DEVDHAR PATEL

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EDUCATION

University of Massachusetts - Amherst, MA
[Aug 2019 - ***present***]
PhD computer science (GPA : 3.9)
Advisor: Hava Siegelmann, Ph.D.

University of Massachusetts - Amherst, MA
[Aug 2017 - ***May*** 2019]
MS computer science (GPA : 3.89)

Vellore Institute of Technology - Vellore, India
[2011 - 2015]
Bachelor of Technology in computer science and engineering (GPA: 7.92/10)
Thesis: “Universal Low-Cost Sensor Interface Using GSM Module Capable of IOT”
Advisors: **Prof. Senthil J** and **Dr. Maria Ekstrand** (Professor, University of California San Francisco)

PUBLICATIONS

1. **Patel, D.**, & Siegelmann, H. (2024). Overcoming Slow Decision Frequencies in Continuous Control: Model-Based Sequence Reinforcement Learning for Model-Free Control. arXiv preprint arXiv:2410.08979. **(Accepted ICLR 2025)**

2. Russell, J., Gavier. I., **Patel, D.**, Rietman, E., & Siegelmann, H. (2025). Optimizing Neural Network Representations of Boolean Networks. **(Accepted ICLR 2025)**

3. **Patel, D.**, & Siegelmann, H. (2024). Navigating the Unknown: Leveraging Self-Information and Diversity in Partially Observable Environments. Biochemical and Biophysical Research Communications, 150923.

4. **Patel, D.**, Sejnowski, T., & Siegelmann, H. (2024). Optimizing Attention and Cognitive Control Costs Using Temporally Layered Architectures. *Neural Computation*, 1-30.

5. **Patel, D.**, Russell, J., Walsh, F., Rahman, T., Sejnowski, T., & Siegelmann, H. (2023, June). Temporally Layered Architecture for Adaptive, Distributed and Continuous Control. In The 22nd International Conference on Autonomous Agents and Multiagent Systems (pp. 2830) (AAMAS 2023).

6. Gavier, I., Russell, J., **Patel, D.**, Rietman, E., & Siegelmann, H. (2023, May). Neural Network Compiler for Parallel High-Throughput Simulation of Digital Circuits. In 2023 IEEE International Parallel and Distributed Processing Symposium (IPDPS) (pp. 613-623). IEEE.

7. **Patel, D.**, Gavier, I., Russell, J., Malinsky, A., Rietman, E., & Siegelmann, H. (2022, July). Automatic Transpiler that Efficiently Converts Digital Circuits to a Neural Network Representation. In 2022 International Joint Conference on Neural Networks (IJCNN) (pp. 01-08). IEEE.

8. Tan, W., Kozma, R., & **Patel, D.** (2022). Optimization methods for improved efficiency and performance of Deep Q-Networks upon conversion to neuromorphic population platforms. Knowledge-Based Systems, 241, 108257.

9. **Patel, D.** & Kozma, R. (2020, July). Unsupervised Features Extracted using Winner-Take-All Mechanism Lead to Robust Image Classification. In 2020 International Joint Conference on Neural Networks (IJCNN 2020).

10. Tan, W., **Patel, D.**, & Kozma, R. (2021, May). Strategy and benchmark for converting deep q-networks to event-driven spiking neural networks. In *Proceedings of the AAAI conference on artificial intelligence* (Vol. 35, No. 11, pp. 9816-9824).

11. **Patel, D.**, Hazan, H., Saunders, D. J., Siegelmann, H. T., & Kozma, R. (2019). Improved robustness of reinforcement learning policies upon conversion to spiking neuronal network platforms applied to Atari Breakout game. Neural Networks, 120, 108-115.

12. Saunders, D. J., **Patel, D.**, Hazan, H., Siegelmann, H. T., & Kozma, R. (2019). Locally connected spiking neural networks for unsupervised feature learning. Neural Networks, 119, 332-340.

13. Hazan, H., Saunders, D. J., Khan, H., **Patel, D.**, Sanghavi, D. T., Siegelmann, H. T., & Kozma, R. (2018). Bindsnet: A machine learning-oriented spiking neural networks library in python. Frontiers in neuroinformatics, 12, 89.

WORKSHOPS & POSTERS

1. **Overcoming Slow Decision Frequencies in Continuous Control: Model-Based Sequence Reinforcement Learning for Model-Free Control. (Contributed Talk)** PRL @ AAAI 2025. 03/04/2025
2. **Overcoming Slow Decision Frequencies in Continuous Control: Model-Based Sequence Reinforcement Learning for Model-Free Control**. GenPlan @ AAAI 2025. 03/04/2025
3. **Developing muscle memory using temporally asymmetric actor-critic.** From Neuroscience to Artificially Intelligent Systems (NAISYS) meeting, Cold Spring Harbor Laboratory. 9/28/2024
4. **Robust control in partially observable environments using self-information and asymmetric actor-critic.** From Neuroscience to Artificially Intelligent Systems (NAISYS) meeting, Cold Spring Harbor Laboratory. 09/28/2024
5. **Temporally Layered Architecture for Adaptive, Distributed and Continuous Control.** Human centered robotics summer symposium, UMASS Amherst. 08/11/2023
6. **Efficient Control in Real Time Reinforcement Learning Using Temporally Layered Architecture.** Control and Learning Enabled Verifiable Robust AI (CLEVR-AI) MURI Year 1 Review, Northeastern University. 08/23/2022
7. **TempoMod: Enhancing resiliency, efficiency, and learning capability with Neuron frequency modulation and temporal adaptivity.** Interdisciplinary Neurosciences Conference, UMASS Amherst. 05/26/2022
8. **Robust Control in Real Time Reinforcement Learning Using Adaptive Response Times.** From Neuroscience to Artificially Intelligent Systems (NAISYS) meeting, Cold Spring Harbor Laboratory. 04/05/2022

RESEARCH EXPERIENCE

Graduate Researcher, BINDS Lab, University of Massachusetts Amherst May 2018 - present

Advisor: **Hava Siegelmann** (Professor, University of Massachusetts Amherst)

- Energy efficient, time aware and low frequency control using reinforcement learning
- Neuroscience Inspired Time Aware artificial intelligence including early exits and adaptive control of agents
- Compiler for conversion of digital circuits to neural networks for parallel fast simulation
- Biologically inspired and Biologically-plausible artificial intelligence. Including Spiking neural networks, generalization in neural networks, Reinforcement learning
- Involved in building a Python library for GPU-enabled Spiking neural network simulation

Tel-Me-Box: Validating and testing a novel, low-cost, real-time adherence monitoring device June, 2014 - 2020

Advisor: **Dr. Maria Ekstrand** (Professor, University of California San Francisco)

- Design and manufactured portable low-cost adherence monitor devices for a research study.
- The NIH funded research study is being conducted by University of California, San Francisco at St. Johns Research Institute, Bangalore, India.
- More than 200 of these devices have been successfully deployed in remote areas.

Creation Labs, VIT University March 2014 - May, 2015

Advisor: **Dr. V. Raju** (then Vice Chancellor, VIT University, Vellore)

- Core member of a student-driven multidisciplinary lab established to carry out research projects and develop disruptive technologies in many different fields. http://creationlabs.in/
- Worked on various projects including Open projects, Adherence monitor device, UDK game demo and smart clock.
- Managed the lab on a day-to-day basis in terms of technical guidance, acquiring resources and organizing events.

• Mentored and overlooked various projects. Some notable projects include: Traffic dashboard, a smart traffic monitoring platform that won the ACM big data challenge, Mars rover built for the European rover challenge and a smart irrigation system.

PROFESSIONAL EXPERIENCE

GameChange Solutions, Dubai January, 2016 - May, 2017
Software developer
• Helped develop a gamified performance management and planning module for the banking industry.

Camel Port logistics, Mumbai
Software developer January, 2015 - October, 2015
• designed and developed the platform for GPS tracking of vehicles via online portal.
• worked on developing the e-commerce website.

TEACHING EXPERIENCE

- CMPSCI 119 – Introduction to Programming (Teaching Associate Spring 2025)
- CMPSCI 591/691NR – Neuroscience and Engineering (Teaching Associate Spring 2023) (Co-taught with Prof. Hava Siegelmann)
- First Year Seminar – Neuroscience and AI (Teaching Associate Fall 2022)
- CMPSCI 119 - Introduction to Programming (TA Fall 2024)
- INFO 150 - A Mathematical Foundation for Informatics (TA Spring 2024)
- CMPSCI 383 - Artificial Intelligence (TA – Fall 2023)
- CMPSCI 591/691NR – Neuroscience and Engineering (TA Spring 2022)
- CMPSCI 335 - Inside the Box - How Computers Work (TA Fall 2020)
- CMPSCI 690NR - Neural Networks and Neurodynamics (TA Spring 2020)
- CMPSCI 383 – Artificial Intelligence (TA Fall 2019)

AWARDS

1. The Initiative on Neurosciences (IONs) Inspiration Award winner 2022 (UMASS Amherst)
2. UMASS CICS Travel Grant 2023
3. UMASS CICS Travel Grant 2022

SEVICE & OUTREACH

Undergraduate and Higher Education Mentoring
- UMASS Undergraduate Research Volunteers (URV) Program Winter 2024
- UMASS Undergraduate Research Volunteers (URV) Program Summer 2024
- AI session for Massenberg Summer STEM Institute 2023 (10^{th} grade students)
- UMASS Undergraduate Research Volunteers (URV) Program Summer 2023
- UMASS Undergraduate Research Volunteers (URV) Program Winter 2022-2023
- UMASS Undergraduate Research Volunteers (URV) Program Summer 2021

Reviewer
- Biochemical and Biophysical Research Communications: 2024
- Nature Scientific Reports: 2024
- Neural Processing Letters: 2023
- Nature Machine Intelligence: 2023
- IEEE Transactions on Neural Networks and Learning Systems: 2023
- Frontiers in Computational Neuroscience: 2022
- ICML: 2022
- IJCNN: 2022
- Nature Scientific Reports: 2022

NOTABLE UNDERGRADUATE MENTEES

1. **Charles Zhang**: Post-bac Researcher Harvard
2. **Elvira Xiong**: MS Computer Science UMASS Amherst
3. **Itir Sayar**: PhD Program Computer Science UMASS Amherst

SPEAKING ENGAGEMENTS

Invited Talks

- Bridging the Gap Between AI Planning and Reinforcement Learning Workshop (PRL) @ AAAI 03/04/2025: "Overcoming Slow Decision Frequencies in Continuous Control: Model-Based Sequence Reinforcement Learning for Model-Free Control"
- From Neuroscience to Artificially Intelligent Systems (NAISys) 2024: "Optimizing Attention and Cognitive Costs with Multi-Policy Reinforcement Learning"
- DARPA Microelectronics Automation Design Assurance Meeting (MADAM) 2022: "MOKA: Modular Knowledgeable AI" (To Program Managers)

Guest Lectures

- University of Massachusetts Amherst, FYS: Modern Computing. "Introduction to Bio-Inspired Reinforcement Learning." – October 23, 2024
- University of Massachusetts Amherst, COMPSCI 389 Introduction to Machine learning. "Multi-objective Optimization in Neural Networks" – Spring 2022
- University of Massachusetts Amherst, COMPSCI 690NR Machine Learning. "Introduction to Spiking Neural Networks." – Spring 2020