KARUSH SURI

Homepage ◇ Email ◇ GitHub ◇ Google Scholar ◇ LinkedIn ◇ X

EDUCATION

University of Toronto 2025 - 2029 (Expected)
PhD, Electrical & Computer Engineering *Toronto, Canada*
Thesis: TBD
GPA: TBD

University of Toronto 2019 - 2021
MASc, Electrical & Computer Engineering *Toronto, Canada*
Thesis: Deep Hierarchical Reinforcement Learning
GPA: 4/4

Amity University 2015 - 2019
BTech, Electrical & Computer Engineering *Delhi, India*
Thesis: Sign Language Translation from Wearable Sensors (demo)
GPA: 8.78/10 (rank: 1/142)

AWARDS

Academic

University of Toronto Doctoral Scholarship 2025 - 2029
Laura Bassi Scholarship (declined) 2025
Electrical & Computer Engineering Fellowship, University of Toronto 2020 - 2021
Edward S. Rogers Graduate Scholarship, University of Toronto 2019 - 2020
Best in Technical Innovation Award (Class of 2015-2019), Amity University 2019
Most Frugal Innovation Award, Amity University 2018
100% Curriculum Merit Scholarship, Amity University 2015
Young Achievers in Mathematics Award 2015

Industrial

Outstanding Reviewer, NeurIPS 2023
Outstanding Intern Buddy, Google X 2022

EMPLOYMENT

Valence Labs (Mila) 2023 - 2025
Research Engineer *Montreal, Canada*
Advisors: Dr. Emmanuel Bengio
Projects: **(1)** Multi-Modal Phenomic Foundational Models, **(2)** Amortized Inference with GFlowNets

Google X 2021 - 2023
AI Resident *Mountain View, USA*
Advisors: Grace Brentano & Dr. Lam Nguyen
Project: Undisclosed

INTERNSHIPS

Borealis AI 2020 - 2021
Student Researcher *Toronto, Canada*
Advisors: Xiao Qi Shi
Projects: Deep Hierarchical Reinforcement Learning for Trade Execution

PUBLICATIONS

$*$ = equal contribution

"*A Cross Modal Knowledge Distillation & Data Augmentation Recipe for Improving Transcriptomics Representations through Morphological Features*" ICML 2025

Ihab Bendidi, Yassir El Mesbahi, Alisandra Kaye Denton, Karush Suri,
Kian Kenyon-Dean, Auguste Genovesio, Emmanuel Noutahi

"*Understanding Conditional Computation in Contrastive Phenomic Retrieval*" Technical Report 2025
Karush Suri, Puria Moghadam, Frederik Wenkel, Maciej Sypetkowski,
Emmanuel Bengio, Emmanuel Noutahi, Dominique Beaini

"*How Molecules Impact Cells: Unlocking Contrastive PhenoMolecular Retrieval*" NeurIPS 2024
Philip Fradkin*, Puria Moghadam*, Karush Suri, Frederik Wenkel,
Ali Bashashati, Maciej Sypetkowski, FM4S @ NeurIPS 2024 **(oral)**
Dominique Beaini **(best paper award)**

"*On the Scalability of GNNs for Molecular Graphs*" NeurIPS 2024
Maciej Sypetkowski, Frederik Wenkel, Farimah Poursafaei,
Nia Dickson, Karush Suri, Philip Fradkin, Dominique Beaini

"*Surprise Minimizing Multi-Agent Learning with Energy-based Models*" NeurIPS 2022
Karush Suri, Xiao Qi Shi, Konstantinos Plataniotis, Yuri Lawryshyn

"*Off-Policy Evolutionary Reinforcement Learning with Maximum Mutations*" AAMAS 2022 **(oral)**
Karush Suri

"*Continuous Sign Language Recognition from Wearable IMUs*
using Deep CapsNet and Game Theory" CEE, Elsevier, 2019
Karush Suri, Rinki Gupta

"*Transfer Learning for sEMG-based Hand Gestures using*
Deep Learning in a Master- Slave Architecture" IEEE IC3I 2018
Karush Suri, Rinki Gupta

PENDING PATENTS

"*Generating Actions for a Supply Chain Network*" 2024
Lam Nguyen, Grace Brentano, Sze Lee, Karush Suri, Anikait Singh,
Salil Pradhan, David Andre
Google X, Application Number: 52862.

"*Large Language Model Derived Environment State Changes In Supply Chain Logistics*" 2023
Lam Nguyen, Grace Brentano, Salil Pradhan, David Andre, Gearoid Murphy,
Sze Lee, Karush Suri, Raja Panjwani, Anikait Singh, Klara Kaleb
Google X, Application Number: 52750.

"*Large Language Model Interface for Supply Chain Networks*" 2023
Lam Nguyen, Grace Brentano, David Andre, Salil Pradhan, Anikait Singh, Karush Suri
Google X, Application Number: 52503.

"*Generating Network Alignment Information*" 2022
Raja Panjwani, Anikait Singh, Ashish Chona, Sze Lee, Grace Brentano,
Karush Suri, Lam Nguyen, Salil Pradhan
Google X, Application Number: 52766.

SERVICES

Reviewer, *ICML* 2024 - Present
Reviewer, *ICLR* 2024 - Present
Reviewer, *NeurIPS* 2024 - Present
Teaching Assistant, *Digital Image Processing*, University of Toronto 2021
Teaching Assistant, *Computational Thinking*, University of Toronto 2021
Teaching Assistant, *Computer Networks*, University of Toronto 2020
Teaching Assistant, *Computer Organization*, University of Toronto 2020

Autodidactic Learning

1. Reading

I shortlist and read 3-5 conference papers every week. Papers are shortlisted based on how different they are from my current research or engineering topic. I also revisited old mathematics and machine learning textbooks. Some of the material I have read and solved over the years is listed below-

- Topology, James Munkres, all chapters
- Topics in Algebra, I.N. Herstein, all chapters
- Optimization Algorithms on Matrix Manifolds, P. Absil, R. Mahony, R. Sepulchre, all chapters
- Convex Optimization, Stephen Boyd, chapters 6-11
- Neuro-dynamic Programming, Dimitri Bertsekas and John Tsitsiklis, chapters 1-6
- Abstract Dynamic Programming, Dimitri Bertsekas, chaters 1-2
- Machine Learning: A Probabilistic Perspective, Kevin Murphy, chapters 20-24
- Pattern Recognition and Machine Learning, Christopher Bishop, chapters 8-12

2. Writing

I write my ideas in a document once every week. I tend to summarize my idea in 0.5-1 page. In addition to my ideas, I used to summarize important papers. Length of the summary was kept 1 page. The list of paper summaries can be found here.

3. Code Implementations

I previously implemented large codebases as open-source projects once every two months. Below is the list of polished as well as unpolished codebases-

- Toy Examples (JAX and PyTorch) (here)
- Hierarchical DQN (JAX) (here)
- Proximal Policy Optimization (JAX) (here)
- Conservative Q Learning (JAX) (here)
- Discrete Gumbel Samplers (JAX) (here)
- Eligibility Traces with Neural Networks (PyTorch) (here)
- Evolution Strategies (PyTorch) (here)
- Lagrangian Algorithms and Vector Products (Autograd) (here)