Shivam Goel

shivam.goel@tufts.edu | personal website | linkedin | github | twitter | scholar

Research interests

- Reinforcement learning
- Neurosymbolic AI
- Robotics/Robot Learning
- Cognitive Systems
- Multimodal learning
- Computer Vision/Deep Learning

Education

Tufts University — Medford, MA
Ph.D. Candidate in Computer Science — *Jan 2020 – Present*
Advisor: Dr. Jivko Sinapov

Washington State University — Pullman, WA
Masters of Science in Computer Science — *Aug 2015 – May 2017*
Advisor: Dr. Matthew E. Taylor

Uttar Pradesh Technical University — Noida, UP
Bachelors of Engineering in Information Technology — *Aug 2011 – June 2015*

Peer reviewed Publications

- **Shivam Goel**, Shijie Fang, Wenchang Gao, Matthias Scheutz, Jivko Sinapov. FLEX : A Framework for Learning Robot-Agnostic Force-based Skills Involving Sustained Contact Object Manipulation. Under review at IEEE International Conference on Robotics and Automation (ICRA), Atlanta, 2025.
- Pierrick Lorang, **Shivam Goel**, Yash Shukla, Patrick Zips, Matthias Scheutz. A Framework for Neurosymbolic Goal-Conditioned Continual Learning for Open World Environments. In proceedings of International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, 2024.
- James Staley, **Shivam Goel**, Yash Shukla, Elaine Schaertl Short. Agent-Centric Human Demonstrations Train World Models. In proceedings of the First Reinforcement Learning Conference (RLC), Amherst, 2024
- **Shivam Goel**, Yichen Wei, Panagiotis Lymperopoulos, Klara Chura, Matthias Scheutz, Jivko Sinapov. NovelGym: A Flexible Ecosystem for Hybrid Planning and Learning Agents Designed for Open Worlds. In proceedings of the 23rd International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2024.
- **Shivam Goel**, Panagiotis Lymperopoulos, Ravenna Thielstrom, Evan Krause, Patrick Feeney, Pierrick Lorang, Sarah Schneider, Yichen Wei, Eric Kildebeck, Stephen Goss, Michael C. Hughes, Liping Liu, Jivko Sinapov and Matthias Scheutz. A Neurosymbolic Cognitive Architecture Framework for Handling Novelties in Open Worlds. Journal of Artificial Intelligence (AIJ), Vol. 331, Special Issue on Open-World AI, June 2024.
- Yash Shukla, Bharat Kesari, **Shivam Goel**, Robert Wright, Jivko Sinapov. A Framework for Few-Shot Policy Transfer through Observation Mapping and Behavior Cloning. In Proceedings of IEEE Robotics and Automation Society (IROS), 2023.
- Pierrick Lorang, **Shivam Goel**, Patrik Zips, Jivko Sinapov, Matthias Scheutz. Speeding-up continual learning through information gains in novel experiences. In proceedings of 4th Planning and Reinforcement Learning (PRL) Workshop at International Joint Conference on Artificial Intelligence (IJCAI), 2022.
- **Shivam Goel**, Yash Shukla , Vasanth Sarathy, Matthias Scheutz, and Jivko Sinapov. RAPid-Learn: A Framework for Learning to Recover for Handling Novelties in Open-World Environments.In Proceedings of International Conference on Development and Learning (ICDL), 2022.
- **Shivam Goel**, Gyan Tatiya, Matthias Scheutz, Jivko Sinapov. NovelGridworlds: A Benchmark Environment for Detecting and Adapting to Novelties in Open Worlds. In proceedings of 13th Adaptive Agents and Learning (ALA) Workshop at the International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2021
- Faizan Muhammad, Vasanth Sarathy, Gyan Tatiya, **Shivam Goel**, Saurav Gyawali, Mateo Guaman, Jivko Sinapov, Matthias Scheutz. A novelty-centric agent architecture for changing worlds. In proceedings of 20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2021

- Vasanth Sarathy, Daniel Kasenberg, **Shivam Goel**, Jivko Sinapov, Matthias Scheutz. Spotter: Extending symbolic planning operators through targeted reinforcement learning. In proceedings of the 20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2021
- Garrett Wilson, Christopher Pereyda, Nisha Raghunath, Gabriel de la Cruz, **Shivam Goel**, Sepehr Nesaei, Bryan Minor, Maureen Schmitter-Edgecombe, Matthew E Taylor, Diane J Cook. Robot-enabled support of daily activities in smart home environments. In Proceedings of Journal of Cognitive Systems Research, 2019
- **Shivam Goel**, Santosh Bhusal, Matthew E Taylor, Manoj Karkee. Detection and localization of birds for Bird Deterrence using UAS. In proceedings of Annual International Meeting of the American Society of Agricultural and Biological Engineers (ASABE), 2017.
- Santosh Bhusal, Kapil Khanal, **Shivam Goel**, Manoj Karkee, Matthew Edmund Taylor. Bird deterrence in a vineyard using an Unmanned Aerial System (UAS). In Transactions of the American Society of Agricultural and Biological Engineers (ASABE), 2019.
- Santosh Bhusal, **Shivam Goel**, Kapil Khanal, Matthew Taylor, Manoj Karkee. Bird detection, tracking and counting in wine grapes. In proceedings of Annual International Meeting of the American Society of Agricultural and Biological Engineers (ASABE), 2017.

Experience

Mulip Lab – Tufts University Medford, MA
Researcher *Jan 2020 – present*
- Advisor: Dr. Jivko Sinapov
- Designing neurosymbolic AI techniques to enhance sample efficiency in robot/agent learning for open-world scenarios.
- Authored multiple peer-reviewed conferences and journal publications focused on AI, robotics, and machine learning.

HRI Lab – Tufts University Medford, MA
Researcher *May 2023 – present*
- Advisor: Dr. Matthias Scheutz
- Developing AI approaches to adapt on-the-fly in robotic manipulation scenarios and self-driving car domains.
- Developed a neurosymbolic approach for agent adaptation in dynamic self-driving car simulation (CARLA) environments.

IRL Lab – Washington State University Pullman, WA
Researcher *Oct 2016 – Dec 2019*
- Advisor: Dr. Matthew E. Taylor
- Focused on computer vision and reinforcement learning in robotics applications.
- Collaborated with agricultural roboticists in developing AI systems for bird deterrence and apple picking in orchards.
- Co-authored multiple journal articles and peer-reviewed conference articles at agricultural tech and computer vision venues.

CASAS Lab – Washington State University Pullman, WA
Researcher *Jan 2018 – Dec 2019*
- Advisor: Dr. Diane J. Cook
- Worked on smart home technology for elder care, utilizing AI for daily living assistance.
- Co-authored a journal article and a peer-reviewed conference paper in the areas of healthcare technology and elderly care.

Center of AI for Social Good – University of Southern California Los Angeles, CA
Research Intern *Apr 2018 – Dec 2018*
- Advisors: Dr. Milind Tambe & Dr. Bistra Dilkina
- Worked on AI research for environmental and societal benefits, focusing on wildlife conservation
- Developed computer vision techniques for detecting wildlife and poachers using UAV-based thermal imaging (improved detection accuracy from 30% to 68%).

Teaching Experience

Tufts University – Teaching Assistant Medford, MA
Artificial Intelligence – Dr. Fabrizio Santini *Sep 2023– Present*
- Assisted students with AI theory and assignment implementation queries.
- Graded tests and homework assignments

Washington State University – Teaching Assistant Pullman, WA
Operating Systems – Dr. K.C. Wang *Sep 2018– Dec 2019*
- Co-developed assignments for the course involving C++
- Graded and assisted students in assignments

Washington State University – Teaching Assistant Pullman, WA
Software Engineering – Dr. David Bakken *Sep 2017– May 2018*
- Co-developed assignments for the course involving C#
- Graded and assisted students in assignments

Washington State University – Teaching Assistant Pullman, WA
Algorithms – Dr. Zhe Dang *Sep 2016– Dec 2016*
- Graded and assisted students in assignments

Current active projects

Robot learning in open-world environments | *Reinforcement learning, Task & Motion Planning, Hierarchical RL*
- Robot adaptation to out-of-distribution situations in open-world environments

Hint-guided learning to efficiently resolve open world novelties | *Neurosymbolic AI, Human Robot Interaction*
- Constrain the state space of the agent to guide itself towards relevant state spaces through SAT solving.
- Larger goal is to incorporate human-in-the-loop learning in open-world environments

Force based reinforcement learning for novelty handling | *Task & Motion Planning, Physics-based learning*
- Learning tasks using physical simulators to learn robot agnostic policies.

Skills

Programming: Python, Java, C++, R, MATLAB
Frameworks: Robot Operating Systems (ROS), Robosuite, CARLA
Deep Learning frameworks: PyTorch, Tensorflow, PyBullet
Developer Tools: Linux, Git, Docker, VS Code, IntelliJ
Relevant Coursework: Reinforcement Learning, Probabilistic Robotics for HRI, Machine Learning, Artificial Intelligence, Introduction to Robotics, Operating Systems, Pervasive Computing, Robot Kinematics and Dynamics.

Service & Outreach

2025 : IROS-25, ICAPS-25 Reviewer
2024 : ICAPS-24, IEEE-ICDL, IEEE Transactions on Control Systems Technologies reviewer
2022 : AAMAS-22 reviewer
2022 : Co-organizer & Program Committee at 2nd IJCAI Workshop on Artificial Intelligence for Autonomous Driving (AI4AD).
2020 : Initiated and organized bi-weekly RL reading group at Tufts SAIL-ON program.
2019: RL Reading Group Coordinator at WSU
2016, 2017: IRL Lab bi-weekly seminar coordinator at WSU
2018, 2019: Volunteered as a photographer at the Eastern Washington Aspirations in Computing Award Ceremony and Banquet.