YASH SHUKLA

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RESEARCH INTERESTS

- Reinforcement Learning
- Curriculum Learning
- Sim2Real Transfer
- Robot Learning
- Computer Vision
- Multimodal Learning for Robots

EDUCATION

Ph.D. in Computer Science and Human-Robot Interaction Sept '20 – Present
TUFTS University, Medford, MA (GPA - 4.0/4.0)
Relevant Courses: Reinforcement Learning, Probabilistic Robotics, Algorithms

Master of Science in Robotics Engineering Aug '18 – May '20
Worcester Polytechnic Institute (WPI), Worcester, MA (GPA - 4.0/4.0)
Relevant Courses: Deep Learning for Perception, Artificial Intelligence, Robot Control, Human Robot Interaction

Bachelor of Engineering (Hons.) in Mechanical Engineering Aug '14 – May '18
Birla Institute of Technology and Science, Pilani, India (CGPA - 8.36/10)
Relevant Courses: Digital Image Processing, Robotics and Mechanisms, Mechatronics

PEER-REVIEWED PUBLICATIONS

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, *To appear in Proceedings of International Conference on Development and Learning (ICDL), 2022.*
** - Denotes equal contribution*

Yash Shukla, Jivko Sinapov. A Framework for Curriculum Schema Transfer from Low-Fidelity to High-Fidelity Environments, *At the 3^{rd} Workshop on Closing the Reality Gap in Sim2Real Transfer for Robotics at Robotics: Science and Systems (RSS), 2022.*

Yash Shukla, Kaleb Loar, Robert Wright, Jivko Sinapov. An Object-Oriented Approach for Generating Low-Fidelity Environments for Curriculum Schema Transfer, *At the Scaling Robot Learning Workshop at International Conference on Robotics and Automation (ICRA), 2022.*

Yash Shukla, Christopher Thierauf, Ramtin Hosseini, Gyan Tatiya, Jivko Sinapov. ACuTE: Automatic Curriculum Transfer from Simple to Complex Environments, *In proceedings of the International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2022.*

Gyan Tatiya, **Yash Shukla**, Michael Edegware and Jivko Sinapov. Haptic Knowledge Transfer Between Heterogeneous Robots using Kernel Manifold Alignment, *In proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020.*

SKILLS

Programming: Python, C/C++, MATLAB, Java

Robotic Frameworks: Robot Operating System

Deep Learning Frameworks: PyTorch, Tensorflow, Keras

Simulation Softwares: PyBullet, Gazebo, OpenRave, NVIDIA FleX, OpenAI gym, MuJoCo, Isaac Gym

Libraries: OpenCV, Point Cloud Library, scikit-learn

EXPERIENCE

Tufts University, Medford, MA Aug '20 – Present

Designing efficient techniques for Curriculum Learning in Reinforcement Learning.

· Proposed curriculum transfer for efficient learning in Robotic high-fidelity environments (AAMAS 2022).

· Formulating novel curricula design by incorporating Linear Temporal Logic in long horizon tasks.(Under submisssion)

Computer Vision Team, MathWorks, Natick, MA May '19 – Aug '19

· Formulated an innovative CV algorithm to improve accuracy of camera calibration parameters for Fisheye Cameras.

· The Checkerboard Detection algorithm designed for Fisheye Cameras had better true positive detection even for images from Pinhole and Stereo Cameras.

· Achieved better checkerboard detection precision (98 %) as compared to the existing technique (83 %).

Centre for Artificial Intelligence and Robotics, Bangalore, India Jan '18 – June '18

· Developed a novel image processing algorithm for efficient road segmentation in unstructured environment.

· Generated pointcloud costmap in ROS using Velodyne LIDAR, Stereo Camera and Ultrasonic sensor.

· Achieved better segmentation accuracy (91 %) as compared to existing Pyramid Scene Parsing Network (79 %).

PROJECTS

Zero-Shot Policy Transfer through observation mapping Jan '21 – Present

· Developed zero-shot policy transfer by cloning a policy with observations mapped using modified CycleGAN.

· Formulated task agnostic policy transfer using learned latent models. (Work currently under submission)

Offline RL with human feedback, Tufts University Jan '21 – Present

· Working on incorporating human feedback in a diverse offline RL dataset to improve sample efficiency.

Dynamic novelty accommodation in plan execution failures, Tufts University May '21 – Jan '22

· Built a framework for dynamic open-world novelty accommodation in incomplete domain knowledge scenarios.

· Co-authored a paper accepted at the International Conference on Development and Learning (ICDL), 2022.

Multi-Source Feature Alignment for Collaborative Robot Learning, Tufts University Jan '20 – May '20

· Designed representation for knowledge transfer using kernel manifold alignment (KEMA). (Accepted at IROS 2020)

· The representation enabled two source robots to transfer knowledge about novel objects to a target robot.

Graphical Neural Network For Real-Time Simulation of Soft Robotic Snakes, WPI Jan '20 – May '20

· Developed a graph neural network to model structure of a soft snake robot for efficient locomotion.

· Achieved improved time to threshold and regret on PPO compared to non graphical model.

Learning based Motion Planning for Manipulators, WPI Aug '19 – Dec '19

· Designed and applied DDPG-MP to a 4 DOF manipulator to achieve motion planning faster than RRT.

· Compared and evaluated Imitation Learning, Supervised Learning and DDPG-MP approaches for motion planning.

Viewpoint optimization for aiding grasp synthesis using Supervised learning, WPI Jan '19 – Dec '19

· Implemented active vision methodology to optimize depth sensor viewpoint to increase synthesized grasp quality.

· Implementing the algorithms on Franka Emika Panda Robot.

Ship Detection and Segmentation from Aerial Images, WPI Aug '18 – Dec '18

· Implemented a two model Deep Learning architecture to segment ships from aerial images on Airbus Dataset.

· Applied ResNet to classify images containing ships and later segmented them using a stacked Hourglass model.

Control Lyapunov Barrier Strategy for Adaptive Cruise Control, WPI Aug '18 – Dec '18

· Combined Control Lyapunov and Barrier Functions to achieve Adaptive Cruise Control for a vehicle.

· Extended this control strategy in 2 Dimensions with incorporation of the dynamic model of turtlebot.