduced privacy interdependence to participants by showing them a simple example with their own Facebook data. Participants are then interviewed about changes to their perception of privacy and how that might impact their future sharing.

### Misinformation

Surveyed user traits in conjunction with attitudes towards misinformation tags to determine which traits correlate with tag distrust.

### Mixture of Experts

Modified an existing mixture of experts large language model by experimenting with weight averaging to create a shared expert to boost performance and decrease both training and inference computational costs.

### Mental Health LLM

In real time interventions for dialectical behavior therapy. I built a RAG pipeline to leverage DBT content to improve pre-trained model's understanding of DBT to eventually provide DBT interventions given anxiety and depression detection via wearables.

## Human-AV Explanations

Participants were shown different driving scenarios in conjunction with visual & auditory explanations with varying degrees of correctness. Participants rated their trust in the system before and after accurate or inaccurate explanations displayed.

## Experience

### University of California San Diego

July 2021 - August 2022

#### Undergraduate Research Assistant

- Web Scraped Facebook using Selenium to make inferences on a user's connections
- Designed logistic regression models capable of detecting hate speech on Twitter & used word embedding (Word2Vec) to bin dataset into different types of hate speech
- Designed and implemented a UI in React with a Node and Flask backend to help non-tech savvy users identify faulty ML systems
- Created SQL databases on an AWS server and conducted queries to support UI backend
- Built Balltree with various similarity metrics to show similar tweets that may be mislabeled

### Virufy

January 2022 - August 2022

#### Associate Audio Machine Learning Engineer

- Peer review ML research involving cough audio classification in Tensorflow and SK-Learn
- Retrained existing models via transfer learning to conduct audio classification
- Utilize Sagemaker to explore new feature and architecture combinations with novel data

### The Hammer Museum

February 2016 - October 2017

#### Visual Experience Representative

- Protected artwork, worked front-desk, & trained other employees

### Hotpoint App & Samuels Advertising

Summer of 2015, 2016 & 2017

#### Graphic Design Internships

- Prototyped logo designs and for-print magazine spreads
- Crafted one sheet designs for prospective buyers
- Designed geotags for a photo booth app

## Teaching

### TA - COGS 107B (Systems Neuroscience)

Summer 2023

### Course Development - DSC 266R (Human-Centered AI)

Fall 2023, Summer 2024

### TA - DSC 266R (Human-Centered AI)

Winter 2024, Winter 2025

### TA - COGS 17 (Neurobiology of Cognition)

Spring 2024

## Projects

### Vehicle Motion Forecasting

- Explored various model architectures (MLP, LSTM, CNN, Transformer) to predict motion of a car
- Selected and normalized relevant features (position, velocity, lanes) from the Argoverse dataset
- Achieved highest performance via an MLP with a RMSE of 1.48

### Snake Reinforcement Learning

- Utilized N-Step Temporal Difference and SARSA methods to play snake and compared performance
- Designed a custom Open-AI gym environment and deep Q-Learning agent in keras that reached level 20 consistently (max 40) with a small state space of 10 and action space of 3

### Generalizable Deep Speech Anonymization

- Leveraged Generative Adversarial Networks for Denoising Diffusion Implicit Models to learn a distribution over language agnostic speaker embeddings
- Used a modified loss to bias the generative model towards an anonymized distribution

### GLOBEM Supervised and Exploratory Analysis

- Use generalized linear model to select features from GLOBEM dataset for PHQ-4 and PANAS prediction
- Conduct gridsearch with random forrest classifier and k-fold validation
- Analysis of best model's features using SHAP values

### **Reddit Fake News Detector**

- Classified news headlines as fake news based off article headlines run through tf-idf and PCA
- Considered various models & unsupervised methods such as K-Means, SVMs, and random forests
- Best resulting model was an SVM that achieved a **95% accuracy**, eventually utilized by a Reddit bot that provided warnings about potentially false content

### **DJAI**

- Scraped Spotify for emotion based playlists to create a dataset of music with emotion labels
- Built a SVM model to classify songs by emotion
- Retrained an existing audio to emotion model on the RAVDESS dataset

### **Image Denoising Comparison**

- Implemented and compared different denoising algorithms such as BM3D, Non-Local Means, Wavelet Denoising, and Total Variation Denoising to a CNN on the SIDD-Medium dataset.

### **Machine Learning Gridsearch**

- Utilized SK-Learn to compare different machine learning algorithms and their various parameters through pipelines and gridsearching
- KNN, SVM, and LOGREG algorithms were compared on different datasets

### **Homework Schedule Discord Bot**

- Created a Discord bot that allows users to keep track of assignment due dates and notified users when deadlines were approaching by storing relevant information in firebase

### **Skills**

**Programming Languages** - Python, SQL, Java, CSS, HTML, C++, C, Javascript

**Frameworks** - Pandas, NumPy, SK-Learn, TensorFlow, Keras, PyTorch, Selenium, React, Node, Flask

**Spoken Languages** - English, Spanish, Farsi, Hebrew

**Misc** - Git, HuggingFace, Sagemaker, MySQL, AWS, Illustrator, Lightroom, Photography, Firebase

### **Leadership**

DISCO Lead

3x GRADWIC Mentor

Founder of Graduate Student Volleyball Party (GSVP) @ UC San Diego