Jaidev Gill

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Education

University of Michigan, Ann Arbor — August 2024 – Present
Ph.D. in Electrical and Computer Engineering
Advisor: Jing Shuang (Lisa) Li

University of Michigan, Ann Arbor — August 2024 – December 2025
M.S.E. in Electrical and Computer Engineering — GPA: 4.00/4.00

University of British Columbia, Vancouver — September 2019 – May 2024
B.A.Sc. in Engineering Physics with Distinction — GPA: 90.7 %, 3.93/4.00
Co-operative Education Program
Advisor: Christos Thrampoulidis

Research Experience

University of Michigan, Electrical Engineering and Computer Science — Ann Arbor, MI
Graduate Researcher, Advisor: Prof. Jing Shuang (Lisa) Li — August 2024 – Present

- *Current Research Interests*: Developing theoretical limitations on the identification of network structure by applying tools from linear systems theory, nonlinear dynamical system anaylsis, and contraction theory. Equivalent neural implementations of controllers.

University of British Columbia, Electrical and Computer Engineering — Vancouver, BC
Undergraduate Researcher, Advisor: Prof. Christos Thrampoulidis — September 2022 – April 2024

- *Project: Neural Collapse in the Terminal Phase of Training for Supervised-Contrastive Loss (SCL)*: Developed a set of simulations to validate findings related to SCL's tendency to exhibit Neural Collapse. Designed an algorithm that tunes the learned geometry of feature embeddings.

University of British Columbia, Electrical and Computer Engineering — Vancouver, BC
Senior Capstone, Advisor: Prof. Sudip Shekhar — September 2023 – April 2024

- *Project: Pound-Drever-Hall Laser Stabilization*: Designed and implemented a fully integrated FPGA based laser stabilization system that significantly reduced linewidth of the laser by correcting for temperature and current drifts during operation.

Robotics and Control Laboratory — Vancouver, BC
Senior Capstone, Advisor: Dr. David Black — September 2022 – February 2024

- *Project: Deep Learning in Fluorescent Spectroscopy-Guided Neurosurgery*: Designed an end-to-end computer vision pipeline to correctly identify cancerous tissue the concentration of a chemical compound (PpIX) through our machine learning and classical optimization approaches. The developed methods are now the state of the art for PpIX quantification.

Stewart Blusson Quantum Matter Institute — Vancouver, BC
Undergraduate Researcher, Advisor: Prof. Joshua Folk — May 2022 – August 2022

- *Project: Design of a Radio-Frequency Cryogenic Amplifier for Ultra Low Temperature (4K) Johnson Noise Experiments*: Developed an amplifier and a suite of software to study the Johnson noise of quantum devices in a dilution refrigerator. Designed a superconducting inductor for a tank circuit used during measurements.

Publications

Book Chapter

[1] Eric Suero Molina, David Black, Andrew Xie, **Jaidev Gill**, Antonio Di Ieva, and Walter Stummer. "**Machine and Deep Learning in Hyperspectral Fluorescence-Guided Brain Tumor Surgery**". In: *Computational Neurosurgery*. Ed. by Antonio Di Ieva, Eric Suero Molina, Sidong Liu, and Carlo Russo. Cham: Springer Nature Switzerland, 2024, pp. 245–264. ISBN: 978-3-031-64892-2. DOI: 10.1007/978-3-031-64892-2_15. URL: https://doi.org/10.1007/978-3-031-64892-2_15.

Journal

[1] David Black*, **Jaidev Gill***, Andrew Xie*, Benoit Liquet, Antonio Di Ieva, Walter Stummer, and Eric Suero Molina. "**Deep Learning Based Hyperspectral Image Correction and Unmixing for Brain Tumor Surgery**". In: *iScience* 27.12 (2024). * Co-First Authors. Abstract appeared at 75th Annual Meeting of the German Society of Neurosurgery (DGNC), p. 111273. ISSN: 2589-0042. DOI: https://doi.org/10.1016/j.isci.2024.111273. URL: https://www.sciencedirect.com/science/article/pii/S2589004224024982.

Conference

[1] **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.

[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.

Presentations

Engineering the Neural Collapse Geometry of Supervised-Contrastive Loss. *AAAI 2024 Student Abstract*. February 2024

Deep Learning in Fluorescence Spectroscopy-Guided Neurosurgery. *Macquarie University*. August 2023

Cryogenic Amplifier for Small Signal Measurements. *Blusson QMI Summer Undergraduate Talks*. August 2022

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, 2022, 2021

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, Spring 2023

Awards

Vector Institute Scholarship in Artificial Intelligence, $17,500 (declined) 2024 – 2025

NSERC Canadian Graduate Scholarships - Master's, $27,000 (declined) 2024 – 2025

Graduating Class of 1935 Scholarship, $1,350 2024

Dean's Honour List 2019 – 2024

Professional Activities Fund, $230 2024

Donald J. Evans Scholarship in Engineering, $500 2023

TREK Excellence Scholarship for Continuing Students, $1,500 x 2, $750 x 2 2020 – 2023

NSERC Undergraduate Student Research Award, $6,000 x 2 Summer 2023, Fall 2022

Engineering Scholarship, $500 2022

Quantum Pathways Scholar 2021 – 2024

Lorne Manning Hill Memorial Scholarship, $1,250 2020

Service

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

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

Additional Experience

Tochtech Technologies Surrey, BC
Hardware & Software Test Engineer 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. Wrote unit tests in Javascript using the Jest framework to test functionality of software. Implemented a CI/CD pipeline using Docker and Jenkins that expedited deployment time.