



Varun Sreedhara Bhatt

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Research Interests: Open-Ended Learning, Quality Diversity Optimization, Reinforcement Learning, Multi-Agent Systems, Human-Robot Collaboration

EDUCATION

Doctor of Philosophy (Computer Science) | University of Southern California | **GPA: 4/4** [2021-Present]

- Training generally capable intelligent agents by leveraging quality diversity optimization and scenario generation

Master of Science (Computing Science) | University of Alberta | **GPA: 3.9/4** [2018-2020]

- **Thesis:** Inference-Based Deterministic Messaging for Multi-Agent Communication (supervised by Prof. Michael Buro)
 - Identified issues with multi-agent reinforcement learning methods when learning to communicate
 - Proposed a method based on simulating Bayesian inference of private state for guiding agent's messages

Bachelor of Technology (Electrical Engg) | Indian Institute of Technology Bombay | **GPA: 9.55/10** [2014-2018]

- Minor in Computer Science (GPA: 10/10)
- **Project:** Unsupervised Learning Using Sparse Coding in Spiking Convolutional Neural Networks (supervised by Prof. Udayan Ganguly)
 - Extended the idea of sparse coding into spiking convolutional neural networks
 - Showed improvements in data and energy efficiency compared to traditional CNNs

PUBLICATIONS, PATENTS, AND PRE-PRINTS

- Zhang, Y., Jiang, H., **Bhatt, V.**, Nikolaidis, S., and Li, J. "**Guidance Graph Optimization for Lifelong Multi-Agent Path Finding**," *arXiv preprint arXiv:2402.01446*. (Accepted at IJCAI 2024). [Arxiv link](#)
- Zhang, Y., Fontaine, M. C., **Bhatt, V.**, Nikolaidis, S., and Li, J. "**Arbitrarily Scalable Environment Generators via Neural Cellular Automata**," in *Advances in Neural Information Processing Systems (NeurIPS)*, 2023. [Arxiv link](#).
- **Bhatt, V.**, Nemlekar, H., Fontaine, M.C., Tjanaka, B., Zhang, H., Hsu, Y. C., and Nikolaidis, S. "**Surrogate Assisted Generation of Human-Robot Interaction Scenarios**," in *Proceedings of the Conference on Robot Learning (CoRL)*, 2023. [Oral Presentation](#). [Arxiv link](#).
- Zhang, Y., Fontaine, M. C., **Bhatt, V.**, Nikolaidis, S., and Li, J. "**Multi-Robot Coordination and Layout Design for Automated Warehousing**," in *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI)*, 2023. [Arxiv link](#).
- **Bhatt, V.***, Tjanaka, B.*, Fontaine, M. C.*, and Nikolaidis, S. "**Deep Surrogate Assisted Generation of Environments**," in *Advances in Neural Information Processing Systems (NeurIPS)*, 2022. [Arxiv link](#).
- **Bhatt, V.** and Buro, M. "**Inference-based Deterministic Messaging For Multi-Agent Communication**," in *Proceedings of the 35th AAAI Conference on Artificial Intelligence*, 2021. (also accepted at the *AAAI Workshop on Reinforcement Learning in Games*, 2021). [Arxiv link](#).
- Kalyanakrishnan, S., Aravindan, S.*, Bagdawat, V.*, **Bhatt, V.***, Goka, H.*, Gupta, A.*, Krishna, K.*, and Piratla, V.* "**An Analysis of Frame-skip in Reinforcement Learning**," *arXiv preprint arXiv:2102.03718*, 2021. [Arxiv link](#).
- **Bhatt, V.**, Shrivastava, S., Chavan, T., and Ganguly, U. "**Software-Level Accuracy Using Stochastic Computing With Charge-Trap-Flash Based Weight Matrix**," in *Proceedings of the International Joint Conference on Neural Networks (IJCNN)*, 2020. [Arxiv link](#).
- Shrivastava, S., Chavan, T., **Bhatt, V.**, and Ganguly, U. "**Flash Memory for Low Energy Synapse**," an Indian Patent Application (Number 201921006118).
- **Bhatt, V.**, and Ganguly, U. "**Sparsity Enables Data and Energy Efficient Spiking Convolutional Neural Networks**," in *Proceedings of the 27th International Conference on Artificial Neural Networks (ICANN)*, 2018.

WORK EXPERIENCE

Research Assistant | *Prof. James Wright, University of Alberta, Canada*

[Sep 2020-Aug 2021]

- Worked on modelling human behaviour in strategic games
- Collected human behaviour data using **Amazon Mechanical Turk** and analyzed it through **behavioural game theory** models

Internships

• **Samsung Electronics** | *South Korea*

[May-July 2017]

- Created a prototype for a **smart home monitoring system** using anomaly detection
- Received a **pre-placement offer** based on the work done during the internship

• **Philips** | *India*

[May-July 2016]

- Developed a framework to **automatically generate lip-sync animations** and emotions in a 3D avatar given a text to speak, as a part of a virtual chatbot

Teaching Assistantship

• **Deep Learning and its Applications**, *University of Southern California*

[Spring 2024]

• **Introduction to Robotics**, *University of Southern California*

[Fall 2023]

• **Intelligent Agents**, *University of Alberta*

[Winter 2020]

• **Reinforcement Learning Specialization**, *University of Alberta on Coursera*

[2019-2020]

• **Introduction to the Foundations of Computation**, *University of Alberta*

[Fall 2018, Winter 2019, Fall 2019]

• **Partial Differential Equations**, *Indian Institute of Technology Bombay*

[Autumn 2016]

OTHER TALKS

- **“Quality Diversity Scenario Generation for Robust Intelligent Agents”** at USC Theta Tau Professor Research Event, 2024, on behalf of the ICAROS Lab.
- Introduction to **“Environment Generation for Generalizable Robots (EGG)”** at EGG workshop at RSS 2023.
- Talk on **“Training Multiple Intelligent Agents to Communicate”** at the Tea Time Talks 2019, Department of Computing Science, University of Alberta (video available on [YouTube](#))
- Joint talk with Arta Seify on **“The StarCraft 2 ML Environment”** at the AIIDE-18 Workshop on Artificial Intelligence for Strategy Games
- The project "Smart Room" was selected as the best project in the category of reproducibility at Tech & RnD Exposition 2015, IIT Bombay

OUTREACH

- Represented ICAROS Lab in the Robotics Open House 2024, showing robot demos to K-12 students.
- Led the organization of the first workshop on **“Environment Generation for Generalizable Robots (EGG)”** at RSS 2023.
- Conference/Journal reviews: GECCO 2023, EGG workshop at RSS 2023, ALOE workshop at NeurIPS 2023, HRI 2024, GECCO 2024, TEVC-IEEE

TECHNICAL SKILLS

- **Programming Languages:** Python, C/C++
- **Libraries:** PyTorch, TensorFlow, NumPy, Pandas, Jax, ROS, Isaac Sim