

JAIDEV GILL

jaidevg@mich.edu | Google Scholar | <https://jaidevgill.github.io/>

EDUCATION

University of Michigan, Ann Arbor, MI
Ph.D. in Electrical and Computer Engineering
M.Sc. in Electrical and Computer Engineering
Advisor: Jing Shuang (Lisa) Li

August 2024 – Present

University of British Columbia, Vancouver, BC
B.A.Sc. in Engineering Physics with Distinction
Co-operative Education Program
Advisor: Christos Thrampoulidis

September 2019 – May 2024
Cumulative GPA: 90.7 %, 3.93/4.00

EXPERIENCE

University of British Columbia, Electrical and Computer Engineering
Undergraduate Researcher, Advisor: Prof. Christos Thrampoulidis

Vancouver, BC
September 2022 – April 2024

- Worked in a collaborative group at UBC and the University of California, Santa Barbara we explored the training dynamics of Neural Networks trained under Cross-Entropy and Supervised-Contrastive Loss which was published in ICLR 2024
- Designed an algorithm to engineer the learned features of machine learning models which was published in ICASSP 2024
- We ran numerical experiments with MATLAB and the CVX package to explore an optimization based approach in understanding the learned representations of data, we then validated numerical and theoretical work against the empirical representations of real Deep Neural Networks using Python with Pytorch, Numpy and Scipy

Stewart Blusson Quantum Matter Institute
Undergraduate Researcher, Advisor: Prof. Joshua Folk

Vancouver, BC
May 2022 – August 2022

- Designed and implemented an RF cryogenic amplifier to be used in ultra low temperature (4K) Johnson Noise experiments
- Developed a suite of software in Igor to communicate between lock-in amplifiers and data acquisition computers to automate testing
- Minimized extraneous electrical noise in the dilution refrigerator to ensure performance measurements were noise-resistant
- Conducted literature reviews of Quantum electronics to design a novel superconducting inductor that would be used to set the resonance frequency of our measurement circuit
- Completed a Machine Shop certification that allows full access to operate a mill, lathe, and drill press

Tochtech Technologies
Hardware & Software Test Engineer

Surrey, BC
January 2021 – April 2021

- Designed, proposed, developed and implemented test plans in order to test the functionality of both software and hardware, while managing issues and testing timelines through JIRA
- Wrote unit tests in Javascript using the Jest framework to test functionality of software, and gathered and analyzed real-time data of users to ensure accuracy
- Implemented a CI/CD pipeline using Docker and Jenkins that saved hours of deployment time
- Developed user documentation that clearly illustrated operational use of products

PROJECTS

Deep Learning in Fluorescent Spectroscopy-Guided Neurosurgery
Senior Capstone, Advisor: David Black

Vancouver, BC
September 2022 – February 2024

- Under the supervision of a PhD student in the Robotics and Control Laboratory we developed novel techniques in the analysis of light emissions from brain tissue
- Differentiation of cancerous and healthy brain tissue is near impossible in normal lighting conditions, in order to correctly identify cancerous tissue the concentration of a chemical compound (PpIX) was quantified through our machine learning and classical optimization approaches
- Presented work to the CNS Lab at Macquarie University, wrote a paper and currently writing a book chapter describing our techniques

Pound-Drever-Hall Laser Stabilization
Senior Capstone, Advisor: Prof. Sudip Shekhar

Vancouver, BC
September 2023 – April 2024

- Designed and implemented a fully integrated FPGA based laser stabilization system
- Characterized optical components, such as a Fabry-Perot cavity, phase modulator and laser
- Was able to significantly reduce linewidth of the laser by correcting for temperature and current drifts during operation

PUBLICATIONS

IN SUBMISSION

- [1] David Black*, **Jaidev Gill***, Andrew Xie*, Benoit Lique, Antonio Di Ieva, Walter Stummer, and Eric Suero Molina. *Deep Learning-Based Correction and Unmixing of Hyperspectral Images for Brain Tumor Surgery*. * Co-First Authors. Abstract appeared at 75th Annual Meeting of the German Society of Neurosurgery (DGNC). 2024. arXiv: 2402.03761 [eess.IV].

CONFERENCE

- [2] Ganesh Ramachandra Kini, Vala Vakilian, Tina Behnia, **Jaidev Gill**, and Christos Thrampoulidis. "Symmetric Neural-Collapse Representations with Supervised Contrastive Loss: The Impact of ReLU and Batching". In: *The Twelfth International Conference on Learning Representations*. Short version appeared at ICML HiLD 2023, DeepMath 2023. 2024. URL: <https://openreview.net/forum?id=AyXIDfvYg8>.
- [3] **Jaidev Gill**, Vala Vakilian, and Christos Thrampoulidis. "Engineering the Neural Collapse Geometry of Supervised-Contrastive Loss". In: *ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Short version appeared as a Student Abstract at AAAI 2024. 2024, pp. 7115–7119. DOI: 10.1109/ICASSP48485.2024.10447379.

PRESENTATIONS

- Engineering the Neural Collapse Geometry of Supervised-Contrastive Loss. February 2024
AAAI 2024 Student Abstract Program.
- Deep Learning in Fluorescence Spectroscopy-Guided Neurosurgery. August 2023
Computational NeuroSurgery Lab, Macquarie University.
- Cryogenic Amplifier for Small Signal Measurements. August 2022
Blusson QMI Summer Undergraduate Talks.

TEACHING

Teaching Assistant PHYS 159 – Introductory Physics Laboratory for Engineers UBC
A laboratory course with emphasis on experimental design, measurement and analysis techniques. Spring 2024

Teaching Assistant ELEC 221 – Signals and Systems UBC
Complex numbers, LTI systems, convolution sum, discrete-time Fourier series and transforms, z-transform, sampling, introduction to filtering and modulation, feedback systems, stability. Fall 2023

Teaching Assistant ELEC 221 – Signals and Systems UBC
Complex numbers, LTI systems, convolution sum, discrete-time Fourier series and transforms, z-transform, sampling, introduction to filtering and modulation, feedback systems, stability. Spring 2023

Teaching Assistant PHYS 159 – Introductory Physics Laboratory for Engineers UBC
A laboratory course with emphasis on experimental design, measurement and analysis techniques. Spring 2022

Teaching Assistant PHYS 159 – Introductory Physics Laboratory for Engineers UBC
A laboratory course with emphasis on experimental design, measurement and analysis techniques. Spring 2021

AWARDS

Vector Institute Scholarship in Artificial Intelligence 2024 – 2025
Support awarded to pursue an AI study path in the University of Toronto's MSc in ECE program. \$17,500 (declined)

NSERC Canadian Graduate Scholarships - Master's 2024 – 2025
Support awarded to attend a master's program in Canada. \$27,000 (declined)

Graduating Class of 1935 Scholarship 2024
Award made on the recommendation of a UBC Faculty member. \$1,350

Dean's Honour List 2019 – 2024
Students with a sessional average of at least 80% while taking 30 or more credits.

Professional Activities Fund 2024
Award made on the recommendation of the UBC Faculty of Applied Science to fund participation in AAAI 2024. \$230

Donald J. Evans Scholarship in Engineering	2023
Award made on the recommendation of the UBC Faculty of Applied Science.	
TREK Excellence Scholarship for Continuing Students	2023
Awarded to the top 5% of undergraduate students at UBC.	
NSERC Undergraduate Student Research Award	Summer 2023
Awards funding research conducted in the Electrical and Computer Engineering Department at UBC.	
Engineering Scholarship	2022
Award made on the recommendation of the UBC Faculty of Applied Science.	
NSERC Undergraduate Student Research Award	Fall 2022
Awards funding research conducted in the Electrical and Computer Engineering Department at UBC.	
TREK Excellence Scholarship for Continuing Students	2022
Awarded to the top 5% of undergraduate students at UBC.	
TREK Excellence Scholarship for Continuing Students	2021
Awarded to the top 5% of undergraduate students at UBC.	
Quantum Pathways Scholar	2021 – 2024
Award for up to four years of funded research experience at the Stewart Blusson Quantum Matter Institute.	
Lorne Manning Hill Memorial Scholarship	2020
Award made on the recommendation of the UBC Faculty of Applied Science.	
TREK Excellence Scholarship for Continuing Students	2020
Awarded to the top 5% of undergraduate students at UBC.	
BC Achievement Scholarship	2019
The BC Achievement scholarship recognizes the 8,000 graduates with the top academic achievement in the province.	
Annie B. Jamieson Award	2019
Awarded to the top High School graduate who previously attended Annie B. Jamieson Elementary.	

SERVICE

Conference Reviewer: International Conference on Machine Learning (ICML) 2024

Workshop Reviewer: High-dimensional Learning Dynamics Workshop (HiLD) 2024