Kaiwen Bian

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Undergraduate in Data Science & Cognitive Behavioral Neuroscience

Introduction & Inspiration

I am a Data Science student double majoring in Cognitive Behavioral Neuroscience at University of California in San Diego (UCSD) since September 2022. I am passionate about finding bridges between Data Science and Neuroscience through forms of algorithm, machine learning, and mathematics to understand different forms of intelligence, both natural and artificial. I am fluent in both Chinese and English, and open-minded for new ideas and learning opportunities.

Education

University of California, San Diego, USA — 2022.09 –
BS, Data Science
BS, Cogitative Behavioral Neuroscience

Quality School International - QSI, Chengdu, China — 2016.01 – 2022.06
Honored Degree of International Baccalaureate

Experiences

May 2024 – Present

UCSD CSE, La Jolla, CA
Advisor: Prof. Sichun Gao
Machine learning puts emphasis on the training results rather than the learning process, which misses one critical characteristic of human learning where we can learn robust to changing tasks and from sequential experience. I try to frame the general problem of Continual Learning from the perspective of Reinforcement Learning & Cognitive Neuroscience, hoping to develop algorithms that utilize the same strategies of how we learn onto an artificial agent.

Jan 2024 – Present

Salk Institute, La Jolla, CA
Advisor: Prof. Talmo Pereira
The Virtual Neural Lab (VNL) project is a collaboration between Salk and Harvard University to create a working RL pipeline for generating the "brains" for a virtual rodent. We try leverage Goal-directed Deep Reinforcement Learning and Inverse Kinematics Imitation Learning to make an artificial agent with artificial network to "learn" behavior of actual rodent. We are exploring both GPU data-parallel training (Jax/Brax) and CPU multi-node distributed training (Ray/Acme).

May 2023 – May 2024

University of California, San Diego, La Jolla, CA
Advisor: Prof. Sean Trott
Researching Affordance Embodied Simulation's presences in Multimodal models through the UCSD Faculty Mentorship Program (started Sep 2023). We try to improve the reliability of machine learning models through examining the degree of models' "understanding" of the subtle keys in human languages and how it is used to map the world we know.

Jul 2023 – Sep 2023

Intel Data Science Summer Project, Chengdu, Sichuan
Supervisor: Runner Yang
Followed Intel Chengdu's senior Data Scientists to experience data science in the industry and participated in a few small data projects over the summer mainly involving data cleaning & reformatting, automation, and using Power BI for Intel planning's data analysis.

Jun 2021 – Jun 2022

Intel & Kang-Hua Center Joint Project, Chengdu, Sichuan
Supervisor: Dr. Jiawei Wu
Studying factors contributing to Biodiversity in a Mega-city (Chengdu). I examined chemical, biological, human, and climate factor that caused the prosperousness of the wetland in Pi-du district and created a scientific model that captures details in each aspect in a paper/report, which was recognized by the Kang-Hua Ecosystem center for facilitating their environmental protection cause.

Apr 2021 – Oct 2021

Sichuan University, Chengdu, Sichuan
Supervisor: Prof. Jeungphill Hanne
Researching on the unidirectional motion in the sub-microbiology. We produced unpublished manuscript discussing our perspective and potential theories involving the unidirectional motion.

Feb 2019 – Feb 2021

Sichuan University & QSI Joint Project, Chengdu, Sichuan
Supervisor: Prof. Jangho Yoon
I led a team for ISEF project using Python, MATLAB, Phasic Deconvolution Analysis, and GSR hardware to create a sensor-based emotional detection system. We received the American Psychological Association Award from ISEF 2021 after presenting in the ISEF 2021 conference.

Data Science Projects

Sep 2024 – Jan 2025

Light-weight Agent Based Collaboration Systems
We build a system that is lightweight, customizable, and that is capable of social-reasoning and expecting what the other agent should be doing through the lens of adversarial collaboration. We are building a generalize agent model for every single agent in this environment and hopefully moving a step closer to level one agent. View our system documentation here.

Sep 2024 – Nov 2024

Sequential Based Recommendation for Business Owners
Sequential pattern has always been a key feature in doing business recommendations for users. However, little has down in the field for the inverse. We propose our deep learning based approach to use advance sequential models to model interactions between users and businesses across time and give different business suggestions to business owners for better matching users in a new region. View our system documentation here.

Jun 2024 – Aug 2024

Discrete Muti-addicted State Q-agents Making Decisions
In nature, there may exist common characteristics in information processing and decision making that are exhibited by different type of systems. It has long been proposed that reinforcement learning algorithms and the neural mechanism of human decision making are highly alike. In this study, we investigated different Q-agents with different exploration strategies decision-making performance under a discrete multi-addicted state environment. View unpublished manuscript here.

Apr 2024 – Jun 2024

Intuitive Laplacian Eigenmap Visualization
Dimensionality reduction technique is a as find the "principals" in high dimensional data, which tends to be very noisy and would affect the accuracy of simple classifier significantly. However, these techniques are usually very mathematically for public to understand without prior background. We developed this visualization project using D3, JavaScript to deliver an intuitive understanding of one of the most popular dimensionality reduction algorithms (Laplacian Eigenmap) on the artwork collections in MET. Project website here.

Jan 2024 – Apr 2024

Robust Ensemble Learning
Project employed advanced techniques such as TF-IDF transformation, PCA, and a homogenous ensemble learning method, specifically Random Forest, to construct a reliable multi-class classifier with more robust and reliable predictions even facing imbalanced datasets, ensuring dependable predictions in scenarios where data distribution is skewed. Project website here.

Scholarships & Awards

2021

Prominent Teacher Award for Global Tour Class
Intel's recognizing 2.5 years (2019 – 2022) of contribution to volunteering causes.

2021

The American Psychological Association Award from ISEF
Top awards to psychology & technology projects in ISEF 2021.

2019

Certificate of Membership with National Honor Society
One of the top organizations for high school students to contribute to social works and students benefits.

Presentations

2024 **UCSD Open Undergraduate Research Symposium**
La Jolla, California
Research presentation on Affordance Embodied Simulation's presences in Multimodal models (FMP Program)

2022 **International Baccalaureate at QSI**
Chengdu, Sichuan
Research presentation on fluid dynamics' study & the formation of potential flows for the Honored Degree of International Baccalaureate.

2021 **ISEF China**
Chengdu, Sichuan
Research presentation on sensor-based emotional detection system.

Leadership & Social Services

Nov 2019 – Jun 2022 **Intel Volunteer Program**
I initiated and led the Global Tour Class volunteer program where we regularly visited local primary school for English lessons. I received the Prominent Teacher Award for Global Tour Class from Intel and the program continued to benefit others after my graduation.

Mar 2021 – Jun 2022 **Quality School International Chengdu**
I was the president of QSI Student Council & Board Member of National Honor Society where I managed executive board of 10+ members to ran weekly meetings and deliver events and benefits to student population.

Skills

Data Science: Python, Panda & EDA, Regular Expression, Web Scraping, Java, Data Structure.
ML: Distributed & Parallel Deep Reinforcement Learning (Brax, Acme), PyTorch, TensorFlow, Jax, Flax, Ray, Sk-Learn.
Mathematics: Probability, Stochastic Processes, Statistics, Convex Optimization, Linear Algebra, Vector Calculus, Graph Theory, Some Analysis & Topology.
Neuroscience: System & Cognitive Neuroscience, Neuroanatomy, Motivational Neurobiology.
Languages: Fluent Chinese and English.
Sports Science & Hobbies: Exercise Physiology, Kinesiology, Nutrition, Skateboarding (6+ years), Strength Training.