

Ian Raymond Domingo

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Statement

I am a Master's student in Computer Science at the University of California, Irvine, where I also completed my Bachelor's degree in an accelerated three years. I work primarily in machine learning, with emphasis on optimization, model behavior, and biologically inspired learning mechanisms. My work spans theoretical, empirical, and applied settings, including neural balancing, large language model memorization, multimodal learning, and applied ML systems in both academic and industry environments. I intend to pursue a doctorate and continue work at the intersection of learning theory, deep learning, and model behavior.

Education

University of California, Irvine

B.S. in Computer Science

Sep 2020 – Jun 2023

GPA: 3.6

Relevant coursework: Boolean Algebra and Logic, Computational Linear Algebra, Discrete Mathematics, Probability and Statistics, Data Structures, Algorithms, Operating Systems, Computer Networks, Machine Learning and Data Mining, Artificial Intelligence, Computer Vision, Graph Algorithms, Distributed Systems

M.S. in Computer Science

Sep 2024 – Jun 2026 (expected)

GPA: 3.9

Relevant coursework: Seminar in Computer Science Research, Transaction Processing and Distributed Data Management, Systems and Machine Learning, Advanced Machine Learning

Experience

University of California, Irvine

Researcher

Apr 2023 – Present

- Working closely with Professor Pierre Baldi and Antonios Alexos on biologically plausible machine learning, optimization, and model behavior.
- Designed, implemented, and evaluated neural balancing methods across fully connected, convolutional, locally connected, and transformer architectures.
- Led experimental design, implementation, and analysis for multiple accepted and submitted publications.
- Conducted large-scale experiments on CIFAR-10, TinyImageNet, text, speech, and multimodal datasets.
- Contributed to theoretical framing, empirical validation, and manuscript preparation.

Purdue University

Researcher

Apr 2024 – Present

- Member of a joint UCI–Purdue Noyce grant collaboration on emotional speech recognition.
- Designed multimodal models combining text, audio, and vision using transformer architectures.
- Worked on dataset curation, augmentation, and evaluation for MELD and IEMOCAP.

University of Southern California

Researcher

Jan 2024 – Apr 2024

- Contributed to machine learning research in clinical and bioinformatics settings.
- Assisted in model development, data preprocessing, and manuscript writing.

Amazon

Applied Scientist Intern

Summer 2025

- Developed machine learning systems to intelligently restructure and enrich security classification data.
- Fine-tuned and evaluated large language models on internal datasets.
- Integrated models into production pipelines within AWS-based infrastructure.

iMetalX

Machine Learning Intern

2024

- Worked on 3D reconstruction and multi-view geometry pipelines.
- Implemented structure-from-motion workflows and evaluated reconstruction quality.

Publications

Improving Deep Learning Speed and Performance through Synaptic Neural Balance
AAAI 2025 (Main Track); workshops at NeurIPS 2024 (OPT, SciForDL, MLNCP)

A Theory of Synaptic Neural Balance: From Local to Global Order
Artificial Intelligence Journal (AIJ) @ IJCAI 2025

Memorization: A Close Look at Books
L2M2 Workshop @ ACL 2025

Prediction of Sepsis Mortality in ICU Patients Using Machine Learning
BMC Medical Informatics and Decision Making, 2024

Manuscripts and Submissions

Convolutional and Neuronal Neural Balancing — in preparation

Tourbillon — submitted to NLDL 2025; accepted at UniReps Workshop @ NeurIPS 2024

Neurodegeneration-Inspired Model Degradation — submitted to Nature, 2024

Projects

Neural Balancing

2023 – Present

- Developed a biologically inspired framework for balancing neurons by enforcing parity between input and output weight norms.
- Implemented full, semi, and gradient-based balancing schemes and evaluated their effects on optimization stability and convergence.
- Extended balancing from fully connected networks to convolutional networks via position-wise neuronal balancing, treating each spatial location as an independent neuron.
- Designed modular experimental infrastructure to ensure fair comparison across baseline, channel-balanced, and neuron-balanced models.
- Results accepted at AAAI 2025; extended theoretical work accepted at AIJ @ IJCAI 2025; additional experiments presented at NeurIPS 2024 workshops.

Convolutional Neural Balancing Experiments

2024 – Present

- Investigated neural balancing in convolutional architectures where residual connections and weight sharing complicate channel-level balancing.
- Developed position-wise balancing schemes and pseudo-balancing strategies to study norm dynamics independent of test accuracy.
- Ran controlled experiments on CIFAR-10 and TinyImageNet tracking input/output norm ratios over training.
- Preparing a standalone manuscript focused on empirical methodology and optimization behavior.

LLM Memorization and Regurgitation Analysis

2024 – Present

- Studied verbatim memorization in large language models under deterministic decoding.
- Designed autoregressive self-feeding experiments allowing models to reconstruct memorized training passages token by token.
- Demonstrated memorization as a dynamic vulnerability rather than static lookup.
- Paper accepted at L2M2 Workshop @ ACL 2025.

PushApart and k-WTA Attention Mechanisms

2024 – Present

- Designed regularization strategies to encourage diversity across transformer attention heads.
- Implemented cosine-similarity penalties across Q/K/V projections (PushApart).
- Explored k-winners-take-all mechanisms for dynamically activating only the most effective attention heads.
- Conducted initial experiments on vision transformers and planned follow-up work in text classification.

Multimodal Emotional Speech Recognition

2023 – Present

- Developed emotion classification models using text, audio, and vision modalities for healthcare-oriented human–robot interaction.

- Fine-tuned transformer-based language models on MELD and IEMOCAP datasets.
- Implemented cross-attention mechanisms to fuse modalities and evaluated unimodal versus multimodal performance.
- Performed extensive preprocessing, augmentation, and class balancing on multimodal datasets.

Generating Medical Summaries from Gene Data

2023 – 2024

- Built an end-to-end pipeline to generate diagnostic summaries from lists of genetic mutations.
- Adapted OCR models for structured table extraction from clinical reports.
- Mapped gene mutations to known conditions using a curated knowledge base.
- Used large language models to assemble coherent summaries grounded in extracted evidence.

Neural Erosion: Modeling Neurodegeneration in AI Systems

2024

- Studied controlled degradation of neural networks via structured noise injection as an analogue to aging and neurodegeneration.
- Conducted experiments on Llama 2 using mathematical and verbal reasoning benchmarks.
- Evaluated degradation effects on sentiment analysis models.
- Work covered by TechXplore and the UCI Donald Bren School of Information and Computer Science.

3D Reconstruction and Neural BRDF Modeling

2024 – Present

- Implemented a full structure-from-motion pipeline using OpenMVG and OpenMVS.
- Reconstructed a detailed 3D model of a vehicle from consumer-grade imagery.
- Estimated camera poses, sparse and dense point clouds, and surface normals.
- Prepared downstream experiments for neural BRDF fitting using reconstructed geometry.

Universal Recommender System for Restaurants

2024 – Present

- Designed a data-driven recommendation system using structured relational data from restaurant operations.
- Modeled user preferences based on seating, ordering history, and dining duration.
- Integrated SQL-backed storage with machine learning-based ranking.

Offline-First Ticket Analytics Platform

2023 – 2024

- Built an offline-first system for tracking ticket availability across multiple vendors.
- Designed PostgreSQL and SQLite synchronization strategies.
- Applied machine learning methods to analyze long-term pricing and availability trends.

Work History

Amazon, Seattle, WA

Jun - Aug 2025

Applied Scientist Intern

- Developed machine learning systems to restructure and enrich large-scale security classification data.
- Fine-tuned and evaluated large language models on internal datasets.
- Integrated models into production AWS pipelines.
- Inclined for hire as Applied Scientist (L4)

iMetalX, Remote

Jan - Jun 2025

Machine Learning Intern

- Worked on 3D reconstruction and multi-view geometry pipelines for industrial data.
- Implemented structure-from-motion workflows and evaluated reconstruction quality.

Coffee Society, Cupertino, CA

Jun 2019 – Mar 2020

Barista

- Managed store operations including opening and closing, customer service, cash handling, and food preparation.

Tinosys, Cupertino, CA

May 2019 – Jul 2019

Full Stack Developer

- Developed a React Native application with AWS-backed data management and authentication.

City of Cupertino, Cupertino, CA
Leader in Training

May 2019 – Jul 2019

- Supervised youth programs and coordinated activities and field trips.

Math Enrichment, Cupertino, CA
Tutor

May 2017 – Jul 2018

- Assisted with instruction, grading, and supervision in mathematics programs.

Skills

Programming: Python, PyTorch, TensorFlow, JavaScript, Java, C++, R

Machine Learning: Deep learning, transformers, LLMs, multimodal learning, optimization

Systems: AWS, PostgreSQL, SQLite, Supabase, Vercel

Other: Experimental design, reproducibility, large-scale training